Centennial Coal

Springvale Coal Pty Limited
Springvale Colliery
ANNUAL REVIEW

March 2017

Centennial Coal
Environment Matters

Table 1. Annual Review Title Block

Name of Operation	Springvale Colliery
Name of Operator	Springvale Coal Pty Limited
Development Consent/ Project Approval #	SSD 5594
Mining Lease #	ML1303, ML 1323, ML 1326, ML 1424, ML 1537, ML 1588, ML 1670, MLA 445, MLA 451, MLA 497, CL 377, MPL 314, EL 6974, AUTH 460
Name of Holder of Mining Lease	Centennial Springvale Pty Ltd and Springvale SK Kores Pty Ltd
Water License #	10WA118719 (WAL 36383) 10BL603519 (WAL 36383) 10BL602017 (WAL 36443) 10BL601863 (WAL 36446)
Name of Holder of Water License	Centennial Springvale Pty Ltd
MOP/RMP Start Date	November 2015
MOP/RMP End Date	October 2022
Annual Review Start Date	1 January 2016
Annual Review End Date	31 December 2016

I, Mick Cairney, certify that this audit report is a true and accurate record of the compliance status of Springvale Colliery for the period 01/01/2016 to 31/12/2016 and that I am authorized to make this statement on behalf of Springvale Coal Pty Ltd

Note:

a) *The Annual Review is an 'environmental audit' for the purposes of s122B(2) of the Environmental Planning and Assessment Act 1979. Section 122E provides that a person must not include false or misleading information (or provide information for inclusion) in an audit report produced to the Minister in connection with an environmental audit if the person knows that the information is false or misleading in a material respect. The maximum penalty is, in the case of a corporation, $1 million and for an individual, $250,000.*

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

Name of Authorised Reporting Officer	Mick Cairney
Title of Authorised Reporting Officer	Executive General Manager Operations
Signature of Authorised Reporting Officer	
Date	

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1. STATEMENT OF COMPLIANCE

Compliance status is presented into **Tables 2** and **3**.

Table 2. Statement of Compliance

Were all conditions of the relevant approval(s) complied with?	
SSD 5594	No
EPBC 2011/5949	Yes
EPBC2013/6881	Yes
SMP LW 411-418 (04/1673)	Yes
ML 1303	Yes
ML 1323	No
ML 1326	Yes
ML 1424	Yes
ML 1537	Yes
ML 1588	Yes
ML 1670	Yes
CL 377	Yes
MPL 314	No
EL 6974	Yes
AUTH 460	Yes
EPL 3607	No
WAL 36383	Yes
WAL 36443	Yes
WAL 36446	Yes

Table 3. Non-Compliances

Relevant Approval	Condition #	Condition summary	Compliance Status	Comment	Section addressed in Annual Review
SSD 5594	Schedule 2, Condition 2a	Generally in accordance with EIS-Manning Numbers	Non-Compliant	Employment exceeds a full time workforce of up to 310	Section 11
SSD 5594	Schedule 4, Condition 1	Noise Criteria Limit	Non-Compliant	One exceedance recorded	Section 6.2, Section 11
ML 1323	4	Compliance Report	Administrative Non-Compliance	Timing of submission	Section 11
MPL 314	4	Compliance Report	Administrative Non-Compliance	Timing of submission	Section 11
EPL 3607	L2.4	Water and Land Concentration limits	Non-Complaint	Concentration limits exceeded	Section 11
EPL 3607	M2.4	Land Monitoring Requirements	Non-Compliant	One depositional dust gauge sample was not recorded	Section 11
EPL 3607	M2.4	Water Monitoring Requirements	Non-Compliant	One weekly pH sample was not recorded	Section 11

Note: Compliance Status Key for Table 3

Risk Level	Colour Code	Description
High		Non-compliance with potential for significant environmental consequences, regardless of the likelihood of occurrence
Medium		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-compliance with: • Potential for moderate environmental consequences, but is unlikely to occur; or Potential for low environmental consequences, but is likely to occur
Administrative		Only to be applied where the non-compliance does not result in any risk of environmental harm (eg submitting a report to government later than required under approval conditions)

2. INTRODUCTION

Springvale Mine is an existing underground coal mine producing high quality thermal coal which is supplied to both domestic and international markets. It is located 15 kilometres to the northwest of the regional city of Lithgow and 120 kilometres west-northwest of Sydney in New South Wales (NSW). This is shown in **Figure 1**.

Underground coal mining commenced at Springvale Mine in 1995 following the granting of Springvale Mine's development consent (DA 11/92) on the 27th of July 1992, pursuant to Section 101 under Part 4 of the NSW Environmental Planning and Assessment Act, 1979 (EP&A Act). Springvale Coal Pty Limited is the operator of Springvale Mine.

On the 21st of September 2015 SSD 5594 was approved by the Department of Planning and Environment. The approval of SSD 5594 allows Springvale to continue underground coal mining operations within the Lithgow Seam at rates up to 4.5 Mtpa until 31 December 2028, with subsequent rehabilitation and closure works. In summary the project includes:

- continued longwall mining operations to extract up to 4.5 million tonnes per annum (Mtpa) of run-of-mine (ROM) coal from the Lithgow Seam;
- continued operation of the mine's pit top area, support facilities and utilities;
- extension and continued use of the Springvale Delta Water Transfer Scheme, bore dewatering facilities and ventilation infrastructure;
- continued processing (sizing and screening) of ROM coal at the pit top area;
- continued stockpiling of ROM coal (85,000 tonnes (t) capacity);
- continued transportation of processed coal by overland conveyor to Centennial's Western Coal Services site (WCSS) for further processing or to the Mt Piper Power Station;
- continued transportation of processed coal by road haulage to other local domestic customers (limited to 50,000 tpa); and
- rehabilitation of the pit top area and Newnes Plateau surface infrastructure sites.

A summary of the development consent and mining lease boundary is shown in **Figure 2** and **3**.

The main components of Springvale Mine's operations are an underground longwall mine, accessed via the Springvale pit top, and supporting surface infrastructure within the pit top area and on Newnes Plateau within the Newnes State Forest. The Newnes Plateau infrastructure areas are accessed for light vehicles via State Mine Gully Road located in north Lithgow, and Old Bells Line of Road though Clarence for light and heavy vehicles Newnes Plateau and Pit Top disturbance Areas are shown in Figure 4 and 5 respectively.

The contact details for Springvale personnel responsible for environment management and community relations, along with details for community complaints and enquiries have been provided in **Table 4**.

Table 4. Springvale Colliery Primary Contacts

Contact	Position	Contact Details
Primary Contacts		
Brian Nicholls	Mine Manager	T: (02) 6350 1613
		F: (02) 6355 1502
Catherine Suggate	Environment and Community Co-ordinator	T: (02) 6350 1672
		F: (02) 6355 1502
Community Enquiries/Complaints		
Springvale Enquiries and Community Complaints		T: (02) 6350 1640

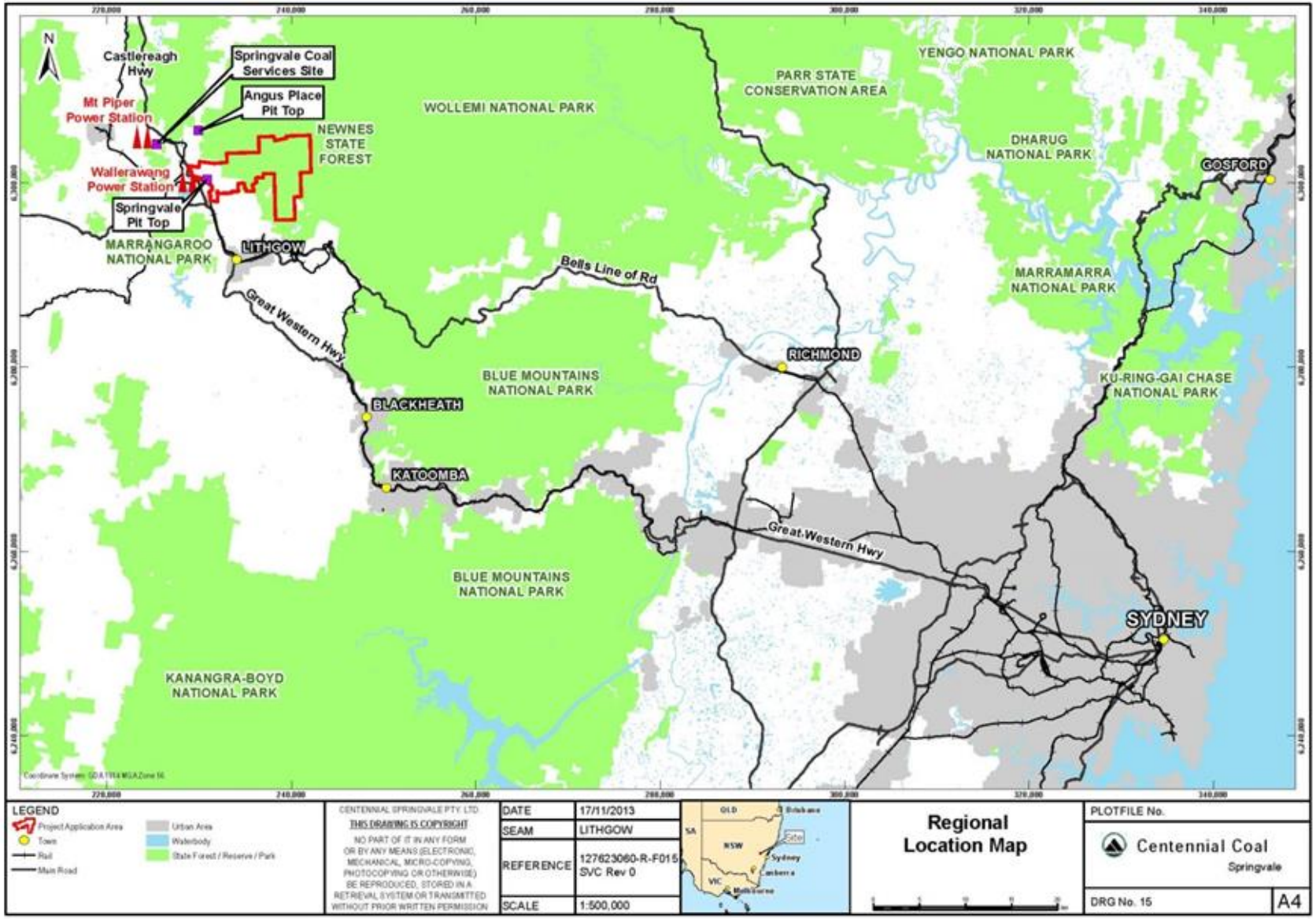


Figure 1. Regional Locality Plan

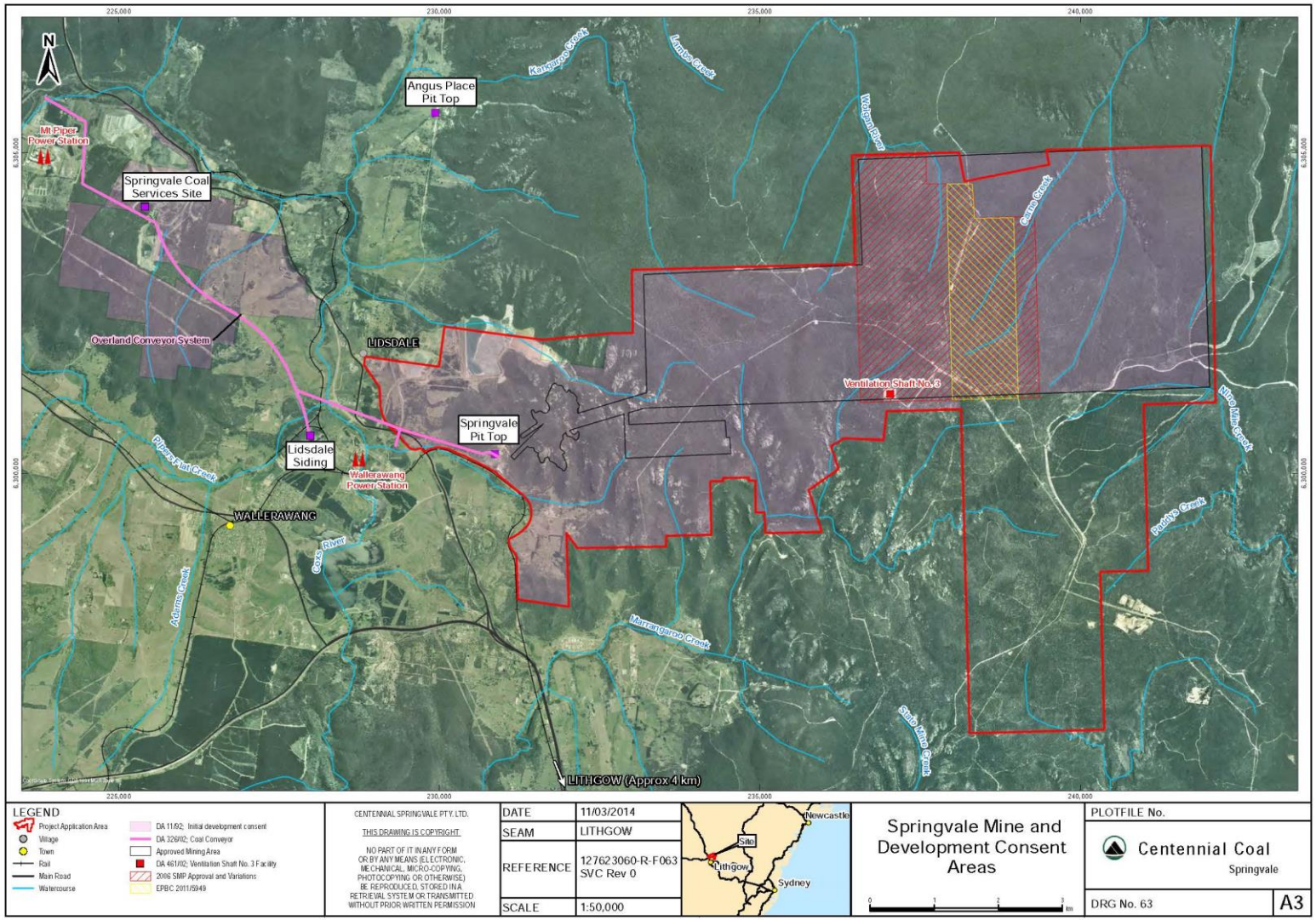


Figure 2. Development Consent Boundary

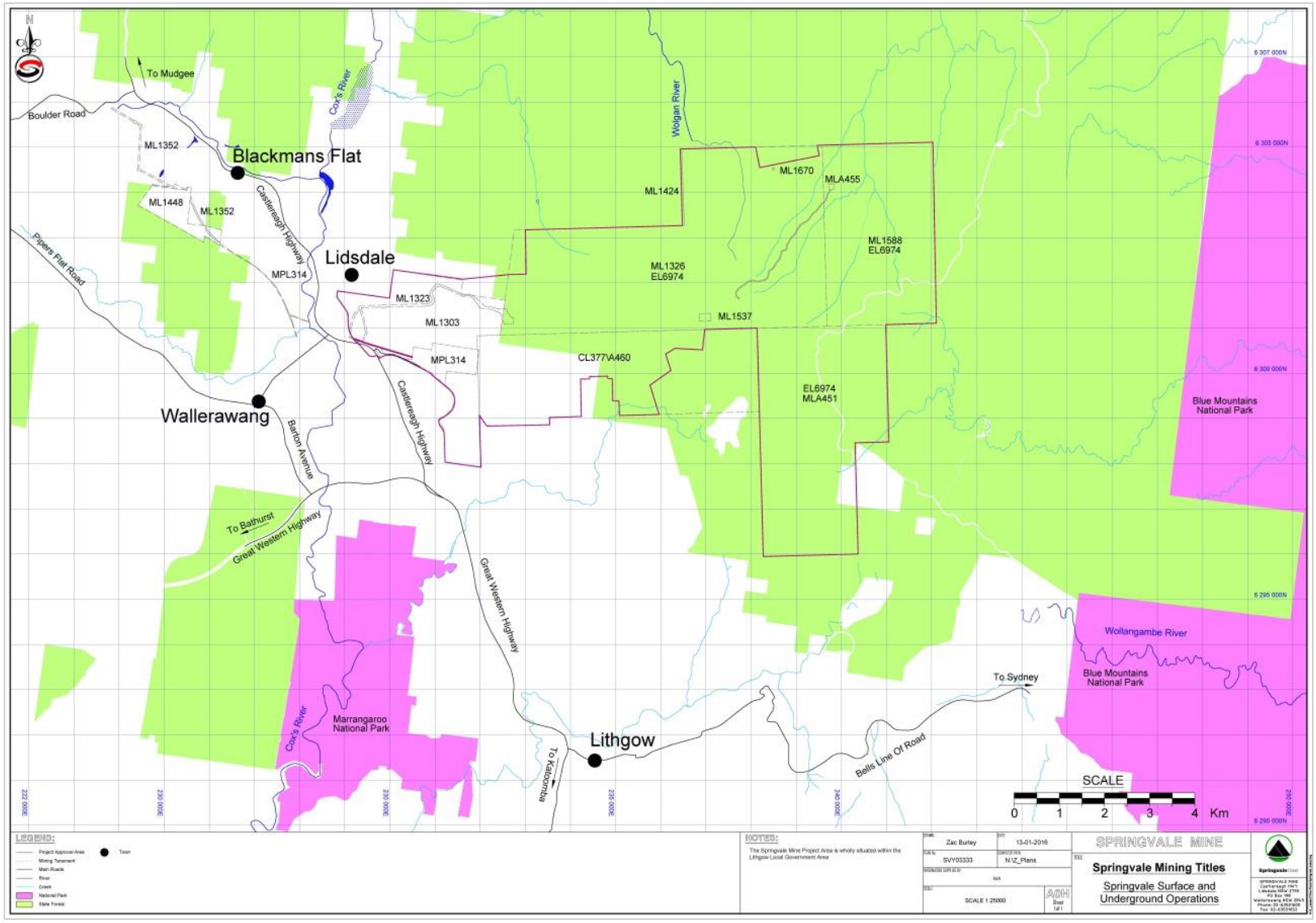


Figure 3. Mining Lease Boundaries

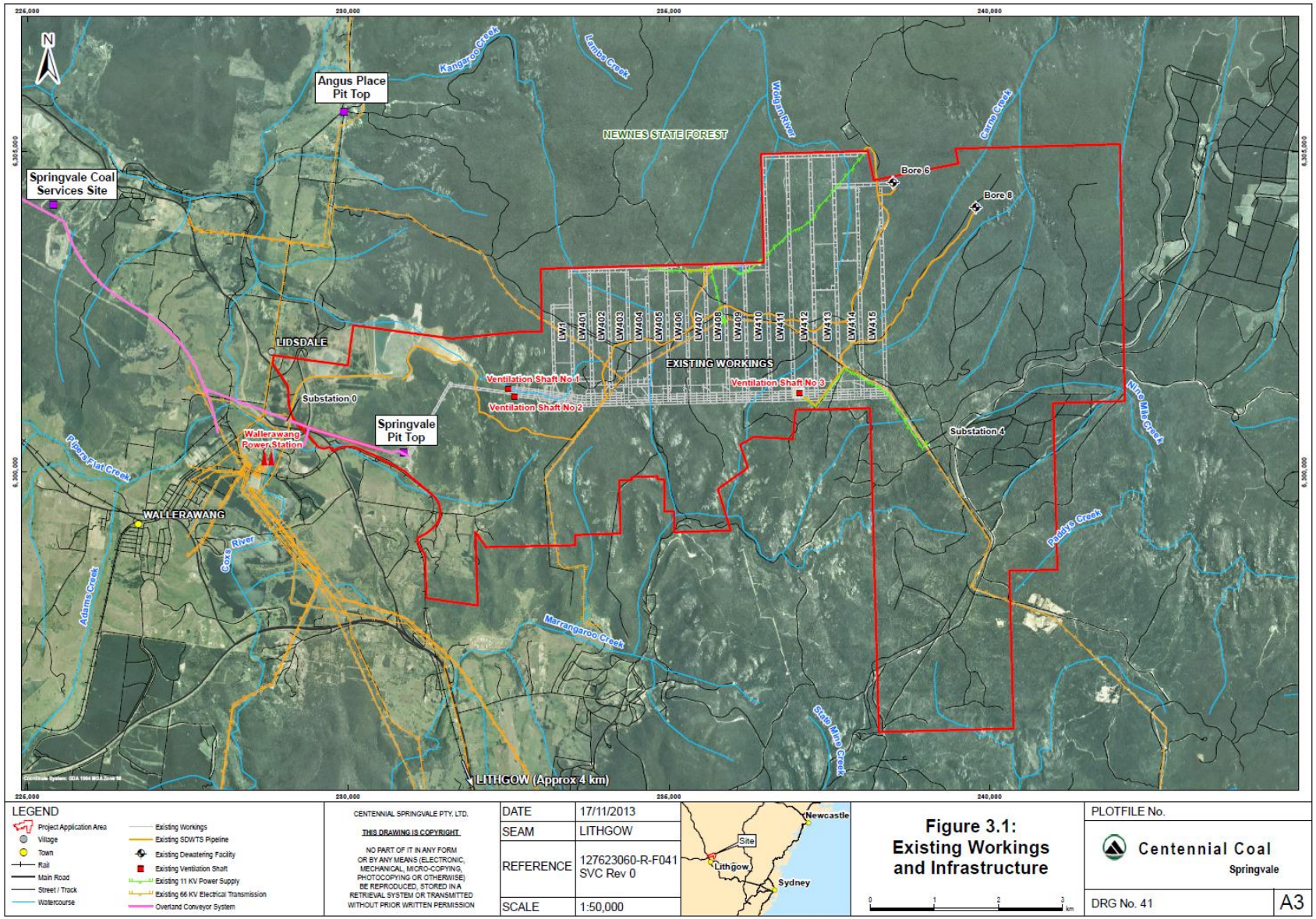


Figure 4. Newnes Plateau Operational Disturbance

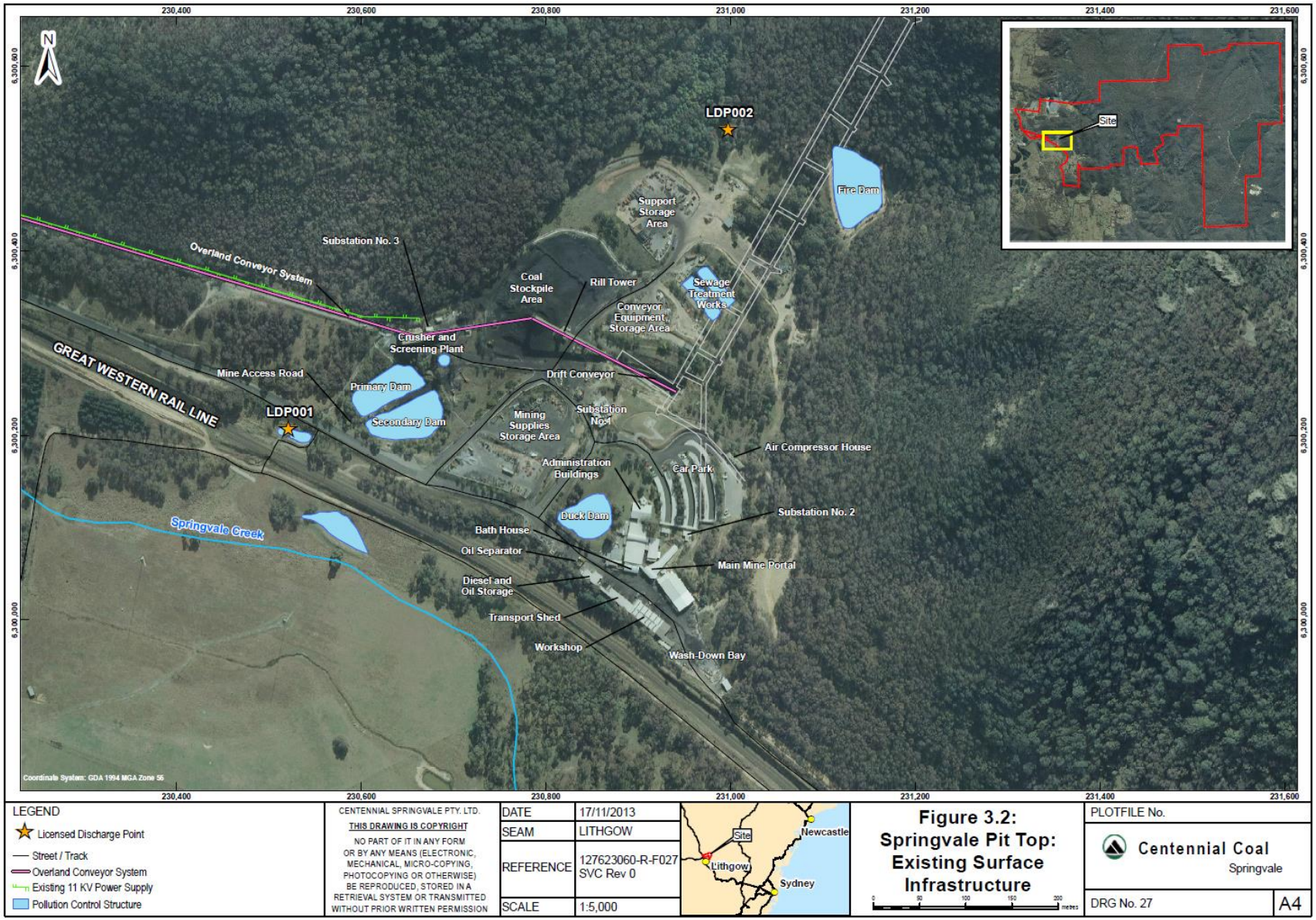


Figure 5. Springvale Pit Top Operational Disturbance

3. APPROVALS

The following sections provide a summary of approvals held by Springvale Colliery and any changes made to those approvals over the reporting period.

3.1. Development Consents and EPBC Approvals

Development Consent SSD 5594 was granted to Springvale on the 21st of September 2015. This consent supersedes the former Development Consent DA 11/92. In accordance with Schedule 2, Condition 10 of SSD 5594, DA 11/92 was required to be surrendered by the 21st of September 2016. Given the large number of landholders within the existing development consent boundaries, Centennial requested and received agreement by DPE to extend the date for the surrender of the consent to the 21st of September 2017. All development and activities at Springvale from the 21st of September 2016 will be undertaken in accordance with SSD 5594 and DA 11/92 will not be relied upon to undertaken development or activities beyond those encompassed by SSD 5594.

Springvale also operates in accordance with two federal approvals under the EPBC Act granted by the Department of Environment (former Department of Sustainability, Environment, Water, Population and Communities). Approval EPBC 2011/5949 was granted on the 14th of March 2012 and allows Springvale to extract coal from Longwalls 415 – 417. A second approval (EPBC 2013/6881) was issued on the 15th of October 2015 to allow secondary extraction associated with the Springvale Mine Extension Project SSD 5594. During the reporting period, the Springvale Extraction Plan for Longwall 419 was approved by DoE and DPE, and a resultant variation made to the EPBC2013/6881 approval. The variation was approved on the 29th of July 2016 and pertained to Conditions 6 and 7.

Additional detail pertaining to the Springvale Development Consents and EPBC Approvals has been provided in **Table 5**.

Table 5. Development Consents and EPBC Approvals

Approval	Details	Date of Issue	Expiry
SSD 5594	Springvale Mine Extension Project	21 September 2015	31 December 2028
EPBC 2011/5949	Mining of Longwalls 415 – 417.	14 March 2012	19 March 2032
EPBC 2013/6881	Mining associated with the Springvale Mine Extension Project.	15 October 2015	8 October 2035

Two Modifications to SSD 5594 were also submitted to DPE for assessment during the reporting period. Details of these are outlined in **Table 6** below.

Table 6. SSD 5594 Modification Details and Status

Modification No.	Details of Modification	Date of Application /Exhibition Period	Status (as at 31 December 2016)
Mod 1	• Increase of the approved workforce (including contractors) from 310 full time equivalent (FTE) to 450; • Increase in ROM coal production from the approved 4.5 Mtpa to 5.5 Mtpa; and • Increase in the existing stockpile capacity at the Springvale pit top from 85,000 tonnes to 200,000 tonnes capacity and an increase in the coal stockpile footprint by 0.3ha northeast of the	23/07/2016 / 02/08/2016 – 23/08/2016	Assessment

Modification No.	Details of Modification	Date of Application /Exhibition Period	Status (as at 31 December 2016)
	stockpile area.		
Mod 2	• To remove the requirement to *Meet limits for salinity of 700 (50th percentile), 900 (90th percentile)and 1000 (100th percentile) uS/cm by 30 June 2017;* and • To defer to 30 June 2019 the requirement to *Eliminate acute and chronic toxicity from LDP009 discharges to aquatic species by 30 June 2017, with acute toxicity defined as >10% effect relative to the control group and chronic toxicity defined as >20% effect relative to the control group.*	22/12/2016 / 24/01/2017 – 28/02/2017	Submitted

3.2. Authorisations

The Springvale holding includes Mining Lease (ML) 1303, ML 1323, ML 1326, ML 1424, ML 1537, ML 1588, ML 1670, one Coal Lease (CL) (CL 377) and one Mining Purposes Lease (MPL) (MPL 314). Springvale also undertake exploration activities in accordance with Exploration Licence (EL) 6974 and Authorisation (AUTH) 460. On the 29th of October 2012 and 2nd of June 2015 Centennial Springvale Pty Limited submitted Mining Lease Application (MLA) 445 and MLA 497, respectively. MLA 445 is associated with the Bore 8 dewatering facility (and the associated infrastructure corridor) and MLA 497 is associated with Licenced Discharge Point (LDP) 009. Additional details relating to these mining tenements have been provided in **Table 7**.

Table 7. Mining Tenements

Lease	Grant Date	Expiry Date
ML 1303	15 December 1992	15 December 2034
ML 1323	3 August 1993	3 August 2035
ML 1326	28 September 1993	18 August 2024
ML 1424	18 August 2003	18 August 2024
ML 1537	15 June 2003	15 June 2024
ML 1588	19 June 2006	19 June 2027
ML 1670	17 February 2012	17 February 2033
ML 1727	4 February 2016	4 February 2037
MLA 445^	-	-
MLA 497^	-	-
CL 377	24 February 1992	9 March 2025
MPL 314	3 August 1993	3 August 2035
EL 6974	11 December 2007	13 December 2017
AUTH 460	7 July 1992	6 June 2020

^MLA 445, and MLA 497 were submitted 29 October 2012 and 2 June 2015, respectively.

One new mining lease, ML 1727, was obtained during the reporting period. ML 1727 is associated with the proposed longwall panels 424 – 432.

3.3. SMP Longwalls 411 - 418

In May 2005, Springvale submitted a Subsidence Management Plan (SMP) Application to the NSW Department of Primary Industries (now DRE) seeking approval for first workings and secondary extraction within Longwalls 411 – 418. SMP Approval was issued on the 7th of March 2006 (Reference Number 04/1673). Subsequent SMP variations were submitted and approved between 2008 and 2014 allowing various changes to the mining layout within Longwalls 413 – 418. Underground mining in Longwalls 411 to 418 has now been completed (extraction of Longwall 418 was completed on the 27th of May 2016). Monitoring will continue to be undertaken post-mining in accordance with the approved Longwalls 411 to 418 SMP.

Additional details pertaining to the SMP Approvals and SMP Variations at Springvale have been provided in **Table 8**.

Table 8. SMP Approvals and Variations

SMP	Issue Date	Description	Purpose of Refinement
Initial SMP Approval 04/1673	2006	SMP for Longwalls 411-418	Mining lease requirement for approved SMP prior to mining and in accordance with the approved dimensions of DA 11/92. Void widths of 315 m and longwalls lengths in excess of 3,750 m.
Section 138 Approval (*Coal Mine Regulation Act 1982*)	January 2006	-	Approval to extract Longwalls 411 and 412 within the Lithgow Seam.
SMP Variation	November 2008	Reduction in Length of Longwalls 414-418	Longwalls 414 to 418 shortened by 471 m to the south to avoid a geological syncline running through the northern extent of these longwall blocks. Also as a result of this mine design modification, sensitive surface features have been avoided, including hanging swamps and pagodas to the north of Longwalls 416 to 418.
SMP Variation 08/8497	February 2009	Longwall 413 step around and reduction of Longwall 414	Step around of Longwall 413 was approved to avoid existing geological constraints. Longwall 414 shortened by approximately 700 m to the south due to anticipated geological conditions which could potentially lead to dangerous roof control issues and difficult mining conditions within the northern portion of Longwall 414.
SMP Variation 08/8497	August 2009	Changes to Longwall 413 block dimensions	Variation to the take-off face position in Longwall 413.
Clause 88 Approval	October 2009	-	Variation approval to extract Longwall 414 within the Lithgow Seam.
SMP Variation 08/8497	2010	Reduction in length of Longwall 414	Based on monitoring results and feedback from stakeholder consultation, Longwall 414 was shortened by in excess of 1,186 m. Dimensions were modified to avoid significant business interruption and production discontinuity. Another outcome of the shortening of Longwall 414 was the avoidance of Sunnyside Swamp.

SMP	Issue Date	Description	Purpose of Refinement
SMP Variation 08/8497	2011	Changes in Mine Plan dimensions of Longwalls 416 and 417	Change of mine plan to reduce void width of Longwalls 416 and 417 from 315 m to 261 m and increase of chain pillar width from 45 m to 58 m. The new dimensions were to improve underground stability and minimise the risk of environmental impact to surface features.
SMP Variation 08/8497	2012	SMP Variation Longwall 415	Change in mine plan to reduce the length of Longwall 415 due to geological conditions.
SMP Variation 11/3964	2012	SMP Variation Longwall 416	Longwall 416 was shortened based upon identification of lithology change, which posed a risk to mine safety, coal quality and production rates. Also as a result of this mine design modification, sensitive surface features have been avoided, including hanging swamps to the north of Longwall 416.
SMP Variation OUT 12/27914 OUT13/37387 OUT14/33055	2013/2014	SMP Variation Longwalls 411-418	Reduction of Longwall 416 Length to current Bore 8 drive age. Subsequent approvals under same variation for Longwalls 417 and 418
SMP Variation OUT13/2174	2013	SMP Variation Longwalls 411-418	Change in mine plan dimensions for Longwalls 411–418. Increase of pillar length to 130 m.
SMP Variation OUT13/1178	2013	Extension in time SMP Approval	Variation to extend relevant SMP approvals until 28 September 2014.
SMP Variation OUT13/21877	2013	SMP Variation Longwalls 411-418	Adjust Longwall 418 void dimensions to be consistent with Longwalls 416-417.
SMP Variation OUT14/9977	2014	SMP Variation Longwalls 411-418	Increase Longwall cutting height up to 3.5 m outside Newnes Plateau Shrub Swamp Buffer Zones (as defined by SEWPaC EPBC approval)
SMP Variation OUT 14/15149	2014	SMP Variation Longwalls 411-418	Extension of time to 30 September 2015.
SMP Variation OUT15/26505	2015	SMP Variation Longwalls 411-418	Extension of time to 30 September 2016.

As shown in **Table 8**, there were no further SMP Variations during the reporting period.

3.4. Longwall 419 Extraction Plan

In July 2016, the Longwall 419 Extraction Plan was approved allowing for the commencement of secondary extraction in Longwall 419. Mining commenced within Longwall 419 on the 2nd of August 2016. Monitoring of subsidence related impacts will be undertaken in accordance with the requirements of the Longwall 419 Extraction Plan.

The Extraction Plan was been developed in accordance with the requirements of:

- SSD 5594, Schedule 3, Conditions 1, 2, 3, 4, 5, 6, 7, and 10;
- EPBC 2013/6881 Conditions 2, 4, 5, 7, 9, 12; and

- Department of Planning and Environment and NSW Trade and Investment Guidelines for the Preparation of Extraction Plans.

This Annual Review encompasses the Six-Monthly Environmental Monitoring Report requirement of the Longwall 419 Extraction Plan, which states that the reports will be submitted by 31st of September (covering January to June) and by the 31st of March in the form of an Annual Review.

3.5. Licences

Environment Protection Licence

Springvale currently operates under Environmental Protection Licence (EPL) 3607, issued under the *Protection of the Environment Operations Act 1997* (POEO Act). There were no changes to EPL 3607 during the reporting period.

Water Licences

Springvale currently holds four groundwater extraction licences as outlined in **Table 8**9 Additionally Springvale holds licences for groundwater monitoring bores under the Water Act.

Dangerous Goods Licence

Springvale possesses Dangerous Goods Licence (NDG027897 2014 acknowledgement number) for the storage and handling of hazardous chemicals on the premises. There were no changes to the dangerous goods licence over the reporting period.

The Springvale licenses are summarised in **Table 9**.

Table 9. Licences

Licence	Date of Issue	Expiry
EPL 3607	17 May 2000	Renewed Annually
Groundwater Licence 10WA118719 (WAL 36383)	5 August 2013	Perpetuity
Groundwater Licence 10BL603519 (WAL 36383)	25 February 2010	Perpetuity
Groundwater Licence 10BL602017 (WAL 36443)	4 September 2007	Perpetuity
Groundwater Licence 10BL601863 (WAL 36446)	4 September 2007	Perpetuity
Dangerous Goods Licence	16 February 2012	Perpetuity

3.6. Other Approvals

Occupation Permit

The Newnes State Forest is located above the majority of the Springvale underground workings. Springvale has established a Level 3 Occupation Permit with the Forestry Corporation of NSW (FCNSW) to operate under the forest and to build infrastructure and other surface facilities. The permit allows for infrastructure construction and ongoing maintenance on the surface to support below ground operations, including ventilation, dewatering and electricity supply infrastructure. Level 2 Occupation permits will be discussed with the FCNSW with regards to short term duration activities such as exploration drilling. Details of the Occupation Permit have been provided in **Table 10**.

Section 95 Certificate

Springvale currently holds three Section 95 Certificates issued by the OEH. The approvals allow for the installation of monitoring equipment within Gang Gang East and Gang Gang South West Shrub Swamps; for the hand removal of weeds within Newnes Plateau Shrub Swamp, and to undertake remediation works in East Wolgan Swamp which is a Newnes Plateau Shrub Swamp. Newnes Plateau Shrub Swamps are listed as an Endangered Ecological Community (EEC) under the Threatened Species Conservation Act 1995 (TSC Act). Previous certificates have been granted for geotechnical and geophysical investigations in additional to the installation of monitoring equipment. The certifications were issued under the TSC Act, pursuant to Section 95(2).Additional details for the Section 95 Certificates have been provided in **Table 10**.

Table 10. Occupation Permits and Section 95 Certificates

Licence	Date of Issue	Expiry	Details
Level 3 Occupation Permit – Infrastructure	17 December 2012	1 February 2018	Approval from FCNSW allowing to operate and build surface infrastructure/facilities on the surface within the Newnes State Forest to support below ground operations.
Section 95 Certificate Document No 1111270	27 June 2013	30 June 2020	Approval from OEH to allow the hand removal of weeds from within East Wolgan Swamp and Narrow Swamp.
Section 95 Certificate Document No C0000077	25 November 2013	30 June 2024	Approval from OEH to allow geotechnical/geophysical investigations and the installation of monitoring equipment within EEC.
Section 95 Certificate Document No C0002065	1 August 2016	31 August 2021	Approval from OEH to allow installation and operation of eight augured boreholes at five locations within Newnes Plateau Shrub Swamp.

4. OPERATIONS SUMMARY

Springvale has approval for the extraction of up to 4.5 million tonnes per annum (Mtpa) of ROM coal from the Lithgow Seam underlying the Project Application Area. Coal processing and distribution is managed at the Springvale Coal Services site in accordance with the Western Coal Services Project (State Significant Development 12_5579). The exception for this is the transport of up to 50,000 tonnes per annum of coal from the Springvale pit top to local domestic customers by road haulage.

Table 11 presents a production summary as applicable to SSD 5594 only.

Table 11. Production Summary

Material	Approved Limit (and source)	Previous Reporting Period (Actual)	This Reporting Period (Actual)	Next Reporting Period (Forecast)
Waste Rock/ Overburden	NIL	Not Applicable	Not Applicable	Not Applicable
ROM Coal	4.5 million tonnes per calendar yr (Source: SSD5594 S2 C6)	3.531844 Mt	4.293898 Mt	4.233232 Mt
Coarse reject	NIL	Not Applicable	Not Applicable	Not Applicable
Fine reject (Tailings)	NIL	Not Applicable		
Saleable product	NIL	Not Applicable	Not Applicable	Not Applicable

There are no inconsistences between approved limits and actual production.

4.1. Other Operations

All operational management of coal processing and transport facilities is undertaken by the Western Coal Services Project (State Significant Development 12_5579), except for the transport of up to 50,000 tonnes per annum of coal from the Springvale pit top to local domestic customers by road haulage which is needed to be authorised by SSD 5594.

Springvale's operational summary is presented in **Table 12**. Operations relating to the Western Coal Services Project are reported in the Western Coal Services Annual Review.

Table 12. Operations Summary

	Approved Limit (and source)	Previous Reporting Period (Actual)	This Reporting Period (Actual)	Comment (if applicable)
Hours of operation	24 hours a day, 7 days a week (Source: SSD5594 S2 C7)	24 hours a day, 7 days a week	24 hours a day, 7 days a week	No change
Transport (rail)	NIL	Not Applicable	Not Applicable	Not Applicable
Transport (road)	50,000 tonnes of ROM Coal per calendar year (Source: SSD 5594 S2 C8)	2,799.50 tonnes	49,943.9 tonnes	Within approved limits

5. ACTIONS REQUIRED FROM PREVIOUS ANNUAL REVIEW

Table 13. Actions from Previous Annual Review

Requested By	Action Required	Action Taken	Where addressed in Annual Review
DRE	Minor changes to the rehabilitation scheduling need to be explained in the Annual Review.	A MOP update has been completed and corrections made to the disturbance and rehabilitation footprints. Notes, where required, included in the Annual Review where minor changes have occurred.	Section 8.1
	Additional rehabilitation monitoring sites should be implemented at decommissioned Dewatering Bore Facilities.	Additional sites added to the annual rehabilitation monitoring and reported on in the Annual Review.	Section 8.2
DPE	Include the results of the low frequency noise investigations.	Findings have been reported on in the Annual Review.	Section 6.2.1.2
	Provide more detail for results which are higher than the allowable noise criteria, including where applicable any construction/mine operation activities that were audible and the weather conditions at the time.	Noted. Additional details have been provided around the noise exceedance recorded during the reporting period.	Section 6.2.1.1 and Section 11
	Provide a comparison of data between years and trends for noise and water monitoring.	Data trends for a minimum three year period (where available) have been graphed for trend analysis in relevant Appendices. Observed significant trends have been discussed in the Annual Review.	Appendices 2, 4 and 5.
	Include units of measure in Tables 16, 17 and 18.	Tables 16, 17 and 18 (tables 22, 23 and 28 in this report) updated with units of measure.	Section 7.2.1 and Section 7.2.3
	Provide a more detailed summary of biodiversity monitoring results.	Details on the flora triggers identified through biodiversity monitoring have been	Section 6.4

Requested By	Action Required	Action Taken	Where addressed in Annual Review
		included in the Annual Review. Seasonal biodiversity results are also further detailed in the Subsidence Management Status Reports available on the Springvale website.	
	Provide timeframes for the completion of activities listed in Section 12.	Timeframes indicated for proposed activities.	Section 12

6. ENVIRONMENTAL PERFORMANCE

Table 14 below outlines requirements and performance as per the DPE Annual Review Guideline (October 2015) Reporting Framework. Approval criteria limits are aligned to SSD 5594, granted on the 21st of September 2015. Further analysis of environmental performance has been included in Section 6 in order to satisfy requirements in accordance with SSD 5594, principally Schedule 6, Condition 12.

The Subsidence Management Status Reports prepared and submitted by Springvale present in-depth results as required under SMP LW411-418.

Table 14. Environmental Performance

Aspect	Approval criteria/ EIS prediction					Performance during the reporting period (Max Result)					Trend/ key management implications	Implemented / proposed management action
Noise	Location receiver number	Day ($L_{AEQ15min}$)	Evening ($L_{AEQ15min}$)	Night ($L_{AEQ15min}$)	Night ($L_{A1\ 1min}$)	Location receiver number	Day ($L_{AEQ15min}$)	Evening ($L_{AEQ15min}$)	Night ($L_{AEQ15min}$)	Night ($L_{A1\ 1min}$)	Results are generally within the criteria and are not significantly different from previously obtained results. An exceedance was detected at S2 during evening monitoring in Q1.	During 2016 Centennial submitted a Western Region Noise Management Plan for approval.
	S1	44	44	46	52	S1	38	41	42	46		
	S2	43	43	46	53	S2	42	45	43	48		
	S3	35	35	35	60	S3	Inaudible	Inaudible	Inaudible	Inaudible		
	All other Privately owned Land	35	35	35	45	All other Privately owned Land	32	33	34	40		
Air quality	Pollutant	Averaging Period	Criterion			Pollutant	Averaging Period	Max Result			Results are within the criteria and are not significantly different from previously obtained results.	During 2016 Centennial submitted a Western Region Air Quality and Greenhouse Gas Plan for approval.
	PM_{10}	Annual	30			PM10	Annual	9.3				
	PM_{10}	24 hour	50			PM10	24 hour	41				
	TSP	Annual	90			TSP	Annual	18.5				
	Deposited Dust	Annual	$2g/m^2$/month	$4g/m^2$/month		Deposited Dust	Annual Average	DG1: $1.53/m^2$/month DG2 $0.29/m^2$/month				

Aspect	Approval criteria/ EIS prediction		Performance during the reporting period (Max Result)	Trend/ key management implications	Implemented / proposed management action
Biodiversity	Ecology And Swamps	No significant impacts are predicted on threatened species or EECs; and No significant impacts are predicted on aquatic habitats, flora, fauna or stygofauna Longwall mining by the Project is unlikely to have a significant impact on swamps.	Fauna monitoring has been undertaken in accordance with approved monitoring programs and concludes no identifiable impacts from underground mining at Springvale Colliery on fauna. Threatened species continue to be recorded. Flora monitoring data indicates that prolonged dry and warm conditions on the Newnes Plateau may be having a substantial impact on swamp condition. Swamp impact sites are behaving differently to swamp control sites (statistical difference), indicating the potential effects of mining as evident in the monitoring dataset. Trigger investigation levels have been exceeded under the SMP Approval and subsequent investigations are underway (further details in Section 6.4).	Monitoring results indicated the need for further investigation (i.e. trigger level exceedances). Investigations were initiated in 2016 and monitoring will continue in order to determine causation and required further actions.	Monitoring and management will continue to be undertaken in accordance with the SMP approval, EPBC Approval requirements and Extraction Plan requirements.
	Conservation Areas	The nearest conservation reserve, the Gardens of Stone National Park and the wider Blue Mountain World Heritage Area, will not experience any measurable subsidence movements as a result of the Project.	Not Applicable	Not Applicable	Not Applicable
Heritage	Aboriginal Heritage	Site #45-1-2739 (located above Longwall 419) is the first Aboriginal Heritage site to be undermined under SSD 5594. The only effect of subsidence as identified in the EIS was that the sites may be located at a slightly lower elevation that that at which they now exist, the extent of which depends on the site's location in relation to the longwalls.	Compliant - A Baseline inspection was conducted on the 16th of December 2015 and a Post-Mining Inspection on the 17th of November 2016. The Post-Mining inspection concluded that no damage to the artefact or surrounding area was observed and that the site was in a similar condition to the original baseline recording.	No impacts to Aboriginal Heritage sites from subsidence at Springvale on have been identified.	Continue to monitor and manage Aboriginal Heritage sites in accordance with the Aboriginal Cultural Heritage Management Plan.
	Historic heritage sites	No historic heritage items and/or National Heritage Places have been identified within the Project Application Area or assessed to be impacted upon by the Project. As such, there are no historic heritage impacts associated with the Project.	Not Applicable	Not Applicable	During 2016 Centennial submitted a Western Region Historic Heritage Management Plan for approval.

6.1. Meteorological Monitoring

Springvale mine is required to operate a meteorological station on-site in accordance with EPL 3607. A summary of meteorological data collected from Springvale Colliery during 2016 is presented in **Table 15**.

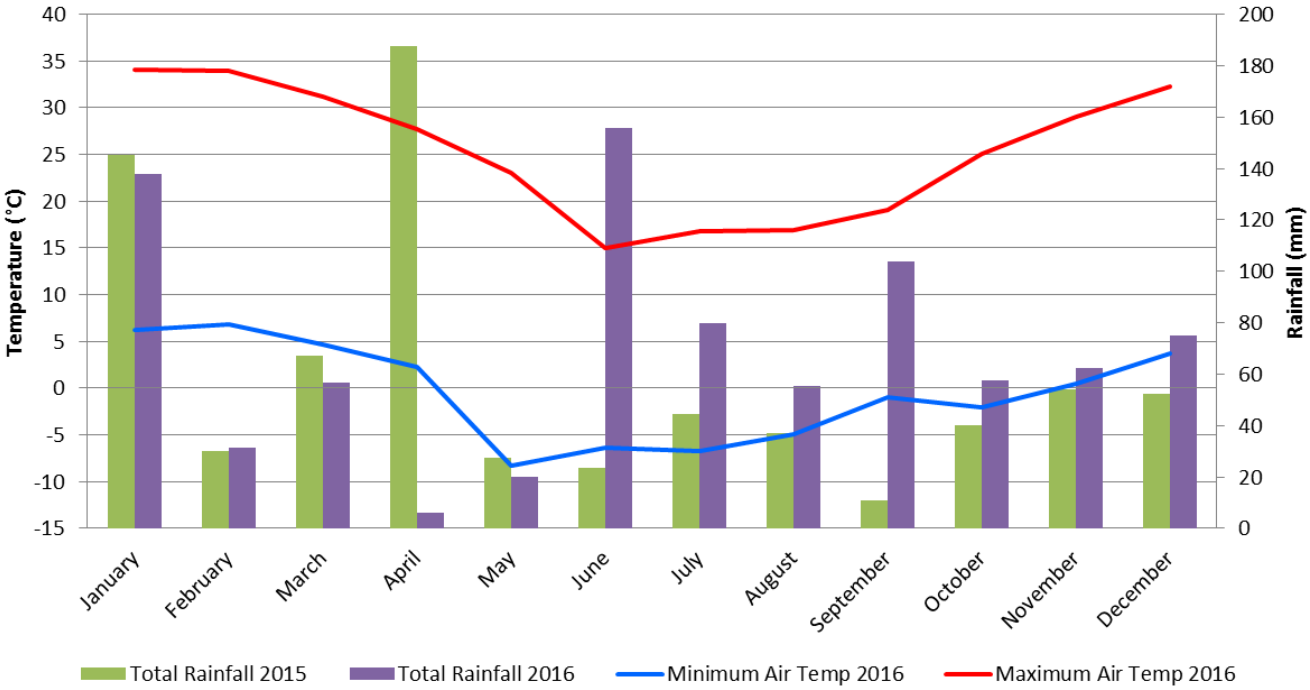
Table 15. Site Weather Data

Month	Minimum Air Temp. at 2m (°C)	Maximum Air Temp. at 2m (°C)	Total Rainfall (mm)
January	6.28	34.1	138
February	6.86	33.89	31.2
March	4.69	31.14	56.8
April	2.25	27.67	6
May	-8.24	22.99	19.8
June	-6.4	15.02	155.8
July	-6.73	16.8	79.6
August	-4.94	16.9	55.2
September	-1.01	19.11	103.8
October	-2.04	25.06	57.4
November	0.47	29.05	62.2
December	3.65	32.2	75.2

The minimum temperature recorded on-site during the reporting period was -8.24°C in May and the maximum temperature recorded was 33.89°C in February. Temperature variation during 2016 was generally greater compared to 2015. Minimum temperatures were considerably lower May through November while maximum and maximum temperatures were comparatively higher January through to June.

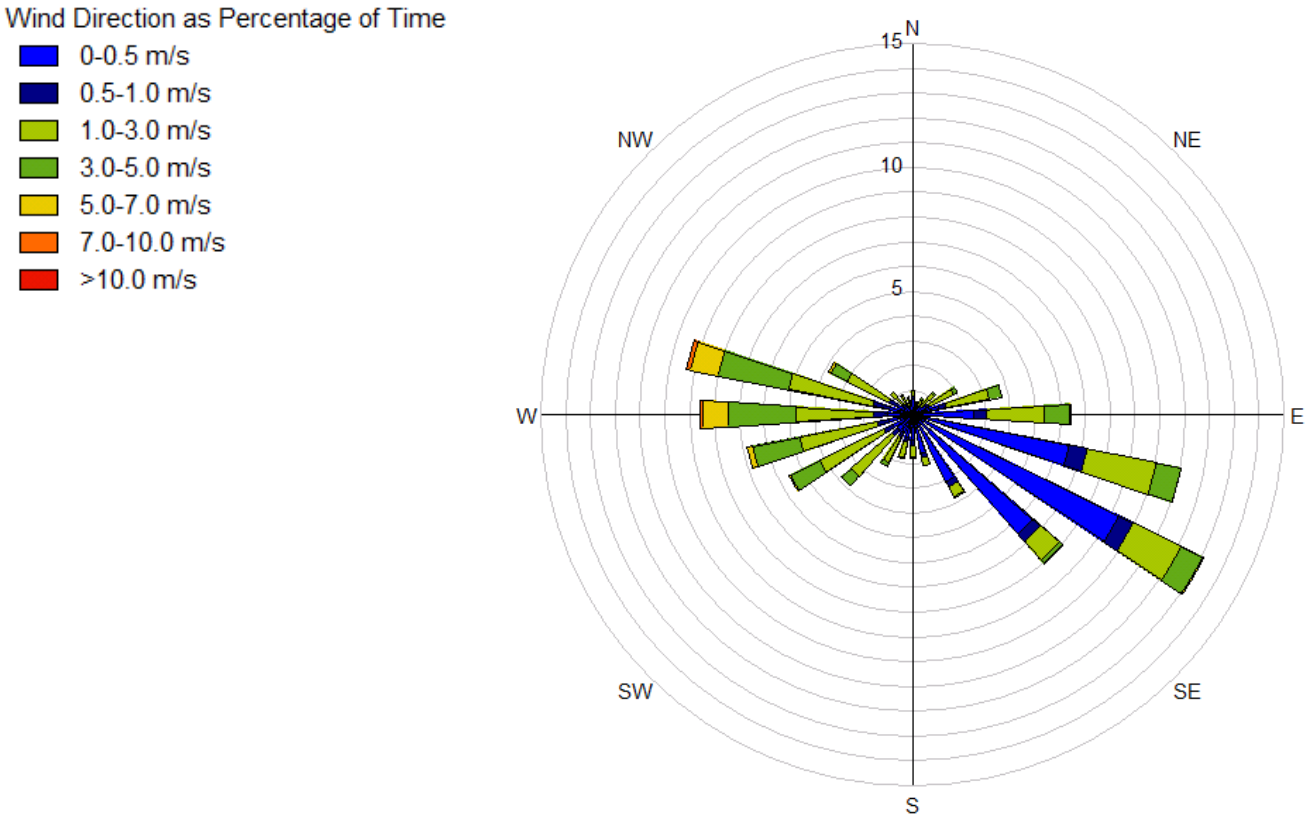
Annual temperature and rainfall is presented in **Figure 6**, with 2015 rainfall data also presented for comparative purposes. Total rainfall increased by 121mm from 720mm in 2015 to 841mm in 2016. Monthly rainfall was consistently higher from June 2016 to December 2016 compared to higher monthly totals occurring between January and May in 2015.

Figure 6. Annual Temperature and Rainfall



An annual wind velocity and direction wind rose is presented in **Figure 7**. Both parameters are consistent with 2015 averages, with the predominant wind speed and wind direction during the reporting period 1.54m/sec and east south east respectively.

Figure 7. Annual Wind Rose



6.2. Noise

Project specific noise goals that were established for the Environmental Assessment (refer Section 75W Modification to Development Consent DA 11/92, dated October 2013) and were adopted in SSD 5594 and EPL 3607.

Noise monitoring during the reporting period was undertaken in accordance with SSD 5594 and EPL3607. SSD 5594 Condition 2 of Schedule 4 came into effect on 1 July 2016, reducing night LAeq(15minute) noise criteria limits at receiver locations S1 and S2. The change in criteria limits was reflected in the quarterly noise monitoring undertaken in quarter 3 and quarter 4. An excerpt from SSD 5594 outlining the change is provided below.

Schedule 4

NOISE

Noise Criteria

1. *From the date of this consent until 30 June 2016, the Applicant shall ensure that the noise generated by the development does not exceed the criteria in Table 3 at any residence on privately-owned land.*

Table 3: Noise Criteria dB(A)

Receiver Location*	Day	Evening	Night	
	LAeq (15minute)	LAeq (15minute)	LAeq (15minute)	LA1 (1minute)
S1	44	44	46	52
S2	43	43	46	53
S3	35	35	35	60
All other privately-owned land	35	35	35	45

2. *From 1 July 2016, the Applicant shall ensure that the noise generated by the development does not exceed the criteria in Table 4 at any residence on privately-owned land, or have notified, in accordance with Schedule 5, the owners of residences represented by Receiver Numbers S1 and S2 that they are entitled to acoustic treatment of their residence.*

Table 4: Noise Criteria dB(A)

Receiver Location*	Day	Evening	Night	
	LAeq (15minute)	LAeq (15minute)	LAeq (15minute)	LA1 (1minute)
S1	44	44	42	52
S2	43	43	43	53
S3	35	35	35	60
All other privately-owned land	35	35	35	45

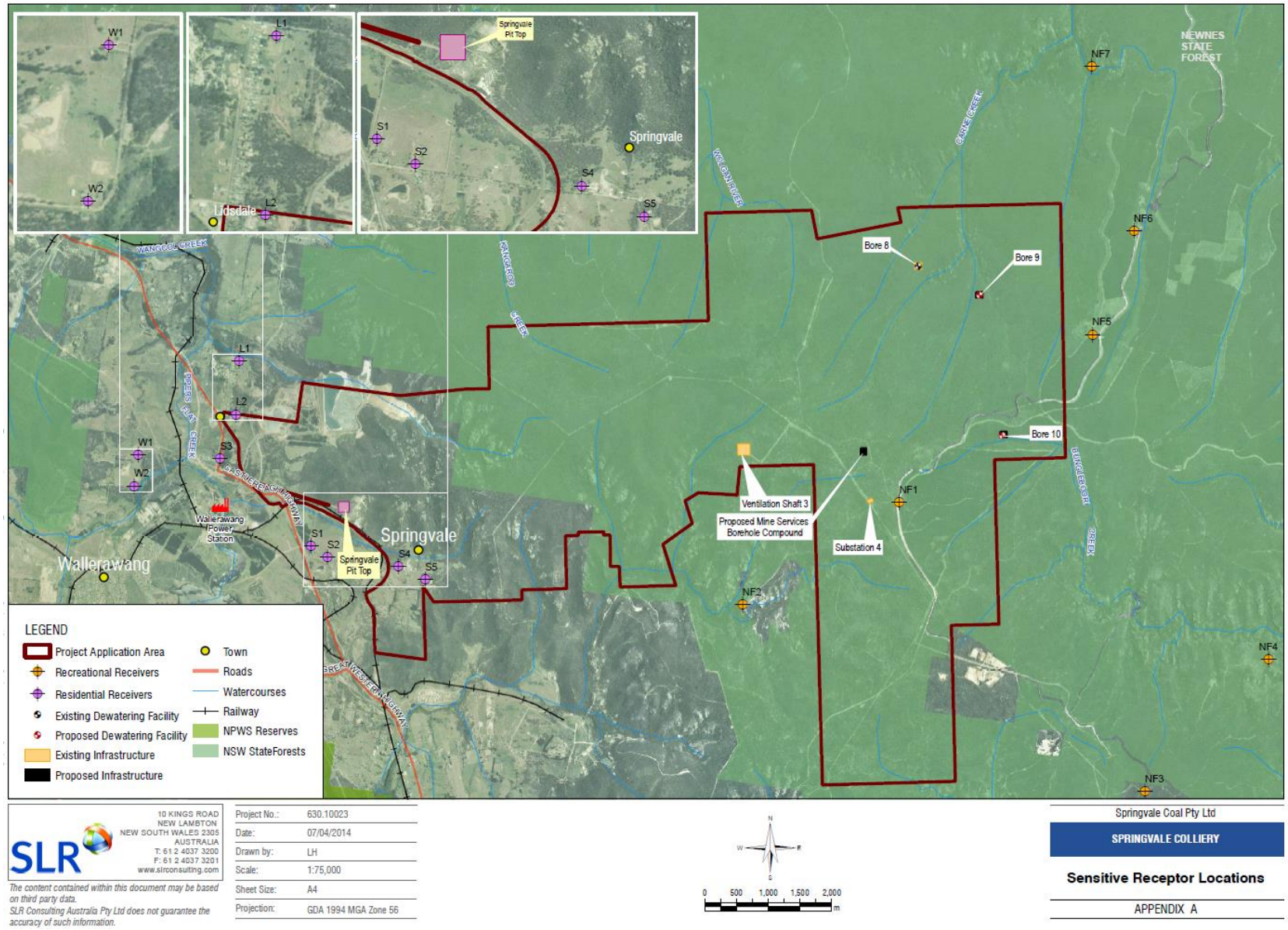


Figure 8. Sensitive Receiver Locations

6.2.1.1. Noise Monitoring

Operator attended noise monitoring was conducted at five locations during the reporting period in accordance with requirements under SSD 5594 and EPL 3607.

Table 16 below compares the results of the operator attended noise monitoring with relevant noise goals.

An exceedance of 2dB was recorded at location 2 (S2) during the evening period of quarter 1 monitoring. The result recorded was 45dBA against the criteria limit of 43dBA. The major noise contributors identified during the surveys included general mechanical plant noise from the pit top, primarily from the CHPP as well as stockpile dozer operation during the evening monitoring period. Weather conditions at the time were a north westerly at 2m/s and 16 degrees. Further details of this exceedance result are outlined in Table 45 of Section 11.

While the exceedance was reported to DPE, as per the Industrial Noise policy Section 11.1.3, "*A development will be deemed to be in non-compliance with a noise consent or licence if the monitored noise level is more than 2 dB above the statutory noise limit specified in the consent of licence condition.*"

Compliance with the noise criteria goals was otherwise achieved at all other noise monitoring locations during all monitoring periods.

Results are shown graphically in Appendix 6, with results from 2014 onwards included for trend analysis. 2016 results are consistent with previous years with no significant trends identified.

Table 16. Noise Monitoring Results Summary 2016

Location	Q1	Q2	Q3	Q4	Criteria Limit (as at 31 December 2016)
Day (LAeq (15 minute) dBA)					
S1 (EPL ID No. 11)	38	35	<38	35	44
S2 (EPL ID No. 12)	41	36	<42	36	43
S3 (EPL ID No. 13)	Inaudible	Inaudible	Inaudible	Inaudible	35
All other privately-owned land					35
S4 (EPL ID No. 14)	32	30	<35	Inaudible	35
S5 (EPL ID No. 14)	<25	Inaudible	Inaudible	Inaudible	35
Evening (LAeq (15 minute) dBA)					
S1	37	34	41	37	44

Location	Q1	Q2	Q3	Q4	Criteria Limit (as at 31 December 2016)
S2	45	33	42	36	43
S3	Inaudible	Inaudible	Inaudible	Inaudible	35
All other privately-owned land					35
S4	30	31	33	<30	35
S5	<25	Inaudible	31	Inaudible	35
Night (LAeq (15 minute) dBA)					
S1	42	34	42	37	42
S2	39	37	43	39	43
S3	Inaudible	Inaudible	Inaudible	Inaudible	35
All other privately-owned land					35
S4	31	<30	34	Inaudible	35
S5	<25	Inaudible	32	<30	35
Night (LA1 (1 minute) dBA)					
S1	45	43	46	41	52
S2	43	42	47	48	53
S3	Inaudible	Inaudible	Inaudible	Inaudible	60
All other privately-owned land					45
S4	33	33	40	Inaudible	45
S5	<25	Inaudible	37	<30	45

6.2.1.2. Low Frequency Noise Monitoring

Low frequency noise investigations were undertaken during 2014 and 2015 following two complaints received suggesting that low frequency noise was originating from the Springvale Ventilation Fan. Investigations attempted to match acoustic signatures by frequency and amplitude to Springvale and other major noise sources in the area. Signatures measured at the residences were not consistent with Springvale noise sources and no conclusive evidence was found to suggest that Springvale would be responsible for the measured or perceived low frequency noise levels.

A further review of the report conducted by a specialist consultant concluded that low frequency noise measured at these residences did not require further investigation or mitigation and that Springvale was compliant with approval and license conditions during monitoring surveys conducted.

6.3. Air Quality

Potential dust sources from the Springvale Colliery operations include unsealed or dirty traffic areas, coal stockpiles, ventilation fans, and coal being conveyed. Dust controls used on unsealed or dirty traffic areas include the use of water carts, water cannons\sprinklers, and regular road sweeping. In December 2010 Springvale installed and commissioned a High Volume Air Sampler (HVAS) capable of measuring both Total Suspended Particles (TSP) and PM10. The unit is located on an adjoining property on Springvale Lane. The system operates automatically for a 24 hour period every 6 days in accordance with Australian Standards. There is no requirement for Springvale to monitor TSP and PM10, however this unit is providing valuable baseline data.

There is no recent history of fugitive dust complaints from adjoining residents nor has there been any regulatory notices issued requiring surface dust suppression. The Springvale Environmental Management System provides a platform for the maintenance and operation of dust control measures. Compliance monitoring is undertaken for due diligence and compliance purposes using independent contractors.

The Springvale Colliery pit top is situated against the Newnes State Forest and therefore is largely enclosed by native forest. Coal delivered to the ROM stockpile is wet with moisture levels ranging from 10-12% which acts to reduce particulate emissions. Other measures which are routinely employed at the Springvale Colliery to reduce emissions of particulate matter are the implementation of speed limits on internal roads, the enclosure of coal crushing and screening processes and material transfer by conveyor as well as the use of water carts on open areas of site. In addition, paved and bitumen covered pit top areas are swept with a street sweeper twice per week to minimise dust loading.

6.3.1. Dust Monitoring

Depositional Dust

Air quality monitoring has been undertaken during the reporting period in accordance with SSD 5594 and EPL 3607 requirements. The results obtained were below the criteria levels specified in SSD 5594.

Table 17 presents a summary of dust results obtained during the reporting period. **Figure 9** shows the mean result of both the dust gauges.

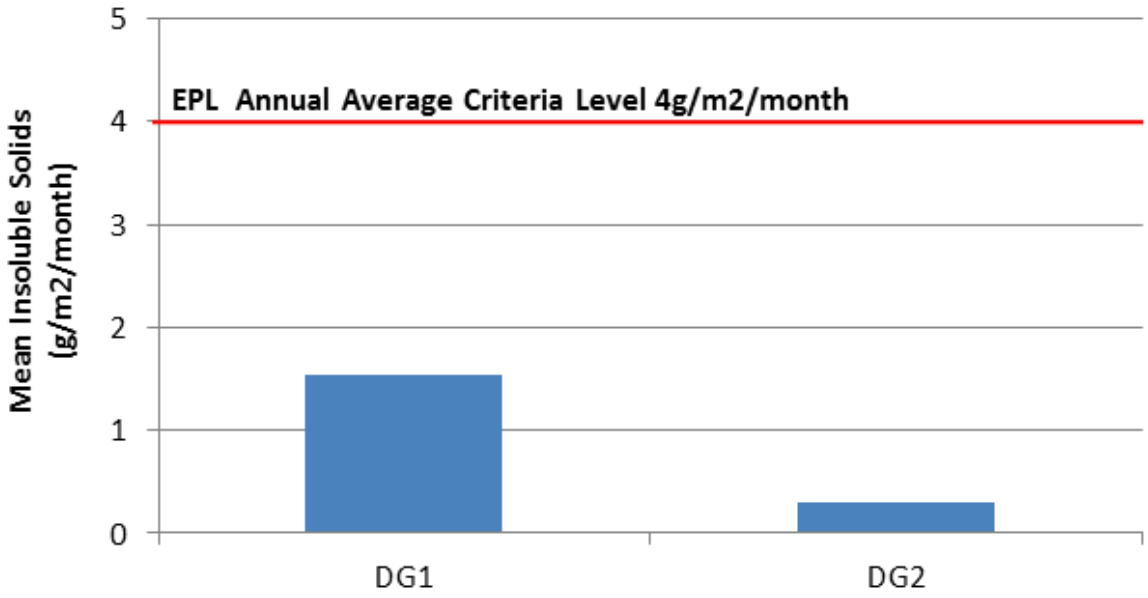
Air quality results are also presented graphically in Appendix 1.

Table 17. 2016 Monthly Dust Gauge Results

Month	DG1	DG2
January	1.2	0.3
February	1.3	0.3
March	2.2	0.7
April	0.8	0.3
May	1.3	0.2
June	0.5	0.3
July	1.8	0.2
August	3.3	0.1
September	0.4	0.4

Month	DG1	DG2
October	1.1	0.1
November	0.6	0.1
December	3.9	0.5

Figure 9. 2016 Average Dust Gauge Deposits



A comparison of the 2013 - 2016 dust monitoring results is presented in **Table 18**.

Table 18. Annual Average Dust Monitoring Results

Springvale Dust Gauge	2013	2014	2015	2016
DG1	1.63	1.44	1.53	1.53
DG2	1.09	0.51	0.68	0.29
AVERAGE	1.36	0.99	1.11	0.91

Results recorded at DG1 were consistent with previous results recorded, with no change from 2015 to 2016. DG2 showed a significant drop from 2015 and is markedly lower than results recorded during 2013 – 2015. The annual average insoluble solids for all dust gauges in the reporting period were all below the annual average of the EPL 4g/m2/month guideline.

Total Suspended Particulates (TSP) and Particulate Matter (PM10)

The HVAS monitoring system was commissioned in late 2010. A comparison of the 2013 - 2016 average results is displayed in **Table 19**.

Table 19. HVAS Average Results

AVERAGE	TSP (µg/m3)	PM10 (µg/m3)
2012	24	9

AVERAGE	TSP (µg/m3)	PM10 (µg/m3)
2013	17	7
2014	15	7
2015	14	8
2016	19	9

The annual average for TSP and PM10 remained below guideline limits of 90µg/m3 and 30µg/m3 respectively.

EIS (1992) Predictions \ Recommendations

The EIS predicted that Wallerawang Power Station would contribute 1g/m^2/month deposited dust in the area, which is located approximately 1.5km from Springvale Pit Top. The main dust generating sources identified within the EIS area as follows:

- Coal product and reject stockpiles;
- Scraper, dozer and grader movements on overburden;
- Areas exposed prior to rehabilitation;
- Coal loading and hauling operations; and
- Vehicle movements on unpaved roads.

Additionally, road and traffic, residential developments and agricultural activities were predicted as being generally localised in area and duration and may contribute to deposited dust levels for Springvale Coal. The principle sources of airborne dust may potentially arise from the storage and transport of coal, which will be transported to the power station by conveyor soon after extraction. It is however noted that dust emanating from the transported coal is largely controlled as the coal has a moisture content of approximately 8%.

Airborne dust control measures recommended within the EIS are as follows:

- Water sprays fitted to the main coal stacking gantries and activated automatically to apply 2L/m^2/hr of water over stockpile areas when wind speeds exceed 20–25 km/hr;
- Conveyor system (three-quarter's enclosed) and the section running past Duncan Street will be fully enclosed;
- Pit top access road will be sealed to restrict dust generation due to vehicle movements;
- The access road to the Washery site will be gravel and watered on an irregular basis given the low expected usage;
- Regular watering of the reject emplacement area; and
- Progressive rehabilitation of the reject emplacement area.

The results for 2016 show all dust gauges were below the 4g/m^2/month annual average criteria. Based on the EIS prediction of Wallerawang Power Station contributing 1g/m^2/month to the surrounding area, it may be viewed that the impact of Springvale Coal on air quality is minor, with the annual average for DG1 – DG2 being 0.91 g/m^2/month during 2016.

During the reporting period control measures implemented included watering of unsealed roads & coal stockpiles, vacuum sweeping of sealed surfaces (both on an as required basis), plus the use of a predominately (fully) enclosed conveyor system. The current controls were assessed to be appropriate during the site specific particulate matter control best practice assessment conducted during 2012 and are deemed effective in controlling airborne dust during the reporting period.

6.4. Biodiversity

A comprehensive environmental monitoring program has been prepared which covers the LW411-418 SMP Area in accordance with relevant conditions of the SMP Approval and Longwall 419 Extraction Plan Area. Additional Management Plans also exist under EPBC 2011/5949 and EPBC 2013/6881. Monitoring and management of biodiversity impacts has been undertaken in accordance with these documents. Results are presented in the SMSR, EPBC Annual Reports and Six Monthly Environmental Monitoring Reports.

6.4.1. Flora Triggers

Triggers for flora have been developed using data collected from reference site monitoring carried out since 2003. The triggers have been developed based on an analysis of natural variance in vegetation communities which has been determined following an analysis of reference site data.

Details of trigger levels for flora are set out in Table 20. Each trigger has a defined level of change and a defined timescale in which this change is to be observed to determine whether an impact has occurred. Triggers were identified in the Winter and Spring 2016 monitoring reports, the details of which are outlined below.

Winter 2016 Report Results

Two flora performance trigger indicators were found to have exceeded performance indicator triggers during Winter 2016 monitoring. These were:

- An increase of 1 additional eucalypt individual at impact site SSE01 in Sunnyside East Swamp (i.e. an increase of more than 3 individuals within a one year period).
- The condition of *Gleichenia dicarpa* (a key swamp species) declined at three Carne West Swamp sites (i.e. WC01, WC03 and WC04) by greater than a 1.5 condition score between impact and reference sites for this key species.

An Initial Notification Report and Trigger Investigation report were completed as per the THPSSMP for Longwalls 415 - 417.

Details of the triggers are also detailed in **Table 20**.

Spring 2016 Report Results

Two flora performance trigger indicators were found to have exceeded performance indicator triggers during Spring 2016 monitoring. These were:

- The condition of *Gleichenia dicarpa* (a key swamp species) was below the trigger threshold for three Carne West monitoring sites (i.e. WC02, WC03 and WC04). This result is consistent with findings reported in the winter 2016 monitoring report for WC03 and WC04. However, differences to the winter 2016 reporting include a new trigger event at WC02 and a return to within range condition for WC01.
- An increase in bare ground of greater than 100 m2 over a 3 year period at WC04. The change observed is 1.25% in summer 2016 to 28.75% in spring 2016.

An Initial Notification Report was submitted to the Department of Environment in relation to the Spring 2016 performance indicator exceedances on the 9th of March 2016. A Trigger Investigation Report will follow in accordance with the THPSSMP. Findings and actions will be presented in the EPBC Annual Reports.

Details of the triggers are also presented in **Table 20**.

Table 20. Flora Triggers Levels and 2016 Flora Triggers

Performance Indicator	Parameter Measured	Trigger Level*	Winter 2016	Spring 2016
Change in species assemblage	Change in diversity of native species	A change in the number of species of greater than 30 % for a given site within a three year period.	Trigger in TRI01 (reference swamp). Reason unknown.	Trigger in LGG01 (reference swamp). Reason unknown.
	Recruitment of eucalypt species	An increase in eucalypts in an impact site compared to reference sites of more than three individual plants within a one year period.	SSE01 has exceeded the trigger value for eucalypt recruitment and may require management action pending results of spring 2016 monitoring. Investigation recommended.	No exceedance in trigger values observed.
Change in condition	Condition of key species	A decline in condition score at an impact site of more than 1.5 compared to the average condition score at un-impacted sites within a one year period.	WC01, WC03 and WC04 have exceeded a condition trigger for the key swamp species *Gleichenia dicarpa*. Investigation recommended.	WC02, WC03 and WC04 have exceeded a condition trigger for the key swamp species *Gleichenia dicarpa*. Continued investigation recommended.
	Non-live ground cover	An increase of bare ground of more than 100m^2 in a site within a three year period.	No impact sites showed an increase in bare earth beyond the trigger level.	Increase of magnitude exceeding the trigger level was observed in WC04. Trigger consistent with 'condition of key species' trigger.
	Non-native weeds	An increase in non-native weed species of more than 4 in a monitoring site (each having a cover of greater than 5%) compared to the average number in reference sites within a one year period.	No impact sites showed an increase in weed species beyond the trigger level.	No impact sites showed an increase in weed species beyond the trigger level.

*Taken from THPSS MMP 415-417 and THPSS MMP 418. Data collection method used consistent with Erskine and Fletcher (2011).

6.5. Heritage

6.5.1. Aboriginal Heritage

In 2016 Centennial Coal prepared a Western Region Aboriginal Cultural Heritage Management Plan in consultation with relevant stakeholders. This document aims to provide Centennial and Springvale with a consistent approach to consultation with local Aboriginal communities regarding Aboriginal cultural heritage identification as well as identify consistent minimum standards and processes for aboriginal cultural heritage identification, monitoring and management across Centennial's western operations. The plan was approved by the DPE and was in effect during the reporting period.

The first aboriginal heritage site projected to be undermined, as applicable to SSD 5594, was the isolated artefact (Site #45-1-2739) located above Longwall 419. The only potential effect on this site from subsidence is that it will be located at a slightly lower elevation than that at which it now exists. The extent of this will be dependent on the site's location in relation to the longwalls.

In accordance with the Heritage Management Plan (prepared under Schedule 3, Condition 10h of SSD 5594), a Baseline inspection and report was undertaken for Site #45-1-2739 in advance of Longwall 419 and a Post-mining Inspection following undermining. The Baseline inspection was conducted on the 16th of December 2015 and the Post-Mining Inspection on the 17th of November 2016. The Post-mining inspection concluded that no damage to the artefact or surrounding area was observed and that the site was in a similar condition to the original baseline recording. A secondary Post-mining inspection is required eight months following undermining and is proposed to be conducted in July 2017.

EIS (1992) Predictions \ Recommendations

The archaeological survey undertaken as part of the EIS predicts that the shelters above the area proposed for Longwall mining are not at risk from subsidence. It was recommended that shelter sites be included in any subsidence monitoring programs as a check on their stability.

During the reporting period, no noticeable damage to these shelter sites was observed, nor damage caused by subsidence. These findings are representative of those predicted within the EIS.

6.5.2. Natural and European Heritage

In 2016 Centennial Coal prepared a Western Region Historic Heritage Management Plan. The plan was approved by the DPE and was in effect during the reporting period.

Newnes State Forest occupies the area above the Springvale underground coal leases. The area is currently managed by Forests NSW who regularly carries out logging activities of both its pine plantations and native forests. In addition to logging activities, tracks are maintained by Forests NSW which attracts a large number of 4WD and trail bike riders. The area is also very popular for campers and bushwalkers. In 2006, the Newnes State Forest was gazetted as a hunting area for Bow Hunters.

An historical heritage assessment has been completed including a review of relevant Commonwealth, State and local historic heritage registers. The review of relevant registers included the National Heritage List, Commonwealth Heritage List, State Heritage Register, State Government Agency Heritage and Conservation Register and the Lithgow City Local Environmental Plan. No historic heritage items and/or National Heritage Places have been identified within the Springvale Colliery holding.

6.6. Waste

The major waste streams from the mine include water, packaging material including plastic, paper and cardboard, wood, waste oil, oil filters, oil drums, scrap metal, hoses, bottles (plastic and glass), sewage effluent, as well as general putrescible rubbish.

General waste is disposed of to landfill by licensed waste contractors. Recyclable materials, for example, plastic, paper and cardboard products, are recycled whenever possible at the site. Oil drums and filters are recycled with other waste metals, and are removed from site by a metal recycling company. Waste oil collected in the workshop is stored in an underground collection sump before being removed off site by a licensed contractor for recycling. Sewage is treated and applied to land in the on-site sewage treatment plant

Paper, plastic and cardboard are recycled both from bulk packaging from the store and site offices, either at the pit top or other infrastructure areas or transferred to a recycling facility.

Non-production waste is managed in accordance with the EIS and existing Mining Operations Plan, with all potentially hazardous material stored and/or bunded appropriately in accordance with relevant standards. Where possible, all quantities of waste or recyclable material are quantified and recorded for benchmarking and continuous improvement purposes as well as reporting in accordance with the National Greenhouse and Energy Reporting Scheme.

During the reporting period a recycling rate of 20.29% (Total offsite waste tonnes / Recycled waste) was achieved. This represents a decreased recycling rate, comparing to 39.78% in 2015.

Springvale Colliery will investigate improved recycling practices in 2017 with the objective of increasing recycling rates and improving waste segregation across site.

A summary of the waste removed and recycled is presented in **Figures 10** and **11**.

Figure 10 2016 Waste Management Summary

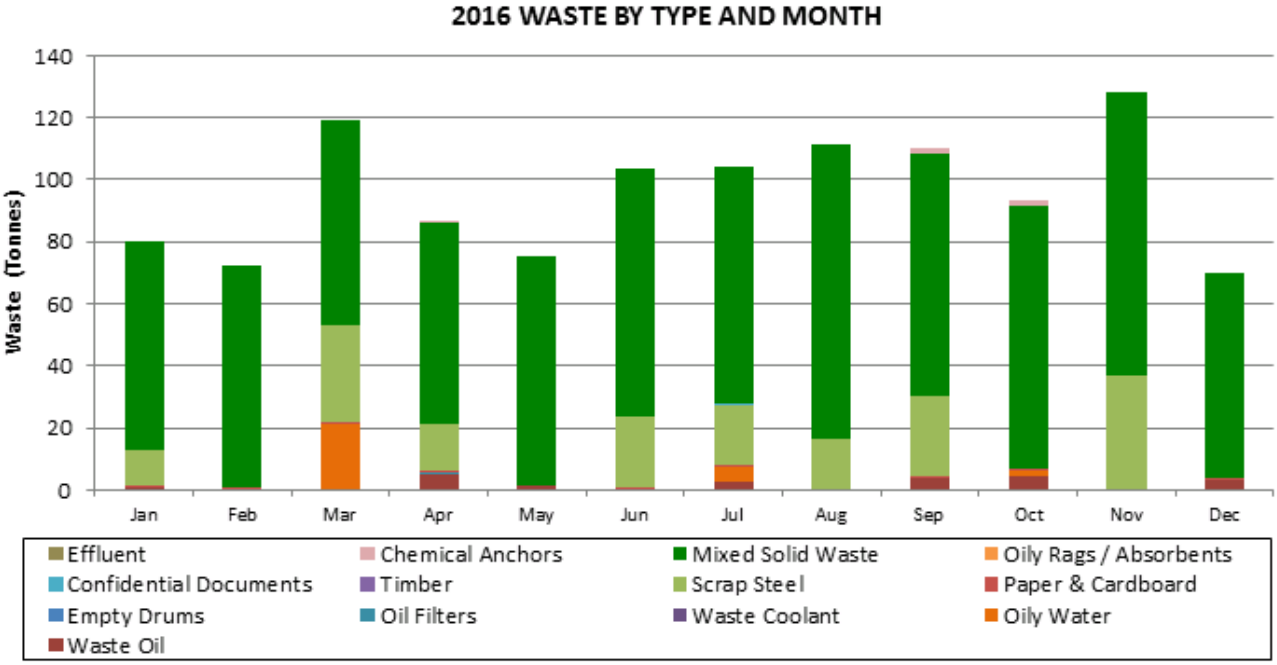
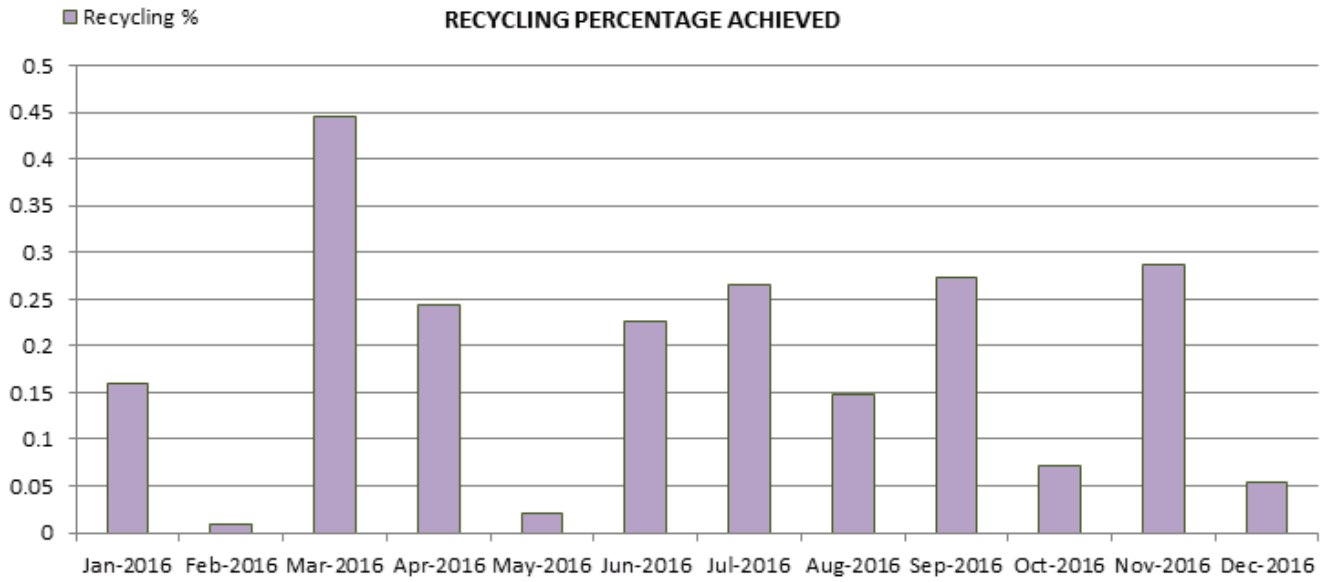


Figure 11 2016 Recycling Summary



6.7. Contaminated Land

Major potential sources of groundwater pollution around the pit-top area are from hydrocarbon storage and dispatch. To eliminate this risk the underground fuel tanks were decommissioned and validated in 2009. They have subsequently been replaced with fully self-contained above ground storage facilities. A comprehensive Phase 2 Environmental Site Assessment was undertaken during 2016. The Assessment was targeted to address data gaps and assess the nature and extent of the contamination previously identified to date at the Site, as well as emerging contaminates of concern PFAS, through a combination of intrusive and non-intrusive investigation.

6.8. Hydrocarbon Contamination

Fuels and oils are stored in purpose built facilities with appropriate bunding and firefighting provisions. Diesel is stored in above ground bunded tanks from where it is transferred to diesel pods for underground use or direct to machinery. A licenced contractor is engaged to remove and recycle and/or dispose of used oil and grease products at licensed facilities.

6.9. Spontaneous Combustion

The Lithgow coal seam has a low propensity for spontaneous combustion with no spontaneous combustion issues in relation to in-situ or for processed Lithgow seam coal. The highest risk of spontaneous combustion in relation to Lithgow seam coal appears to be during stockpiling for periods greater than approximately 1 year. Springvale coal is generally stockpiled for less than 1 year. There have been no incidences of spontaneous combustion in the life of Springvale mine.

EIS (1992) Predictions \ Recommendations

As predicted within the EIS, no occurrences of spontaneous combustion were observed during the reporting period.

6.10. Bushfire

The majority of the land within the Springvale holding has been identified as Bushfire Prone Land. Fire history data from the Forestry Corporation of NSW indicates that the majority of bushfires in the area spread from the north and east of Springvale Mine due to the direction of dominant winds

throughout the bushfire season. A number of fire trails exist across the Newnes Plateau, namely Sunnyside Ridge Road, Campbells Track and Maiyingu Marragu Trail. These act as containment lines mitigating a degree of bushfire risk to Springvale Mine's infrastructure.

Springvale Mine has established a Bushfire Management Plan (SV–MS–029 (2013)) and the associated Bushfire Management Procedure (SV-MS-029-WP-568 (2011)) in consultation with the NSW Rural Fire Service. These documents identify both the risks posed by bushfire to Springvale Mine assets, and control strategies to mitigate these risks.

In 2013 the devastating State Mine fire burnt through more than 46,000 hectares. The bushfire caused power outage and minor damage to mine infrastructure located on the Newnes Plateau. Several flora monitoring plots on the Springvale lease were affected by the bushfire.

In 2016 there were no bushfires affecting Springvale Colliery.

EIS (1992) Predictions \ Recommendations

The EIS details the requirement for firefighting services to access water at the Pit Top and Washery in the event of a bushfire. Current bushfire controls include the Springvale-Delta Transfer Scheme, which pumps up to 30ML per day from Springvale Coal and Angus Place Colliery to LDP009 discharge point. Along the pipelines length, fire hydrant points have been installed for use by fire services.

6.11. Mine Subsidence

During the reporting period the extraction of Longwall 418 was completed on the 27th of May 2016 with a total retreat of 2487m. Following the longwall move, extraction of Longwall 419 commenced on the 2nd of August 2016 and chainage as at the 31st of December was 734m

No anomalous surface movements were detected during the reporting period that warranted investigation.

EIS (1992) Predictions \ Recommendations

Subsidence monitoring results are within predictions detailed in the EIS. These predictions for subsidence are detailed below:

- 33 (potential) longwall panels;
- Panels 1 – 2 to experience subsidence range from 40% of mined thickness (i.e. 1.2m) to 65% (i.e. 1.95m) and tensile strain between 5mm/m and 13mm/m;
- Panels 3 – 25 to experience similar subsidence levels (40 – 65%), although the depth of cover increases from panel 3 – 19 (e.g. panels 3 – 7 between 310 – 355m and panels 8 – 25 between 295 – 420m);
- Maximum subsidence over panels 3 – 19 (i.e. 40% of mined thickness or 1.44m); and Subsidence to occur within 6 – 9 months post extraction, with the majority of subsidence occurring within 4 months of the longwall passing a particular point.

6.12. Methane Drainage / Ventilation

The Lithgow coal seam is particularly low in methane gas content and therefore no active management such as methane drainage is required. However, for mine safety reasons monitoring is carried out for mine ventilation gasses.

6.13. Public Safety

Springvale Mine has an approved Public Safety Management Plan to manage public safety in all surface infrastructure areas. This has been developed as part of the Subsidence Management Plan applications and Longwall 419 Extraction Plan approval process.

The Plans are updated as required and include the following controls:

- providing, where practical, fencing and warning signage around the pit top area, and security staff patrols on a regular basis; and
- Should subsidence pose a potential public safety risk, warning signs will be erected and subsidence repairs will be completed as soon as practicable. All actions will be completed as per the Trigger Action Response Plan.

During 2016 there were no variations in Springvale's approach to managing aspects associated with public safety.

6.14. Weeds

Major weed threats include Blackberry, Scotch Thistle, St. Johns Wart, which are targeted by the noxious weed control program within the monthly surface maintenance program. Weeds are targeted during the autumn and spring seasons. The weed control program mainly focuses on controlling weeds on the Pit Top, Overland Conveyor and Coal Services Sites.

A s95 certificate has been granted by OEH to enable weed control works (including hand removal of weeds) to be undertaken in both the East Wolgan and Narrow Swamps as a result of activities associated with previous mine dewatering operations. A suitably qualified contractor (Bush Doctor) undertakes these works as required.

Weed control works are carried out where required, as identified during the inspections of the Pit Top and disturbance areas of the Newnes Plateau. During the reporting period, pine trees were removed from along the access road. Weed species identified will be targeted for eradication.

6.15. Erosion and Sediment Control

There are minimal exposed earthen areas at Springvale and most activities at the pit top are undertaken on relatively flat areas. In addition, high activity areas are sealed (e.g. car park areas). Internal unsealed roads are maintained to prevent dust, primarily through dust suppression sprays and water carts. Sediment fences are installed where required to filter sediment from drainage / seepage. Sediment is controlled by a series of dams and water treatment facilities at the Springvale pit top and at Newnes Plateau infrastructure sites. Water discharged is monitored for suspended solids.

6.16. Feral Animals

There were no issues of concern regarding feral animal control during the reporting period.

7. WATER MANAGEMENT

7.1. Water Licences

The following table presents water take for Springvale 2015/2016 financial year. It is important to note that **Table 21** reports on the WATER YEAR which is from the 1st of July to the 30th of June, not the calendar year.

Table 21. Groundwater Extraction

WAL Number	Water Sharing Plan, source and management zone (as applicable)	Entitlement (ML)	Passive take/flows (ML)	Active pumping (ML)	TOTAL (ML)
WAL 36383	Sydney Basin Richmond Groundwater Source	5,958	N/A	5,557.8	5,557.8
WAL 36446	Sydney Basin Coxs River Groundwater Source	3,300	N/A	1,051.9	1,051.9
WAL 36443	Sydney Basin Coxs River Groundwater Source	585	N/A	533.6	533.6

Volume is reported in annual megalitres (ML).

7.2. Surface Water Monitoring

Surface water monitoring is undertaken in accordance with EPL 3607. Results of the monitoring are reported on an annual basis to the OEH via the EPA Annual Return. The following tables provide a summary of results obtained during the reporting period.

A Site Water Management Plan was prepared during the reporting period, as required under SSD 5594 Schedule 4 Condition C14.

7.2.1. Water Quality – Licensed Discharge Points

Water quality results for LDP001 and LDP009 are presented in **Tables 22** and **23** below.

LDP water quality results are also presented graphically in Appendix 2.

Table 22. LDP001 Quality

Pollutant	Unit of measure	Lowest sample value	Mean of sample	Highest sample value	Limit
Conductivity	microsiemens per centimeter (□S/cm)	395	962.72	1158	NA
Filterable iron	milligrams per litre (mg/L)	<0.05	<0.05	<0.05	NA
Filterable manganese	milligrams per litre (mg/L)	<0.001	0.01	0.02	NA

Pollutant	Unit of measure	Lowest sample value	Mean of sample	Highest sample value	Limit
Oil and Grease	milligrams per litre (mg/L)	<5	<5	<5	10
pH	pH	7.68	8.43	8.94	6.5-9.0
Total suspended solids	milligrams per litre (mg/L)	<5	0.93	7	30

EC ranged from 395μS/cm to 1158μS/cm with an average of 962.72μS/cm. This is slightly lower than the 2015 average of 910.62μS/cm, however generally consistent with previous years.

Filterable iron and oil and grease results were consistently below the respective detection limits (<0.05 and <5) during the reporting period.

Filterable manganese ranged from <0.001mg/L to 0.02mg/L with an average of 0.01mg/L. This is slightly higher than the 2015 average of 0.005mg/L, however generally consistent with previous years.

The pH of discharged water from LDP001 ranged between 7.68 and 8.94 with an average of 8.43. The acid dosing system in place which utilized real time technology to adjust to varying flows and pH levels continued to operate effectively during the reporting period.

TSS ranged from <5mg/L to 7mg/L with an average of 0.93mg/L. This is slightly lower than the 2015 average of 1.15mg/L.

No exceedances against any water quality parameters were recorded at LDP001 during the reporting period.

Table 23. LDP009 Quality

Pollutant	Unit of measure	Lowest sample value	Mean of sample	Highest sample value	Limit
Aluminium (dissolved)	milligrams per litre (mg/L)	<0.01	0.0117	0.013	0.45
Arsenic (dissolved)	milligrams per litre (mg/L)	0.007	0.018	0.066	0.024
Boron (dissolved)	milligrams per litre (mg/L)	<0.05	0.063	0.1	0.37
Conductivity	microsiemens per centimeter	1055	1198.2	1286	1200
Copper (dissolved)	milligrams per litre (mg/L)	<0.001	0.000113	0.003	0.007

Pollutant	Unit of measure	Lowest sample value	Mean of sample	Highest sample value	Limit
Fluoride	milligrams per litre (mg/L)	1	1.23	1.5	1.8
Iron (dissolved)	milligrams per litre (mg/L)	<0.05	0.00113	0.06	0.4
Manganese (dissolved)	milligrams per litre (mg/L)	0.003	0.00896	0.028	1.7
Nickel (dissolved)	milligrams per litre (mg/L)	<0.001	0.00255	0.004	0.047
Oil and Grease	milligrams per litre (mg/L)	<5	<5	<5	10
pH	pH	7.18	7.77	8.21	6.5-9
Total suspended solids	milligrams per litre (mg/L)	<5	1.07	6	50
Turbidity	nephelometri c turbidity units (NTU)	1	3.43	8	50
Zinc (dissolved)	milligrams (mg/L)per litre	<0.005	0.0023	0.02	50

Results for Aluminium, Boron, Copper, Fluoride, Iron, Manganese, Nickel, Oil & Grease, pH, total suspended solids, turbidity and Zinc were all within EPL criteria limits for the reporting period.

Arsenic results ranged from 0.007mg/L to 0.066mg/L with an average of 0.0018mg/L. Three exceedances were recorded during the reporting period. Two exceedances were a result of a malfunction of the Ferric Chloride dosing system which treats water from the Bore 940 sites (an LDP009 water source). The system was subsequently upgraded and no further exceedances associated with a pump malfunction were recorded. A third exceedance recorded was triggered by increased dewatering through Bore 940 causing the mobilisation of naturally occurring minerals in the underground goaf water storage.

EC results ranged from 1055µS/cm to 1310µS/cm with an average of 1198.2µS/cm. This represents a slight increase from the previous reporting period, where the average was 1180.04µS/cm. A number of exceedances against the EPL criteria level of 1200µS/cm were recorded during the reporting period. The increased EC levels and exceedances have been attributed to the increased exposure of mine water with goaf material. Specialist assessments have been undertaken which have concluded that there have been no adverse impacts from the elevated EC levels.

Further details regarding the non-compliances are outlined in Section 11 of this report and are available via the EPA Annual Return available online through the EPA website link:

http://epa.nsw.gov.au/prpoeoapp/Detail.aspx?instid=3607&id=3607&option=licence&searchrange=licence&range=POEO licence&prp=no&status=Issued

Licenced Discharge Points 6 and 7 are not associated with SSD 5594 and no discharges from Licensed Discharge Points 4, 5 and 10 occurred during the reporting period. No water quality results have therefore been included for these points.

EIS (1992) Predictions \ Recommendations

An extensive Surface Water Management System has been developed as part of the Springvale Coal Environmental Management System (SV-MS-027). This document, along with the Springvale Coal Subsidence Environmental Monitoring Program (SV-MS-036), identifies, describes and details the requirements which Springvale Coal must meet for surface water monitoring, analysis and reporting.

7.2.2. Water Quality – Newnes Plateau

Surface Water Flows and Levels

Surface water flows and levels at Springvale are monitored at six separate locations as detailed below:

- Sunnyside Swamp – flows are interpreted through pool depth monitors.
- Carne West Swamp – flows are interpreted through pool depth monitors.
- Carne West Pool.
- Tristar Swamp.
- Twin Gully Swamp.
- Marrangaroo Creek Upstream.

Carne West Pool

A pool depth monitor was installed at the bottom end of Carne West Swamp on 30 May 2012. Pool depths show characteristic spikes which correspond to rainfall. Pool depths were around 0.1m at the start of the reporting period but then increased to around 0.3m during January and February due to the high rainfall events. Three further peaks occur in April, May and December.
A lag of between one and two months is apparent between the high rainfall periods and the peak pool depths.

It is noted that spikes in pool depth do not always have a clear, immediate relationship to individual rainfall readings. Progressive increases in pool depth during periods of below average rainfall indicate that there is considerable storage retained in the swamp alluvium/peat, and a delayed release of this water to the pool is occurring. The lag time appears to vary from several days up to several months.

There are no mining impacts indicated by the monitoring results over the reporting period. Surface water flow behaviour has not changed when pre-mining and post mining behaviour are compared.

Carne West Swamp

No flow was recorded (dry) at Carne West Swamp during the reporting period. This is consistent with results in 2015, however flows have historically been identified before this time.

Sunnyside Swamp

Pool depth data show characteristic peaks which correlate to rainfall intensity and downstream flow gauging, as would be expected. Consistent flows were reported at Sunnyside Swamp throughout the reporting period, with peaks following the rainfall events. However these peaks are

generally lower than those in preceding years. A lag of approximately one month is evident behind the January, June and August rainfall events.

Tristar Swamp

Consistent flows were reported at Tristar Swamp throughout the reporting period, with peaks following the rainfall events in most cases. A lag of between one and two weeks is evident behind the rainfall events.

Twin Gully Swamp

Flows were reported at Twin Gully Swamp throughout the reporting period, with a peak in September of 660kL/day following a high rainfall event. Flow dropped off to 57kL/day in November following a lower rainfall period. A lag of between one and two weeks is evident behind rainfall events.

Marrangaroo Creek Upstream

Flows were reported at Marrangaroo Creek throughout the reporting period, with a peak in September of 261kL/day following a high rainfall event, which is similar to flows at Twin Gully Swamp. Flow dropped off to 23kL/day in November following a lower rainfall period. A lag of a few days to a week is evident behind rainfall events.

Surface Water Quality

Surface water quality is monitored at the following locations:

- Sunnyside Swamp – within swamp.
- Sunnyside swamp – directly down gradient of the swamp (Wolgan river US).
- Upper Wolgan River – upstream of confluence with East Wolgan Swamp.
- Upper Wolgan River – downstream of the junction with East Wolgan Swamp.
- Carne West Swamp – CW1 and CW2.
- Sunnyside East Swamp – SSE3.
- Carne Swamp.

The Sunnyside Swamp and Upper Wolgan River sites are monitored for electrical conductivity (EC), pH, manganese and iron. The Carne West Swamp and Sunnyside East Swamp sites are monitored for electrical conductivity (EC), pH and iron. The monitoring results are discussed below.

Wolgan River

A summary of the water quality statistics for Wolgan River are provided in **Table 24**.

Table 24. Wolgan River - 2016 Water Quality Statistics

Site	Analyte	Min	Max	Mean
East Wolgan D/S Junction	pH	5.86	8.13	6.97
	EC (uS/cm)	25	51	32.06
	Mn (mg/L)	0.001	0.01	0.004
	Fe (mg/L)	0.21	0.90	0.37
Sunnyside U/S Junction	pH	5.73	8.41	7.15

Site	Analyte	Min	Max	Mean
	EC	18	42	32.8
	Mn (mg/L)	0.001	0.014	0.004
	Fe (mg/L)	0.23	1	0.39

pH values measured at Wolgan Junction do not show a specific trend over the reporting period except that the pH increases just after lower than average rainfall periods and decreases just after higher than average rainfall periods. Over the reporting period, values ranged from 5.73 to 8.41. Although the pH is within historical ranges, the pH fluctuation over the monitoring period is generally higher than the historical fluctuation.

EC values measured over the reporting period at Wolgan Junction are typically around 32µS/cm. During the reporting period EC values have been fairly stable, and generally ranged from 18 to 51µS/cm, with a number of small spikes. The main spikes occurred in April at Sunnyside U/S Junction with an EC of 42µS/cm and in November at East Wolgan D/S Junction with an EC of 51µS/cm, during low rainfall periods. EC values are at the low end of historical ranges.

Manganese concentrations are generally at the lower end of the historical range and both sites generally correlate quite well. Over the reporting period values have typically fluctuated in the range from 0.001 to 0.014 mg/L, with higher spikes in February and lower spikes in October coinciding with rainfall and flow events.

The iron concentrations at both monitoring sites show almost identical trends over the current review period. Values are at the lower end of historical values, in the range 0.21 to 1mg/L. There are no clearly observed mining impacts indicated by the monitoring results during the review period.

Sunnyside Swamp

A summary of the water quality statistics for Sunnyside Swamp are provided in **Table 25**.

Table 25. Sunnyside Swamp - 2016 Water Quality Statistics

Site	Analyte	Min	Max	Mean
Sunnyside Swamp D/S	pH	5.91	7.95	6.71
	EC (uS/cm)	31	46	36.35
	Mn (mg/L)	0.002	0.009	0.005
	Fe (mg/L)	0.33	1.34	0.53
Sunnyside Swamp U/S	pH	5.42	7.5	6.18
	EC	32	53	40
	Mn (mg/L)	0.002	0.026	0.011
	Fe (mg/L)	0.16	1.14	0.41

pH levels fluctuate between 5.42 and 7.95 over the reporting period, with Sunnyside Swamp D/S typically elevated above Sunnyside Swamp U/S as in the previous reporting period. The

measured pH levels are within historical limits, however the pH fluctuation over the monitoring period is generally higher than the historical fluctuation.

EC values at Sunnyside Swamp D/S have remained relatively stable over the reporting period except for spikes in July, September and November during low rainfall periods. At Sunnyside Swamp U/S values were slightly lower during the first half of the reporting period compared to the second half. EC values have typically fluctuated within historical limits, however EC values are at the low end of historical ranges.

Manganese has typically ranged from 0.002 to 0.026mg/L. There was an increase in concentrations at Sunnyside Swamp at both sites during the lower rainfall period (February to May) and a drop in concentrations following the June and July higher rainfall.

As with Wolgan Junction, iron concentrations at both sites show almost identical trends over the current review period and values have remained within historical limits (albeit at the lower end of historical values), in the range 0.16 to 0.6mg/L except for a spike in February at both sites.

Carne Swamp

A summary of the water quality statistics for Carne Swamp are provided in **Table 26**. There was a period of approximately four months (March to June 2016) when the swamp was dry and no samples were collected.

Table 26. Carne Swamp - 2016 Water Quality Statistics

Site	Analyte	Min	Max	Mean
Carne Swamp	pH	4.66	7.25	5.79
	EC (uS/cm)	20	134	40.6
	Mn (mg/L)	<0.01	0.013	0.011
	Fe (mg/L)	0.05	0.1	0.08

pH levels fluctuate between 4.89 and 5.83 over the reporting period. The measured pH levels are within historical limits.

EC values at Carne Swamp have typically fluctuated within historical limits over the reporting period although the EC values from June to November 2016 are slightly higher than in the previous reporting period.

Manganese concentrations ranged from 0.01 to 0.04mg/L over the reporting period. There were spikes in June and December, however fluctuations are within historical ranges.

Iron concentrations at Carne Swamp were higher during the first two months of the reporting period including a historically high spike in February of 1.87mg/L. However, Fe concentrations from June to November are some of the lowest concentrations measured at Carne Swamp yet.

Sunnyside East Swamp

A summary of the water quality statistics for Carne Swamp are provided in **Table 27**. Monitoring at Sunnyside East commenced in March 2016.

Table 27. Sunnyside East Swamp - 2016 Water Quality Statistics

Site	Analyte	Min	Max	Mean
Sunnyside East	pH	4.66	7.25	5.79
	EC (uS/cm)	20	134	40.6
	Mn (mg/L)	<0.001	0.013	0.011
	Fe (mg/L)	0.05	0.1	0.08

The pH levels fluctuate between 4.6 and 7.25 over the reporting period and there is no specific trend or correlation between rainfall and pH.

EC values at in Sunnyside East Swamp show a gradual increase from April to September and a spike in October, the cause of which is not known.

Manganese concentrations were stable over the reporting period with no specific trend.

Iron concentrations at Sunnyside East Swamp were low and fluctuated between 0.05 and 0.1mg/L.

7.2.3. Water Volume

Water volume for the reporting period was monitored through flowmeters located at discharge points LDP001, LDP002 and LDP009. Daily discharge volumes are measured against EPL 3607 volume limits and reported on monthly in the EPL 3607 Environmental Monitoring Report published on the Springvale website. Annual discharge volumes are outlined in **Table 28**.

Table 28. Water Volume

Licensed Discharge Point	Annual Total (kilolitres)
LDP001	201410.81
LDP002	702.25
LDP004	No discharge
LDP005	No discharge
LDP009	8256378.22
LDP010	No discharge

7.3. Groundwater Monitoring

7.3.1. Groundwater Monitoring Strategy

As part of the environmental management plans for Springvale Colliery, an intensive monitoring programme has been implemented on the Newnes Plateau to detect any impacts from underground mining on the groundwater regime, and in particular the Newnes Plateau Shrub Swamps (NPSS). The greater monitoring programme incorporates NPSS and groundwater monitoring locations above both Springvale Colliery and the adjacent Angus Place Colliery. The monitoring locations within the Springvale mining lease boundary include the following main aspects:

- [1]Groundwater levels monitored in 10 swamps, with a total of 24 swamp piezometers;
- Flow from Junction Swamp monitored through a v-notch weir, and flows in Sunnyside Swamp and Carne West Swamp indicated by pool depth monitors;
- Groundwater levels in the regional shallow aquifer measured in 22 piezometers, which are installed on the ridges between the swamps;
- Hydrogeological conditions in the geological sequence above the working seam are monitored by multi-level piezometer arrays, installed in 11 boreholes across the entire spatial extent of mining lease boundary;
- A basic weather station providing climatic data on the Newnes Plateau;
- Water quality data recorded in 10 piezometers across 4 swamps.

Data is recorded at various frequencies as follows:

- Swamp and aquifer piezometer data automatically recorded every three hours;
- Surface water level data in pools and weirs automatically recorded every hour;
- Multilevel piezometers generally record data once per day;
- Dipped aquifer piezometers are measured at each data collection trip (monthly);
- Barometric data recorded automatically every three hours for correction of piezometer data;
- Swamp water quality data recorded monthly.

7.3.2. Swamp Water Levels

Overall, water levels in ten of the twelve swamps in the monitoring network display a pattern for the current reporting period that is consistent with the previous reporting period trends and correlates with the CRD curve and prevailing climatic conditions. These swamps comprised Sunnyside West Swamp, Sunnyside Swamp, Junction Swamp, Gang Gang West Swamp, Gang Gang Swamp, Carne Central Swamp, Bungleboori Swamp, Marrangaroo Swamp, Twin Gully Swamp and Tristar Swamp. The water levels in these swamps appear to be fluctuating as normal in response to the prevailing rainfall conditions during 2016.

Historically at both Sunnyside East Swamp and at Carne West Swamp, water levels show an uncharacteristic decline to below the piezometer bases that coincides with the passing of LW418 and 419. In the current reporting period all the water levels are still below the piezometer bases except for responses to above average rainfall events. The decline in the water level at the newly installed SPR1601 since monitoring commenced in September 2016, is directly related to mining at LW419 which commenced in August 2016.

[1] MSEC742. Centennial Coal: Springvale Colliery Extraction Plan for LW419 to LW422. Subsidence predictions and impacts Assessments. Mine Subsidence Engineering Consultants. Report MSEC472. March 2015.

It is worth noting that Sunnyside East and Carne West Swamps coincide with a Type 1 geological structure as identified in MSEC742[1], while Gang Gang West is located adjacent to a Type 2 Structure. In the case of Sunnyside East and Carne West Swamps, these swamps coincide with two splays of the Type 1, Deanes Creek Lineament Zone, while Gang Gang West Swamp is located between the Deans Creek Lineament and a Type 2 structure that coincides with the alignment of Gang Gang Swamp.

Both Type 1 and Type 2 structures are associated with anomalous subsidence and increased subsidence effects are anticipated at these locations. Type 1 and 2 structures also propagate from the Lithgow Seam through to the ground surface. It is possible that these structures may have enhanced permeability due to the encroaching subsidence effects, and are unduly impacting on the overlying swamps.

The following sections provide an overview of data trends for swamp water levels as per the current SMP Area.

Sunnyside West Swamp

There is one piezometer installed in Sunnyside West Swamp, the details of which are shown in **Table 29**.

Table 29. Sunnyside West Swamp Piezometer Information

Piezometer	Mined Status	Monitoring Commencement
SW1	LW413B and LW414	26/07/2007

The water levels at Sunnyside West Swamp show a strong response to rainfall.

Over the reporting period water levels have fluctuated by up to 1.6m. Water levels below the level of the logger (2.2 metres below ground level (mbgl)), occurred from 1 March to 16 May.

There was a rise in the water level from 5 June to 21 July due to above average rainfall. Peak water levels occurred from July to September, with a gradual decline to December.

Rapid water level rise and regression is a typical response to rainfall at Sunnyside West, however average water levels appear to be lower than those prior to 2012.

Sunnyside Swamp

There are five piezometers installed in Sunnyside Swamp, the details of which are shown in **Table 30**.

Table 30. Sunnyside Swamp Piezometer Information

Piezometer	Mined Status	Monitoring Commencement
SS1	Not Undermined	12/05/2005
SS2	Not Undermined	12/05/2005
SS3	Not Undermined	12/03/2010
SS4	Not Undermined	12/03/2010
SS5	Not Undermined	12/03/2010

All five piezometers show strong responses to individual rainfall events. At SS1 and SS2 these natural fluctuations are overprinted by water level responses due to sampling events.

Piezometers SS2, SS4 and SS5 show similar scale fluctuations with water level change of the order of 0.22 to 0.36m over the reporting period. SS4 typically fluctuates from 0.09mbgl to 0.17m

above ground level (magl), SS2 has water levels in the range 0.3 to 0.58mbgl and SS5 has water levels in the range 0.04magl to 0.45mbgl.

SS1 typically displays water levels between SS2 and SS5, however the response is muted. Due to low permeability and recovery time following sampling, a large proportion of the SS1 water level readings are over printed by sampling drawdown and recovery trends.

SS3 shows the greatest degree of variation in water levels of up to 1.15m. Upper water levels are comparable with other Sunnyside Swamp piezometers, however water levels rapidly decline to below the piezometer bottom with lower rainfall from 18 February to 2 June 2016.

Over the reporting period water levels in all piezometers have fluctuated within historical limits and show a close correlation with rainfall. No significant trends are apparent.

Sunnyside East Swamp

Three piezometers are installed into Sunnyside East Swamp as shown in **Table 31**.

Table 31. Sunnyside East Swamp Piezometer Information

Piezometer	Mined Status	Monitoring Commencement
SSE1	LW417	12/03/2010
SSE2	LW417	12/03/2010
SSE3	LW418	12/03/2010

SSE1 is the deepest of the three piezometers installed at Sunnyside East and shows water levels below the base of the piezometer from January to mid-September, and slightly above the base of the piezometer for the rest of the reporting period. Historically, SSE1 has shown some strong responses to larger rainfall events but only during periods of high rainfall when water levels in other parts of the swamp were elevated 1 to 1.5m above current levels.

Since declining below the base of the SSE2 piezometer in August 2013, water levels have typically only shown responses to the larger rainfall events. The water level was below the base of the piezometer for most of the reporting period and slightly above the base from 12 August possibly in response to the higher than average rainfall for the last six months of the year.

Similar to SSE2, SSE3 water levels have declined from approximately ground level during 2012 to below the base of the piezometer in August 2013. Over the current reporting period, a number of small scale fluctuations of approximately 0.6m are apparent in response to rainfall events however these fluctuations are not consistent with those observed prior to the water level decline.

Current water levels and responses to rainfall events at Sunnyside East are not consistent with pre August 2013 water levels following periods of below average rainfall, such as early 2010; this is particularly evident at SSE3 and SSE2.

Carne West Swamp

There were previously four piezometers installed into Carne West Swamp as shown in **Table 32**. An additional piezometer SPR1601 was installed in 2016. The installed depth of SPR1601 is 6.3m, and it is the deepest of the five piezometers.

Table 32. Carne West Piezometer Information

Piezometer	Mined status	Monitoring Commencement
CW1	Undermined LW419	12/05/2005
CW2	Undermined LW419	12/05/2005
CW3	Adjacent LW417	14/10/2011
CW4	Adjacent LW417	14/10/2011
SPR1601	Adjacent LW419	31/08/2016

The water levels observed in CW1 and CW2 have historically been in the range 0.1 to 0.25mbgl, but began declining below historical levels in early 2014.

In July 2014 water levels in CW1 declined to below the base of the piezometer and have since remained below the base except for a response to a large rainfall event on 21 April 2015. From July 2016 it appears as if the transducer in CW1 is reading a water level but during the site visit it was dry. Hence it is likely that the transducer is only reading water trapped in the bore end cap, since the water level has minimal variation of approximately 0.05m.Water levels in CW2 also began to decline in mid-2014 to below the piezometer base in June 2015 (previous reporting period) and have remained below the piezometer base until June 2016.

Following a period of higher than average rainfall from June to September 2016, there was an increase in the water level for a period of four months but water levels declined to below the base of the piezometer for the remainder of the reporting period.

Since October 2011 the water levels in CW3 only responded briefly to the largest rainfall events followed by a rapid water level decline to below the base of the piezometer, and has been below the base of the piezometer since February 2013. The data for CW4 shows variable responses from October 2011 to mid-2013 but has been below the base of the piezometer since July 2013.

Previously both of these piezometers only recorded water levels following a period of two years of above average rainfall in 2012 and 2013.

At SPR1601, 250m from LW419, there is a decline in the water level of 2.7m since monitoring commenced in September to the end of the reporting period, fluctuating briefly in response to rainfall events.

Carne Central Swamp

There is one piezometer installed in Carne Central Swamp as shown in **Table 33**.

Table 33. Carne Central Swamp Piezometer Information

Piezometer	Mined status	Monitoring Commencement
GG1	Not Undermined	14/10/2011

Water levels measured at the Carne Central piezometer (CC1) are very similar to water levels in Gang Gang Swamp, and fluctuated between 0.07magl and 0.34mbgl over the reporting period. The water levels declined from 0.061magl in January to 0.34mbgl in May 2016 due to below average rainfall. A rapid rise was observed in June 2016 with water levels above ground level from June to November 2016 due to above average rainfall. Sampling events are also evident in the data set.

Water levels at CC1 have fluctuated within historical limits over the reporting period.

Gang Gang West Swamp

There are six piezometers in Gang Gang West Swamp, as shown on **Table 34**. Two of these (GW1 and GW2) were in place before the 2016 monitoring period and an additional four piezometers (SPR1602, SPR 1603, GW3 and GW4) were installed in August and October 2016.

Table 34. Gang Gang West Piezometer Information

Piezometer	Mined status	Monitoring Commencement
GW1	Not undermined	14/10/2011
GW2	Not undermined	14/10/2011
SPR1602	Not undermined	31/08/2016
SPR1603	Not undermined	31/08/2016

Piezometer	Mined status	Monitoring Commencement
GW3	Not undermined	01/10/2016
GW4	Not undermined	01/10/2016

The water levels measured at GW1 have historically fluctuated between 0.05m above ground level and 0.1mbgl, however in September 2014, water levels began to decline beyond these historical limits to below the piezometer base in February 2015. The levels remained below the piezometer base until June 2016. Following the higher rainfall period from June to September 2016, there was a rapid rise in water level in June, fluctuating between ground level and 0.56mbgl, before dropping off in October to below the piezometer base for the remainder of the reporting period.

At GW2 the water levels fluctuated between 0.02magl and 0.09mbgl for the first month of the reporting period, but declined rapidly during February to 0.5mbgl in response to reduced rainfall. A brief response to March and May 2016 rainfall events is observed. Following a higher rainfall period from June to September 2016, there was a rapid rise in the water level from 0.52mbgl to ground level in June, fluctuating around ground level until the end of September. The water level declined in response to reduced rainfall to the end of the reporting period except for a response to a higher rainfall event in mid-December.

At GW3 there was a gradual decrease in water level from October to the end of the reporting period due to reduced rainfall, except for a brief response to a high rainfall event in December.

The water level at GW4 shows a rapid decrease in October to below the piezometer base, and did not recover for the rest of the reporting period.

At SPR1602 and SPR1603, 850m and 930m away from LW419 respectively, the water level declined gradually with brief responses to rainfall events.

Gang Gang Swamp

There are three piezometers installed in Gang Gang Swamp, as shown in **Table 35**. One of these (GG1) was in place before the 2016 monitoring period and two additional piezometers (GG2 and GG3) were installed in October 2016.

Table 35. Gang Gang Swamp Piezometer Information

Piezometer	Mined status	Monitoring Commencement
GG1	Not undermined	14/10/2011
GG2	Not undermined	01/10/2016
GG3	Not undermined	01/10/2016

The water levels in Gang Gang Swamp piezometer GG1 typically range between 0.07magl and 0.30mbgl over the reporting period. The natural variation is also over-printed by drawdown and recovery responses due to sampling events. The decline in water levels during February, the lower than average water levels from February to May, and the gradual rise in water levels from May to July, correlate well with rainfall over the reporting period.

There is a gradual decrease in water levels in GG1, GG2 and GG3 from October to the end of the reporting period due to reduced rainfall, except for a brief spike in December in response to a high rainfall event.

Over the current reporting period water levels at GG1 have fluctuated within historical limits.

East Wolgan Swamp

East Wolgan Swamp is located above the eastern extent of the current Angus Place longwalls and has been undermined by Angus Place Colliery longwalls 960 and 970. The swamp is the down gradient extension of the Junction Swamp above the neighboring Springvale Colliery, and is a licensed discharge point (LDP004) for Springvale. LDP004 is currently only used for emergency discharge. There were no recorded discharge events into the East Wolgan Swamp during the review period.

The water level at East Wolgan swamp is monitored at WE1 and WE2 and water levels closely resemble rainfall patterns and intensity. Since early 2009 the responses have declined to short duration spikes in water level and since mid-2009 WE1 and WE2 water levels have generally remained at or below the base of piezometer.

During the reporting period water levels at both WE1 and WE2 continued to respond intermittently to large rainfall events.

7.3.3. Regional Shallow Aquifer Water Levels

Standpipe Piezometers

A series of nineteen ridge boreholes have been established to monitor the groundwater level in the perched and shallow aquifers of the Burralow Formation and Banks Wall Sandstone at Springvale.

The standpipe piezometers are summarised in **Table 36**.

The Standpipe piezometers are equipped with water level pressure transducers (with the exception of Bore RSE) and data loggers, and are installed over a large spatial extent of the Springvale mining lease boundary.

Standpipe piezometers monitoring water levels in the regional shallow aquifer generally display stable trends which fluctuate with rainfall and climatic conditions in the same manner as previous years.

Table 36. Standpipe Piezometer Locations

Monitoring Point	Easting	Northing	Monitoring Commence Date	Hole Depth (mbgl)	Data Recording Method
RSE	236840	6304191	20/12/2005	Unknown	Manual dip
SPR1111	240404	6303692	14/12/2011	60.9	Pressure transducer
SPR1112	240852	6302995	15/12/2011	50.0	Pressure transducer
SPR1113	240625	6302160	13/02/2012	60.6	Pressure transducer
SPR1109	239186	6303314	14/12/2011	60.1	Pressure transducer
SPR1108	241045	6301305	04/11/2011	76.1	Pressure transducer
SPR1107	239739	6302330	04/11/2011	55.6	Pressure transducer
SPR1110	238699	6302635	14/12/2011	65.8	Pressure transducer
SPR1101	238484	6303627	14/11/2011	47.4	Pressure transducer
SPR1106	239980	6304227	15/12/2011	86.2	Pressure transducer

Monitoring Point	Easting	Northing	Monitoring Commence Date	Hole Depth (mbgl)	Data Recording Method
SPR1104	239746	6303184	04/11/2011	47.0	Pressure transducer
SPR1210	239677	6300052	31/05/2013	131.2	Pressure transducer
SPR1211	239677	6300052	31/05/2013	133.8	Pressure transducer
SPR1301	239275	6299271	26/05/2014	86.7	Pressure transducer
RSS	238072	6303500	01/12/2005 to 14/12/2011	Unknown	Manual Dip
			14/12/2011		Pressure transducer

Seven of the piezometers show either the continuation of gradual declining water levels or show relatively stable trends (SPR1108, SPR1111, SPR1113, SPR1301 and AP5PR – stable or slight decline). RSS is generally stable but did readily respond to higher rainfall from May to October 2016, which isn't observed at other piezometers. SPR1211 is generally stable and fluctuating around 1140mAHD.

The logger in SPR1210 stopped working at the end of January, and it is presumed it was destroyed by forestry equipment. SPR1402 became blocked at a shallow depth.

SPR1401 is a replacement for SPR1101, located above LW416, which was destroyed due to subsidence. SPR1401 shows a continuation of a gradual declining water level during the reporting period.

Water levels at SPR1110 remain below the base of the piezometer.

Piezometers that display changed or different trends are as follows:

- SPR1107, located 150m east of LW419, shows a 4m decline in water level between January and November 2016, and a 2m decline from November to December 2016.
- SPR1104, located 180m east of LW419, shows the continuation of a gradual declining water level (~1.5m) until 18 September, after which there was a step in the data with a decline in the water level of ~3m.
- SPR1403 located above LW418 and 160m west of LW419, shows a decline in water level of 2.2m from mid-December 2015 to early January 2016, and dropped below the base of the piezometer for the remainder of the reporting period.
- SPR1109, located above LW418, 120m west of LW419 and adjacent to swamp piezometers CW1 and CW2, shows a stepped decline of 3.6m from the end of the previous reporting period into the early part of the current reporting period, similar to the step in the water level at SPR1403. Water levels then continue a steady declining trend (~2.9m) to the end of the reporting period.

Standpipe Water Level Interpretation

The four standpipe piezometers closest to sections of LW418 and LW419, which were mined during this reporting period, are the following:

- SPR1107 (150m from LW419).
- SPR1104 (180m from LW419).
- SPR1403 (160m from LW419).

- SPR1109 (120m from LW419, above mined out section of LW418).

The decline at SPR1107 is inferred to be directly related to longwall extraction and subsidence at LW419.

At SPR1104 the gradual declining water level of ~1.5m until 18 September, and the stepwise water level decline of ~3m in September and October are related to longwall mining at LW419.

The stepped water level decline at SPR1403 and SPR1109 in December 2015 and January 2016, followed by stabilisation, is inferred to be due to bed separation effects and increased storage due to subsidence at LW418.

Overall, water levels in the standpipe piezometers that monitor the regional shallow aquifer, display trends that fluctuate as normal and in the same manner as in previous years. With the exception of the four piezometers mentioned above, no significant mining impacts have been observed.

Vibrating Wire Piezometers

Multi-level vibrating wire piezometers (VWPs) have been installed in boreholes across the mining lease boundary area to monitor pore pressures at various levels in the overburden and coal measure lithologies. Most of the VWPs are located in the centre of the current workings at Springvale Colliery, in the area that is currently being mined, or will be mined over the next few years.

For the analysis and interpretation of groundwater levels in this report, only VWP monitoring points in the vicinity of the active longwall extraction during 2016 have been analysed, these being SPR36, SPR37, SPR66, SPR67 and SPR67, as shown in **Table 37**.

Table 37. Vibrating Wire Piezometer Locations

Monitoring Point	Easting	Northing	Monitoring Frequency	Monitoring Commence Date	No.of Functioning Piezometers	VWP Setting Depth (mbgl)*
SPR36	239358	6303496	Twice Daily	11/2015	1 of 8	35, **75, 130, 146, 274, 320, 376, 389**
SPR37	239078	6300367	Daily	09/06/2001	2 of 8	110, **135**, 165, 187, 260, 320, 350, 405
SPR66	239824	6301994	Daily	30/09/2009	8 of 8	35, 80, 130, 180, 230, 290, 348, 372
SPR67	238709	6302283	Daily	28/09/2009	5 of 8	35, 50, 70, 90, 110, **160, 200, 260**

*__Bold__ denotes sensors that have been lost or damaged.

SPR36

Vibrating Wireline Piezometer (VWP) SPR36 is located above the LW419 and originally monitored the piezometric pressures across eight formations. Four of the eight sensors were still operating until the end of September 2016 but communications were lost due to mining at LW419.

Currently only the shallowest sensor is still recording.

The following is noted over the review period:

- Sensor #8 shows the continuation of a slight declining trend
- Sensors #3, #5, #6 and #7 display a sharp decline in water levels in September in the period before communication was lost.

SPR37

SPR37 is located approximately 1.1km south of LW418 and LW419. Piezometric pressures were originally monitored in eight formations at SPR37, however only seven sensors (#1, #3, #4, #5,

#6, #7 and #8) remain operational. Over the review period, piezometric pressures declined slightly.

The following is noted over the review period:

- Sensor #3 had a decline in the water level of approximately 2.5m during April and May 2016 with fluctuations from October to the end of the reporting period.

SPR66

SPR66 is located 220m east of LW419. The piezometric pressures are monitored in eight formations at SPR66.

The following is noted over the reporting period:

- Sensors #1 to #4 show very consistent, parallel responses. A stepped depressurisation event is apparent, from January to May that is likely to be associated with the longwall extraction. This response is also mimicked in a subdued form in Sensor #5 located above the Mount York Claystone.
- Sensors #6, #7 and #8, also show parallel responses. Sensors #6, #7 and #8 which have previously been relatively static, show a small decline period from February to May with a minor decline over the rest of the reporting period.

SPR67

SPR67 is located 300m west of LW418 and 600m east of LE419 above mined out LW417.

Piezometric pressures were originally monitored in eight formations at SPR67, however communication was lost with sensor #1 in 2014, and during the previous reporting period communications have been lost to Sensors #2 and #3 with the passing of LW417.

Water levels at the remaining five sensors show a slight decline over the reporting period.

7.3.4. Groundwater Quality Monitoring

Groundwater quality is monitored at two separate locations:

- Carne West Swamp – CW1 and CW2
- Sunnyside East Swamp – SSE3

Carne West Swamp

It was not possible to collect samples at CW1 and CW2 for analyses over the reporting period, as the piezometers were dry.

Sunnyside East Swamp

It was not possible to collect a sample at SSE3 for analyses over the reporting period, as the piezometer was dry.

7.3.5. Soil Moisture Monitoring

Soil moisture monitoring commenced in October 2016 at Gang Gang West (GW1SM, GW3SM) and Gang Gang East (GG2SM, GG3SM) until the end of the year. This time period commences after the peak rainfall period of 2016 (June to September) and hence soil moisture would be expected to decrease somewhat.

- At GW1SM all the probes had a slight decrease in soil moisture over the reporting period of approximately 1% with minor temporary spikes from rainfall events, except for the 20cm and 50cm probes. At the 50cm probe the soil moisture decreased from ~48 % to

~15%, and at the 20cm probe the soil moisture decreased from ~13% to ~11%. In general, this shows dry near surface soils.

- The soil moisture at GW3SM ranged between 27% and 57%. At the 0cm, 10cm and 20cm probes the soil moisture decreased between 8% and 27% with minor temporary spikes from rainfall events. The soil moisture at probes at 30cm, 40cm, 50cm and 60cm remained stable. In general, this shows moist near surface soils with permanent moisture at about 30cm depth.
- GG2SM has false data prior to early November, which is to be disregarded, and equipment was reinstalled following this date. The soil moisture at the 0cm, 10cm, 20cm, 30cm and 40cm probes decreased between 3% and 18% except for large spikes during rainfall events over the reporting period. The soil moisture at the 50cm probe was variable but high at about 50-70%. The soil moisture at the 60cm probe remained stable and decreased slightly by approximately 2%. At the 70cm and 80cm probes, the soil moisture remained stable at around 52%. In general, this shows damp near surface soils with permanent moisture at about 60cm depth.
- GG3SM has high overall soil moisture with the majority of probes above 30% since installation. At the 0cm and 10cm probes there was a slight decrease in soil moisture with temporary spikes from rainfall events. The 20cm and 30cm probes show temporary spikes from rainfall, sometimes reaching 100% as well as a wide range of variability. The soil moisture at probes 40cm, 50cm, 60cm, 70cm, 80cm, 90cm and 100cm remained stable over the reporting period. In general, this shows moist near surface soils with permanent moisture at about 40cm depth.

8. REHABILITATION

8.1. Rehabilitation in 2016

Springvale has adopted a progressive approach to rehabilitation to reduce and mitigate potential environmental impacts. Facilities no longer required, for example, exploration sites, or ventilation and dewatering facilities, are rehabilitated soon after decommissioning, to return disturbed land to the original landform. Rehabilitation is followed up with periodic inspections and maintenance as necessary based upon evidence of endemic regrowth, weeds and soil disturbance. Rehabilitation acceleration techniques are undertaken as required following approval from the Forestry Corporation of NSW (FCNSW) and in accordance with the Springvale – FCNSW Level 3 Occupation Permit.

Due to the underground nature of mining operations at Springvale, surface disturbance and the need for progressive rehabilitation is relatively minor compared to that required at an open cut mining operation. No major rehabilitation of the pit top and Newnes Plateau infrastructure is anticipated until site closure.

During the reporting period no rehabilitation or disturbance was undertaken. There has therefore been no change in disturbance footprint in 2016.

The status of mining and rehabilitation as at the end of 2016 is presented in **Table 38** and **Figure 12**.

During 2016, a review of the MOP and Rehabilitation Cost Estimate (RCE) was undertaken at the request of DRE. As part of this process a review of Springvale pit top and Newnes Plateau infrastructure was undertaken and disturbance and rehabilitation footprints assessed. The revised areas (hectares) were used to update the MOP and RCE, which were subsequently approved by DRE. **Table 38** reflects the current approved MOP footprint.

Table 38. Rehabilitation Status

Mine Area Type	Previous Reporting Period (Actual)	This Reporting Period (Actual)	Next Reporting Period (Forecast)
	Year 2015 (ha)	Year 2016 (ha)	Year 2017 (ha)
A. Total mine footprint[2]	37.9	37.9*	40.8
B. Total active disturbance[3]	34.4	34.4	35.9
C. Land being prepared for rehabilitation[4]	0	0	1.4
D. Land under active rehabilitation[5]	3.5^	3.5[#]	4.9
E. Completed rehabilitation[6]	0	0	0

*1 ha of disturbance associated with Booster Pump Station 1 and Booster Pump Station 2 scheduled for 2016 has been moved to 2017 due to a minor change to the project timeline.

^The 3.5 ha of land under rehabilitation as at the end of 2015 relates to the Bore 1 – Bore 4 dewatering facilities, services corridor to the Bore 8 dewatering facility, Old Fire Dam and the Settlement Pond Site.

[#]1.4 ha of rehabilitation associated with the Booster Pump Station 1, Booster Pump Station 2 and associated infrastructure corridors scheduled for 2016 has been moved to 2017 to align with the Booster Pump Stations project timelines.

[2] **Total Mine Footprint:** includes all areas within a mining lease that either have at some point in time or continue to pose a rehabilitation liability due to mining and associated activities. As such it is the sum of total active disturbance, decommissioning, landform establishment, growth medium development, ecosystem establishment, ecosystem development and relinquished lands (as defined in the DRE MOP/RMP Guidelines). Please note that subsidence remediation areas are excluded.
[3] **Total Active Disturbance:** includes all areas requiring rehabilitation
[4] **Land being prepared for rehabilitation:** includes the sum of mine disturbed land that is under the following rehabilitation phases – decommissioning, landform establishment and growth medium development (as defined in DRE MOP/RMP Guidelines)
[5] **Land under active rehabilitation:** includes areas under rehabilitation and being managed to achieve relinquishment – includes 'ecosystem and land use establishment' and 'ecosystem and land use sustainability (as defined under the DRE MOP/RMP Guidelines)
[6] **Completed rehabilitation**: requires formal sign off from DRE that the area has successfully net the rehabilitation land use objectives or completion criteria

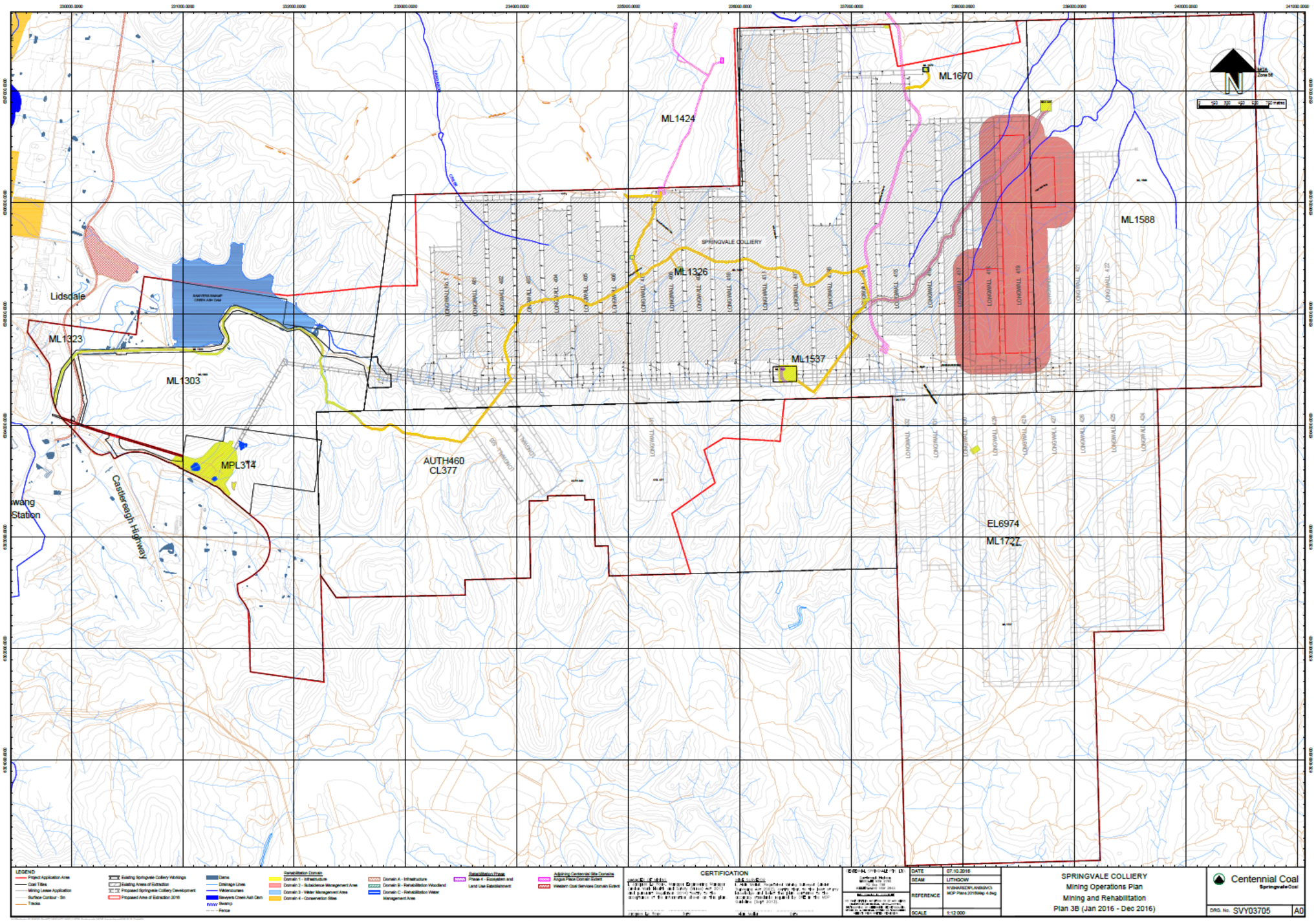


Figure 12. Disturbance, Rehabilitation and Mining at 31 Dec 2016

8.2. Rehabilitation Monitoring

Rehabilitation monitoring was undertaken during 2016 on the Newnes Plateau and at the Pit Top. Monitoring continued at five previously established rehabilitation monitoring sites (SPR1, SPR2, SPR3, SPR4 and SPR5). Four additional sites were established in 2016 and will be included in the ongoing monitored program (SPR6, SPR7, SPR8 and SPR9).

- SPR 1 – Rehabilitation site previously used as a dam. The Old Fire Dam has since been infilled with soil and or seeded with native vegetation;
- SPR 2 – Rehabilitation site on the Newnes Plateau is associated with the infrastructure corridor to the Bore 8 Dewatering Facility;
- SPR 3 – Rehabilitation site on the Newnes Plateau at the previous Bore 2 Dewatering Facility;
- SPR 4 – Control site for the Pit Top located upslope from SPR 1;
- SPR 5 – Control site on the Newnes Plateau;
- SPR 6 – Rehabilitation site located on Newnes Plateau at the previous Bore 1 Dewatering Borehole;
- SPR 7 – Rehabilitation site located on Newnes Plateau at the previous Bore 3 Dewatering Borehole;
- SPR 8 – Rehabilitation site located on Newnes Plateau at previous Bore 4 Dewatering Borehole; and
- SPR 9 – Control site located on Newnes Plateau.

A summary of monitoring results at rehabilitation sites is provided below:

SPR 1

This site was found to be performing well in terms of stability and retention of materials. Numerous bare soil patches were visible on the steeper sections of the transect during the 2016 survey and while these exposed areas appeared to be stable, they would likely benefit from some additional soil protection to avoid future erosion. Application of mulch to these areas would be beneficial and may support native plant growth. It is important that any mulch is sourced locally and from similar native vegetation (ideally if any other clearing of native vegetation takes place on the mine).

Vegetation on this site is well established and contains a relatively high diversity of native species. A key issue is the dominance of wattle (*Acacia*) and Dogwood regrowth in the canopy and understorey strata. In addition, there is an overall lack of eucalypt saplings becoming established. Only small eucalypts (most less than 0.5 m tall) were observed and these are sparsely distributed. It is possible that at this early stage of regeneration, the faster growing *Acacia* are outcompeting or 'shading' the juvenile eucalypts. This is often encountered on rehabilitation sites and may resolve naturally as Acacia individuals die off (lifespan generally 10-15 years). Alternatively, rehabilitation performance could be enhanced by thinning some of the wattles (*Acacia* sp.) and introducing long stem planting of native eucalypts. Eucalypt planting would preferably be conducted in patches of bare soil.

Some minor weed growth was observed at SPR 1, however, future weed growth problems are unlikely. Ongoing monitoring will allow any growth of weeds to be identified and controlled appropriately.

SPR 2

SPR2 contains a number of large diameter logs and a thick cover of woody debris that could retard seed germination rates and seedling establishment in its early stages (when seeds require space and sun exposure to germinate). Nonetheless, it is apparent that native plants

are readily growing between the woody debris and this growth is expected to increase. Native plant regeneration on SPR 2 is likely to continue naturally.

There is no evidence of any significant erosion on the site .

No exotic plant species were observed at this site. Ongoing monitoring will allow any growth of weeds to be identified and controlled appropriately.

SPR 3

Native vegetation on this site is in good health and has almost reached the species diversity of the respective control site (SPR 5). Similar to the other rehabilitation sites, no problematic erosion is apparent and material retention is likely to increase as vegetation becomes more established.

No exotic plant species were observed at this site. Ongoing monitoring will allow the appearance of new weed species and weed growth to be identified and controlled appropriately.

SPR 6

Rehabilitation works appear to be only recent (2-3 years) and vegetation is regenerating naturally. The ground surface also contains woody debris, rocks, bare soil and stumps.

Similar to the other rehabilitation sites, no problematic erosion is apparent and material retention is likely to increase as vegetation becomes more established.

No exotic plant species were observed at this site. Ongoing monitoring will allow the appearance of new weed species and weed growth to be identified and controlled appropriately.

SPR 7

Native vegetation on this site is in good health and exceeds the species diversity of SPR 9, the adjacent control site.

Rehabilitation age is approximately three years and vegetation is regenerating naturally. The site is vegetated and soil surface is stable. Large tree stumps, logs, branches and leaf litter is present in the groundlayer.

Similar to the other rehabilitation sites, no problematic erosion is apparent and material retention is likely to increase as vegetation becomes more established. There is a small stockpile of soil adjacent to the monitoring plot that requires removal and/or spreading, with subsequent mulching and possibly planting. There is also a narrow unsealed track traversing the rehabilitation area. Mulch should be placed over the track to minimise erosion risk during rainfall events. Rehabilitation works will be required should the existing bore top, concrete pad and chain mesh fence around Bore 3 be removed.

No exotic plant species were observed at this site. Ongoing monitoring will allow any growth of weeds to be identified and controlled appropriately.

SPR 8

Native vegetation on this site is in good health and has the same species diversity of the respective control site (SPR 4). The vegetation appears to be approximately five years old

and contains a dense layer of juvenile eucalypt species growing to around 2 to 5 m tall. The soil surface appears stable and contains sub-shrubs, eucalypt seedlings, ferns and herbs.

Similar to the other rehabilitation sites, no problematic erosion is apparent and material retention is likely to increase as vegetation becomes more established.

No exotic plant species were observed at this site. Ongoing monitoring will allow any growth of weeds to be identified and controlled appropriately.

8.3. Agreed Post-Rehabilitation Land Use

Following the cessation of mining operations at Springvale, the pit top and all rehabilitated areas on the Newnes Plateau will be rehabilitated to woodland commensurate with the adjacent remnant vegetation. The *Springvale Mine Extension Project Decommissioning and Rehabilitation Strategy* (SLR 2014) prepared as a component of the EIS commits to the final land use for these areas becoming 'environmental protection works' which is consistent with the surrounding land use of forestry within the Newnes State Forest. Additionally the final land use aligns with the current Lithgow Local Environmental Plan (LEP) 1994, the Draft Lithgow LEP 2013 and the Lithgow Draft Land Use Strategy 2010 – 2030.

8.4. Rehabilitation Maintenance

East Wolgan Swamp was impacted over a period of years by a combination of regulator approved mine water discharge and potential subsidence effects.

The East Wolgan Swamp major slump and the piping area were rehabilitated in accordance with the s95 Certificate issued by OEH with major works completed through 2014 by The Bush Doctor swamp rehabilitation specialist. A joint inspection with OEH, Bush Doctor and Centennial was undertaken on the 10th of December 2014 as per the s95 Certificate. Work continued with final brush-matting activities in January 2015. A report on that critical initial rehabilitation phase was provided to OEH in February 2015, an interim report in May 2015, with following reports for Summer and Winter 2016 completed during this current Annual Review period. Centennial Coal is in discussion with OEH regarding maintenance works on existing rehabilitation areas as well as further potential hydration and revegetation opportunities in East Wolgan Swamp.

8.5. Renovation/Removal of Buildings

No permanent buildings were removed during the reporting period.

8.6. Exploration and Construction Works

No exploration or construction activities were conducted during the reporting period.

8.7. Rehabilitation Sign Off from the DRE

No rehabilitation areas received formal sign-off from DRE that they were completed to a standard suitable for lease relinquishment during the reporting period.

8.8. Variations in Activities from the MOP

A MOP amendment was submitted and approved by DRE during the reporting period. This amendment covered operational and rehabilitation activities proposed from 2016 to 2022 including:

- Proposed exploration activities;
- Proposed construction activities (Booster Pump Stations 1 and 2);
- Proposed groundwater monitoring (stygofauna); and

- Updated Table 24 (Rehabilitation and Disturbance Rates during the MOP term) based on Plans developed to support the 2016 Rehabilitation Cost Estimate.

8.9. Key Issues Affecting Successful Rehabilitation

The MOP identifies a number of issues that have the potential to affect rehabilitation at Springvale. These included:

- Greater than anticipated subsidence impacts;
- Erosion and sedimentation;
- Poor topsoil quality;
- Subsidence impacts on steep slopes; and
- Bushfire.

None of these issues were encountered during the reporting period. Continued erosion and sediment control maintenance work was completed at infrastructure sites on the Newnes Plateau, including the Bore 8 and Vent Shaft 3 Site facilities.

8.10. Next Reporting Period

Rehabilitation at Springvale will be undertaken progressively and will involve partial rehabilitation of the following disturbed areas after completion of construction on Newnes Plateau. Rehabilitation and disturbance in 2017 is summarized in **Table 38**, and includes:

- 0.9 ha of disturbance associated with construction of the Mine Services Borehole, Bore 9 Dewatering Facility and associated infrastructure corridors as well as Booster Pump Station 2; and
- In 2017 1.4 ha of land will be prepared for rehabilitation, post construction works. These areas include rehabilitation associated with the Bore 5 and Bore 6 dewatering facilities and infrastructure corridoes associated with Booster Pump Station 1 and Booster Pump Station 2.

In 2017 work is planned to continue re-hydration and revegetation of East Wolgan Swamp with a commitment to working on the most severely affected areas of the upland swamp community in alignment with the s95 Certificate issued in response to the s91 condition: *The rehabilitation works will also include a significant commitment to ongoing monitoring and maintenance*. This work will include the monitoring and where required, maintenance of structures used as part of the works, removal of weeds, and where appropriate redesign and implementation of further structures, coir logs and associated materials. Restoration works will be performed in accordance with the ‘Save Our Swamp’ soft engineering solutions for swamp remediation (SOS 2010).

9. COMMUNITY

9.1. Environmental Complaints

One community complaint was received during the reporting period. The complaint related to empty haul trucks travelling from Springvale Coal Services to Springvale. Springvale Mine was temporarily hauling ROM coal to Springvale Coal Services via the Castlereagh Highway. The complaint was regarding the speed and noise (tail gates not secured properly) of the returning empty trucks travelling along the Highway to Springvale Mine.

A Centennial representative contacted the complainant and was advised of the following actions to be implemented:

- Minimise truck movements and truck speed leaving Springvale Coal Services to 80kmph;
- Check tailgates on trucks are fastened;
- Limit truck movements to weekdays where possible; and
- Notify complainant if weekend hauling is planned.

Trends in community complaints are documented in **Table 39**.

Table 39. Community Complaint Trends

	2013	2014	2015	2016
Number	2	2	1	1
Category	Noise	Low Frequency Noise	Traffic	Noise

9.2. Community Engagement

9.2.1. Community Consultative Committee

A Community Consultative Committee (CCC) has been established to monitor the operations and provide a forum whereby the community can communicate with the mine operators and be kept up to date with the progress of the mine.

In 2012 the established Angus Place CCC was combined to also include Springvale. Furthermore in October 2014 the CCC was also expanded to include Western Coal Services.

The combined Angus Place, Springvale and Western Coal Services CCC aims to facilitate a single channel of communication regarding current operations in the area.

The committee is composed of:

- An independent chairperson;
- Four representatives from Centennial Coal, including the Environment and Community Officer;
- One representative from Council; and
- At least three representatives from the local community.

Two CCC meetings were held during the reporting period (14th of April and 11th of October). Minutes from the meeting are available on the Centennial Coal website.

The Western Region Consultative Committee meets on a regular basis to find the best solution(s) to the following challenges:

- Respecting the local and regional environment;
- Minimising adverse impacts of mine operations on people, homes, and businesses;
- Supporting the economic, social and cultural life of the area; and

- Maintaining profitable and efficient mine operations that meet regulatory requirements.

Meetings will continue to be held during 2017.

9.2.2. Community Contributions

Centennial continued to support local community projects/events/citizens during the reporting period. In 2016 this included but was not limited to:

- Youth Futures Program (The Smith Family);
- Daffodils at Rydal 2016 (Rydal Village Association Inc);
- 125 years Celebrations (Zig Zag Public School);
- Rydal Show (Rydal A, H & P Society);
- NAIDOC Day Celebrations (Mingaan Wiradjuri Aboriginal Corporation); and
- Newnes Junction to Wolgan Valley Rail Trail Development and Environmental Plan.

9.2.3. Community Activities

Centennial continued to participate in local community activities during the reporting period. Activities included but were not limited to Daffodils at Rydal, Annual 'Back to Hartley' Day, NAIDOC Day celebrations as well as Portland Central School, Wallerawang Public School and Cooerwull Public School presentations.

9.2.4. Community Enhancement

As required under Schedule 2, Condition 15 of SSD 5594, Centennial shall pay a community contribution to Lithgow City Council (LCC) of $0.03 per saleable tonne of coal produced from Springvale, Angus and Airly mines, capped at $200,000. They contribution is due by the 31st of March each year commencing on the 31st of March 2016.

For operations undertaken during 2016, the Springvale community contribution has been calculated to be $119,804.37. Payment will be made to LCC in accordance with SSD 5594. This annual community contribution will be allocated for long term community activities and projects.

10. INDEPENDENT AUDIT

As required under SSD 5594 Schedule 5 Condition 3, an Independent Environmental Audit was commissioned prior to the 31st of June 2016. MCW Environmental was endorsed by DPE in June 2016 to conduct the audit and the final audit report and corrective actions were submitted to DPE in December 2016. Findings and proposed corrective actions are tabulated in Appendix 7.

11. INCIDENTS AND NON-COMPLIANCES DURING THE REPORTING PERIOD

The following tables provide a summary of non-compliances identified in Section 1 of the Annual Review (this document).

Table 40. Table SSD 5594 Manning

Nature of the incident/non-compliance.	Site manning numbers
Date of incident/ non-compliance (if known; if not known state not known).	2016
The location of the incident/ non-compliance (include a figure if appropriate), if known.	Springvale Operation
Detail the cause of the incident/non-compliance.	Increased production as a result of Angus Place being on Care and Maintenance
Detail action that has been, or will be, taken to mitigate any adverse effects of the incident/ non-compliance.	No adverse effects to the community as a result of increased workforce
Detail action that has been, or will be, taken to prevent recurrence of the incident/ non-compliance.	A modification (Mod 1) to SSD 5594 is currently being assessed for Springvale to align manning with current and future site demands.

Table 41. Mining Lease Compliance Report

Nature of the incident/non-compliance.	Timing of Compliance Report Submission
Date of incident/ non-compliance (if known; if not known state not known).	2016
The location of the incident/ non-compliance (include a figure if appropriate), if known.	N/A.
Detail the cause of the incident/non-compliance.	Variation in reporting dates across different leased held across the operation. A Group Compliance Report was submitted, however the 12 month reporting submission date was not met for ML1323 and MPL314.
Detail action that has been, or will be, taken to mitigate any adverse effects of the incident/ non-compliance.	Group Compliance Report submitted in December 2016. No adverse effects of late submission.
Detail action that has been, or will be, taken to prevent recurrence of the incident/ non-compliance.	Centennial has engaged with DRE to determine appropriate Group Reporting Data for all Centennial operations. Reporting date will be confirmed formally to ensure future reporting requirements are met.

The following tables summaries EPL3607 non-compliances during the reporting period as relevant to SSD5594.

Table 42. Failure to Monitor - LDP001

Nature of the incident/non-compliance.	Failure to monitor pH weekly during discharge at Point 1 (LDP001).

Date of incident/ non-compliance (if known; if not known state not known).	Week of the19th of September 2016.
The location of the incident/ non-compliance (include a figure if appropriate), if known.	LDP001.
Detail the cause of the incident/non-compliance.	A grab sample was obtained from LDP001 on the 20th of September 2016 by the Springvale environmental monitoring contractor. There was an error with the pH lab reading conducted and no result obtained. A re-sample was scheduled during the week however the monitoring contractor did not complete it.
Detail action that has been, or will be, taken to mitigate any adverse effects of the incident/ non-compliance.	Springvale has in place an acid-dosing system above the LDP001 discharge point to maintain pH levels of discharged water within the EPL criteria limit range for LDP001. The dosing system is automatic and dosing levels are controlled by a pH sensor upstream of LDP001. The system is inspected weekly and maintained as required by a contracted water treatment service provider, with maintenance reports provided weekly to Springvale. During the reporting period no exceedances of pH were detected during testing by the maintenance contractor. The results prior to and following the week of the 19th September 2016 were within criteria limits and as no malfunction was detected with the dosing system the week of the 19th September 2016, it is unlikely that pH levels were exceeded. An indicative in-situ pH reading of 8.08 was taken by the water treatment services contractor during the routine weekly inspection of the dosing system on the 19th September 2016 at the LDP001 discharge point, indicating that levels were within EPL criteria levels.
Detail action that has been, or will be, taken to prevent recurrence of the incident/ non-compliance.	Springvale environmental representative met with monitoring contractor to discuss compliance obligations. Additional supervision of the monitoring contractor and more regular reviews of data collected have also been initiated by the Springvale environmental department.

Table 43. Arsenic Exceedances – LDP009

Nature of the incident/non-compliance.	Three Arsenic exceedances at Point 9 (LDP009).
Date of incident/ non-compliance (if known; if not known state not known).	**Date** **Result** 29/06/2016 0.025 05/07/2016 0.029 20/12/2016 0.066

The location of the incident/ non-compliance (include a figure if appropriate), if known.	Point 9 (LDP009) – Centennial's Springvale Water Transfer System bypass point east of Kerosene Vale Ash Dam.
Detail the cause of the incident/non-compliance.	The cause of the elevated Arsenic levels at LDP009 is the mobilization of naturally occurring minerals within the geological sequence as a result of goaf water storage and the subsequent dewatering of the mine. A dosing plant is installed to treat the water with Ferric Chloride prior to discharge and maintain Arsenic levels at LDP009 below the EPL criteria limit. The exceedances on the 29/06/2016 and the 05/07/2016 were due to a malfunction of the dosing pump. The exceedance on the 20/12/2016 was not due to any failures with the dosing system, but increased dewatering rates causing the increased mobilization of naturally occurring minerals.
Detail action that has been, or will be, taken to mitigate any adverse effects of the incident/ non-compliance.	Due to the non-compliance events being one-off short term events, no adverse environmental impacts are likely.
Detail action that has been, or will be, taken to prevent recurrence of the incident/ non-compliance.	The malfunctioning pump was replaced following the exceedances on the 29/06/2016 and the 05/07/2016. No further exceedances associated with the failure or malfunction of the dosing system have occurred in the reporting period. An inspection regime is in place to ensure the dosing system is operating effectively and sufficient dosing chemical is available. Following the exceedance on the 20/12/2016, dewatering of the mine is now aimed at keeping water levels below the point where the exceedance occurred (i.e. below the point where natural occurring minerals are mobilising into the goaf water storage).

Table 44. Electrical Conductivity Exceedances – LDP009

Nature of the incident/non-compliance.	Twenty-five Electrical Conductivity exceedances at Point 9 (LDP009).			
Date of incident/ non-compliance (if known; if not known state not known).	**Date**	**Result (mg/l)**	**Date**	**Result (mg/l)**
	5/01/2016	1261	19/04/2016	1219
	12/01/2016	1286	26/04/2016	1219
	19/01/2016	1226	27/04/2016	1219
	25/01/2016	1224	3/05/2016	1220
	9/02/2016	1247	17/05/2016	1233
	15/02/2016	1281	7/06/2016	1225

	16/02/2016 1285 23/02/2016 1232 2/03/2016 1241 8/03/2016 1229 29/03/2016 1214 5/04/2016 1233 12/04/2016 1207	21/06/2016 1205 29/06/2016 1217 13/07/2016 1210 18/10/2016 1204 1/11/2016 1230 8/11/2016 1225
The location of the incident/ non-compliance (include a figure if appropriate), if known.	Point 9 (LDP009) – Centennial's Springvale Water Transfer System bypass point east of Kerosene Vale Ash Dam.	
Detail the cause of the incident/non-compliance.	Increased exposure of mine water make with goaf material.	
Detail action that has been, or will be, taken to mitigate any adverse effects of the incident/ non-compliance.	Various specialist assessments have been undertaken as part of the Springvale Mine Extension project which conclude that there are no adverse impacts from elevated EC levels.	
Detail action that has been, or will be, taken to prevent recurrence of the incident/ non-compliance.	Centennial is currently undertaking a review of water management activities within the Western Region with the objective of meeting the agreed requirements of the Springvale Mine Extension Project. This review includes the ongoing development and consultation process with government bodies regarding the Upper Cox's River Monitoring Action Plan and Modification 2 to the SSD_5594.	

Table 45. Noise Exceedance – S2

Nature of the incident/non-compliance.	Exceedance of noise criteria at EPL Point 12 (receptor S2).
Date of incident/ non-compliance (if known; if not known state not known).	31/03/2016
The location of the incident/ non-compliance (include a figure if appropriate), if known.	Point 12 (receptor S2).
Detail the cause of the incident/non-compliance.	Primary noise contributor during the evening noise survey where the exceedance was recorded was from the CHP Stockpile Dozer.
Detail action that has been, or will be, taken to mitigate any adverse effects of the incident/ non-compliance.	No lasting impacts. No complaints received.
Detail action that has been, or will be, taken to prevent recurrence of the incident/ non-compliance.	Once notification of the exceedance had been received, the dozer was inspected by Westrac technicians who determined the track chains and link assemblies required replacement. This work was subsequently completed by Westrac. Further to the repair work, the following actions were undertaken: CHP operators required to report abnormal

	noise emanating from the dozer during stockpile operations. Reminding dozer operators to use 2nd gear while reversing to reduce track slap (in accordance with site Standard). Westpac fitters inspect tracks at regular maintenance intervals and there is an increased frequency of Custom Track Service by CAT Product Support.

Table 46. Summary of Reportable Incidents and Regulatory Actions

Compliance Type	Agency	Number	Response
Incidents	Not Required	0	Springvale Colliery in 2016 did not have an incident which caused or threatened material harm and/or exceeds the limits or performance measures/criteria in SSD 5594.
Caution Notices	EPA	0	NA
Warning Letters	EPA	0	NA
Penalty Notices	Not Required	0	NA
Prosecutions	Not Required	0	NA

12. ACTIVITES TO BE COMPLETED IN THE NEXT REPORTING PERIOD

The following activities (and associated timings) are planned to be undertaken by Springvale in 2017:

- Completion of the Extraction of Longwall 419.
    - Scheduled to be completed mid March 2017.
- Extraction Plan approval for Longwalls 420 – 422.
    - Submission of Longwalls 420 – 422 Extraction Plan documents scheduled for March 2017, following consultation process with relevant stakeholders as per SSD 5594.
- Commencement of Longwall 420.
    - Extraction commencement scheduled for April 2017.
- Continued development of Western Region Management Plans to meet the requirements of SSD_5594.
    - Re-submission of revised Western Region Noise Management Plan and Western Region Air Quality & Greenhouse Gas Management Plan planned for March 2017.
    - Reviews of additional Western Region Management Plans to be conducted following submission of Annual Reviews and as required, revisions made and submitted to DPE for approval.
- Approved exploration and construction activities.
    - Exploration program scheduled to commence in late April/early May, pending approval process. Up to six exploration site locations proposed.
    - Booster Pump Stations 1 and 2 scheduled for construction, following approvals, in quarter 1 2017.

Centennial Coal

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