LIDDELL

GLENCORE

2018 Annual Review

Status: Final

Version: 1

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Table 1 Title Block

Name of operation	Liddell Coal Operations Pty Ltd
Name of operator	Liddell Coal Operations
Development consent / project approval #	DA-305-11-01
Name of holder of development consent / project approval	Liddell Coal Operations
Mining lease #	ML1597, CCL708, ML1552, ML1313
Name of holder of mining lease	Liddell Tenements Pty Ltd
Water licence #	Refer to **Table 6**
Name of holder of water licence	Refer to **Table 6**
MOP/RMP start date	December 2017
MOP/RMP end date	December 2020
Annual Review start date	January 1st 2018
Annual Review end date	December 31st 2018

I, David Foster, certify that this audit report is a true and accurate record of the compliance status of Liddell Coal Operations Pty Ltd for the period 1st January 2018 to 31st December 2018 and that I am authorized to make this statement on behalf of Liddell Coal Operations Pty Ltd.

Note.

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

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

Name of authorized reporting officer	David Foster
Title of authorized reporting officer	Operations Manager
Signature of authorized reporting officer	
Date	29 March 2019

1 Statement of Compliance

During the reporting period, LCO operated as per the approvals listed in **Section 3**. The following **Table 2** and **Table 3** provide a summary of LCO's compliance with key operational approvals.

Table 2 Statement of compliance

Statement of Compliance	
Approval	Were all conditions of approval complied with?
DA 305-11-01	No
ML #1597	Yes
ML #1313	Yes
CCL #708	Yes
ML #1552	Yes
EPL 2094	No
EPBC 2013/6908	Yes
MOP 2018-2020	Yes
Aboriginal Heritage Impact Permit (AHIP No. 0000623)	Yes
OSSM 3916/2008 (Onsite Sewage Management System)	No

During the reporting period LCO had a number of non-compliances listed below in **Table 3**.

Table 3 Non-compliances

Non Compliances					
Approval	Condition Reference	Condition Description	Compliance status*	Comment	Section of AR for detailed response
DA 305-11-01	Schedule 3 Condition 16	Short term impact assessment criterion for particular matter	Non-compliant	Short term impact assessment criterion for particular matter exceeded the 24 hour averaging period PM10 criterion at monitoring unit SX38-D1 on four occasions. Investigation determined that extraordinary events or regional conditions resulted in the exceedances opposed to contribution by LCO operations.	Section 6.3
DA 305-11-01	Schedule 3 Condition 16	Short term impact assessment criterion for particular matter	Non-compliant	Short term impact assessment criterion for particular matter exceeded the 24 hour averaging period PM10 criterion at monitoring unit SX38-D2 on 11 occasions. Investigation determined that extraordinary events, regional conditions or unit faults resulted in the exceedances opposed to contribution by LCO operations.	Section 6.3
DA 305-11-01	Schedule 3 Condition 21A	Water pollution	Non-complaint	An incident occurred on 28 November 2018 in which sediment laden run-off breached a containment drain and flowed into an isolated pool within Bowman's Creek.	Section 7.2.2

DA 305-11-01	Schedule 3 Condition 21B	Discharge limit exceedance	Non-compliant	In June/July 2018 the MIA STP treated effluent exceeded the E.coli concentration limit specified in each applicable approval at the discharge. LCO responded in accordance with the Water Management Plan TARP. Treated effluent from the plant is recycled into the mine dirty water system and contained onsite.	
OSSM 3916/2008 (Onsite Sewage Management System)	Schedule 3 Condition 21B	Discharge limit exceedance			
EPL 2094	Condition L2.4	Discharge limit exceedance			
DA 305-11-01	Schedule 3 Condition 4	Impact Assessment Criteria	Non-compliant	Blast fired on 16/01/2018 resulting in a ground vibration measurement recording of 27.49mm/s at Newdell zone substation. At the time of the exceedance the compliance limit at Newdell zone substation, agreed to by Ausgrid, was a VPPV less than or equal to 26mm/s where the blast frequency is below 12Hz for any individual blast. LCO conducted investigation in to the exceedance and in the process of agreeing to an increased blast criteria limit at Newdell Zone Substation	Section 6.2

* Compliance status as per the *Compliance status key Table 3* of the NSW Government Annual Review Guideline reproduced below as **Table 4.**

Table 4 Compliance Status Key

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)

2 Introduction

Liddell Coal, located in the Upper Hunter Valley, is operated by Liddell Coal Operations Pty Limited (LCO) under the conditions of development consent DA 305-11-01. This Annual Review (AR) has been prepared by LCO in accordance with the *Annual Review Guidelines* (NSW Government, 2015) and Schedule 5, Condition 3 of the DA 305-11-01.

LCO is an established open-cut mine located at Ravensworth, approximately 25 kilometres north-west of Singleton in the Upper Hunter Valley of New South Wales. LCO is operated and managed by Liddell Coal Operations Pty Limited, a wholly owned subsidiary of Glencore Coal Pty Limited (Glencore), on behalf of a joint venture between Glencore (67.5%) and Mitsui Matsushima Australia (32.5%).

Mining operations at LCO have been continuous since the 1950s. Operations prior to the 1950s were intermittent, with underground operations commencing in 1923 and open cut operations in 1946. Current open cut operations access the coal reserves previously not mined by the underground operations. The current open cut mining operation has been in operation since 1990.

A locality map and aerial photograph of the operation is shown in **Figure 1** and **Figure 2** respectively.

During the reporting period mining operations were undertaken using the excavator and truck /shovel method of operation. LCO has consent to extract no more than eight million tonnes of run-of-mine (ROM) coal per annum. Product coal, both semi-soft and thermal, is transported to Newcastle Port by rail via the Hunter Valley Rail Loop and Main Northern Railway Line, for sale to the export market.

The contact details for the personnel directly responsible for the environmental management of LCO are shown in **Table 5**.

Table 5 Mine contacts

Name	Position	Company	Contact Numbers
David Foster	Operations Manager	Liddell Coal Operations	(02) 6570 9919 (M) 0459 168 589
Daniel Brogan	Mining Manager	Liddell Coal Operations	(02) 6570 9937 (M) 0429 456 969
Ben de Somer	Environment and Community Manager	Liddell Coal Operations	(02) 6570 9947 (M) 0427 936 734

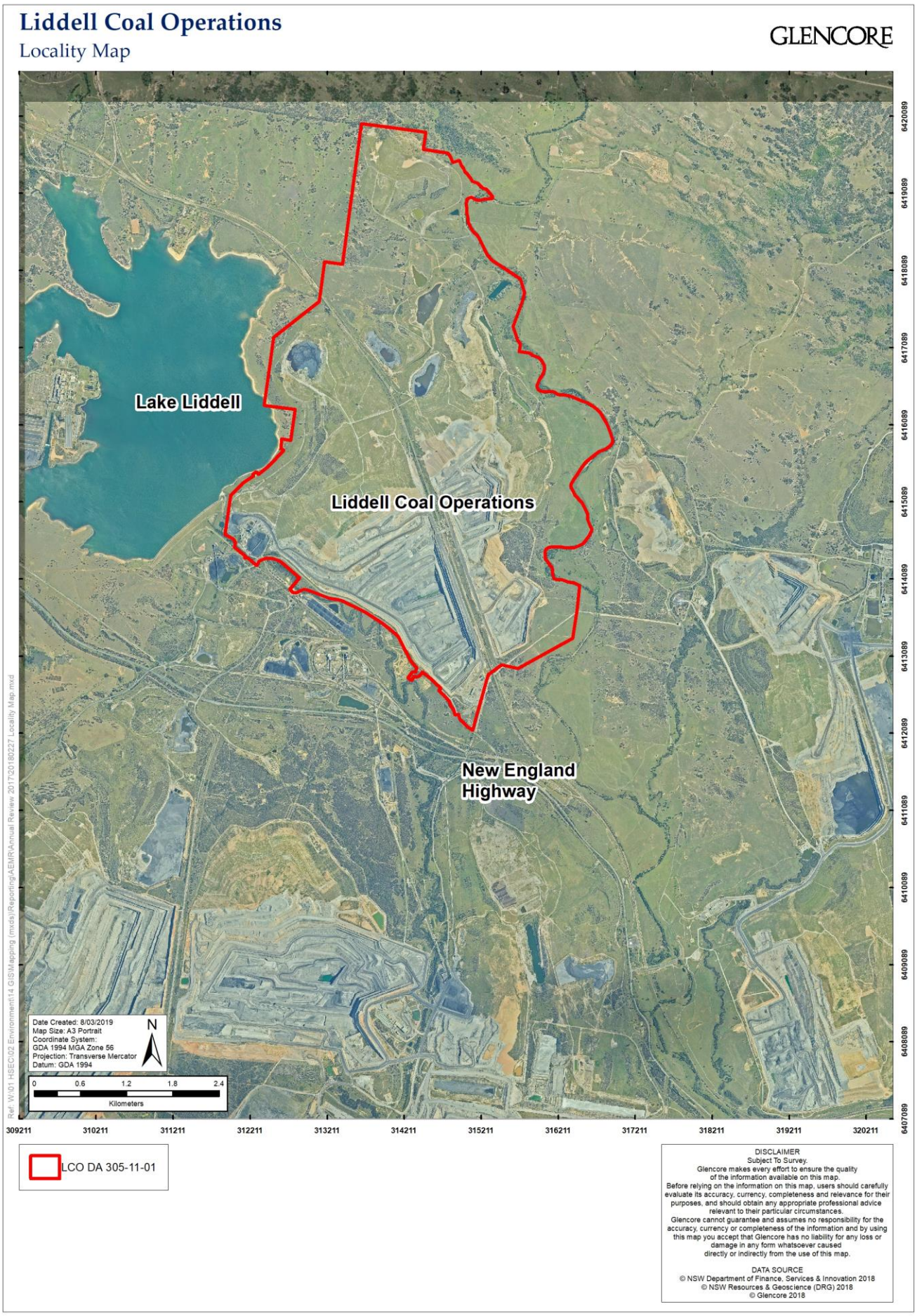


Figure 1 Locality map

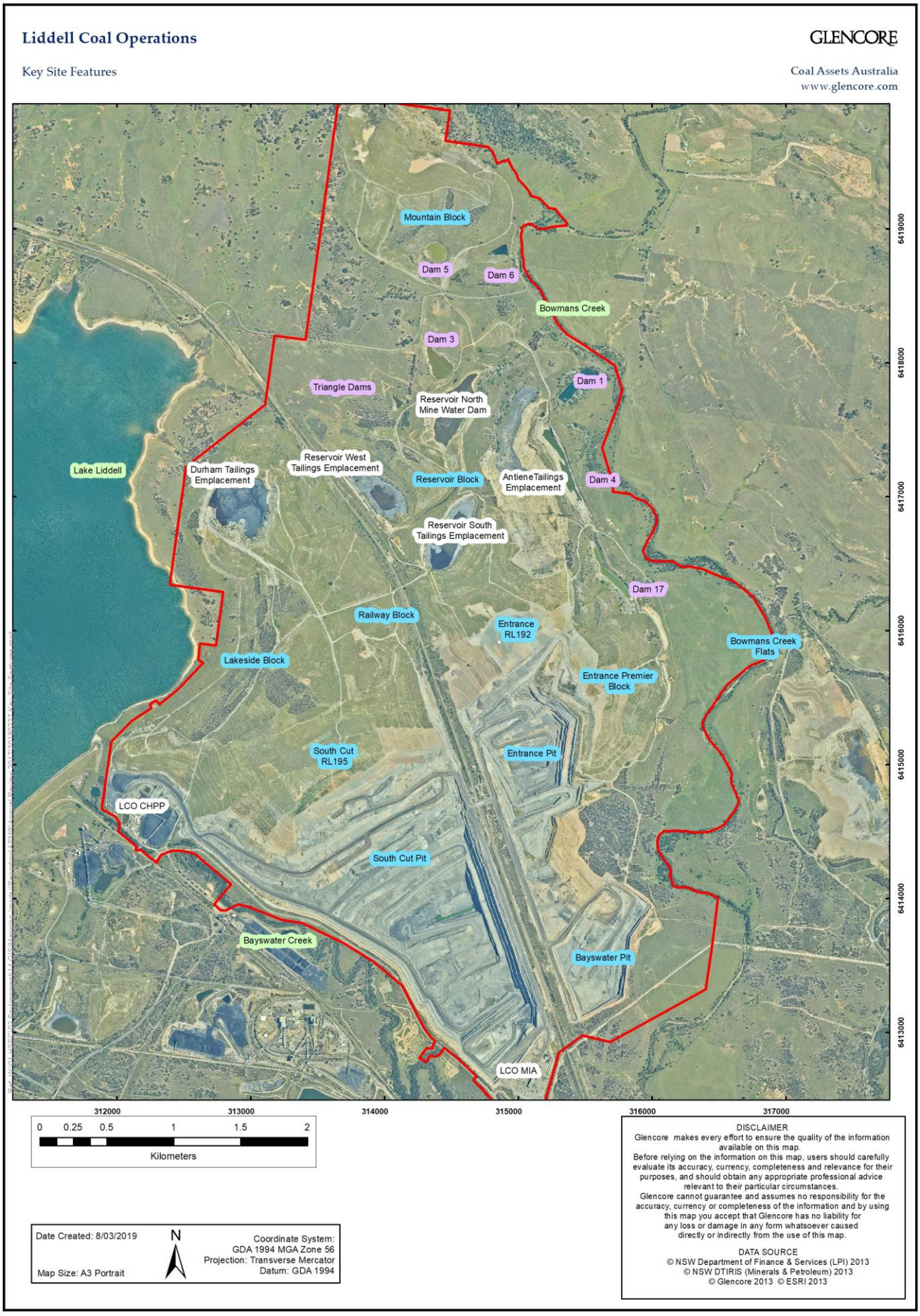


Figure 2 Aerial photograph of LCO – key site features

3 Approvals

A number of consents, leases, licences and other approvals regulate mining operations at LCO. The status of development consents, licenses and relevant approvals are listed in **Table 6.**

LCO operates primarily under one consolidated mining lease, ML 1597, as shown in .

Compliance with the EPL is reported annually to the Environment Protection Authority (EPA) in the EPL Annual Return. LCO's compliance with the EPL is also discussed in **Section 1** of this report.

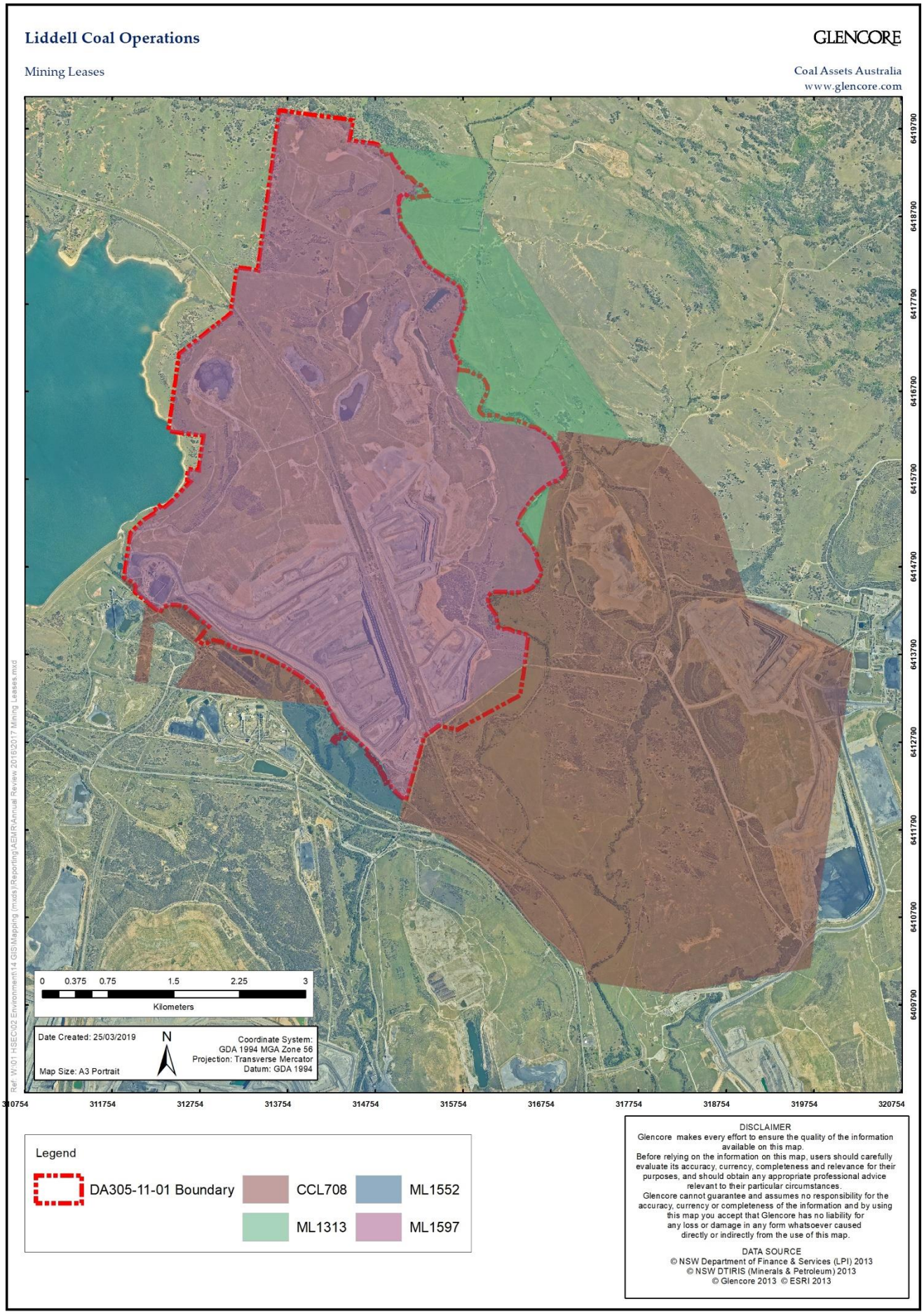


Figure 3 Mining Leases

Table 6 List of consents, leases, licences and other approvals

Development Approvals			
Approval Number	**Authority**	**Description**	**Expiry Date**
DA 305-11-01	- Department of Planning and Environment	- Continued operation of the Liddell Colliery	31 December 2023
DA 305-11-01 Modification 2	- Department of Planning and Environment	- Increase in the maximum total ROM coal production rate from 4.5 to 8 Mtpa tonnes per annum; - increase in the mining footprint within the approved South and Barrier Pits by a total of 47 hectares; - construction and operation of a new preparation section of the Coal Handling and Preparation Plant and minor upgrades to the ROM receival and product coal facility; - establishment of a new supplementary coal stockpile; - receival and delivery of up to 1.5 Mtpa of coal to and from Cumnock No. 1 Colliery; - increase in the maximum transportation rate of reclaimed tailings from 0.3 to 0.5 Mtpa to Macquarie Generation; - realignment of an already approved access road and services corridor relocation of part of the Old New England Highway; - relocation and construction of the open cut mining offices, workshops and associated infrastructure to the south eastern portion of the Liddell development consent area; - construction of a bridge over the Main Northern Railway to provide for more efficient movement of coal and overburden between open cut pits; and - modifications to the footprint and size of the already approved Dam 13B.	31 December 2023
DA 305-11-01 MOD 3	- Department of Planning and Environment	- Alterations to the approved intersection layout for the Old New England Highway/mine access road intersection; - minor realignment of the development consent boundary to accommodate the road works; - reuse of treated effluent from the office/workshop complex; and - corrections to numbering in the development consent.	31 December 2023
DA 305-11-01 MOD 4	- Department of Planning and Environment	- Additions to the Mining Infrastructure Area including: - two additional high machinery workshop bays; - additional relocatable admin & workshop offices; - fuel farm extension; - storage shed and compound.	31 December 2023

DA 305-11-01 MOD 5	- Department of Planning and Environment	- Extension of the South and Entrance Pits to the south east and, upon completion of mining in these pits, the mining of coal resources under the Mine Infrastructure Area (MIA) during which time the MIA will be relocated to temporary facilities. The extension will enable the recovery of an additional approximate 38 million tonnes (Mt) of Run of Mine (ROM) coal. - The extension of open cut mining activities will lead to an associated extension of the life of mine at LCO from 2023 to 2028. - A tailings emplacement area will be constructed within the final void of the South Pit to dispose of the additional tailings associated with the extension of open cut mining activities. - Minor additional infrastructure including: - Construction and commissioning of a transfer point and conveyor connected to the existing Mt Owen/Glendell/Macquarie Generation conveyor is proposed, enabling LCO to send coal to Ravensworth, and receive coal and crushed gravel from Mt Owen, via the existing conveyor system. The new conveyor will deliver/take material to/from a new 50,000 tonne stockpile; and - Infrastructure and ancillary surface disturbance to support the new mining areas will be required, including but not limited to, power lines, water management infrastructure and haul roads.	31 December 2028
DA 305-11-01 MOD 6	- Department of Planning and Environment	- Constructing approximately 11 kilometres of tailings pipeline connecting both the Ravensworth Complex and Liddell Colliery Coal Handling and Preparation Plants to the West Pit Void Ravensworth East. - Constructing a flocculent plant near the West Pit Void at Ravensworth East. - Staged emplacement of tailings generated from Ravensworth and Liddell within the Ravensworth East West Pit Void. - Interim utilisation of the Narama Void as a central water storage facility for the Greater Ravensworth Area.	31 December 2028
EPBC 2013/6908	- Department of Environment	- Approval for controlled action under the EPBC Act 1999 to expand the existing Liddell open cut coal mine operations in the Hunter Valley region in New South Wales, located approximately 25km north-west of Singleton under the following Controlling Provisions: • Listed threatened species and communities (sections 18 & 18A) • Listed migratory species (sections 20 and 20A) • Water resources/trigger (sections 24D and 24 E)	31 December 2044

Mining Leases, Environmental Protection Licence & Mining Operations Plan		
Mining Leases		
Title	**Authority**	**Expiry Date**
Mining Lease 1597	DPE Department of Resources and Geoscience (NSW)	5 November 2028
Consolidated Coal Lease No. 708	DPE Department of Resources and Geoscience (NSW)	30 December 2023
Mining Lease No. 1313	DPE Department of Resources and Geoscience (NSW)	13 October 2023
Cumnock Sublease Mining lease No. 1552	DPE Department of Resources and Geoscience (NSW)	10 March 2025
Environmental Protection Licence		
Licence	**Description**	**Expiry Date**
EPL 2094	Environmental Protection Licence (File number 27051)	30 June (Anniversary Date)
Mining Operation Plan		
Name	**Commencement Date**	**Expiry Date**
Liddell Colliery Mining Operations Plan 2018 – 2020 (MOP)	1 December 2017	1 December 2020
Mining Operations Plan Addendum	24 October 2018	1 December 2020

Surface Water Extraction Licences						
Locality	**Licence No.**	**Holder**	**Use**	**Water Source/ Management Zone/ Type**	**Annual Allocation (ML)**	**Annual Usage (ML)**
Bowmans Creek	WAL18320	Enex Foydell Pty Ltd	Irrigation	Jerrys Water Source/ Jerrys Management Zone/ Unregulated River	50	Nil
Bowmans Creek	WAL18304	Enex Foydell Pty Ltd	Irrigation	Jerrys Water Source/ Jerrys Management Zone/ Unregulated River	32	Nil

Bowmans Creek	WAL18318	Novacoal Australia Pty Ltd	Irrigation	Jerrys Water Source/ Jerrys Management Zone/ Unregulated River	55	Nil
Bayswater Creek	WAL18306	Mitsushima Australia Pty Ltd Enex Liddell Pty Ltd Gabume Pty Ltd	Industrial (coal mining)	Jerrys Water Source/ Jerrys Management Zone/ Unregulated River	100	Nil
Hunter River via AGL Macquarie Generation	WAL7815	Liddell Tenements Pty Ltd	Industrial	Hunter Regulated River Water Source/ Zone 1B Regulated River	20	Nil

Groundwater Licences

Locality	Licence No.	Holder	Lot/DP	Purpose	Annual Extraction Allocation (ML)	Annual Extraction 2018 (ML)
Haz 6	20BL168066	Liddell Tenements Pty Ltd	81/607296	Monitoring	N/A	N/A
Dur 3	20BL168065	Liddell Tenements Pty Ltd	31/837350	Monitoring	N/A	N/A
LC1	20BL168064	Liddell Tenements Pty Ltd	353/867083	Monitoring	N/A	N/A
Durham 1	WAL41499	Liddell Tenements Pty Ltd	33/862516	Industrial	6000	Nil
8 South 3 & 4	WAL41498	Liddell Tenements Pty Ltd	32/870789	Industrial	6000	Nil
Durham 2 & 4	WAL41497	Liddell Tenements Pty Ltd	3/237654	Industrial (2 bores)	1000	Nil
Haz 1&2	WAL39760	Enex Liddell Pty Ltd Mitsui Mitsushima Australia Pty Ltd	81/607296	Industrial (2 bores)	5500	395
ALV1, ALV2, ALV3, ALV4, ALV7, ALV8, ALV9	20BL168053	LCO Pty Ltd	43/654013 201/848078 4/255403 81/607296 6/255403 32/545601	Test bore/Monitoring	N/A	N/A
Bowmans Creek Alluvial	WAL18302	Liddell Southern Tenements Pty Ltd	32/545601	Irrigation	5	Nil

	20WA210940	Enex Foydell Limited	6/1077004	Irrigation	5	Nil
M49	WAL41493	Liddell Southern Tenements Pty Ltd	32/545601	Dewatering	2500	1295
Mt Owen 1	WAL41493 (previously 20BL168209)	Mt Owen Pty Ltd	353/867083	Stock, domestic, farming and test purposes	2500	Nil
Mt Owen 2	20BL169544	Mt Owen Pty Ltd	353/867083	Dewatering	2500	Nil
Middle Liddell	WAL41498	LCO Pty Ltd	1/237766	Dewatering	6000	898

Aboriginal Heritage Permits			
Licence	**Site**	**Salvage Date**	**Expiry Date**
#2348 (dated 7 August 2007)	Chain of Ponds Site Area (LID 28, 29, 30, 31, 32)	21, 22, 23 November 2006	3 October 2016
S87 #2883 S90 #2896	Bayswater Creek	March/April 2008	18 February 2010 18 March 2020
S90 Permit #c0000623	DA 305-11-01 Modification 5 development consent area	January/February 2015	3 December 2024

Radiation Management Licence				
Type	**Licence Number**	**Purpose**	**Licence Holder**	**Expiry Date**
Radiation Management Licence	5061082	Sell, possess, store or give away regulated material (including radiation apparatus, radioactive substances or items containing radioactive substances) for one year	Liddell Coal Operations Pty Limited	12 September 2019

Effluent Treatment Permits					
Licence/Permit Reference	**Regulatory Authority**	**Purpose**	**Licence Holder**	**Approval Date**	**Expiry Date**
WTA 2006-002	Muswellbrook Shire Council	Permit to Operate Aerated Wastewater Treatment System	Liddell Coal Operations Pty Limited	16 May 2014	21 April 2019
OSSM 3916/2008	Singleton Shire Council	Permit to Operate Aerated Wastewater Treatment System	Liddell Coal Operations Pty Limited	1 July 2018	30 June 2019

4 Operations Summary

During 2018, operational activities were conducted generally in accordance with the approved Mining Operations Plan (MOP) 2018-2020. An Addendum to this MOP was granted on 24 October 2018 to permit emplacement of a combined additional 580 thousand cubic metres of tailings in the Reservoir West and Reservoir South Tailings Dams during 2019.

During the reporting period there were a number of construction projects undertaken in accordance with the approved MOP and DA305-11-01. This included:

- Continued progression of mining operations in a southerly direction in the south pit and entrance pit as well as further clearance and mining in the Bayswater Pit
- Commenced planning and construction of the tailings pipeline to Mt Owen Complex (West Pit) as approved by DA305-11-01 Mod 6 to provide for improved LOM tailings emplacement **Section 6.9**.
- Construction of additional tailings pipeline infrastructure between the Durham, Reservoir West and Reservoir South Tailings Emplacement areas; detailed in **Section 6.9**.
- Continued building monitoring and implementation of stabilisation measures at the Chain of Ponds Inn in order to progress the vibration trigger limits in consultation with DPE; detailed in **Section 6.6.**
- Progression of the remediation plan for the Mountain Block area in order to commence remediation earthworks once required approvals are in place; detailed in **Section 8.7.**
- Continued implementation of biodiversity management plan commitments including habitat augmentation, weed management and supplementary planting as detailed in **Section 8.3**
- Installation of fencing and water supply across the South Cut Pasture Rehabilitation area for the commencement of managed grazing to control Rhodes Grass in accordance with the post mining land use outlined in the Biodiversity Management Plan and MOP; detailed in **Section 8.3.1**
- Continued implementation of Indirect Offset commitments as well as Biodiversity Offset Area regeneration activities detailed in **Section 8.4**

Mining operations

The open cut mining sequence at LCO includes:

- Land preparation including vegetation removal and pre-stripping topsoil;
- Removal of overburden;
- Coal extraction, predominantly using excavators and tucks;
- Coal processing and transport.

Mining will continue in accordance with the MOP targeting coal from the Lemington, Pikes Gully, Arties, Liddell, Barrett and Hebden seams. These seams range from 0.7 metres (m) to 9.5 m in thickness, and include semi-soft and thermal coal types. Mining will generally utilise hydraulic excavators and trucks which are suitable for working in the South Pit and Entrance Pit to recover coal from multiple seams.

No mining was undertaken using dragline or highwall extraction methods during 2018.

Key production statistics are summarised in **Table 7** below. During the reporting period there was no non-compliance with the sites approved production limits.

Other Operations

Coal is transported from the open cut areas by truck to a ROM stockpile with an approximate capacity of 200,000 tonnes for storage prior to processing in the CHPP.

The CHPP produces both semi soft coking coal and thermal coal. The CHPP operates 24 hours a day, seven days a week, with the exception of downtime due to maintenance (generally 10 to 12 hours each fortnight). The CHPP has a processing capacity of 8 Mtpa.

As per **Table 7** below, the total ROM coal processed at Liddell's CHPP during the 2018 reporting period was 5,933,351 tonnes. The total product coal produced was 4,123,866 tonnes with 1,719,540 tonnes of coarse and 175,366 tonnes of fine rejects generated.

No ROM coal produced at Mt Owen was processed in the Liddell CHPP, nor was any ROM coal transported to Ravensworth Central Coal Processing Facility in accordance with Schedule 2 Condition 6 b) and 6 c) during 2018

During the reporting period, 3,991,456 tonnes of product coal including export thermal coal and export semi soft coal were railed to the Port of Newcastle by trains along the Main Northern Railway Line.

In accordance with Schedule 3, condition 33 (a) and (b) of DA 305-11-01, LCO monitored coal haulage movements as part of standard operations. Daily train haulage movements are presented in **Appendix A**. There were no sales of tailings during the reporting period and no truck movements for the transportation of tailings along the New England Highway as per condition 32(a).

Table 7 Production summary

Production Summary				
Material	**Approved limit**	**2017 actual**	**2018 forecast**	**2018 actual**
Prime Waste Rock / Overburden (bcm)	N/A	31,144,732	36,294,428	35,728,416
ROM Coal / Ore (t)	8,000,000	4,259,086	5,898,959	5,933,351
Coarse reject (t)	N/A	1,262,040	1,605,846	1,719,540
Fine reject (Tailings) (t)	N/A	135,810	535,282	175,366
Saleable product (t)	N/A	2,911,634	3,779,861	4,123,866

Major activities proposed in the next reporting period

All activities proposed in the next Annual Review period will be consistent with the approved LCO MOP and DA305-11-01 Mod 6.

Forecast major changes to the operation during the next reporting period include:

- continued clearing and mining in Bayswater Pit as well as rehabilitation activities in accordance with the 2018-2020 MOP and 2018 MOP Addendum;
- continued implementation of Biodiversity Offset commitments;
- commencement of slope stabilisation and rehabilitation measures at Mountain Block as necessary approvals are finalised(see **Section 8.7** for detail);
- re-commencement of tailings emplacement in the Reservoir West and Reservoir South Tailings emplacement areas in combination with the Durham tailings emplacement area; and
- Finalisation of construction and commissioning of tailings pipeline to Mt Owen Complex West Pit; and continued capping of the Antiene Tailings dam.

5 Actions Required at Previous Annual Review

NSW Department of Planning & Environment – Resources Regulator provided written advice on the 2017 Annual Review on the 25 September 2018 after completing a site inspection on the 28 August 2018. The NSW Department of Planning & Environment (DPE) completed a desktop review of compliance of the 2017 Annual Review and provided comment on 4 September 2018.

There were no actions identified as requiring attention following review of the 2017 Annual Review by the Resources Regulator or DPE.

6 Environmental Performance

6.1 Noise

The approved Noise Monitoring Program outlines the noise monitoring required to be undertaken by LCO to ensure compliance with statutory requirements at LCO. The program addresses the requirements contained in DA 305-11-01.

Monthly attended noise monitoring is undertaken at representative locations surrounding LCO, refer to **Figure 4**. LCO has a real time, directional noise monitoring unit that is programmed to send an SMS to key operational personnel when a trigger noise level is reached. Alarm conditions are currently measured and calculated with respect to low frequency noise levels, that being the noise frequency consistent with continuous open cut mining noise and seeks to target continuous noise output from the mining operation and exclude extraneous noise sources. Trigger levels are set below and at relevant criterion at the nearby sensitive receivers as identified in the DA 305-11-01.

Noise criteria for LCO are prescribed in Schedule 3, Condition 1 of DA 305-11-01. LCO are required to ensure that noise generated by the development does not exceed the noise impact criteria in **Table 8**.

Table 8 Development consent noise impact assessment criteria dB (A)

Assigned Residential Location Number	Daytime $L_{Aeq\ (15\ minute)}$	Evening $L_{Aeq\ (15min)}$	Night $L_{Aeq\ (15min)}$	Night $L_{A\ (1\ min)}$
1, 5, 6, 7, 8, 9, 10, 11, 12, 14	35	35	35	45
2	35	35	36	45
3	36	35	37	45
4	36	35	36	45
All other privately owned land	35	35	35	45

Noise Compliance monitoring is undertaken as per Appendix 6 of DA-305-11-01. The noise emission limits identified in **Table 8** apply under all meteorological conditions, which are measured from the LCO met station, except the following:

- During periods of rain or hail;
- Average wind speed at microphone height exceeds 5m/s;
- Wind speeds greater than 3m/s measured at 10m above ground level; or
- Temperature inversion conditions greater than 3˚C/100m, or alternatively stability class F & G.

Noise Monitoring Results

Attended compliance noise monitoring during the reporting period was undertaken on a monthly basis by a specialist noise consultant (Global Acoustics) at two representative neighbouring residential locations along Hebden Road (see **Figure 4**). $L_{Aeq(15\ minute)}$ measurements against compliance criteria are detailed in the **Table 9**.

Results of attended noise monitoring during the reporting period show that LCO complied with the noise limits applicable at all monitoring locations.

Table 9 Noise monitoring results

Location	Date	Wind Speed (m/s)	LCO $L_{Aeq\ (15min)}$ dB	LCO $L_{Aeq\ (1min)}$ dB	Exceedance
	January				
1317 Hebden Road	04/1	3.2	<25	<25	NA
1246 Hebden Road	04/1	3.8	<25	<25	NA
	February				
1317 Hebden Road	22/2	4.2	<20	<20	NA
1246 Hebden Road	22/2	3.8	<20	<20	NA
	March				
1317 Hebden Road	12/3	3.4	NM	NM	NA
1246 Hebden Road	12/3	3.2	NM	NM	NA
	April				
1317 Hebden Road	12/4	3.5	IA	IA	NA
1246 Hebden Road	12/4	2.8	IA	IA	NA
	May				
1317 Hebden Road	24/5	3.0	25	29	NA
1246 Hebden Road	24/5	2.7	<25	28	NA
	June				
1317 Hebden Road	25/6	0.7	IA	IA	NA
1246 Hebden Road	25/6	1.0	IA	IA	Nil
	July				
1317 Hebden Road	16/7	1.9	IA	IA	Nil
1246 Hebden Road	16/7	2.8	IA	IA	Nil
	August				
1317 Hebden Road	02/8	1.1	IA	IA	Nil
1246 Hebden Road	02/8	1.2	IA	IA	Nil
	September				
1317 Hebden Road	18/9	1.5	28	31	Nil
1246 Hebden Road	18/9	1.1	<20	26	Nil
	October				
1317 Hebden Road	09/10	1.6	29	32	Nil
1246 Hebden Road	09/10	2.2	32	35	Nil
	November				
1317 Hebden Road	13/11	2.5	IA	IA	NA
1246 Hebden Road	13/11	2.9	<20	<20	NA
	December				
1317 Hebden Road	05/12	5.4	<20	<20	NA
1246 Hebden Road	05/12	4.7	<20	<20	NA

Notes:

1. Atmospheric data is from LCO weather station;
2. These are results for LCO in the absence of all other noise sources;
3. NM denotes audible but not measurable, IA denotes inaudible;
4. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable

Comparison to EA Predictions

The Liddell Coal EA (2015) proposes that modifications to the development consent would not produce an exceedance of the LCO operational specific noise criteria (35 dB(A)) at any surrounding privately owned residence during the reporting period. All noise monitoring events during 2018 were in accordance with these predictions.

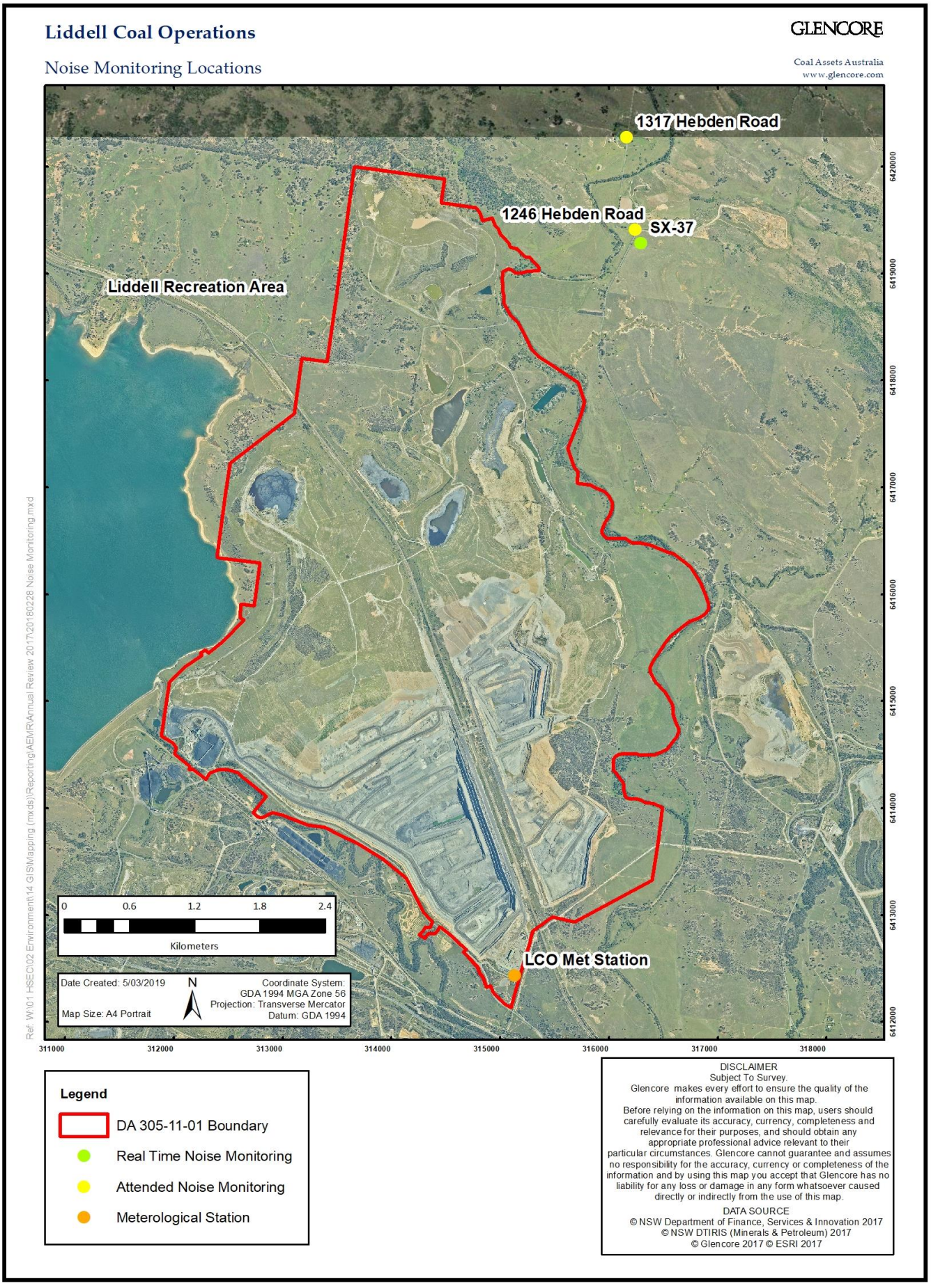


Figure 4 Noise monitoring locations

6.2 Blasting

Blasting criteria for LCO are prescribed in Schedule 3 of DA 305-11-01. The consent condition covers criteria for overpressure, ground vibration and vibration limits at designated structures. **Table 10** below sets out the blasting impact assessment criteria for the reporting year as per DA-305-11-01.

Table 10 Blasting impact assessment criteria as per DA-305-11-01

Location	Airblast overpressure level (dB(Lin Peak)	Ground vibration (mm/s)	Allowable exceedance
Residence on privately owned land (Scrivens/Burlings)	115	5	5% of the total number of blasts over a 12 month period
	120	10	0%
Newdell zone substation	-	<=30 above 12Hz and <=26 below 12Hz (01/11/2017 – current)	0%
Other public infrastructure	-	50	0%

Schedule 3, Condition 9 of the DA stipulates that blasting activities can only be undertaken at LCO between 9 am and 5 pm Monday to Saturday, inclusive. No blasting is allowed to be undertaken on Sundays, public holidays, or at any other time without the written approval of the Secretary.

In accordance with Schedule 3, Condition 10 of the DA, LCO can carry out a maximum of 3 blasts per day and 8 blasts per week (average over a calendar year) on the site. However this condition does not apply to blasts that generate ground vibration of 0.5mm/s or less at any residence on privately owned land, blast misfires or blasts required to ensure the safety of the mine, its workers or the general public.

LCO operates a combined 24 hour blasting information and community complaints hotline (1800 037 317).

A blast event initiated in Bayswater Pit on 7 May 2018 resulted in minor cracking and surface heave within the Liddell-Bowmans Creek Sensitive Archaeological Landscape (LID-BC-SAL). This incident is described in **Section 6.5**.

Chain of Ponds Inn Blast Management Strategy

Additional to the blasting impact criteria specifically identified in the DA, the Chain of Ponds Inn is a heritage and sensitive structure located on the Old New England Highway adjacent the operation. In accordance with the Schedule 3 Condition 5 of the DA, LCO developed a Blast Management Strategy for the Inn with specific blasting impact limits. A staged increase in the vibration level and air blast exposure at the Chain of Ponds Inn, combined with continual monitoring of vibration and air blast levels and corresponding structural behaviour, will enable an adaptive management approach to blasting in the vicinity of the Inn. Limits for blast overpressure and ground vibration at the Chain of Ponds Inn (COPI) were varied in June 2016 to 30 to 40mm/s PPV, as LCO progressed trigger levels in accordance with the approved Blast Management Strategy. Management of the Chain of Ponds Inn is discussed further in **Section 6.6** whilst this section only examines compliance with applicable limits during the reporting period.

Newdell Zone Substation Blast Management Strategy

Development Approval conditions also required LCO to develop a Blast Management Strategy for the Newdell Zone Substation. In accordance with DA305-11-01 (as modified), the primary objective of this Strategy is to ensure that blasting at LCO has a negligible impact on the structural integrity and does not accelerate the deterioration of electrical equipment efficiency (directly caused by blasting activities and exclusive of normal operational deterioration) of the Newdell Zone substation, compared to the existing condition and structural integrity of the substation at the date that consent was granted to DA305-11-01 MOD 5 (December 2014).

Similar to the Chain of Ponds Inn discussed above, a staged increase in the vibration level at the Newdell Zone Substation, combined with continual monitoring of vibration levels and corresponding structural behaviour, will enable an adaptive management approach to blasting in the vicinity of the substation. The strategy involves at-source management measures (blast design control), particularly within a distance of 350 metres to the substation, combined with an inspection and blast review regime to effectively manage blasting in the vicinity of the substation.

LCO and Ausgrid have developed several agreements related to blasting in proximity to the Newdell Zone Substation. These agreements include:

- Blast Vibration Mitigation Works Agreement – At the time, this related to vibration mitigation measures to be installed at the substation following investigations carried out by Ausgrid. Note that these works have been completed.
- Blast Vibration Consent Deed – This outlines that Ausgrid consents to LCO blasting above the previous vibration limits (20mm/s for 90% of blasts and 25mm/s for 100% of blasts) on the basis that blast mitigation works are completed at the Newdell Zone Substation. It allows for a staged approach to increases in blasting limits.
- Blast Vibration Works Monitoring Agreement – This outlines the respective obligations for Ausgrid to carry out the blast vibration works monitoring and commercial arrangements for Liddell to reimburse Ausgrid for the cost of the monitoring.

In accordance with DA305-11-01 Schedule 3 Condition 4a) and the approved Newdell Zone Substation Blast Management Strategy, LCO reached agreement with Ausgrid to progress an increase of blast vibration limits at the Substation from the 1st November 2017 and subsequently notified the DPE of the increase in limits on the 2 November 2017. The revised blasting limits are such that blasting does not cause:

a) ground vibration or VPPV that is greater than 30mm/s above 12Hz for any individual blast; and
b) ground vibration or VPPV that is greater than 26mm/s below 12Hz for any individual blast.

As per the approved blast management strategy, the proposed increase in limits is incremental and effectiveness of the mitigation measures will be confirmed by the Ausgrid monitoring program prior to increasing limits further. Conversely, monitoring analysis may also demonstrate that the mitigation measures have not been effective and Ausgrid will notify Liddell that vibration limits will need to revert back to specified in DA305-11-01. In either case LCO will continue to advise the Department when vibration limits are varied in accordance with the approved blast management strategy.

Blast Monitoring Results

Blast monitoring locations are presented in **Figure 5** and monitoring results for the reporting period are provided in **Appendix F**.

Blast monitoring was undertaken at two privately owned residences, the Chain of Ponds Inn and Newdell Substation throughout the reporting period. There were 146 blasts fired throughout the reporting period.

There were no non-compliances with DA305-11-01 Schedule 3 Condition 9 or 10 (pertaining to days of blasting and frequency) during the reporting period. All blasts were conducted within the hours of 09:00 and 17:00 and on Monday to Saturday No blasts were undertaken on Public Holidays. The blast monitoring system recorded 100% blast data at all sites.

There was one blast vibration exceedance recorded on the 16/01/2018 which recorded a Vector-sum Peak Particle Velocity (VPPV) ground vibration of 27.49 mm/s at the Newdell Substation blast monitor.

The blasting limits for the Newdell Substation are described in the above Section. The dominant frequency resulting from the blast event on 16/01/2018 was 11 Hz, therefore the VPPV limit of 26 Hz applies. As a result, the VPPV for this blast exceeded this limit by 1.49 mm/s.

Both the Department of Planning and Environment (DPE) and AusGrid were notified of the exceedance on the same day in accordance with the approved Newdell Substation Blast Management Strategy. In accordance with Schedule 5 Condition 11 an incident investigation report was prepared and submitted. The subsequent investigation did not identify any impacts to the substation infrastructure and determined that the likely cause of the exceedance was varied geological conditions increasing the blast modelling “K-factor” constant when compared to prediction.

It should also be noted that in accordance with the approved Strategy and the executed agreements between LCO and Ausgrid, for Ausgrid to have the confidence to progress to the next stage of limit increases, actual VPPV results from blasts are required as close as possible to the current blasting limits. The reasoning is that it would provide sufficient data to prove the upgrades are functioning as expected, and enable the next stage of the limit increase to occur.

A summary of blasting performance against DA305-11-01 during the reporting period is presented in **Table 11**.

Table 11 Blasting performance summary

Site	Approval Criteria airblast overpressure level (dB(Lin Peak)	Approval Criteria ground vibration (mm/s)	Performance during the reporting period	Key management implications	Proposed management actions
Burlings/ Scrivens	115	5	Compliant (1 blast exceedance of 117.1db(L) within 5% of the total number of blasts over a 12 month period)	NA	None required
Newdell zone substation	-	< or =30mm/s above 12Hz for any individual blast; and < or =26mm/s below 12Hz for any individual blast.	Non-Compliant (1 blast exceedance of 27.49 mm/s at 11Hz)	Continue liaising with infrastructure owners in order to determine an appropriate ground vibration level increase during the next reporting period	. Continued implementation of the approved Strategy and Agreements executed with Ausgrid.
Other Public Infrastructure	-	50	Compliant	NA	None required
Chain of Ponds Inn	150	40	Compliant for 100% of blasts	NA	Continued implementation of the approved Strategy. 9refer Section 6).

Comparison to EA Predictions

The Liddell Coal EA (2015) proposes that modifications to the development consent would see continued compliance with vibration and overpressure criteria at the LCO receptors. Furthermore, blasting was proposed to be unlikely to cause significant damage to the Chain of Ponds Inn and Newdell Zone Substation providing that the blast management strategy developed for the Project is implemented.

Figure 5 Blast monitoring locations

6.3 Air Quality

Air quality monitoring is undertaken in accordance with the Liddell Coal Air Quality Management Monitoring Program (AQMMP). In addition, the LCO Dust Management TARP and LCO Spontaneous Combustion Management Plan are used for the ongoing management of air quality.

The AQMMP was developed in accordance with Schedule 3 Condition 19 of DA-305-11-01. In accordance with this condition, the AQMMP includes a combination of deposited dust gauges, high volume air samplers (HVAS) and continuous PM10 Tapered Element Oscillating Monitors (TEOMs) to monitor any dust emissions, and an air quality monitoring protocol for evaluation of compliance with the air quality impact assessment criteria. The AQMMP was reviewed and updated during 2018 in accordance with DA-305-11-01.

The compliance air quality monitoring network includes Depositional Dust Gauges, paired High Volume Air Samplers (PM10 and TSP) and continuous TEOMs representative of privately owned residences with potential to be impacted and continuous boundary monitoring. The LCO air quality monitoring network is shown in **Figure 6**.

As per the AQMMP and the Dust Management TARP, the control measures undertaken to minimise potential impact on air quality at LCO include:

- regular dust inspections are carried out and excavation and tipping activities may be ceased or modified if excessive dust is observed;
- real time dust monitoring is undertaken to assist with the management of dust on-site;
- disturbance of the minimum area necessary for construction and prompt rehabilitation of construction areas;
- watering of roads and trafficked areas to minimise the generation of dust; permanent roads are constructed from hard non-friable material and have defined marker posts to prevent vehicle deviations;
- long term topsoil stockpiles are vegetated to reduce dust generation;
- dust suppression sprays situated on the ROM dump hopper and transfer conveyor points are actuated to reduce potential dust generation; and
- all equipment is maintained in good working order to reduce emissions.

In line with the AQMMP and Condition 19, Schedule 3, LCO operates four relocatable supplementary boundary PM10 air quality monitors. The units are operated to:

- Determine LCO's contribution to local dust levels, based on their upwind and downwind positioning relative to the location of LCO mining activity; and
- Supplement the reactive operational dust management at LCO.

The relocatable boundary monitoring is a solar/battery powered trailer mounted equipment using an EBAM air quality monitor. The unit connects to a live monitoring system and will provide for early response to measured air quality impacts. As per the AQMMP, four units were integrated into the existing air quality monitoring network to inform dust management performance.

Air Quality Criteria

The following details the air quality compliance impact criteria applicable during the reporting period.

Schedule 3, Condition 16 of DA 305-11-01 requires that LCO manage their operations so as to satisfy the relevant air quality criteria for deposited dust and dust concentration emitted to privately owned land not owned by LCO.

Deposited dust levels refer to the quantity of dust particles that settle out from the air as measured in grams per square meter per month (g/m2/month) at a particular location. The LCO Air Quality Impact Assessment Criteria for deposited dust is summarised in **Table 12**.

Table 12 Long term impact assessment criteria for deposited dust

Pollutant	Averaging Period	Maximum increase in deposited dust level	Maximum total deposited dust level
Deposited dust	Annual	2g/m^2/month	4g/m^2/month

Dust concentration refers to airborne dust and is measured in micrograms per cubic meter (µg/m^3). Dust concentration is measured as total suspended particulate matter (TSP) and particulate matter of less than 10 microns in diameter (PM_{10}). TSP relates to all suspended particles, which are usually in size range of zero to 50 micrometres (µm). TSP measurements include PM10 particles. TSP is compared to long term (annual average) goals and PM10 is compared to both long term (annual average) and short term (24 hour maximum) goals. Particle sizes larger than 50 µm are measured as deposited dust. The LCO Air Quality Impact Assessment Criteria for dust concentration (particulate matter) is summarised in **Table 13.**

Table 13 Impact assessment criteria for particulate matter

Pollutant	Standard/Goal	Averaging Period
Total Suspended Particulate Matter (TSP)	90 µg/m^3 (Long-term goal)	Annual
Particulate Matter <10µg (PM_{10})	50 µg/m^3 (Short-term goal)	24 hour maximum
	30 µg/ m^3 (Long-term goal)	Annual

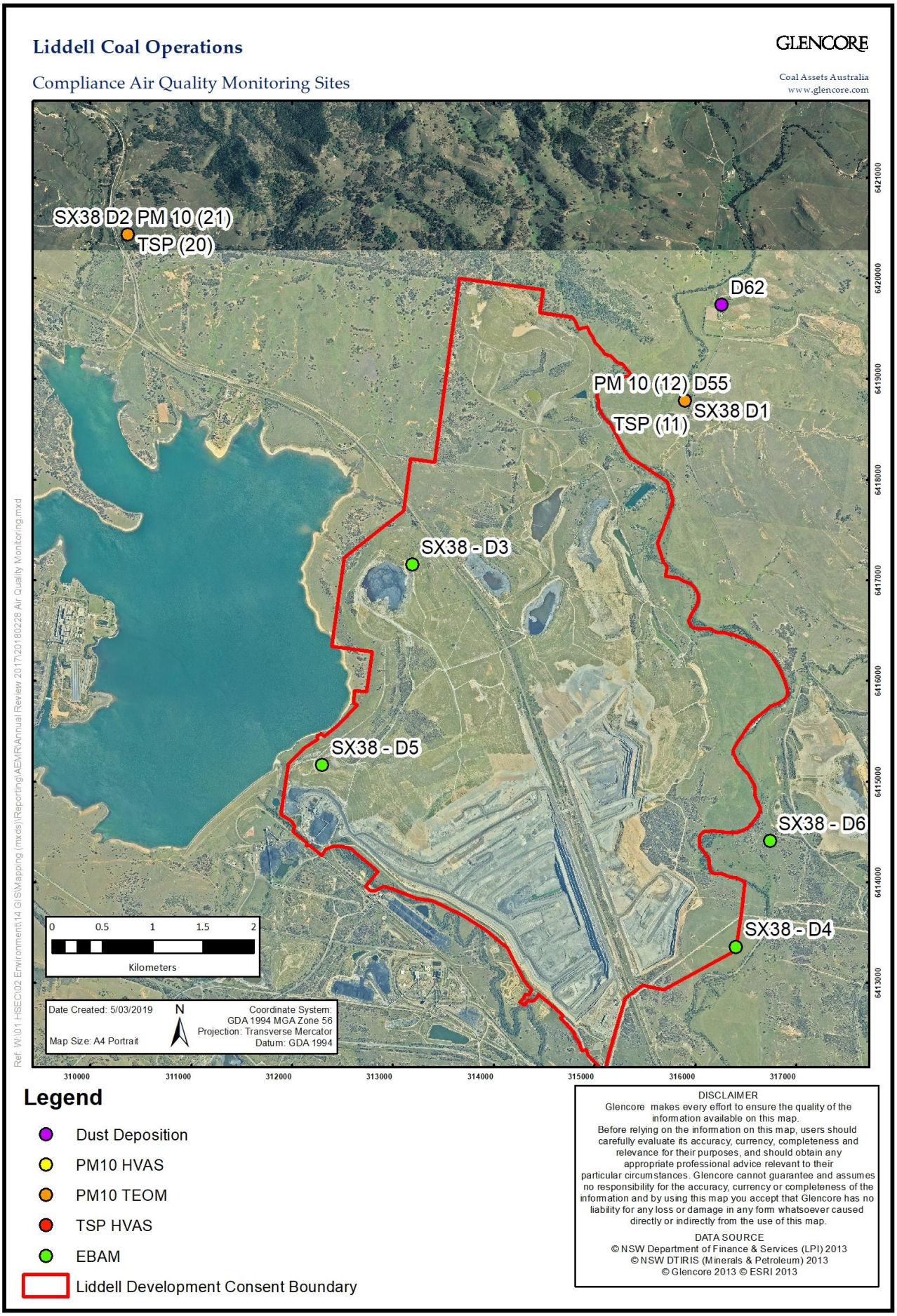


Figure 6 Air quality monitoring sites

Deposited Dust

The location of LCO's compliance depositional dust gauges are shown on **Figure 6**. In accordance with the EPL and Air Quality Management and Monitoring Program, monitoring results are collected from all deposited dust gauges on a monthly basis. Deposited dust monitoring results are provided in **Appendix C**. Two dust gauges maintained by LCO are representative of private residences (D55 and D62). During the reporting period both monitoring sites met the annual average criteria.

A summary of LCO's dust deposition gauge performance with compliance criteria is presented in **Table 14**.

Table 14 Annual average depositional dust comparison

Monitoring location	Approval Criteria (g/m2)	Performance during the reporting period (g/m^2)	Key management implications	Proposed management actions
D55	4	Compliant (1.5)	NA	None required
D62	4	Compliant (1.6)	NA	None required

Deposited Dust - Comparison to EA Predictions

The Liddell Coal Modification to Development Consent Environmental Assessment (EA) (Pacific Environment Limited, 2013) makes predictions that the modifications alone or cumulatively will not result in exceedances of the relevant deposited dust criteria at any private residence in the surrounding area. This is an annual average criterion.

All annual averages at dust gauges representative of private residences were below the maximum annual average deposited dust level of 4 g/m2/month, as the modelling predicted.

High Volume Air Sampling - TSP

LCO operates two compliance High Volume Air Samplers (HVAS) which sample Total Suspended Particulates (TSP), as shown in **Figure 6.**. In accordance with the Air Quality Monitoring Program and EPL requirements, TSP is measured by the samplers every six days. TSP monitoring results are presented in **Figure 7** and **Figure 8** and provided in **Appendix C**.

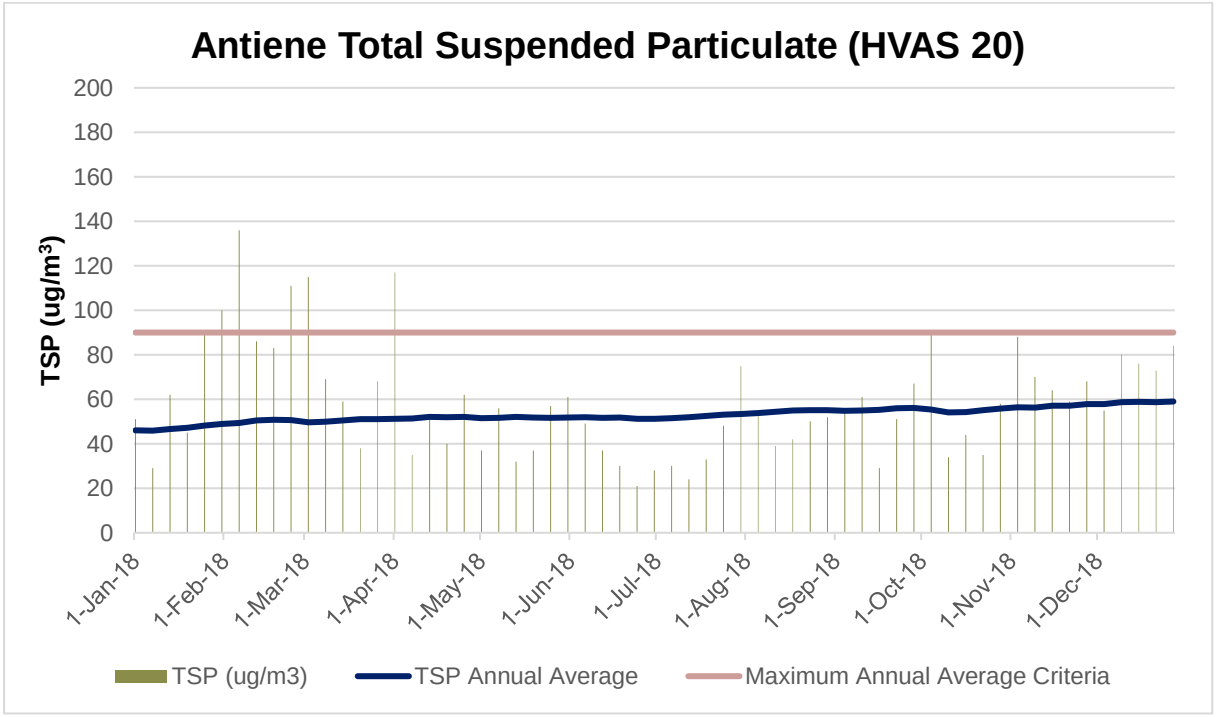


Figure 7 Antiene HVAS TSP Annual Results

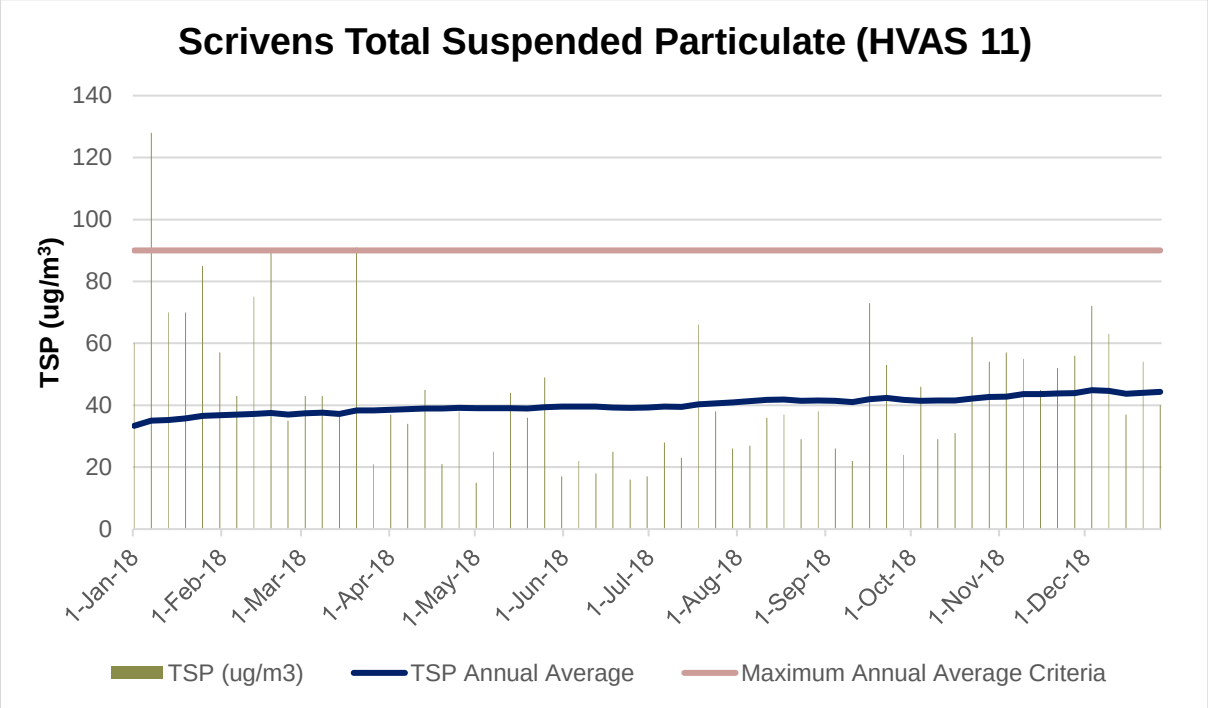


Figure 8 Scrivens HVAS TSP Annual Results

During the reporting period LCO complied with the TSP annual average goal (90µg/m^3) at the Antiene (HVAS 20) and Scrivens property (HVAS 11). The annual average TSP at HVAS 20 was 59 µg/m^3 and 44 µg/m^3 at HVAS 11.

High Volume Air Sampling – PM10

LCO operates two compliance HVAS which sample fine particulates with an aerodynamic diameter of less than 10 microns (PM10), as shown in **Figure 6**. In accordance with the Air Quality Management and Monitoring Program and EPL requirements, PM10 is measured by the samplers every six days.

PM10 monitoring results are presented in **Figure 9** and **Figure 10,** detailed results provided in **Appendix C**. These results are compared against daily meteorological data (wind speed and direction) to determine whether dust levels are attributable to Liddell Coal Operations.

During the reporting period, LCO complied with the PM10 long term (annual average) criterion (30 µg/m^3) and short term criterion (50 µg/m^3) at Scrivens (HVAS 12) and Antiene (HVAS 21). The annual average PM10 at HVAS 12 was 17 ug/m^3 with a maximum concentration of 47 ug/m^3 (recorded on 7 January 2018). The annual average PM10 at HVAS 21 was 22 µg/m^3 with a maximum concentration of 48 µg/m^3 (recorded on 20 March 2018). There were no exceedances of the impact assessment criteria during the reporting period.

A single sample was not collected from Scrivens (HVAS 12) on 15 December 2018 due torn filter paper. An additional ‘make up run’ was undertaken on 24 January 2019.

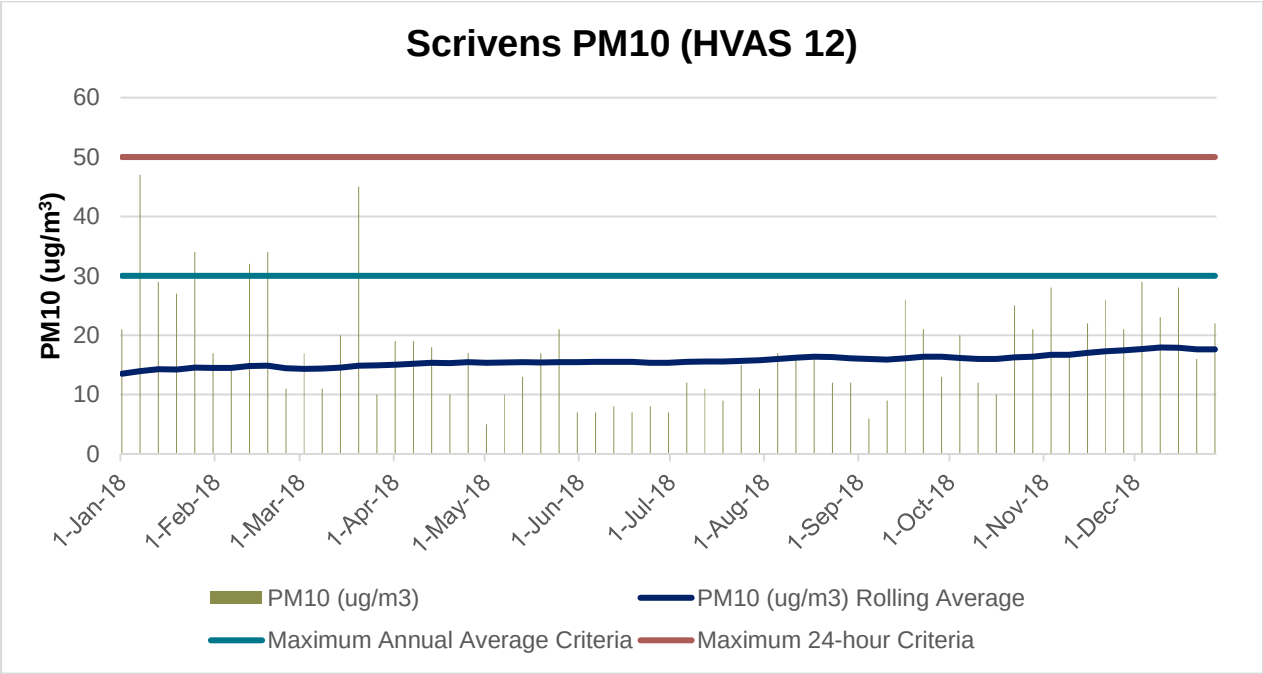


Figure 9 Scrivens HVAS PM10 Annual Results

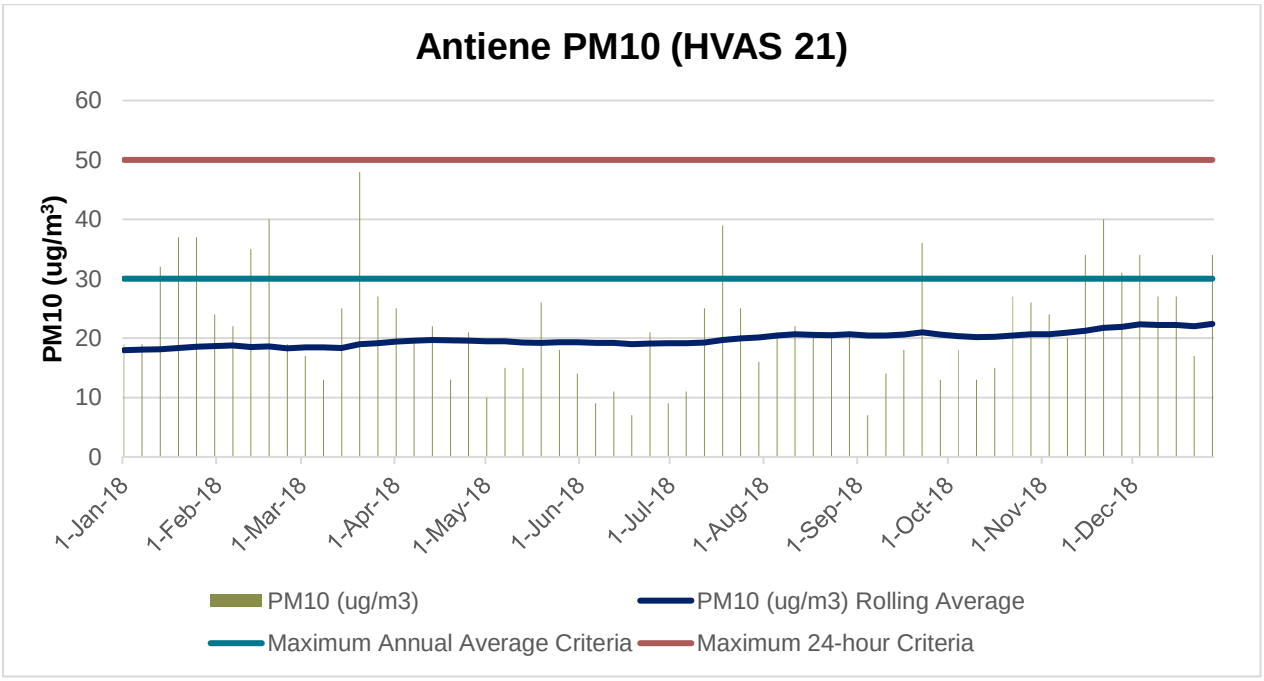


Figure 10 Antiene HVAS PM10 Annual Results

High Volume Air Samplers - Comparison to EA Predictions

The Liddell Coal EA (2013) did not predict any exceedances of the annual average PM_{10}, criteria at any of the nearest receptors. When considering LCO and other sources (including mining and other non-mining sources), none of the nearby privately owned residences are predicted to experience annual average PM10 levels above the relevant criterion, as per **Table 13**, on an annual basis.

Continuous Monitoring – PM10

LCO operate two continuous Tapered Element Oscillating Microbalance (TEOM) measuring 10µm Particulate Matter dust levels around the site. Air quality and meteorological monitoring data are evaluated against monitor-specific PM10 and meteorological triggers on a real-time basis with dust alarms automatically triggered by LCO's data acquisition system. The alarms are sent to key operational personnel and are used as an auxiliary management tool in controlling dust emissions at Liddell.

During the reporting period, LCO complied with the PM10 long term (annual average) criterion (30 µg/m^3) at Scrivens (SX38-D1) and Antiene (SX38-D2). The short term 24 hour criterion (50 µg/m^3) was exceeded 15 times during the reporting period at continuous monitoring units SX38-D1 and SX38-D2. A summary of each exceedance event is provided in **Table 15** below.

Table 15 Air quality exceedance summary

Exceedance Date	Unit	Short Term Criterion (ug/m^3)	Monitored Result (ug/m^3)	Investigation Results
8/1/2018	SX38-D2	50	59.6	Unit faults caused by high ambient temperatures resulted in invalid dust monitoring results above site criterion.
9/1/2018	SX38-D2	50	55.6	Unit faults caused by high ambient temperatures resulted in invalid dust monitoring results above site criterion.
23/1/2018	SX38-D2	50	52.1	Unit faults caused TEOM unit noise resulted in elevated dust reading causing measured results to exceed site criterion.
9/2/2018	SX38-D2	50	57.7	Regional air quality conditions were elevated and a significant southerly change caused a spike in short term conditions resulting in the exceedance of the 24 hour average criteria.
15/2/2018	SX38-D1	50	56.6	Regional dust levels were elevated due to bushfire activity affecting the local area. Event excluded as an extraordinary event in accordance with DA305-11-01 Schedule 3 Condition 16 (d)
15/2/2018	SX38-D2	50	65.7	Regional dust levels were elevated due to bushfire activity affecting the local area. Event excluded as an extraordinary event in accordance with DA305-11-01 Schedule 3 Condition 16 (d)
16/2/2018	SX38-D2	50	50.4	Regional dust levels were elevated due to bushfire activity affecting the local area. Event excluded as an extraordinary event in accordance with DA305-11-01 Schedule 3 Condition 16 (d)
19/3/2018	SX38-D2	50	55.7	During daylight hours, LCO was downstream of SX38-D2 and therefore unlikely to contribute to monitored levels. Regional monitors and boundary monitors recorded high dust levels upstream prior to entering the LCO boundary.
20/3/2018	SX38-D2	50	54.7	LCO boundary monitors demonstrated that despite regional conditions being poor, LCO had negligible contribution to the regional air quality.
15/4/2018	SX38-D1	50	59.1	Unit was located upstream of LCO and therefore unlikely to have contributed to the measured dust levels.
15/4/2018	SX38-D2	50	65.2	Unit was located upstream of LCO and therefore unlikely to have contributed to the measured dust levels.
22/11/2018	SX38-D1	50	130.2	Event excluded as an extraordinary event in accordance with DA305-11-01 Schedule 3 Condition 16 (d) due to a dust storm moving Western NSW to the East Coast and through the Hunter Region.
22/11/2018	SX38-D2	50	146.4	Event excluded as an extraordinary event in accordance with DA305-11-01 Schedule 3 Condition 16 (d) due to a dust storm moving Western NSW to the East Coast and through the Hunter Region.
23/11/2018	SX38-D1	50	115.6	Event excluded as an extraordinary event in accordance with DA305-11-01 Schedule 3 Condition 16 (d) due to a dust storm moving Western NSW to the East Coast and through the Hunter Region.
23/11/2018	SX38-D2	50	121.3	Event excluded as an extraordinary event in accordance with DA305-11-01 Schedule 3 Condition 16 (d) due to a dust storm moving Western NSW to the East Coast and through the Hunter Region.

Continuous monitoring points SX38-D1 and SX38-D2 failed to monitor PM10 continuously on 13 occasions in accordance with Section 2.11 of the approved LCO AQMMP. Section 4.5 of the National Environment Protection (Ambient Air Quality) Measure Technical Paper No. 5 – Data Collection and Handling, 2001 (Prepared by the National Environment Protection Council Peer Review Committee), identifies an average concentration can only be valid if it is based on at least 75% of the expected samples in the daily averaging period.

LCO has identified that monitoring points SX38-D1 and SX38-D2 failed to achieve PM10 data availability greater than 75% a number of times, during the reporting period. These instances are summarised in **Table 16** below.

Table 16 Failure to meet PM10 data availability instances

Monitoring Period	Unit	Data Availability (%)	Comments
9/1/2018	SX38-D2	53	Air conditioner and circuit breaker faults
10/1/2018	SX38-D2	0	Air conditioner and circuit breaker faults
11/1/2018	SX38-D2	71	Air conditioner and circuit breaker faults
11/1/2018	SX38-D1	33	Unit outage due to tripped circuit breaker
12/1/2018	SX38-D1	35	Unit outage due to tripped circuit breaker
14/01/2018	SX38-D2	54	Unit outage due to tripped circuit breaker
15/01/2018	SX38-D2	43	Unit outage due to tripped circuit breaker
27/01/2018	SX38-D2	29	Power outage
28/01/2018	SX38-D2	69	Power outage
16/05/2018	SX38-D2	48	12 month planned maintenance
17/05/2018	SX38-D2	62	12 month planned maintenance
22/07/2018	SX38-D2	70.1	Unexplained fault required unit restart
9/09/2018	SX38-D2	70.1	Unit stopped due to modem lockup
30/10/2018	SX38-D2	70.8	Unexplained fault required unit restart
7/11/2018	SX38-D2	73.6	Case/cap heater alarms data excluded

Despite the above instances in which SX38-D1 and SX38-D2 failed to achieve PM10 daily availability greater than 75%, the overall valid data availability for each unit during 2018 was 98.7% and 97.4% respectively.

The rolling annual average PM10 at SX38-D1 was 17 ug/m^3 and 23 ug/m^3 at SX38-D2. PM10 monitoring results are presented in **Figure 11** and **Figure 12.**

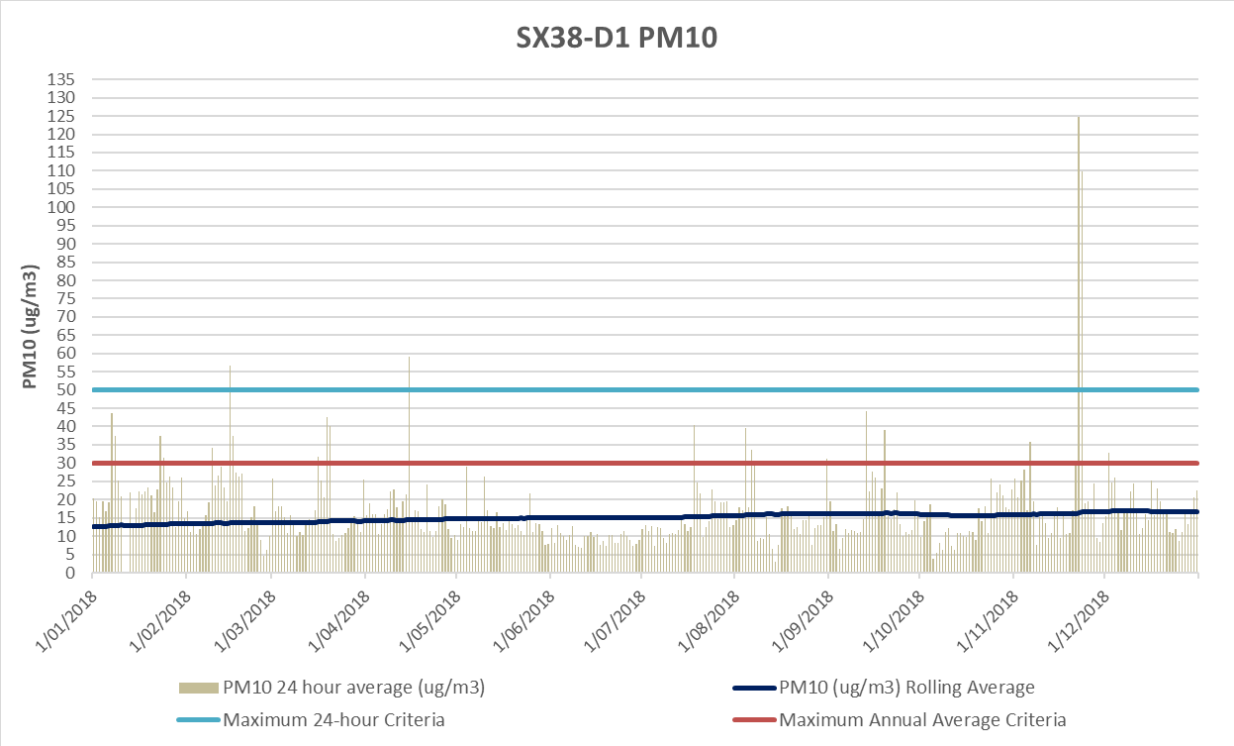


Figure 11 SX38-D1 TEOM PM10 Results

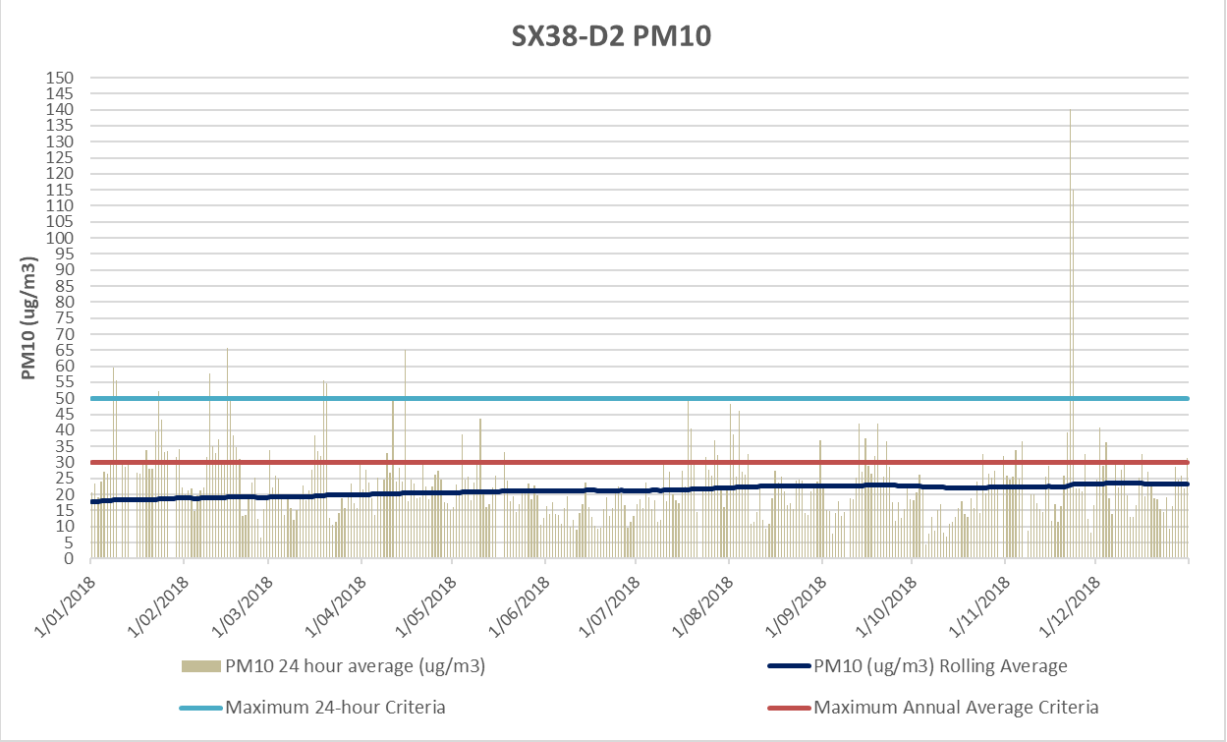


Figure 12 SX38-D2 TEOM PM10 Results

Continuous PM10 Monitoring - Comparison to EA Predictions

The DA 305-11-01 Modification 5 Environmental Assessment (EA) predicted that there was a very minor chance of LCO exceeding the compliance limit of 50 µg/m^3 with the probability of this occurring being less than 0.3%. While exceedance of this criteria was recorded at private residences (SX38-D1 and SX38-D2) during the reporting period, as predicted, LCOs contribution to these values was not considered significant.

Pollution Reduction Programs

During 2018, no new Pollution Reduction Programs were completed however LCO did continue to implement Haul Road Dust Monitoring program as established from a 2013 PRP for Particulate Matter Control Best Practice – Wheel Generated Dust. This monitoring program includes determining the haul road dust control efficiency achieved across the operation on four occasions throughout the year. Real-time concentrations of PM10 were measured using a DustTrak real time analyser attached to a 4WD vehicle. The mobile dust sampling method has been approved by the US EPA for use in a similar pollution reduction programs and the sampler is equivalent to that used in the ACARP project on wheel generated dust monitoring. Emissions were monitored from controlled haul roads (loading circuits), with baseline data collected at an uncontrolled test site; the dust monitored coming off the haul road surface was compared to the uncontrolled section to determine the control efficiency. All monitoring is completed in line with the original PRP methodology including the metrological conditions leading up to and during the monitoring event, silt sampling and scope of monitoring. As per the AQMMP, LCO aims to achieve greater than 80% control efficiency at all times.

During each monitoring event LCO achieved the target 80% control efficiency with results as follows:

- Q1 February – 87%
- Q2 May –87%
- Q3 August – 92%
- Q4 December – 92%

6.4 Visual and Stray Light

Visual impact management is undertaken in accordance with the practices outlined in the LCO MOP (LCO, 2018) and the LCO Lighting Management Procedure. In accordance with these documents, visual impacts are managed through:

- prompt rehabilitation;
- prioritisation of rehabilitation, focusing effort on areas that are most visually prominent from off-site private residences and public transport routes; and
- directing of light away from residences.

During the reporting period, flood lighting in mining areas was located to minimise direct light emitted to Hebden Road, Antiene Road, the New England Highway, the Main Northern Railway, or towards any dwellings. During 2018, there were no lighting complaints received.

Comparison to EA Predictions

The DA 305-11-01 Modification 5 Environmental Assessment (EA) predicted that the project would have negligible to low visual impact on surrounding receptors due to open cut pits moving in a southerly direction away from the nearest privately owned receptors. As per predictions, no lighting complaints were received by LCO during the reporting period.

6.5 Aboriginal Cultural Heritage

Aboriginal Heritage Impact Permit (AHIP) C0000623 (AHIMS Permit ID 3765) was issued by OEH on 3rd December 2014 for the salvage of all sites within the impact footprint of Development Modification 5.

The LCO Aboriginal Cultural Heritage Management Plan (ACHMP) was revised during the reporting period to incorporate changes resulting from consultation with OEH and Registered Aboriginal Parties (RAPs) during the review period. The revised plan was reviewed and approved by DPE in August 2018.

During May 2018, LCO completed Archaeological Due Diligence assessment of the Mitchell Hills biodiversity offset area to provide for the protection of cultural heritage within these areas. No Aboriginal sites or sensitive landforms were identified within the study area.

A series of Archaeological Due Diligence inspections were undertaken by a qualified representative from OzArk across LCO operations during 2018. None of these assessments recorded any new or previously

recorded sites and they were located on landforms which were either subject to high levels of historic disturbance or on landforms deemed unsuitable for occupation. No Salvage Programs were completed in 2018.

A number of additional consultation activities occurred with the LCO RAPs during 2018. A summary of these activities are as follows:

- Offset Site Inspection – as requested in the 2017 Annual Meeting, LCO invited all RAPs to attend a site inspection of the LCO Offset Areas to review the new sites located during the 2017 Offset Due Diligence surveys. Additionally this consultation provided the opportunity for RAPs to provide guidance on revegetation options for the areas. Following consultation with RAPs and DPE in April 2018, an appropriate approach to revegetation works which minimise impacts to Archaeological sites within LCO Offset Areas was agreed. Minutes and presentations were provided to all LCO RAPs for review and comment.
- Tubestock planting – subsequent to the agreed method above, LCO invited all RAPs to participate in the hand planting of tubestock in the LID-BC-SAL, away from known Aboriginal sites. This project was completed on the 21 and 22 of June 2018.
- Modification 7 – LCO invited RAPs to consult regarding Modification 7. A meeting was held with attendees on the 16 July 2018 with minutes and presentations provided to all RAPs for review and comment.
- LID-BC-SAL blast heave – to foster transparency, LCO advised LCO RAPs on 28 June 2018 of a surface blast on 7 May 2018 that led to some minor cracking and surface heave within the LID-BC-SAL. Furthermore, in the interest of transparency, LCO also notified OEH of the blast. LCO provided the investigated report from an Archaeologist from Ozark which identified that no harm has occurred to any Aboriginal objects, as defined under s.86 of the *National Parks and Wildlife Act 1974.* LCO provided the opportunity for RAPs to visit the area of impact and discuss remediation options (if necessary) or alternatively the site would be visited during the annual meeting and inspection.

The annual inspection and meeting was held with RAPs on 4 December 2018. During this inspection, RAPs visited the location where blast heave entered the LID-BC-SAL. Due to the nature of the area and no catchment, it was agreed that it was best to leave the area as is and continue to monitor. The following actions were discussed and agreed on during the inspection:

- Continue to place additional straw bales with grass seed to be placed at HAZ2 OS1 for scour protection;
- Provide a map of extant sites and extents at the next annual meeting;
- Include discussion of cultural burns in the agenda for the 2019 Annual meeting; and
- Organise next annual meeting in approximately November 2019 and coordinate the meeting for earlier in the day.

Outstanding actions from the November 2017 Annual meeting were addressed during 2018. These include:

- Installation of a gate near HAZ2 OS1 to allow for better access;
- Organise removal of waste internal fencing near HAZ2 OS1;
- Place small signs in the field (within the Sensitive Aboriginal Landscape (SAL)) to identify site name.

Since the 2018 annual inspection, LCO has installed additional straw bales at HAZ2 OS1 to assist in protecting the area from the scour.

For further information relating to Aboriginal heritage management at Liddell, please refer to the LCO ACHMP, which can be accessed from the Liddell Coal Website www.liddellcoal.com.au.

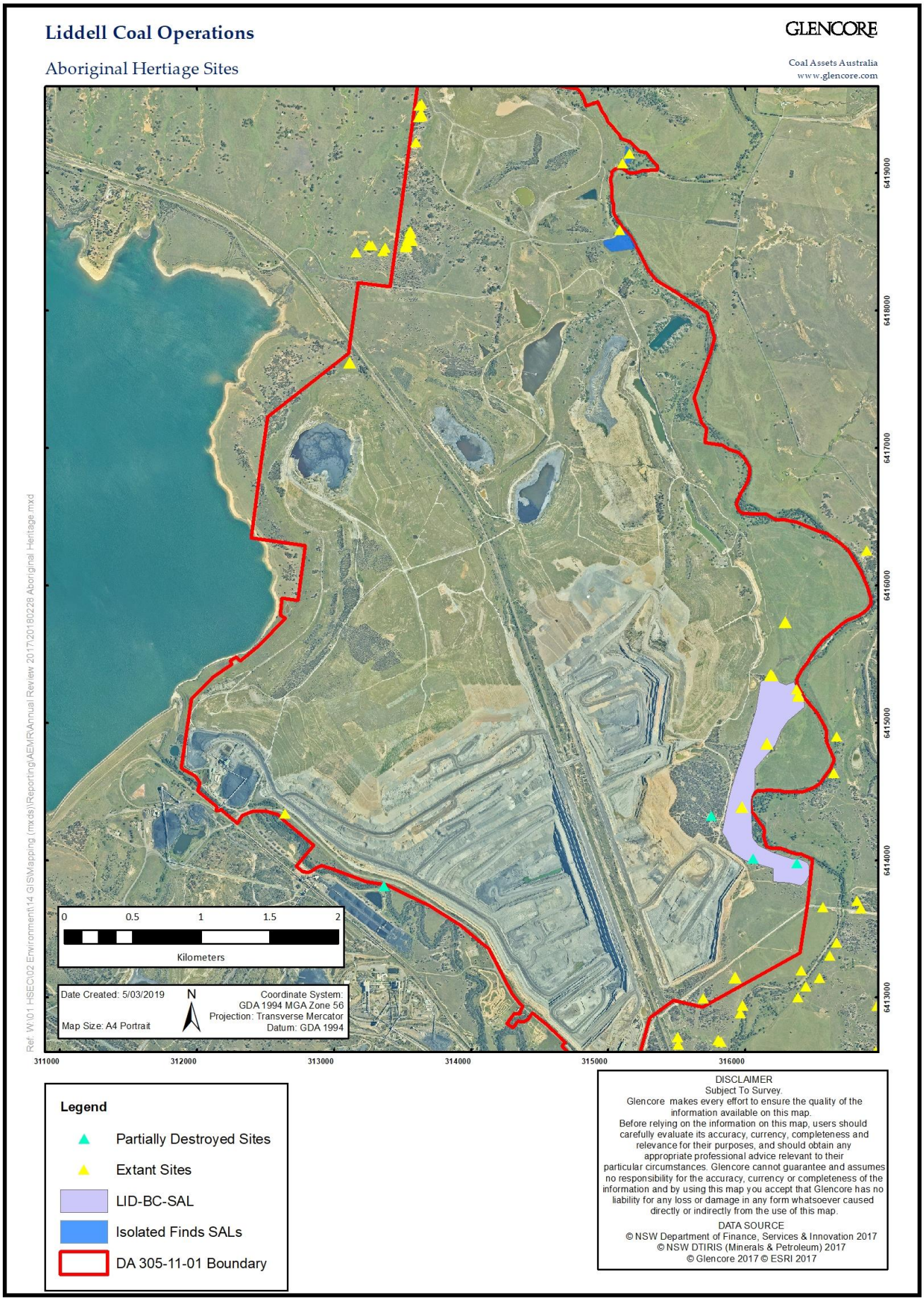


Figure 13 Aboriginal archaeological sites within Development Consent Boundary

6.6 Heritage

The Environmental Assessment (EA) prepared for the development consent modification (DA305-11-01 Modification 5) found that mining in the vicinity of the Chain of Ponds Inn (COPI) could proceed without any major risk of damage, provided that blast design control is implemented and a number of defects in the structures within the COPI complex are rectified prior to the commencement of the close range blasting program.

As required by Condition 15A of DA-305-11-01 (as modified) the Chain of Ponds Inn Blast Management Strategy (COPI Strategy) has been developed by LCO to document the management of potential blast related impacts on the Chain of Ponds Inn. This strategy was revised and approved by the DPE on the 17 October 2018 in consultation with NSW Heritage Council and Coal & Allied (owner).

In accordance with DA305-11-01, the primary objective of this Strategy is to ensure that blasting at LCO does not cause loss of heritage value, and/or have a negligible impact on the structural integrity of the external fabric of the Inn, compared to the existing condition and structural integrity of the Inn at the date that consent was granted to DA305-11-01 MOD 5 (December 2014).

The COPI Strategy describes a process whereby the staged increase in the vibration level and air blast exposure (trigger levels) at the Chain of Ponds Inn, combined with continual monitoring of vibration and air blast levels and corresponding structural behaviour, will enable an adaptive management approach to blasting in the vicinity of the Inn. The strategy involves both at-receptor mitigation measures (structural stabilisation measures at the Chain of Ponds Inn) and at-source management measures (blast design control), particularly within a distance of 350 metres to the Inn, combined with an inspection and blast review regime to effectively manage blasting in the vicinity of the Inn.

During the reporting period, no impacts to the Inn Complex have been noted by either building vibration monitoring or visual inspection.

As identified in the 2017 Annual Review, some fragments of loose plaster from the ground floor archway had dislodged and fallen to the floor following a blast on the 11 May 2017. As per the approved management strategy, the damage was deemed insignificant and no structural impacts to the Inn occurred. Repairs to this plaster will be completed when the blasting program affecting the building is completed in approximately 2021.

Bill Jordan Associates determined that there has been no structural impact to the Inn complex resulting from blasting during the reporting period.

Management Actions During 2018

As per the requirements of the management strategy, continuous monitoring of blasting as well as structure response monitoring occurred during 2018. No further stabilisation mitigation works were identified as being required. A summary of the building response monitoring is outlined below.

During the reporting period, levels of 40 mm/s PPV were measured at the COPI Complex with no measured or observed effects on the buildings. In accordance with Section 5.2 the COPI Strategy, Bill Jordan and Associates identified that no vulnerable walls or other items required further support and therefore recommended continuation of the blast management program in accordance with the approved Strategy.

Analysis of Blast Monitoring

The structures were monitored with accelerometers on 6 occasions during the year, from 2/2/2018 to 11/12/2018. For each of these events, vibrations were measured at the building locations specified in the strategy with the acceleration measurements analysed and compared with the in-ground geophone velocity measurements (the site geophone). For both the geophone and the accelerometers, the analysis yield acceleration, velocity and displacement results, together with frequency analyses for all.

The accelerometer mounting locations chosen to best describe the behaviours of the buildings are shown in **Figure 14**. With the exception of locations Ad and Bc, all are at the tops of the two-storey walls and generally measure the most-damaging in-plane movements. Location Ad is at the top of a chimney and is measuring the movement about its weaker axis; location Bc is at the centre of a two-storey wall which is unsupported by a floor and for which the out-of-plane movement is the most critical.

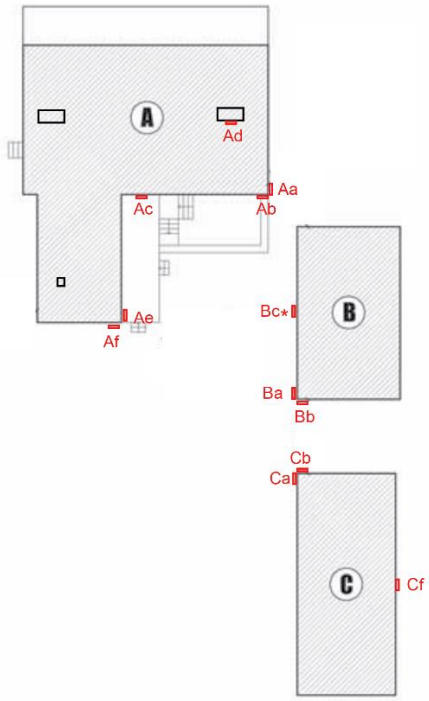


Figure 14 Diagram of accelerometers on COPI

Displacement of a building element is the best indication that damage may be caused, as this relates directly to the strain in the building fabric. In a report prepared by Bill Jordan & Associates dated 16 March 2016, the acceptable displacements were tabulated for each of the monitored locations. The most vulnerable locations were shown to be the chimneys and the large unsupported two-storey side wall(s) of the kitchen block (Building B).

No results recorded in 2018 suggested that any change was required in these criteria.

The maximum displacements recorded during the year at each location are shown in **Table 17**.

Table 17 Maximum displacements recorded in 2018

Location	Max. displacement (mm)	Tolerance	% of tolerance
Aa	0.55	7	8
Ab	1.04	7	15
Ac	1.61	7	23
Ad	5.01	12	42
Ae	0.65	7	9
Af	1.52	7	22
Ba	0.64	5	13
Bb	1.29	5	26
Bc	1.09	3	36
Ca	0.73	5	15
Cb	1.06	5	21
Cf	1.11	5	23

Data relating to the effects of groundwave frequencies continued to be gathered during the year and has been used to refine blast design parameters.

Visual Inspection Outcomes

Visual inspections were completed through the year on a minimum quarterly basis as per the approved Strategy. The buildings were assessed for damage as per the agreed methodology and no differences could be found in the condition of any of the buildings fabric which are attributable to blasting impacts.

Trends and compliance issues

During 2018, there were no exceedances of the compliance limits at the Chain of Ponds Inn nor was there any significant damage as a result of blasting activities.

Blast vibrations are still not reliably predictable, different factors influence the actual vibration levels for each blast and the predictions will continue to vary from the recordings of the event. A conservative approach/margin is considered in both the prediction models and the building behaviour models and it will continue to be appropriate to continue this into the future.

Comparison to EA Predictions

The Liddell Coal EA (2015) proposes that modifications to the development consent would be unlikely to cause significant damage to the Chain of Ponds Inn provided that the blast management strategy developed for the Project is implemented. A staged and adaptive management approach has been applied to South Cut blasting and has not resulted in any significant damage to the Inn in 2018.

Future Work

Continued monitoring of the buildings behaviour as per the strategy will occur to further develop the predictive modelling and provide for the conservation of the structures.

6.7 Exploration

Exploration activities were undertaken by LCO during 2018 with the approved disturbance boundary for the purpose of providing more detail for the development of reliable short term mine plans, particularly in relation to structural position of seams and the character of seam splits in the Lemingtons, Liddell and Arties seams. A total of 19 exploration holes were drilled by LCO during the reporting period and also included the installation of two piezometers to assist with managing geotechnical stability in the Entrance Pit.

6.8 Spontaneous Combustion

Fine coal along the ribs of exposed pillars in old underground workings associated with the Liddell coal seam have been historically linked to spontaneous combustion at LCO. To manage spontaneous combustion the mine plan aims to keep the underground workings submerged with water to limit coal exposure to oxygen for as long as possible. Once exposed, the mine design then incorporates benches for sealing off the high wall, which minimises the ingress of oxygen. Where areas of spontaneous combustion are exposed, the affected material is removed where possible, dumped low in spoil areas and covered with at least 20 m of inert material. If removal is not feasible, care is taken to minimise potential dust generation, and the coal is processed in the CHPP as soon as practicable to minimise ROM stockpile time. Spontaneous combustion of stockpiled product coal at LCO is rare due to the moisture introduced during the washing process and the regular transfer of coal to the Port of Newcastle for export. In the event that stockpiles start to generate heat due to delays in transportation, coal in the stockpiles is spread out and soaked with water to allow the heat to dissipate. Measures to control spontaneous combustion are documented in the LCO Spontaneous Combustion Management Plan, which is reviewed and updated regularly.

Historically, underground workings in the Liddell seam were de-watered a number of months prior to mining. This allowed the coal to be exposed to oxygen, facilitating spontaneous combustion. The mining process was revised and implemented during 2013, 2014 and sees a just-in-time methodology, where by an increased pumping network has enabled the workings to be de-watered just prior to excavation. By eliminating the coal's exposure to the atmosphere and propensity to combust, rather than relying on an engineering treatment once exposed, a significant reduction in the environmental hazard has been realised.

Since revising the management practices, the methodology has proven successful with a considerable reduction of spontaneous combustion. Whilst there have been occurrences of spontaneous combustion within working areas, the extent and duration of these affected areas has reduced. LCO did not have any management issues relating to spontaneous combustion resulting in either odour or air quality complaints during the reporting period.

LCO remains committed to developing and improving environmental management strategies. If the adopted spontaneous combustion strategy exhibits unsatisfactory performance, then the methodology will be reassessed and an effective strategy implemented to achieve acceptable outcomes.

6.9 Tailings and Rejects Management

The processing of ROM coal in the CHPP produces both tailings and coarse rejects. This section details the tailings and rejects management strategy employed by LCO.

Tailings and reject management strategy, operation and disposal

Tailings and reject production is dependent on a number of factors including the source coal seam, seam section, in-pit mining conditions, out of seam dilution, stockpile weathering prior to washing, and weather conditions during and prior to mining.

Coarse rejects generated from the LCO CHPP are in the order of 26% of ROM coal processed, and consist of carbonaceous shale, mudstone and claystone, with minor coarser rocks such as siltstone and sandstone. Coarse rejects will be co-dispersed throughout the overburden dumps in varying levels during dump construction with a final placement to be a minimum of 5m below the final landform. Capping of coarse reject is undertaken using inert overburden to minimise the risk of spontaneous combustion. Carbonaceous shale in the coarse rejects has a very low spontaneous combustion potential.

Under DA305-11-01, up to 0.5 Mtpa of tailings reclaimed from LCO can be sold to Macquarie Generation, with the actual annual rate depending on the moisture content of tailings in situ, and the energy content after mining, recovery, drying and screening. The tailings are to be transported in haul trucks via Pikes Gully Road underpass and a merging lane to the New England Highway to the nearby power station at a rate of no more than 114 truck movements per day (i.e. 57 loaded trucks), 5 days per week. No transportation of tailings to Macquarie Generation occurred during 2018.

LCO has approval to dispose of tailings in the Antiene, Reservoir West, Reservoir South and the Railway fines (now referred to as the Durham Tailings) emplacement areas.

The Antiene tailings storage facility (TSF) has reached capacity and use of this void as an active tailings emplacement area ceased in August 2009. A strategy for the capping of Antiene TSF was submitted to the DRE in December 2014. As per the capping strategy submitted to DRE, LCO commenced capping of the Southern portion of Antiene TSF during 2016 and aims to recommence capping operations on the Northern portion during 2019, pending confirmation of sufficient surface strength. At this stage approximately 23ha of the 33ha dam have had an initial capping layer of 1.5m created.

Deposition into the Reservoir South Tailings Dam ceased in 2014 and deposition into the Reservoir West Tailings Dam ceased in December 2013. Both reservoir tailings dams (RTDs) have been in a settling/drying stage since cessation of emplacement which has resulted in approximately 580 thousand cubic metres of combined additional capacity becoming available for tailings emplacement. An addendum to the 2018 – 2020 Mining Operations Plan was approved by the Resources Regulator on 24 October 2018 to permit the alternating emplacement of tailings between the RTDs and Durham TSF during 2019.

During 2018, the Durham TSF was the only active tailings emplacement at Liddell. The Durham TSF emplacement was previously planned to reach capacity during early 2019 however the temporary recommissioning of the Reservoir Tailings dams will extend the life of Durham TSF until late 2019 and provide for greater consolidation of material as it is placed in thinner layers.

Between 2019 and 2021, LCO plan to commence emplacement of tailings in Mount Owen's West Pit void in consideration of the Greater Ravensworth Area Water and Tailings Strategy in accordance with DA305-11-01 Modification 6. This void will enable sufficient tailings disposal capacity in the period when the Durham TSF is reaching capacity. LCO plan to commence tailings emplacement in the South Pit Tailings Dam in 2021.

In order to assist in settlement of the tailings, free standing water is pumped from the surface of the tailings dams when required. A pump is rotated between the inactive tailings dams and water is syphoned off when it is a suitable depth.

Water in the Durham Tailings Dam and Reservoir Tailings Emplacements is managed through decant ponds and secondary flocculation at the Durham TSF. Flocculent is mixed with the tailings at the tailings pipe outlet to increase solids density. Water then filters through the decant structures and is then pumped to the mine water storage dams.

Table 18 below shows indicative timeframes for capping and final rehabilitation for each facility.

Table 18 Tailings emplacement and rehabilitation timeframes

	2017	2018	2019	2020	2021	2022	2023
RTEA (Reservoir South and West Tailings Emplacement)			Active			Rehab	Rehab
Durham Tailings Emplacement	Active	Active	Active			Rehab	Rehab
Antiene Tailings Dam	Rehab	Rehab	Rehab				
Mount Owen West Pit			Active	Active	Active		
South Pit Tailings Emplacement					Active	Active	Active

6.10 Waste Management

LCO engage a licensed waste management contractor to handle, transport, track and dispose of all waste streams, including special waste and dangerous goods in accordance with EPL 2094, DA 305-11-01, the POEO Act (1997) and other applicable Commonwealth and State legislation.

Waste segregation is a key component of the LCO waste management system to ensure that waste groups are segregated appropriately to allow for treatment separately. The segregation of bins is inspected weekly by the licensed waste management contractor to identify any issues prior to the waste going offsite and to allow for any actions to be implemented as required.

LCO monitor the quantities of each waste stream monthly to ensure resource recovery is high and are tracking against the achievement of the internal annual recycling target of 92%. Whilst LCO did not meet the internal target of 92%, the increase in hazardous materials disposed was expected due to a demolition of a property containing asbestos.

Table 19 below shows the total recycling efficiency percentage achieved monthly at LCO in 2018.

Table 19 Recycling efficiency recorded in 2018

Month	Total Recycled (%)	Comments
January	95.44	
February	88.15	Slight increase in hazardous and non-hazardous materials disposed
March	93.69	
April	93.68	
May	92.27	
June	91.53	
July	93.30	
August	68.56	Increase in hazardous materials disposed
September	90.12	
October	92.89	
November	88.50	Increase in non-hazardous materials disposed
December	92.34	
2018 Total	89.18	

7 Water Management

7.1 Water Management System

Water management is one of the key operational activities at LCO and is managed through the LCO Water Management Plan. The LCO Water Management Plan (WMP) documents the processes and responsibilities of all aspects of the site water management system. This WMP has been compiled to satisfy the relevant requirements of DA 305-11-01 (as modified), as well as condition's 12, 13, 14, 15 and 16 of the Australian Government EPBC approval. During 2018, LCO consulted with DPE to update the WMP. The key updates comprised of revisions to the water licences register and contextual details to align with 2018 progression of operations.

The water management system at LCO is integrated, that is, the water from both the open cut operations and former underground operations is managed together, in an integrated system. The integrated water management system at LCO is designed around the following operational objectives:

- To maintain a low risk of uncontrolled discharge occurring from the process water (CHPP) or mine water systems over the mine life.
- To minimise the need to export water and salt to the Hunter River by maximising re-use on-site and by transferring excess water to other nearby mining operations.
- To minimise risks of disruption to mining operations by efficient mine and underground workings dewatering.
- To ensure that effective control over generation of airborne particulates is not interrupted due to lack of water by maintaining a reliable water supply.
- To ensure uninterrupted operation of the CHPP by maintaining a reliable water supply.
- To minimise the potential effects of erosion and its associated impacts as a result of mining operations changing flows or conditions downstream.

LCO is guided in its decisions using a life-of-mine water balance model which will enable the prediction of future water supply security and risks of excess open cut pit water. LCO store water on site to maintain supply security during dry conditions, and maximise the water reuse in the CHPP and for dust suppression.

Inflows which contribute to the LCO water balance include site rainfall runoff, tailings water reclaim, former underground inflows and water sourced from neighbouring operations. Outflows or usage from the LCO water balance include evaporation, water used in the CHPP, for dust suppression, vehicle wash down, to mitigate spontaneous combustion in waste rock emplacements, water exported to neighbouring operations and controlled release of surplus water in accordance with EPL 2094 and the HRSTS.

The water uses at LCO include CHPP use, tailings export, dust suppression (haul roads and stockpiles), equipment wash down and potable water usage. The water consumption at LCO was generally consistent with previous reporting periods. Note changes in water consumption are a result of many variables including pit progression, groundwater inflow, rainfall, atmospheric conditions, etc.

LCO also participates in the Hunter River Salinity Trading Scheme (HRSTS), allowing it to discharge from a licensed discharge point located on Chain of Ponds Creek. These discharges take place during high flow periods in compliance with HRSTS regulations. LCO also utilises pipeline infrastructure between Mt Owen, Liddell and Ravensworth (Greater Ravensworth) to assist in the life of mine water holdings of each operation and provide better drought proofing ability as well as strategic use of available mine water storages at each operation reducing the requirement for additional dams/voids.

During 2018, LCO completed an annual review of the site water balance as per Section 7.6 of the WMP including review of the total water flows within the water management system. **Table 20** contains a summary of the water balance results. A summary of the water flows onsite LCO during the reporting period is shown in **Figure 15**. Further, during the reporting period LCO consulted with DPE to update the WMP; specifically updates to the training and communication requirements and contextual updates to align of the plan with current operations.

Table 20 Site water balance

2018 Site Water Balance	
Total Inputs (ML)	2,624
Total Outputs (ML)	3,342
Inputs minus Outputs (ML)	-718
Storage at Start (ML)	7,918
Storage at End (ML)	7,132
Change in Storage (ML)	-786
Imbalance (ML)	-68
Total Inputs + Total Outputs equals total flow through site (ML)	5967
Imbalance Percentage	1.1%

Water balance model calibration and validation will be undertaken in 2019 by comparing model estimates of total water volume stored in all monitored water storages against water volumes estimated from historical monthly monitoring records as required by DA305-11-01 Condition 23 and the WMP.

Mine Dewatering

Bore M49 (20BL172293), Mt Owen bore (20BL169544) and Middle Liddell Bore (MLB; 20BL172588) are utilised to dewater the open cut mine ahead of mining. M49 bore is being maintained at or below -21m AHD. During the reporting period Middle Liddell Bore ranged between -56mAHD and -46mAHD. **Section 7.3** details groundwater monitoring results (water level and water quality) for the reporting period.

Table 21 provides a summary of the water take in 2018 from the groundwater licences held by LCO with an extraction allocation. LCO did not take from any surface water licences during the reporting period.

Table 21 Groundwater take

Water Licence	Entitlement	Passive take	Active pumping	Total
WAL41499 (previously 20BL168063)	500	0	0	0
WAL41498 (previously 20BL168062)	6000 (Combined) MLB	242ML	128ML	370ML
WAL41498 (previously 20BL172588)				
WAL39760 (previously 20BL168060)	5500 Haz 1&2	0	172ML	172ML
WAL18302	5	0	0	0
20WA210940 (previously 20BL017861)	5	0	0	0
WAL41493 (previously 20BL172293)	2500 (Combined) M49	365ML	35ML	400ML
WAL41493 (previously 20BL168209)				
20BL169544	2500	0	0	0
WAL41497 (previously 20BL168061)	1000	0	0	0

Framework Representation

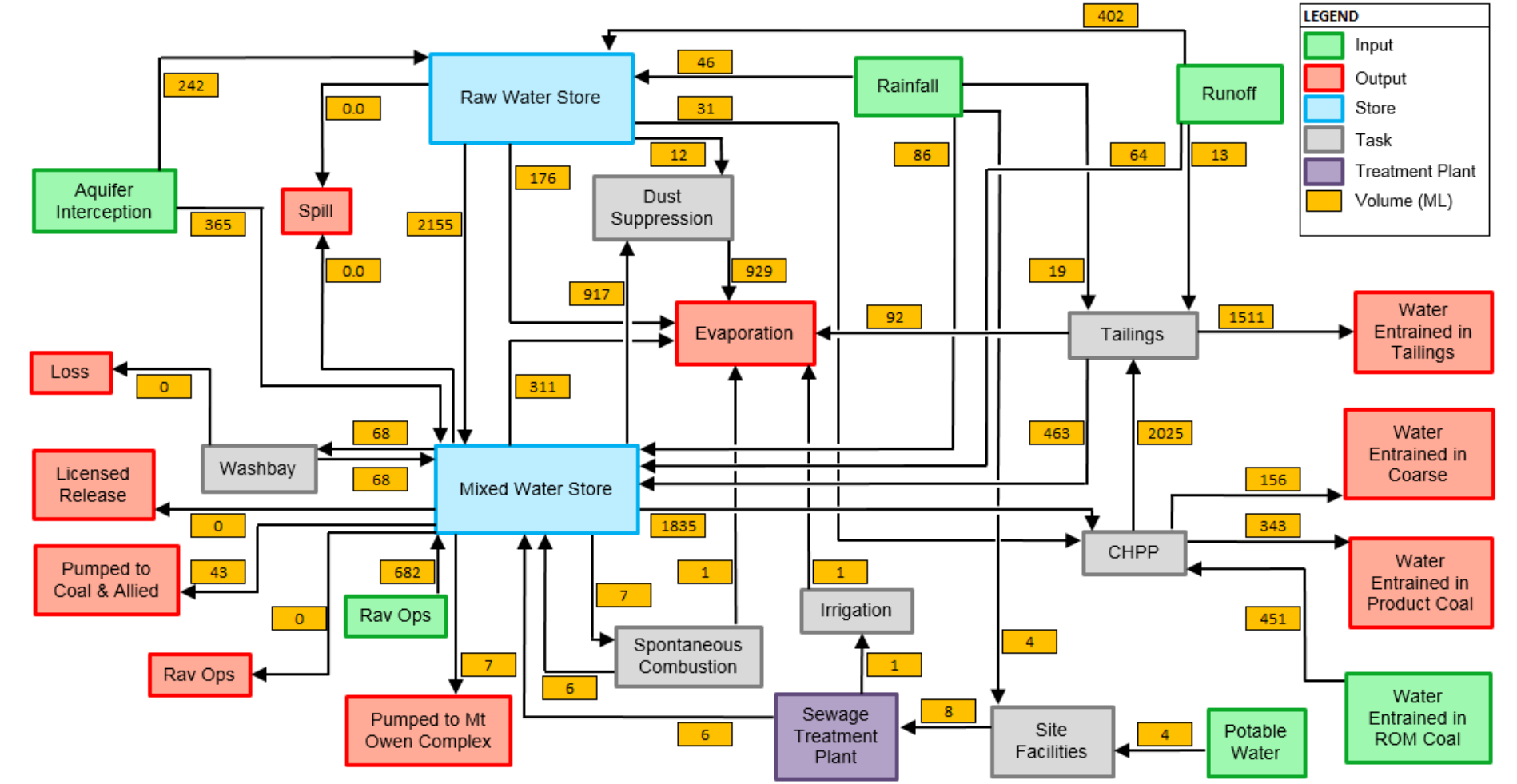


Figure 15 Site water balance

7.2 Surface Water Monitoring

Surface water monitoring is undertaken along the two creek lines adjacent the operation (Bayswater and Bowmans) as well as at onsite water storages. This monitoring program utilises specific surface water quality monitoring trigger limits which provide for the identification of potential adverse impacts.

The trigger limits or impact assessment criteria for both Bayswater and Bowmans Creek has been determined based on a statistical analysis of data collected over a 5 year period. In accordance with ANZECC (2000) guidelines a 90th percentile concentration is appropriate for maintaining water quality. Importantly, impact assessment criteria apply based on the flow conditions of the each creek line and monitoring location; due to the disturbed nature of both catchments this is deemed to be an appropriate statistical criterion to adopt whilst mining operations are ongoing. The creek trigger levels are presented in **Table 22**. Noting the acronyms; TSS – Total Suspended Particulate, EC – Electrical Conductivity, TDS – Total Dissolved Solids.

Table 22 WMP trigger values for surface water quality

	pH lower limit[4]	pH upper limit		EC 90th %tile[1]	EC Max[2]	TDS 90th %tile[1]	TDS Max[2]	TSS 90th %tile[1]	TSS Max[2]
		90th %tile[1]	Max[2]						
Bayswater	6.5	8.3	8.5	5130	7300	3230	5180	50[3]	302
Bowmans Creek	6.5	8.3	8.8	2020	4570	1210	3460	50[3]	97

[1] whole creek 90th percentile
[2] maximum recorded value for whole creek
[3] ANZECC criteria for TSS
[4] ANZECC criteria for pH lower limit

Trigger Level when creek is flowing
Trigger Level when no flow in creek

Monitoring during the reporting period was completed as per the applicable approved WMP. The following sections detail exceedances, if any, of applicable WMP trigger levels; full monitoring results are shown in **Appendix D.**

The surface water monitoring locations are shown above on **Figure 16**.

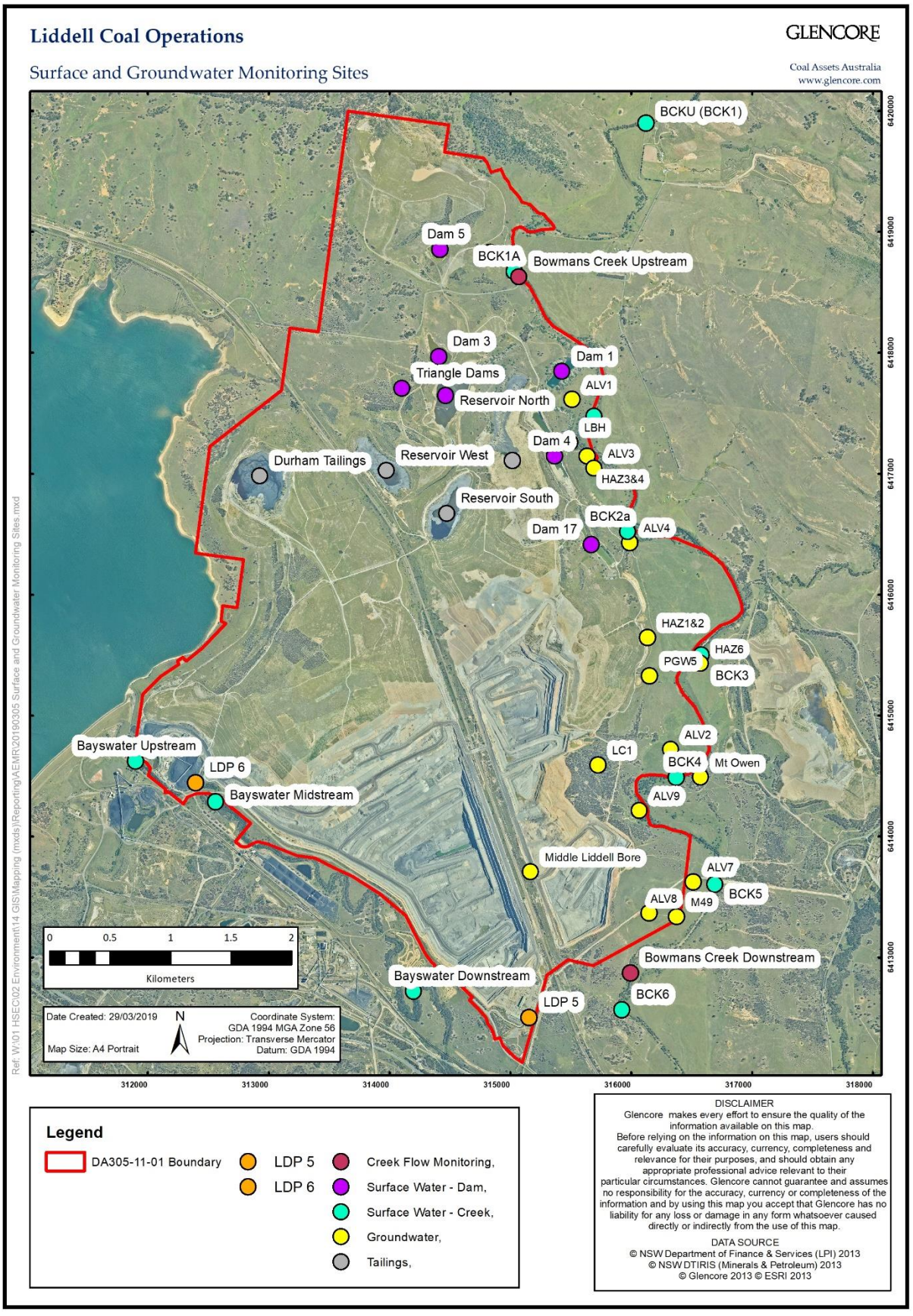


Figure 16 Surface and groundwater monitoring locations

7.2.2 Surface Water Monitoring Results Review

Bayswater Creek

Monitoring of the three sites within the creek (Upstream, Midstream and Downstream) was completed monthly during the reporting period in accordance with the WMP. Bayswater Creek is a highly modified watercourse and regularly experiences periods of low or no flow. The measured water quality levels were typical of historical results with considerable range due to the infrequent flow and highly modified catchment. There was no exceedance of flow or no flow applicable WMP trigger levels.

Bowmans Creek

Monitoring of the eight sites within the creek (upstream BCK1, BCK1A, BCK2, BCK2A, BCK3, BCK4 BCK5 and downstream BCK6) was completed monthly during the reporting period in accordance with the WMP.

It should be noted sections of Bowmans Creek are ephemeral in nature and often pool or have very low flow leading to potential stagnant conditions which influences water quality. With this consideration as detailed above, trigger limits are dependent on the flow conditions at time of monitoring.

Table 23 below summarises the trigger limit exceeded in Bowmans Creek during the reporting period. A summary of the triggers, observations and TARP investigations is included herein.

Table 23 Bowmans Creek trigger limit summary

Bowmans Creek – Values Exceeding Trigger Limits																
Month	BCK1 (Upstream)				BCK 1A				BCK2				BCK2A			
	pH	EC (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	EC (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	EC (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	EC (µS/cm)	TSS (mg/L)	TDS (mg/L)
Jan																
Feb																
Mar						6720		5100								
Apr																
May						2800		1710								
Jun						3690		2330								
Jul						3550		2420								
Aug						2960		1950								
Sep						3900		3010								
Oct						6650		4480								
Nov						5600		3390								
Dec						6730		4860								
Month	BCK3				BCK4				BCK5				BCK6 (Downstream)			
	pH	EC (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	EC (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	EC (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	EC (µS/cm)	TSS (mg/L)	TDS (mg/L)
Jan																
Feb																
Mar																
Apr																
May																
Jun																
Jul																
Aug								1240								
Sep																
Oct																
Nov							102				114					
Dec																

Orange Shading – Denotes an exceedance of the 90%ile trigger limit (applicable when the creek is flowing)

Yellow Shading – Denotes an exceedance of the Max trigger limit (applicable when the creek is not flowing)

During 2018, LCO recorded below average rainfall and above average evaporation which has had observable changes to the flow and water quality of Bowmans Creek.

The measured TDS and EC levels along Bowmans Creek identified a number of exceedances of flow applicable criteria during the reporting period. Each of the exceedances applied to the flowing 90th%ile limits however, monitored conditions at each event recorded either slow or trickle indicating that no flow trigger levels are nearly applicable. Of note, eight consecutive exceedances of EC and

TDS criteria were recorded at monitoring location BCK 1A. In accordance with the surface water trigger action response plan, DPE, DOE and DoI were notified in August and again in November after three and six consecutive exceedances respectively. Investigations were undertaken for each and a summary of findings is provided below. During this time, two instances of exceeding TSS criteria during no flow conditions were also recorded. Given there were no sustained exceedances of TSS criteria in accordance with the surface water trigger response plan and considering the isolated nature of these measurements it is unlikely to be representative of any mining impact and no further investigation of these results were required.

BCK1A Investigation TARP

Surface water monitoring at BCK1A identified exceedances of the 90th%ile trigger limits for EC and TDS from May to December 2018. The two investigations included the following:

- Field inspections of the site
- Review of flow conditions within the creek system
- Review of monitoring results
- Review of operational storages and water management controls

The investigation TARP findings have determined that:

- It is unlikely that potential harm has occurred or will occur at the observed levels.
- Mine water storages do not appear to indicate leakage or connectivity to the creek system as supported by water quality analysis of the isolated pools surrounding BCK1A and visual observations.
- Mining activities have not caused the observed levels.
- The climate data shows high evaporation and below average rainfall with significant variation in residual rainfall mass curve that is the longest downward trend since 2005. Since rainfall and subsequent creek flow has a large impact on the water quality of the creek system, it is likely the absence of rain has contributed to the observed quality levels.
- It is likely that decreases in water levels within the alluvial system, as a result of the continued dry conditions, could reduce the confining pressures of the underlying weathered and hard rock water bodies. There this could lead to increase interaction between surface water and the underlying saline water, increasing EC and TDS levels.
- The upstream and downstream monitoring locations have recorded ‘still’ or ‘dry’ flow conditions during the same trigger period indicating that the creek is behaving in an ephemeral manner and likely transitioning slowly to the ‘no flow’ applicable investigation trigger levels.

MIA Onsite Sewerage System Discharge Quality Exceedance

Liddell operate a Wastewater Treatment Plant (WWTP) at the Mine Infrastructure Area (MIA) for the treatment of waste water prior to discharge into the mine dirty water containment system. LCO has a water quality limits on the MIA WWTP discharge stated in the Development Consent, Singleton Shire Council OSSM Approval and the Environmental Protection Licence (as Licenced Discharge Point 5).

Results for routine sampling were received on the 25 June 2018 demonstrating that the WWTP had not achieved the performance criteria required. As per Section 10.2.1 of the WMP, LCO responded in accordance with the Surface Water Trigger Action Response Plan (TARP), Table 10.2 of the WMP.

In line with the TARP, LCO undertook resampling to determine if the result was representative and if there was ongoing exceedance. The sampling identified an exceedance and subsequently the EPA, DP&E and Singleton Shire Council where notified on the 13 July 2018. LCO conducted an investigation into the event, undertook system maintenance/repairs to rectify the treatment plant performance and provided a summary report as required under each approval/licence. The investigation concluded that the observations were not of potential harm to the environment based

on the results monitored and since the treated effluent is recycled into the mine dirty water system and contained wholly onsite.

HRSTS Discharge Monitoring

Any discharges from Liddell Coal must be undertaken in accordance with the Hunter River Salinity Trading Scheme (HRSTS). During 2018, there were no discharge events under the HRSTS.

Discharge Event

A single offsite discharge of sediment laden water was recorded at LCO during the reporting period. This event was reported to the NSW EPA and other required authorities in accordance with the LCO Pollution Incident Response Management Plan (PIRMP) and Water Management Plan (WMP) (approved under NSW DA305-11-01 and EPBC Approval 2013/6908). An investigation was subsequently undertaken in accordance with the LCO WMP. Details of this investigation are summarised below.

On 28 November 2018, LCO recorded a total of 35.6mm of rainfall. Whilst completing routine high rainfall inspections in accordance with the WMP a supervisor observed sediment laden runoff breaching a containment drain blocked by blast heave. This sediment laden runoff was observed to mix with run off from undisturbed areas of remnant vegetation and follow existing drainage lines to an isolated and pooled section of Bowmans Creek.

Actions to control and contain the sediment laden water were commenced immediately after identifying the failure. This included drainage repairs, pumping, water sampling and reporting to relevant authorities.

The captured sediment laden water was subsequently pumped from the isolated pool back into the LCO mine water system.

As the incident was responded to in a timely manner to mitigate potential impacts, it has not resulted in potential or actual environmental harm. LCO has identified and implemented system improvements to mitigate likelihood of a similar event reoccurring.

Surface water comparison to EA Predictions

With reference to the EA predictions from the surface water assessment (Gilbert and Associates, 2013), this part identifies the predictions made with comparison to monitoring findings. The key conclusions of the predictive model simulations and surface water impact assessment have been compared to the findings of the WMP approved monitoring program and detailed in the table below. In brief, observations from the monitoring programs demonstrate current impacts are within the EA predictions.

Table 24 Surface Water Impact Comparison to EA predictions

Surface Water Impact Comparison to EA Predictions	
Key EA Conclusion	Comparison to Monitoring Observations
Changes to flows in local creeks due to expansion and subsequent capture and use of drainage from mine area catchments.	Mining remains within the approved extents hence no impacts to the catchment greater than predictions. Monitoring has not shown significant changes in creek line base flow due to mining operations. Rehabilitation activities aligning with current approved final landform design providing for impacts management in line with the EA.
Potential for export of contaminants (principally sediments and soluble salts) in mine area runoff and accidental spills from containment storages (principally sediments, soluble salts, oils and greases), causing degradation of local and regional water courses.	There was one discharge of sediment laden water from the operation during the reporting period. Further details regarding the discharge event are provided below. Monitoring and investigations have not identified mining related impacts to the surface water quality. No other breaches of the mine water containment system occurred.
Short term increases in salinity during periods of licensed discharge under the HRSTS.	There were no discharge events under the HRSTS during the reporting period.

7.3 Groundwater Monitoring

LCO is located within an area of the Upper Hunter Valley subject to extensive underground and open cut mining activities since the early 20th century. Current and historical mining operations have extensively altered the physical features and environmental setting of the local area, including the region's surface water and groundwater systems. Mining operations to the west, south and east of LCO, Lake Liddell to the west, and the major geological feature Hunter Thrust to the north, all have major influence on groundwater levels in the region. Due to such operations and features regional groundwater levels largely reflect current and past mining activities, with water levels varying with time and location according to local mining activities.

The WMP groundwater monitoring program adopts site specific trigger values for impact investigation and assessment. If monitoring results suggest significant and continuous deviation from historical or background trends in water quality, further investigations into potential impacts are conducted. It is highlighted that, due to changes in land-use in the vicinity of LCO through both mining and agriculture, as well as local variability in groundwater conditions, there is limited opportunity for establishment of groundwater reference sites. Accordingly, for groundwater quality, a trigger level of 80th percentile and 100th percentile of the historical record has been adopted. Currently, investigations into potential impacts are conducted if there are three consecutive exceedances of the nominated triggers. The following outlines groundwater trigger level definitions as defined in the WMP.

Groundwater level trigger definition

Groundwater level monitoring is carried out at least monthly on the shallow, unconfined, water table aquifers of Bowmans Creek alluvium and the underlying shallow bedrock. Water pressure monitoring is carried out at least monthly on the deeper, confined, hard rock aquifers.

There are three components to the groundwater level trigger definitions. These are described in detail in the WMP (LCO, 2018) and summarised as follows:

1. Impact trigger – An impact trigger is drawdown of 2m in the alluvium compared to the local reference site for the northern and southern impact zone as shown in the WMP; only applicable at ALV9 and ALV8L.
2. Investigation trigger – An investigation trigger and is measurement below the monthly, baseline (10th percentile) water level on three consecutive occasions. The purpose of this trigger is to identify unexpected changes to groundwater level. ALV9 does not have an investigation trigger because these triggers were developed using historical baseline data and ALV9 was a recent installation (December 2017) to provide greater coverage for the identification of alluvial groundwater impacts in the northern drawdown area.
3. Subsequent Investigation Trigger - A Subsequent Investigation Trigger is designed to address the potential for harm to listed threatened species, communities and migratory species of concern to EPBC Approval 2013/6908. Following an investigation of an exceedance of Groundwater Level Trigger Definition #2 that concludes the exceedance is not mining-related, should groundwater levels continue to be measured below the lower 10th percentile for a further nine months, such that the exceedance has continued continuously for 12 months, then a subsequent investigation shall be undertaken to confirm that the exceedance remains unrelated to mining activity.

Groundwater quality trigger definition

There are two components to the groundwater quality trigger definitions. These are described in detail in the WMP and summarised as follows:

1. EC investigation trigger – An investigation trigger because of a monthly measurement either below the, baseline (20th%ile) or above the monthly baseline (80th%ile) on three consecutive occasions. Note the 20th%ile triggers levels are designed to identify downward leakage from the alluvium to the shallow bedrock to provide another mechanism to detect potential alluvial impacts in addition to the water level triggers and.

2. pH investigation trigger - An investigation trigger because of a monthly measurement either above or below the default pH trigger values from ANZECC (2000) for lowland rivers located in NSW.

Table 25 presents the current site specific trigger levels for water level and groundwater quality and shows the data relevant to the reporting period.

Monitoring results observed during the reporting period are summarised in following **Section 7.3.2** with the breakdown of:

- Groundwater quality of alluvial and shallow bedrock aquifers including applicable ITARP summaries
- Groundwater quality of hard rock aquifer
- Groundwater levels of Alluvial and Shallow Bedrock Aquifers including applicable ITARP summaries
- Groundwater level of hard rock aquifers
- Comparison to EA predictions

The groundwater monitoring locations (compliance and management bores) are shown above on **Figure 16**.

Table 25 Groundwater quality impact assessment criteria

Groundwater Quality Impact Assessment Criteria							
		Groundwater Elevation (mAHD) – Definition #2 & #3		**EC (µS/cm)**			**pH**
		10th%ile	Ref. Min	20%ile	80%ile	Max	
Alluvial and Shallow Bedrock Aquifers							
ALV1	Alluvial aquifer (L)	106.22	104.88	N/A	1370	2020	6.5 – 8.5
	Shallow bed rock (S)	106.44	104.35	N/A	1560	1770	
LBH	Alluvial aquifer (L)	105.74	104.55	N/A	1550	3090	
ALV3	Alluvial aquifer (L)	103.81	102.43	N/A	1390	3080	
	Shallow bed rock (S)	103.52	102.25	N/A	2800	4510	
ALV4	Alluvial aquifer (L)	102.14	100.97	N/A	1920	3080	
	Shallow bed rock (S)	101.42	100.28	N/A	5310	6430	
ALV2	Alluvial aquifer (L)	93.08	91.12	N/A	2830	4160	
	Shallow bed rock (S)	93.21	89.35	2560	2820	3370	
ALV7	Alluvial aquifer (L)	87.02	86.43	N/A	1780	2310	
	Shallow bed rock (S)	83.56	82.39	N/A	2230	2540	
ALV8	Alluvial aquifer (L)	85.06	83.66	N/A	1310	1880	
	Shallow bed rock (S)	82.99	80.94	1540	1990	2400	
Hard Rock Aquifers (Coal Measures)							
PGW5	Overburden (L)	N/A	N/A	N/A	N/A	N/A	6.5 – 8.5
	Coal Measure (S)	N/A	N/A	N/A	N/A	N/A	
Groundwater Level Trigger Definition #1 – 2m drawdown in Bowmans Creek Alluvium							
ALV9L	Groundwater elevation of monitoring piezometer ALV2L minus 5.0m (AHD).						
ALV8L	Groundwater elevation of monitoring piezometer ALV7L minus 4.5m (AHD).						

7.3.2 Monitoring Results Review

Groundwater quality of Alluvial and Shallow Bedrock Aquifers

Long term groundwater quality monitoring results for the alluvial and shallow bedrock aquifers including the reporting period are shown in **Figure 17** to **Figure 21** and in **Appendix E**; a summary of these results during the reporting period is provided herein. During the reporting period, there were no investigations triggers.

During the months of September and October, the lower limit for pH of 6.5 was exceeded at five (5) piezometers (ALV1L, LBH, ALV3L, ALV4L, ALV4S) for an aggregate of seven (7) times. The exceedances represent the lowest pH data form the alluvial and shallow bedrock monitoring bores since data collection began. The exceedances occurred over one or two data points and were not sustained; the pH level at those sites have since returned the relatively stable trend that has existed throughout the data collection period as shown in **Figure 17** and **Figure 18**.

The exceedances do coincide with relatively low groundwater and stream flow levels, however groundwater and stream flow levels continued to decline following the exceedances, so the low pH values are unlikely to be related to low groundwater and/or streamflow levels. There is no indication that the observed pH fluctuation could be mining related.

Table 26 summarises the EC measurements of groundwater, with comparison to the applicable trigger levels. There have been twelve exceedances of the EC upper limit and two exceedances of the EC lower limit. The timing and location of the EC exceedances do not coincide with that of the pH exceedances, which indicates that these events are isolated do not represent an overall degradation of water quality. Long term monitoring results are shown in **Figure 20** and **Figure 21.**

Table 26 Groundwater exceedances for EC in alluvial and shallow bedrock aquifers

Groundwater exceedances for EC in alluvial and shallow bedrock aquifers													
Site	ALV1L	ALV1S	LBH	ALV3L	ALV3S	ALV4L	ALV4S	ALV2L	ALV2S	ALV7L	ALV7S	ALV8L	ALV8S
Impact assessment Criteria													
Lower Limit	-	-	-	-	-	-	-	-	*2560*	-	-	-	*1540*
Upper Limit	*1370*	*1560*	*1550*	*1390*	*2800*	*1920*	*5310*	*2830*	*2820*	*1780*	*2230*	*1310*	*1990*
Maximum	*2020*	*1770*	*3090*	*3080*	*4510*	*3080*	*6430*	*4160*	*3370*	*2310*	*2540*	*1880*	*2400*
Jan					4.23				2.84				
Feb					2.90				2.83				
Mar					2.89								
Apr							5.51						
May													
Jun									2.56				1.50
Jul									2.54				
Aug									2.86		2.25		
Sep									2.85		2.28		
Oct									2.88		2.36		
Nov													
Dec													

Green Shading – Denotes an exceedance of the 20%ile investigation limit
Orange Shading – Denotes an exceedance of the 80%ile investigation limit
Yellow Shading – Denotes an exceedance of the 100%ile maximum investigation limit

On three occasions the requirement for an investigation has been triggered by three consecutive exceedances of the upper EC limit at ALV3S, ALV2S and ALV7S. The conclusions of those investigations are summarised in below.

Table 27 ITARP investigations for quality triggers completed in 2018

Month of 3rd exceedance	Site	Conclusions
February	ALV3S	• The general increase in salinity at ALV3S was consistent with the increase in slope of the residual mass curve (evaporation) and the declining trend observed in the residual mass curve (rainfall) since March 2017. • It was therefore considered that the reduced rainfall recharge has led to the rising trend in EC observed at ALV3S. • This mechanism reflects natural variability due to climatic factors and is not considered to be a mining-related impact and potential environmental harm.
October	ALV2S and ALV7S	• The general increase in salinity at ALV2S and ALV7S was consistent with the increase in slope of the residual mass curve (evaporation) and the declining trend observed in the residual mass curve (rainfall) since March 2017. • The trigger exceedances are inferred to have occurred due to drier than average climate conditions resulting in reduced net recharge to the groundwater systems. • The observed deviations beyond the trigger values are less than the reference maximum values and as such are not considered to be representative of conditions which would have potential to harm the environment. • This mechanism reflected natural variability due to climatic factors and not considered to be a mining-related impact.

Groundwater quality of Hard Rock Aquifer (Coal Measures)

Long term groundwater quality monitoring results for the hard rock aquifers including the reporting period is shown in **Figure 19 , Figure 22** and in **Appendix E**; a summary of these results is provided below. Monitoring of piezometers at site PGW5 is used to inform LCO on groundwater pressurisation of the strata between the Bowmans Creek shallow bedrock and lower overburden and underground workings. From August 2017, PGW5 was not retained as trigger level monitoring site.

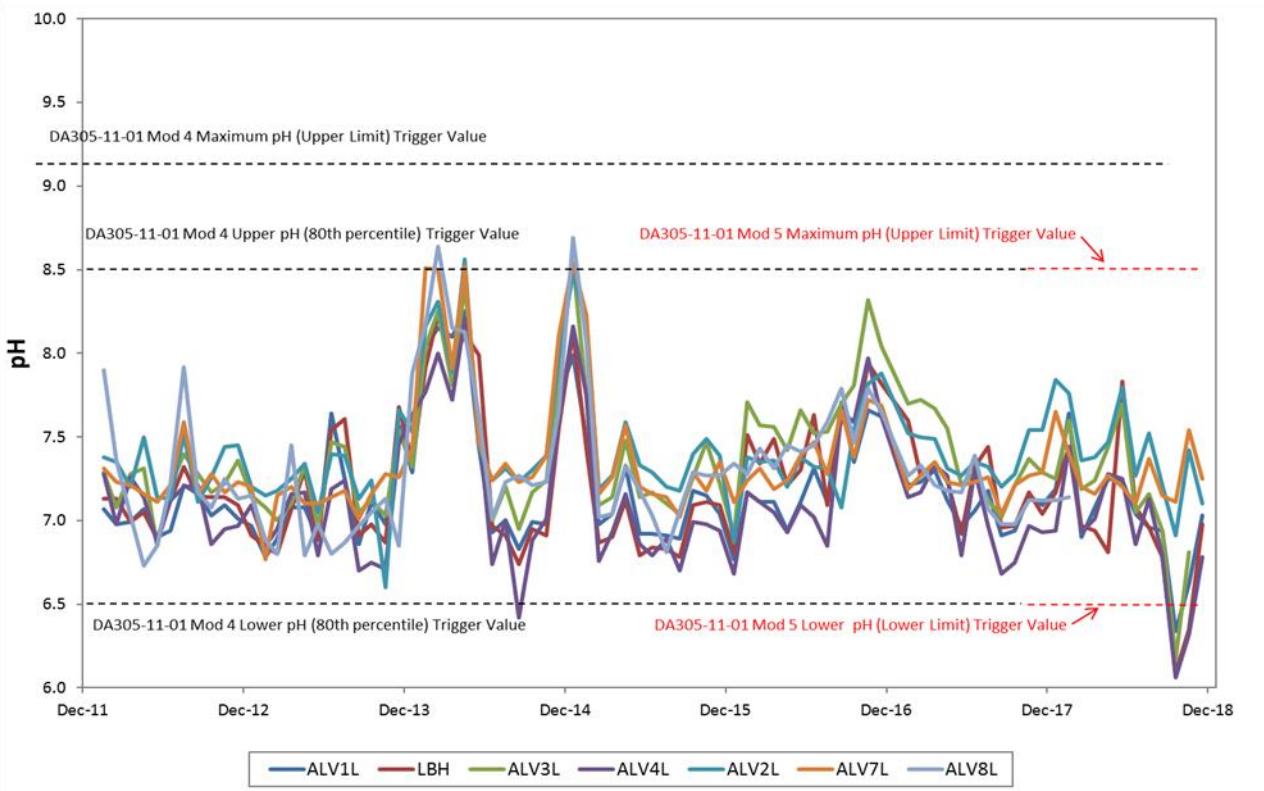


Figure 17 Groundwater pH data in alluvial bores – 2013 to 2018

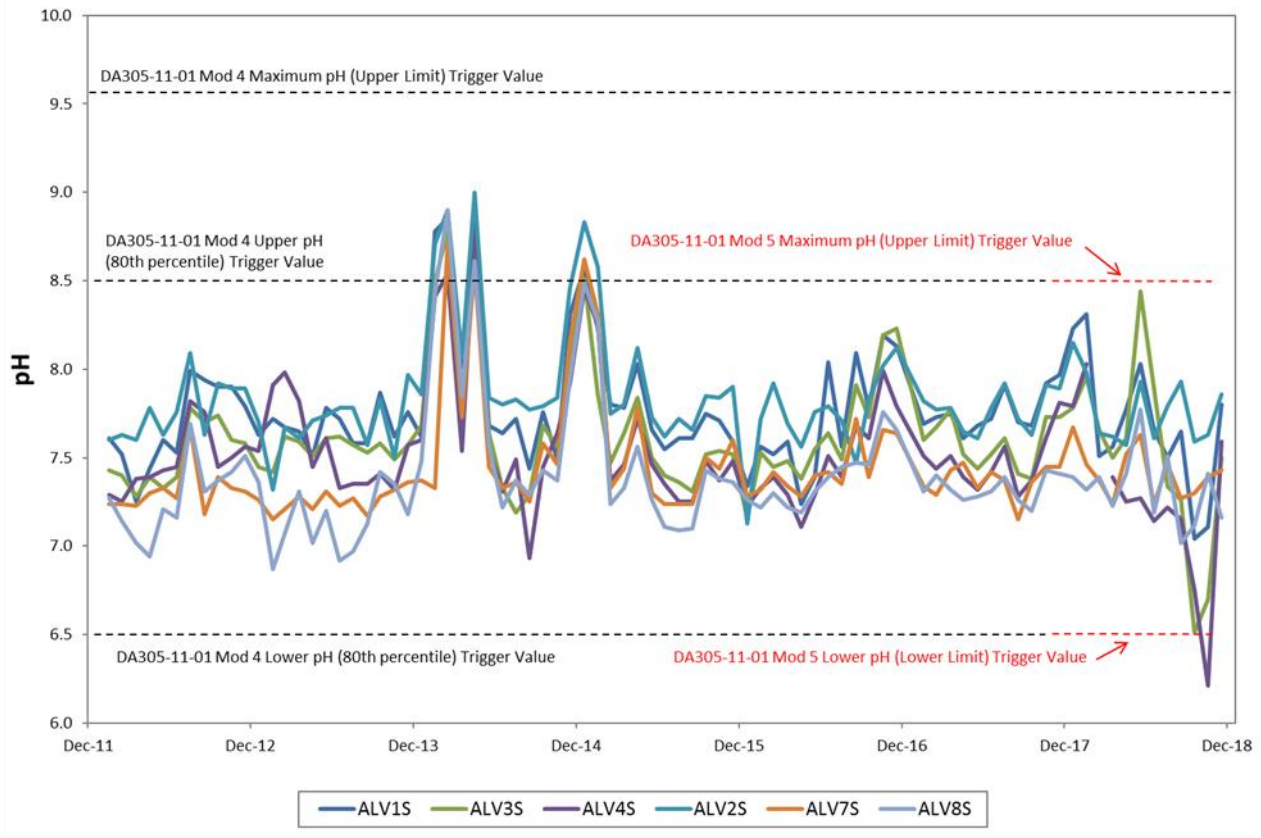


Figure 18 Groundwater pH data in shallow bedrock (overburden) bores – 2013 to 2018

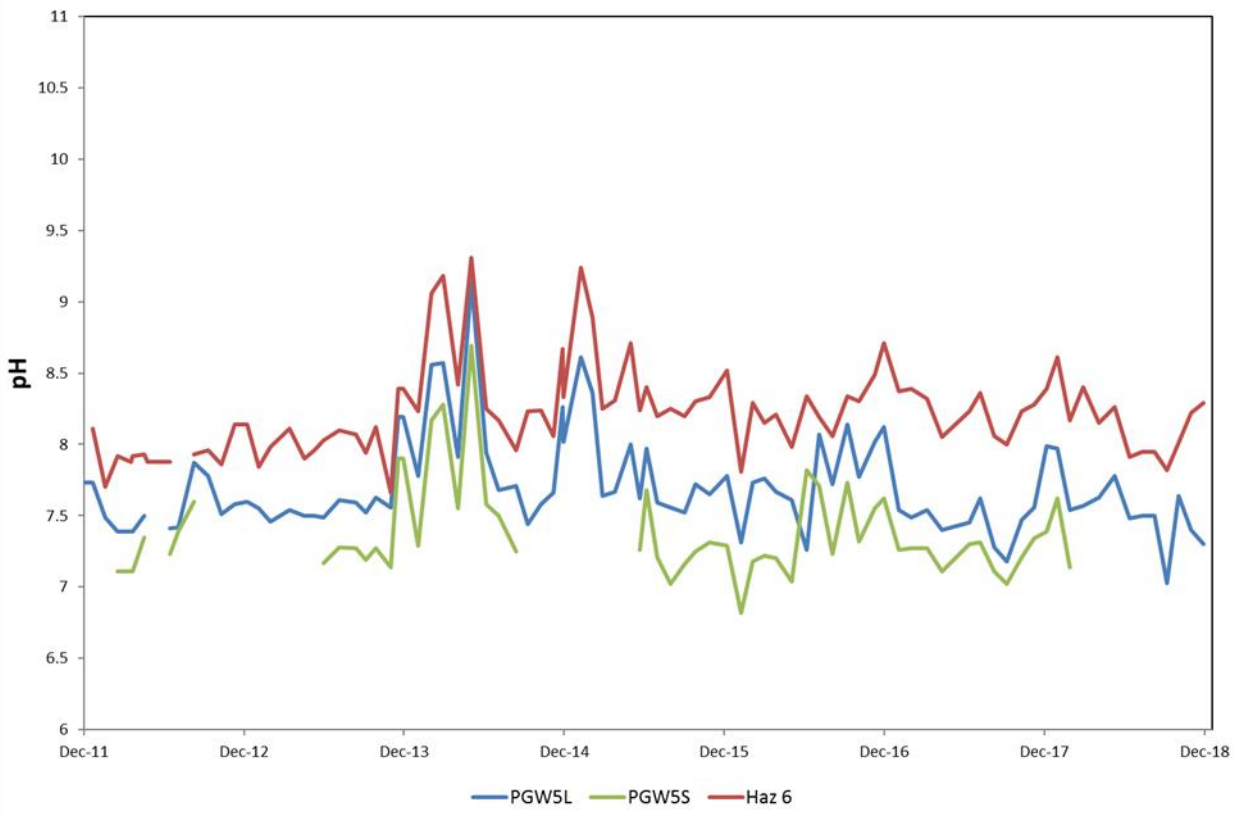


Figure 19 Groundwater pH data in hard rock (overburden & coal measure) piezometers – 2013 to 2018

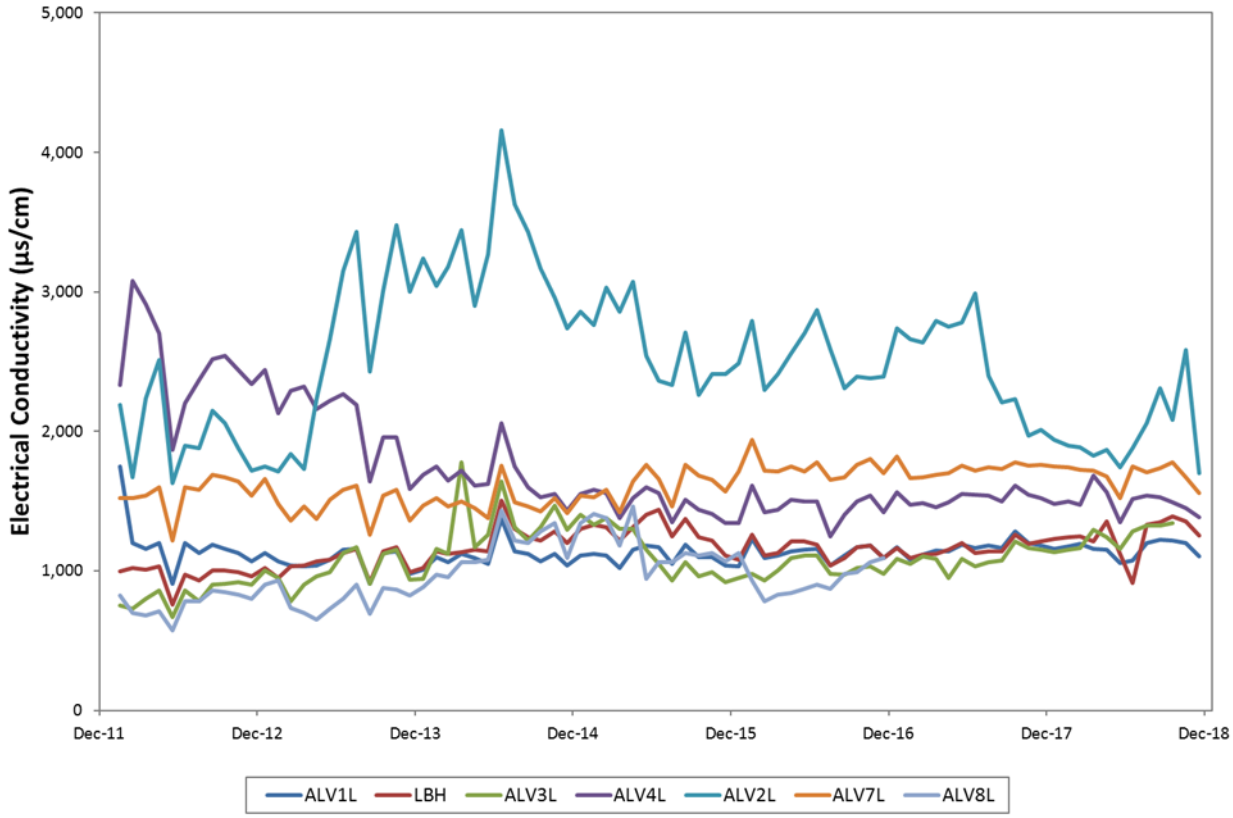


Figure 20 Groundwater Salinity (EC) in alluvial bores – 2013 to 2018

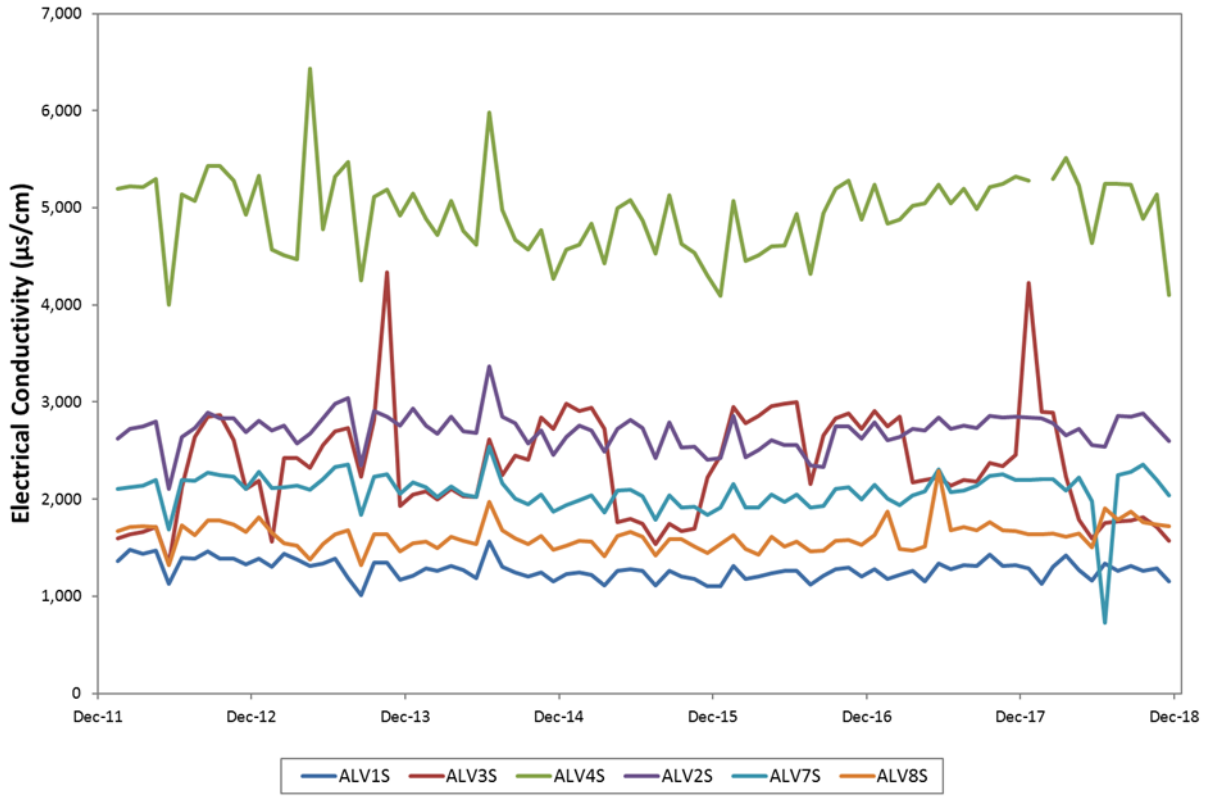


Figure 21 Groundwater Salinity (EC) in shallow bedrock (overburden) bores – 2013 to 2018

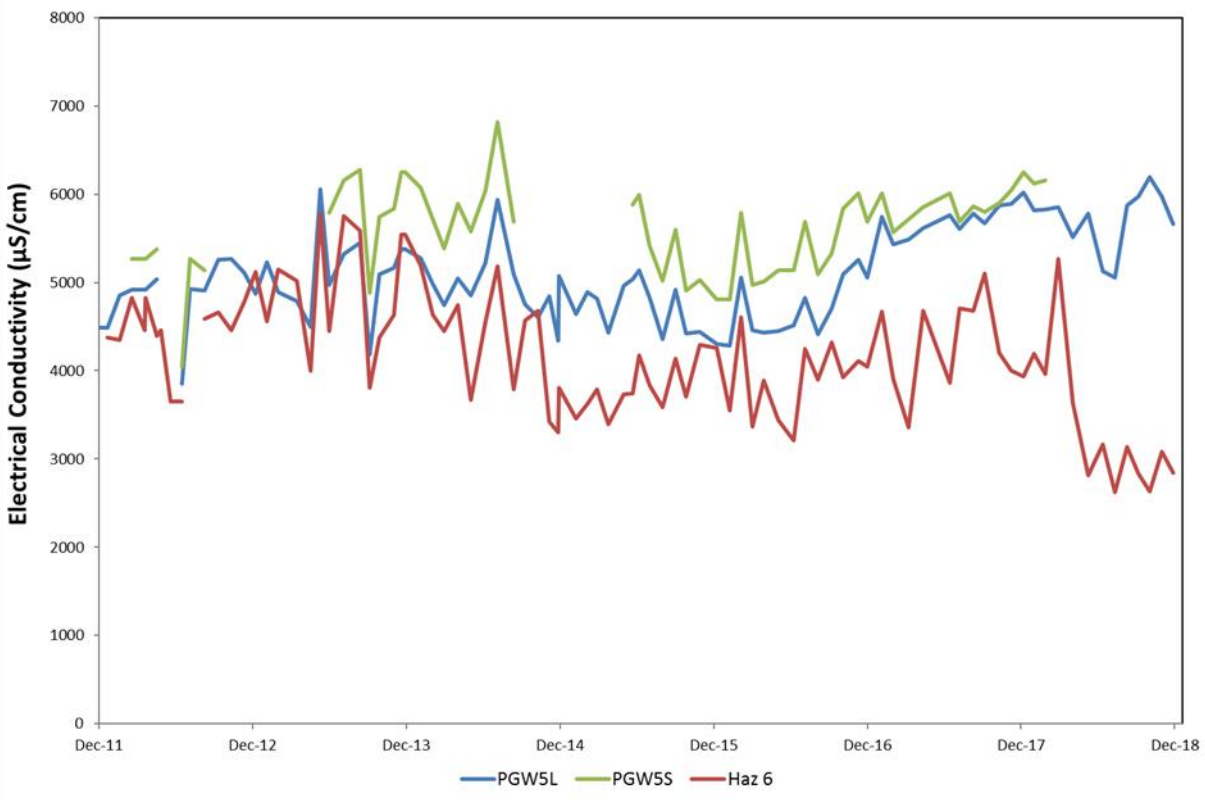


Figure 22 Groundwater Salinity (EC) hard rock (coal measures) bores – 2013 to 2018

Groundwater Levels of Alluvial and Shallow Bedrock Aquifers

LCO monitor the groundwater level of the Bowmans Creek Alluvial and Shallow Bedrock Aquifers to identify any potential impacts from mining such as depressurisation. Hydrographs for piezometers targeting the alluvium and shallow bedrock are displayed in **Figure 23** and **Figure 24** respectively.

The residual mass curve for rainfall is also presented in **Figure 23** and **Figure 24**. The residual mass curve for rainfall calculates the difference between observed rainfall and the average amount of rainfall for that time of the year (defined monthly). This was developed from the SILO dataset (Station No. 061208 at Ravensworth). The SILO dataset consists patched (infilled and interpolated) climatic data throughout Australia. Patching climatic data is necessary to fill in any missing observations days, for example.

Groundwater elevations within the water table aquifer decrease with distance downstream. This is because the elevation of the water table within a near surface aquifer (for example, the water table aquifer at LCO), is typically a subdued reflection of surface topography. i.e. in the same way that a surface water course flows from high topographic elevation to low topographic elevation. The steepness of the hydraulic gradient (slope of groundwater elevation with distance down-gradient) reflects other factors including the permeability of aquifer material, differences in propensity for recharge as well as groundwater/surface water interaction.

With reference to full historical monitoring results, the sympathetic response in water levels observed in the paired bores indicate similar processes are driving the recharge for both the alluvial aquifer and shallow bedrock aquifer. The different absolute levels for the paired bores reflect the different hydraulic connectivity between the alluvium and shallow bedrock. Water level relationships show a shift from slight upward pressures (gaining stream) upstream (ALV1), through to equal pressures adjacent to LCO (ALV3, ALV4, ALV2) to slight downward pressures (losing stream) to the south (ALV7, ALV8). Rainfall (recharge) appears to be the dominant driver for groundwater level variability for the Bowmans Creek alluvium.

With respect to trigger exceedances, there were no exceedances of the Impact Triggers for alluvial draw down impact assessment. There were a number of Investigation and Subsequent Investigation (Definition 2 & 3 respectively) trigger level exceedances summarise herein.

During 2018, there were a greater number of groundwater level exceedances compared to 2017. This is considered a response to the dry climate experienced during the latter part of 2017 and throughout 2018. The decline in residual mass curve (rainfall) coupled with an increasing residual mass curve (evaporation) suggested that below average rainfall and higher than average evaporation conditions prevailed for the majority of 2017 and 2018. The low rainfall and high evaporation conditions coincided with a consistent decline in groundwater levels across all alluvial and shallow bed rock piezometers installed along the aquifer of Bowman's Creek, implying the decline was not localised.

Table 28 presents recorded exceedances of groundwater level triggers during the 2018 monitoring period. **Table 28** presents a summary of the ITARP investigations completed in 2018. ALV9 does not have an applicable Definition #2 investigation trigger as these triggers were developed using historical baseline date.

Table 28 Groundwater level trigger exceedances

Groundwater level exceedances													
Site	ALV1L	ALV1S	LBH	ALV3L	ALV3S	ALV4L	ALV4S	ALV2L	ALV2S	ALV7L	ALV7S	ALV8L	ALV8S
10%ile	106.22	106.44	105.74	103.81	103.52	102.14	101.42	93.08	93.21	87.05	83.56	85.06	82.99
Min	104.88	104.35	104.55	102.43	102.25	100.97	100.28	91.12	89.35	86.43	82.39	83.66	80.94
Jan	106.18			103.60	103.30	102.08						84.11	
Feb	105.91	106.22	105.57	103.34	103.01	101.96	101.36		93.14	86.96	82.27	83.99	79.22
Mar	105.73	106.11	105.35	103.18	102.84	101.86	101.27	93.07	93.05	86.80	82.31	83.72	79.67
Apr				103.63	103.36					86.80	83.06	-	81.29
May										86.84	82.93	-	81.31
Jun										86.77	82.07	-	79.54
Jul						102.05				86.68	81.56	-	78.08
Aug	106.21			103.64	103.34	102.10			93.14	86.63	81.09	-	77.41
Sep	106.04		105.58	103.39	103.08	101.98	101.33		93.11	86.54	80.83	-	77.17
Oct	105.89	106.38	105.43	102.88	103.22	101.90	101.22	93.01	93.01	86.48	80.64	-	77.11
Nov	105.76	106.15	105.33	103.10	102.73	101.76	101.12	92.90	92.93	86.42	80.45	-	76.95
Dec	105.62	105.94	105.22	103.03	102.59	101.69	101.00	92.79	92.74	86.32	79.56	-	76.35

Orange Shading – Denotes an exceedance of the 10%ile investigation limit
Yellow Shading – Denotes an exceedance of the 100%ile maximum investigation limit

Table 29 Groundwater level trigger exceedances investigation summary

Month of 3rd exceedance	Site	Conclusions
February	ALV3S and ALV3L	• The climate data shows high evaporation and below average rainfall for the majority of 2017 and early 2018, which is considered to have resulted in the observed decrease in water levels. • ALV3L and ALV3S are not within the extent of drawdown from mining operations. • Water levels along the whole system have generally declined similarly to ALV3. Further, the observed decline is consistent for both the shallow bedrock and alluvium along the whole system. • The exceedance at ALV3L and ALV3S are not outside of the maximum range recorded. • From the investigation findings, ALV3L and ALV3S groundwater levels are likely reflecting natural variability due to climate factors and there is no mining related impact or likely potential of environmental harm.
March	ALV1L and ALV4L	• There appears to be no clear correlation between the levels measured at these three bores with that of the underground workings, inferring continued lack of connectivity hence no depressurisation at these bores. • ALV1L and ALV4L are not within the extent of drawdown impacts from mining operations. • The climate data shows high evaporation and below average rainfall for the majority of 2017 and early 2018, which is considered to have resulted in the observed decrease in water levels. • Water levels along the whole system have generally declined similarly. Further, the observed decline is consistent for both the shallow bedrock and alluvium along the whole system. • The exceedances are not outside of the maximum range recorded for the applicable levels datasets. • Groundwater levels at ALV1L and ALV4L represent natural variability due to climatic factors. No mining-related impact or potential for environmental harm.

April	ALV7L, ALV7S and ALV8S	• Whilst the measured values exceeded the reference maximum of the baseline dataset recorded for the site in February and March, levels have recovered to within the baseline reference range in April. • Groundwater levels at ALV7L, ALV7S and ALV8S represent natural variability due to climatic factors. No mining-related impact or potential for environmental harm.
September	ALV4L and ALV8L	• There appears to be no clear correlation between the levels measured at these bores with that of the underground workings, inferring continued lack of connectivity hence no depressurisation at these bores. • ALV4 is not within the extent of predicted drawdown impacts from mining operations. • Water levels along the whole system have generally declined similarly. Further, the observed decline is consistent for both the shallow bedrock and alluvium along the whole system; implying groundwater levels is driven by climatic variations rather than a specific mining related impact. • ALV8 is paired with reference bore ALV7 to monitor for potential drawdown and has not exceeded drawdown trigger investigation limits. ALV7L has consistently exceeded specific groundwater level definition triggers for eight consecutive months. This indicates the decrease in water levels is not localised (as per EA predictions) and likely driven by regional climatic conditions. • Groundwater levels at ALV4L and ALV8L represent natural variability due to climatic factors. No mining-related impact or potential for environmental harm.
October	ALV1L, ALV3L and ALV3S	• Dry climate conditions and subsequent reduced net recharge are inferred to have caused the decline in groundwater levels. A prolonged period of declining rainfall CDFM between late April 2017 to early August 2018 supports this conclusion. • Groundwater levels at ALV1L, ALV3L and ALVS3 represent natural variability due to climatic factors. No mining-related impact or potential for environmental harm.
October	ALV2S	• It is considered that the groundwater levels measured at ALV2S reflect natural variability due to climatic factors and there is not a mining-related impact. The climate data shows below average rainfall for around two years, which is considered to have resulted in the observed groundwater levels. • It is highlighted that the observed groundwater level at ALV2S is not outside of the maximum range recorded and is not of sufficient magnitude to lead to a down gradient impact on beneficial use. • ALV2S is not within the extent of drawdown from mining operations and there are no potential seepage sources. Furthermore, ALV2L is used as the reference site for the northern drawdown impact monitoring location • Water levels along the whole system are generally declining. Further, the observed decline is consistent for both the shallow bedrock and alluvium along the whole system; implying groundwater levels is driven by climatic variations rather than a specific mining related impact. This conclusion has been corroborated by previous ITARP investigations at LCO, which have all yielded a clear link between climatic variations and low groundwater levels.
November	ALV4S and LBH	• Water levels along the whole system have generally declined similarly. Further, the observed decline is consistent for both the shallow bedrock and alluvium along the whole system; implying groundwater levels is driven by climatic variations rather than a specific mining related impact. • The climate data shows high evaporation and below average rainfall with significant variation in residual rainfall mass curve that is the longest downward trend since 2005. As evidenced by the rainfall CRD and streamflow measurements, there has been no ease in drought conditions. Since there is direct relationship between these bores and rainfall, it is not expected that there is potential for harm to the environment as the system is varying naturally.
December	ALV1S and ALV2L	• There appears to be no clear correlation between the levels measured at these bores with that of the underground workings, inferring continued lack of connectivity hence no depressurisation at these bores.

		• ALV1 and ALV2 are not within the extent of predicted drawdown impacts from mining operations. Note, ALV2 is the reference point for drawdown monitoring bore ALV9. • Water levels along the whole system have generally declined similarly. Further, the observed decline is consistent for both the shallow bedrock and alluvium along the whole system; implying groundwater levels is driven by climatic variations rather than a specific mining related impact. • The climate data shows high evaporation and below average rainfall with significant variation in residual rainfall mass curve that is the longest downward trend since 2005. As evidenced by the rainfall CRD and streamflow measurements, there has been no ease in drought conditions. Since there is direct relationship between these bores and rainfall, it is not expected that there is potential for harm to the environment as the system is varying naturally. Neither ALV1S or ALV2L have exceeded the reference maximums depth to water measurements supporting this conclusion.

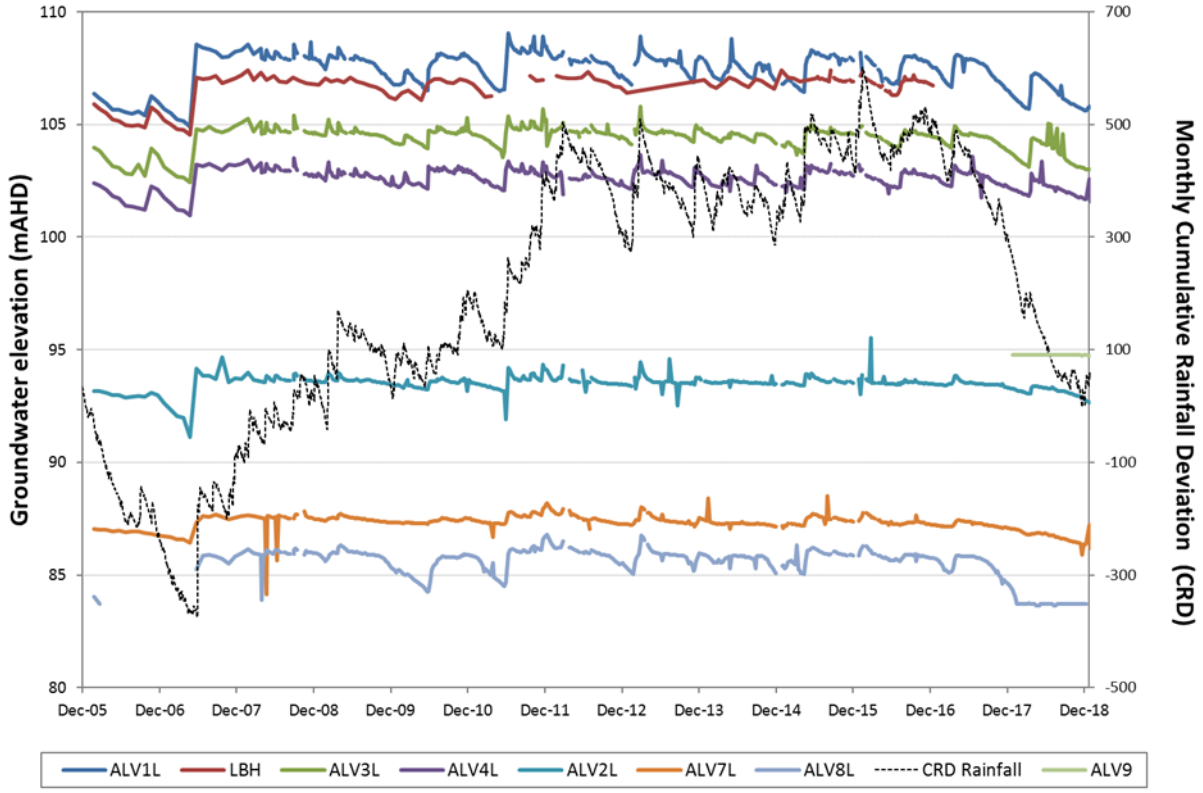


Figure 23 Groundwater level data in alluvial bores – 2006 - 2018

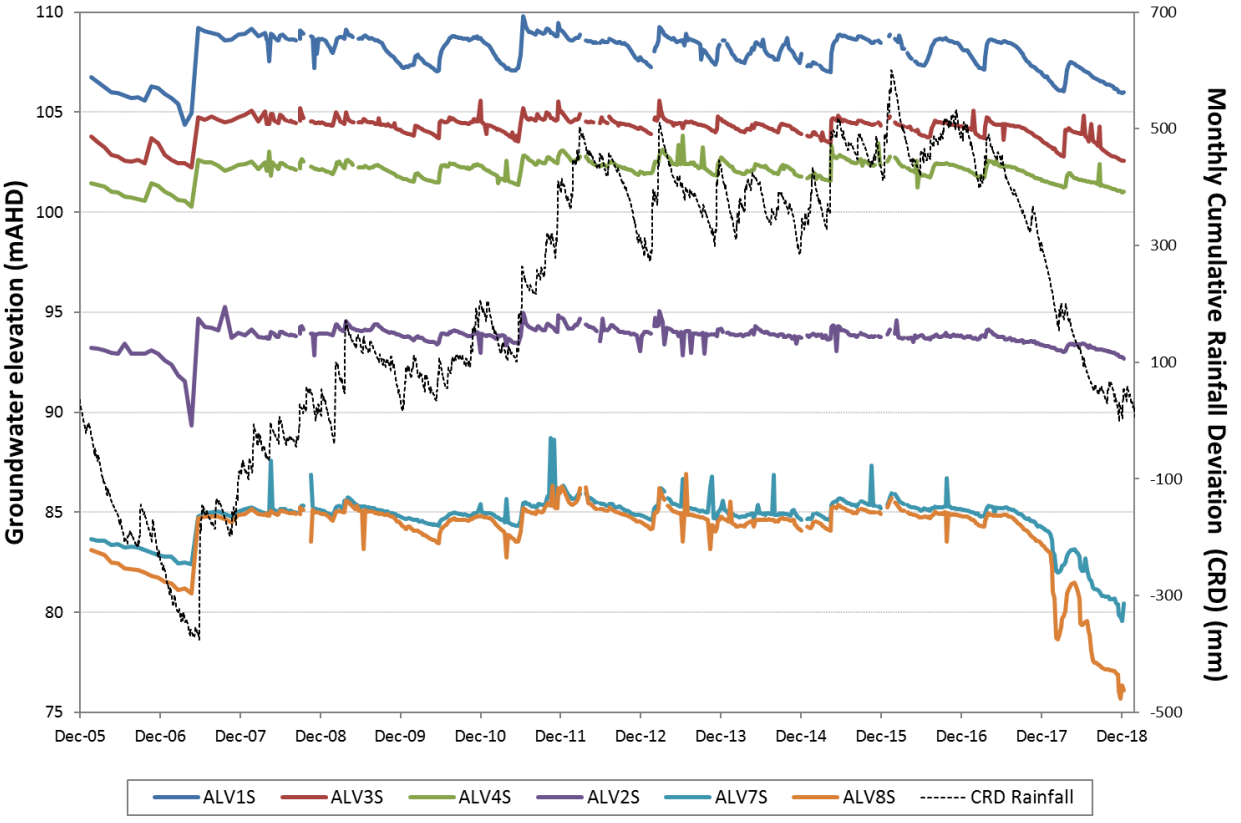


Figure 24 Groundwater level data in shallow bedrock bores – 2006 - 2018

Groundwater Levels of Hard Rock Aquifer (Coal Measures)

LCO monitor a number of hard rock aquifers to provide for the ongoing water management onsite. Hydrographs for piezometers targeting the regional hard rock aquifer associated with the coal measures are shown in **Figure 16**. The groundwater elevations vary significantly between the piezometers monitored, reflecting differences in groundwater levels between different stratigraphic layers and as a consequence of recent and historical mining and dewatering operations. There are no investigation groundwater trigger levels for monitoring of these water bodies.

Figure 25 shows there is a significant difference in groundwater elevation between the alluvial and shallow bedrock water table piezometers and the groundwater elevations maintained in the previous underground workings, as indicated by 8 South (whilst available), M49 and the Middle Liddell Bore (MLB). The difference demonstrates that there is no hydraulic connection between the alluvial and shallow bedrock water tables and the underground workings and therefore no mechanism by which to depressurise the water table aquifers.

Piezometers PGW5L and PGW5S overlie the Hazeldene workings. As shown in **Figure 25**, there is no groundwater level response at site PGW5S due to changes in groundwater elevation in the Hazeldene monitoring locations (Haz 1 to Haz 6).

Groundwater levels in the Liddell underground workings are subject to depressurisation due to dewatering activities to accommodate current open cut mining operations at LCO. Piezometer LC1 has been dry since July 2010 as a result of these dewatering activities.

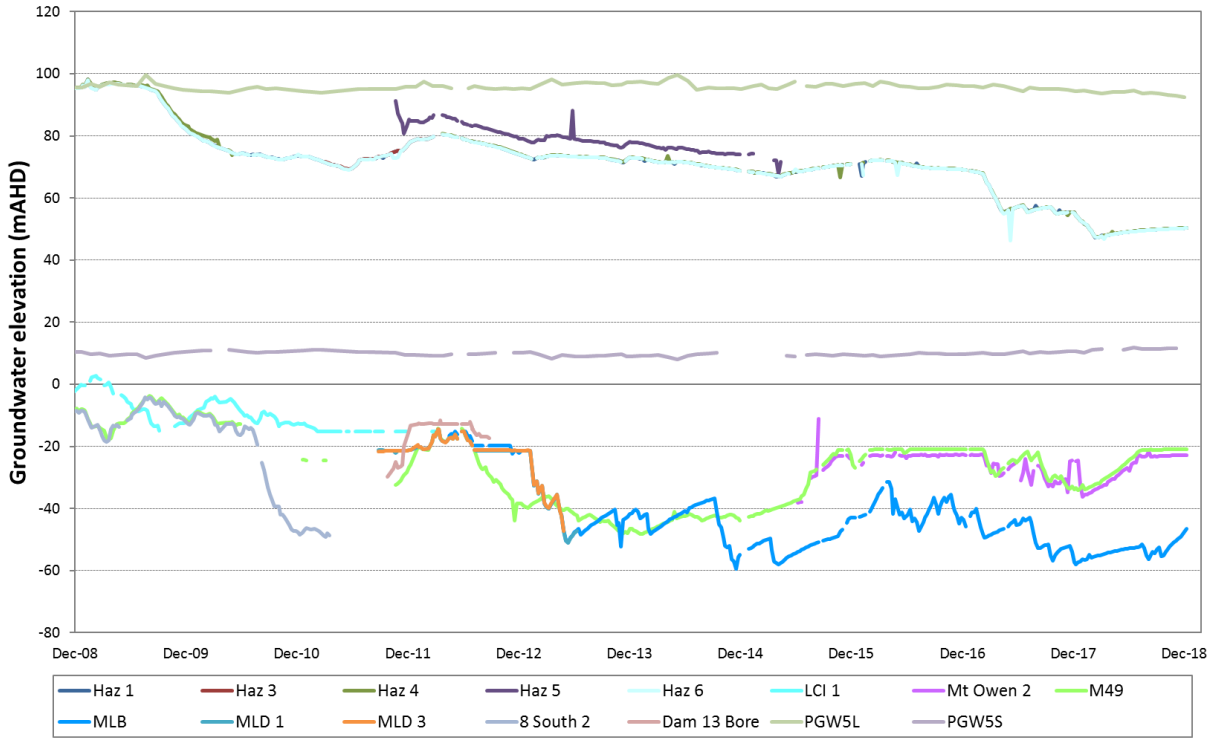


Figure 25 Groundwater level data in hard rock (coal measures) bores – 2006 – 2018

Groundwater Comparison to EA Predictions

With reference to the EA predictions from the groundwater assessment (SKM, 2013), this section identifies the predictions made with comparison to monitoring findings. The key conclusions of the predictive model simulations and groundwater impact assessment have been compared to the findings of the WMP approved monitoring program and detailed in **Table 30** below. In brief, observations from the monitoring programs demonstrate impacts within the EA predictions.

Table 30 Groundwater Impact Comparison to EA predictions

Groundwater Impact Comparison to EA Predictions	
Key EA Conclusion	Comparison to Monitoring Observations
Impacts to Bowmans Creek alluvial aquifer	
With the exception of the final year of the Entrance Pit progression (year 2022), the magnitude of alluvial losses estimated by the model under the proposed is similar to the leakage rates predicted for current mining operations at LCO. These estimated losses from the alluvium amount to between 150 to 180 ML/year up to 2021, and peak at 270 ML/year for 2022.	Monitoring has not shown connectivity between the Entrance Pit and Bowman's Creek alluvial aquifer. No definition 1 groundwater level impact triggers initiated during 2018.
Under the proposed modification, model results predict that the progression of the South Pit has negligible impact on the Bowmans Creek alluvial aquifer in terms of increased leakage or drawdown.	Monitoring has not shown connectivity between the South Pit and Bowman's Creek alluvial aquifer. No definition 1 groundwater level impact triggers initiated during 2018. This EA conclusion is considered to be corroborated by monitoring results.
Estimates of historical baseflow contributions to Bowmans Creek streamflow suggest the peak estimated loss of groundwater flow caused by the proposed modification accounts for approximately 4% to 8% of the estimated baseflow component of streamflow and less than 2% of measured annual streamflow.	Monitoring has not shown connectivity between the mining operations and Bowman's Creek alluvial aquifer. This EA conclusion is considered to be corroborated by monitoring results.
Recent groundwater monitoring data and predictive model results indicate leakage from the alluvial aquifer induced by previous underground mining and current open cut mining activities at LCO are having negligible impact on groundwater levels within the alluvium. As a result the estimated losses in groundwater flow under the proposed modification are unlikely to have a significant impact on streamflow in Bowmans Creek or on water levels within the associated alluvial aquifer.	Monitoring has not shown connectivity between the mining operations and Bowman's Creek alluvial aquifer. This EA conclusion is considered to be corroborated by monitoring results.
Historical monitoring of groundwater within the Bowmans Creek alluvium suggests minimal impact of mining operations on groundwater quality, and model simulations provide no indication that the proposed modification will alter the hydrogeologic regime in a manner that would adversely affect groundwater quality.	Monitoring has not shown mining related impacts on Bowman's Creek alluvial aquifer. This EA conclusion is considered to be corroborated by monitoring results.
Predicted drawdown within the Bowmans Creek alluvial aquifer is expected to be negligible (less than 0.25 m) relative to current water levels up to 2019. When estimated leakage rates peak at the end of mining, drawdown is predicted to peak at less than one meter relative to current water levels. This peak drawdown estimate falls below the minimal impact criteria for aquifer interference activities as defined in the NSW Aquifer Interference Policy (2012).	Monitoring has not shown drawdown as a result of mining and the predicted peak drawdown period has not been achieved during 2018. This EA conclusion is considered to be corroborated by monitoring results.
Impacts to hard rock aquifers	
Estimated total groundwater extraction from the regional hard rock aquifer, determined as the sum of - pit inflows and dewatering requirements, needed to accommodate the proposed modification peaks at less than 4,000 ML/year. LCO currently holds extraction licenses totalling 27,000 ML/year for this water source.	Modelled and measured extraction of hard rock aquifers is within licence limits and below the estimated peak of 4,000ML/year estimations.
Post mining equilibrium simulations predict the Entrance Pit final void will act as a sink and the South Pit will act as a source for groundwater flow from and to the regional hard rock aquifer. Predicted increases in salinity in the South Pit final void (G&A, 2013) result in potential long term impacts to groundwater quality in the hard rock aquifer due to leakage of increasingly saline water from the South Pit final void when water levels in the void are above approximately 65 m AHD.	Not yet triggered.

8 Rehabilitation

8.1 Post Rehabilitation

Post mining land use options for LCO were reviewed and assessed for the preparation of the Rehabilitation Strategy included in the MOD 5 EA (Umwelt, 2013). The proposed final landform and final land uses are depicted on Plan 4 of the 2018 Mining Operations Plan (MOP) and are outlined in the sections below. Features of the proposed final landform and final land uses are described below.

The proposed final landform and land use for LCO is shown in **Figure 26** and includes woodland habitat corridors that connect with proposed native vegetation rehabilitation at Ravensworth Operations, Mount Owen Complex and the Ravensworth Operations Hillcrest Offset Area. Additionally, habitat enhancement will be undertaken along Bowmans Creek to enhance habitat specifically for the Spotted-tailed Quoll. Regeneration works associated with Bowmans Creek are documented in the Biodiversity Management Plan.

The overall objectives of the proposed post-mining land use design are:

- to contribute to effective native corridors through the area which promote fauna movements between Ravensworth Operations, Mt Owen Complex, Lake Liddell and the Ravensworth Operations Hillcrest Offset Area;
- to maintain and provide additional suitable habitat for the spotted-tailed quoll (Dasyurus maculatus maculatus) identified during fauna monitoring programs in 2012, particularly around the Bowmans Creek area;
- to provide opportunities for future agricultural activities such as sustainable grazing;
- to improve the visual amenity of the area; and
- not to preclude other potential post mining land use options should they be determined to be viable and preferable as part of the detailed mine closure planning process that commences at least five years prior to the planned cessation of mining.

8.2 Current Status

Rehabilitation and disturbance status of the operation as at the end of the reporting period is shown in **Figure 27**. The figure shows the extents of mining related disturbance and rehabilitation completed to date (differentiated between grassland and woodland type) and 10m contours. During the reporting period, LCO completed rehabilitation and disturbance activities as detailed in the MOP. **Figure 28** shows the 2018 proposed, actual completed 2018 rehabilitation and forecast 2019 rehabilitation.

Table 31 Rehabilitation Status

Rehabilitation Status			
Mine Area Type [A]	Previous Reporting Period (Actual ha)	This Reporting Period (Actual ha)	Next Reporting Period (Forecast ha)
	2017	2018	2019
A: Total mine footprint	1576	1615	1626
B: Total active disturbance	771	743	705
C: Land being prepared for rehabilitation	0	0	0
D: Land under active rehabilitation	805	872	921
E: Completed rehabilitation	0	0	0

[A] – Area types as defined in the NSW Government Annual Return Guidelines.

No rehabilitation areas onsite have been assessed against the MOP completion criteria for the purpose of formal relinquishment. Additionally, annual biodiversity monitoring was completed in 2018 as per the Biodiversity Management Plan (BMP). The results of both of these monitoring programs and comparison to performance criteria are presented in **Section 8.3.** Full details of the monitoring programs completed are available on the LCO website.

MOP Rehabilitation Commitments

During 2018, LCO completed rehabilitation generally in accordance with the approved MOP. **Table 32** shows the hectares put forward in the MOP, actuals as well as the variance. Within the next reporting period, LCO forecasts to complete 11ha of disturbance and 49ha of rehabilitation. As per the EIS, LCO is completing rehabilitation progressively throughout the life of the operation.

Table 32 MOP Rehabilitation Status

	MOP		Full Year Actual		Variance	
	Disturbance (ha)	**Rehabilitation (ha)**	**Disturbance (ha)**	**Rehabilitation (ha)**	**Disturbance (ha)**	**Rehabilitation (ha)**
2017	51	30	51	37	0	+7
2018	40	68.3	39	67	-1	-1
				MOP Cumulative Variance	-1	+6

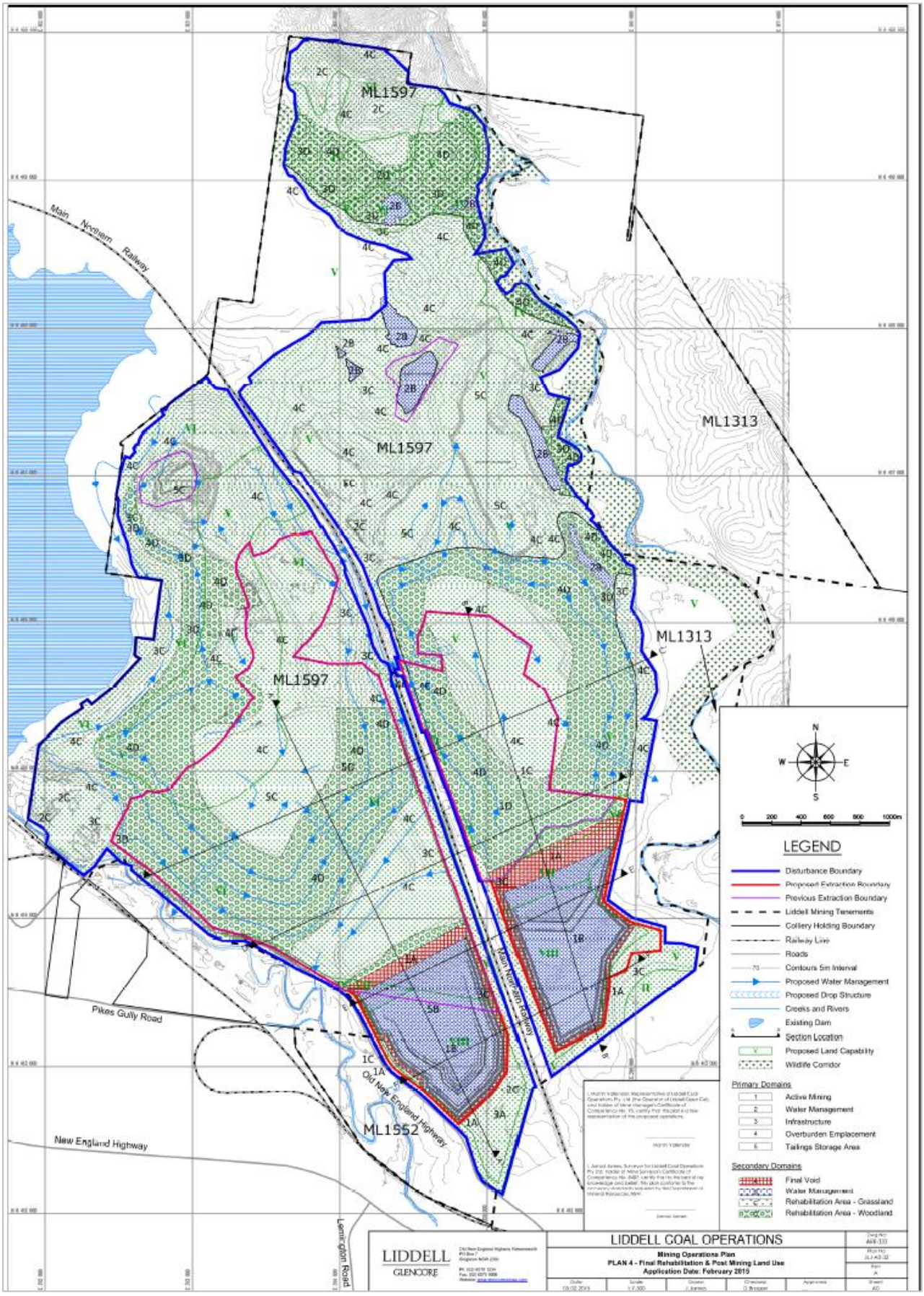


Figure 26 MOP Plan 4 – Current approved final landform

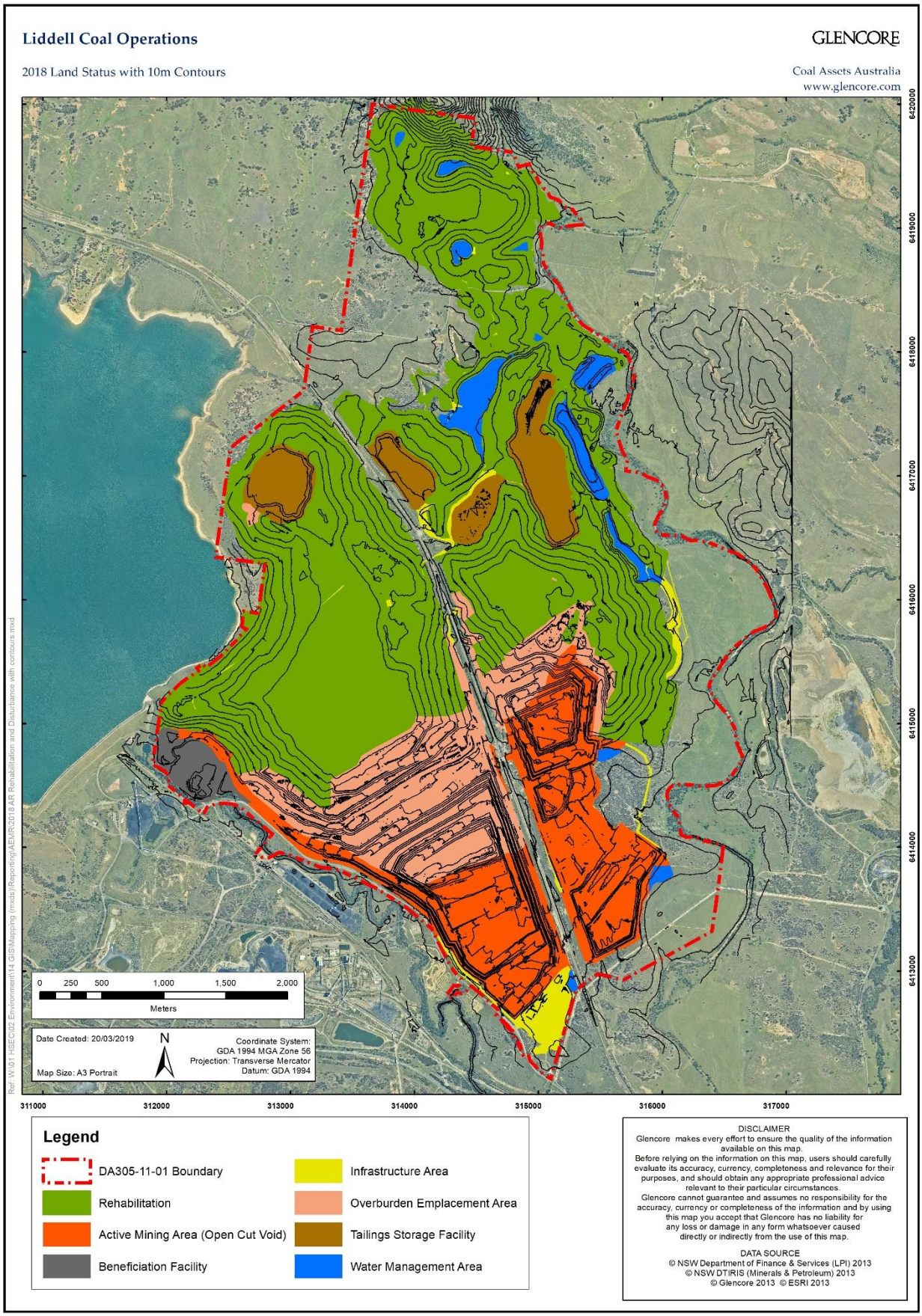


Figure 27 Current rehabilitation and disturbance status

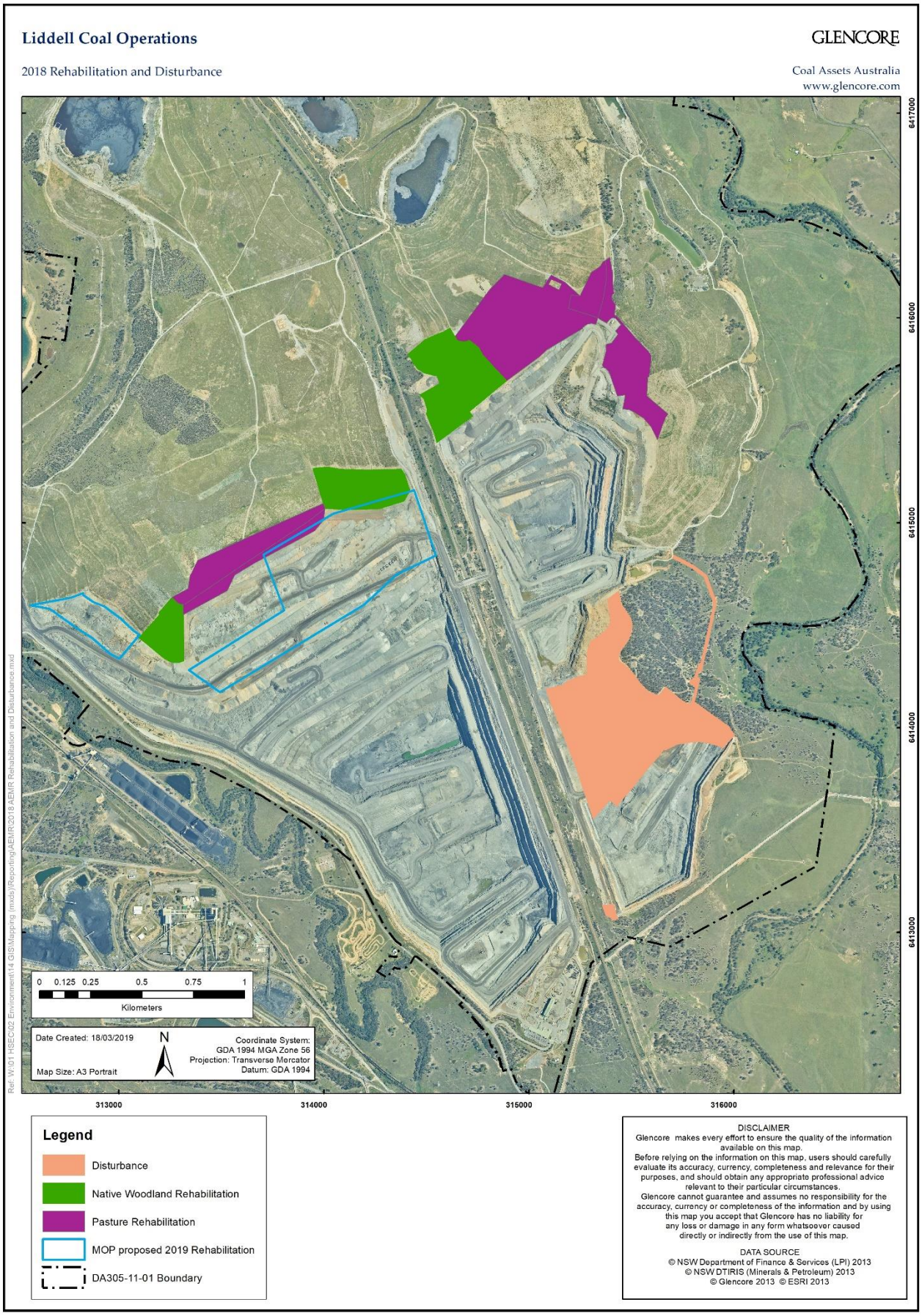


Figure 28 Rehabilitation and disturbance during 2018

8.3 Biodiversity Management

During 2018, LCO continued to operate in accordance with the approved MOP and BMP which detail the rehabilitation practices/monitoring and biodiversity practices/monitoring respectively. The detailed rehabilitation and biodiversity monitoring was completed in accordance with the MOP and BMP with the findings summarised below. **Appendix H** includes a summary of the rehabilitation establishments works completed during 2018.

The BMP was updated and approved in consultation with the Department of Planning on the 19 October 2018.

8.3.1 Biodiversity Monitoring Summary

As part of the approved DA305-11-01 Mod 5, LCO developed a Biodiversity Management Plan (BMP). The objectives of the BMP are to provide direction for the short to long term management and enhancement of the biodiversity values of the BMP Area, as well as to provide a detailed description of the measures to be implemented to achieve this over the next three years (as per the State requirements). LCO's performance tracking towards the objectives is detailed in the section below. The BMP area is defined as all land within the DA305-11-01 consent boundary excluding any biodiversity offset areas and includes rehabilitation areas and remnant vegetation.

In general remnant vegetation sites have maintained broadly consistent vegetation and fauna diversity and abundance since monitoring commenced in 2012. Both provide a range of habitat features that have remained intact and unaltered by mining and mining-related activities. Floristic monitoring identified higher than average overall floristic diversity at one remanent site with lower than average overall floristic diversity monitored at the second remanent site. This also was correlated with native diversity at the remanent sites. It was noted that fluctuations in floristic diversity seem to be related to changes in grassy vegetation cover which are directly related to the prolonged drought conditions. Introduced flora species diversities were similar between remanent and monitoring sites with floristic data collected shows that introduced species coverage has not substantially increased since 2016.

Other key findings of the 2018 biodiversity monitoring program were as follows:

- Substantial weed and pest management works have been undertaken by LCO throughout 2018.
- Remanent vegetation at W02 is generally in good condition; however some potentially problematic weed species are present in this area which require management.
- Riparian remnant site R01 is dominated by introduced species in the groundcover.
- Rehabilitated vegetation at WR02 has undergone a slight increase in native diversity that correlates with a decline in weed species cover.
- There has not been a noteable increase in the extent of feral species presence. This appears to be being suppressed by LCO management actions.
- No signs consistent with myrtle rust, Phytophthora or Chytrid fungust were identified.
- Styofauna diversity at all sites remain low.
- Rehabilitated vegetation at WR02 is in moderate condition (species diversity and plant health), however could be assisted in becoming more compatible with reference vegetation by reducing weed levels/maintaining weed management efforts and increase diversity of native flora species in the groundcover.

LCO will continue to implement the BMP commitments and recommendations detailed in the 2018 BMP monitoring report. Key recommendations to be implemented during 2019 by LCO will include:

- Continued supplementary plantings to assist in infilling vegetation where gaps in certain strata have been identified.
- Progressive installation of habitat features such as boulders, rocks and logs prior to seeding/planting activities, and/or adjacent to established rehabilitation areas.

- Continued weed and feral fauna management.

As per the BMP, LCO will prepare an Annual Ecological Monitoring Report (AEMR), which will document the monitoring methods and results from the winter monitoring period through to the autumn monitoring period. The intent of this report will be to provide a comparison of the data collected with previous monitoring event and to provide (where necessary) ongoing management recommendations and ameliorative methods to ensure the biodiversity within the BMP area is subject to a positive feedback loop. The full report summarising the method and results of the 2018 Annual Ecological Monitoring Program is available on the LCO website.

Biodiversity Management Performance Indicators

The performance indicators and completion criteria for the short and medium term biodiversity management are identified in the BMP. Completion criteria are objective target levels or values assigned to a variety of indicators (i.e. slope, species diversity, groundcover etc.), which can be measured against to demonstrate progress and ultimate success of rehabilitation. As such, they provide a defined end point, at which point in time rehabilitation can be deemed successful and the lease relinquishment process can proceed.

The performance indicators are for the first three years of the implementation of this BMP are used to assist in demonstrating how management actions are progressing towards achieving completion criteria.

The completion of and performance against each of these indicators/criterion is summarised in **Table 33** below based on the outcomes of ecological monitoring and inspections across LCO for each year.

Table 33 BMP Performance Indicator Summary

Action/Item	Performance Indicator	Compliance	Performance Comment
Year 3 2018			
Fencing, Signage and Access Control			
Minimum twice-yearly inspections of fences and signage to identify any works required. Fencing and signage of relevant parts of BMP area should be as per Section 4.1	Inspections undertaken nominally in March and September. Damaged critical fences to be repaired within 1 week (temporary if needed), final repairs and non-critical repairs to be completed in 1 month	Compliant	Signage installed and maintained as required
Access Track Maintenance			
Minimum twice a year BMP Area inspections to identify track conditions, any works required and any unnecessary tracks to be remediated	Inspections undertaken nominally in March and September. Action and repair track damage or remediation where applicable.	Compliant	
Topsoil Management			
Areas containing weeds that may pose a threat to rehabilitation are targeted using appropriate weed control methods prior to topsoil stripping. Methods may include, foliar spraying, basal bark spaying, cut and paint, slashing and other mechanical methods as deemed appropriate.	Pre-stripping weed control of topsoil is completed, as needed.	Compliant. Weed control is completed prior to topsoil stripping (where required) to minimise future potential impact to rehabilitation success.	Weeds are managed in line with Weed Action Plan. Preclearance survey identifies any weed infestations requiring further management.
Pathogen Management			
If reasonable potential for pathogens is identified in the BMP Area, appropriate pathogen monitoring and management protocols are developed and implemented.	If reasonable potential is identified, pathogens are considered in design and implementation of monitoring works. If identified (or potential identified), management actions for specific pathogens are developed and implemented.	Compliant.	No signs likely to be associated with Phytophthora, myrtle rust or chytrid fungus observed during 2018 BMP monitoring.

Action/Item	Performance Indicator	Compliance	Performance Comment
Seed Collection			
Where suitable remnant vegetation is available, implementation of seed collection and handling program for use in revegetation/rehabilitation works.	Pre-clearing surveys identify potential seed sources. Seeds are collected, stored and handled according to appropriate program. Collected seed resources are used in revegetation/rehabilitation works.	Complaint.	Seed resources being collected and substituted in seed mix for rehabilitation as key species are available.
Vegetation Clearing			
Detailed pre-clearing procedure is to be implemented when clearing of woody native vegetation (including shrub, groundcover and isolated trees in grasslands).	Pre-clearing process is to be implemented as part of Ground Disturbance Permit process. Outcomes of pre-clearing process are recorded and recommendations are implemented.	Compliant.	LCO implements pre-clearing as part of Ground Disturbance Permit process with outcomes recorded and recommendations implemented.
Detailed tree-felling process is to be implemented when clearing areas of woody native vegetation (including shrub, groundcover and isolated trees in grasslands).	Tree felling process is to be implemented as part of the Ground Disturbance Permit process. Outcomes of tree-felling process are recorded and recommendations are implemented.	Compliant.	LCO implements tree-felling as part of Ground Disturbance Permit process, with outcomes recorded and recommendations implemented.
Translocation Works			
Translocation of tiger orchids or other threatened flora species (if encountered during pre-clearing process) to biodiversity offset areas.	Tiger orchids identified during pre-clearing process are salvaged during the tree felling process and are translocated into biodiversity offset areas. Any translocated individuals are subject to regular monitoring and maintenance works, if required.	Compliant.	One tiger orchid was translocated to Mountain Block BOA and has been subject to monitoring as required. Translocation is thus far deemed successful.

Action/Item	Performance Indicator	Compliance	Performance Comment
	Reporting of translocation works and monitoring works is maintained.		
Remnant Vegetation and Habitat Management			
Remnant vegetation is to be protected from accidental impact.	Areas to be disturbed will be clearly defined in the field to prevent accidental impact to remnant vegetation.	Compliant	Remnant monitoring sites are in areas of undisturbed vegetation which are fenced to prevent unauthorised access. No accidental damage or removal of remnant vegetation was evident during BMP inspections. Fence line inspections are undertaken biannually in accordance with commitments of the BMP.
Remnant vegetation is protected from disturbance.	Remnant vegetation will be fenced or sign-posted as necessary to protect from disturbance. Annual inspections are completed to assess condition of fences and signs, areas of erosion concern, weeds or feral animals requiring control. Management works will be conducted, as necessary.	Compliant.	Remnant monitoring sites are in areas of undisturbed vegetation which are fenced to prevent unauthorised access. No accidental damage or removal of remnant vegetation was evident. Annual monitoring included assessment of areas of erosion concern and introduced species. Fence line inspections are undertaken biannually in accordance with commitments of the BMP.
Annual inspections undertaken by suitably qualified personnel to assess the extent of natural regeneration occurring.	Annual inspection undertaken by suitably qualified personnel to assess extent of natural regeneration occurring. Appropriate action is undertaken if regeneration is deemed as being inadequate.	Compliant.	Annual monitoring included assessing degree of regeneration of native trees. Native regeneration was identified and considered adequate at W02, R01 and WR02.

Action/Item	Performance Indicator	Compliance	Performance Comment
Weed Control			
Complete weed inspections of BMP area every two months to document diversity and abundance of noxious weed records. This will then inform ongoing control actions (as needed), including timing, frequency, target species and methods to be used.	Inspections completed every two months, followed by implementation of required control methods, as required.	Compliant	Inspections being completed as required with appropriate weed priorities actioned.
Weed inspections of remnant and rehabilitation areas	Annual inspections are undertaken of remnant vegetation to identify areas of weed infestation. Weed management actions of infestations are undertaken in accordance with current or other best practice approaches.	Compliant.	Inspections being completed as required with appropriate weed priorities actioned. Annual Weed Action Plan completed and implemented. Annual monitoring undertaken and management recommendations to be actioned. Previously identified weeds being targeted and noted as being effective during monitoring and inspections.
Feral Animal Control			
Complete feral animal inspections of BMP area every two months to document sighting and abundance records. This will then inform ongoing control actions (as needed), including timing, frequency, target species and methods to be used.	Inspections completed every two months, followed by implementation of required control methods, as required.	Compliant	Feral animal inspections are undertaken every two months in accordance with commitments of the BMP. Foxes (Vulpes vulpes), were identified in low numbers and subsequently should be key species for management in 2019. Unlike previous monitoring years, the pig (Sus scrofa) presence appears to be declining.
Develop and implement an effective annual pest animal action plan.	Develop and implement pest animal action plan. Stable or downward trend in population size recorded.	Compliant	Annual Pest Action Plan developed and implemented for 2018. Pest numbers appeared to be stable and low.
Develop a vertebrate pest control register to document when and where each control method is implemented.	Update and maintain vertebrate pest control register.	Compliant	Vertebrate pest control register maintained and updated throughout 2018.

Action/Item	Performance Indicator	Compliance	Performance Comment
Blue-billed Duck Management			
Complete habitat enhancement, maintenance and monitoring works (as required) for the blue-billed duck	Ongoing habitat enhancement and management works within Dam 3 and two Triangle Dams. Monitoring works as required.	Compliant	Habitat values for Dam 1 and Triangle dams assessed in 2018 monitoring. Both provide low habitat value due to drought reducing vegetation cover, and 2018 water levels in Triangle Dams were low.
Habitat Enhancement			
Salvage of habitat features (particularly for the spotted-tailed quoll) such as hollow-bearing trees, logs, stumps, large rocks and boulders.	Suitable habitat features identified during the pre-clearing process are salvaged. Salvaged features are either re-instated into areas with low levels of habitat features or stockpiled appropriately for later use. Timber or boulder piles will be constructed in riparian areas and areas of regeneration, revegetation and/or rehabilitation (as appropriate) to provide potential quoll denning habitat.	Compliant	Habitat material is identified during the pre-clearance process and salvaged where possible to reinstate into BMP areas.
Nest boxes are providing habitat value for native fauna.	Biodiversity offset areas, areas of remnant vegetation and suitably established rehabilitated vegetation (not in disturbance areas) will be supplemented with nest boxes as required.	Compliant	Remnant vegetation and suitably established rehabilitation areas have been supplemented with nest boxes.
Salvaged–reinstated hollows	An indicative sample of salvaged and re-instated hollows are subject to annual monitoring in conjunction with nest boxes.	Compliant	Habitat features suitable for salvage are stockpiled or directly placed into rehabilitation and offset areas. Ongoing habitat augmentation works will continue as per recommendation from monitoring events.

Action/Item	Performance Indicator	Compliance	Performance Comment
Timing of nest box installation	Removed hollows will be replaced (with nest boxes) within six months of each discrete clearing event.	Compliant	46 hollows, stag trees or trees with sheeting bark cleared during 2018. Hollows and logs removed during clearing works have been placed in offset and rehabilitation areas. 266 nest boxes have been installed as part of an ongoing program in the offset and BMP areas during 2018. Ongoing habitat augmentation works will continue.
Grazing Management			
Stock rotation	Cattle are grazed within improved pasture areas within mine rehabilitation >3years where practical Stocked will be managed to allow pasture recovery and maintain pasture availability and sufficient groundcover.	Compliant	LCO coordinate a cattle grazing trial and rotate stock between paddocks under supervision of district agronomist
Bushfire Management			
Bushfire Management Plan will be implemented	Implementation of requirements of updated Bushfire Management Plan.	Compliant	Bushfire Management Plan updated in 2018. No signs of bushfire impacts were noted during the 2018 monitoring event.
Ecological Monitoring			
Undertake floristic, fauna, LFA, waterbird, nest box, stygofauna and instream/riparian monitoring program throughout LCO	Monitoring program completed and reported.	Compliant	Monitoring indicates remnant sites have remained relatively stable since commencing of monitoring; however rehabilitation sites are still young and will not be likely to provide comparable floristic and faunal diversity to reference vegetation for a number of years.
Undertake annual inspections of LCO rehabilitation areas as per the MOP	Annual inspections completed	Compliant	Annual inspections of LCO rehabilitation areas completed and included in this Annual Review.

8.3.2 Rehabilitation Monitoring Summary

LCO also conduct a specific and detailed rehabilitation monitoring program as detailed in the MOP. Due to the age of the operation, LCO has established rehabilitation areas which are distinctly different reflecting the evolving rehabilitation objectives and practices. Each area has unique challenges for progressing towards the final land uses of pasture and woodland which are being managed by LCO. Further detail is provided in the below from the 2018 Rehabilitation Monitoring Report.

Overall the condition of rehabilitation at LCO is moderate and trending towards the target. Most areas have a good ground coverage which is preventing substantial erosion. In the case of woodland vegetation however, ground coverage is provided by non-target species (particularly Rhodes grass (Chloris gayana)) and vegetation has not been established for lengths of time in which substantial soil organic matter (leaf litter) has had the time to accrue. In terms of pasture areas, height and density are typically good for grazing.

Pasture Rehabilitation

The two broad pasture rehabilitation types across the LCO site include the older pasture areas that are dominated by Rhodes grass (Chloris gayana) and the newly established pasture areas that are dominated by a higher diversity of species including kikuyu (Cenchrus clandestinus) and lucerne (Medicago sativa).

The older pasture areas have a higher overall biomass but contain a lower diversity of species and generally consist of lower quality pasture species. The pasture in these areas is developed to a level that is likely to be suitable for grazing at this stage. These pastures are managed to increase diversity, particularly of higher quality pasture species including legumes and non-grass pasture species and to limit old “rank” growth and encourage new growth of the dominant pasture species Rhodes grass. During 2018, LCO installed infrastructure including fencing, watering network of troughs/tanks as well as yards to allow for rotational grazing of an initial 100ha of suitable rehabilitation pastures on the South Cut RL195. LCO aim to commence grazing in these areas during 2019 to improve pasture quality and demonstrate land capability suitable of the intended final land use.

The newly established pasture areas have a lower cover and lower overall biomass than the older pasture areas but consist of a greater diversity of higher quality species including legumes and non-grass pasture species. These pasture areas are generally still establishing and are not likely to be able to support prolonged grazing at this stage, however, some areas may benefit from short periods of intensive grazing. These pastures should be managed to maintain and increase the diversity of high quality pasture species, increase cover and biomass.

Specifically at this stage the pasture rehabilitation typically lacks the legume establishment and diversity desired of a relinquishing pasture area. Given the age of most of the pasture rehabilitation onsite and the requirement of continuous management of pasture, LCO do not consider there to be an issue with the development. At the current stage the pasture rehabilitation is performing as a stable landform supporting the basis of pasture rehabilitation including organic carbon cycling. Domination of Rhodes grass in many areas is acknowledged with sustainable management actions to be completed as LCO progress towards relinquishment. Broadly, the pasture rehabilitation strategy including the management of Rhodes grass will be to commence active management of the land including fencing and shade for grazing as well as typical ameliorant and seeding farming practices such as aerial over sowing legume species.

Woodland Rehabilitation

Woodland rehabilitation areas are more variable and each of the rehabilitation areas face unique challenges. Most areas, however, contain suitable species in at least one vegetative layer. Importantly to note that woodland rehabilitation in particular is developed in stages wherein each strata layer is developed in turn.

Dominance of weed species, particularly invasive perennial grasses and galenia (Galenia pubescens) is a major threat to the establishment of a ground layer in all Woodland rehabilitation areas. The 2019 Weed action plan has included priority species and areas to manage weed presence to a minimum. Monitoring has identified that augmentation of rehabilitation areas that have poor cover or diversity in particular layers by direct seeding or planting of suitable native species in

these layers will be an important part of progressing these areas towards the final land-use. Increasing the habitat value of these areas by installing; stag trees, hollows and rock and log piles will also be important in improving the biometric scores for these rehabilitation areas. Planting of other locally endemic species may also be beneficial.

Generally, canopy composition in woodland rehabilitation areas contain species appropriate to target vegetation communities. Due to the time required to develop a functioning target woodland, woodland rehabilitation at LCO is at a range of different stages all of which require some form of ongoing management. Typically, woodland rehabilitation is developing appropriately with no serious arising concerns.

The quality of rehabilitation as compared to the representativeness of the rehabilitation to the target vegetation communities has improved over time. A number of actions have been made recently to improve the quality of existing rehabilitation including weed control efforts and thinning works in existing woodland rehabilitation. Planting to augment the understory and mid-layers in woodland areas is also planned to be carried out once weather conditions are commensurate for planting.

Rehabilitation Management Performance Indicators

As per the MOP, rehabilitation requires maintenance and continuous adaptive management to improve the performance of each area; adaptive management is guided by monitoring results where appropriate actions are completed as required. LCO utilise a Trigger Action Response Plan (TARP) to provide a framework for assessing rehabilitation areas performance and identification of maintenance actions as appropriate. The TARP identifies key aspects of rehabilitation (such as landform stability), subsequent key elements (for instance erosion control) and then a condition rating (‘green’ requires no intervention to ‘amber’ and ‘red’ which require some investigation /intervention. **Table 34** below identifies the TARP elements that as having a status other than ‘green’.

As per the MOP, the site progress towards the MOP performance Indictors/Completion Criteria was reviewed as part of the monitoring completed in 2018. **Appendix G** lists all of the completion criteria and comments from the 2018 monitoring.

A rehabilitation summary of areas established during 2018 is provided in **Appendix H.**

Rehabilitation legacy areas exist within the BMP area, primarily the Mountain Block. This site has been reported and LCO is currently proceeding with Specific Remediation Action Plans (RAP) to rehabilitate. LCO progress with the RAP is outlined below in **Section 8.7**. The following table does not include these this areas as they are reported upon specifically in line with a RAP.

Table 34 MOP TARP Status – exceptions only

Aspect/Category	Key Element	Element Number	2018 Status	`MOP Detail		Comment
Landform Stability	Erosion Control	3	Amber	Trigger	Minor gully or tunnel erosion present and/or active rilling >200 mm deep.	Isolated areas identified with remediation required. Ongoing maintenance and monitoring.
				Response	A suitably trained person to inspect the site. Investigate opportunities to install water management infrastructure to address erosion. Remediate as appropriate.	
Topsoil Availability	Topsoil Quantity	8	Amber	Trigger	Topsoil balance indicates a deficiency in topsoil available for rehabilitation over the Life of the Mine.	During reporting period LCO utilised topsoil alternatives (OGM and ameliorant combinations). LCO will continue to investigate suitable alternatives with consideration to rehabilitation performance.
				Response	Investigate options and alternatives (e.g. OGM) to be able to meet future topsoil requirements Continue direct seeding on spoil where possible and approved.	
Vegetation	Weed Presence	10	Amber/Red	Trigger	Weeds are limiting the establishment of rehabilitation significantly.	Some recent woodland areas have a high cover of weed species (galenia pubescence and penesetium clandestinus) that pose particular risk to target vegetation establishment. This is not atypical for new rehabilitation areas. LCO is conducting weed control in these areas and will continue to monitor revegetation performance. LCO regularly monitor weed presence conduct control activities.
				Response	Engage weed management contractor to remove introduced species from the site as soon as practicable. Investigate management measures to assist native plant establishment including use of ameliorants and implement as appropriate.	
	Species Composition	11	Amber	Trigger	Woodland vegetation is not on a timely trajectory of developing native tree and shrub species composition consistent with final landform and/or completion criteria.	Some older woodland areas require maintenance/intervention (such as thinning and supplementary planting) to improve species diversity. LCO plans to continue rehabilitation improvement works in these areas.
				Response	Review native seed mix and amend accordingly. Consider remedial actions such as tubestock planting, reseeding or other management practices to achieve required species composition.	

Aspect/Category	Key Element	Element Number	2018 Status	`MOP Detail		Comment
Vegetation	Species Composition	12	Amber	Trigger	Pasture vegetation is not a timely trajectory developing grass and legumes species consistent with final landform and completion criteria, appropriate to the district and suitable for cattle grazing.	Pasture areas are generally suitable to sustain grazing. Some older pasture areas require maintenance/intervention (such as grazing and supplementary sowing) to improve species diversity. LCO plans to continue rehabilitation improvement works in these areas.
				Response	Investigate additional weeding and re-seeding where required and ensure seed mix utilised is consistent with desired species composition.	
Biodiversity	Habitat Corridors	13	Amber	Trigger	Habitat corridors are successfully established and consistent with the desired vegetation community composition however are not being utilised for fauna species movement.	LCO continually develop and include habitat material into rehabilitation areas. Woodland vegetation corridors are still developing and as such future monitoring events will further inform if any additional actions are required.
				Response	Investigate whether sufficient habitat features (rock piles, felled hollow bearing trees, nest boxes etc.) are available and have been incorporated into the corridors.	

8.4 Biodiversity Offset Management

As part of the approved DA305-11-01 Mod 5, LCO developed a Biodiversity Offset Management Plan (BOMP) to guide ongoing management of the LCO biodiversity offset areas to maintain and enhance biodiversity values, particularly those relating to threatened species and threatened ecological communities (TECs) within the LCO biodiversity offset areas. **Figure 29** shows LCO biodiversity offset area comprising of Mountain Block, Bowmans Creek Riparian Corridor and Mitchell Hills South Offset Areas. During 2018, LCO completed an ecological monitoring in accordance with the BOMP as well as commenced various management actions relating to the performance indicators; both of which are detailed below.

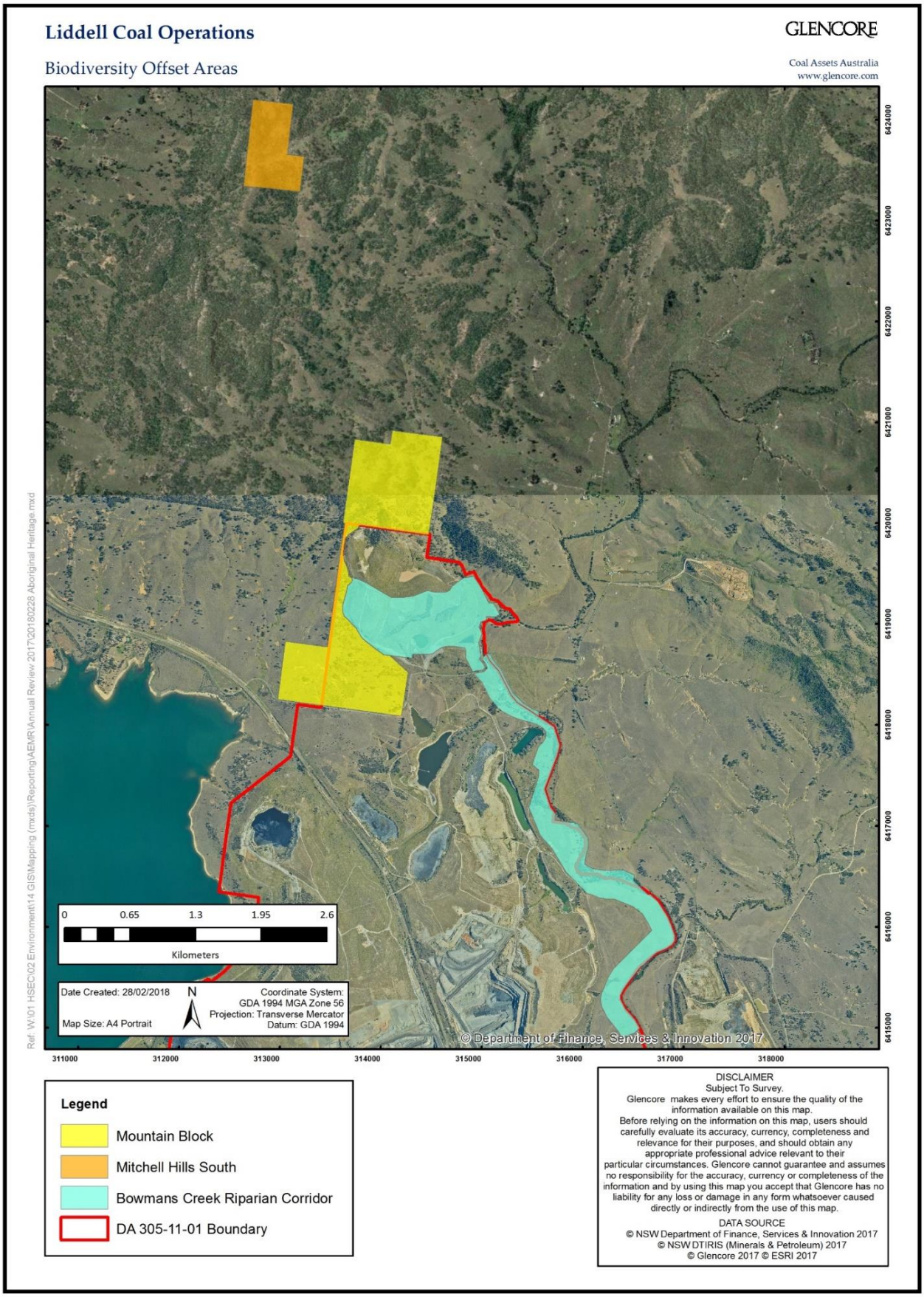


Figure 29 Biodiversity Offset Areas

Biodiversity Offset Monitoring Summary

In general, the remanent vegetation of Mitchell Hills South has the highest habitat values of the biodiversity offset areas, with high hollow densities, rock on rock habitat, moderate log presence, abundant shrubs, low introduced species although they key lacking habitat is permanent water. Bowmans Creek Riparian Corridor requires the greatest amount of ongoing active management, particularly for high introduced groundcover species, to improve recruitment of canopy species and increase of habitat features such as logs and boulders. Quality habitat was also noted in Mountain Block, however much of the vegetation within the offset is regrowth and has not yet developed hollows or other habitat complexity (such as logs). Permanent water resources in this BOA are also limited. Although remnant vegetation at the BOAs was in good/moderate condition and the general coverage of weed species was low (monitoring sites had invasive species present that require active management to prevent reduction in ecological value over time.

Although not necessarily within monitoring plots and subsequently may not be reflected within quantitative monitoring results LCO has been undertaking extensive management actions within the Mountain Block, Mitchell Hills South and Bowmans Creek Riparian Corridor since 2017. Works have been targeted at areas deemed in greatest need of management. Of particular note was the decline in occurrence of African lovegrass (Eragrostis curvula) across all BOAs as a result of targeted weed spraying works. This should allow for recovery of small native herbs and grasses that had potential to be out competed by this invasive species.

The 2018 monitoring, particularly remote cameras, identified low utilisation of monitoring sites by foxes (Vulpes vulpes) and no pigs (Sus scrofa) were identified in 2018. This low utilisation may be attributable to management actions of these species or could correlate with a poor breeding season as a result of reduced resources. This result may lead to an increased usage of some areas by spotted-tailed quolls (Dasyurus maculatus maculatus) during the 2019 monitoring event. Ongoing management of these feral species is recommended as a priority to retain these low levels of occurrence.

It is anticipated that floristic and fauna value provided by the BOAs will increase with time as more management actions required by the BOMP are initiated and as tubestock planted begin to grow and provide improved habitat value (canopy coverage and foraging resources).

Key findings of the 2018 biodiversity offset monitoring program were as follows:

- Some declines were evident in floristic and fauna diversity in 2018 from previous events, however these declines directly relate to the prolonged drought conditions being experienced.
- Substantial revegetation works have been undertaken in 2018 in Bowmans Creek Riparian Corridor. Unfortunately this revegetation is not necessarily reflected in monitoring data, as drought conditions have led to substantial sapling mortality.
- Remnant revegetation is generally in good condition; however some potentially problematic weed species are encroaching in these areas (particularly riparian vegetation and grassland areas which has particularly high occurrence of exotic grass in patches) despite management activities.
- Level of feral pig appear to have reduced since the baseline monitoring event and 2016, this is likely as a result of management actions being implemented. These actions will assist in the local recovery of the threatened spotted-tailed quoll.
- Substantial nestbox installation has been undertaken in all three offsets. Preliminary monitoring of these nest boxes are promising for colonisation by local hollow-dependent fauna, including the threatened species the brush-tailed phascogale (Phascogale tapoatafa tapoatafa).
- Substantial increases in size and presence of eastern grey kangaroo (Macropus giganteus) mobs were identified in 2018 compared to previous years. This species is likely moving into these areas (particularly grasslands) due to lack of available resources elsewhere as a consequence of the drought.

- No signs of pathogens myrtle rust, *Phytophthora cinnamomi* or chytrid fungus were identified.

Biodiversity Offset Performance Indicators

The BOMP includes objectives which are to provide direction for the short to long term management and enhancement of the biodiversity values of the LCO biodiversity offset areas, as well as to provide a description of the measures to be implemented to achieve this over the next three years.

The performance indicators are for the first three years of the implementation of this BMP are used to assist in demonstrating how management actions are progressing towards achieving completion criteria.

The completion of and performance against each of these indicators/criterion is summarised in **Table 35** below based on the outcomes of ecological monitoring and inspections across LCO for each year.

Table 35 BOMP Performance Indicator Summary

Relevant Offset Area	Action	2018 Performance Indicator	Compliance	Performance Comment
Year 3 2018				
Pathogen Management				
All biodiversity offset areas	If reasonable potential for pathogens is identified in the BOAs, appropriate pathogen monitoring and management protocols are developed and implemented.	If reasonable potential is identified, pathogens are considered in design and implementation of monitoring works. If identified (or potential identified), management actions for specific pathogens are developed and implemented.	Compliant	No signs likely to be associated with Phytophthora, myrtle rust or chytrid fungus observed in any of the BOAs.
Fencing and Signage				
All biodiversity offset areas	Removal of redundant fences.	Continued removal of redundant fences as required.	Compliant	Large sections have been removed in accordance with the BOMP
	Inspections of fences every two months to identify condition.	Inspections every two months. Damaged critical fences to be repaired within one week (temporary if needed), final repairs and non-critical repairs to be completed in one month.	Compliant	Fenceline inspections are undertaken every two months in accordance with the BOMP
	Information signage for the spotted-tailed quoll.	Informational signage (for the spotted-tailed quoll) is maintained.	Compliant	Signage is installed and in good condition. New offset signage also present.
Grazing Management				
All biodiversity offset areas	All stock to be removed from BOAs	No stock grazing	Partially complaint	No evidence of cattle grazing was evident during 2018 in Mitchell Hills South or Mountain Block. Cattle grazing was observed at Bowmans Creek Riparian Corridor site W07.
	Minimum bi-monthly inspections to determine	To be completed bi-monthly.	Compliant	Cattle inspections are undertaken bi-monthly in accordance with the BOMP.

Relevant Offset Area	Action	2018 Performance Indicator	Compliance	Performance Comment
	presence of rogue stock and assess condition of fences.			No cattle were identified in Mitchell Hills South or Mountain Block. Cattle were present from time to time in Bowmans Creek however are being relocated as required.
	Remove reported rogue stock and repair damaged fences.	Action and remove reported rogue stock and repair damaged fences.	Compliant	Fence reparation works are undertaken in accordance with the BOMP.
Track Maintenance				
All biodiversity offset areas	New access tracks (only where necessary) are subject to due diligence assessments.	Complete due diligence assessments for new access tracks to minimise impact on biodiversity, where possible.	Compliant	Due diligence assessments have been completed for all biodiversity offset areas.
	Minimum twice yearly (nominally in March and September) inspections to identify track conditions.	Inspections undertaken nominally in March and September. Action and repair track damage.	Complaint	Access tracks inspections are undertaken bi-annually in accordance with BOMP commitments
	Rehabilitation of unnecessary access tracks.	Tracks no longer required will be rehabilitated.	Compliant	All tracks present are considered necessary
Pest Management				
Bowmans Creek Riparian Corridor	Complete feral animal inspections of BOAs every two months to document sighting and abundance records. This will then inform ongoing control actions (as needed), including timing, frequency, target species and methods to be used.	Inspections completed every two months, followed by implementation of required control methods, as required.	Compliant	Feral animal inspections are undertaken every two months in accordance with commitments of the BOMP. Foxes (Vulpes vulpes), and dogs (Canis lupus familiaris) were identified in low numbers, do not appear to be increasing in abundance and subsequently should be key species for management in 2019, whereas pig (Sus scrofa) numbers were less than during baseline monitoring.
Mountain Block and Mitchell Hills South	Complete feral animal inspections every four months to document sighting and abundance records. This will then inform ongoing control actions (as needed), including timing, frequency,	Inspections completed every four months, followed by implementation of required control methods, as required.	Compliant	Feral fauna were all identified in low numbers and do not appear to be increasing in abundance.

Relevant Offset Area	Action	2018 Performance Indicator	Compliance	Performance Comment
	target species and methods to be used.			Feral animal inspections are undertaken every four months in accordance with commitments of the BOMP.
All biodiversity offset areas	Develop and implement an annual pest animal action plan.	Develop and implement pest animal action plan. Stable or downward trend in population size recorded.	Compliant	Annual pest action plan developed and implemented during 2018. Pest numbers appeared to be stable during monitoring events.
	Particular action is paid to managing foxes, feral cats and feral dogs in order to protect the spotted-tailed quoll population in this area.	Implementation of favoured fox, feral cat and feral dog control measures. Monitoring of impacts of fox, feral cat and feral dog control on spotted-tailed quoll population.	Compliant	Feral dogs and foxes were identified in 2018 in Mountain Block and Bowmans Creek Riparian Corridor, but not in Mitchell Hills. Feral fauna were all identified in low numbers and do not appear to be increasing in abundance. Pig presence was not detected during 2018.
	Develop a vertebrate pest control register to document when and where each control method is implemented.	Update and maintain vertebrate pest control register.	Compliant	Vertebrate pest control register developed and implemented.
Weed Management				
Bowmans Creek Riparian Corridor	Complete weed inspections every two months to document diversity and abundance of noxious weed records.	Inspections completed every two months, followed by implementation of required control methods, as required.	Compliant	Inspections completed in accordance with the BOMP. Weeds requiring management were identified for Bowmans Creek Riparian Corridor. Evidence of galenia and introduced grass spraying was evident and appeared successful.
Mountain Block and Mitchell Hills South	Complete weed inspections every four months to document diversity and abundance of noxious weed records.	Inspections completed every four months, followed by implementation of required control methods, as required.	Compliant	Inspections completed in accordance with the BOMP. Weeds requiring management were identified during 2018 annual monitoring.

Relevant Offset Area	Action	2018 Performance Indicator	Compliance	Performance Comment
Natural Regeneration				
Mountain Block and Mitchell Hills South	Control of weeds and feral animals in regeneration areas.	Weed and feral animal control works are completed, as required.	Compliant	Targeted weed control works and targeted feral fauna control programs were undertaken in 2018 in response to species identified during the 2017 monitoring.
Mountain Block and Mitchell Hills South	Confirmation of mapping of areas for regeneration, including appropriateness of target community	Revised in ongoing monitoring works, as needed.	Compliant	No change identified from 2017 monitoring. Target revegetation communities are appropriate. Natural recruitment is occurring in both Biodiversity Offset Areas. Assisted regeneration work is occurring in both Biodiversity Offset Areas.
Mountain Block and Mitchell Hills South	Management of regeneration progress is responsive to monitoring outcomes.	Monitoring of regeneration areas.	Compliant	Monitoring of regeneration progress was made in 2018
Assisted Regeneration				
Mountain Block and Mitchell Hills South	Review need for assisted regeneration where outcomes of natural regeneration is deemed lacking.	Natural regeneration.	Compliant	Natural regeneration was identified in BOAs. Assisted regeneration activities were undertaken in 2018 with variable success
Rehabilitation				
Bowmans Creek Riparian Corridor Mountain Block Offset Area	Develop detailed performance criteria for all management zone types.	Detailed criteria developed based on annual monitoring of analogue sites.	Compliant	BOMP criteria updated in 2018 in response to progressive monitoring results.
Bowmans Creek Riparian Corridor Mountain Block Offset Area	Implement rehabilitation/ revegetation program.	Implementation of plan.	Compliant	Log stockpiles to increase habitat value were identified in central Bowmans Creek Riparian Corridor (not present in monitoring sites). Revegetation works commenced in Bowmans Creek Riparian Corridor and Mountain Block. Nest boxes have been installed in both BOAs.

Relevant Offset Area	Action	2018 Performance Indicator	Compliance	Performance Comment
Bowmans Creek Riparian Corridor	Positive feedback loop from monitoring results.	Feedback from monitoring is incorporated into ongoing review and improvement of plan.	Compliant	To be updated in response to these works.
Habitat Augmentation				
Bowmans Creek Riparian Corridor	Salvage of habitat features (particularly for the spotted-tailed quoll) such as hollow-bearing trees, logs, stumps, large rocks and boulders.	Suitable habitat features identified during the pre-clearing process are salvaged. Salvaged features are either re-instated into areas with low levels of habitat features or stockpiled appropriately for later use. Timber or boulder piles will be constructed in riparian areas and areas of regeneration, revegetation and/or rehabilitation (as appropriate) to provide potential quoll den habitat.	Compliant	Large log piles and rock piles have been installed in central Bowmans Creek Riparian Corridor.
Bowmans Creek Riparian Corridor	Nest boxes are providing habitat value for native fauna.	Continue staged installation of nest boxes.	Compliant	Nest box installation is taking place in this BOA. Signs of presence and actual occupation of nest boxes is occurring.
Bowmans Creek Riparian Corridor	Salvaged–reinstated hollows	Established nest boxes are subject to annual inspection and maintenance.	Compliant	Salvaged and reinstated log piles were identified in central Bowmans Creek Riparian Corridor; however not in monitoring sites.
Bowmans Creek Riparian Corridor	Timing of nest box installation	Salvaged and re-instated hollows are subject to annual monitoring in conjunction with nest boxes.	Compliant	Bowmans Creek Riparian Corridor nest boxes were monitored in 2018.
Bowmans Creek Riparian Corridor	Salvaging, stockpiling and deployment of habitat features	Removed hollows will be replaced (with nest boxes) within six months of each discrete clearing event.	Compliant.	Salvaged and reinstated log piles present in central Bowmans Creek Riparian Corridor; however not in monitoring sites.

Relevant Offset Area	Action	2018 Performance Indicator	Compliance	Performance Comment
All biodiversity offset areas	Habitat augmentation will occur in Mountain Block and Mitchell Hills South BOAs if monitoring identifies a dearth of key habitat features like hollows or log/boulder piles.	Suitable habitat features identified and salvaged as part of pre-clearing process. These are then stockpiled until deployed in target areas once rehabilitation/regeneration works are complete.	Compliant	Nest boxes have been installed in all BOAs. Log pile installation continuing along Bowmans Creek Riparian Corridor.
Translocation				
All biodiversity offset areas	Translocation of tiger orchids or other threatened flora species (if identified in pre-clearing process) to BOAs. Methods to be adopted are detailed within the BMP.	Tiger orchids are salvaged and translocated according to the process in the BMP as needed.	Compliant	One tiger orchid successfully translocated to Mountain Block in 2018.
Creek and Drainage Line Protection				
Bowmans Creek Riparian Corridor	Fencing/protection of LCO controlled side of riparian corridor.	Riparian corridor will be fenced from human and livestock access.	Compliant	Need for fencing reparation works were not identified.
Bowmans Creek Riparian Corridor	Rehabilitation works to address stabilisation and erosion issues, as necessary.	Implementation, as needed.	Compliant	Assessed in separate program
Seed Collection				
All biodiversity offset areas	Where suitable remnant vegetation is available, implementation of seed collection and handling program for use in revegetation/rehabilitation works.	Pre-clearing surveys identify potential seed sources. Seeds are collected, stored and handled according to appropriate program. Collected seed resources are used in revegetation/rehabilitation works.	Compliant	No substantial seeding resources identified during 2018 monitoring. Seed collection has been occurring as resources are available.

Relevant Offset Area	Action	2018 Performance Indicator	Compliance	Performance Comment
Erosion Sedimentation and Salinity				
All biodiversity offset areas	Develop remediation plan and implement.	Earthworks complete and vegetation establishing on previously eroded areas.	Compliant	Undertaken as part of separate program
	Monitor completed erosion works and action repairs if required.	Monitor completed erosion works and action repairs if required.	Complaint	Undertaken as part of separate program
Bushfire				
All biodiversity offset areas	The current Bushfire Management Plan will be updated according to the approved modification. Bushfire Management Plan will be implemented.	Implementation of requirements of updated Bushfire Management Plan.	Compliant	Bushfire Management Plan implemented.
Monitoring				
All biodiversity offset areas	Undertake floristic, fauna, LFA and nest box monitoring program	Monitoring program completed and reported	Compliant	
	Undertake annual inspections of LCO rehabilitation and active regeneration areas	Annual inspections completed	Compliant	
	Native fauna presence in rehabilitation/regeneration areas	Fauna monitoring completed	Compliant	

8.5 Indirect Offset Management

Liddell Coal Operations (LCO) received approval for the extension of Liddell Open Cut Coal Mining Operations under the State Environmental Planning and Assessment Act 1979 (EPA Act) on 1 December 2014 (DA 3015-11-01 Modification 5) and approval under the Commonwealth Environment Protection Biodiversity Conservation Act 1999 (EPBC Act) on 24 December 2014 (EPBC Approval 2013/6908).

The State and Commonwealth approvals both require the provision of an indirect offset to augment the agreed land-based biodiversity offsets to address the impacts of the project. This indirect offset was agreed to be a financial contribution towards recovery actions for the spotted-tailed quoll (Dasyurus maculatus maculatus) as part of the:

- Final Draft National Recovery Plan for the Spotted-tailed Quoll Dasyurus maculatus (Long and Nelson 2008); and/or
- Management actions identified for the spotted-tailed quoll as part of the Office of Environment and Heritage (OEH) Saving Our Species Project Species Action Statement.

An Indirect Offset Plan (IOP) was been prepared to satisfy the conditions of the State and Commonwealth approvals relating to this financial contribution. A revised IOP was submitted on the 23th March 2017 and subsequently approved by the Australian Government Department of Environment & Energy (DoEE) on the 5 May 2018. The revised IOP details amended projects Task 2 Surveying/Monitoring STQ Populations and Task 3 Assess Habitat Use by Female STQ.

Management Actions during the reporting period

Task 1 Development of Individual Recognition Software for Quolls

To recap, Task 1 involves the development and sharing of computer software that enables the identification of individual quolls from remote camera data. In the 2017 Annual Report we advised that the software development was successful, with the initial build of the Quoll Identification Toolkit (QIT) completed utilising $80,000 funds providing by LCO under research agreement with Invasive Animals Limited (IAL).

As documented in the 2017 the software developer Delves Falzon Pty Limited recommended a number of actions to complete before publicly releasing the QIT. IAL have advised the following summary in **Table 36**.

Table 36. QIT Development Progress

Action	Status
1. Continue to refine Matlab based version (address issues raised in initial testing).	Complete
2. Conduct user testing with NSW OEH Saving our Species and UNE/NSW Dept. Primary Industries project groups.	Progressing in 2018/19 FY with additional funding from OEH.
3. Undertake refinements to QIT once testing is complete	Awaiting outcome of user-testing
4. Prepare scientific paper for publication	In progress
5. Develop user manual	In progress
6. Release of QIT for use	In progress

As indicated in item 2, IAL subsequently identified that further funding was required to complete the user testing phase and allow further refinements to the QIT. Further funding has been provided by NSW OEH and the user testing program is now progressing utilising images and quoll identification collected by NSW OEH and NSW DPI project groups.

Task 2 Surveying/Monitoring STQ Populations

A research agreement was developed and executed on the 4 April 2018 with the University Of New England (UNE) to undertake the Project. In short, this project focuses on the development of survey and

monitoring techniques of Spotted-tailed quoll populations by implementing a draft camera trapping protocol (based on previous research) for testing and refinement. It is proposed to establish camera trapping grids (lured camera trap stations) replicated at three sites over four years within Royal National Park, Wollemi National Park and in the Middle Foy Brook offset areas. These areas are known to contain a population of quolls, and these have been recorded in the area by way of a variety of survey methods including live trapping, camera trapping, spotlighting, scat collection and hair funnels. Further detail can be viewed within Section 6.4 of the IOP.

The Middle Foy Brook monitoring program was installed in late July 2018, with subsequent maintenance visits in October and November 2018. **Figure 30** below displays the camera locations.

During 2018 LCO committed $61,000 to fund the project in accordance with the UNE Research Agreement. The funding has been utilised to purchase necessary cameras and consumables to initially establish the project, and maintenance costs since.

Whilst the data is being assessed in terms of individual quoll recognition, the cameras have yielded 482 separate captures of and individual quoll between late July and October 2018, and a further 98 captures between October and November 2018. Other species of interest detected include Koala, Brush-tailed Phascogales and Red-necked Pademelon.

Task 3 Assess Habitat Use by Female STQ

The Research Agreement discussed above also provides for the establishment of this project in 2019.

Management Actions during the next reporting period

QIT Toolkit

IAL have advised ongoing refinement of the software as per the actions summarised in **Table 36**. LCO will continue to liaise with IAL on progress towards QIT release, and subsequent publication of a scientific paper detailing the software-based recognition of individual quolls from camera trap images.

2019 Implementation – Tasks 2 and 3

Implementation of the camera trapping program will continue for Task 2 with the collection of data from the Middle Foy Brook Offset areas and the replication sites within Mt Royal and Wollemi National Parks. The Task 2 program will also extended to include the following elements:

- Environmental assessments of each camera trap location;
- Deployment of cage trapping to within each monitoring area to derive an alternative estimate of population size and to collect both DNA and demographic data;
- Data analysis and interim reporting.

Further funding of $29,000 is expected to be supplied to UNE on implementation of the Task 3 project, programmed to commence in 2019. The project involves the capture and tracking (using telemetry collars) 6 female quolls per year from the Middle Foy Brook Area population. Spatial data will be collected for the purpose of developing further understanding of how female quolls use non-conservation lands and to understand their minimum habitat requirements.

To complete Year 3 implementation, a further $11,000 will be provided on completion of a mid-year summary report detailing progress, financial reporting and results to date.

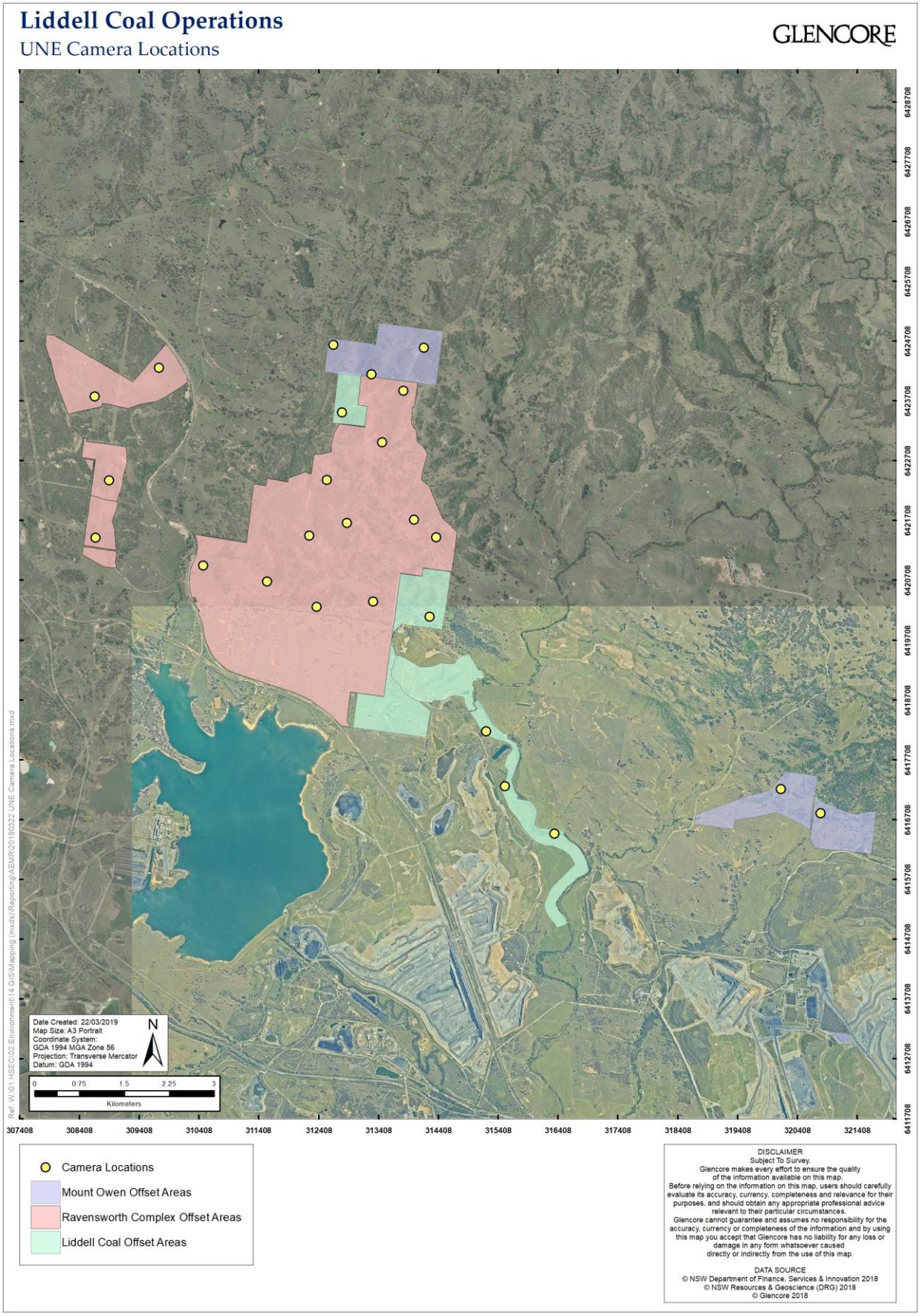


Figure 30 UNE monitoring program camera locations

8.6 Rehabilitation Research and Trials

Project 1

LCO currently operates a rehabilitation project which aims to establish two ecological communities over a 16 ha area of overburden. Of the 16 ha, 8 ha was seeded with a Central Ironbark, Spotted Gum, Grey Box Forest community seed mix (Area 1). The second 8 ha was seeded with a Central Hunter Grey Box, Ironbark Woodland community seed mix (Area 2). Both areas received the same preparation treatments which included the application of 5 t/ha of Gypsum, 2 t/ha of Cal-S, 2 t/ha of lime and 120 t/ha of the composted soil conditioner Organic Growth Medium (OGM). Initial monitoring of the rehabilitation areas conducted in 2012 and follow-up monitoring conducted annually; below summarises current status of each area.

For Area 1, the canopy layer in Trial Plot 1 is patchy but developing well in most areas. It occurs at approximately 1400 stems per hectare and 40% cover; and between approximately 5m and 8m in height. The canopy is dominated by grey box (*Eucalyptus moluccana*) and narrow-leaved ironbark (*Eucalyptus crebra*). Rough-barked apple (*Angophora floribunda*) is present throughout. The mid layer is patchy and dominated by weeping myall (*Acacia pendula*) and sticky hop-bush (*Dodonaea viscosa*). With densities of shrub species at approximately 400 stems per hectare. The ground layer has a cover of around 60% and is dominated by rhodes grass (*Chloris gayana*) and galenia (*Galenia pubescens*). Some native ground layer species were present in low numbers including; shorthair plumegrass (*Dichelachne micrantha*), barbed wire grass (*Cymbopogon refractus*) and bluegrass (*Dichanthium sericeum*). Species from the family Chenopodeaceae including; ruby saltbush (*Enchylaena tomentosa*) and climbing saltbush (*Einadia nutans*) were common. A thin litter layer consisting of the leaves and bark of eucalypts and exotic grasses is present across the Trial Plot 1 area. Due to the age of the rehabilitation, topsoil development remains minimal at this stage.

For Area 2, the canopy layer in Trial Plot 2 is dense (approximately 1000 stems per hectare and 60% cover) and between approximately 5m and 10m in height. The canopy is dominated by spotted gum (*Corymbia maculata*) with narrow-leaved ironbark (*Eucalyptus crebra*), rough-barked apple (*Angophora floribunda*) and grey box (*Eucalyptus moluccana*) present throughout. One species that is not consistent with the target vegetation community being lemon-scented gum (*Corymbia citriodora*) is also present in low numbers throughout the Trial Plot 2 area. The mid layer is sparse, consisting of isolated shrubs at densities of less than 100 stems per hectare. Species present include sickle wattle (*Acacia falcata*), hickory wattle (*Acacia implexa*) and blackthorn (*Bursaria spinosa*). The ground layer has a cover of around 55% and is dominated by rhodes grass (*Chloris gayana*) and galenia (*Galenia pubescens*). Some native ground layer species were present in low numbers including; ruby saltbush (*Enchylaena tomentosa*) and climbing saltbush (*Einadia nutans*). A thin litter layer consisting of the leaves and bark of eucalypts, particularly spotted gum (*Corymbia maculata*) is present. Due to the age of the rehabilitation, topsoil development remains minimal at this stage.

Considering the age of both of these areas, it is expected that the groundcover and shrub abundance will transform as the canopy species develop and continue to shade out the invasive Rhodes grass. Weed management activities will continue in these areas and monitoring will continue annually. Supplementary planting, selective tree thinning and habitat augmentation works are planned to occur in 2019 to further develop the rehabilitation areas.

Over the course of the trial, the areas have changed significantly with both exhibiting challenges in developing ground cover and mid story. Notably, it highlights the consistent evolution of the vegetation and maintenance works required to achieve the target communities as well as the staging of vegetation development; i.e. as canopy develops the mid and ground cover changes significantly.

Project 2

Overview: LCO has commenced a new rehabilitation trial during 2016 to further investigate weed load issues arising in recent woodland rehabilitation areas which were the subject of a separate rehabilitation trial.

The initial trial involved changing from the standard woodland rehabilitation ground preparation being sowing into deep ripped overburden and implementing an alternate technique of sowing into a layer of topsoil and Organic Growth Medium (OGM) deep ripped into overburden.

The hypothesis predicted improved strike rates of native species, in particular native grasses which have been identified in previous monitoring events as typically deficient in all woodland rehabilitation areas. The topsoil was to provide the soil structure/medium conducive to plant establishment and the OGM (applied at light rates) to supplement the organic carbon lacking in the soil and overburden. Unfortunately, the 2016 rehabilitation monitoring of native woodland areas in the Entrance Pit confirmed the regular inspection findings; that there was a significant emergence of weed presence occurring. This is likely due to the presence of weed seeds dormant in the topsoil benefiting from the additional organic material load provided

by the OGM. LCO are managing the weed presence with increased weed management resource efforts and monitoring within the affected area. This area has become the first case of the rehabilitation trial – a) OGM, topsoil and overburden ripped surface.

In response to the rehabilitation performance in the Entrance Pit woodland areas, LCO have since revised the ground preparation techniques and extended to a new trial area on the South Cut western batter and established two new cases. This trial extension involves two 4ha plots comparing woodland development when sown into: b) OGM and overburden ripped surface; c) topsoil and overburden ripped surface. Hence, the trial now comprises three cases.

Findings:

2018 monitoring results of the Entrance Pit woodland areas have shown effective management of weed species occurring however some species still present requiring continued focus. Entrance Premier rehabilitation has been established in three stages between 2015 and 2017. Earlier rehabilitation (established in 2015 and 2016) is characterised by a patchy distribution of shrubs and canopy species and an understorey dominated by couch and exotic pasture grasses. Rehabilitation established in 2017 typically has a higher density and diversity of shrub and canopy species. Generally, Canopy species occur at very low densities across the area (less than 25 stems per hectare), however, a small number of isolated patches have good numbers of native species in all layers. Mid story species also had a patchy distribution across the area, however, mid story species were more common than those in the canopy and occurred across the area at densities of approximately 400-500 stems per hectare. Cooba (*Acacia salicina*) was the dominant species in the shrub layer, other common mid story species include blue bush (*Maireana microphylla*), western silver wattle (*Acacia decora*), fan wattle (*Acacia amblygona*) and sickle wattle (*Acacia falcata*). The ground layer is dominated by native couch grass (*Cynodon dactylon*) and exotic species including; coolah grass (*Panicum coloratum*), galenia (*Galenia pubescens*) and kikuyu (*Cenchrus clandestinus*). A diversity of native ground layer species are present in low densities. Commonly encounter native ground layer species include; barbed wire grass (*Cymbopogon refractus*), spear grass (*Austrostipa scabra*), ruby salt bush (*Enchylaena tomentosa*) and climbing salt-bush (*Einadia nutans*). LCO aimed to complete supplementary infill planting in 2018 to improve native establishment however with persistent drought conditions works have been postponed till autumn 2019 to improve likelihood of successful establishment.

The monitoring results of the two 4ha plots have shown clearly observable differences. The vegetation across these area varies in its composition and structure relative to the presence/absence of topsoil. The topsoiled area generally has a higher cover of ground layer species (approximately 65%) but had minimal shrub and canopy layer species evident at the time of inspection (<50 stems per hectare for both). The areas that have minimal topsoil had a lower cover of ground layer species (40%) but a higher number of mid and canopy layer species (500 and 200 stems per hectare respectively) were evident. With the persistent drought conditions throughout 2018 and the relatively young age of vegetation establishment many of the plants that have established are too small for definitive identification and it is expected that monitoring in 2019 will better indicate the establishment of the areas.

8.7 Mountain Block

As per the current MOP/RMP approved November 2017, the following design development process was completed during early 2018:

- Obtaining soil samples for flume testing in the laboratory, in order to quantify the materials erosion risk of the material to be used in the outer slopes;
- Analysis of the materials, using the Water Erosion Prediction Project (WEPP) analysis software to determine sustainable flow lengths and slopes;
- Updating the conceptual designs of the final landform by incorporating “Applied Geofluv™” and Geographic information Systems (GIS) erosion risk analysis, to optimise the conceptual design. It will include a constructability analysis in 3D for consultation and initial costing;
- Final design for the final landform, incorporating issues raised from the conceptual landform reviews;
- Analysis of the proposed final landform, using the SIBERIA erosion model to quantify the short and long term erosion risk (with and without vegetation);
- Providing engineering details for tender that include construction drawings, together with a Bill of Quantities and technical specifications; and
- Final reporting to summarise the design details and any residual risks.

The outcomes of the design process presented to NSW DPE and Resources Regulator (formerly DRG) on the 23 April 2018. It was agreed that LCO would progress the remediation design ready for release as construction tender by end Q3 2018.

In parallel it was also identified that LCO required DA305-11-01 approval boundary to address areas of rehabilitation legacy and instability across the entire slope. DA Modification 7 was prepared and submitted in August 2018 to meet this requirement.

The construction tender for the remediation works was released in early November 2018, after a short delay to conduct a constructability peer review with the assistance of the NSW Soil Conservation Service to further inform the design and tender specification. Tender submission period closed mid December 2018 and LCO is currently working through a review process to select a preferred supplier.

Management Actions during the next reporting period

At the time of writing this report, LCO received approval for Modification 7 on 12 February 2019. LCO has since progressed an Ancillary Mining Lease Application to add the extension area to ML1597. Once complete, this will allow the MOP/RMP to be varied for the remediation project and complete the necessary approval requirements.

LCO will also finalise award of the construction tender and engage the preferred supplier and commence the project post securing of the required approvals.

9 Stakeholder Engagement

Community Complaints

The management of complaints is undertaken in accordance with EMS, LCO's Stakeholder Engagement Strategy and Schedule 5, Condition 1 of DA 305- 11-01. LCO operates a combined 24 hour community complaints and blasting information hotline (1800 037 317) which is advertised in the community newsletter and on the LCO public website.

No complaints were received during the reporting period.

An annual comparison of the complaints received at LCO is shown in **Figure 31.**

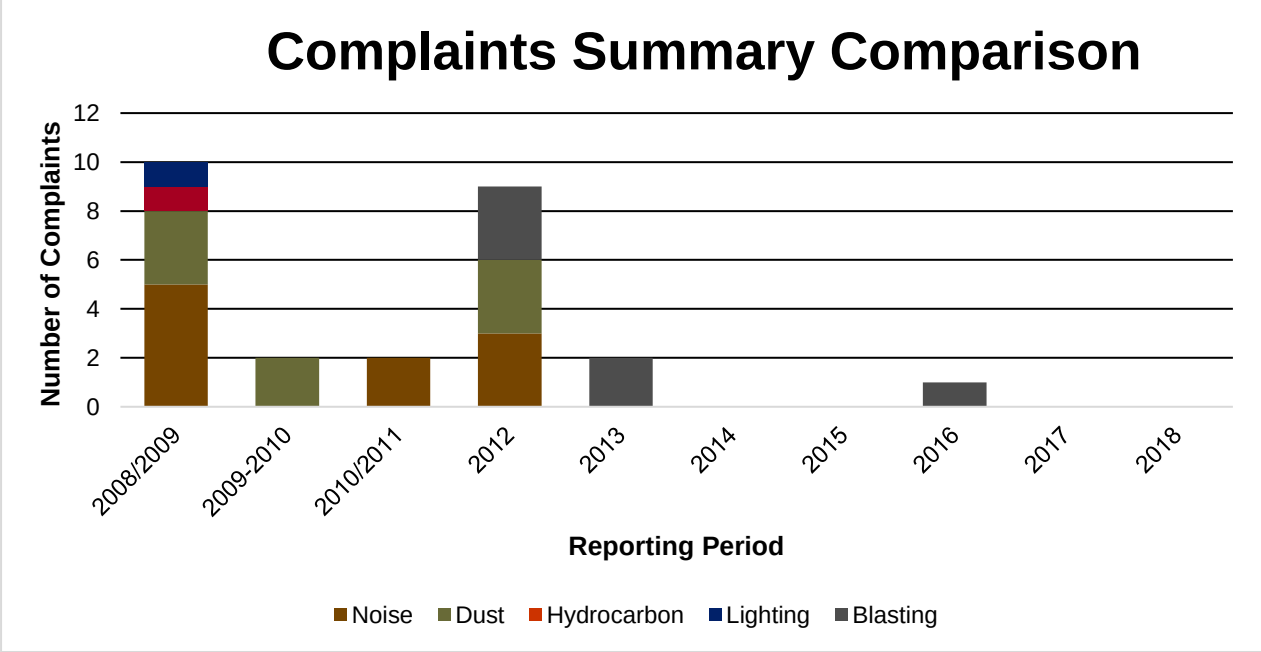


Figure 31 Complaints summary

Stakeholder Engagement

LCO undertakes stakeholder engagement activities in accordance with the Stakeholder Engagement Strategy (the strategy) which includes the Community Engagement, Community Development and Community Investment Plans. The strategy identifies the objectives for consultation and stakeholder engagement, methods of consultation for the various stakeholder groups and priorities for community development.

LCO personnel regularly liaise with the local community in person, over the phone, through the Greater Ravensworth Area community newsletters and via email correspondence. A copy of newsletters sent out to the community and are also available on our public website.

Community Consultative Committee

LCO maintains a CCC in accordance with Schedule 5 Condition 7 of DA 305-11-01.

The LCO CCC provides a forum for local community, local government and mine management to meet and discuss key environmental and community interests and concerns. CCC meetings are held every six months. The CCC met on two occasions during the reporting period including in May 2018 and again in November 2018.

CCC Meeting Minutes are available for download from the LCO website.

Liddell Coal Operations Website

In accordance with Schedule 5, Condition 9 of DA 305-11-01, LCO maintains a website (www.liddellcoal.com.au) to provide access to information on the operation including environmental, community and operational updates.

Community Investment

LCO aims to provide support for local projects relating to the community, health, education and the environment, in the form of cash donations, sponsorship, and in-kind support for a range of community, educational and environmental initiatives.

During the reporting period LCO made donations to the following organisations and charities (in no specific order):

Table 37 Community Investment Program Recipients

Community Investment Projects	
Branxton Golf Club	Pallative Care Unit Newcastle
Salvation Army	Mens Health Rural Education Van
Lake Liddell Recreational Area	Upper Hunter Conservatorium of Music
Soar for Sebastian – Charity Golf Day	Muswellbrook High School
Singleton Toy Library	Muswellbrook Public School
Hebden Wild Dog Association	Upper Hunter Communications Brigade
Muswellbrook Relay for Life	Singleton Public School
Ovarian Cancer Early Detection	Singleton Fly Fishing Club
Camp Quality	Little Wings Flight for Sick Kids
Muswellbrook Girl Guides	Carries Place
Mark Hughes Foundation	

10 Independent Audit

An independent environmental audit was undertaken for the Department of Planning & Environment for the period of 1 July 2012 to 31 December 2015 by Hanson Bailey and was completed over the period of 2 – 5 February 2016. The audit assessed compliance against Development Consent DA 305-11-01 (as modified) and also assessed compliance with the conditions of Environmental Protection Licence 2094, key mining authorities and other licence documents.

A list of audit non-compliances, recommendations and actions to address is summarised below in **Table 38.**

Table 38 Independent audit non-compliances and recommendations

Condition Reference	Description	Risk Level	Action taken
DA 305-11-01			
Non-Compliances			
Schedule 3, Condition 23 (ci)	Complete the calibration of the Site Water Balance as soon as possible in 2016 (also included as a commitment in Section 7.5 of the WMP).	Administrative	Water balance calibration completed and report sent to DPI Water and DPE
Recommendations			
Schedule 3, Condition 34	Continue to support the development of plantings on the Old New England Highway bund to ensure that an adequate visual screen is established.	Low	Additional trees planted to replace failed ones. Trees continue to be watered where necessary and monitored.
Schedule 3, Condition 37	Commission a visual impact specialist to review the performance of the measures to enhance the natural appearance of the RL 195 emplacement area to ensure integration with surrounding natural landforms.	Low	Visual assessment complete and provided to DPE for review and determination
Schedule 3, Condition 37	Attempt to obtain greater clarification from DP&E and DRE as to their expectations regarding landform integration.	Low	As above
Mining Operations Plan			
MOP Section 3.4.3	Amend Section 3.4.3 of the MOP at the next variation to describe the use of OGM top-dressed overburden in some rehabilitation areas.	Administrative	Addressed in MOP amendment submitted and approved Feb 2017
MOP Section 3.4.3	Amend MOP Section 3.4.3 to ensure the commitment “LCO propose to re-spread 100mm of topsoil on all rehabilitation”, is subject to the LCO Soil Distribution Plan.	Administrative	Addressed in MOP amendment submitted and approved Feb 2017
MOP Section 3.4.3	Amend Section 3.4.3 of the MOP at the next variation to describe the current process used by LCO to source local native seed for use in site rehabilitation.	Administrative	Addressed in MOP amendment submitted and approved Feb 2017
MOP Section 7.3.4	Amend MOP Section 7.3.4 at the next variation to provide clarity regarding the source of seed used in LCO rehabilitation.	Administrative	Addressed in MOP amendment submitted and approved Feb 2017
MOP Section 9.2	Assess the ecological and rehabilitation monitoring results against the relevant rehabilitation completion criteria in future Annual Reviews. If required, monitoring results should trigger a management response as described in the MOP TARP. LCO should ensure that there is a clear decision making pathway between	Low	Included in Section 8.3 of the 2015, 2016 and 2017 Annual Review.

	monitoring results, completion criteria, the TARP and resulting management measures.		
MOP Appendix F	Continue with investigations under the Mountain Block Remedial Strategy, as outlined in the 2015 MOP, Appendix F.	Medium	See Section 8.7
MOP (general)	In future MOPs or MOP amendments, consider linking rehabilitation commitments with milestones other than calendar years, such as production or disturbance progress, to ensure rehabilitation commitments match operational progress. Rehabilitation commitments would then reflect fluctuations in operational tempo.	Administrative	As per consultation with DRE, the MOP period has been shortened from seven to three years to allow for evolving mine planning. Commitments remain calendar year based for rehabilitation and disturbance.
DA 20/2008 & ST 18/2008 (SC Sewerage Management System Approval)			
Condition 3	Review contractor reporting procedures to confirm monitoring results are provided to SC within 7 days of testing as required under the approval condition.	Administrative	SC advise quarterly reporting is acceptable.
20BL172588 Middle Liddell Bore			
Condition 12	The water licence audit was not completed within the five year period required under Condition 12. It is recommended that LCO address this issue with DPI-Water and seek to undertake the required audit as soon as possible in 2016.	Administrative	DPI Water contacted and confirmed they are satisfied that requirements have been addressed in Independent Environmental Audit and previous Annual Reviews. This will continue to apply for future audit intervals.
Other Recommendations			
Biodiversity Management Plan Section 6	Recommend updating Section 6 of the plan at the next revision to include options for weed control in advance of topsoil stripping in addition to just spraying to align with practices being undertaken.	Administrative	Section 6 of the BMP updated and DPE and DOE notified of the changes.
LCO SD PRO 0079	Review remediation actions and responsibility for the bioremediation area to ensure that the site and emplaced materials are adequately maintained.	Low	Bioremediation area management procedure reviewed and DP&E notified of changes.
Aboriginal Cultural Heritage Management	Remove any residual fencing and signage of Aboriginal heritage sites collected during the 2015 archaeological salvage to minimise any future uncertainty in the management of remaining sites.	Administrative	Complete. All remaining fenced sites exist within the LID BC SAL
General Rehabilitation	Review areas of bare patches on the ridges of contour banks in the Railway Block rehabilitation and remediate these areas if required.	Low	Review of bare areas completed and requirement for maintenance identified. These areas were subsequently re-ploughed with ameliorants and reseeded in June 2016. A review of pasture rehabilitation establishment was completed during 2017 finding that
General Rehabilitation	Reinstate cover on the disturbed face of the topsoil stockpile on the RL 192 overburden emplacement if the dump is not planned for modification during 2016.	Low	Topsoil stockpile seeded.
General Rehabilitation	Implement a formal review process to assess the immediate and long term	Administrative	Ongoing. Rhodes grass domination of the South Cut

	success of grazing and slashing trials as a control measure for Rhodes grass dominated pasture, to determine the value of these activities as a long term controls (for biodiversity and woodland corridor areas).		rehabilitation areas has been identified as requiring strategic control to ensure the development of the pasture areas to meet MOP completion criteria. During 2018, LCO constructed fencing, shade and watering systems to allow grazing in the South Cut rehabilitation areas. Throughout 2019, planting of shelter belts and grazing will commence with performance to be reviewed as part of the rehabilitation monitoring program.
General Rehabilitation	Based on those areas with specific biodiversity objectives (such as proposed habitat features or woodland corridors) identified in the 2015 MOP, priorities for the slashing and/or grazing control of Rhodes grass should be documented, and a schedule determined to ensure sufficient time and resources are allocated to achieve the required outcomes.	Administrative	Rhodes grass domination of the South Cut rehabilitation areas has been identified as requiring strategic control to ensure the development of the pasture areas to meet MOP completion criteria. In 2017, LCO engaged specialist rehabilitation consultant to review rehabilitation performance across the site, detail the prevalence of Rhodes grass and assess effectiveness of current management practices. Recommendations from the report are being implemented including, rotational grazing, slashing and supplementary planting as part of routine rehabilitation maintenance/management activities. As described earlier, the South Cut grazing program is in progress as a key management measure.
General Rehabilitation	Continue to review the performance of the Weed Action Plan to reflect corrective actions for high risk locations and the weed species present on site.	Low	Performance is reviewed through annual monitoring events and inspections completed every 2 months. Weed Action Plan has been developed for 2017 and 2018.

The next independent audit is to be undertaken in February 2019.

11 Incidents and non-compliances during the reporting period

During the reporting period LCO had a number of incidents and non-compliances during the reporting period and are outlined below in **Table 39.**

Table 39 Non-compliance summary

Approval	Condition Reference	Condition Description	Description	Action taken
DA 305-11-01	Schedule 3 Condition 16	Impact Assessment Criteria	Exceedance of PM10 24 hour average at SX38-D2 of 59.6 ug/m^3 for the 8 January 2018.	Investigation commenced and reported to DPE. Investigation determined SX38-D2 was experiencing faults resulting in invalid data. Unit diagnostics show the unit air conditioner was unable to cope with the extreme temperature and maintain the enclosure at the required temperature for proper operation of the TEOM. Additional maintenance measures have been completed in order to mitigate future occurrences.
DA 305-11-01	Schedule 3 Condition 16	Impact Assessment Criteria	Exceedance of PM10 24 hour average at SX38-D2 of 55.6 ug/m3 for the 9 January 2018.	Investigation commenced and reported to DPE. Investigation determined SX38-D2 was experiencing faults resulting in invalid data. Unit diagnostics show the unit air conditioner was unable to cope with the extreme temperature and maintain the enclosure at the required temperature for proper operation of the TEOM. Additional maintenance measures have been completed in order to mitigate future occurrences.
DA 305-11-01	Schedule 3 Condition 4	Impact Assessment Criteria	At 13:08 on 16 January 2018, blast RL-27_1197_S2001 resulted in a VPPV of 27.49mm/s at LCO's monitoring point at the Newdell Substation owned by Ausgrid. Current blasting limits for the Substation are as follows: - Maximum VPPV of 30mm/s for frequencies greater or equal to 12Hz; or - Maximum VPPV of 26mm/s for frequencies less than 12Hz The dominant frequency resulting from this blast was 11Hz, therefore the VPPV limit of 26mm/s governs. Consequently, the VPPV for this blast exceeded limits by 1.49mm/s.	Ausgrid and DPE were notified and investigation commenced. Inspections by Ausgrid have not identified any damage to infrastructure at the Substation as a result of the incident. Investigation determined that the likely cause of the exceedance is due to varying geological conditions that has resulted in a 'k factor' much higher than anticipated and previously experienced for similar blasts. LCO will continue to work with Ausgrid in accordance with the Blast Consent Deed and progress moving towards the next blasting limit increase.

DA 305-11-01	Schedule 3 Condition 16	Impact Assessment Criteria	Exceedance of PM10 24 hour average at SX38-D2 of 52.1 ug/m^3 for the 23 January 2018.	Investigation commenced and reported to DPE. A spike in recorded levels was measured and determined to be attributed to erroneous data. Exclusion of this erroneous data returned a 24 hour average of 45 ug/m^3
DA 305-11-01	Schedule 3 Condition 16	Impact Assessment Criteria	Exceedance of PM10 24 hour average at SX38-D2 of 57.7 ug/m^3 for the 9 February 2018.	Investigation commenced and reported to DPE. Investigation determined that regional air quality conditions were elevated (LCO was downstream of SX38-D2) and a significant southerly change caused a spike in short term conditions that resulted in the exceedance of the 24 hour criteria.
DA 305-11-01	Schedule 3 Condition 16	Impact Assessment Criteria	Exceedance of PM10 24 hour average at SX38-D2 of 50.4 ug/m^3 for the 16 February 2018.	Investigation commenced and reported to DPE. Regional dust levels were elevated due to bushfire activity affecting the local area. Event excluded as an extraordinary event in accordance with DA305-11-01 Schedule 3 Condition 16 (d)
DA 305-11-01	Schedule 3 Condition 16	Impact Assessment Criteria	Exceedance of PM10 24 hour average at SX38-D2 of 55.7 ug/m^3 for the 13 March 2018.	Investigation commenced and reported to DPE. Investigation determined during daylight hours, LCO was downstream of SX38-D2 and therefore unlikely to contribute to monitored levels. Regional monitors and boundary monitors recorded high dust levels upstream prior to entering the LCO boundary.
DA 305-11-01	Schedule 3 Condition 16	Impact Assessment Criteria	Exceedance of PM10 24 hour average at SX38-D2 of 54.7 ug/m^3 for the 20 March 2018.	Investigation commenced and reported to DPE. LCO boundary monitors demonstrated that despite regional conditions being poor, LCO had negligible contribution to the regional air quality.
DA 305-11-01	Schedule 3 Condition 16	Impact Assessment Criteria	Exceedance of PM10 24 hour average at SX38-D1 and SX38-D2 for the 15 April 2018. Results were the units were 59.1 ug/m^3 and 65.2 ug/m^3 for SX38-D1 and SX38-D2 respectively.	Investigation commenced and reported to DPE. Investigation determined that units were located upstream of LCO and therefore unlikely to have contributed to the measured dust levels.
DA 305-11-01	Schedule 3 Condition 21B	Discharge limit exceedance	In June/July 2018 the MIA STP treated effluent exceeded the E.coli concentration limit	LCO implemented the response plan as outlined in the WMP and undertook resampling to determine if the result was

OSSM 3916/2008 (Onsite Sewage Management System)	Schedule 3 Condition 21B	Discharge limit exceedance	specified in each applicable approval at the discharge. Treated effluent from the plant is recycled into the mine dirty water system and contained onsite.	representative. The sampling identified an exceedance and subsequently the EPA, DP&E and Singleton Shire Council where notified on the 13 July 2018. LCO conducted an investigation into the event, undertook system maintenance/repairs to rectify the treatment plant performance and provided a summary report as required under each approval/licence. The investigation concluded that the observations were not of potential harm to the environment based on the results monitored and since the treated effluent is recycled into the mine dirty water system and contained wholly onsite.
EPL 2094	Condition L2.4	Discharge limit exceedance		
DA 305-11-01	Schedule 3 Condition 16	Impact Assessment Criteria	Exceedance of PM10 24 hour average at SX38-D1 and SX38-D2 for the 22 November 2018. Results were the units were 130.2 ug/m^3 and 146.4 ug/m^3 for SX38-D1 and SX38-D2 respectively.	Investigation commenced and reported to DPE. Event excluded as an extraordinary event in accordance with DA305-11-01 Schedule 3 Condition 16 (d) due to a dust storm moving Western NSW to the East Coast and through the Hunter Region.
DA 305-11-01	Schedule 3 Condition 16	Impact Assessment Criteria	Exceedance of PM10 24 hour average at SX38-D1 and SX38-D2 for the 15 April 2018. Results were the units were 115.6 ug/m^3 and 121.3 ug/m^3 for SX38-D1 and SX38-D2 respectively.	Investigation commenced and reported to DPE. Event excluded as an extraordinary event in accordance with DA305-11-01 Schedule 3 Condition 16 (d) due to a dust storm moving Western NSW to the East Coast and through the Hunter Region.
DA 305-11-01	Schedule 3 Condition 21A	Water Pollution	Sediment laden surface runoff breaching a containment drain and flowing into an isolated pool within Bowmans Creek on 28 November 2018.	Incident was reported to the EPA and other agencies in accordance with the Pollution Incident Response Management Plan and the Water Management Plan. As the sediment-laden water that entered Bowmans Creek was localised, LCO was able to remove as much as practical the sediment-laden water from the isolated pool. To prevent a similar future occurrence, LCO identified and implemented a system improvement to identify, manage and control high-risk mining areas that have the potential to compromise erosion and sediment control infrastructure.

* Compliance status as per the *Compliance status key Table 3* of the NSW Government Annual Review Guideline

12 Activities to be completed in the next reporting period

All activities proposed in the next Annual Review period will be consistent with the approved LCO MOP, approvals and specific management plans. The following summarises a number of key activities and proposed environmental performance improvement measures to be completed in the next reporting period:

- LCO's mining operations will continue to progress in a southerly direction in both mining areas. Additionally, further clearance and mining in the Bayswater Pit (South Entrance Pit) will occurring in alignment with the MOP.
- Progress necessary approvals and construction tender award to commence works on the Mountaint Block remediation area.
- **Section 6.2** discussed the blasting performance and specific management actions required at the Newdell Sub Station. Implementation of the blast management strategy and stage increase in vibration limits in consultation with Ausgrid will continue in 2019.
- **Section 6.6** discussed the Chain of Ponds Inn and the implementation of stabilisation measures in accordance with the COPI Strategy. LCO will continue to implement these stabilisation measures and monitoring regime as required during 2019 in order to progress the vibration trigger limits in consultation with DPE.
- **Section 6.9** discussed the decreasing onsite tailings capacity, LCO aims to commission the tailings pipeline to Mt Owen Complex (West Pit) as approved by DA305-11-01 Mod 6.
- **Section 8.3** identifies the rehabilitation biodiversity and offset monitoring results/performance which will continue to drive management actions. LCO will continue maintenance works, weed and pest control actions and implement the BOMP through the commencement of active regeneration works in Bowman's Creek Riparian Corridor in particular. There will be a focus on the installation/construction of habitat material and connectivity across rehabilitation and offset areas.
- **Section 8.3** outlined the current status of rehabilitation areas, monitoring results and management actions completed during 2018. LCO will continue to implement the BMP and MOP management commitments including but not limited to:
    - Augment the habitat resource (nest boxes, log piles, hollows, etc.) to encourage fauna diversity;
    - Conduct maintenance (weed control, erosion repairs, tree thinning, etc.) works as required;
    - Complete supplementary planting to improve species diversity;
    - Continue rehabilitation trial areas;
    - Continue to develop and implement grazing strategy throughout South Cut pasture rehabilitation to control Rhodes grass. This will involve the establishment of shade (trees, shelter belts, etc.) and water resources.
- **Section 8.4** outlined the current status of Offset areas, monitoring results and management actions completed during 2018. LCO will continue to implement the BOMP management commitments including but not limited to:
    - Refine and implement the Offset Remediation Strategy using results from monitoring results, rehabilitation trials and in consultation with appropriate experts;
    - Augment the habitat resource (nest boxes, log piles) to encourage fauna diversity;
    - Continue to conduct maintenance works such as targeted feral fauna and flora management;
    - Continued implementation of active regeneration works in all offset areas;
    - Trial remediation methodology for eroded areas of the Mountain Block Offset Area;
    - Continue fence line improvement works.
    - Submit Voluntary Conservation Agreement as a log term security mechanism for the offsets.
- As part of the ongoing Offset implementation Works summarised in **Section 8.4**, the findings of due diligence investigations will require the update and submission of the Aboriginal and Cultural Heritage Management Plan in early 2019.

- **Section 8.5** detailed the progress of the Indirect Offset Management program. During 2019, LCO will work to progress the quoll monitoring project in conjunction with the UNE.

13 References

NSW Government (2015) Annual Review Guideline

ANZECC (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality

AS/NZS 5667.1 (1998) Water Quality – Sampling – Guidance on the Design of Sampling Programs, Sampling Techniques and the Preservation and Handling of Samples

AS/NZS 5667.6 (1998) Water Quality – Sampling – Guidance on the Sampling of Rivers and Streams

Department of Environmental and Climate Change (DECC) (2007) Approved Methods for Sampling of Air Pollutants in New South Wales

Department of Environment, Climate Change and Water (DECCW) (2004) Approved Methods for Sampling and Analysis of Water Pollutants in New South Wales

Department of Mineral Resources (1999) Synoptic Plan: Integrated Landscapes for Coal Mine Rehabilitation in the Hunter Valley of NSW

Department of Trade & Investment (undated) EDG003 Guidelines to the Mining, Rehabilitation, and Environmental Management Process

Umwelt 2016 Biodiversity Monitoring Report. Prepared for Liddell Coal Operations Pty. Ltd*

Umwelt 2016 Biodiversity Offset Monitoring Report Prepared for Liddell Coal Operations Pty Ltd*

Umwelt 2016 Rehabilitation Monitoring Report Prepared for Liddell Coal Operations Pty Ltd*

Landcom (2004) Managing Urban Stormwater: Soils and Construction Manual

LCO (2016) Noise Management Plan*

LCO (2017) Spontaneous Combustion Management Plan**

LCO (2017) Air Quality Management and Monitoring Program*

LCO (2016) Land Clearing and Topsoil Stripping Procedure**

LCO (2017) Liddell Dust Management TARP**

LCO (2016) Waste Management Plan**

LCO (2017) Environmental Management Strategy*

LCO (2016) Aboriginal Cultural Heritage Management Plan*

LCO (2017) Water Management Plan*

LCO (2015) Blast Management Strategy – Chain of Ponds Inn*

SLR (2013) Liddell Coal Operations Modification to Development Consent Environmental Assessment*

*LCO document available on public website (www.liddellcoal.com.au)

**LCO document not publicly available

Appendix A - Train Haulage Summary

Glencore Coal

COAL RECEIVALS

Report Period 01/01/2018 12:00 am to 31/12/2018 12:00 am

CoalMan Site : Liddell Coal Marketing Pty Ltd

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
Pacific National	Monday 01 January 2018	LD134	Liddell to Kyushu EPC - JFY'17	Corona Queen	1 January 2018				9,075.90								9,075.90
		LD348	Liddell to Kyushu EPC - JFY'17	Corona Queen	1 January 2018				9,006.00								9,006.00
		Summary of Monday 01 January 2018							18,081.90								18,081.90
	Wednesday 03 January 2018	LD122	Liddell to Kyushu EPC - JFY'17	Corona Queen	3 January 2018							9,292.60					9,292.60
		LD240	Liddell to NSC JFY17-Fixed Price - $84.97	Lord Star	3 January 2018								9,061.80				9,061.80
		LD280	Liddell to NSC JFY17-Fixed Price - $84.97	Lord Star	4 January 2018				9,093.60								9,093.60
		Summary of Wednesday 03 January 2018							9,093.60			9,292.60	9,061.80				27,448.00
	Thursday 04 January 2018	LD200	Liddell to NSC JFY17-Fixed Price - $84.97	Lord Star	4 January 2018				8,708.60								8,708.60
		LD362	Liddell to NSC JFY17-Fixed Price - $84.97	Lord Star	4 January 2018				8,810.00								8,810.00
		Summary of Thursday 04 January 2018							17,518.60								17,518.60
	Friday 05 January 2018	LD148	Liddell to NSC JFY17-Fixed Price - $84.97	Kumano Maru	5 January 2018				8,623.20								8,623.20

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		LD184	Liddell to NSC JFY17- Fixed Price - $84.97	Kumano Maru	5 January 2018				9,192.60								9,192.60
		LD246	Liddell to NSC JFY17- Fixed Price - $84.97	Lord Star	6 January 2018							8,573.00					8,573.00
		LD338	Liddell to NSC JFY17- Fixed Price - $84.97	Kumano Maru	5 January 2018								8,430.00				8,430.00
		Summary of Friday 05 January 2018							17,815.80			8,573.00	8,430.00				34,818.80
	Saturday 06 January 2018	LD256	Liddell to NSC JFY17- Fixed Price - $84.97	Kumano Maru	6 January 2018				8,416.80								8,416.80
		LD318	Liddell to NSC JFY17- Fixed Price - $84.97	Kumano Maru	6 January 2018				8,584.60								8,584.60
		Summary of Saturday 06 January 2018							17,001.40								17,001.40
	Sunday 07 January 2018	LD224	Liddell to NSC JFY17- Fixed Price - $84.97	Lord Star	7 January 2018				4,303.33			4,330.27					8,633.60
		Summary of Sunday 07 January 2018							4,303.33			4,330.27					8,633.60
	Monday 08 January 2018	LD146	Liddell to NSC JFY17- Fixed Price - $84.97	Kumano Maru	8 January 2018							8,830.00					8,830.00
		LD188	Liddell to NSC JFY17- Fixed Price - $84.97	Kumano Maru	8 January 2018							9,148.60					9,148.60
		Summary of Monday 08 January 2018										17,978.60					17,978.60
	Friday 19 January 2018	LD166	Tohoku (NCP/ RAVN) JFY17 - 1 panamax @ USD$87.36	Ohshu Maru	19 January 2018		9,114.00										9,114.00
		Summary of Friday 19 January 2018					9,114.00										9,114.00

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
	Tuesday 23 January 2018	LD144	GCS (XMO) to SJEP CY18 Base Tonnage (3 pnx @ US $94)	Ishizuchi	23 January 2018						9,069.00						9,069.00
		LD244	GCS (XMO) to SJEP CY18 Base Tonnage (3 pnx @ US $94)	Ishizuchi	24 January 2018						8,603.00						8,603.00
		Summary of Tuesday 23 January 2018									17,672.00						17,672.00
	Wednesday 24 January 2018	LD110	Mangoola to GIAG for Zhejiang - Q4 '17	Nightkiss	24 January 2018							9,246.00					9,246.00
		LD188	Mangoola to GIAG for Zhejiang - Q4 '17	Nightkiss	24 January 2018							4,329.38	4,441.62				8,771.00
		LD250	Mangoola to GIAG for Zhejiang - Q4 '17	Nightkiss	24 January 2018							4,490.30	4,237.70				8,728.00
		Summary of Wednesday 24 January 2018										18,065.68	8,679.32				26,745.00
	Friday 26 January 2018	LD148	Mangoola to GIAG for Zhejiang - Q4 '17	Nightkiss	26 January 2018							4,236.82	4,188.18				8,425.00
		LD324	GCS to Shikoku Jan-Sep'18	Tachibana	26 January 2018		8,576.00										8,576.00
		Summary of Friday 26 January 2018					8,576.00					4,236.82	4,188.18				17,001.00
	Sunday 28 January 2018	LD104	GCS to Shikoku Jan-Sep'18	Tachibana	28 January 2018		8,565.00										8,565.00
		LD246	GCS to Shikoku Jan-Sep'18	Tachibana	28 January 2018						8,500.00						8,500.00
		LD320	GCS (XMO) to SJEP CY18 Base Tonnage (3 pnx @ US $94)	Ishizuchi	29 January 2018		8,616.00										8,616.00
		Summary of Sunday 28 January 2018					17,181.00				8,500.00						25,681.00
	Wednesday 31 January 2018	LD122	Liddell to NSC JFY17 GC NEWC-Oct-Dec	Ototachibana	31 January 2018		8,965.00										8,965.00

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		LD254	Liddell to NSC JFY17 GC NEWC-Oct-Dec	Ototachibana	31 January 2018							4,552.79	4,437.21				8,990.00
		Summary of Wednesday 31 January 2018					8,965.00					4,552.79	4,437.21				17,955.00
	Thursday 01 February 2018	LD110	Liddell to NSC JFY17 GC NEWC-Oct-Dec	Ototachibana	1 February 2018						9,025.00						9,025.00
		LD266	Liddell to NSC JFY17 GC NEWC-Oct-Dec	Ototachibana	2 February 2018								8,865.00				8,865.00
		Summary of Thursday 01 February 2018									9,025.00		8,865.00				17,890.00
	Friday 02 February 2018	LD250	Liddell to NSC JFY17 GC NEWC-Oct-Dec	Ototachibana	2 February 2018	8,570.00											8,570.00
		Summary of Friday 02 February 2018				8,570.00											8,570.00
	Sunday 04 February 2018	LD108	Liddell to NSC JFY17 GC NEWC-Oct-Dec	Ototachibana	4 February 2018							8,633.00					8,633.00
		LD158	Q4 Bulga to Nippon Steel - JFY17	Ototachibana	4 February 2018	9,083.00											9,083.00
		LD208	Q4 LD to China Steel Corp - JFY17	Aquaproud	4 February 2018										9,107.00		9,107.00
		LD256	Liddell to NSC JFY17 GC NEWC-Oct-Dec	Santa Lucia	4 February 2018		8,583.00										8,583.00
		LD310	Q4 LD to China Steel Corp - JFY17	Aquaproud	5 February 2018	9,209.00											9,209.00
		LD316	Liddell to NSC JFY17 GC NEWC-Oct-Dec	Ototachibana	4 February 2018		9,156.00										9,156.00
		Summary of Sunday 04 February 2018				18,292.00	17,739.00					8,633.00			9,107.00		53,771.00
	Monday 05 February 2018	LD204	Bulga to Tohoku EPC 14.0% - Jul/Sep GC Newc	Shoryu	5 February 2018	8,517.00											8,517.00

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		LD360	Q4 LD to China Steel Corp - JFY17	Aquaproud	5 February 2018										8,876.00		8,876.00
		Summary of Monday 05 February 2018				8,517.00									8,876.00		17,393.00
	Tuesday 06 February 2018	LD380	Q4 LD to China Steel Corp - JFY17	Aquaproud	6 February 2018	4,494.61					4,535.39						9,030.00
		Summary of Tuesday 06 February 2018				4,494.61					4,535.39						9,030.00
	Wednesday 07 February 2018	LD144	Bulga to Kyushu EPC - October RP	Corona Queen	7 February 2018	8,968.00											8,968.00
		Summary of Wednesday 07 February 2018				8,968.00											8,968.00
	Thursday 08 February 2018	LD276	Liddell to NSC JFY17 GC NEWC-Oct-Dec	Santa Lucia	9 February 2018						9,245.00						9,245.00
		Summary of Thursday 08 February 2018									9,245.00						9,245.00
	Friday 09 February 2018	LD172	Liddell to NSC JFY17 GC NEWC-Oct-Dec	Santa Lucia	9 February 2018	1,385.97	7,849.03										9,235.00
		LD222	MO to POSCO - Q1 CY18	HL Success	9 February 2018	9,070.00											9,070.00
		LD288	Q3 Additional tonnes JFY'17 50kt	Santa Lucia	10 February 2018	7,517.81			1,611.19								9,129.00
		Summary of Friday 09 February 2018				17,973.78	7,849.03		1,611.19								27,434.00
	Saturday 10 February 2018	LD142	Mangoola to GIAG for Zhejiang - Q4 '17	Anangel Innovation	10 February 2018							9,243.00					9,243.00
		LD290	Liddell to NSC JFY17 GC NEWC-Oct-Dec	Santa Lucia	11 February 2018	6,068.48					3,121.52						9,190.00
		Summary of Saturday 10 February 2018				6,068.48					3,121.52	9,243.00					18,433.00
	Sunday 11 February 2018	LD150	Q4 LD to China Steel Corp - JFY17	Aquaproud	11 February 2018						1,179.50				7,931.50		9,111.00
		Summary of Sunday 11 February 2018									1,179.50				7,931.50		9,111.00
	Monday 12 February 2018	LD106	Mangoola to GIAG for Zhejiang - Q4 '17	Anangel Innovation	12 February 2018							8,545.00					8,545.00

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		LD170	Liddell to JFE - Apr'17-Mar'18 (Oct RP-1.75)	Cape Verde	12 February 2018						7,751.19		1,443.81				9,195.00
		LD244	Liddell to JFE - Apr'17-Mar'18 (Oct RP-1.75)	Cape Verde	12 February 2018				8,632.00								8,632.00
		LD308	Liddell to JFE - Apr'17-Mar'18 (Oct RP-1.75)	Cape Verde	13 February 2018				9,039.00								9,039.00
		Summary of Monday 12 February 2018							17,671.00		7,751.19	8,545.00	1,443.81				35,411.00
	Tuesday 13 February 2018	LD126	MO to POSCO - Q1 CY18	Pan Bona	13 February 2018	8,612.00											8,612.00
		LD264	Q4 LD to China Steel Corp - JFY17	Sea Express	13 February 2018										8,849.00		8,849.00
		LD304	Q4 LD to China Steel Corp - JFY17	Sea Express	14 February 2018	8,992.00											8,992.00
		Summary of Tuesday 13 February 2018				17,604.00									8,849.00		26,453.00
	Wednesday 14 February 2018	LD388	Liddell to JFE - Apr'17-Mar'18 (Oct RP-1.75)	Cape Verde	14 February 2018				5,115.83			3,874.17					8,990.00
		Summary of Wednesday 14 February 2018							5,115.83			3,874.17					8,990.00
	Thursday 15 February 2018	LD304	Bulga to Joban Joint PC - 1st & 2nd shipments	Shoyo	16 February 2018	5,377.81						3,277.19					8,655.00
		LD390	Q4 LD to China Steel Corp - JFY17	Sea Express	15 February 2018										9,129.00		9,129.00
		Summary of Thursday 15 February 2018				5,377.81						3,277.19			9,129.00		17,784.00
	Friday 16 February 2018	LD264	Hokuriku (NCA to RAVN switch)	Energy Prometheus	16 February 2018	9,019.00											9,019.00
		Summary of Friday 16 February 2018				9,019.00											9,019.00

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
	Saturday 17 February 2018	LD150	Bulga to Joban Joint PC - 1st & 2nd shipments	Shoyo	17 February 2018	8,526.00											8,526.00
		LD246	LD - UBE JFY'17 - Mit. Paper - 30kt (Buyers Option)	Bulk Uruguay	17 February 2018	7,251.00											7,251.00
		LD330	LD - UBE JFY'17 - Mit. Paper - 30kt (Buyers Option)	Bulk Uruguay	17 February 2018		8,515.00										8,515.00
		Summary of Saturday 17 February 2018				15,777.00	8,515.00										24,292.00
	Sunday 18 February 2018	LD114	LD - UBE JFY'17 - Mit. Paper - 30kt (Buyers Option)	Bulk Uruguay	18 February 2018	6,899.07					1,576.93						8,476.00
		LD188	LD - UBE JFY'17 - YES - 60kt Oct BM	Coral Sapphire	18 February 2018			9,116.00									9,116.00
		LD318	LD - UBE JFY'17 - YES - 60kt Oct BM	Coral Sapphire	19 February 2018			5,222.06			3,435.94						8,658.00
		Summary of Sunday 18 February 2018				6,899.07		14,338.06			5,012.87						26,250.00
	Monday 19 February 2018	LD188	LD - UBE JFY'17 - YES - 60kt Oct BM	Coral Sapphire	19 February 2018						8,791.00						8,791.00
		LD308	LD - UBE JFY'17 - YES - 60kt Oct BM	Coral Sapphire	20 February 2018			3,354.78			5,655.22						9,010.00
		LD380	LD - UBE JFY'17 - YES - 60kt Oct BM	Coral Sapphire	19 February 2018				8,594.00								8,594.00
		Summary of Monday 19 February 2018						3,354.78	8,594.00		14,446.22						26,395.00
	Monday 26 February 2018	LD192	Q4 LD to China Steel Corp - JFY17	Ocean Sapphire	26 February 2018			9,135.00									9,135.00
		Summary of Monday 26 February 2018						9,135.00									9,135.00

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		LD344	Liddell to NSC JFY17 GC NEWC-Oct-Dec	NSU Obelisk	7 March 2018	8,762.00											8,762.00
		Summary of Wednesday 07 March 2018				17,929.00					4,581.52		4,540.48				27,051.00
	Thursday 08 March 2018	LD138	Liddell to NSC JFY17 GC NEWC-Oct-Dec	NSU Obelisk	8 March 2018			8,594.00									8,594.00
		LD250	Liddell to Chugoku - JFY17 - 20kt (Apr Ref Price & GC Newc)	Energia Centaurus	8 March 2018				8,978.00								8,978.00
		Summary of Thursday 08 March 2018						8,594.00	8,978.00								17,572.00
	Friday 09 March 2018	LD190	Liddell to NSC JFY17 GC NEWC-Oct-Dec	NSU Obelisk	9 March 2018	0.00						3,528.74	4,997.26				8,526.00
		LD272	Liddell to Chugoku - JFY17 - 20kt (Apr Ref Price & GC Newc)	Energia Centaurus	10 March 2018			4,299.91	0.00		4,144.09						8,444.00
		Summary of Friday 09 March 2018				0.00		4,299.91	0.00		4,144.09	3,528.74	4,997.26				16,970.00
	Saturday 10 March 2018	LD306	Liddell to Chugoku - JFY17 - 20kt (Apr Ref Price & GC Newc)	Energia Centaurus	11 March 2018			4,386.26			4,065.74						8,452.00
		Summary of Saturday 10 March 2018						4,386.26			4,065.74						8,452.00
	Sunday 11 March 2018	LD116	Liddell to NSC JFY17 GC NEWC-Oct-Dec	Dyna Globe	11 March 2018							9,140.00					9,140.00
		LD252	Liddell to NSC JFY17 GC NEWC-Oct-Dec	Dyna Globe	11 March 2018			8,520.00									8,520.00
		Summary of Sunday 11 March 2018						8,520.00				9,140.00					17,660.00
	Tuesday 13 March 2018	LD188	Liddell to NSC JFY17- Fixed Price - $84.97	Linda Hope	13 March 2018				4,470.57			4,404.43					8,875.00
		Summary of Tuesday 13 March 2018							4,470.57			4,404.43					8,875.00

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
	Wednesday 14 March 2018	LD174	Liddell to NSC JFY17 GC NEWC-Oct-Dec	Dyna Globe	14 March 2018			1,567.49	3,947.50		3,030.01						8,545.00
		LD244	Liddell to NSC JFY17-Fixed Price - $84.97	Linda Hope	14 March 2018				5,797.33		3,217.67						9,015.00
		Summary of Wednesday 14 March 2018						1,567.49	9,744.83		6,247.68						17,560.00
	Thursday 15 March 2018	LD114	Liddell to NSC JFY17-Fixed Price - $84.97	Linda Hope	15 March 2018						9,125.00						9,125.00
		Summary of Thursday 15 March 2018									9,125.00						9,125.00
	Sunday 18 March 2018	LD172	Liddell to NSC JFY17-Fixed Price - $84.97	NSU Sirius	18 March 2018				6,528.11			2,667.89					9,196.00
		LD282	Liddell to NSC JFY17-Fixed Price - $84.97	NSU Sirius	19 March 2018			0.00	9,127.00								9,127.00
		Summary of Sunday 18 March 2018						0.00	15,655.11			2,667.89					18,323.00
	Monday 19 March 2018	LD304	Liddell to NSC JFY17-Fixed Price - $84.97	NSU Sirius	20 March 2018			8,608.00									8,608.00
		Summary of Monday 19 March 2018						8,608.00									8,608.00
	Tuesday 20 March 2018	LD160	GCS to Kobe IPP - Mutual Option Jan-Mar'18	Asahi Maru	20 March 2018				8,615.00								8,615.00
		Summary of Tuesday 20 March 2018							8,615.00								8,615.00
	Wednesday 21 March 2018	LD146	Liddell to NSC JFY17-Fixed Price - $84.97	NSU Sirius	22 March 2018			1,305.71	8,023.29								9,329.00
		Summary of Wednesday 21 March 2018						1,305.71	8,023.29								9,329.00
	Thursday 22 March 2018	LD256	Liddell to NSC JFY17-Fixed Price - $84.97	NSU Sirius	23 March 2018				3,501.87				5,236.13				8,738.00
		Summary of Thursday 22 March 2018							3,501.87				5,236.13				8,738.00

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
	Sunday 25 March 2018	LD230	XMO to Chugoku EPC - JFY18 1st, 2nd & 3rd shipments	Sincere Pisces	26 March 2018	8,735.00											8,735.00
		Summary of Sunday 25 March 2018				8,735.00											8,735.00
	Monday 26 March 2018	LD110	Hokkaido EPC Year 2 of 3 - Base Tonnage	Shin Sanyo Maru	26 March 2018			8,489.00									8,489.00
		LD216	XMO to Chugoku EPC - JFY18 1st, 2nd & 3rd shipments	Sincere Pisces	26 March 2018						4,190.46		5,016.54				9,207.00
		Summary of Monday 26 March 2018						8,489.00			4,190.46		5,016.54				17,696.00
	Tuesday 27 March 2018	LD198	XMO to Chugoku EPC - JFY18 1st, 2nd & 3rd shipments	Sincere Pisces	27 March 2018	8,636.00											8,636.00
		LD266	Hokkaido EPC Year 2 of 3 - Base Tonnage	Shin Sanyo Maru	28 March 2018						1,730.83	4,627.17	2,871.01				9,229.00
		Summary of Tuesday 27 March 2018				8,636.00					1,730.83	4,627.17	2,871.01				17,865.00
	Wednesday 28 March 2018	LD112	Hokkaido EPC Year 2 of 3 - Base Tonnage	Shin Sanyo Maru	28 March 2018						4,613.63	4,561.37					9,175.00
		LD214	Hokkaido EPC Year 2 of 3 - Base Tonnage	Shin Sanyo Maru	28 March 2018				8,628.00								8,628.00
		Summary of Wednesday 28 March 2018							8,628.00		4,613.63	4,561.37					17,803.00
	Thursday 29 March 2018	LD276	Hokkaido EPC Year 2 of 3 - Base Tonnage	Shin Sanyo Maru	30 March 2018									8,508.00			8,508.00
		LD334	Hokkaido EPC Year 2 of 3 - Base Tonnage	Shin Sanyo Maru	29 March 2018			7,402.14	1,211.86								8,614.00
		Summary of Thursday 29 March 2018						7,402.14	1,211.86					8,508.00			17,122.00
	Friday 30 March 2018	LD216	Hokkaido EPC Year 2 of 3 - Base Tonnage	Shin Sanyo Maru	30 March 2018				1,105.72		7,469.28						8,575.00

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		LD346	Hokkaido EPC Year 2 of 3 - Base Tonnage	Shin Sanyo Maru	30 March 2018									8,963.00			8,963.00
		Summary of Friday 30 March 2018							1,105.72		7,469.28			8,963.00			17,538.00
	Saturday 31 March 2018	LD140	Liddell to JFE - Apr'18-Mar'19 - April RP	Shin Koho	31 March 2018						5,092.03	3,713.97					8,806.00
		LD230	Liddell to JFE - Apr'18-Mar'19 - April RP	Shin Koho	31 March 2018									8,815.00			8,815.00
		Summary of Saturday 31 March 2018									5,092.03	3,713.97		8,815.00			17,621.00
	Sunday 01 April 2018	LD264	Liddell to Ube - Ube Own Use - 34kt	Jozen	1 April 2018						8,682.00						8,682.00
		LD336	Liddell to JFE - Apr'18-Mar'19 - April RP	Shin Koho	1 April 2018				8,634.00								8,634.00
		Summary of Sunday 01 April 2018							8,634.00		8,682.00						17,316.00
	Monday 02 April 2018	LD164	Liddell to NSC JFY17-Fixed Price - $84.97	New Expedition	2 April 2018	8,018.14						1,353.86					9,372.00
		LD248	Liddell to Ube - Ube Own Use - 34kt	Jozen	3 April 2018				8,533.00								8,533.00
		LD326	Liddell to NSC JFY17-Fixed Price - $84.97	New Expedition	2 April 2018	0.00						8,418.00					8,418.00
		Summary of Monday 02 April 2018				8,018.14			8,533.00			9,771.86					26,323.00
	Tuesday 03 April 2018	LD184	Liddell to JFE - Apr'18-Mar'19 - April RP	Shin Koho	3 April 2018						5,184.89	4,042.11					9,227.00
		LD288	Liddell to NSC JFY17-Fixed Price - $84.97	New Expedition	4 April 2018	8,654.00											8,654.00

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		LD328	Liddell to Ube - Ube Own Use - 34kt	Jozen	3 April 2018			0.00	9,108.00								9,108.00
		Summary of Tuesday 03 April 2018				8,654.00		0.00	9,108.00		5,184.89	4,042.11					26,989.00
	Wednesday 04 April 2018	LD332	Liddell to NSC JFY17-Fixed Price - $84.97	New Expedition	4 April 2018	8,680.00											8,680.00
		Summary of Wednesday 04 April 2018				8,680.00											8,680.00
	Thursday 05 April 2018	LD142	Liddell to NSC JFY17-Fixed Price - $84.97	New Expedition	5 April 2018						4,036.63	4,143.37					8,180.00
		Summary of Thursday 05 April 2018									4,036.63	4,143.37					8,180.00
	Friday 06 April 2018	LD148	Liddell to Kyushu EPC - Q2'18	Kurenai	6 April 2018						9,316.00						9,316.00
		LD264	Liddell to Ube - Ube Own Use - 34kt	Jozen	6 April 2018						4,255.06		4,307.94				8,563.00
		Summary of Friday 06 April 2018									13,571.06		4,307.94				17,879.00
	Saturday 07 April 2018	LD166	Liddell to Kyushu EPC - Q2'18	Kurenai	7 April 2018	7,953.00											7,953.00
		LD264	Liddell to Kyushu EPC - Q2'18	Kurenai	8 April 2018			8,838.00									8,838.00
		Summary of Saturday 07 April 2018				7,953.00		8,838.00									16,791.00
	Sunday 08 April 2018	LD358	Liddell to Kyushu EPC - Q2'18	Kurenai	8 April 2018			8,631.00									8,631.00
		Summary of Sunday 08 April 2018						8,631.00									8,631.00
	Monday 09 April 2018	LD168	Liddell to Kyushu EPC - Q2'18	Kurenai	9 April 2018			9,070.00									9,070.00
		LD250	Liddell to Kyushu EPC - Q2'18	Kurenai	10 April 2018			9,035.00									9,035.00
		Summary of Monday 09 April 2018						18,105.00									18,105.00
	Thursday 12 April 2018	LD362	Liddell to Kyushu EPC - Q2'18	Kurenai	12 April 2018						9,125.00						9,125.00
		Summary of Thursday 12 April 2018									9,125.00						9,125.00

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
	Friday 13 April 2018	LD152	Liddell to Ube - Mitsubishi Paper (April RP +0.75)	Fortune Tiger	13 April 2018	8,311.00											8,311.00
		LD210	Liddell to NSC JFY17-Fixed Price - $84.97	NSU Ultimate	13 April 2018	8,626.00											8,626.00
		LD364	Liddell to NSC JFY17-Fixed Price - $84.97	NSU Ultimate	13 April 2018	3,978.06					4,679.94						8,658.00
		Summary of Friday 13 April 2018				20,915.06					4,679.94						25,595.00
	Saturday 14 April 2018	LD142	Liddell to Ube - Mitsubishi Paper (April RP +0.75)	Fortune Tiger	14 April 2018									9,096.00			9,096.00
		Summary of Saturday 14 April 2018												9,096.00			9,096.00
	Sunday 15 April 2018	LD376	Liddell to Ube - Mitsubishi Paper (April RP +0.75)	Fortune Tiger	15 April 2018									6,440.30	2,509.70		8,950.00
		Summary of Sunday 15 April 2018												6,440.30	2,509.70		8,950.00
	Monday 16 April 2018	LD144	MG to GIAG	Charlotte Selmer	16 April 2018							9,155.00					9,155.00
		Summary of Monday 16 April 2018										9,155.00					9,155.00
	Tuesday 17 April 2018	LD350	MG to GIAG	Charlotte Selmer	17 April 2018							8,955.00					8,955.00
		Summary of Tuesday 17 April 2018										8,955.00					8,955.00
	Thursday 19 April 2018	LD154	MG to GIAG	Aquaenna	19 April 2018							8,020.00					8,020.00
		LD226	MG to GIAG	Aquaenna	19 April 2018							8,780.00					8,780.00
		Summary of Thursday 19 April 2018										16,800.00					16,800.00
	Friday 20 April 2018	LD200	Liddell to Ube - JEN - April RP	Coral Sapphire	20 April 2018				9,121.00								9,121.00
		LD246	Liddell to Ube - JEN - April RP	Coral Sapphire	20 April 2018			0.00	9,053.00								9,053.00
		Summary of Friday 20 April 2018						0.00	18,174.00								18,174.00
	Saturday 21 April 2018	LD214	Liddell to NSC JFY18 GC NEWC Jan-Mar	Navios Gem	21 April 2018	8,860.00											8,860.00
		LD300	MG to GIAG	Aquaenna	21 April 2018							4,527.94	4,442.06				8,970.00

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		Summary of Saturday 21 April 2018				8,860.00						4,527.94	4,442.06				17,830.00
	Sunday 22 April 2018	LD130	Liddell to NSC JFY18 GC NEWC Jan-Mar	Navios Gem	22 April 2018	8,567.00											8,567.00
		LD226	Liddell to NSC JFY18 GC NEWC Jan-Mar	Navios Gem	22 April 2018						9,114.00						9,114.00
		LD320	Liddell to NSC JFY18 GC NEWC Jan-Mar	Navios Gem	23 April 2018	8,576.00											8,576.00
		LD334	Liddell to NSC JFY18 GC NEWC Jan-Mar	Navios Gem	22 April 2018						9,133.00						9,133.00
		Summary of Sunday 22 April 2018				17,143.00					18,247.00						35,390.00
	Monday 23 April 2018	LD162	Liddell to NSC JFY18 GC NEWC Jan-Mar	Navios Gem	23 April 2018							8,643.00					8,643.00
		Summary of Monday 23 April 2018										8,643.00					8,643.00
	Tuesday 24 April 2018	LD120	GCS to Luhai Group Co., Ltd	Glovis Advance	24 April 2018							8,185.00					8,185.00
		Summary of Tuesday 24 April 2018										8,185.00					8,185.00
	Wednesday 25 April 2018	LD164	Liddell to Chugoku - JFY18	Shin Sekiyo	25 April 2018						8,772.00						8,772.00
		LD226	Liddell to Chugoku - JFY18	Shin Sekiyo	25 April 2018						8,659.00						8,659.00
		LD320	GCS to Luhai Group Co., Ltd	Glovis Advance	26 April 2018								8,579.00				8,579.00
		Summary of Wednesday 25 April 2018									17,431.00		8,579.00				26,010.00
	Thursday 26 April 2018	LD114	Liddell to Chugoku - JFY18	Shin Sekiyo	26 April 2018						8,302.00						8,302.00
		LD244	Liddell to Chugoku - JFY18	Shin Sekiyo	26 April 2018			8,778.00									8,778.00
		Summary of Thursday 26 April 2018						8,778.00			8,302.00						17,080.00
	Friday 27 April 2018	LD158	Q1 LD to China Steel Corp - JFY18	China Steel Challenge	27 April 2018									9,005.00			9,005.00

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		LD326	Q1 LD to China Steel Corp - JFY18	China Steel Challenge	28 April 2018				4,555.24						4,447.76		9,003.00
		LD370	Liddell to Chugoku - JFY18	Shin Sekiyo	27 April 2018						9,266.00						9,266.00
		Summary of Friday 27 April 2018							4,555.24		9,266.00			9,005.00	4,447.76		27,274.00
	Sunday 29 April 2018	LD366	Q1 LD to China Steel Corp - JFY18	China Steel Responsibility	29 April 2018	8,611.00											8,611.00
		Summary of Sunday 29 April 2018				8,611.00											8,611.00
	Monday 30 April 2018	LD358	Q1 LD to China Steel Corp - JFY18	China Steel Responsibility	30 April 2018									8,576.00			8,576.00
		Summary of Monday 30 April 2018												8,576.00			8,576.00
	Tuesday 01 May 2018	LD210	Q1 LD to China Steel Corp - JFY18	China Steel Responsibility	1 May 2018									8,537.00			8,537.00
		LD266	Q1 LD to China Steel Corp - JFY18	China Steel Challenge	2 May 2018				9,130.00								9,130.00
		Summary of Tuesday 01 May 2018							9,130.00					8,537.00			17,667.00
	Wednesday 02 May 2018	LD112	Q1 LD to China Steel Corp - JFY18	China Steel Responsibility	2 May 2018				4,612.07					1,081.80	3,559.14		9,253.00
		LD178	Q1 LD to China Steel Corp - JFY18	China Steel Responsibility	2 May 2018	0.00			9,124.00								9,124.00
		Summary of Wednesday 02 May 2018				0.00			13,736.07					1,081.80	3,559.14		18,377.00
	Saturday 05 May 2018	LD116	GCS to Kobe IPP - Apr'18-Mar'19	Asahi Maru	5 May 2018							9,047.00					9,047.00
		Summary of Saturday 05 May 2018										9,047.00					9,047.00
	Sunday 06 May 2018	LD102	GCS to Kobe IPP - Apr'18-Mar'19	Asahi Maru	6 May 2018			7,684.08	1,165.92								8,850.00
		LD162	GCS to Kobe IPP - Apr'18-Mar'19	Asahi Maru	6 May 2018				9,037.00								9,037.00

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		LD264	GCS to Kobe IPP - Apr'18-Mar'19	Asahi Maru	7 May 2018				9,069.00								9,069.00
		Summary of Sunday 06 May 2018						7,684.08	19,271.92								26,956.00
	Monday 07 May 2018	LD372	GCS to Kobe IPP - Apr'18-Mar'19	Asahi Maru	7 May 2018			8,832.00									8,832.00
		Summary of Monday 07 May 2018						8,832.00									8,832.00
	Tuesday 08 May 2018	LD286	GCS to Kobe IPP - Apr'18-Mar'19	Asahi Maru	9 May 2018			9,030.00									9,030.00
		LD308	Liddell to NSC JFY18 GC NEWC Jan-Mar	New Expedition	8 May 2018			8,240.00									8,240.00
		LD346	Liddell to NSC JFY18 GC NEWC Jan-Mar	New Expedition	8 May 2018			4,680.55	4,284.45								8,965.00
		Summary of Tuesday 08 May 2018						21,950.55	4,284.45								26,235.00
	Wednesday 09 May 2018	LD190	Liddell to NSC JFY18 GC NEWC Jan-Mar	New Expedition	9 May 2018			8,655.40									8,655.40
		LD226	Liddell to NSC JFY18 GC NEWC Jan-Mar	New Expedition	9 May 2018			0.00	8,962.20								8,962.20
		LD306	Liddell to NSC JFY18 GC NEWC Jan-Mar	New Expedition	10 May 2018				1,299.58			7,574.82					8,874.40
		LD348	Bulga to Joban Joint PC - 3rd shipment	Crystal Wind	9 May 2018			8,572.40									8,572.40
		Summary of Wednesday 09 May 2018						17,227.80	10,261.78			7,574.82					35,064.40
	Saturday 12 May 2018	LD172	HVOCS Kobe IPP TH - 1H JFY'18	Brilliant Century	12 May 2018				8,449.20								8,449.20
		Summary of Saturday 12 May 2018							8,449.20								8,449.20
	Wednesday 16 May 2018	LD144	Liddell to Ube - YES - April RP 40kt	Pegasus Island	16 May 2018							9,347.00					9,347.00

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		LD244	Liddell to Ube - YES - April RP 40kt	Pegasus Island	16 May 2018				9,298.00								9,298.00
		Summary of Wednesday 16 May 2018							9,298.00			9,347.00					18,645.00
	Thursday 17 May 2018	LD156	Liddell to Ube - YES - April RP 40kt	Pegasus Island	17 May 2018				9,320.00								9,320.00
		LD230	Liddell to Ube - YES - April RP 40kt	Pegasus Island	17 May 2018				8,722.00								8,722.00
		Summary of Thursday 17 May 2018							18,042.00								18,042.00
	Friday 18 May 2018	LD286	Liddell to Ube - YES - April RP 40kt	Pegasus Island	19 May 2018				6,548.44			2,479.96					9,028.40
		Summary of Friday 18 May 2018							6,548.44			2,479.96					9,028.40
	Monday 21 May 2018	LD128	GCS to Rhodium #053CN	Golden Houston	21 May 2018								8,534.00				8,534.00
		LD214	GCS to Rhodium #053CN	Golden Houston	21 May 2018							4,387.75	4,258.85				8,646.60
		LD320	GCS to Rhodium #053CN	Golden Houston	21 May 2018							8,756.80					8,756.80
		Summary of Monday 21 May 2018										13,144.55	12,792.85				25,937.40
	Tuesday 22 May 2018	LD132	GCS to Rhodium #053CN	Golden Houston	22 May 2018							8,467.40					8,467.40
		LD200	GCS to Rhodium #053CN	Golden Houston	22 May 2018							3,412.67	5,001.53				8,414.20
		LD274	GCS to Rhodium #053CN	Golden Houston	23 May 2018							3,814.59	4,817.21				8,631.80
		LD350	GCS to Rhodium #053CN	Golden Houston	22 May 2018							4,303.80	4,286.00				8,589.80
		Summary of Tuesday 22 May 2018										19,998.46	14,104.74				34,103.20
	Thursday 24 May 2018	LD230	GCS to Kobe IPP - Apr'18-Mar'19	Energy Glory	24 May 2018				8,920.20								8,920.20
		Summary of Thursday 24 May 2018							8,920.20								8,920.20

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
	Friday 25 May 2018	LD260	Liddell to NSC JFY18 GC NEWC Jan-Mar	Dyna Globe	25 May 2018			4,150.51				0.00	4,213.09				8,363.60
		Summary of Friday 25 May 2018						4,150.51				0.00	4,213.09				8,363.60
	Saturday 26 May 2018	LD178	Liddell to NSC JFY18 GC NEWC Jan-Mar	Dyna Globe	26 May 2018				8,525.00								8,525.00
		LD276	Liddell to NSC JFY18 GC NEWC Jan-Mar	Dyna Globe	27 May 2018				6,492.75			2,492.45					8,985.20
		LD372	Liddell to NSC JFY18 GC NEWC Jan-Mar	Dyna Globe	26 May 2018			8,521.80									8,521.80
		Summary of Saturday 26 May 2018						8,521.80	15,017.75			2,492.45					26,032.00
	Sunday 03 June 2018	LD210	Liddell to NSC JFY18 GC NEWC Jan-Mar	NSU Voyager	3 June 2018			9,147.40									9,147.40
		LD298	Liddell to NSC JFY18 GC NEWC Jan-Mar	NSU Voyager	4 June 2018						8,928.00						8,928.00
		Summary of Sunday 03 June 2018						9,147.40			8,928.00						18,075.40
	Monday 04 June 2018	LD132	Liddell to NSC JFY18 GC NEWC Jan-Mar	NSU Voyager	4 June 2018			8,809.80									8,809.80
		Summary of Monday 04 June 2018						8,809.80									8,809.80
	Tuesday 05 June 2018	LD174	Liddell to NSC JFY18 GC NEWC Jan-Mar	NSU Voyager	5 June 2018								9,077.20				9,077.20
		Summary of Tuesday 05 June 2018											9,077.20				9,077.20
	Thursday 07 June 2018	LD310	GCS to Kobe IPP - Apr'18-Mar'19	Brilliant Discovery	8 June 2018								8,463.40				8,463.40
		Summary of Thursday 07 June 2018											8,463.40				8,463.40
	Friday 08 June 2018	LD370	GCS to Kobe IPP - Apr'18-Mar'19	Brilliant Discovery	8 June 2018				9,026.40								9,026.40
		Summary of Friday 08 June 2018							9,026.40								9,026.40

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
	Thursday 14 June 2018	LD176	Liddell to NSC JFY18 GC Newc Apr-Jun	Cape Vanguard	14 June 2018			8,381.20									8,381.20
		LD280	Liddell to NSC JFY18 GC Newc Apr-Jun	Cape Vanguard	15 June 2018							8,958.80					8,958.80
		LD376	GCS to Kobe IPP - Apr'18-Mar'19	Brilliant Discovery	14 June 2018				7,664.62		1,209.18						8,873.80
		Summary of Thursday 14 June 2018						8,381.20	7,664.62		1,209.18	8,958.80					26,213.80
	Sunday 17 June 2018	LD306	Liddell to NSC JFY18 GC Newc Apr-Jun	Dyna Camellia	18 June 2018			8,263.00									8,263.00
		Summary of Sunday 17 June 2018						8,263.00									8,263.00
	Monday 18 June 2018	LD298	Liddell to NSC JFY18 GC Newc Apr-Jun	Dyna Camellia	19 June 2018			8,972.60									8,972.60
		Summary of Monday 18 June 2018						8,972.60									8,972.60
	Tuesday 19 June 2018	LD180	Liddell to NSC JFY18 GC Newc Apr-Jun	Spring Pride	19 June 2018							8,717.60					8,717.60
		Summary of Tuesday 19 June 2018										8,717.60					8,717.60
	Wednesday 20 June 2018	LD130	Liddell to NSC JFY18 GC Newc Apr-Jun	Spring Pride	20 June 2018			8,544.00									8,544.00
		LD356	Liddell to NSC JFY18 GC Newc Apr-Jun	Dyna Camellia	20 June 2018			1,337.06			7,724.94						9,062.00
		Summary of Wednesday 20 June 2018						9,881.06			7,724.94						17,606.00
	Thursday 21 June 2018	LD132	Liddell to NSC JFY18 GC Newc Apr-Jun	Spring Pride	21 June 2018				8,954.80								8,954.80
		LD216	Liddell to NSC JFY18 GC Newc Apr-Jun	Spring Pride	22 June 2018				8,463.00								8,463.00
		Summary of Thursday 21 June 2018							17,417.80								17,417.80
	Friday 22 June 2018	LD240	Liddell to NSC JFY18 GC Newc Apr-Jun	Spring Pride	23 June 2018			8,871.80									8,871.80

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		Summary of Friday 22 June 2018						8,871.80									8,871.80
	Sunday 24 June 2018	LD210	Liddell to NSC JFY18 GC Newc Apr-Jun	Spring Pride	24 June 2018			6,932.37				2,119.63					9,052.00
		Summary of Sunday 24 June 2018						6,932.37				2,119.63					9,052.00
	Monday 25 June 2018	LD290	Liddell to Ube - Ube Own Use - 10kt (Apr/ May/Jun)	Semiramis	26 June 2018											8,522.80	8,522.80
		LD320	GCS (XMO) to SJEP CY18 Base tonnage (7 pnx @ US $109)	Ishizuchi	25 June 2018			8,882.00								0.00	8,882.00
		Summary of Monday 25 June 2018						8,882.00								8,522.80	17,404.80
	Tuesday 26 June 2018	LD282	Liddell to Ube - JEN - April RP	TR Infinity	27 June 2018						8,957.40						8,957.40
		Summary of Tuesday 26 June 2018									8,957.40						8,957.40
	Wednesday 27 June 2018	LD138	Q1 LD to China Steel Corp - JFY18	Golden Kennedy	27 June 2018				2,668.16							6,447.44	9,115.60
		LD254	Liddell to Ube - JEN - April RP	TR Infinity	27 June 2018											8,822.60	8,822.60
		LD360	Q1 LD to China Steel Corp - JFY18	Golden Kennedy	27 June 2018											8,237.00	8,237.00
		Summary of Wednesday 27 June 2018							2,668.16							23,507.04	26,175.20
	Thursday 28 June 2018	LD126	Liddell to Ube - Ube Own Use - 10kt (Apr/ May/Jun)	Semiramis	28 June 2018						6,300.89	2,707.51					9,008.40
		Summary of Thursday 28 June 2018									6,300.89	2,707.51					9,008.40
	Friday 29 June 2018	LD306	GCS to Kobe IPP - Apr'18- Mar'19	Cymona Progress	30 June 2018											8,962.80	8,962.80
		Summary of Friday 29 June 2018														8,962.80	8,962.80
	Saturday 30 June 2018	LD244	GCS to Kobe IPP - Apr'18- Mar'19	Cymona Progress	30 June 2018						8,402.20						8,402.20

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		LD354	GCS to Kobe IPP - Apr'18-Mar'19	Cymona Progress	30 June 2018				8,333.40								8,333.40
		Summary of Saturday 30 June 2018							8,333.40		8,402.20						16,735.60
	Sunday 01 July 2018	LD168	GCS to Kobe IPP - Apr'18-Mar'19	Cymona Progress	1 July 2018				3,167.29		5,841.31						9,008.60
		Summary of Sunday 01 July 2018							3,167.29		5,841.31						9,008.60
	Tuesday 10 July 2018	LD178	Rav North to Pen - Dec'17-Sep'18	Ultra Daniela	10 July 2018							8,741.00					8,741.00
		Summary of Tuesday 10 July 2018										8,741.00					8,741.00
	Wednesday 11 July 2018	LD108	Rav North to Pen - Dec'17-Sep'18	Ultra Daniela	11 July 2018							8,407.00					8,407.00
		Summary of Wednesday 11 July 2018										8,407.00					8,407.00
	Friday 13 July 2018	LD132	Liddell to Ube - Mitsubishi Paper (April RP +0.75)	Cherry Dream	13 July 2018											8,326.80	8,326.80
		Summary of Friday 13 July 2018														8,326.80	8,326.80
	Saturday 14 July 2018	LD150	Liddell to Ube - Mitsubishi Paper (April RP +0.75)	Cherry Dream	14 July 2018											8,864.20	8,864.20
		Summary of Saturday 14 July 2018														8,864.20	8,864.20
	Sunday 15 July 2018	LD156	Liddell to Ube - Mitsubishi Paper (April RP +0.75)	Cherry Dream	15 July 2018							8,564.80					8,564.80
		LD208	Liddell to Ube - Mitsubishi Paper (April RP +0.75)	Cherry Dream	15 July 2018											7,650.30	7,650.30
		LD320	Liddell to Ube - Mitsubishi Paper (April RP +0.75)	Cherry Dream	16 July 2018											8,506.20	8,506.20
		Summary of Sunday 15 July 2018										8,564.80				16,156.50	24,721.30

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
	Monday 16 July 2018	LD202	Mt Owen to Shikoku EPC - JFY18 (Yr5-5) Fixed Price Shipments	Corona Lions	16 July 2018											8,928.00	8,928.00
		LD266	Liddell to Ube - Mitsubishi Paper (April RP +0.75)	Cherry Dream	16 July 2018											9,003.00	9,003.00
		Summary of Monday 16 July 2018														17,931.00	17,931.00
	Tuesday 17 July 2018	LD114	Mt Owen to Shikoku EPC - JFY18 (Yr5-5) Fixed Price Shipments	Corona Lions	17 July 2018											8,764.20	8,764.20
		LD282	Mt Owen to Shikoku EPC - JFY18 (Yr5-5) Fixed Price Shipments	Corona Lions	18 July 2018											9,019.20	9,019.20
		LD326	Mt Owen to Shikoku EPC - JFY18 (Yr5-5) Fixed Price Shipments	Corona Lions	17 July 2018											9,106.00	9,106.00
		Summary of Tuesday 17 July 2018														26,889.40	26,889.40
	Friday 20 July 2018	LD302	Mt Owen to Shikoku EPC - JFY18 (Yr5-5) Fixed Price Shipments	Corona Lions	21 July 2018			1,195.46				7,762.94					8,958.40
		Summary of Friday 20 July 2018						1,195.46				7,762.94					8,958.40
	Saturday 21 July 2018	LD198	XMO to Chugoku EPC - JFY18 4th shipment	Sincere Pisces	21 July 2018			8,833.80									8,833.80
		Summary of Saturday 21 July 2018						8,833.80									8,833.80
	Monday 23 July 2018	LD122	XMO to Chugoku EPC - JFY18 4th shipment	Sincere Pisces	23 July 2018			8,471.80									8,471.80

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		Summary of Monday 23 July 2018						8,471.80									8,471.80
	Thursday 26 July 2018	LD120	Liddell to NSC JFY18 Fixed price	Cape Vanguard	26 July 2018	8,963.40											8,963.40
		LD356	HVOCS NSSM 1st Quarter (July/Sep) 400kt - July Shipments	United Adventure	26 July 2018	8,262.20											8,262.20
		Summary of Thursday 26 July 2018				17,225.60											17,225.60
	Friday 27 July 2018	LD182	Liddell to NSC JFY18 Fixed price	Cape Vanguard	27 July 2018											8,463.00	8,463.00
		LD300	Liddell to NSC JFY18 Fixed price	Cape Vanguard	28 July 2018							8,518.20					8,518.20
		Summary of Friday 27 July 2018										8,518.20				8,463.00	16,981.20
	Saturday 28 July 2018	LD162	Liddell to NSC JFY18 Fixed price	Cape Vanguard	28 July 2018											8,582.00	8,582.00
		LD208	Liddell to NSC JFY18 Fixed price	Cape Vanguard	28 July 2018											8,256.80	8,256.80
		LD270	MO to Nakayama Joint Power (Idemitsu) - April RP	Santa Cruz	29 July 2018											8,928.00	8,928.00
		LD370	Liddell to NSC JFY18 Fixed price	Cape Vanguard	28 July 2018			8,463.00									8,463.00
		Summary of Saturday 28 July 2018						8,463.00								25,766.80	34,229.80
	Sunday 29 July 2018	LD162	Liddell to NSC JFY18 Fixed price	Cape Vanguard	29 July 2018											8,567.00	8,567.00
		LD228	MO to Nakayama Joint Power (Idemitsu) - April RP	Santa Cruz	29 July 2018											8,556.00	8,556.00
		Summary of Sunday 29 July 2018														17,123.00	17,123.00
	Monday 30 July 2018	LD182	Liddell to NSC JFY18 Fixed price	Cape Vanguard	30 July 2018							8,463.00					8,463.00
		LD348	Liddell to NSC JFY18 Fixed price	Cape Vanguard	30 July 2018							9,140.20					9,140.20
		Summary of Monday 30 July 2018										17,603.20					17,603.20

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
	Friday 03 August 2018	LD214	HVOCS to Yancoal Australia July-Sep (Q3) TS0.55	F.D. Angelica	4 August 2018			8,767.00									8,767.00
		LD288	HVOCS to Yancoal Australia July-Sep (Q3) TS0.55	F.D. Angelica	4 August 2018			8,756.80									8,756.80
		LD348	Liddell to Ube - JEN - Pricing Option 1A (35kt)	Century Wave	3 August 2018							8,950.00					8,950.00
		Summary of Friday 03 August 2018						17,523.80				8,950.00					26,473.80
	Saturday 04 August 2018	LD154	Liddell to Ube - JEN - Pricing Option 1A (35kt)	Century Wave	4 August 2018							2,070.10				7,028.70	9,098.80
		LD226	Liddell to Ube - JEN - Pricing Option 1A (35kt)	Century Wave	4 August 2018						8,374.40						8,374.40
		LD298	HVOCS to Yancoal Australia July-Sep (Q3) TS0.55	F.D. Angelica	5 August 2018			9,055.20									9,055.20
		LD370	Liddell to Ube - JEN - Pricing Option 1A (35kt)	Century Wave	4 August 2018											8,566.60	8,566.60
		Summary of Saturday 04 August 2018						9,055.20			8,374.40	2,070.10				15,595.30	35,095.00
	Sunday 05 August 2018	LD362	HVOCS to Yancoal Australia July-Sep (Q3) TS0.55	F.D. Angelica	5 August 2018			3,265.18							5,264.22		8,529.40
		Summary of Sunday 05 August 2018						3,265.18							5,264.22		8,529.40
	Monday 06 August 2018	LD212	GCS to Kobe IPP - Apr'18-Mar'19	Asahi Maru	6 August 2018											8,517.60	8,517.60
		LD288	GCS to Kobe IPP - Apr'18-Mar'19	Asahi Maru	7 August 2018				7,140.69							1,322.31	8,463.00
		Summary of Monday 06 August 2018							7,140.69							9,839.91	16,980.60

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
	Tuesday 07 August 2018	LD116	GCS to Kobe IPP - Apr'18-Mar'19	Asahi Maru	7 August 2018							8,555.80					8,555.80
		LD180	GCS to Kobe IPP - Apr'18-Mar'19	Asahi Maru	7 August 2018			4,375.30			4,180.70						8,556.00
		Summary of Tuesday 07 August 2018						4,375.30			4,180.70	8,555.80					17,111.80
	Wednesday 08 August 2018	LD168	CM to TOSOH JFY'18	Sea Confidence	8 August 2018						8,463.00						8,463.00
		Summary of Wednesday 08 August 2018									8,463.00						8,463.00
	Thursday 09 August 2018	LD118	CM - Chugoku (Rav North) Spot - July & September	Sage Sagittarius	9 August 2018			8,374.80									8,374.80
		LD162	CM - Chugoku (Rav North) Spot - July & September	Sage Sagittarius	9 August 2018			4,799.62				3,667.38					8,467.00
		Summary of Thursday 09 August 2018						13,174.42				3,667.38					16,841.80
	Saturday 11 August 2018	LD108	HVOCS to Yancoal Australia July-Sep (Q3) TS0.55	Taho Europe	11 August 2018	9,123.00											9,123.00
		LD264	HVOCS to Yancoal Australia July-Sep (Q3) TS0.55	Taho Europe	11 August 2018	8,740.00											8,740.00
		Summary of Saturday 11 August 2018				17,863.00											17,863.00
	Sunday 12 August 2018	LD112	HVOCS to Yancoal Australia July-Sep (Q3) TS0.55	Taho Europe	12 August 2018	6,675.32									2,103.68		8,779.00
		Summary of Sunday 12 August 2018				6,675.32									2,103.68		8,779.00
	Tuesday 14 August 2018	LD222	Liddell to Chugoku - July/Sep (Buyer's Option)	Key Future	14 August 2018						9,041.00						9,041.00
		Summary of Tuesday 14 August 2018									9,041.00						9,041.00

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
	Wednesday 15 August 2018	LD332	Liddell to Chugoku - July/Sep (Buyer's Option)	Key Future	15 August 2018										8,561.80		8,561.80
		Summary of Wednesday 15 August 2018													8,561.80		8,561.80
	Thursday 16 August 2018	LD120	Liddell to Chugoku - July/Sep (Buyer's Option)	Key Future	16 August 2018							8,577.00					8,577.00
		Summary of Thursday 16 August 2018										8,577.00					8,577.00
	Friday 17 August 2018	LD120	MO to Idemitsu - JFY'18-710kt	Dyna Crane	17 August 2018				9,087.40								9,087.40
		Summary of Friday 17 August 2018							9,087.40								9,087.40
	Saturday 18 August 2018	LD246	Q2 Bulga to Nippon Steel - 132.5 @ US $137	Dyna Camellia	18 August 2018										8,390.00		8,390.00
		Summary of Saturday 18 August 2018													8,390.00		8,390.00
	Sunday 19 August 2018	LD102	Q2 Bulga to Nippon Steel - 132.5 @ US $137	Dyna Camellia	19 August 2018	3,767.52									4,044.48		7,812.00
		LD174	Q2 Bulga to Nippon Steel - 132.5 @ US $137	Dyna Camellia	19 August 2018	4,279.14									4,420.26		8,699.40
		Summary of Sunday 19 August 2018				8,046.66									8,464.74		16,511.40
	Monday 20 August 2018	LD122	MO to POSCO - Q3 CY18	Pan Bona	20 August 2018										8,422.40		8,422.40
		LD178	MO to Idemitsu - JFY'18-710kt	Dyna Crane	20 August 2018				4,396.50			4,396.50					8,793.00
		LD246	MO to POSCO - Q3 CY18	Pan Bona	20 August 2018										8,939.80		8,939.80
		Summary of Monday 20 August 2018							4,396.50			4,396.50			17,362.20		26,155.20
	Tuesday 21 August 2018	LD128	Liddell to NSC JFY18 Fixed price	Cape Harvest	21 August 2018			7,409.10	1,212.30								8,621.40

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		LD264	Liddell to Ube - Teijin - GCI 2018 Q3 - 2019 Q1 + 2.20	Global Bonanza	22 August 2018			8,482.60									8,482.60
		Summary of Tuesday 21 August 2018						15,891.70	1,212.30								17,104.00
	Wednesday 22 August 2018	LD102	Liddell to Ube - Teijin - GCI 2018 Q3 - 2019 Q1 + 2.20	Global Bonanza	22 August 2018						9,147.80						9,147.80
		LD146	Liddell to Ube - Teijin - GCI 2018 Q3 - 2019 Q1 + 2.20	Global Bonanza	22 August 2018			4,284.81			2,125.91	2,108.89					8,519.60
		LD226	MO to POSCO - Q3 CY18	Hyundai Vision	22 August 2018			2,128.89						7,073.11			9,202.00
		Summary of Wednesday 22 August 2018						6,413.70			11,273.71	2,108.89		7,073.11			26,869.40
	Thursday 23 August 2018	LD174	Liddell to NSC JFY18 Fixed price	Cape Harvest	23 August 2018							9,032.40					9,032.40
		LD240	Liddell to NSC JFY18 Fixed price	Cape Harvest	23 August 2018			8,507.80									8,507.80
		LD318	Q2 Rav North to NS&SM corp - 82.5kt @ US $137	Cape Harvest	24 August 2018			1,549.41						6,815.99			8,365.40
		Summary of Thursday 23 August 2018						10,057.21				9,032.40		6,815.99			25,905.60
	Saturday 25 August 2018	LD168	Liddell to Chugoku - Jan/Mar (Buyer's Option)	Shoryu	25 August 2018								8,403.80				8,403.80
		LD242	Liddell to Chugoku - Jan/Mar (Buyer's Option)	Shoryu	25 August 2018			8,525.80									8,525.80
		Summary of Saturday 25 August 2018						8,525.80					8,403.80				16,929.60
	Sunday 26 August 2018	LD104	Liddell to Chugoku - Jan/Mar (Buyer's Option)	Shoryu	26 August 2018			5,762.35				2,693.45					8,455.80

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		LD298	Hokkaido EPC Year 2 of 3 - Base Tonnage	Shin Sapporo Maru	27 August 2018								8,404.40				8,404.40
		Summary of Sunday 26 August 2018						5,762.35				2,693.45	8,404.40				16,860.20
	Monday 27 August 2018	LD212	Hokkaido EPC Year 2 of 3 - Base Tonnage	Shin Sapporo Maru	27 August 2018				8,864.60								8,864.60
		LD282	Hokkaido EPC Year 2 of 3 - Base Tonnage	Shin Sapporo Maru	28 August 2018								9,125.00				9,125.00
		Summary of Monday 27 August 2018							8,864.60				9,125.00				17,989.60
	Sunday 02 September 2018	LD116	HVOCS NSSM 1st Quarter (July/Sep) 400kt - April RP	Dyna Globe	2 September 2018							9,110.00					9,110.00
		LD214	Liddell to JFE - Apr'18-Mar'19 - April RP	Brilliant Jupiter	2 September 2018								8,518.60				8,518.60
		LD276	Liddell to JFE - Apr'18-Mar'19 - April RP	Brilliant Jupiter	2 September 2018			0.00	8,742.80								8,742.80
		Summary of Sunday 02 September 2018						0.00	8,742.80			9,110.00	8,518.60				26,371.40
	Monday 03 September 2018	LD168	Liddell to JFE - Apr'18-Mar'19 - April RP	Brilliant Jupiter	3 September 2018			6,494.52							1,421.28		7,915.80
		Summary of Monday 03 September 2018						6,494.52							1,421.28		7,915.80
	Wednesday 05 September 2018	LD274	Liddell to JFE - Apr'18-Mar'19 - April RP	Brilliant Jupiter	6 September 2018			1,039.63				8,121.37					9,161.00
		Summary of Wednesday 05 September 2018						1,039.63				8,121.37					9,161.00
	Friday 07 September 2018	LD192	Q2 LDto China Steel Corp - JFY18	Alisios	7 September 2018									0.00	8,346.60		8,346.60
		Summary of Friday 07 September 2018												0.00	8,346.60		8,346.60
	Saturday 08 September 2018	LD302	Ulan to Tohoku EPC - Spot	Tarumaesan Maru	9 September 2018			9,130.00									9,130.00

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		Summary of Saturday 08 September 2018						9,130.00									9,130.00
	Sunday 09 September 2018	LD126	Liddell to Ube - YES - April RP 40kt	Robin Wind	9 September 2018						8,559.60						8,559.60
		LD262	Liddell to Ube - YES - April RP 40kt	Robin Wind	9 September 2018			8,877.20									8,877.20
		LD316	Bulga to Joban Joint PC - 6th shipment	Corona Optimum	10 September 2018			9,013.20									9,013.20
		LD338	Bulga to Joban Joint PC - 6th shipment	Corona Optimum	9 September 2018			8,928.00									8,928.00
		Summary of Sunday 09 September 2018						26,818.40			8,559.60						35,378.00
	Monday 10 September 2018	LD120	Q2 LDto China Steel Corp - JFY18	Alisios	10 September 2018										8,205.00		8,205.00
		LD170	Bulga to Joban Joint PC - 6th shipment	Corona Optimum	10 September 2018			8,289.60									8,289.60
		LD278	Ulan to Tohoku EPC - Spot	Tarumaesan Maru	11 September 2018			8,315.00									8,315.00
		LD306	GCS to Ube (Ube Steaming Coal) - UBE own use - April RP	Jozen	11 September 2018			8,279.20									8,279.20
		Summary of Monday 10 September 2018						24,883.80							8,205.00		33,088.80
	Tuesday 11 September 2018	LD118	Liddell to Ube - YES - April RP 40kt	Robin Wind	11 September 2018			4,664.29			4,381.11						9,045.40
		LD212	HVOCS to Yancoal Australia July-Sep (Q3) TS0.65	SBI Lambada	11 September 2018			4,266.14			4,028.66						8,294.80
		Summary of Tuesday 11 September 2018						8,930.43			8,409.77						17,340.20
	Wednesday 12 September 2018	LD144	Mangoola to GIAG for Zhejiang	Orsola Bottiglieri	12 September 2018					9,059.60							9,059.60

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		LD324	GCS to Ube (Ube Steaming Coal) - UBE own use - April RP	Jozen	12 September 2018			3,735.27				4,623.73					8,359.00
		LD380	Bulga to Marusumi Paper (NOC) - Oct '17 - Sep'18	TTM Harmony	12 September 2018			8,401.20									8,401.20
		Summary of Wednesday 12 September 2018						12,136.47		9,059.60		4,623.73					25,819.80
	Thursday 13 September 2018	LD138	Mangoola to GIAG for Zhejiang	New Joy	13 September 2018							8,441.20					8,441.20
		LD308	Q2 LDto China Steel Corp - JFY18	Alisios	13 September 2018			6,396.24							2,081.16		8,477.40
		Summary of Thursday 13 September 2018						6,396.24				8,441.20			2,081.16		16,918.60
	Friday 14 September 2018	LD116	Mangoola to GIAG for Zhejiang	New Joy	14 September 2018					8,493.20							8,493.20
		LD248	Mangoola to GIAG for Zhejiang	New Joy	14 September 2018					8,945.20							8,945.20
		LD358	Q2 LDto China Steel Corp - JFY18	Cemtex Fortune	14 September 2018	3,740.38									4,652.42		8,392.80
		Summary of Friday 14 September 2018				3,740.38				17,438.40					4,652.42		25,831.20
	Saturday 15 September 2018	LD150	Mangoola to GIAG for Zhejiang	New Joy	15 September 2018					8,710.00							8,710.00
		LD334	Mangoola to GIAG for Zhejiang	Orsola Bottiglieri	15 September 2018							4,268.92	4,314.08				8,583.00
		LD370	Mangoola to GIAG for Zhejiang	Orsola Bottiglieri	15 September 2018							4,453.02	4,571.18				9,024.20
		Summary of Saturday 15 September 2018								8,710.00		8,721.94	8,885.26				26,317.20
	Monday 17 September 2018	LD360	Mangoola to GIAG for Zhejiang	New Joy	17 September 2018					8,689.20							8,689.20
		Summary of Monday 17 September 2018								8,689.20							8,689.20
	Friday 21 September 2018	LD126	Bulga to NSC - 8th Shipment Fixed Price	Spring Brave	21 September 2018			8,456.00									8,456.00

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		LD338	Bulga to NSC - 8th Shipment Fixed Price	Spring Brave	21 September 2018						8,459.20						8,459.20
		Summary of Friday 21 September 2018						8,456.00			8,459.20						16,915.20
	Saturday 22 September 2018	LD122	MO to GIAG (FPG) Sep'18 130kt	Formosabulk Brave	22 September 2018					8,549.60							8,549.60
		LD210	Bulga to NSC - 8th Shipment Fixed Price	Spring Brave	22 September 2018	8,548.20					0.00						8,548.20
		Summary of Saturday 22 September 2018				8,548.20				8,549.60	0.00						17,097.80
	Sunday 23 September 2018	LD196	MO to GIAG (FPG) Sep'18 130kt	Formosabulk Brave	23 September 2018					8,470.40							8,470.40
		Summary of Sunday 23 September 2018								8,470.40							8,470.40
	Monday 24 September 2018	LD168	Mangoola to GIAG for Zhejiang	NPS Century	24 September 2018						4,447.87	0.00	4,481.73				8,929.60
		LD286	Bulga to Nippon Paper - JFY18	Dyna Crane	25 September 2018			9,084.00									9,084.00
		Summary of Monday 24 September 2018						9,084.00			4,447.87	0.00	4,481.73				18,013.60
	Tuesday 25 September 2018	LD120	Bulga to Nippon Paper - JFY18	Dyna Crane	25 September 2018			8,352.00									8,352.00
		LD254	Bulga to Nippon Paper - JFY18	Dyna Crane	25 September 2018						9,100.40						9,100.40
		Summary of Tuesday 25 September 2018						8,352.00			9,100.40						17,452.40
	Thursday 27 September 2018	LD154	MG to GIAG	HL Boryeong	27 September 2018			1,237.76				3,685.33	3,545.50				8,468.60
		LD224	Bulga to Nippon Paper - JFY18	Dyna Crane	27 September 2018			8,950.80									8,950.80
		Summary of Thursday 27 September 2018						10,188.56				3,685.33	3,545.50				17,419.40
	Friday 28 September 2018	LD178	MG to GIAG	HL Boryeong	28 September 2018							4,680.69	4,617.31				9,298.00

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		LD264	Bulga to Nippon Paper - JFY18	Dyna Crane	28 September 2018			9,091.40									9,091.40
		Summary of Friday 28 September 2018						9,091.40				4,680.69	4,617.31				18,389.40
	Saturday 29 September 2018	LD116	MG to GIAG	HL Boryeong	29 September 2018					8,345.40							8,345.40
		LD210	XMO to Chugoku EPC - JFY18 5th shipment	Sincere Pisces	29 September 2018						9,100.20						9,100.20
		LD264	Hokkaido - GC Newc (1 shipment Oct/Dec)	Corona Garland	30 September 2018						9,187.00						9,187.00
		Summary of Saturday 29 September 2018								8,345.40	18,287.20						26,632.60
	Sunday 30 September 2018	LD298	Bulga to NSC - 8th Shipment Fixed Price	New Expedition	1 October 2018						8,545.00						8,545.00
		Summary of Sunday 30 September 2018									8,545.00						8,545.00
	Monday 01 October 2018	LD220	Hokkaido - GC Newc (1 shipment Oct/Dec)	Corona Garland	1 October 2018			2,594.64			6,425.96						9,020.60
		LD372	Bulga to NSC - 8th Shipment Fixed Price	New Expedition	1 October 2018						8,556.00						8,556.00
		Summary of Monday 01 October 2018						2,594.64			14,981.96						17,576.60
	Tuesday 02 October 2018	LD306	Bulga to NSC - 8th Shipment Fixed Price	New Expedition	3 October 2018			4,166.12			4,226.88						8,393.00
		Summary of Tuesday 02 October 2018						4,166.12			4,226.88						8,393.00
	Friday 05 October 2018	LD114	CM to TOSOH JFY'18	Sea Pearl	5 October 2018						9,031.20						9,031.20
		Summary of Friday 05 October 2018									9,031.20						9,031.20
	Saturday 06 October 2018	LD202	Liddell to NSC JFY18 Fixed Price	New Expedition	6 October 2018	8,459.00											8,459.00
		Summary of Saturday 06 October 2018				8,459.00											8,459.00
	Sunday 07 October 2018	LD254	Liddell to NSC JFY18 Fixed Price	New Expedition	7 October 2018	8,460.00											8,460.00

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		LD322	Liddell to NSC JFY18 Fixed Price	New Expedition	7 October 2018						9,061.80						9,061.80
		Summary of Sunday 07 October 2018				8,460.00					9,061.80						17,521.80
	Monday 08 October 2018	LD106	Liddell to NSC JFY18 Fixed Price	NSU Trust	8 October 2018						8,556.00						8,556.00
		LD192	Liddell to NSC JFY18 Fixed Price	NSU Trust	8 October 2018			8,583.60									8,583.60
		LD240	CM to TOSOH JFY'18	Sea Pearl	9 October 2018						8,986.20						8,986.20
		Summary of Monday 08 October 2018						8,583.60			17,542.20						26,125.80
	Tuesday 09 October 2018	LD116	CM to TOSOH JFY'18	Sea Pearl	9 October 2018						8,556.00						8,556.00
		Summary of Tuesday 09 October 2018									8,556.00						8,556.00
	Wednesday 10 October 2018	LD104	GCS to Shikoku (Q4'18 & Q1'19) 36 trains @ US $110	Tachibana	10 October 2018											9,080.20	9,080.20
		LD260	Liddell to NSC JFY18 Fixed Price	NSU Trust	10 October 2018					8,446.00							8,446.00
		LD330	Liddell to NSC JFY18 Fixed Price	New Expedition	10 October 2018						8,279.20						8,279.20
		Summary of Wednesday 10 October 2018								8,446.00	8,279.20					9,080.20	25,805.40
	Thursday 11 October 2018	LD120	MO to Idemitsu - JFY'18-710kt	Orient Genesis	11 October 2018			8,636.00									8,636.00
		Summary of Thursday 11 October 2018						8,636.00									8,636.00
	Friday 12 October 2018	LD148	Liddell to NSC JFY18 Fixed price	Dyna Camellia	12 October 2018						8,463.00						8,463.00
		LD212	Q3 Rav North to NS&SM corp - JFY'18	NSU Trust	12 October 2018			8,935.40									8,935.40
		LD364	Liddell to NSC JFY18 Fixed Price	NSU Trust	12 October 2018	7,013.93					1,486.07						8,500.00
		Summary of Friday 12 October 2018				7,013.93		8,935.40			9,949.07						25,898.40

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
	Saturday 13 October 2018	LD276	Bulga to Chugoku EPC - US $116.87	Hanabusa	14 October 2018						8,455.00						8,455.00
		LD384	Bulga to Chugoku EPC - US $116.87	Hanabusa	13 October 2018						8,490.00						8,490.00
		Summary of Saturday 13 October 2018									16,945.00						16,945.00
	Sunday 14 October 2018	LD150	Bulga to Nippon Steel Corp 1st Shiment GC Newc Jul/Sep	NSU Responsibility	14 October 2018						8,463.00						8,463.00
		LD348	Liddell to NSC JFY18 Fixed price	Dyna Camellia	14 October 2018	8,400.60											8,400.60
		Summary of Sunday 14 October 2018				8,400.60					8,463.00						16,863.60
	Monday 15 October 2018	LD132	Bulga to Chugoku EPC - US $110.78 - No sellers's commission	Shin Sanyo Maru	15 October 2018						8,258.20						8,258.20
		LD192	Bulga to Chugoku EPC - US $110.78 - No sellers's commission	Shin Sanyo Maru	15 October 2018						8,486.20						8,486.20
		Summary of Monday 15 October 2018									16,744.40						16,744.40
	Tuesday 16 October 2018	LD124	XMO to Idemitsu - (3 @ April RP minus USD$1.00)	TTM Phoenix	17 October 2018						8,229.20						8,229.20
		LD304	Liddell to NSC JFY18 Fixed price	Dyna Camellia	16 October 2018			6,424.10			2,069.70						8,493.80
		Summary of Tuesday 16 October 2018						6,424.10			10,298.90						16,723.00
	Wednesday 17 October 2018	LD116	XMO to Akemi IPP - JFY18- Oct JPU - $1.50	Star Georgia	17 October 2018			8,920.80									8,920.80
		LD224	Liddell to JFE - Apr'18-Mar'19 - October RP	Cape Green	17 October 2018			9,081.20									9,081.20

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		LD282	CM to Hokkaido - 1 x 81kt April RP	Hakuyo	18 October 2018			9,186.00									9,186.00
		Summary of Wednesday 17 October 2018						27,188.00									27,188.00
	Thursday 18 October 2018	LD138	Liddell to JFE - Apr'18-Mar'19 - October RP	Cape Green	18 October 2018						8,406.00						8,406.00
		LD220	CM to Hokkaido - 1 x 81kt April RP	Hakuyo	18 October 2018						8,463.00						8,463.00
		LD324	Bulga to Nippon Steel Corp 1st Shiment GC Newc Jul/Sep	NSU Responsibility	18 October 2018						9,066.60						9,066.60
		Summary of Thursday 18 October 2018									25,935.60						25,935.60
	Friday 19 October 2018	LD124	Bulga to Nippon Steel Corp 1st Shiment GC Newc Jul/Sep	NSU Responsibility	19 October 2018						9,150.00						9,150.00
		LD252	Liddell to JFE - Apr'18-Mar'19 - October RP	Cape Green	19 October 2018			1,839.71							7,088.29		8,928.00
		LD332	XMO to Akemi IPP - JFY18- Oct JPU - $1.50	Star Georgia	19 October 2018			5,037.17			3,515.83						8,553.00
		Summary of Friday 19 October 2018						6,876.88			12,665.83				7,088.29		26,631.00
	Saturday 20 October 2018	LD260	Liddell to JFE - Apr'18-Mar'19 - October RP	Cape Green	21 October 2018						9,146.80						9,146.80
		Summary of Saturday 20 October 2018									9,146.80						9,146.80
	Sunday 21 October 2018	LD302	Liddell to JFE - Apr'18-Mar'19 - October RP	Cape Green	22 October 2018			3,150.86			5,914.14						9,065.00
		Summary of Sunday 21 October 2018						3,150.86			5,914.14						9,065.00

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
	Monday 22 October 2018	LD102	CM to Hokkaido - 1 x 81kt April RP	Hakuyo	22 October 2018			4,545.98			4,457.02						9,003.00
		Summary of Monday 22 October 2018						4,545.98			4,457.02						9,003.00
	Wednesday 24 October 2018	LD204	Liddell to NSC JFY18 Fixed Price	NSU Sirius	24 October 2018					8,463.00							8,463.00
		LD290	SCS to JX (Toray)	Key Journey	24 October 2018			8,432.20									8,432.20
		Summary of Wednesday 24 October 2018						8,432.20		8,463.00							16,895.20
	Thursday 25 October 2018	LD178	Liddell to NSC JFY18 Fixed Price	NSU Sirius	25 October 2018	8,893.00											8,893.00
		LD310	Liddell to NSC JFY18 Fixed Price	NSU Sirius	26 October 2018	8,856.60				0.00							8,856.60
		Summary of Thursday 25 October 2018				17,749.60				0.00							17,749.60
	Friday 26 October 2018	LD124	Q3 LD to China Steel Corp - JFY18	Stella Eva	26 October 2018	3,169.60		5,727.20		0.00							8,896.80
		LD276	Liddell to NSC JFY18 Fixed Price	NSU Sirius	26 October 2018						4,079.42		4,950.18				9,029.60
		Summary of Friday 26 October 2018				3,169.60		5,727.20		0.00	4,079.42		4,950.18				17,926.40
	Tuesday 30 October 2018	LD148	Hokkaido EPC Year 3 of 3 - Base Tonnage	Corona Wisdom	30 October 2018			8,928.00									8,928.00
		Summary of Tuesday 30 October 2018						8,928.00									8,928.00
	Wednesday 31 October 2018	LD144	HVOCS NSSM SS - Q3 2018 Base Tonnage	Sen-Oku	31 October 2018									8,790.20			8,790.20
		LD330	HVOCS NSSM SS - Q3 2018 Base Tonnage	Sen-Oku	31 October 2018									8,928.00			8,928.00
		Summary of Wednesday 31 October 2018												17,718.20			17,718.20
	Thursday 01 November 2018	LD132	Hokkaido EPC Year 3 of 3 - Base Tonnage	Corona Wisdom	1 November 2018						9,051.40						9,051.40

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		LD252	HVOCS NSSM SS - Q3 2018 Base Tonnage	Sen-Oku	1 November 2018									8,412.60			8,412.60
		Summary of Thursday 01 November 2018									9,051.40			8,412.60			17,464.00
	Friday 02 November 2018	LD160	Hokkaido EPC Year 3 of 3 - Base Tonnage	Corona Wisdom	2 November 2018			4,417.47			3,990.93						8,408.40
		Summary of Friday 02 November 2018						4,417.47			3,990.93						8,408.40
	Wednesday 07 November 2018	LD274	GCS to Kobe IPP - Apr'18-Mar'19	Asahi Maru	8 November 2018			8,582.40									8,582.40
		Summary of Wednesday 07 November 2018						8,582.40									8,582.40
	Thursday 08 November 2018	LD230	GCS to Kobe IPP - Apr'18-Mar'19	Asahi Maru	8 November 2018						9,118.60						9,118.60
		LD320	Liddell to NSC JFY18 Fixed Price	Pacific Oak	9 November 2018	8,463.00											8,463.00
		Summary of Thursday 08 November 2018				8,463.00					9,118.60						17,581.60
	Friday 09 November 2018	LD230	GCS to Kobe IPP - Apr'18-Mar'19	Asahi Maru	10 November 2018	8,390.00											8,390.00
		Summary of Friday 09 November 2018				8,390.00											8,390.00
	Saturday 10 November 2018	LD152	Liddell to NSC JFY18 Fixed Price	Pacific Oak	10 November 2018			3,625.26			4,922.74						8,548.00
		Summary of Saturday 10 November 2018						3,625.26			4,922.74						8,548.00
	Sunday 11 November 2018	LD166	GCS to Kobe IPP - Apr'18-Mar'19	Asahi Maru	11 November 2018	4,569.04					4,459.16						9,028.20
		Summary of Sunday 11 November 2018				4,569.04					4,459.16						9,028.20
	Monday 12 November 2018	LD214	Liddell to NSC JFY18 Fixed Price	Ototachibana	12 November 2018			9,180.20									9,180.20
		LD270	Liddell to NSC JFY18 Fixed Price	Pacific Oak	13 November 2018			5,509.20					2,974.60				8,483.80
		Summary of Monday 12 November 2018						14,689.40					2,974.60				17,664.00
	Tuesday 13 November 2018	LD132	Liddell to NSC JFY18 Fixed Price	Ototachibana	13 November 2018						8,665.40						8,665.40

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		LD302	Liddell to Ube - JEN - October RP	Cemtex Pioneer	14 November 2018			9,043.00									9,043.00
		LD308	Liddell to NSC JFY18 Fixed Price	Ototachibana	13 November 2018			9,050.40									9,050.40
		Summary of Tuesday 13 November 2018						18,093.40			8,665.40						26,758.80
	Wednesday 14 November 2018	LD250	Liddell to NSC JFY18 Fixed Price	Ototachibana	14 November 2018			8,574.80									8,574.80
		LD366	Liddell to Ube - JEN - October RP	Cemtex Pioneer	14 November 2018						8,632.60						8,632.60
		Summary of Wednesday 14 November 2018						8,574.80			8,632.60						17,207.40
	Thursday 15 November 2018	LD208	MO to Idemitsu - Hofu	Sea Pearl	15 November 2018			9,063.60									9,063.60
		LD300	Liddell to Ube - JEN - October RP	Cemtex Pioneer	16 November 2018			2,777.02			5,685.98						8,463.00
		Summary of Thursday 15 November 2018						11,840.62			5,685.98						17,526.60
	Friday 16 November 2018	LD212	Liddell to NSC JFY18 Fixed Price	Ototachibana	16 November 2018	5,124.58		3,523.42									8,648.00
		LD362	Liddell to NSC JFY18 Fixed Price	Ototachibana	16 November 2018			8,370.00									8,370.00
		Summary of Friday 16 November 2018				5,124.58		11,893.42									17,018.00
	Saturday 17 November 2018	LD168	Liddell to NSC JFY18 Fixed Price	Ototachibana	18 November 2018			3,651.54					4,743.46				8,395.00
		Summary of Saturday 17 November 2018						3,651.54					4,743.46				8,395.00
	Sunday 18 November 2018	LD132	Liddell to NSC JFY18 Fixed Price	Ototachibana	18 November 2018			8,543.60									8,543.60
		Summary of Sunday 18 November 2018						8,543.60									8,543.60
	Sunday 25 November 2018	LD166	Liddell to NSC JFY18 Fixed Price	Ototachibana	25 November 2018						3,990.36		4,608.64				8,599.00
		LD300	Liddell to NSC JFY18 GC NEWC Jul- Sep	Dyna Globe	26 November 2018			8,504.20									8,504.20
		Summary of Sunday 25 November 2018						8,504.20			3,990.36		4,608.64				17,103.20
	Monday 26 November 2018	LD182	Q3 LD to China Steel Corp - JFY18	Sky Jade	26 November 2018				8,556.00								8,556.00

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		LD254	Liddell to NSC JFY18 GC NEWC Jul- Sep	Dyna Globe	27 November 2018			3,627.23			4,929.37						8,556.60
		Summary of Monday 26 November 2018						3,627.23	8,556.00		4,929.37						17,112.60
	Tuesday 27 November 2018	LD112	Q3 LD to China Steel Corp - JFY18	Sky Jade	27 November 2018									8,640.00			8,640.00
		LD208	Q3 LD to China Steel Corp - JFY18	Sky Jade	27 November 2018			8,253.40									8,253.40
		LD342	Q3 LD to China Steel Corp - JFY18	Sky Jade	27 November 2018									8,103.40			8,103.40
		Summary of Tuesday 27 November 2018						8,253.40						16,743.40			24,996.80
	Wednesday 28 November 2018	LD168	Liddell to Ube - Mitsubishi Paper (October RP + 1.00)	Great Legend	28 November 2018				9,122.00								9,122.00
		Summary of Wednesday 28 November 2018							9,122.00								9,122.00
	Thursday 29 November 2018	LD148	Liddell to JFE - Apr'18-Mar'19 - October RP	Unta	29 November 2018				8,347.60								8,347.60
		LD182	Liddell to JFE - Apr'18-Mar'19 - October RP	Unta	29 November 2018						8,975.20						8,975.20
		LD324	Liddell to Ube - Mitsubishi Paper (October RP + 1.00)	Great Legend	29 November 2018				8,442.80								8,442.80
		Summary of Thursday 29 November 2018							16,790.40		8,975.20						25,765.60
	Friday 30 November 2018	LD150	Liddell to Ube - Mitsubishi Paper (October RP + 1.00)	Great Legend	30 November 2018						9,151.00						9,151.00
		LD210	Liddell to JFE - Apr'18-Mar'19 - October RP	Unta	30 November 2018					8,463.00							8,463.00

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		Summary of Friday 30 November 2018								8,463.00	9,151.00						17,614.00
	Saturday 01 December 2018	LD214	Liddell to JFE - Apr'18-Mar'19 - October RP	Unta	1 December 2018				4,799.12		3,663.88						8,463.00
		Summary of Saturday 01 December 2018							4,799.12		3,663.88						8,463.00
	Monday 03 December 2018	LD234	Liddell to NSC JFY18 GC NEWC Jul- Sep	Santa Lucia	3 December 2018				8,323.20								8,323.20
		LD302	Liddell to NSC JFY18 GC NEWC Jul- Sep	Santa Lucia	4 December 2018				8,556.00								8,556.00
		Summary of Monday 03 December 2018							16,879.20								16,879.20
	Thursday 06 December 2018	LD154	Liddell to NSC JFY18 GC NEWC Jul- Sep	Santa Lucia	6 December 2018				8,928.00		0.00						8,928.00
		Summary of Thursday 06 December 2018							8,928.00		0.00						8,928.00
	Sunday 09 December 2018	LD246	Liddell to NSC JFY18 GC NEWC Jul- Sep	Kashima Maru	9 December 2018				8,409.60								8,409.60
		Summary of Sunday 09 December 2018							8,409.60								8,409.60
	Monday 10 December 2018	LD240	Liddell to NSC JFY18 GC NEWC Jul- Sep	Kashima Maru	10 December 2018	8,509.00											8,509.00
		LD340	Liddell to NSC JFY18 GC NEWC Jul- Sep	Kashima Maru	10 December 2018				8,823.20								8,823.20
		Summary of Monday 10 December 2018				8,509.00			8,823.20								17,332.20
	Tuesday 11 December 2018	LD326	Liddell to NSC JFY18 GC NEWC Jul- Sep	Kashima Maru	11 December 2018				8,862.20								8,862.20
		Summary of Tuesday 11 December 2018							8,862.20								8,862.20
	Wednesday 12 December 2018	LD130	Liddell to Ube - JEN - October RP	Alpha Loyalty	12 December 2018				9,127.40								9,127.40
		LD222	Liddell to Ube - JEN - October RP	Alpha Loyalty	12 December 2018				8,821.40								8,821.40
		Summary of Wednesday 12 December 2018							17,948.80								17,948.80

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
	Thursday 13 December 2018	LD150	Liddell to Ube - JEN - October RP	Alpha Loyalty	13 December 2018				9,064.20								9,064.20
		Summary of Thursday 13 December 2018							9,064.20								9,064.20
	Saturday 15 December 2018	LD104	Liddell to Ube - JEN - October RP	Alpha Loyalty	15 December 2018				5,250.19				3,282.01				8,532.20
		LD174	Liddell to NSC JFY18 GC NEWC Jul- Sep	Hisui Horizon	15 December 2018					9,036.40							9,036.40
		LD266	Liddell to NSC JFY18 GC NEWC Jul- Sep	Hisui Horizon	16 December 2018				2,982.20								2,982.20
		LD316	Liddell to Ube - JEN - October RP	Alpha Loyalty	15 December 2018				9,095.20								9,095.20
		Summary of Saturday 15 December 2018							17,327.59	9,036.40			3,282.01				29,646.00
	Sunday 16 December 2018	LD112	Liddell to NSC JFY18 GC NEWC Jul- Sep	Hisui Horizon	16 December 2018				4,606.45				4,489.95				9,096.40
		LD240	Liddell to NSC JFY18 GC NEWC Jul- Sep	Hisui Horizon	17 December 2018				9,178.00								9,178.00
		Summary of Sunday 16 December 2018							13,784.45				4,489.95				18,274.40
	Monday 17 December 2018	LD278	Liddell to NSC JFY18 GC NEWC Jul- Sep	Hisui Horizon	18 December 2018				9,221.00								9,221.00
		LD388	CM to Hokkaido - Shipments 1 & 2 @ Oct. RP	Corona Ace	17 December 2018				8,645.00								8,645.00
		Summary of Monday 17 December 2018							17,866.00								17,866.00
	Tuesday 18 December 2018	LD250	Liddell to NSC JFY18 GC NEWC Jul- Sep	Hisui Horizon	19 December 2018				9,215.00								9,215.00
		LD362	CM to Hokkaido - Shipments 1 & 2 @ Oct. RP	Corona Ace	18 December 2018				8,846.00								8,846.00
		Summary of Tuesday 18 December 2018							18,061.00								18,061.00
	Wednesday 19 December 2018	LD198	Liddell to NSC JFY18 Fixed Price	New Future	19 December 2018				8,928.00								8,928.00

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		LD334	Liddell to NSC JFY18 Fixed Price	New Future	19 December 2018				3,854.58				3,779.62				7,634.20
		Summary of Wednesday 19 December 2018							12,782.58				3,779.62				16,562.20
	Thursday 20 December 2018	LD130	Liddell to NSC JFY18 GC NEWC Jul- Sep	Hisui Horizon	20 December 2018				4,281.65				4,753.35				9,035.00
		Summary of Thursday 20 December 2018							4,281.65				4,753.35				9,035.00
	Friday 21 December 2018	LD132	Liddell to NSC JFY18 Fixed Price	New Future	21 December 2018					8,928.00							8,928.00
		Summary of Friday 21 December 2018								8,928.00							8,928.00
	Saturday 22 December 2018	LD138	Liddell to NSC JFY18 Fixed Price	New Future	22 December 2018				8,463.00								8,463.00
		LD264	Liddell to NSC JFY18 Fixed Price	New Future	22 December 2018	8,463.00											8,463.00
		Summary of Saturday 22 December 2018				8,463.00			8,463.00								16,926.00
	Sunday 23 December 2018	LD140	Liddell to NSC JFY18 Fixed Price	New Future	23 December 2018				3,613.93				4,695.27				8,309.20
		LD302	UL to GIAG (TPC) (MO Brand)	W-Oslo	24 December 2018					8,928.00							8,928.00
		Summary of Sunday 23 December 2018							3,613.93	8,928.00			4,695.27				17,237.20
	Thursday 27 December 2018	LD182	Liddell to NSC JFY18 Fixed Price	Kure Maru	27 December 2018				8,930.00								8,930.00
		Summary of Thursday 27 December 2018							8,930.00								8,930.00
	Friday 28 December 2018	LD120	Liddell to NSC JFY18 Fixed Price	Kure Maru	28 December 2018				4,428.16				4,493.24				8,921.40
		LD276	Q3 LD to China Steel Corp - JFY18	Amami	29 December 2018									8,694.60			8,694.60
		Summary of Friday 28 December 2018							4,428.16				4,493.24	8,694.60			17,616.00
	Saturday 29 December 2018	LD244	Q3 LD to China Steel Corp - JFY18	Amami	29 December 2018									8,509.00			8,509.00
		Summary of Saturday 29 December 2018												8,509.00			8,509.00
	Sunday 30 December 2018	LD388	Liddell to NSC JFY18 Fixed Price	Cape Rainbow	30 December 2018	8,826.60											8,826.60
		Summary of Sunday 30 December 2018				8,826.60											8,826.60

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
	Monday 31 December 2018	LD106	Liddell to NSC JFY18 Fixed Price	Cape Rainbow	31 December 2018				8,425.60								8,425.60
		LD166	Bulga to Kansai EPC US$109.77	Maizuru Benten	31 December 2018					4,990.08			4,088.92				9,079.00
		LD210	Liddell to NSC JFY18 Fixed Price	Cape Rainbow	31 December 2018				3,139.20	5,838.20							8,977.40
		LD276	Q3 LD to China Steel Corp - JFY18	Amami	31 December 2018									9,012.20			9,012.20
		Summary of Monday 31 December 2018							11,564.80	10,828.28			4,088.92	9,012.20			35,494.20
	Summary of Pacific National					432,461.57	77,939.03	754,719.10	685,712.78	132,355.28	683,428.55	459,363.70	267,485.03	156,611.31	136,350.50	205,028.75	3,991,455.60
Summary of Liddell Coal Marketing Pty Ltd						432,461.57	77,939.03	754,719.10	685,712.78	132,355.28	683,428.55	459,363.70	267,485.03	156,611.31	136,350.50	205,028.75	3,991,455.60
Grand Total						432,461.57	77,939.03	754,719.10	685,712.78	132,355.28	683,428.55	459,363.70	267,485.03	156,611.31	136,350.50	205,028.75	3,991,455.60

COAL UNLOADED DELTA

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	Total
Grand Total						

Coal Receivals total 3,991,455.60

Coal Unloaded delta Total:

Adj Total: 3,991,455.6

sbrennan Thu Jan 10 2019 09:23:20 GMT+1100 (AEDT)

Appendix B - Meteorological Summary

Date Sampled	Average Air temp @ 2m (°C)	Average Air temp @ 10m (°C)	Average Wind Speed (m/s)	Daily Rain (mm)
1/01/2018	26.5	25.7	4.1	0.0
2/01/2018	25.1	24.2	4.5	7.8
3/01/2018	23.0	22.2	5.0	0.2
4/01/2018	23.1	22.1	3.7	0.0
5/01/2018	24.9	24.2	2.6	0.0
6/01/2018	29.5	29.0	2.2	0.0
7/01/2018	35.3	35.0	3.5	0.0
8/01/2018	31.0	30.4	3.0	0.0
9/01/2018	28.8	28.1	2.9	0.6
10/01/2018	22.7	21.8	5.4	0.0
11/01/2018	24.6	23.7	3.3	0.0
12/01/2018	27.8	27.3	2.0	0.6
13/01/2018	31.2	30.7	5.9	0.0
14/01/2018	22.8	21.8	5.0	0.0
15/01/2018	21.6	20.7	3.7	0.0
16/01/2018	21.9	20.9	5.4	0.0
17/01/2018	21.5	20.9	3.5	0.0
18/01/2018	23.4	23.0	2.8	0.0
19/01/2018	26.4	25.9	3.1	0.0
20/01/2018	25.5	24.8	3.6	0.0
21/01/2018	26.5	25.7	3.4	0.0
22/01/2018	30.2	29.9	2.7	0.0
23/01/2018	29.4	29.0	2.7	0.0
24/01/2018	29.2	28.6	3.3	0.0
25/01/2018	27.4	26.7	2.9	0.0
26/01/2018	27.9	27.1	2.8	0.0
27/01/2018	28.7	27.9	3.1	0.0
28/01/2018	28.3	27.4	4.8	0.0
29/01/2018	26.9	25.9	4.7	0.0
30/01/2018	27.4	26.8	2.5	0.0
31/01/2018	21.8	20.9	5.3	0.0
1/02/2018	20.3	19.3	5.3	0.0
2/02/2018	20.2	19.3	4.5	0.0
3/02/2018	21.7	20.7	5.1	0.0
4/02/2018	21.7	20.9	4.5	0.0
5/02/2018	22.9	22.3	3.2	0.0
6/02/2018	23.7	22.8	4.1	0.0
7/02/2018	23.9	23.2	4.0	0.0
8/02/2018	25.3	24.8	2.0	0.0
9/02/2018	28.3	28.1	3.2	0.4

Date Sampled	Average Air temp @ 2m (°C)	Average Air temp @ 10m (°C)	Average Wind Speed (m/s)	Daily Rain (mm)
10/02/2018	27.6	26.7	3.0	0.0
11/02/2018	28.1	27.5	5.1	0.0
12/02/2018	27.5	26.6	3.9	0.0
13/02/2018	26.9	26.0	3.8	0.4
14/02/2018	30.2	29.5	3.9	0.0
15/02/2018	27.7	26.9	3.5	0.0
16/02/2018	26.7	25.9	4.5	0.0
17/02/2018	25.4	24.4	4.4	0.0
18/02/2018	27.7	27.0	3.0	0.0
19/02/2018	25.2	24.4	4.5	0.0
20/02/2018	19.7	19.0	5.2	10.6
21/02/2018	21.3	20.4	4.4	0.0
22/02/2018	22.2	21.6	3.0	0.0
23/02/2018	24.5	23.7	2.6	0.0
24/02/2018	28.2	27.6	3.0	0.0
25/02/2018	26.2	25.4	4.5	19.4
26/02/2018	18.8	18.1	4.2	19.4
27/02/2018	20.9	20.1	4.2	0.0
28/02/2018	24.6	24.0	2.7	0.0
1/03/2018	26.0	25.1	5.3	0.0
2/03/2018	23.1	22.2	4.3	0.0
3/03/2018	25.1	24.5	2.2	0.0
4/03/2018	25.6	25.0	3.0	30.6
5/03/2018	22.8	22.0	3.2	0.6
6/03/2018	20.0	19.3	4.5	1.8
7/03/2018	20.8	20.1	5.4	0.0
8/03/2018	20.9	20.0	4.7	0.0
9/03/2018	21.3	20.5	4.5	0.0
10/03/2018	21.6	20.9	3.9	0.0
11/03/2018	21.5	20.9	2.5	0.0
12/03/2018	21.1	20.7	2.7	0.0
13/03/2018	21.9	21.1	4.2	0.0
14/03/2018	23.9	23.1	2.3	0.0
15/03/2018	26.0	25.5	2.6	0.0
16/03/2018	25.0	24.1	4.4	1.0
17/03/2018	27.5	26.8	2.9	0.0
18/03/2018	29.6	29.2	3.8	0.0
19/03/2018	29.4	28.9	2.6	0.0
20/03/2018	24.8	24.3	4.1	0.0
21/03/2018	20.0	19.2	5.4	22.2

Date Sampled	Average Air temp @ 2m (°C)	Average Air temp @ 10m (°C)	Average Wind Speed (m/s)	Daily Rain (mm)
22/03/2018	18.7	18.0	5.2	9.4
23/03/2018	19.6	18.9	4.1	2.6
24/03/2018	22.7	22.0	1.8	0.0
25/03/2018	26.3	25.8	4.0	0.0
26/03/2018	22.8	22.3	4.1	21.2
27/03/2018	18.9	18.5	3.7	0.0
28/03/2018	21.7	21.4	1.9	0.0
29/03/2018	22.2	21.5	2.1	0.0
30/03/2018	27.1	27.4	1.5	0.0
31/03/2018	23.0	22.3	3.7	0.0
1/04/2018	24.5	24.0	1.6	0.0
2/04/2018	24.9	24.7	2.8	0.8
3/04/2018	22.3	21.6	4.0	0.0
4/04/2018	22.0	21.1	3.3	0.0
5/04/2018	22.7	22.1	1.8	0.0
6/04/2018	22.7	22.3	2.5	0.0
7/04/2018	22.6	22.3	1.7	0.0
8/04/2018	24.2	24.0	2.4	0.0
9/04/2018	26.3	25.8	3.4	0.0
10/04/2018	21.4	20.7	3.5	0.0
11/04/2018	22.0	21.8	1.5	0.0
12/04/2018	25.1	24.7	3.8	0.0
13/04/2018	26.7	26.0	4.8	0.0
14/04/2018	24.5	23.8	6.1	8.8
15/04/2018	21.8	21.1	7.1	0.0
16/04/2018	23.3	22.7	5.2	0.0
17/04/2018	20.0	19.5	3.6	0.0
18/04/2018	19.3	18.5	3.7	0.0
19/04/2018	19.4	19.2	1.8	0.0
20/04/2018	20.3	19.7	2.5	0.2
21/04/2018	19.9	19.2	3.0	0.0
22/04/2018	18.8	18.4	2.6	0.0
23/04/2018	18.9	18.5	2.0	0.0
24/04/2018	19.0	18.8	2.2	0.0
25/04/2018	17.9	17.6	1.3	1.6
26/04/2018	20.8	20.1	3.2	0.0
27/04/2018	18.4	17.7	3.5	0.0
28/04/2018	16.7	16.2	2.9	0.0
29/04/2018	16.0	15.5	1.9	0.0
30/04/2018	16.9	16.6	1.8	0.8

Date Sampled	Average Air temp @ 2m (°C)	Average Air temp @ 10m (°C)	Average Wind Speed (m/s)	Daily Rain (mm)
1/05/2018	17.0	16.7	2.0	0.0
2/05/2018	17.7	17.6	1.6	0.0
3/05/2018	19.7	19.5	1.9	0.0
4/05/2018	21.1	20.8	4.4	0.0
5/05/2018	15.4	15.1	2.0	0.0
6/05/2018	14.1	14.0	2.3	0.0
7/05/2018	16.1	16.3	1.8	0.0
8/05/2018	17.4	17.4	1.6	0.0
9/05/2018	19.0	18.6	2.6	0.0
10/05/2018	19.6	18.9	4.9	0.0
11/05/2018	12.8	11.9	8.6	0.0
12/05/2018	16.2	15.4	7.5	0.0
13/05/2018	16.1	15.4	3.1	0.0
14/05/2018	15.5	15.1	2.4	0.0
15/05/2018	14.7	14.3	2.2	0.0
16/05/2018	14.0	13.7	2.5	0.0
17/05/2018	13.4	13.5	1.2	0.0
18/05/2018	15.4	14.8	2.7	0.0
19/05/2018	13.9	14.0	1.6	0.0
20/05/2018	15.4	14.7	4.2	0.0
21/05/2018	15.9	15.1	4.6	0.0
22/05/2018	17.3	16.5	4.7	0.0
23/05/2018	16.0	15.6	1.9	0.0
24/05/2018	16.1	15.4	2.9	0.0
25/05/2018	16.5	15.8	3.2	0.0
26/05/2018	14.3	14.2	2.0	0.0
27/05/2018	13.6	13.2	1.5	0.0
28/05/2018	14.3	14.1	1.3	0.0
29/05/2018	17.1	16.7	2.5	0.0
30/05/2018	15.2	14.4	3.8	5.2
31/05/2018	12.7	12.2	3.7	0.0
1/06/2018	12.6	12.6	2.1	0.0
2/06/2018	12.4	12.2	2.3	3.6
3/06/2018	15.8	15.2	2.4	0.6
4/06/2018	14.6	14.1	1.9	0.0
5/06/2018	13.8	13.1	2.4	0.8
6/06/2018	13.3	12.6	2.2	0.8
7/06/2018	14.3	13.7	2.7	0.2
8/06/2018	12.7	12.5	1.6	0.4
9/06/2018	14.2	13.6	1.7	2.2

Date Sampled	Average Air temp @ 2m (°C)	Average Air temp @ 10m (°C)	Average Wind Speed (m/s)	Daily Rain (mm)
10/06/2018	12.6	12.1	1.5	1.6
11/06/2018	13.2	12.7	1.3	0.8
12/06/2018	12.8	12.3	2.0	0.2
13/06/2018	14.7	14.0	3.5	0.0
14/06/2018	13.8	13.0	3.3	0.0
15/06/2018	15.5	14.8	5.6	0.0
16/06/2018	14.7	13.9	6.5	0.0
17/06/2018	11.5	10.6	8.4	0.0
18/06/2018	13.5	12.7	4.5	0.0
19/06/2018	11.6	10.9	2.2	18.2
20/06/2018	13.3	12.8	2.4	1.2
21/06/2018	13.0	12.5	1.2	0.0
22/06/2018	11.7	11.1	1.5	0.2
23/06/2018	13.5	12.8	3.0	0.0
24/06/2018	11.2	11.0	1.9	0.0
25/06/2018	11.1	10.9	1.9	0.0
26/06/2018	10.8	10.7	1.8	0.0
27/06/2018	11.5	11.0	1.4	0.0
28/06/2018	13.0	12.2	1.4	2.4
29/06/2018	11.7	10.8	3.0	0.2
30/06/2018	13.9	13.3	3.8	0.0
1/07/2018	11.0	10.6	1.9	0.0
2/07/2018	13.4	12.6	3.1	0.0
3/07/2018	12.6	12.1	1.5	0.0
4/07/2018	13.4	13.0	1.6	0.2
5/07/2018	17.6	16.9	2.9	0.0
6/07/2018	20.4	19.7	6.5	0.0
7/07/2018	13.1	12.2	6.4	0.0
8/07/2018	11.8	10.9	8.4	0.0
9/07/2018	12.7	12.2	2.8	0.0
10/07/2018	10.6	10.3	2.0	0.0
11/07/2018	10.9	10.8	1.5	0.0
12/07/2018	11.8	11.4	2.8	0.0
13/07/2018	11.7	10.9	4.1	0.0
14/07/2018	10.5	9.8	2.7	0.0
15/07/2018	10.9	10.1	3.2	0.0
16/07/2018	11.4	10.6	4.0	0.0
17/07/2018	14.6	13.9	4.8	0.0
18/07/2018	17.3	16.8	3.9	0.0
19/07/2018	15.7	15.2	3.5	0.0

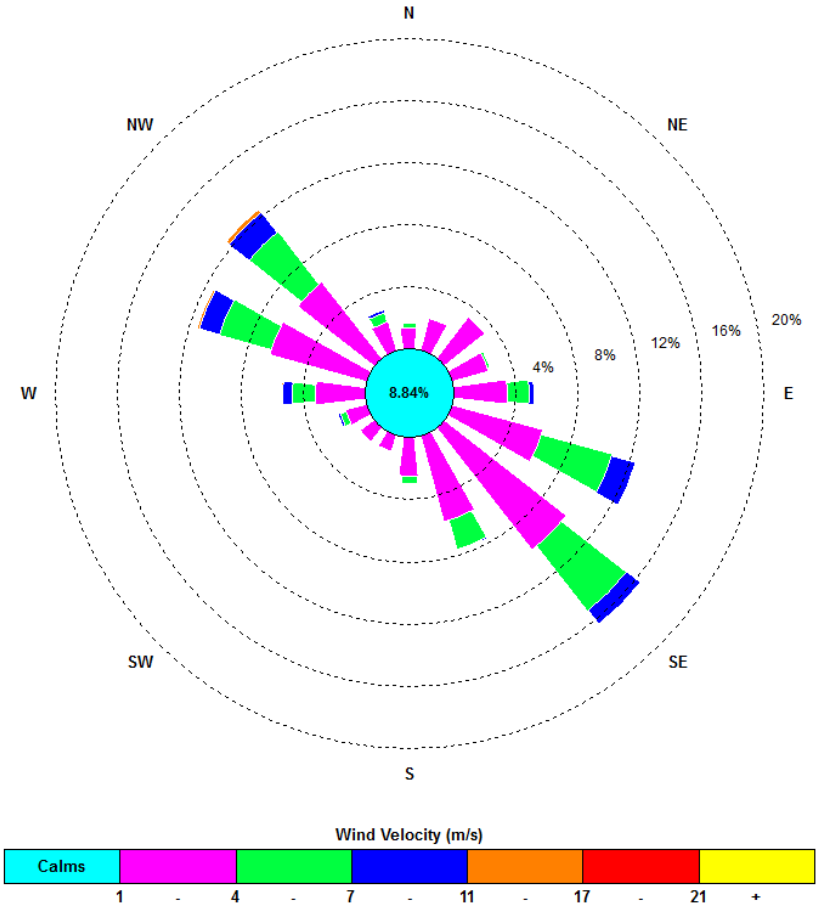
Date Sampled	Average Air temp @ 2m (°C)	Average Air temp @ 10m (°C)	Average Wind Speed (m/s)	Daily Rain (mm)
20/07/2018	14.6	14.1	5.8	0.0
21/07/2018	11.7	11.2	3.4	0.0
22/07/2018	9.6	9.5	1.8	0.0
23/07/2018	11.6	11.2	2.8	0.0
24/07/2018	17.5	17.0	4.4	0.0
25/07/2018	16.7	16.2	3.0	0.0
26/07/2018	14.8	14.3	2.9	0.0
27/07/2018	13.7	13.7	1.3	0.0
28/07/2018	15.1	14.9	1.5	0.0
29/07/2018	17.4	16.9	5.2	0.2
30/07/2018	14.1	13.2	5.0	0.0
31/07/2018	14.6	13.8	4.9	0.0
1/08/2018	15.6	15.2	3.1	0.0
2/08/2018	13.1	13.0	2.0	0.0
3/08/2018	15.0	14.8	2.9	0.8
4/08/2018	14.8	14.0	4.8	0.6
5/08/2018	14.3	14.0	2.4	0.0
6/08/2018	12.7	12.4	3.8	12.8
7/08/2018	13.8	13.1	5.7	0.0
8/08/2018	14.0	13.3	4.3	0.0
9/08/2018	14.0	13.5	2.0	0.0
10/08/2018	13.6	13.6	2.3	0.0
11/08/2018	18.0	17.5	5.0	0.0
12/08/2018	13.2	12.3	5.2	0.0
13/08/2018	13.2	12.3	5.0	0.0
14/08/2018	15.6	14.8	4.5	0.0
15/08/2018	17.8	17.0	5.6	0.0
16/08/2018	19.4	18.7	5.5	0.0
17/08/2018	13.3	12.8	3.3	0.0
18/08/2018	15.1	14.4	5.1	0.0
19/08/2018	12.6	11.8	6.7	0.0
20/08/2018	12.0	11.1	3.4	0.0
21/08/2018	13.0	12.1	5.4	0.0
22/08/2018	13.3	12.6	3.5	0.0
23/08/2018	11.7	11.4	2.6	0.0
24/08/2018	13.8	13.1	2.6	0.0
25/08/2018	13.8	13.5	1.8	0.2
26/08/2018	13.5	12.8	1.9	7.6
27/08/2018	13.3	12.5	3.1	3.2
28/08/2018	11.9	11.3	1.9	0.0

Date Sampled	Average Air temp @ 2m (°C)	Average Air temp @ 10m (°C)	Average Wind Speed (m/s)	Daily Rain (mm)
29/08/2018	11.2	10.7	2.7	0.0
30/08/2018	11.5	11.1	2.2	0.0
31/08/2018	13.0	12.5	2.7	6.6
1/09/2018	16.1	15.4	6.0	0.0
2/09/2018	14.7	13.8	3.4	0.0
3/09/2018	13.1	12.3	3.7	0.2
4/09/2018	13.3	12.4	4.0	1.0
5/09/2018	14.3	13.4	3.1	0.0
6/09/2018	16.6	15.9	1.8	3.6
7/09/2018	16.0	15.3	1.8	7.2
8/09/2018	15.3	14.6	2.6	0.4
9/09/2018	16.6	15.9	3.6	0.2
10/09/2018	17.0	16.3	2.2	0.0
11/09/2018	16.1	16.2	1.4	0.0
12/09/2018	21.2	20.9	3.4	0.0
13/09/2018	19.6	18.8	3.8	0.0
14/09/2018	21.6	21.1	2.2	0.0
15/09/2018	23.5	23.1	4.9	0.0
16/09/2018	14.7	13.9	4.0	0.0
17/09/2018	13.1	12.7	2.4	0.0
18/09/2018	17.6	17.3	2.9	0.0
19/09/2018	21.9	21.4	4.8	0.0
20/09/2018	13.9	13.3	3.2	0.0
21/09/2018	14.6	14.2	2.1	0.0
22/09/2018	17.4	17.2	2.3	0.0
23/09/2018	18.7	18.1	3.5	0.0
24/09/2018	14.3	13.4	4.7	0.0
25/09/2018	14.7	13.8	3.3	0.0
26/09/2018	11.6	11.1	1.9	3.8
27/09/2018	15.3	14.7	1.4	0.0
28/09/2018	19.8	19.5	3.0	0.0
29/09/2018	19.4	18.6	4.6	0.0
30/09/2018	15.0	14.1	4.0	0.0
1/10/2018	15.9	15.3	2.8	0.0
2/10/2018	17.8	17.3	2.5	0.0
3/10/2018	20.4	20.0	2.7	0.0
4/10/2018	17.8	17.2	2.7	20.8
5/10/2018	15.1	14.3	3.9	8.4
6/10/2018	15.6	14.9	4.0	0.4
7/10/2018	16.6	16.0	1.6	1.8

Date Sampled	Average Air temp @ 2m (°C)	Average Air temp @ 10m (°C)	Average Wind Speed (m/s)	Daily Rain (mm)
8/10/2018	19.5	18.8	2.7	0.4
9/10/2018	20.6	20.1	1.9	0.0
10/10/2018	15.7	15.3	3.4	11.8
11/10/2018	14.1	13.2	5.7	5.2
12/10/2018	15.3	14.4	5.1	0.2
13/10/2018	16.5	15.5	4.6	0.0
14/10/2018	18.5	17.6	5.3	0.4
15/10/2018	19.1	18.2	5.6	0.0
16/10/2018	20.4	19.6	3.8	0.0
17/10/2018	20.2	19.4	2.3	3.6
18/10/2018	21.3	20.6	1.8	1.8
19/10/2018	23.8	23.3	1.9	0.0
20/10/2018	23.5	23.0	2.9	5.2
21/10/2018	19.2	18.3	3.6	0.0
22/10/2018	21.0	20.1	3.0	0.2
23/10/2018	23.9	23.5	2.2	0.0
24/10/2018	19.7	19.0	5.2	0.0
25/10/2018	19.2	18.3	3.8	0.0
26/10/2018	20.7	19.9	3.7	0.0
27/10/2018	22.9	22.1	2.8	0.0
28/10/2018	17.7	17.0	4.7	0.0
29/10/2018	18.0	17.1	4.2	0.0
30/10/2018	22.0	21.6	2.0	0.0
31/10/2018	25.6	25.2	3.2	0.0
1/11/2018	26.8	26.1	2.5	0.0
2/11/2018	30.3	29.7	5.7	0.0
3/11/2018	28.8	28.1	6.3	0.0
4/11/2018	23.7	22.8	3.4	0.0
5/11/2018	25.9	25.6	2.4	0.0
6/11/2018	29.6	29.1	3.4	0.0
7/11/2018	24.6	24.1	3.8	11.0
8/11/2018	16.9	16.1	3.4	8.2
9/11/2018	18.0	17.4	2.4	0.0
10/11/2018	19.8	19.1	3.2	0.0
11/11/2018	19.9	19.3	3.1	0.0
12/11/2018	20.7	19.8	3.8	0.0
13/11/2018	22.0	21.3	2.3	0.0
14/11/2018	22.2	21.6	1.8	0.0
15/11/2018	23.2	22.4	4.2	4.0
16/11/2018	17.8	17.0	4.0	1.2

Date Sampled	Average Air temp @ 2m (°C)	Average Air temp @ 10m (°C)	Average Wind Speed (m/s)	Daily Rain (mm)
17/11/2018	19.9	19.0	4.7	0.0
18/11/2018	19.2	18.3	5.5	0.0
19/11/2018	20.4	19.6	3.3	0.0
20/11/2018	23.5	22.8	2.1	0.0
21/11/2018	24.5	23.8	5.4	0.0
22/11/2018	23.5	22.7	7.8	0.0
23/11/2018	19.9	19.0	8.4	0.0
24/11/2018	21.4	20.5	5.9	0.0
25/11/2018	22.8	22.0	4.7	0.0
26/11/2018	20.4	19.8	3.3	0.0
27/11/2018	21.4	20.8	2.4	0.6
28/11/2018	19.1	18.4	3.5	35.6
29/11/2018	19.9	19.1	3.5	0.0
30/11/2018	21.0	20.5	1.7	0.0
1/12/2018	24.0	23.6	2.3	0.0
2/12/2018	26.9	26.7	5.6	0.0
3/12/2018	24.1	23.5	3.5	0.0
4/12/2018	23.7	23.1	4.6	0.0
5/12/2018	20.7	19.8	6.1	0.0
6/12/2018	22.1	21.2	4.6	0.0
7/12/2018	22.3	21.6	2.9	0.0
8/12/2018	24.4	23.8	2.6	0.0
9/12/2018	26.4	25.9	2.8	0.0
10/12/2018	26.0	25.3	3.7	0.2
11/12/2018	20.7	19.9	2.9	23.4
12/12/2018	21.4	20.6	3.6	0.4
13/12/2018	24.3	23.7	2.7	10.6
14/12/2018	23.4	22.8	2.3	8.6
15/12/2018	24.6	23.9	2.1	0.0
16/12/2018	25.3	24.7	2.6	20.0
17/12/2018	27.0	26.4	3.2	0.0
18/12/2018	25.3	24.6	4.0	0.0
19/12/2018	25.3	24.5	3.6	7.4
20/12/2018	27.2	26.6	3.1	0.4
21/12/2018	22.9	22.1	4.5	0.0
22/12/2018	21.1	20.2	4.4	0.0
23/12/2018	20.2	19.4	4.0	0.0
24/12/2018	21.2	20.7	3.0	0.0
25/12/2018	25.1	24.7	2.5	0.0
26/12/2018	27.1	26.9	2.5	0.0

Date Sampled	Average Air temp @ 2m (°C)	Average Air temp @ 10m (°C)	Average Wind Speed (m/s)	Daily Rain (mm)
27/12/2018	28.7	28.5	2.4	0.0
28/12/2018	30.0	30.1	2.7	0.0
29/12/2018	29.9	29.8	2.6	0.0
30/12/2018	31.7	31.4	3.3	0.0
31/12/2018	29.5	29.2	3.0	3.8



Annual Windrose

Appendix C - Air Quality Monitoring Results

Depositional Dust Compliance Monitoring Results					
Month	D55		D62		Criteria
	Insoluble Solids g/m2/month	Annual Average g/m2/month	Insoluble Solids g/m2/month	Annual Average g/m2/month	Annual Average g/m2/month
Jan-18	4	2.4	3.3	1.7	4
Feb-18	1	2.2	1.2	1.6	4
Mar-18	1.2	2.1	1.2	1.5	4
Apr-18	1.3	2.0	1	1.5	4
May-18	0.8	1.9	1.4	1.5	4
Jun-18	1.4	1.9	1.3	1.5	4
Jul-18	0.5	1.7	0.9	1.5	4
Aug-18	1.2	1.7	0.7	1.5	4
Sep-18	1.5	1.7	1.3	1.6	4
Oct-18	1.4	1.7	1.7	1.6	4
Nov-18	2.1	1.8	2.4	1.7	4
Dec-18	1.5	1.5	2.4	1.6	4

c – Indicates a contaminated sample, this is often due to bird droppings, insects and similar.

High Volume Air Sampling Compliance Monitoring Results – TSP					
Date	Scrivens (HVAS 11)		Antiene (HVAS 20)		Criteria
	TSP (ug.m-3)	12month Rolling Average	TSP (ug.m-3)	12month Rolling Average	TSP Annual Average Criterion
1-Jan-18	60	33	62	46	90
7-Jan-18	128	35	45	46	90
13-Jan-18	70	35	89	47	90
19-Jan-18	70	36	100	47	90
25-Jan-18	85	37	136	48	90
31-Jan-18	57	37	86	49	90
6-Feb-18	43	37	83	49	90
12-Feb-18	75	37	111	51	90
18-Feb-18	90	37	115	51	90
24-Feb-18	35	37	69	51	90
2-Mar-18	43	37	59	50	90
8-Mar-18	43	38	38	50	90
14-Mar-18	38	37	68	50	90
20-Mar-18	91	38	117	51	90
26-Mar-18	21	38	35	51	90
1-Apr-18	37	39	51	51	90
7-Apr-18	34	39	40	51	90
13-Apr-18	45	39	62	52	90
19-Apr-18	21	39	37	52	90
25-Apr-18	38	39	56	52	90
1-May-18	15	39	32	52	90
7-May-18	25	39	37	52	90
13-May-18	44	39	57	52	90
19-May-18	36	39	61	52	90
25-May-18	49	39	49	52	90
31-May-18	17	40	37	52	90
6-Jun-18	22	40	30	52	90
12-Jun-18	18	40	21	52	90
18-Jun-18	25	39	28	52	90
24-Jun-18	16	39	30	51	90
30-Jun-18	17	39	24	51	90
6-Jul-18	28	40	33	52	90
12-Jul-18	23	39	48	52	90
18-Jul-18	66	40	75	53	90
24-Jul-18	38	41	54	53	90
30-Jul-18	26	41	39	53	90
5-Aug-18	27	41	42	54	90
11-Aug-18	36	42	50	54	90
17-Aug-18	37	42	52	55	90
23-Aug-18	29	41	55	55	90
29-Aug-18	38	41	61	55	90
4-Sep-18	26	41	29	55	90

High Volume Air Sampling Compliance Monitoring Results – TSP					
10-Sep-18	22	41	51	55	90
16-Sep-18	73	42	67	55	90
22-Sep-18	53	42	89	56	90
28-Sep-18	24	42	34	56	90
4-Oct-18	46	41	44	55	90
10-Oct-18	29	42	35	54	90
16-Oct-18	31	42	58	54	90
22-Oct-18	62	42	88	55	90
28-Oct-18	54	43	70	56	90
3-Nov-18	57	43	64	56	90
9-Nov-18	55	44	59	56	90
15-Nov-18	45	44	68	57	90
21-Nov-18	52	44	55	57	90
27-Nov-18	56	44	80	58	90
3-Dec-18	72	45	76	58	90
9-Dec-18	63	45	73	59	90
15-Dec-18	37	44	84	59	90
21-Dec-18	54	44	65	59	90

High Volume Air Sampling Compliance Monitoring Results – PM10						
Date	Scrivens (HVAS 12)		Antiene (HVAS 21)		Criteria	
	PM10 (ug/m3)	12month Rolling Average	PM10 (ug/m3)	12month Rolling Average	PM10 Individual Event Criterion	PM10 Annual Average Criterion
1-Jan-18	21	14	19	18	50	30
7-Jan-18	47	14	19	18	50	30
13-Jan-18	29	14	32	18	50	30
19-Jan-18	27	14	37	18	50	30
25-Jan-18	34	15	37	19	50	30
31-Jan-18	17	15	24	19	50	30
6-Feb-18	14	14	22	19	50	30
12-Feb-18	32	15	35	19	50	30
18-Feb-18	34	15	40	19	50	30
24-Feb-18	11	14	19	18	50	30
2-Mar-18	17	14	17	18	50	30
8-Mar-18	11	14	13	18	50	30
14-Mar-18	20	15	25	18	50	30
20-Mar-18	45	15	48	19	50	30
26-Mar-18	10	15	27	19	50	30
1-Apr-18	19	15	25	19	50	30
7-Apr-18	19	15	20	20	50	30
13-Apr-18	18	15	22	20	50	30
19-Apr-18	10	15	13	20	50	30
25-Apr-18	17	15	21	20	50	30
1-May-18	5	15	10	19	50	30
7-May-18	10	15	15	19	50	30
13-May-18	13	15	15	19	50	30
19-May-18	17	15	26	19	50	30
25-May-18	21	15	18	19	50	30
31-May-18	7	15	14	19	50	30
6-Jun-18	7	16	9	19	50	30
12-Jun-18	8	16	11	19	50	30
18-Jun-18	7	16	7	19	50	30
24-Jun-18	8	15	21	19	50	30
30-Jun-18	7	15	9	19	50	30
6-Jul-18	12	16	11	19	50	30
12-Jul-18	11	16	25	19	50	30
18-Jul-18	9	16	39	20	50	30
24-Jul-18	15	16	25	20	50	30
30-Jul-18	11	16	16	20	50	30
5-Aug-18	17	16	21	20	50	30
11-Aug-18	16	16	22	21	50	30
17-Aug-18	16	16	20	21	50	30
23-Aug-18	12	16	21	21	50	30
29-Aug-18	12	16	21	21	50	30
4-Sep-18	6	16	7	20	50	30

High Volume Air Sampling Compliance Monitoring Results – PM10						
10-Sep-18	9	16	14	20	50	30
16-Sep-18	26	16	18	21	50	30
22-Sep-18	21	16	36	21	50	30
28-Sep-18	13	16	13	21	50	30
4-Oct-18	20	16	18	20	50	30
10-Oct-18	12	16	13	20	50	30
16-Oct-18	10	16	15	20	50	30
22-Oct-18	25	16	27	20	50	30
28-Oct-18	21	16	26	21	50	30
3-Nov-18	28	17	24	21	50	30
9-Nov-18	17	17	20	21	50	30
15-Nov-18	22	17	34	21	50	30
21-Nov-18	26	17	40	22	50	30
27-Nov-18	21	17	31	22	50	30
3-Dec-18	29	18	34	22	50	30
9-Dec-18	23	18	27	22	50	30
15-Dec-18	NR	18	27	22	50	30
21-Dec-18	16	17	17	22	50	30

NR = paper torn no valid result returned.

Appendix D - Surface Water Monitoring Results

Water Quality - Bowmans Creek																						
Month	BCK1 (Bowmans Creek Upstream)				BCK 1A				BCK2				BCK2A				BCK3				BCK4			
	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)
Jan	7.84	906	15	502	7.77	4140	10	2390	Dry	Dry	Dry	Dry	7.62	1120	<5	618	8.16	1320	12	690	8.25	2090	16	1100
Feb	7.91	894	22	478	7.64	3860	<5	2630	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	8.12	1430	22	818	8.26	2110	26	1210
Mar	7.96	1060	14	650	7.89	6720	<5	5100	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	8.07	1360	29	778	8.34	2020	36	1250
Apr	7.84	1070	<5	570	8.12	1980	<5	1200	7.55	1310	<5	728	Dry	Dry	Dry	Dry	8.07	1450	38	818	7.61	2010	33	1230
May	7.91	1070	<5	656	7.99	2800	6	1710	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	8.16	1350	7	837	8.24	2100	20	1290
Jun	7.65	1040	<5	596	7.82	3690	<5	2330	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	7.88	1280	13	718	8.01	1960	10	1020
Jul	7.88	1100	8	656	7.96	3550	<5	2420	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	8.03	1360	15	814	8.12	1990	15	1220
Aug	8.01	1100	<5	564	7.89	2960	16	1950	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	8.19	1380	20	846	8.25	1960	22	1240
Sep	8.03	1070	8	644	7.95	3900	7	3010	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	7.97	1370	32	798	8.27	1870	42	1180
Oct	7.99	1170	9	616	7.59	6650	11	4480	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	7.97	1540	21	830	8.12	2060	53	1110
Nov	7.71	1030	15	510	7.44	5600	<5	3390	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	8.17	1540	33	744	8.38	2100	102	1070
Dec	7.74	1020	14	674	7.65	6730	45	4860	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	7.7	1590	19	1060	8.1	2170	96	1470

Water Quality – Bowmans and Bayswater Creek																			
Month	BCK5				BCK6 (Bowmans Ck Downstream)				BWKU (Bayswater Ck Upstream)				BWKM (Bayswater Ck Midstream)				BWKD (Bayswater Ck Downstream) 1			
	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)
Jan	8.19	1920	14	996	7.89	1660	9	885	7.93	3740	6	2150	8.09	5150	<5	3000	Dry	Dry	Dry	Dry
Feb	7.96	1880	31	1060	7.92	1800	36	1030	7.89	3680	8	2250	8.07	5430	<5	3520	Dry	Dry	Dry	Dry
Mar	8.27	2020	16	1210	Dry	Dry	Dry	Dry	7.93	3480	7	2360	8.07	4660	<5	3170	Dry	Dry	Dry	Dry
Apr	8.08	2050	12	1230	7.36	2030	6	1270	7.95	4190	6	2570	8.15	5290	<5	3350	Dry	Dry	Dry	Dry
May	8.46	2220	<5	1320	7.91	1960	<5	1190	7.95	3550	<5	2220	8.15	4840	<5	2820	Dry	Dry	Dry	Dry
Jun	8.14	2190	7	1330	7.43	1910	<5	1270	7.78	3360	<5	2090	8.02	4450	<5	2990	Dry	Dry	Dry	Dry
Jul	8.15	2330	18	1480	Dry	Dry	Dry	Dry	7.95	3460	<5	2270	8.19	4470	5	2940	Dry	Dry	Dry	Dry
Aug	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	8.01	3390	<5	2200	8.13	4310	6	2810	Dry	Dry	Dry	Dry
Sep	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	8.13	3220	6	2230	8.2	3970	<5	2820	Dry	Dry	Dry	Dry
Oct	8.05	2370	27	1360	Dry	Dry	Dry	Dry	7.76	3500	8	2110	7.99	4420	<5	2660	Dry	Dry	Dry	Dry
Nov	8.59	2,350	114	1,340	Dry	Dry	9	885	7.92	3,790	<5	1,940	7.90	5,190	<5	3,100	Dry	Dry	Dry	Dry
Dec	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	7.91	3290	8	2180	8.05	4790	17	3150	Dry	Dry	Dry	Dry

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Appendix E - Groundwater Monitoring Results

Water Quality - Groundwater Monthly Monitoring Results																		
Month	ALV1 Large						ALV1 Small						ALV2 Large					
	pH	Conductivity (mS.cm-1)	Depth to Water (m)	Colour	Odour	Turbidity	pH	Conductivity (mS.cm-1)	Depth to Water (m)	Colour	Odour	Turbidity	pH	Conductivity (mS.cm-1)	Depth to Water (m)	Colour	Odour	Turbidity
Jan	7.64	1.16	5.01	Clear	Nil	Clear	8.31	1.29	4.61	Clear	Nil	Clear	7.76	1.94	4.64	Clear	Nil	Clear
Feb	6.90	1.17	5.28	NR	Nil	NR	7.51	1.30	4.97	NR	Nil	NR	7.36	1.90	4.74	Clear	Nil	Clear
Mar	7.08	1.19	5.46	Clear	Nil	Clear	7.56	1.30	5.08	Clear	Nil	Clear	7.38	1.88	4.81	Clear	Nil	Clear
Apr	7.25	1.16	3.95	Clear	Nil	Slight	7.77	1.42	3.70	Clear	Nil	Clear	7.47	1.82	4.50	Clear	Nil	Clear
May	7.24	1.15	4.12	Brown	Nil	Slight	8.03	1.27	3.91	Clear	Nil	Clear	7.80	1.87	4.57	Clear	Nil	Clear
Jun	7.04	1.06	4.40	Clear	Nil	Clear	7.66	1.16	4.13	Clear	Nil	Clear	7.27	1.74	4.60	Clear	Nil	Clear
Jul	6.96	1.08	4.68	Grey	Nil	Slight	7.50	1.34	4.37	Clear	Nil	Slight	7.52	1.88	4.64	Clear	Nil	Clear
Aug	6.94	1.20	4.98	Clear	Nil	Clear	7.65	1.26	4.58	Clear	Nil	Clear	7.21	2.06	4.72	Clear	Nil	Clear
Sep	6.34	1.22	5.15	Orange	Nil	Slight	7.04	1.31	4.70	Clear	Yes	Clear	6.91	2.31	4.77	Clear	Nil	Clear
Oct	6.62	1.22	5.30	Clear	Nil	Clear	7.11	1.26	4.81	Clear	Nil	Clear	7.42	2.08	4.87	Clear	Nil	Clear
Nov	7.03	1.20	5.43	Orange	Nil	Turbid	7.80	1.29	5.04	Clear	Nil	Clear	7.10	2.59	4.98	Clear	Nil	Slight
Dec	7.62	1.10	5.57	Brown	Nil	Slight	7.83	1.16	5.25	Clear	Yes	Clear	7.83	1.70	5.09	Clear	Nil	Clear

Water Quality - Groundwater Monthly Monitoring Results																		
Month	ALV2 Small						ALV3 Large						ALV3 Small					
	pH	Conductivity (mS.cm-1)	Depth to Water (m)	Colour	Odour	Turbidity	pH	Conductivity (mS.cm-1)	Depth to Water (m)	Colour	Odour	Turbidity	pH	Conductivity (mS.cm-1)	Depth to Water (m)	Colour	Odour	Turbidity
Jan	7.98	2.84	4.63	Clear	Yes	Clear	7.60	1.14	5.91	Clear	Nil	Clear	7.96	4.23	6.21	Grey	Yes	Slight
Feb	7.64	2.83	4.74	Clear	Nil	Clear	7.19	1.15	6.17	Grey	Nil	Slight	7.66	2.90	6.50	Clear	Yes	Clear
Mar	7.62	2.78	4.83	Clear	Nil	Clear	7.24	1.16	6.33	Clear	Nil	Clear	7.50	2.89	6.67	Clear	Nil	Clear
Apr	7.57	2.66	4.48	Clear	Yes	Clear	7.44	1.30	5.88	Clear	Nil	Clear	7.61	2.23	6.15	Clear	Nil	Clear
May	7.93	2.72	4.50	Clear	Nil	Clear	7.70	1.24	5.31	Clear	Nil	Clear	8.44	1.79	5.57	Clear	Nil	Clear
Jun	7.61	2.56	4.48	Clear	Nil	Clear	7.05	1.16	5.41	Clear	Nil	Clear	7.89	1.60	5.71	Clear	Nil	Clear
Jul	7.79	2.54	4.63	Clear	Nil	Clear	7.16	1.29	5.60	Clear	Nil	Clear	7.34	1.76	5.90	Clear	Nil	Clear
Aug	7.93	2.86	4.74	Clear	Nil	Clear	6.94	1.32	5.87	Clear	Nil	Clear	7.26	1.77	6.17	Clear	Nil	Clear
Sep	7.59	2.85	4.77	Clear	Nil	Clear	6.17	1.33	6.12	Grey	Nil	Turbid	6.51	1.78	6.43	Clear	Yes	Clear
Oct	7.63	2.88	4.87	Clear	Nil	Clear	6.81	1.34	6.63	Clear	Nil	Clear	6.70	1.81	6.29	Clear	Nil	Clear
Nov	7.86	2.73	4.95	Clear	Nil	Clear	Too low to sample						7.50	1.71	6.78	Clear	Yes	Clear
Dec	8.14	2.6	5.14	Clear	Nil	Clear	7.44	1.16	6.48	Clear	Nil	Clear	7.68	1.57	6.92	Clear	yes	Clear

Water Quality - Groundwater Monthly Monitoring Results																		
	ALV4 Large						ALV4 Small						PGW5 Large					
Month	pH	Conductivity (mS.cm-1)	Depth to Water (m)	Colour	Odour	Turbidity	pH	Conductivity (mS.cm-1)	Depth to Water (m)	Colour	Odour	Turbidity	pH	Conductivity (mS.cm-1)	Depth to Water (m)	Colour	Odour	Turbidity
Jan	7.44	1.48	5.62	Brown	Nil	Slight	8.03	5.28	6.22	Grey	Nil	Slight	7.97	5.82	11.36	Clear	Nil	Clear
Feb	6.93	1.50	5.74	Grey	Nil	Slight	Too low to sample						7.54	5.83	11.71	Clear	Nil	Clear
Mar	7.01	1.47	5.84	Clear	Nil	Slight	7.39	5.30	6.43	Clear	Nil	Clear	7.57	5.85	12.20	Clear	Nil	Clear
Apr	7.28	1.68	5.38	Clear	Nil	Clear	7.25	5.51	6.00	Clear	Nil	Clear	7.63	5.51	11.66	Clear	Nil	Clear
May	7.25	1.57	5.35	Clear	Nil	Clear	7.27	5.23	6.07	Clear	Nil	Clear	7.78	5.78	11.67	Brown	Nil	Turbid
Jun	6.86	1.35	5.45	Clear	Nil	Clear	7.14	4.64	6.14	Clear	Nil	Clear	7.48	5.13	11.18	Clear	Nil	Clear
Jul	7.13	1.52	5.65	Clear	Nil	Clear	7.22	5.25	6.21	Clear	Nil	Clear	7.50	5.06	12.29	Clear	Nil	Clear
Aug	6.79	1.54	5.60	Clear	Nil	Clear	7.15	5.25	6.28	Clear	Nil	Clear	7.50	5.87	12.02	Clear	Nil	Clear
Sep	6.06	1.53	5.72	Orange	Nil	Turbid	6.75	5.24	6.37	Clear	Yes	Clear	7.03	5.97	12.25	Clear	Nil	Clear
Oct	6.32	1.49	5.80	Orange	Nil	Turbid	6.21	4.89	6.48	Clear	Nil	Clear	7.64	6.19	12.64	Clear	Nil	Clear
Nov	6.78	1.45	5.94	Orange	Nil	Turbid	7.59	5.14	6.58	Clear	Yes	Clear	7.40	5.97	12.95	Clear	Nil	Clear
Dec	7.18	1.38	6.01	Brown	Nil	Turbid	7.54	4.10	6.70	Clear	Yes	Clear	7.30	5.66	13.40	Clear	Nil	Clear

Water Quality - Groundwater Monthly Monitoring Results																		
	PGW5 Small						ALV7 Large						ALV7 Small					
Month	pH	Conductivity (mS.cm-1)	Depth to Water (m)	Colour	Odour	Turbidity	pH	Conductivity (mS.cm-1)	Depth to Water (m)	Colour	Odour	Turbidity	pH	Conductivity (mS.cm-1)	Depth to Water (m)	Colour	Odour	Turbidity
Jan	7.62	6.12	10.09	Brown	Nil	Turbid	7.40	1.75	6.73	Grey	Nil	Slight	7.46	2.20	9.84	Clear	Yes	Slight
Feb	7.14	6.16	11.04	Brown	Nil	Turbid	7.20	1.74	6.81	Clear	Nil	Clear	7.37	2.21	11.50	Clear	Yes	Clear
Mar	Too low to sample						7.16	1.73	6.97	Clear	Nil	Clear	7.24	2.21	11.46	Clear	Nil	Clear
Apr	Dry						7.27	1717	6.97	Clear	Nil	7.27	1.72	6.97	Clear	Nil	Clear	7.52
May	Dry						7.20	1.68	6.93	Brown	Nil	Slight	7.63	2.22	10.84	Clear	Nil	Clear
Jun	Too low to sample						7.10	1.52	7.00	Brown	Nil	Slight	7.24	1.98	11.70	Clear	Yes	Clear
Jul	Too low to sample						7.37	1.75	7.09	Clear	Nil	Clear	7.46	0.73	12.21	Clear	Nil	Clear
Aug	Too low to sample						7.15	1.71	7.14	Clear	Nil	Clear	7.27	2.25	12.68	Clear	Nil	Clear
Sep	Dry						7.11	1.74	7.23	Brown	Nil	Turbid	7.30	2.28	12.94	Light Grey	Nil	Slight
Oct	Dry						7.54	1.78	7.29	Brown	Nil	Slight	7.39	2.36	13.13	Clear	Nil	Clear
Nov	Dry						7.25	1.67	7.35	Brown	Nil	Turbid	7.43	2.20	13.32	Clear	Yes	Clear
Dec	Dry						8.06	1.56	7.45	Brown	Nil	Turbid	8.26	2.04	14.21	Clear	Yes	Clear

Water Quality - Groundwater Monthly Monitoring Results																		
	ALV8 Large						ALV8 Small						LBH (Coal Measures)					
Month	pH	Conductivity (mS.cm-1)	Depth to Water (m)	Colour	Odour	Turbidity	pH	Conductivity (mS.cm-1)	Depth to Water (m)	Colour	Odour	Turbidity	pH	Conductivity (mS.cm-1)	Depth to Water (m)	Colour	Odour	Turbidity
Jan	7.14	1.24	7.91	Brown	Nil	Turbid	7.32	1.64	9.02	Clear	Yes	Slight	7.44	1.23	4.76	Clear	Nil	Clear
Feb	Too low to sample						7.39	1.64	12.80	Clear	Yes	Clear	6.97	1.24	5.22	Grey	Nil	Slight
Mar	Too low to sample						7.23	1.65	12.35	Clear	Nil	Clear	6.94	1.25	5.44	Clear	Nil	Clear
Apr	Dry						7.41	1.62	10.73	Clear	Nil	Clear	6.81	1.21	4.07	Clear	Nil	Clear
May	Dry						7.77	1.65	10.71	Clear	Nil	Clear	7.83	1.36	3.98	Clear	Nil	Clear
Jun	Dry						7.19	1.50	12.48	Clear	Nil	Clear	7.08	1.12	4.55	Clear	Nil	Clear
Jul	Dry						7.51	1.90	13.94	Clear	Yes	Clear	6.96	0.91	4.40	Clear	Nil	Clear
Aug	Dry						7.02	1.79	14.61	Clear	Yes	Clear	6.78	1.33	5.02	Clear	Nil	Clear
Sep	Dry						7.12	1.87	14.85	Grey	Nil	Slight	6.09	1.35	5.21	Clear	Nil	Clear
Oct	Dry						7.41	1.76	14.91	Clear	Nil	Clear	6.35	1.39	5.36	Clear	Nil	Clear
Nov	Dry						7.16	1.74	15.07	Grey	Nil	Slight	6.98	1.35	5.46	Clear	Nil	Clear
Dec	Dry						8.06	1.72	15.67	Clear	Yes	Clear	7.56	1.26	5.57	Clear	Nil	Clear

Appendix F - Blast Monitoring Results

Blast Monitoring Results										
			Chain of Ponds Hotel		Burlings		Scrivens		Substation	
Date	Time	Location	Overpressure (dBL)	Ground Vibration (mm/s)	Overpressure (dBL)	Ground Vibration (mm/s)	Overpressure (dBL)	Ground Vibration (mm/s)	Overpressure (dBL)	Ground Vibration (mm/s)
03/01/2018	13:04:14	South Pit	109.5	1.94	102.5	0.03	92.3	0.03	109.2	1.94
10/01/2018	15:49:58	South Pit	118.1	4.84	104.8	0.06	99.8	0.03	112.6	1.89
11/01/2018	13:11:05	Bayswater Pit	127.5	2.73	102.7	0.06	102.4	0.06	123	1.49
11/01/2018	13:11:05	Bayswater Pit	127.5	2.73	102.7	0.06	102.4	0.06	123	1.49
16/01/2018	13:08:40	South Pit	108.9	7.3	110.8	0.14	105.6	0.07	119.7	27.49
23/01/2018	09:18:48	South Pit	107.3	3.91	86.7	0.1	91.1	0.07	112.6	10.54
29/01/2018	13:00:31	Entrance Pit	103.4	0.75	92.4	0.07	97.6	0.07	103	0.39
31/01/2018	13:00:40	South Pit	114.1	4.1	95.2	0.1	88	0.07	116.7	4.88
02/02/2018	12:21:50	South Pit	117.2	23.17	108.3	0.07	87.1	0.06	113.4	7.29
06/02/2018	14:02:16	Bayswater Pit	104.3	1.39	97.8	0.08	95.1	0.04	101.5	0.72
08/02/2018	13:11:41	South Pit	120.1	39.1	95	0.05	91.6	0.03	110.6	4.16
13/02/2018	14:01:33	Entrance Pit	106.9	1.24	95.6	0.08	98.7	0.08	107.1	1.28
15/02/2018	15:27:33	Entrance Pit	104.2	0.5	94.8	0.07	94.5	0.04	103.4	0.37
19/02/2018	13:23:53	Entrance Pit	104	0.74	106	0.1	96.7	0.04	104.8	0.44
22/02/2018	13:05:31	South Pit	115	3.44	105.6	0.04	88.7	0.02	111.5	1.61
01/03/2018	13:14:01	South Pit	106.4	5.82	107.9	0.11	86.9	0.07	113.8	10.31
06/03/2018	13:06:39	South Pit	111.2	3.24	95.6	0.05	88.6	0.04	114.8	3.08
07/03/2018	13:12:50	Bayswater Pit	107.8	2.05	104.6	0.11	97.7	0.08	105.8	1.32
08/03/2018	13:29:33	Entrance Pit	109.7	0.91	102	0.12	95.5	0.06	108.8	0.55
19/03/2018	13:06:38	Bayswater Pit	103.8	1.53	86	0.06	90.6	0.04	104.5	0.92
21/03/2018	13:13:03	South Pit	113.1	4.89	107.3	0.03	101.3	0.03	107.8	1.64
27/03/2018	13:04:58	South Pit	114.6	4.4	96.1	0.14	97	0.17	117.7	4.22
29/03/2018	11:57:28	Bayswater Pit	113	0.85	88.5	0.02	91.3	0.02	113	0.82

Blast Monitoring Results										
05/04/2018	12:57:44	South Pit	111.9	0.97	86	0.03	89	0.01	115.1	3.87
06/04/2018	12:05:12	South Pit	108.6	4.53	100.8	0.07	83.3	0.03	113.4	6.99
09/04/2018	13:08:08	South Pit	109.9	5.91	85.8	0.1	92.5	0.08	112.1	6.76
10/04/2018	13:08:22	South Pit	116.5	1.31	101.8	0.02	89.2	0.01	112.1	0.8
11/04/2018	13:01:36	Entrance Pit	102.5	0.95	91.1	0.12	100.9	0.09	102.9	0.62
16/04/2018	15:38:58	South Pit	112.8	2.87	99.2	0.03	92.3	0.01	107.6	0.74
17/04/2018	13:12:58	South Pit	113.5	5.16	97	0.13	89.7	0.14	112.5	6.86
18/04/2018	13:02:12	Entrance Pit	107.1	1.02	97.1	0.07	107.5	0.05	107.6	0.82
19/04/2018	13:34:24	Bayswater Pit	110	0.83	81	0.02	86.1	0.01	105.6	0.45
23/04/2018	13:47:56	Bayswater Pit	109.5	0.47	95.9	0.02	94.2	0.01	109	0.33
24/04/2018	12:59:25	South Pit	113.4	0.33	99.1	0.01	87.4	0.01	121.7	1.09
26/04/2018	13:05:49	Bayswater Pit	109.2	0.53	88.6	0.01	95.6	0.02	106.3	0.26
30/04/2018	13:04:24	Bayswater Pit	111.3	1.09	94.6	0.06	96.2	0.03	108.4	0.66
01/05/2018	13:06:57	South Pit	115.5	6.78	84	0.06	85.8	0.04	115	5.19
03/05/2018	13:33:43	Entrance Pit	106.9	1.77	93.1	0.09	110.7	0.06	106.5	1.35
07/05/2018	12:57:33	Bayswater Pit	107.5	2.09	89.6	0.07	87.1	0.05	103.1	1.16
07/05/2018	13:15:28	Bayswater Pit	107.7	1.44	89.7	0.08	99.9	0.06	102.3	0.68
09/05/2018	13:06:54	South Pit	115.3	8.41	92.9	0.09	97.2	0.03	115	12.53
14/05/2018	13:07:32	Entrance Pit	119.9	2.72	104.5	0.11	101.4	0.1	119.1	3.07
16/05/2018	13:37:25	South Pit	117	1.8	91.4	0.01	89.6	0.01	115.2	0.69
16/05/2018	13:38:06	South Pit	113.6	1.75	88.6	0.07	85.9	0.07	114.2	1.71
17/05/2018	13:03:19	Bayswater Pit	101.4	1.87	83.5	0.06	89.3	0.07	97.8	1.11
18/05/2018	13:02:56	Entrance Pit	108.2	0.94	98	0.05	94.8	0.04	110.2	0.81
21/05/2018	13:08:09	South Pit	121.6	2.42	117.1	1.73	89.1	0.01	116.9	5.26
23/05/2018	13:10:44	Entrance Pit	121.7	1.78	106.1	0.09	102.5	0.05	121.7	1.86
24/05/2018	12:41:18	Bayswater Pit	103.4	2.46	90.6	0.11	93	0.06	100.4	1.3
24/05/2018	12:41:18	Bayswater Pit	103.4	2.46	90.6	0.11	93	0.06	100.4	1.3
25/05/2018	13:06:45	South Pit	113.9	4.25	93.2	0.04	93.2	0.03	113	2.86

Blast Monitoring Results										
28/05/2018	12:59:59	South Pit	123.8	1.37	78.4	0.01	84.6	0.01	121.2	1.11
30/05/2018	13:13:30	South Pit	113.2	4.83	107.8	0.08	108.7	0.07	113.9	5.29
31/05/2018	12:56:06	Entrance Pit	109.8	1.31	95.5	0.08	96.9	0.07	111.8	1.02
01/06/2018	13:02:41	Bayswater Pit	106.6	2.03	103.1	0.04	93.8	0.04	100.9	1.11
04/06/2018	13:02:57	South Pit	110.5	2.17	90.9	0.03	94.2	0.03	109.3	1.5
06/06/2018	13:42:12	South Pit	122.4	3.06	96.7	0.01	98.7	0.01	115.2	0.76
06/06/2018	14:14:59	South Pit	127.9	3.77	103.9	0.08	99.6	0.08	134.9	6.34
07/06/2018	13:03:04	Entrance Pit	111.3	0.86	95.2	0.08	101.7	0.05	110.1	0.9
08/06/2018	13:09:53	Bayswater Pit	104	0.95	79.6	0.05	93.7	0.03	103.2	0.42
13/06/2018	16:07:41	South Pit	108.7	4.26	81.3	0.09	92.3	0.07	110.7	4.08
18/06/2018	13:33:32	Bayswater Pit	111.2	1.07	94.5	0.04	98.9	0.02	110.8	0.58
19/06/2018	15:45:44	South Pit	116.6	6.84	105.5	0.06	93.6	0.03	110.2	1.92
20/06/2018	13:05:45	South Pit	113.6	1.46	94.4	0.01	86.8	0.01	108.4	0.76
25/06/2018	13:11:15	South Pit	118.9	7.37	91.1	0.02	87.5	0.01	122	11.14
26/06/2018	13:08:40	South Pit	115.9	3.14	87.3	0.01	87.4	0	109.4	0.31
26/06/2018	13:09:35	South Pit	116.2	3.13	86.3	0.07	88.6	0.05	112.2	2.05
27/06/2018	13:04:17	Entrance Pit	119.1	1.68	100.6	0.11	104.9	0.07	115.8	1.8
28/06/2018	13:01:29	Entrance Pit	103.6	1.22	85.8	0.09	91.2	0.05	101.9	0.88
28/06/2018	13:02:20	South Pit	105.7	3.19	79.6	0.06	86.7	0.04	112.5	8.04
04/07/2018	13:04:56	South Pit	122.3	1.27	81.6	0.01	86.1	0.01	117	0.38
05/07/2018	13:07:26	Bayswater Pit	102.1	1.27	82.2	0.06	88.8	0.05	101.2	0.74
09/07/2018	13:48:36	Bayswater Pit	110.3	0.55	90.5	0.03	93.4	0.02	107.9	0.49
09/07/2018	14:06:31	Bayswater Pit	107.2	0.94	88.3	0.03	95.9	0.02	104.3	0.59
11/07/2018	13:04:23	South Pit	121.9	0.67	83.7	0.01	85.3	0.01	117.1	0.4
12/07/2018	12:59:21	South Pit	113.5	3.21	90.7	0.09	96.6	0.07	114.2	2.39
17/07/2018	13:01:57	Bayswater Pit	107.4	0.92	106.8	0.07	98	0.06	110.7	0.66
21/07/2018	09:05:45	South Pit	135.9	8.36	94.4	0.02	99.8	0.01	128	9.82
25/07/2018	13:12:02	Entrance Pit	103.8	1.05	100.3	0.05	95.8	0.02	102.5	0.57

Blast Monitoring Results										
26/07/2018	13:55:33	Bayswater Pit	103.8	1.89	85.4	0.11	96.2	0.07	100.8	0.97
27/07/2018	13:06:37	South Pit	117.3	9.75	86.3	0.1	89.3	0.07	114	3.51
01/08/2018	13:11:49	Bayswater Pit	98	0.71	100	0.02	105.5	0.06	99	0.4
01/08/2018	13:12:33	South Pit	119.3	23.88	99.5	0.02	91.8	0.01	109	3.59
01/08/2018	13:13:28	South Pit	110.7	0.4	100.3	0.02	93	0.01	116.1	0.77
03/08/2018	09:06:39	South Pit	111.5	2.18	84	0.02	90	0.01	105	0.63
08/08/2018	09:01:36	Bayswater Pit	104.3	1.23	106.2	0.08	104.9	0.03	102.7	0.72
08/08/2018	09:01:36	Bayswater Pit	104.3	1.23	106.2	0.08	104.9	0.03	102.7	0.72
09/08/2018	13:31:02	Entrance Pit	119.9	6.07	96.4	0.17	105.3	0.17	119	4.27
10/08/2018	13:02:37	South Pit	118	14.95	100	0.05	92.2	0.04	116.8	5.82
10/08/2018	13:02:37	South Pit	118	14.95	100	0.05	92.2	0.04	116.8	5.82
17/08/2018	12:29:00	South Pit	110.4	2.25	106.7	0.03	93.5	0.02	108.2	0.61
17/08/2018	12:35:00	Bayswater Pit	107.3	0.51	98.6	0.02	97.1	0.02	102.3	0.46
20/08/2018	12:56:57	Entrance Pit	109.8	1.24	95.6	0.09	107.4	0.07	110.4	1.35
23/08/2018	13:34:05	South Pit	118.9	18.44	93.1	0.09	85.7	0.05	114	4.46
23/08/2018	13:36:08	South Pit	111.6	0.47	101.8	0.02	95.8	0.01	121.7	0.61
23/08/2018	13:36:58	Entrance Pit	95.8	0.2	105.2	0.02	98	0.01	94.7	0.19
28/08/2018	13:10:22	Bayswater Pit	103.4	0.4	84	0.02	91.6	0.01	103.3	0.34
30/08/2018	13:30:59	South Pit	112.1	1.33	90.8	0.05	88.6	0.11	109.2	0.57
30/08/2018	13:33:38	Bayswater Pit	108.7	1.46	87.5	0.1	95.2	0.05	105.4	1.03
30/08/2018	13:33:38	Bayswater Pit	108.7	1.46	87.5	0.1	95.2	0.05	105.4	1.03
05/09/2018	13:30:14	Bayswater Pit	109	2.29	94.1	0.07	91.2	0.04	105.6	1.05
07/09/2018	12:59:14	South Pit	119.5	4.2	89.4	0.04	87.4	0.02	128.4	14.99
11/09/2018	13:07:39	Entrance Pit	103.9	0.25	84	0.01	90.5	0.01	103.8	0.17
11/09/2018	13:02:21	Bayswater Pit	112.7	1.17	94	0.09	98.9	0.05	113.1	1.22
13/09/2018	15:40:57	South Pit	120.7	14.79	94.3	0.07	87.8	0.04	116.3	2.89
17/09/2018	12:58:36	Entrance Pit	96.3	1.04	99	0.15	89.5	0.07	98.3	0.61
20/09/2018	13:11:49	South Pit	121.4	19.44	102.1	0.02	102	0.02	114.5	2.7

Blast Monitoring Results										
21/09/2018	12:58:57	Bayswater Pit	112.6	1.17	93.3	0.04	97.1	0.03	112.3	0.6
25/09/2018	13:40:11	South Pit	122.9	17.89	92.3	0.06	92.3	0.04	122.4	17.25
25/09/2018	13:39:26	South Pit	110.8	0.19	95.8	0.01	87.9	0	107.1	0.12
27/09/2018	13:02:30	Bayswater Pit	110.6	1.04	91.2	0.04	92.9	0.05	109.6	0.61
27/09/2018	13:03:24	South Pit	113.3	3	89.9	0.14	90.5	0.09	114.3	3.99
02/10/2018	15:41:57	South Pit	119.9	10.29	96.6	0.15	92.7	0.05	113	2.93
03/10/2018	13:48:23	South Pit	100.5	0.3	101.1	0.01	91.4	0	96.6	0.09
04/10/2018	13:07:32	Bayswater Pit	101.5	0.69	90	0.04	93.2	0.02	100.1	0.54
09/10/2018	12:36:30	South Pit	111.8	6.2	85	0.07	80	0.05	108.6	1.71
10/10/2018	12:58:22	Bayswater Pit	110.9	1.4	103.7	0.05	101.2	0.03	111.7	0.78
10/10/2018	13:03:45	Bayswater Pit	99.9	0.63	94.4	0.03	99.2	0.02	99.9	0.38
12/10/2018	13:05:43	South Pit	118.5	3.63	102.1	0.06	100.9	0.06	117.1	3.25
18/10/2018	15:37:15	South Pit	110.2	5.65	92.7	0.12	89.8	0.06	115.6	7.49
23/10/2018	13:34:22	Bayswater Pit	108.4	0.22	91.6	0.01	89.1	0.01	105.4	0.12
25/10/2018	15:37:12	Bayswater Pit	105.9	0.54	90.4	0.01	90.4	0.01	104.8	0.53
25/10/2018	15:39:03	South Pit	121.8	3.7	93.9	0.05	99.5	0.04	115.4	1.43
25/10/2018	15:39:03	South Pit	121.8	3.7	93.9	0.05	99.5	0.04	115.4	1.43
25/10/2018	15:39:32	Entrance Pit	110.9	3.46	94.6	0.02	99.5	0.02	106.7	0.63
26/10/2018	12:59:18	Entrance Pit	106.5	0.69	94.1	0.03	97.3	0.02	105.1	0.39
29/10/2018	13:08:27	South Pit	95.9	0.59	102.7	0.06	91.6	0.04	98.5	0.49
29/10/2018	13:08:27	South Pit	95.9	0.59	102.7	0.06	91.6	0.04	98.5	0.49
01/11/2018	13:06:08	Entrance Pit	107.5	0.62	99.4	0.03	96.6	0.02	107.9	0.44
08/11/2018	13:31:07	Bayswater Pit	106.6	2.49	89.4	0.1	93.4	0.06	104.7	1.12
13/11/2018	13:42:27	Bayswater Pit	110.8	0.86	87.9	0.06	96.7	0.05	107.6	0.59
13/11/2018	13:43:52	Entrance Pit	110.9	0.41	91.1	0.03	94.5	0.02	107.4	0.39
19/11/2018	13:00:16	Bayswater Pit	112.6	1.14	88.8	0.05	103.7	0.06	110.7	0.71
20/11/2018	13:04:17	South Pit	123.5	14.19	96.2	0.05	91.7	0.04	112.9	7.37
27/11/2018	15:35:49	South Pit	120.1	5.27	88.6	0.05	89.1	0.03	114.8	1.83

Blast Monitoring Results										
29/11/2018	13:02:55	Entrance Pit	99.9	0.83	101.2	0.13	93	0.09	98.9	0.47
30/11/2018	13:05:04	South Pit	122.1	1.38	91.3	0.02	88.4	0.01	126.5	2.96
03/12/2018	13:39:19	Bayswater Pit	104.3	1.13	101.8	0.05	100.8	0.04	98	0.67
06/12/2018	13:01:22	Entrance Pit	109.4	0.43	110.2	0.04	97.3	0.02	105.6	0.38
11/12/2018	13:02:30	South Pit	126.9	21.06	89.1	0.06	93.8	0.04	119.3	9.47
19/12/2018	13:04:03	Bayswater Pit	109.4	1.41	90.7	0.06	94.4	0.05	108.5	0.85
21/12/2018	11:56:15	Entrance Pit	103.7	0.51	105.7	0.04	99.8	0.03	104.1	0.41
21/12/2018	11:57:09	Bayswater Pit	105	0.77	97	0.03	93	0.02	102.6	0.86
21/12/2018	12:01:35	Bayswater Pit	106.8	0.82	97.4	0.03	95.5	0.02	107.4	0.6

Appendix G - LCO Rehabilitation MOP Completion Criteria

The below table lists the identified rehabilitation completion criteria as specified in the MOP. Focussing on the reporting period, TARP status have been identified and comments included where appropriate.

Domain Objective	Performance Indicator	Completion Criteria	Justification/ Source	Complete (Yes/No)	TARP Element(s) / Status	Comment
Decommissioning Phase						
Domain 1 – Domain 5						
No decommissioning activities any of the five domains.						
Landform Establishment Phase						
Domain Objective	**Performance Indicator**	**Completion Criteria**	**Justification/ Source**	**Complete (Yes/No)**	**TARP Element(s)/ Status**	**Comment**
All Domains						
Post mining landforms will be safe, stable and non-polluting	Slopes	Survey confirms rehabilitated slopes are generally 10 degrees and less than 18 degrees (unless otherwise approved); as supported by site record form XCN SD FRM 0596 - Rehabilitation establishment and methodology record form.	EA Section 3.15 & Section 7.16.9	No	1,2/green	Ongoing rehabilitation surveyed confirmed as compliant.
	Surface rock density	Visual inspections confirm surface spoils are (generally) rock free and provide a friable substrate. Large rocks are removed and placed into habitat piles on rehabilitated areas; as supported by site record form XCN SD FRM 0596 - Rehabilitation establishment and methodology record form.	EA Section 3.15	No	n/a	Ongoing rehabilitation surveyed confirmed as compliant.
	Free draining landforms	Landforms are graded to be generally free draining; as supported by site record form XCN SD FRM 0596 - Rehabilitation establishment and methodology record form.	EA Section 7.16.9	No	4/green	Ongoing rehabilitation surveyed confirmed as compliant.
	Stability	Visual inspections confirm rehabilitated landforms exhibit an absence of slumping; as supported by site record form XCN SD FRM 0596 - Rehabilitation establishment and methodology record form.	MOP	No	1/green	Ongoing rehabilitation surveyed confirmed as compliant.

Domain Objective	Performance Indicator	Completion Criteria	Justification/ Source	Complete (Yes/No)	TARP Element(s) / Status	Comment
	Spontaneous Combustion	Visual monitoring indicates no evidence of spontaneous combustion; as supported by site record form XCN SD FRM 0596 - Rehabilitation establishment and methodology record form.	MOP	No	6/green	Ongoing monitoring confirmed as compliant.
	Dispersive Spoils	Testing confirm dispersive spoils are not present in the surface layer or are appropriately ameliorated; as supported by site record form XCN SD FRM 0596 - Rehabilitation establishment and methodology record form.	MOP	No	7/green	Ongoing monitoring confirmed as compliant.
	ESC	Suitable erosion control measures (e.g. silt fences, mulches etc.) are installed in rehabilitation areas in accordance the Blue Book to minimise soil loss from areas undergoing rehabilitation; as supported by site record form XCN SD FRM 0596 - Rehabilitation establishment and methodology record form.	DECC 2008 EA Section 3.15 & 7.16.9	No	na	Ongoing rehabilitation surveyed confirmed as compliant.
	Gullying	Monitoring demonstrates there are no areas of active gully erosion; as supported by site record form XCN SD FRM 0596 - Rehabilitation establishment and methodology record form.	MOP	No	3/green	Ongoing rehabilitation surveyed confirmed as compliant.
	Rilling	Visual inspections confirm rill erosion is limited to isolated areas of minor rilling up to 200mm deep; as supported by site record form XCN SD FRM 0596 - Rehabilitation establishment and methodology record form.	MOP	No	3/amber	Isolated areas identified with remediation required
Domain 2 – Water Management Area						
Surface water management structures will be designed and constructed in accordance with the Blue Book to minimise erosion and enhance stability	Final landform drainage	Final landform drainage structures including drains, banks, drop structures and dams have been constructed in accordance with Blue Book requirements; as supported by site record form XCN SD FRM 0596 - Rehabilitation establishment and methodology record form.	DECC 2008	No	4/green	None constructed in 2018.

Domain Objective	Performance Indicator	Completion Criteria	Justification/ Source	Complete (Yes/No)	TARP Element(s) / Status	Comment
	Geomorphic stability	Drainage structures are assessed to be stable with no evidence of overtopping or significant scouring, loss of freeboard or channel capacity; as supported by site record form XCN SD FRM 0596 - Rehabilitation establishment and methodology record form.	DECC 2008	No	4/green	Ongoing rehabilitation surveyed confirmed as compliant. No landform drainage issues within rehabilitation areas – except Mountain Block.
Surface water runoff from the final landform will be non-polluting	Discharge water quality	Dirty water is captured and discharged in accordance with the EPL. Analytes measured in accordance with EPL 2094 include; conductivity, pH and TSS.	EPL 2094 Water Management Plan	No	5/green	Water discharge in accordance with EPL
	Runoff water quality	Runoff water quality from rehabilitation areas is within the range of water quality data recorded from analogue sites and does not pose a threat to downstream water quality; as supported by monitoring results undertaken in accordance with LCO SD PLN 0032 - Environmental Monitoring Program. Analytes measured include pH, TSS, TDS and Conductivity.	EA Section 7.16.9	No	5/green	Ongoing monitoring in accordance with the Water Management Plan showing compliance.
Domain 4 – Overburden Emplacement						
Overburden emplacements will be shaped with generally informal profiles and maximum heights that complement the local topography	Landform compatibility	Landforms are assessed to be generally compatible with the surrounding landscape, as shown on MOP Plan 4.	EA Section 7.16.9	No	na	Landform constructed to current approved landform design.
	Height	Survey confirms the South Pit emplacement is no higher than RL 195 m.	EA Section 4.11	No	na	Ongoing rehabilitation height surveyed as compliant
	Informal undulations	Elements such as drainage paths, contour drains, ridgelines, and emplacements are shaped into undulating informal profiles in keeping with natural landforms of the surrounding environment and allowing for a greater diversity of plant species over time	EA Section 3.15	No	na	Ongoing rehabilitation constructed to incorporate informal undulations.
Domain 5 – Tailings Storage Area						
Rehabilitated tailings emplacements will be capped and shaped to	Capping	Tailings will be capped with at least 3 m of inert material including select inert overburden, subsoils and topsoils.	Sect 100 Report EA Section 7.16.9	No	15/green	Initial tailing capping layer of 1.5m has commenced on the Antiene Tailings Dam in 2016. Ongoing works. No

Domain Objective	Performance Indicator	Completion Criteria	Justification/ Source	Complete (Yes/No)	TARP Element(s) / Status	Comment
produce free draining landforms.						other tailings dams ready for capping
	Ponding	Tailings emplacement areas will be shaped to be free draining and exhibit an absence of ponding.	Sect 100 Report EA Section 7.16.9	No	4/green	Initial tailing capping layer of 1.5m has commenced on the Antiene Tailings Dam in 2016. Ongoing works. No other tailings dams ready for capping
Domain A – Final Void						
The South Pit and Entrance Pit final voids will be designed and constructed to produce non-spilling permanent water storage bodies.	Water Balance	The water balance confirms the final voids have been designed and constructed to produce an equilibrium water level of approximately 67 m AHD in both voids.	EA Section 7.3.4	No	16/green	Operations ongoing, no final voids constructed
Final voids will be made safe by: Constructing highwalls and battering back lowwalls to be geotechnically stable; and Constructing perimeter fencing and safety bunds to restrict public access	Carbonaceous materials	All coal and carbonaceous material is capped with a minimum of 5 meters of inert overburden.	MOP	No	na	Operations ongoing.
	Stability	Highwalls and lowwalls have been assessed by a qualified geotechnical engineer to validate long term stability.	EA Section 7.16.9	No	2/green	Operations ongoing, no final high/low walls constructed
	Safety	Safety features (e.g. safety berm and fence) are installed at the crest of highwalls to restrict public access.	MOP	No	na	Operations ongoing, no final high/low walls constructed
Growth Medium Development Phase						
Domain Objective	**Performance Indicator**	**Completion Criteria**	**Justification/ Source**	**Complete (Yes/No)**	**TARP Element(s)/ Status**	**Comment**
All Domains						
Soils (or soil substitutes) will be reinstated on rehabilitation areas with characteristics that are appropriate for the final landuse.	Soil Depth	Topsoil and/or subsoils are spread uniformly at the depth of 100mm; as supported by site record form XCN SD FRM 0596 - Rehabilitation establishment and methodology record form.	MOP	No	8/amber	Topsoil deficit known. Substitute materials utilised as per rehabilitation strategy. Ongoing maintenance and rehabilitation operations to achieve target vegetation.

Domain Objective	Performance Indicator	Completion Criteria	Justification/ Source	Complete (Yes/No)	TARP Element(s) / Status	Comment
	Compaction	Soils are ripped to produce a friable surface prior topsoil spreading; as supported by site record form XCN SD FRM 0596 - Rehabilitation establishment and methodology record form.	MOP	No	na	Ongoing rehabilitation surveyed as compliant. No areas identified as having issues from compaction.
	Ameliorants	Ameliorants (such as gypsum, organics and fertilisers) are spread at the recommended rate per hectare; as supported by site record form XCN SD FRM 0596 - Rehabilitation establishment and methodology record form.	MOP	No	7/green	Ongoing rehabilitation surveyed as compliant
	Temporary ESC	Temporary ESCs are installed prior to topsoil re-spreading. Temporary ESCs will be installed in accordance with the Bluebook such as silt fences, catch drains and sediment basins down slope of rehabilitation areas.	DECC 2008	No	3/green	Ongoing rehabilitation surveyed as compliant
Domain D – Rehabilitation Area – Woodland						
Woodland rehabilitation areas will provide habitat augmentation features (such as rock piles and felled logs and woody debris) for target native species including the Spotted Quoll	Habitat features	Rehabilitation monitoring confirms habitat features are incorporated into woodland rehabilitation areas (including rock piles, felled hollow bearing logs and coarse woody debris).	MOP EA Section 3.15	No	14/green	Operations ongoing, habitat augmentation included in rehabilitation
		Habitat features include structure suitable for Spotted-tailed Quoll den making.	EA Section 4.11 and 7.4.6	No	14/green	Operations ongoing, habitat augmentation included in rehabilitation
Ecosystem Establishment Phase						
Domain Objective	**Performance Indicator**	**Completion Criteria**	**Justification/ Source**	**Complete (Yes/No)**	**TARP Element(s)/ Status**	**Comment**
All Domains						
Enhance the productivity and ecological function of rehabilitation areas by effectively managing risks	Weed presence	The density of weeds in rehabilitated areas is no worse than analogue sites. All measurements will be undertaken in accordance with the Department of Agriculture, Fisheries and Forestry (2008)	EA Section 7.16.9	No	11/overall amber – red in some areas	Operations ongoing, monitoring results included in annual weed action plan. Weed management contractors engaged

Domain Objective	Performance Indicator	Completion Criteria	Justification/ Source	Complete (Yes/No)	TARP Element(s) / Status	Comment
from bushfire, weeds and feral animals		*Field Manual for surveying and Mapping Nationally Significant Weeds.*				throughout the year to control invasive species.
	Feral animal density	Feral animal pests are controlled in accordance with legislation and the MOP.	EA Section 7.16.9 MOP	No	na	Operations ongoing, monitoring results show no significant issues
	Fuel loads	Fuel loads are assessed and managed as required including, maintaining fire-breaks.	EA Section 7.16.9	No	15/green	Operations ongoing. Bushfire Hazard Assessment completed in 2018.
	Access	Firefighting access across rehabilitation areas and water sources (dams) is maintained in accordance with the Bushfire Management Plan.	EA Section 7.16.9	No	15/green	Operations ongoing
Domain B – Water Management						
Surface water runoff from the final landform will be non-polluting.	Discharge water quality	Water quality testing confirms discharge water quality meets EPL requirements. Analytes measured in accordance with EPL 2094 include; conductivity, pH and TSS.	EPL 2094	No	n/a	Operations ongoing, compliant with EPL
Domain C – Rehabilitation Area – Grassland						
At least 1247 ha of grassland will be established that can be demonstrated to be capable of supporting sustainable grazing.	Hectares	Survey confirms that a minimum of 1247 ha of Grassland has been established.	DA 305-11-01 Schedule 3 Condition 37	No	na	Operations ongoing
	Soil Quality	Soil testing indicates that soil pH, ESP and EC are trending toward the range of analogue sites after 5 years.	LCO Rehabilitation Monitoring Strategy (GSSE)	No	7/green	Operations ongoing, no issues identified in monitoring
	Species composition	Pasture species to consist of grasses and legumes appropriate to the district and recognised as suitable for beef cattle grazing.	LCO Rehabilitation Monitoring Strategy (GSSE)	No	12, 13 / amber	Operations ongoing, species sown as per approved list. LCO is implementing rotational grazing where practical to continue pasture improvement. See detailed results in Section 8.

Domain Objective	Performance Indicator	Completion Criteria	Justification/ Source	Complete (Yes/No)	TARP Element(s) / Status	Comment
	Ground cover	Rehabilitation survey confirms at least 80% vegetative cover over a minimum of 95% of areas treated after one year.	LCO Rehabilitation Monitoring Strategy (GSSE)	No	na	Operations ongoing, no issues identified in monitoring
Domain D – Rehabilitation Area - Woodland						
At least 731 ha of woodland will be established on areas disturbed by mining including the slopes of overburden emplacement areas	Hectares	Survey confirms that a minimum of 731 ha of Woodland have been established.	DA 305-11-01 Schedule 3 Condition 37	No	na	Operations ongoing,
Woodland rehabilitation areas will be self-sustaining and require ongoing management inputs that are appropriate for the final land use	Surface cover	Rehabilitation survey confirms ground cover (vegetation, leaf litter, mulch) greater than 70% by Year 5.	This MOP	No	9/green	Operations ongoing
	Soil Quality	Soil testing indicates soil characteristics (pH, EC, ESP) vary by no more than 20% from relevant analogue site after 5 years.	LCO Rehabilitation Monitoring Strategy (GSSE) EA Section 7.16.9	No	7/green	Operations ongoing, no significant issues identified in monitoring
Vegetation compositions in woodland rehabilitation areas will be comparable with analogue vegetation communities, including areas representative of Central Hunter Box – Ironbark Woodland, specifically adjacent to rehabilitation areas at Ravensworth Operations and Mount Owen Complex	Vegetation health	More than 75 per cent of trees are healthy and growing as indicated by long term rehabilitation monitoring.	EA Section 7.16.9	No	na	Operations ongoing, no significant issues identified in monitoring
		Rehabilitation monitoring confirms canopy cover is in the range of 10 per cent to 30 per cent.	EA Section 7.16.9	No	na	Operations ongoing, no significant issues identified in monitoring
	Species presence	Revegetation areas contain flora species assemblages characteristic of each strata for the desired native vegetation communities.	EA Section 7.16.9	No	12/amber in some areas	Operations ongoing, no significant issues identified in monitoring. Supplementary planting works planned to continue in 2019.
		Rehabilitation monitoring confirms the presence of at least two overstorey and two understorey species at all ages.	LCO Rehabilitation Monitoring Strategy (GSSE)	No	12/amber in some areas	Operations ongoing, no significant issues identified in monitoring

Domain Objective	Performance Indicator	Completion Criteria	Justification/ Source	Complete (Yes/No)	TARP Element(s) / Status	Comment
	Stem density	Minimum total tree/shrub densities for seeded areas to be: Year 1 – 1,000 stems/ha Year 5 – 500 stems/ha Year 10 – 400 stems/ha As confirmed by rehabilitation monitoring.	LCO Rehabilitation Monitoring Strategy (GSSE)	No	na	Operations ongoing, no significant issues identified in monitoring. Supplementary planting or tree thinning works planned in 2017.
Ecosystem Sustainability Phase – no rehabilitation in this phase						
All Secondary Domains						
Enhance the productivity and ecological value of rehabilitation areas by effectively managing risks from bushfire, weeds and feral animals	Firefighting resources	Adequate access and water resources for firefighting are retained in the final landform for relinquishment.	EA Section 7.16.9	No	15/ N/A	Operations ongoing
	Weed presence	There are no significant weed infestations that are identified as a risk to rehabilitation.	EA Section 7.16.9	No	11/ N/A	Operations ongoing, monitoring results included in annual weed action plan.
	Feral animal density	Feral animal pests are controlled in accordance with legislation and do not present a risk to biodiversity.	EA Section 7.16.9	No	na	Operations ongoing
Soils (or soil substitutes) will be reinstated on rehabilitation areas with characteristics that are appropriate for the final landuse	Soil chemistry	Soil testing indicates soil N, P, K and S levels are within 20% of levels of analogue site after 10 years.	LCO Rehabilitation Monitoring Strategy (GSSE)	No	7/ N/A	Operations ongoing, no significant issues identified in monitoring
	Organic carbon	Soil testing indicates soil total organic carbon is no less than 20% of levels in adjacent analogue site after 10 years.	LCO Rehabilitation Monitoring Strategy (GSSE)	No	7/ N/A	Operations ongoing, no significant issues identified in monitoring
	Soil profile development	Soil cores demonstrate a developing A and B horizon.	This MOP	No	na	Operations ongoing
Domain A – Water Management Area						
At least 1247 ha of grassland will be established that can be demonstrated to be	Species composition	At least 75% of species surveyed consist of grasses and legumes appropriate to the district and recognised as species suitable for grazing.	EA Section 7.16.9	No	10/ N/A	Operations ongoing, trending towards target. Management of pasture required once appropriate.

Domain Objective	Performance Indicator	Completion Criteria	Justification/ Source	Complete (Yes/No)	TARP Element(s) / Status	Comment
capable of supporting sustainable grazing by: • Having a pasture species mix representative of the district • Providing a mix of land capability suitable for agriculture (Rural Land Capability Class IV, V and VI); • having a carrying capacity comparable to suitable analogue sites; and Requiring management inputs comparable to suitable analogue sites	Natural regeneration	Evidence of second generation pasture plants present during rehabilitation monitoring.	LCO Rehabilitation Monitoring Strategy (GSSE)	No	na	Operations ongoing, trending towards target. Management of pasture required once appropriate.
	Fertiliser and ameliorants	Fertiliser and amelioration are no longer required.	This MOP	No	na	Operations ongoing, trending towards target. Management of pasture required once appropriate.
	Weed and pest management	Weed and pest management inputs are no more than those of analogue sites.	This MOP EA Section	No	na	Operations ongoing, trending towards target. Management of pasture required once appropriate.
	Yields	Pasture production is comparable to similarly managed analogue site yields within 5 years. .	This MOP EA Section 7.16.9	No	na	Operations ongoing, trending towards target. Management of pasture required once appropriate.
	Stock water availability	Water storage and access to water are suitable to support low intensity grazing activities.	This MOP	No	na	Operations ongoing, trending towards target. Management of pasture required once appropriate.
Woodland rehabilitation areas will be self-sustaining and require ongoing management inputs that are appropriate for the final land use	Nutrient recycling	Inspections confirm evidence of nutrient recycling (e.g. presence of fungi).	This MOP	No	na	Operations ongoing, trending towards target.
	Surface cover	Rehabilitation monitoring confirms ground cover (vegetation, leaf litter, mulch) is in the range of analogue sites at Year 10.	This MOP	No	9/ N/A	Operations ongoing, trending towards target.
	Vegetation health	More than 75 per cent of trees are healthy and growing as indicated by long term rehabilitation monitoring.	EA Section 7.16.9	No	na	Operations ongoing, trending towards target.
	Species composition	Revegetation areas contain flora species assemblages characteristic of the desired native vegetation communities.	This MOP EA Section 7.16.9	No	12/ N/A	Operations ongoing, trending towards target, works to ensure composition is trending towards target ongoing
	Reproduction	Rehabilitation monitoring confirms second generation tree seedlings are present or likely to be (e.g. presence of flowering).	EA Section 7.16.9	No	na	Operations ongoing, trending towards target.

Domain Objective	Performance Indicator	Completion Criteria	Justification/ Source	Complete (Yes/No)	TARP Element(s) / Status	Comment
	Structure	Rehabilitation monitoring confirms rehabilitated areas provide a range of vegetation structural habitats (e.g. eucalypts, shrubs, ground cover, developing litter layer, etc.) to encourage use by native fauna species.	EA Section 7.16.9	No	14/ N/A	Operations ongoing, works to ensure composition is trending towards target ongoing
	Native fauna presence	Rehabilitation monitoring confirms target native fauna species are recorded utilising rehabilitation areas.	This MOP	No	na	Operations ongoing, trending towards target.
Woodland rehabilitation corridors will connect with remnant vegetation and rehabilitation at adjacent operations including Ravensworth Operations and Mount Owen Complex, to enhance habitat connectivity	Connectivity	Habitat corridors are shown to be successfully established and consistent with desired vegetation community compositions.	This MOP	No	14/ N/A	Operations ongoing, trending towards target.
		Woodland corridors are assessed to provide contiguous structural habitat.	EA Section 7.16.9	No	14/ N/A	Operations ongoing, trending towards target.

Appendix H - Rehabilitation Detail

2018 Rehabilitation Detail					
Entrance Premier RL192					
Domain	4	**Re-vegetation Date:**	December 2018	**Area:**	19ha
Land Use: Pastoral/grazing **Seed/Plant Mix:** Liddell summer pasture seed mix Landform shaping completed in November 2018 comprising flat top of emplacement area. The area was ripped to reduce compaction, rock raked and gypsum applied at 10T/ha (50% recycled and 50% natural mined). Chisel ploughed surface prior to seeding which was undertaken immediately following site preparation. A minor dam was constructed on the eastern extent of the area and some shelter belt tree lines planted strategically nearby for native fauna habitat and grazing resource. Liddell summer pasture seed mix applied using locally sourced seed (see Table 24 for details) with DAP fertilizer applied at 250kg/ha. Status/Progress: No establishment of cover crop or other pasture species due to complete absence of rainfall and drought conditions. Continue monitor and apply maintenance measures as necessary.					
Entrance Premier RL192 West Slope					
Domain	4	**Re-vegetation Date:**	December 2018	**Area:**	13ha
Land Use: Woodland **Seed/Plant Mix:** Native woodland and cover crop This area is on the western extents of the Entrance Pit overburden emplacement facing the main southern railway. Landform shaping was completed in Q4 2018 comprising of a 10 degree west facing slope. Surface water drainage includes graded contour drains directing flow south towards the entrance pit void downslope. Topsoil sourced from stockpiles and originally from areas of woodland vegetation cleared for mining advancement. Topsoil was applied at 120mm as well as gypsum at 7t/ha. Surface preparation of the area included ripping to 400mm and along the contour with rocks brought to the surface during this process selectively left on the surface. Additional habitat material was constructed including log and/or rock piles for native fauna. Seeding was completed by hand immediately following site preparation with woodland species seed mix consistent with target vegetation, Central Hunter Box Ironbark Woodland. Status/Progress: No cover crop has established due to absence of rainfall. No surface erosion has occurred and deep ripping should mitigate rill occurrence. It is expected that the area will change significantly as it develops over the first 3years.					
South Cut RL195 East Slope					
Domain	4	**Re-vegetation Date:**	October 2018	**Area:**	8ha
Land Use: Woodland **Seed/Plant Mix:** Native woodland and cover crop This area is on the Eastern extents of the South Cut overburden emplacement facing the main southern railway. Landform shaping was completed in Q2 2018 comprising of a 10 degree east facing slope. Surface water drainage includes graded contour drains directing flow south towards the south cut pit void downslope. Topsoil sourced from stockpiles and originally from areas of woodland vegetation cleared for mining advancement. Topsoil was applied at 120mm as well as gypsum at 9t/ha. Surface preparation of the area included ripping to 400mm and along the contour with rocks brought to the surface during this process selectively left on the surface. Additional habitat material was constructed including log and/or rock piles for native fauna. Seeding was completed by UAV immediately following site preparation with woodland species seed mix consistent with target vegetation, Central Hunter Box Ironbark Woodland. Status/Progress: Limited cover crop has established due to absence of rainfall. No surface erosion has occurred and deep ripping should mitigate rill occurrence. It is expected that the area will change significantly as it develops over the first 3years.					
South Cut RL195 West Slope					
Domain	4	**Re-vegetation Date:**	October 2018	**Area:**	4ha
Land Use: Woodland **Seed/Plant Mix:** Native woodland and cover crop This area is on the western extents of the South Cut overburden emplacement facing the main southern railway. Landform shaping was completed in Q2 2018 comprising of a 10 degree west facing slope. Surface water drainage includes graded contour drains directing flow south towards the south cut pit void downslope.					

Topsoil sourced from stockpiles and originally from areas of woodland vegetation cleared for mining advancement. Topsoil was applied at 120mm as well as gypsum at 9t/ha. Surface preparation of the area included ripping to 400mm and along the contour with rocks brought to the surface during this process selectively left on the surface. Additional habitat material was constructed including log and/or rock piles for native fauna. Seeding was completed by UAV immediately following site preparation with woodland species seed mix consistent with target vegetation, Central Hunter Box Ironbark Woodland.

Status/Progress: Limited cover crop has established due to absence of rainfall. No surface erosion has occurred and deep ripping should mitigate rill occurrence. It is expected that the area will change significantly as it develops over the first 3years.

Entrance Premier RL180

Domain	4	**Re-vegetation Date:**	October 2018	**Area:**	12ha

Land Use: Pastoral/grazing

Seed/Plant Mix: Liddell summer pasture seed mix

Landform shaping completed in Q2 2018 comprising flat top of emplacement area. The area was ripped to reduce compaction, rock raked and gypsum applied at 10T/ha (50% recycled and 50% natural mined). Chisel ploughed surface prior to seeding which was undertaken immediately following site preparation. The area adjoins the Entrance RL192 Pasture and hence dam and some shelter belt tree lines provide resources of this area. Liddell summer pasture seed mix applied using locally sourced seed (see Table 24 for details) with OGM applied.

Status/Progress: Good establishment of cover crop with some rainfall in November. Continue monitor and apply maintenance measures as necessary.

South Cut RL195 Center

Domain	4	**Re-vegetation Date:**	September 2018	**Area:**	11ha

Land Use: Pastoral/grazing

Seed/Plant Mix: Liddell summer pasture seed mix

Landform shaping completed in Q2 2018 comprising flat top of emplacement area. The area was ripped to reduce compaction, rock raked and gypsum applied at 10T/ha (50% recycled and 50% natural mined). Chisel ploughed surface prior to seeding which was undertaken immediately following site preparation. Liddell summer pasture seed mix applied using locally sourced seed (see Table 24 for details) with OGM applied.

Status/Progress: Good establishment of cover crop with some rainfall in November. Continue monitor and apply maintenance measures as necessary.