Appendix - A

Schedule of Lands

Springvale Colliery – Schedule of Lands

Owner Name	Lot	DP	Lease	Description
SPRINGVALE MINE				
M.A. Pyne	14	16283	ML1303	Freehold
H.J. Egan & K.M. Hannah	13	16283	ML1303	Freehold
W.J. Unsworth	15	16283	ML1303	Freehold
W.J. Unsworth	16	16283	ML1303	Freehold
D.M. & J.I. Livingstone	12	16283	ML1303	Freehold
J.D Wakeling	11	16283	ML1303	Freehold
P.T Sharp	10	16283	ML1303	Freehold
W.J Unsworth	17	16283	ML1303	Freehold
W.J Unsworth	18	16283	ML1303	Freehold
P.J Braithwaite	19	16283	ML1303	Freehold
J. Rosewarne, V.A Logue, & E.J. Marshall	20	16283	ML1303	Freehold
A.W. Whymark	9	16283	ML1303	Freehold
M.M Alexander	8	16283	ML1303	Freehold
B.E. & G.J Ryan	7	16283	ML1303	Freehold
A.W Hollands	3	15649	ML1303	Freehold
M.S. & L.J. Morris	C	326622	ML1303	Freehold
P.A. Café & A.J. Star	B	326622	ML1303	Freehold
G.J. & S.A. Wheeler	A	326622	ML1303	Freehold
Delta Electricity	1	568265	ML1303	Freehold
Delta Electricity	16	855844	ML1303	Freehold
D. Webb	30	16283	ML1303	Freehold
W.J. Unsworth	29	16283	ML1303	Freehold
W.J. Unsworth	28	16283	ML1303	Freehold
M.C. Bruce	27	16283	ML1303	Freehold
M.C. Bruce	26	16283	ML1303	Freehold
D.N & M.J Morgan	25	16283	ML1303	Freehold
H.C. & M.M. Collins	24	16283	ML1303	Freehold
H.C. & M.M. Collins	23	16283	ML1303	Freehold
F. Fararo	A	417872	ML1303	Freehold

Owner Name	Lot	DP	Lease	Description
J.H & C.F. Epton	1	607402	ML1303	Freehold
C.J. Beecroft	2	607402	ML1303	Freehold
C.A. Willmott & T.M. Northey	3	607402	ML1303	Freehold
A.C. & H.C. Collins	1	551636	ML1303	Freehold
Delta Electricity	101	829410	ML1303	Freehold
Delta Electricity	2	829137	ML1303	Freehold
Delta Electricity	5	829137	ML1303	Freehold
Delta Electricity	228	751651	ML1303	Freehold
Delta Electricity	2	1018958	ML1303	Freehold
State Rail Authority of NSW	1	226790	ML1303	Freehold
State Rail Authority of NSW	2	226790	ML1303	Freehold
The State of NSW	129	751651	ML1303	Crown
Centennial Springvale Pty Ltd and Springvale SK Kores Pty Ltd	125	751651	ML1303	Freehold
Centennial Springvale Pty Ltd and Springvale SK Kores Pty Ltd	2	835651	ML1303	Freehold
State Rail Authority of NSW	3	226790	ML1303	Freehold
J.L. & S.L. Murray	22	868170	ML1303	Freehold
L.S. & M.A. Mickklesson	21	868170	ML1303	Freehold
P.D. Heckendorf	73	751651	ML1303	Freehold
W. & L.G. Brooks	3	805024	ML1303	Freehold
J.L. Murray	4	805024	ML1303	Freehold
The State of NSW	68	751651	NL1303	Crown
A.J. & K.A. Larkins	72	751651	ML1303	Freehold
A.J. & K.A. Larkins	302	751651	ML1303	Freehold
G.S. Dunn	407	751651	ML1303	Freehold
C.C. & R. Bush	67	1004747	ML1303	Freehold
The State of NSW	195	751651	ML1303	Crown
Department of Corrective Services	1	787242	ML1303	Crown
The State of NSW	7	751655	CL377	Crown
J.L, L.J, M.L. & J Danaia	30	751655	CL377	Freehold
J.L, L.J, M.L. & J Danaia	31	751655	CL377	Freehold
J.L, L.J, M.L. & J Danaia	32	751655	CL377	Freehold

Owner Name	Lot	DP	Lease	Description
J.L, L.J, M.L. & J Danaia	33	751655	CL377	Freehold
J.L, L.J, M.L. & J Danaia	37	751655	CL377	Freehold
Puckoon (NSW) Pty Limited	38	751655	CL377	Freehold
Puckoon (NSW) Pty Limited	39	751655	CL377	Freehold
Puckoon (NSW) Pty Limited	99	751655	CL377	Freehold
T.G. & W.F. Best	26	751655	CL377	Freehold
Newnes State Forest	201	751655	CL377	Crown
Newnes State Forest	84	751655	CL377	Crown
Oakey Park Coal Mining and Coke Compan Limited	1	113040	EL6974	Freehold
Boral Resources (NSW) Pty Ltd	47	751655	EL6974	Freehold
Boral Resources (NSW) Pty Ltd	50	751655	EL6974	Freehold
Newnes State Forest	51	751655	EL6974	Crown
Newnes State Forest	52	751655	EL6974	Crown
Newnes State Forest	53	751655	EL6974	Crown
Newnes State Forest	202	751655	EL6974	Crown
Newnes State Forest	203	751655	EL6974	Crown
Newnes State Forest	35	751634	ML1588	Crown
COAL SERVICES				
Delta Electricity	101	829410	MPL314	Freehold
Delta Electricity	1	1087684		Freehold
Delta Electricity	5	1087684		Freehold
Lithgow City Council	1	834231		Freehold
Lithgow City Counci	1	834230		Freehold
Lithgow City Council	2	834230		Freehold
Lithgow City Council	3	834230		Freehold
Lithgow City Council	4	834230		Freehold
Lithgow City Council	5	834230		Freehold
Lithgow City Council	6	834230		Freehold
Lithgow City Council	7	834230		Freehold
Lithgow City Council	8	834230		Freehold
Lithgow City Council	9	834230		Freehold

Owner Name	Lot	DP	Lease	Description
Ivanhoe Coal Pty Limited	101	1137972	MPL314	Freehold
Ivanhoe Coal Pty Limited	16	751651	MPL314	Freehold
Ivanhoe Coal Pty Limited	2	567915	MPL314	Freehold
Ivanhoe Coal Pty Limited	147	751651	MPL314	Freehold
Ivanhoe Coal Pty Limited	385	751651	MPL314	Freehold
Ivanhoe Coal Pty Limited	375	751651	MPL314	Freehold
Ben Bullen State Forest	502	825541	MPL314	Crown
Centennial Springvale Pty Ltd and Springvale SK Kores Pty Ltd	3	1151441	CCL733	Freehold
The State of NSW	70	751636	CCL733	Crown
The State of NSW	7005	1026541	CCL733	Crown
The State of NSW	311	751636	CCL733	Crown
The State of NSW	310	751636	CCL733	Crown
The State of NSW	309	751636	CCL733	Crown
The State of NSW	308	751636	CCL733	Crown
The State of NSW	307	751636	CCL733	Crown
The State of NSW	306	751636	CCL733	Crown
J.M. Cope (Perpetual Lease)	303	751636	CCL733	Freehold
J.D. Cherry	300	751636	CCL733	Freehold
J.W. Hunt	370	751651	CCL733	Freehold
J.W. Hunt	371	751651	MPL314	Freehold
Centennial Springvale Pty Ltd and Springvale SK Kores Pty Ltd	501	825541	ML1352 ML1448	Freehold
Centennial Springvale Pty Ltd and Springvale SK Kores Pty Ltd	357	751651	ML1352 CCL733	Freehold
Centennial Springvale Pty Ltd and Springvale SK Kores Pty Ltd	13	751651	ML1352 CCL733	Freehold
Centennial Springvale Pty Ltd and Springvale SK Kores Pty Ltd	4	1151441	CCL733 ML1319	Freehold
Lithgow City Council	1	1127043	CCL733	Freehold
Lithgow City Council	1	1049889	CCL733	Freehold
Centennial Springvale Pty Ltd and Springvale SK Kores Pty Ltd	2	1151441	ML1352 CCL733	Freehold
Enhance Place Pty Lid	37	827626	CCL733	Freehold
Centennial Springvale Pty Ltd and Springvale SK Kores Pty Ltd	1	126483	CCL733	Freehold
Centennial Springvale Pty Ltd and Springvale SK Kores Pty Ltd	2	126483	CCL733	Freehold

Owner Name	Lot	DP	Lease	Description
Lithgow City Council	42	751636	CCL733	Freehold
Delta Electricity	67	751636	CCL733 ML1319	Freehold
Delta Electricity	15	8049291	ML1352 CCL733 Relinquished	Freehold
Delta Electricity	9	8049291	CCL733 Relinquished	Freehold
Delta Electricity	2	702619	CCL733 Relinquished	Freehold
Delta Electricity	1	702619	CCL733 Relinquished	Freehold
Delta Electricity	191	629212	CCL733 Relinquished	Freehold
Delta Electricity	18	751636	CCL733 Relinquished	Freehold
Centennial Springvale Pty Ltd and Springvale SK Kores Pty Ltd	1	88503	CCL733	Freehold
Ivanhoe Coal Pty Limited	2	596248	CCL733	Freehold
Ivanhoe Coal Pty Limited	351	751651	CCL733	Freehold
Ivanhoe Coal Pty Limited	37	658181	CCL733	Freehold
N.Hunter	222	751651	CCL733	Freehold
B.J. & A.F. Jackson	101	1096754	CCL733	Freehold
N.G.& M.B. Hutchison	102	1096754	CCL733	Freehold
M.J. & R.G. Lane	103	1096754	CCL733	Freehold
P.K. & C.A. Van der Velden	104	1096754	CCL733	Freehold
M.A. Case & R.D. Coutts	105	1096754	CCL733	Freehold
M.N. Orchard	30	18837	CCL733	Freehold
G. Pinna & J. Johnson	31	18837	CCL733	Freehold
G. Pinna & J. Johnson	32	18837	CCL733	Freehold
State Rail Authority of NSW	8	252472	MPL314	Freehold
State Rail Authority of NSW	1	252472	MPL314	Freehold
State Rail Authority of NSW	2	702619	MPL314	Freehold

Development Consent
S91/06569/001
and Notice of Amendments

Appendix - B

New South Wales Government

Department of Planning

Remington Centre
175 Liverpool Street, Sydney 2000
Box 3927 G.P.O. Sydney 2001
DX . 15 Sydney

Telephone : (02) 391 2000 Ext 2077
Fax No : (02) 391 2111
Contact : V. Thomson
Our reference S91/06569/001
Your reference .

[illegible]

The Director
Clutha Coal Pty Limited
1 York Street
SYDNEY NSW 2000

Dear Sir,

PROPOSED SPRINGVALE UNDERGROUND COAL MINE

Reference is made to the development application of 1991, which you lodged with Greater Lithgow City Council seeking consent to the above development.

2. Pursuant to a direction under Section 101 of the Environmental Planning and Assessment Act, 1979, the subject development application was referred by Lithgow City Council for determination by the Minister for Planning.

3. It is advised that the Minister has determined the development in accordance with Section 101 (8) of the Act by granting consent subject to certain conditions. These conditions have been imposed to minimise the adverse impact the development may cause through noise and water pollution, provide for environmental monitoring and reporting and set requirements for infrastructure provision.

4. A copy of the signed determination by the Minister is enclosed for your use. Pursuant to Section 101 (9)(b) of the Environmental Planning and Assessment Act, the development consent takes effect from the date of this letter, being date of notification to the Applicant under Section 101 (10) of the Act.

Yours faithfully,

E. Smith
Secretary

ENVIRONMENTAL PLANNING AND ASSESSMENT ACT, 1979

DETERMINATION OF DEVELOPMENT APPLICATIONS PURSUANT TO SECTION 101

I, the Minister for Planning, pursuant to Section 101 of the Environmental Planning and Assessment Act 1979 ("the Act"), determine the development application ("the application") referred to in Schedule 1 by granting consent to the application subject to the conditions set out in the Schedule 2.

The reasons for the imposition of the conditions are:

(i) to minimise the adverse impact the development may cause through noise, visual amenity, air and water pollution;

(ii) to provide for environmental monitoring and reporting;

(iii) to set requirements for infrastructure provision.

Robert Webster

Robert Webster
Minister for Planning

Sydney, 27/7 1992 File No. S91/06569/001

Schedule 1

Application made by:		Clutha Coal Pty Limited on behalf of Springvale Coal Pty Limited ("the Applicant").
To:		Greater Lithgow City Council (DA 11/92) ("the Council")
In respect of:		Authorisation 409, Mining Purposes Lease Application 384 on land described in Attachment "A".
For the following:	(i)	Construction and operation of an underground coal mine.
	(ii)	Construction and operation of an overland conveyor and coal washery.
NOTE:	(1)	To ascertain the date upon which the consent becomes effective, refer to section 101(9) of the Act.
	(2)	To ascertain the date upon which the consent is liable to lapse, refer to section 99 of the Act.

Attachment (A)

SCHEDULE OF LAND WITHIN SPRINGVALE COAL PROJECT.

Portion 125, Parish of Lidsdale.
Portion 54, Parish of Lidsdale.
Portion 56, Parish of Lidsdale.
Reserved Road.
Portion 229, Parish of Lidsdale.
Portion 42, Parish of Lidsdale.
Portion 228, Parish of Lidsdale.
Lot 16, Deposited Plan 262515.
Lot 15, Deposited Plan 262515.
Lot 2, Deposited Plan 383126.
Skelly Road.
Lot 1, Deposited Plan 575140.
Lot 1, Deposited Plan 160670.
Lot 3, Deposited Plan 108382.
Lot 8, Deposited Plan 252472.
Portion 63, Parish of Lidsdale.
Duncan Street.
Reserved Road.
Portion 16, Parish of Lidsdale.
Reserved Road.
Lot 2, Deposited Plan 567915.
Reserved Road.
Portion 174, Parish of Lidsdale.
Reserved Road.
Portion 385, Parish of Lidsdale.
Portion 375, Parish of Lidsdale.
Reserved Road.
Ben Bullen State Forest.
Portion 371, Parish of Lidsdale.
Reserved Road.
Portion ML66, Parish of Cox.
Lot 2, Deposited Plan 702619.
Lot 6, Deposited Plan 804929.
Lot 13, Deposited Plan 804929.
Lot 191, Deposited Plan 629212.
Lot 14, Deposited Plan 804929.
Portion 18, Parish of Cox.
Mining Purposes Lease No 384 Orange
Part Coal Lease No 239
Part Coal Lease No.377.
Authorisation Area No 409
Part Authorisation Area No 104

Part Consolidated Coal Lease 733

SCHEDULE 2

1. General

The Applicant shall carry out the development of the Springvale Coal Project generally in accordance with the Environmental Impact Statement (EIS) prepared by Sinclair Knight & Partners Pty Limited in accordance with Section 77(3) of the Environmental Planning and Assessment Act, and certified by Robert Byrnes and supplementary information by the Applicant dated April 1992 and as modified by the following conditions.

2. Duration

The duration of this consent is limited to twenty-one (21) years from the granting of the coal lease.

3. Environment Protection Authority

Prior to the commencement of construction of the proposed development the Applicant shall obtain from the Environment Protection Authority ("EPA") all statutory approvals and licences as may be required under the Clean Air Act 1961, the Clean Waters Act 1970, and the Noise Control Act 1975, together with such other approvals or licences as may be required under future legislation or regulations for the conduct of the proposed development. The Applicant shall conduct the development in accordance with the terms of such approvals and licences.

4. Department of Water Resources

(a) The Applicant shall contribute data to a regional groundwater resource assessment of the Colliery holding made by the Department of Water Resources. Such assessment shall include proposals for monitoring the condition of the relevant aquifers by the Applicant.

(b) The Applicant shall consult with the Department of Mineral Resources and monitor the effects of underground mine development, hydrology and hydrogeology of the colliery holding to the satisfaction of the Department of Water Resources.

5. National Parks and Wildlife Service

(a) The Applicant shall undertake an evaluation of the habitat value of the shrub swamps in the colliery holding and the potential effects of subsidence on hydrology and habitat, to the satisfaction of the National Parks and Wildlife Service.

(b) The Applicant shall undertake further flora surveys over the colliery holding as may be required from time to time in conjunction with the monitoring program.

(c) The Applicant shall undertake further archaeological investigation of:

(i) Carne Creek and its clifflines,

(ii) Site 2 detailed recording of artefacts,

(iii) site 7 excavation, and,

provide a report on consultation with the local Aboriginal Land Council on site management.

(d) The Applicant shall undertake further fauna surveys over the colliery holding prior to longwall mining of areas where sensitive habitats are present, as required by the National Parks and Wildlife Service, in consultation with the Department of Mineral Resources.

6. Construction Stage

(a) The Applicant shall not carry out construction activities on proclaimed public holidays;

(b) The Applicant shall limit construction stage disturbance to the minimum area and install temporary fences, as required by the Council.

(c) The Applicant shall implement dust suppression and erosion control measures to the satisfaction of the Greater Lithgow City Council ("the Council").

7. Coal Transportation

(a) The Applicant shall transport all coal to Mt Piper Power Station by overland conveyor after 1 January 1994.

(b) The Applicant may transport up to 50,000 tpa of coal to local domestic market customers by road haulage;

(c) Notwithstanding (a) and (b), the Applicant may haul 300,000 tonnes of pre-contract coal to Mt Piper Power Station via public roads. Such haulage may be made between 7am and 7pm, Monday to Friday, for period ending 31 December, 1993;

(d) The Applicant shall not transport coal by road under emergency conditions without the prior consent of the Council;

(e) The Applicant shall transport all export coal by rail from Lidsdale Siding.

8. Overland Conveyor

(a) The portion of the conveyor along Duncan Street opposite the existing residences shall be constructed partly below ground level in a fully enclosed steel tube. The remainder of the conveyor shall be constructed at ground level or elevated to suit various crossing requirements for waterways and rail.

(b) The Applicant shall submit designs and specifications for the conveyor crossing of the Mudgee Road to the Roads and Traffic Authority for its approval;

(c) The Applicant shall provide to the Council details of the landscaping treatment of the overland conveyor;

(d) The Applicant shall provide to the Department of Conservation and Land Management in relation to the construction and maintenance of the conveyor details of measures to minimise soil erosion and sedimentation effects, for its advice;

(e) The Applicant shall consult with all affected landowners regarding the location and provision of stock and vehicular crossings over the overland conveyor. The Applicant shall provide such works at his own cost.

9. <u>Roads</u>

(a) The Applicant shall construct the intersection with the Mudgee Road and pit-top access road to the satisfaction of the Roads and Traffic Authority;

(b) The access road shall be sealed to a two lane standard prior to 1 January 1994;

(c) The Applicant shall construct the intersection and access road from the Mudgee Road to the Coal Washery site in accordance with the RTA Interim Design Guide Type 'A';

(d) The Applicant shall seal the coal washery access road for a distance of at least 20m beyond the nearest affected residence;

(e) The remaining section of the coal washery access road shall be constructed to the standard of an all weather gravel road, to the Council's requirements;

(f) The Applicant shall submit detailed plans and specifications for road works to the Council for approval prior to the commencement of works.

10. <u>Coal Washery Reject Disposal</u>

(a) The Applicant shall meet the requirements of the Department of Mineral Resources and provide to the Council the results of a geotechnical investigation and an engineering specification for each emplacement area;

(b) The Applicant shall within six months of this consent investigate the possibility of combining all rejects in one emplacement and report to the Department of Mineral Resources and to advise the Council.

11. Mining Subsidence

The Applicant shall meet the requirements of the Department of Mineral Resources and adopt such reasonable practices and techniques as will minimise disturbance to any surface features within the identified protection zones.

12. Water Management

The Applicant shall submit to the EPA, prior to commencement of construction a water management plan for each site of the development showing all proposed drainage diversion channels, collection pits and sedimentation dams to be constructed. Such plan shall incorporate the principles of Total Catchment Management.

13. Effluent Disposal

(a) The Applicant shall provide to the EPA upon its request details of the design and capacity of the method of effluent treatment and disposal including data on quality of effluent for disposal.

(b) The Applicant shall obtain the approval of the EPA, the Council and the Department of Health for the effluent disposal method selected for both pit top and coal washery.

14. Potable Water

The Applicant shall provide a supply of potable water to the pit top site and washery site, at its own expense, to the satisfaction of Council.

16. Flooding

(a) The Applicant shall obtain the consent of the Department of Conservation and Land Management prior to the destruction of any trees (including sapling, shrubs or scrub) along the bank or within 20m of the bank of the Coxs River;

(b) The Applicant shall undertake an appraisal of the impact of the overland conveyor on the incidence and severity of flooding in the vicinity of Duncan Street, Lidsdale. The results of such an assessment are to be submitted to the Council and the Department of Water Resources, prior to the commencement of construction or such other period as the Council may determine.

17. Landscaping

The Applicant shall submit for the Council's approval at least six months prior to commencement of construction or within such further period as the Council may permit:

(a) a detailed landscaping plan illustrating the establishment of trees and shrubs both prior to and during the construction stage, showing existing stands of vegetation and the location of plantings around the surface facilities and the rejects emplacement area;

This plan shall incorporate appropriate erosion control and sedimentation control practices for any earthworks associated with the development;

(b) proposals for the visual appearance of the structural components of the development including paint colours and specifications. Buildings and structures shall be designed so as to present a neat and orderly appearance and to blend as far as possible within the surrounding landscape;

(c) A comprehensive plan of landscape management, which shall include detailed plans, programs to be undertaken, maintenance of all landscape works and plantings and maintenance of building materials and cladding.

18. Parking Facilities

The Applicant shall meet the requirements of the Council to ensure the adequate provision of unloading, loading, manoeuvring and parking of vehicles within the development.

19. Site Rehabilitation

(a) The Applicant shall prepare, within six months of this consent, a comprehensive plan for the staged rehabilitation of all lands disturbed by the development within the colliery holding and the coal washery and reject emplacement. The plan shall be submitted to the Council for its information and to the Department of Mineral Resources for its approval. The plan shall specify contour earthworks, tree screen plantings, grassed areas, means to control leachate from reject emplacements, soil erosion controls, final contours and proposals for maintenance of rehabilitation areas and management of waste disposal, including long term drainage both during and after the cessation of disposal operations, until such time as considered necessary by the Department of Mineral Resources.

(b) The Applicant shall consult and comply with the requirements of the Department of Conservation and Land Management in respect of the preparation and implementation of rehabilitation plans, revegetation programs, soil erosion controls, and associated works.

(c) The Applicant shall consult with the NSW Agriculture and the Department of Conservation and Land Management concerning selection of appropriate vegetation species, seedling establishment techniques, soil testing and fertilizer selection and application.

20. Lidsdale Road Siding

The Applicant shall undertake a noise impact assessment of the Lidsdale rail siding, according to the requirements of the EPA and implement necessary measures for attenuation of noise.

21. Fire Protection

The Applicant shall:

(a) consult and comply with the reasonable requirements of the Council concerning means to prevent and fight bushfires, including the provision of adequate fire tracks within the colliery holding and the provision of appropriate firefighting facilities and staff;

(b) formulate a program of hazard reduction measures and a detailed contingency plan for coping with bushfires each year, in liaison with the Forestry Commission the Department of Bush Fire Services, the National Parks and Wildlife Service and the Council.

22. Environmental Monitoring

The Applicant shall ensure that the following requirements are met to the satisfaction of the EPA, the Department of Water Resources, Department of Mineral Resources, and the Director of Planning ("the Director"):

(a) Monitoring of air quality (particulate dust and dust concentration), water quality (effluent discharged off site), noise levels (night-time noise emissions at nearest residences), at points to be selected at the mine site and at the coal washery site and agreed upon by the Applicant and the EPA;

(b) Monitoring of water quality and reporting to the reasonable requirements of the EPA, and the Department of Water Resources;

(c) Monitoring of subsidence induced by longwall mining to the requirements of the Department of Mineral Resources and including monitoring of flora of drainage sensitive ecosystems and hydrology.

23. The Applicant shall bear the costs associated with the establishment and operation of all monitoring programs referred to in these conditions, the analysis of data, recording results, and providing information required to all relevant agencies.

24. Annual Report

(a) Within six (6) months of the commencement of the construction of the proposed development, the Applicant shall ascertain the requirements of the Director in relation to an annual report to be submitted to the Director, the EPA the Council and the Department of Mineral Resources in respect of the performance of the development. Each report shall be in respect of the calendar year ending 31st December and each report shall be submitted by 31st March of the following year. The first report is to be submitted in 1995. The Applicant shall agree to the Council making the reports publicly available.

(b) The annual report shall provide the following information:

i) the performance of the development in relation to the EIS, the statutory requirements of public authorities, in particular the EPA, and in relation to the conditions of development consent;

ii) the implementation and effectiveness of the environmental controls and conditions relating to the development;

iii) results of environmental monitoring in respect of air, water and noise pollution, groundwater variations in the colliery holding, how these results compare with the predictions in the EIS And whether the results indicate compliance with the conditions of consent and information related to discharges of water (other than uncontaminated stormwater) from the mine site;

iv) mining operations undertaken during the preceding 12 months;

v) workforce characteristics of the development;

vi) modifications to mining operations, if any, to mitigate any adverse environmental impacts;

vii) socio-economic impact of the development other than covered in (v) above;

viii) results of subsidence monitoring and subsidence impacts upon the natural environment, and measures implemented to rectify any damage caused.

25. Environmental Officer

The Applicant shall employ or contract the services of an Environmental Officer whose qualifications are acceptable to the Department of Mineral Resources for the proposed development to be responsible for ensuring that all environmental safeguards proposed for the development and as required by this consent and other statutory approvals are enforced and monitored from the commencement of construction.

26. Infrastructure Contribution

The Applicant shall negotiate and pay to the Council a contribution, pursuant to Section 94 of the Environmental Planning and Assessment Act, for Community Services/Facilities for Council to utilise in the upgrading of facilities provided and to be provided in the City of Greater Lithgow, as a result of the development.

The first payment is due in 1995 on the anniversary of this consent and the remaining three other payments on the successive anniversaries of the Consent.

The basis of the contribution shall be a contribution per employee based on the number of employees on the Company payroll at the anniversary of this Consent in 1995.

The amount of the contribution shall be finalized by 30 September 1992. Condition 29 shall apply for dispute resolution should the parties fail to reach agreement.

27. Rental Housing

The Applicant shall liaise with the Council to monitor local housing demand during the construction stage of the project and in the event of a shortage of rental accommodation liaise with the Council, with a view to provide additional temporary accommodation facilities for use by its construction workforce.

28. Approvals to Council

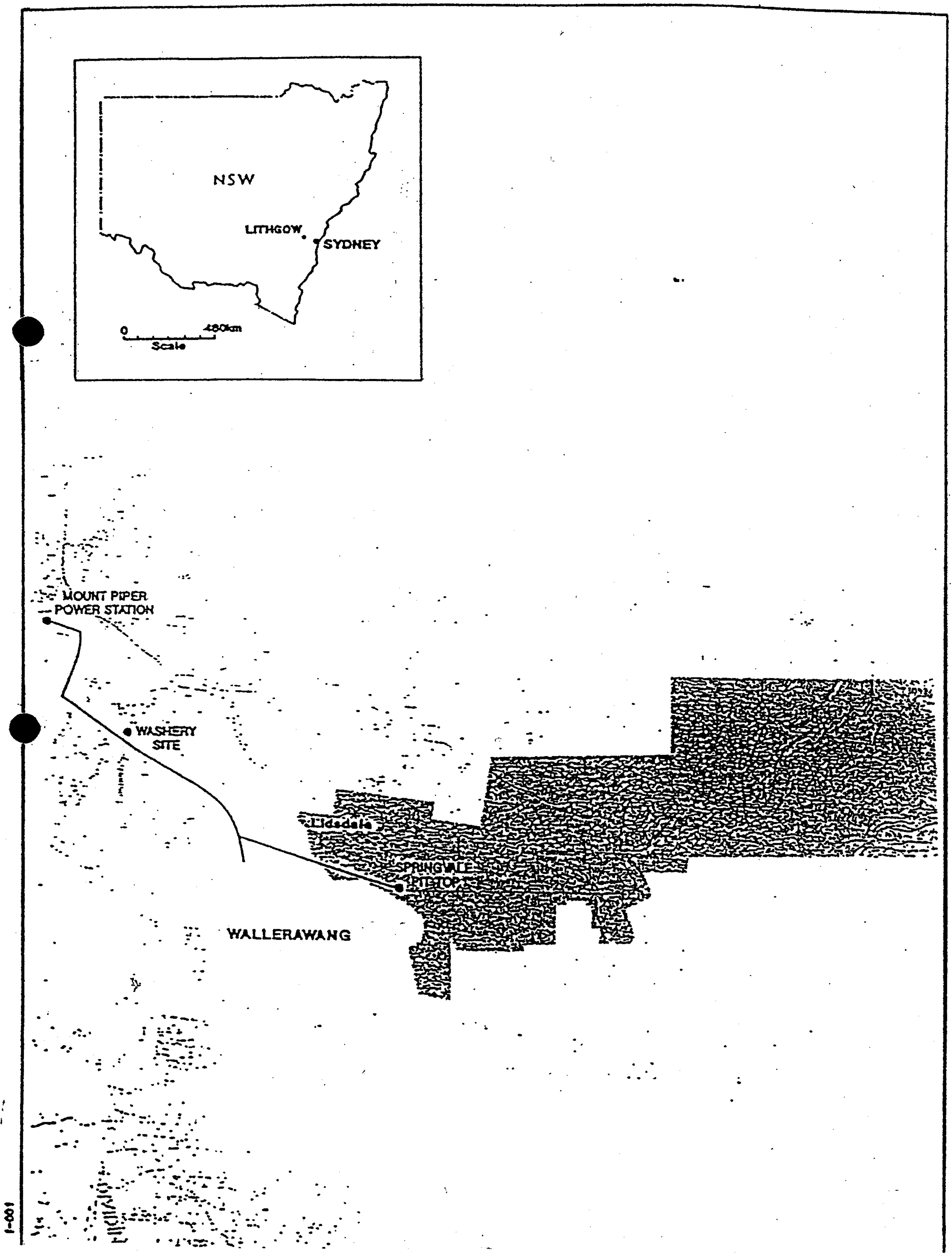
The Applicant shall forward to the Council copies of all environmental and planning approvals of authorities related to the development.

29. Dispute Resolution

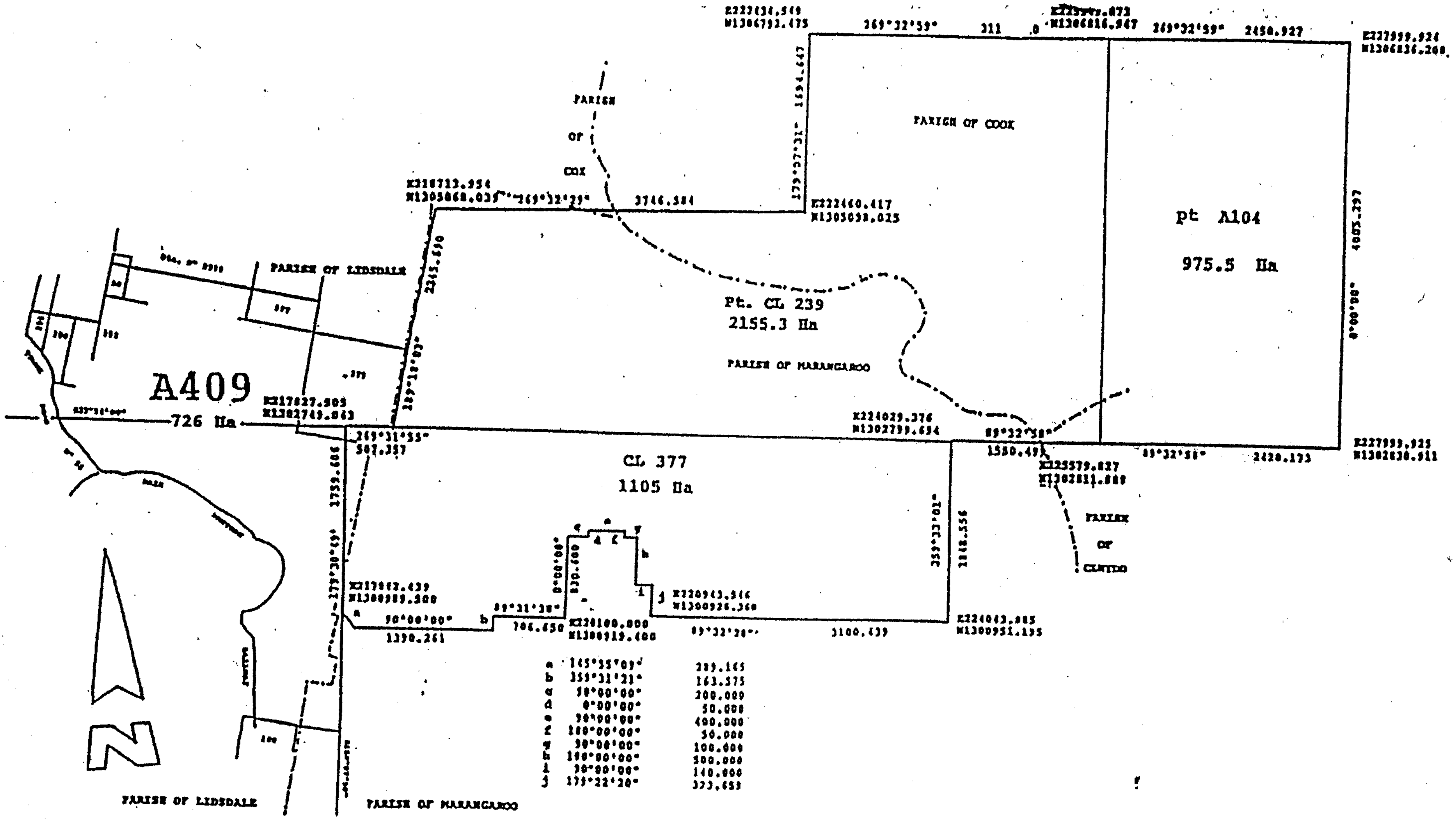
Any dispute arising between any of the parties in respect of the above conditions shall be referred to the Minister for Planning for resolution.

NOTE: This approval does not relieve the Applicant of the obligation to obtain any other approval under the Local Government Act, 1919, as amended, the ordinances made thereunder (including approval of building plans), or any other Act.

ATTACHMENT 1



ATTACHMENT 2



AUTHORISATION N°409

[illegible]

Land District - Lithgow; City - Greater Lithgow
County - Cook; Parishes - Lidsdale and Marangaroo

CLUTHA COAL PTY LIMITED

SPRINGVALE COAL
LEASE AREA

Drawn: P.COLLINS	Revised: 28-4-1992	Drwg No:
A.C.N. 007 984 430	Approved:	SP-55
	Date:	

ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979

NOTICE OF AMENDMENT OF A DEVELOPMENT CONSENT GRANTED UNDER SECTION 101 OF THE ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979 PURSUANT TO SECTION 102 OF THE ACT

I, the Minister for Planning, pursuant to Section 102 of the Environmental Planning and Assessment Act, 1979, being satisfied that the development to which the development consent as modified will relate is substantially the same development, and there being no prejudice to objectors to the original development application, modify the consent referred to in Schedule 1 as set out in Schedule 2.

Robert Webster

ROBERT WEBSTER
Minister for Planning

Sydney ....29/6/.... 1993

S91/06569/Z01

SCHEDULE 1

Consent granted by the Minister for Planning on 27 July 1992, in respect of development application made by the Applicant, Clutha Coal Pty Limited, to Greater Lithgow City Council for the construction and operation of an underground coal mine, overland conveyor and coal preparation facilities, known as Springvale Coal Mine.

SCHEDULE 2

Attachment "A" the land description in Appendix 1.

Condition 1 add at the end of line 7 :-

> "with pit top modifications shown in drawing No. SK 5300/G/91 dated 29/10/92, shaft site as modified shown in drawing No. CL-5100-G-03 dated 10/11/92 and modified mine layout as shown in drawing SP18, dated 1/12/92".

Condition 30
Western Main Colliery

a) The Applicant shall undertake all necessary water pollution control measures, to the satisfaction of the EPA, to minimize contaminated water discharge from the site in wet weather conditions.

b) The Applicant shall carry out all practical measures to minimize water pollution and siltation from the Western Main Colliery Site used for the relocated overland conveyor route, according to the requirements of the Department of Conservation and Land Management and the EPA.

Condition 31
Shafts Site

The Applicant shall meet the requirements of Pacific Power in respect of the use of its Ash Dam Access Road for the period of construction and for maintenance of the proposed ventilation shafts.

Condition 32
Revised Pit Top

The Applicant shall carry out water pollution and siltation control measures according to the revised pit top arrangements, to the satisfaction of the EPA and the Department of Conservation and Land Management.

Condition 33
Fish River Water Supply

The Applicant shall forward copies of plans of the overland conveyor for review in respect of the Fish River Pipeline and concurrence if required by the Fish River Water Supply Operations Manager, prior to commencement of construction.

Condition 34
Erosion and Sediment Control Plan

The Applicant shall submit an erosion and sediment control plan (including temporary, operational phase and permanent works) for each phase of the operation prior to commencement of any earthworks to the Department of Conservation and Land Management for concurrence.

Condition 35
Additional Archaeological Survey

The Applicant shall undertake an archaeological survey of the modified conveyor route and the ventilation shaft site, prior to commencement of construction and report results of surveys to the National Parks and Wildlife Service.

ATTACHMENT A

Property Descriptions

Vent Shaft Site

- Portion 52, Lot 1 - DP 383126, Portion 175, 177 and 178, Portion 181, Lot 2 - DP 551636, Portion 182, Portion 352, Portion 353, Lot 1 - DP 525472, Lot 2 - DP 525472, Portion 452 - Pt Newnes State Forest - No 748 (No. 4 Ext.), Parish of Lidsdale, County of Cook.

Conveyor Route

- Portion 501 DP 825541, Portion 13 Lot 13 - DP 751651, Portion 357, Parish of Lidsdale, County of Cook, Portion 18, Lot 14 - DP 804929, Lot 191 - DP 629212, Lot 13 - DP 804929, Lot 2 - DP 702619, Lot 6 - DP 804929, Parish of Cox, County of Cook.

Western Main Washery and Associated Facilities

- Lot 15 DP 804929, Lot 9 - DP 802929, Parish of Cox, County of Cook

ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979

NOTICE OF AMENDMENT OF A DEVELOPMENT CONSENT GRANTED UNDER SECTION 101 OF THE ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979 PURSUANT TO SECTION 102 OF THE ACT

I, the Minister for Planning, pursuant to Section 102 of the Environmental Planning and Assessment Act, 1979, being satisfied that the development to which the development consent as modified will relate is substantially the same development; and there being no prejudice to objectors to the original development application, modify the consent referred to in Schedule 1 as set out in Schedule 2.

Robert Webster

ROBERT WEBSTER
Minister for Planning

Sydney, 11/4/ 1994 S91/06569/Z01

SCHEDULE 1

Consent granted by the Minister for Planning on 27 July 1992, in respect of development application made by the Applicant, Clutha Coal Pty Limited, to Greater Lithgow City Council for the construction and operation of an underground coal mine, overland conveyor and coal preparation facilities, known as Springvale Coal Mine.

SCHEDULE 2

Attachment "A" (the land description) replace with Attachment 1 Schedule of Land and Tenements.

ATTACHMENT 1

SCHEDULE OF LAND AND TENEMENTS - SPRINGVALE COAL PROJECT

A. SCHEDULE OF LAND

LAND	TITLE
1. SPRINGVALE PIT TOP AREA	
Lot 125, Deposited Plan 751651 (formerly known as Portion 125, Parish of Lidsdale, County of Cook)	F.I. 125/751651
Portion 54, Parish of Lidsdale	Book 3856, No. 465
Lot 561, Deposited Plan 827969	F.I. 561/827969
2. OVERLAND COAL CONVEYOR	
Lot 561, Deposited Plan 827969	F.I. 561/827969
Reserved Road	
Lot 1, Deposited Plan 717025	F.I. 1/717025
Portion 228, Parish of Lidsdale	Book 3346 No. 80
Lot 183, Deposited Plan 751651 (formerly known as Portion 183, Parish of Lidsdale, County of Cook)	F.I. 183/751651
Lot 15, Deposited Plan 262515	F.I. 15/262515
Skelly Road	
Lot 2, Deposited Plan 2383126	F.I. 2/383126
Lot 2, Deposited Plan 575140	Book 3256 No. 753
Lot 1, Deposited Plan 834231	F.I. 1/834231
Lot 31, Deposited Plan 827807	F.I. 31/827807
Lot 1, Deposited Plan 834230	F.I. 1/834230
Lot 2, Deposited Plan 834230	F.I. 2/834230
Lot 3, Deposited Plan 834230	F.I. 3/834230
Lot 4, Deposited Plan 834230	F.I. 4/834230
Lot 5, Deposited Plan 834230	F.I. 5/834230
Lot 6, Deposited Plan 834230	F.I. 6/834230
Lot 7, Deposited Plan 834230	F.I. 7/834230

Lot 8, Deposited Plan 834230	F.I. 8/834230
Lot 9, Deposited Plan 834230	F.I. 9/834230
Portion 63, Parish of Lidsdale	Book 3086 No. 675
PML 11 (Railway) (forming part of Consolidated Coal Lease 770)	
Reserved Road	
Lot 16, Deposited Plan 751651 (formerly known as Portion 16, Parish of Lidsdale, County of Cook)	F.I. 16/751651
Duncan Street	No stratum title will be created for the second crossing of Duncan Street
Lot 8, Deposited Plan 252472	Auto Consol 13329-100
Lot 1, Deposited Plan 252472	Auto Consol 13329-100
Reserved Road	
Lot 2, Deposited Plan 567915	F.I. 2/567915
Reserved Road	
Lot 174, Deposited Plan 751651 (formerly known as Portion 174, Parish of Lidsdale, County of Cook)	F.I. 174/751651
Reserved Road	
Reserved Road	
Lot 385, Deposited Plan 751651 (formerly known as Portion 385, Parish of Lidsdale, County of Cook)	F.I. 385/751651
Lot 375, Deposited Plan 751651 (formerly known as Portion 375, Parish of Lidsdale, County of Cook)	F.I. 375/751651
Reserved Road	
Reserved Road	
Reserved Road	
Lot 502, Deposited Plan 825541	F.I. 502/825541
Lot 371, Deposited Plan 751651 (formerly known as Portion 371, Parish of Lidsdale, County of Cook)	F.I. 371/751651
Reserved Road	

Lot 501, Deposited Plan 825541	F.I. 501/825541
Lot 357, Deposited Plan 751651 (formerly known as Portion 357, Parish of Lisdsdale, County of Cook)	F.I. 357/751651
Lot 13, Deposited Plan 751651 (formerly known as Portion 13, Parish of Lidsdale, County of Cook)	F.I. 13/751651
Reserved Road	
Lot 15, Deposited Plan 804929	Book 3401 No. 315
Lot 9, Deposited Plan 804929	Book 3401 No. 315
Lot 2, Deposited Plan 702619	Book 3604 No. 382
Lot 6, Deposited Plan 804929	Book 3840 No., 223
Lot 13, Deposited Plan 804929	Book 3840 No. 223
Lot 191, Deposited Plan 629212	Book 3604 No. 381
Lot 1, Deposited Plan 803655	F.I. 1/803655
Portion 18, Parish of Cox	Book 3432 No. 26

3. ACCESS ROAD AND VENTILATION SHAFT

Lot 15, Deposited Plan 262515	F.I. 15/2625157
Lot 1, Deposited Plan 585140	Book 3256 No. 753
Lot 182, Deposited Plan 751651 (formerly known as Portion 182, Parish of Lidsdale, County of Cook)	F.I. 182/751651
Lot 2, Deposited Plan 551636	F.I. 2/551636
Lot 1, Deposited Plan 814854	Resumed Road (no current title)
Lot 2, Deposited Plan 525472	F.I. 2/525472
Lot 352, Deposited Plan 751651 (formerly known as Portion 352, Parish of Lidsdale, County of Cook)	F.I. 352/751651
Lot 178, Deposited Plan 751651 (formerly known as Portion 178, Parish of Lidsdale, County of Cook)	Auto Consol 5552-222
Lot 175, Deposited Plan 751651 (formerly known as Portion 175, Parish of Lidsdale, County of Cook)	Auto Consol 5552-222
Lot 177, Deposited Plan 751651	Vol. 1798 Fol. 147
Portion 425, Parish of Lidsdale	Resumed - see NSW Govt. Gazette 30 January 1976
Part Newnes State Forest No. 748	

B. MINING TENEMENTS

(a-c) Clutha Springvale Limited,Samsung Development(Aust)Pty Ltd

(a) SPRINGVALE COAL MINE

1. Exploration Licence No. 4587 (Mining Act 1992)
2. Mining Lease No. 1326 (Mining Act 1992)
3. Coal Lease No. 377 (Coal Mining Act 1973)
4. Mining Lease No. 1303 (Mining Act 1992)

(b) OVERLAND COAL CONVEYOR

[illegible]. Mining Purposes Lease No. 314 (Mining Act 1973)

6. Mining Lease Application No. 9 (Orange) (Mining Act 1992)

(c) ACCESS ROAD AND VENTILATION SHAFT

7. Mining Lease No. 1323 (Mining Act 1992)

(d) WESTERN MAIN COLLIERY (Western Main Colliery Pty Limited)

8. Consolidated Coal Lease No. 733 (Coal Mining Act 1973)

Project Application Form
and Political Donations
Disclosure Statement

Application to modify a development consent

NSW GOVERNMENT
Department of Planning

Date lodged: ____/____/____

DA modification no. ________________
(Office use only)

1. Before you lodge

This form is to be used for applications to modify Part 4 development consents under section 96 or 96AA of the *Environmental Planning and Assessment Act 1979* (EP&A Act). This form is also to be used for Part 4 development consents that are to be modified under section 75W of the Act.

Disclosure statement
Persons lodging modification applications are required to declare reportable political donations (including donations of or more than $1,000) made in the previous two years. For more details, including a disclosure form, go to **www.planning.nsw.gov.au/donations.**

Lodgement
Anyone wishing to lodge an application is recommended to call the Department of Planning to discuss their proposal and modification application requirements prior to lodging their application. You can lodge your completed form, together with attachments and fees at the relevant Department of Planning office listed below. Please lodge Part 4 modification applications with the Department of Planning head office or, for modification applications that are within the Kosciuszko ski resorts area, the Department's Alpine Resorts team.

NSW Department of Planning
Head Office
Ground Floor, 23–33 Bridge Street, Sydney NSW 2000
GPO Box 39 Sydney NSW 2001
Phone: 1300 305 695 Fax: (02) 9228 6555
Email: information@planning.nsw.gov.au

NSW Department of Planning
Alpine Resorts Team
Shop 5A, Snowy River Avenue
PO Box 36, Jindabyne NSW 2627
Phone: (02) 6456 1733 Fax: (02) 6456 1736
Email: alpineresorts@planning.nsw.gov.au

To minimise delay in receiving a decision about your application, please ensure you submit all relevant Information to the Department. When your application has been assessed, you will receive a notice of determination.

2. Applicant and contact details

Company/organisation/agency: Centennial Springvale Pty Limited
ABN: 64 052 096 812

☒ Mr ☐ Ms ☐ Mrs ☐ Dr ☐ Other

First name: Bob
Family name: Miller

STREET ADDRESS

Unit/street no.:
Street name: Castlereagh Highway

Suburb or town: Lidsdale
State: NSW
Postcode: 2790

POSTAL ADDRESS (or mark 'as above'): PO Box 198

Suburb or town: Wallerwang
State: NSW
Postcode: 2845

Daytime telephone: (02) 6350 1600
Fax: (02) 6355 1052
Mobile: 0408083628

Email: Bob.Miller@centennialcoal.com.au

3. Property description

Unit/street no. (or lot no. for Kosciuszko ski resorts):

Street or property name:

Suburb, town or locality:

Postcode:

Local government area: Lithgow

Lot/DP or Lot/Section/DP or Lot/Strata no.
Please ensure that you put a slash (/) between lot, section, DP and strata numbers. If you have more than one piece of land, you will need to separate them with a comma e.g. 123/579, 162/2.

See Appendix A of the EA

Note: You can find the lot, section, DP or strata number on a map of the land or on the title documents for the land, if title was provided after 30 October 1983. If you have documents older than this, you will need to contact the NSW Department of Lands for updated details. If the subject land is located within the Kosciuszko ski resorts area, DP and strata numbers do not apply.

4. Details of the original development consent

Briefly describe your approved development in the space below. If the development has been modified previously you must list all previous modifications and the relevant determination date(s).

See Section 3 of the Environmental Assessment

What was the original development application no.? 11/92

What was the date consent was granted? 27/7/1992

What was the original application fee?

5. Type of modification

An application under section 96 of the EP&A Act is an application to modify a development consent. Modifications to a development consent can also be made under section 75W of the EP&A Act, or section 96AA for court granted consents.

There are five types of modification applications. Please tick the type of modification application that is being sought:

☐ Section 96(1) involving minor error, misdescription or miscalculation.

☐ Section 96(1A) involving minimal environmental impact, where the development as originally approved remains substantially the same.

☐ Section 96(2) other modification, where the development as originally approved remains substantially the same.

☐ Section 96AA modification of consent granted by the Land and Environment Court, where the development as originally approved remains substantially the same.

☒ Section 75W modification, involving use of Part 3A processes to modify the Part 4 consent.

Note: If the proposed modification will lead to the consented development being not 'substantially the same' (except in the case of a proposed modification under section 75W) then you will need to submit a new development application.

6. Extent of modification

Will the modified development be substantially the same as the development that was originally approved?

No ☐➤ Please submit a new development application.

Yes ☐➤ Please provide evidence that the development will remain substantially the same. (If you need to attach additional pages, please list below the material attached).

Note: Question 6 does not apply to proposed modifications under section 75W.

7. Description of modification

- In the case of a section 96(1) application, indicate the nature of the minor error, misdescription or miscalculation in the space below.
- In the case of a section 96(1A), section 96(2) or section 96AA application describe the impact of the modification in the space below. A statement of environmental effects will need to accompany the application, which includes an assessment of the development as proposed to be modified in accordance with section 79C(1) of the EP&A Act. Provisions of the *Heritage Act 1977* may also apply for works to a heritage item or works adjoining a heritage item.
- In the case of a section 75W application under clause 8J(8) of the Environmental Planning and Assessment Regulation 2000, a development consent in force immediately before the commencement of Part 3A of the Act may be modified under section 75W as if the consent were an approval under that Part. However, approval from the Minister is required to lodge a section 75W application. **Applicants should contact the Department first if they are considering applying for a modification under section 75W.**

Regardless of the type of modification, please state below the specific conditions of consent to be modified, deleted or additional conditions request, and details of any other changes being sought.

Springvale seeks to modify development consent S91/06569/001 to allow for the construction and operation of an additional surface mine dewatering facility (Bore 8) and associated infrastructure within the Newnes State Forest on the Newnes Plateau.

Note: If your proposal is within Kosciuszko ski resorts area, please attach a copy of the Interim Lease Variation Approval received from the Department of Environment and Climate Change to your application.

8. General terms of approval from State agencies

If the original development application was classified as integrated development and required approval from one or more State agencies, list them in the space below and their respective general terms of approval. Depending on the type of modification, it may be necessary to refer the modification application to the approval body.

9. Number of jobs to be created

Please indicate the number of jobs the proposed development will create. This should be expressed as a proportion of full time jobs over a full year, (e.g. a person employed full time for 6 months would equal 0.5 of a full time equivalent job; six contractors working on and off over 2 weeks equate to 2 people working full time for 2 weeks, which equals approximately 0.08 of an FTE job).

Construction jobs (full time equivalent) 5

Operational jobs (full time equivalent) 0

10. Application fee

Part 15 of the Environmental Planning and Assessment Regulation 2000 sets out how to calculate the fees for an application for modification of a development consent. If your development needs to be advertised to the public you may also need to include an advertising fee.

Note: Advertising fees attract GST, all other fees do not.

Please contact the Department in order to calculate the fee for your modification application.

Estimated cost of the development	Original application fee	Total fees lodged
		TBC

11. Political donation disclosure statement

Persons lodging modification applications are required to declare reportable political donations (including donations of or more than $1,000) made in the previous two years. Disclosure statements are to be submitted with your application.

Have you attached a disclosure statement to this application?

Yes ☒

No ☐

Note: For more details about political donation disclosure requirements, including a disclosure form, go to **www.planning.nsw.gov.au/donations.**

12. Owner's consent

The owner(s) of the land to be developed must sign the application. If you are not the owner of the land, you must have all the owners sign the application. If the land is Crown land, an authorised officer of the NSW Department of Lands must sign the application. **An original signature must be provided.**

As the owner(s) of the above property, I/we consent to this application:

Signature	Signature
Name	Name
Date	Date

Note: For applications within the Kosciuszko ski resorts area, the approval of the lessee rather than the owner is required.

13. Applicant's signature

The applicant, or the applicant's agent, must sign the application. Only an original signature will be accepted (photocopies or faxed copies will not be accepted).

Signature

In what capacity are you signing if you are not the applicant: MINE MANAGER SPRINGVALE

Date: 11th September, 2012

Name, if you are not the applicant:

14. Privacy policy

The information you provide in this application will enable the Department, and any relevant state agency, to assess your application under the *Environmental Planning and Assessment Act 1979* and other applicable state legislation. If the information is not provided, your application may not be accepted.

If your application is for designated development or advertised development, it will be made available for public inspection and copying during a submission period. Written notification of the application will also be provided to the neighbourhood. You have the right to access and have corrected any information provided in your application. Please ensure that the information is accurate and advise the Department of any changes.

Political donations disclosure statement

NSW GOVERNMENT
Department of Planning

Office use only:

Date received: ___/___/___

Planning application no. __________

This form may be used to make a political donations disclosure under section 147(3) of the *Environmental Planning Assessment Act 1979* for applications or public submissions to the Minister or the Director-General.

Please read the following information before filling out the Disclosure Statement on pages 3 and 4 of this form. Also refer to the 'Glossary of terms' provided overleaf (for definitions of terms in *italics* below). Once completed, please attach the completed declaration to your planning application or submission.

Explanatory information

Making a planning application or a public submission to the Minister or the Director-General
Under section 147(3) of the Environmental Planning and Assessment Act 1979 ('the Act') a person:

(a) who makes a *relevant planning application* to the Minister or the Director-General is required to disclose all *reportable political donations* (if any) made within the *relevant period* to anyone by any *person with a financial interest* in the application, or

(b) who makes a *relevant public submission* to the Minister or the Director-General in relation to the application is required to disclose all *reportable political donations* (if any) made within the *relevant period* to anyone by the person making the submission or any *associate of that person*.

How and when do you make a disclosure?
The disclosure to the Minister or the Director-General of a *reportable political donation* under section 147 of the Act is to be made:

(a) in, or in a statement accompanying, the relevant planning application or submission if the donation is made before the application or submission is made, or

(b) if the donation is made afterwards, in a statement of the person to whom the relevant planning application or submission was made within 7 days after the donation is made.

What information needs to be included in a disclosure?
The information requirements of a disclosure of reportable political donations are outlined in section 147(9) of the Act.

Pages 3 and 4 of this document include a Disclosure Statement Template which outlines the information requirements for disclosures to the Minister or to the Director-General of the Department of Planning.

Note: A separate Disclosure Statement Template is available for disclosures to councils.

Warning: A person is guilty of an offence under section 125 of the *Environmental Planning and Assessment Act 1979* in connection with the obligations under section 147 only if the person fails to make a disclosure of a political donation or gift in accordance with section 147 that the person knows, or ought reasonably to know, was made and is required to be disclosed under section 147.

The maximum penalty for any such offence is the maximum penalty under Part 6 of the *Election Funding and Disclosures Act 1981* for making a false statement in a declaration of disclosures lodged under that Part.

Note: The maximum penalty is currently 200 penalty units (currently $22,000) or imprisonment for 12 months, or both.

Glossary of terms (under section 147 of the *Environmental Planning and Assessment Act 1979*)

gift means a gift within the meaning of Part 6 of the *Election Funding and Disclosures Act 1981*. Note. A gift includes a gift of money or the provision of any other valuable thing or service for no consideration or inadequate consideration.

> Note: Under section 84(1) of *the Election Funding and Disclosures Act 1981* gift is defined as follows:
>
> ***gift*** means any disposition of property made by a person to another person, otherwise than by will, being a disposition made without consideration in money or money's worth or with inadequate consideration, and includes the provision of a service (other than volunteer labour) for no consideration or for inadequate consideration.

local councillor means a councillor (including the mayor) of the council of a local government area.

relevant planning application means:

a) a formal request to the Minister, a council or the Director-General to initiate the making of an environmental planning instrument or development control plan in relation to development on a particular site, or
b) a formal request to the Minister or the Director-General for development on a particular site to be made State significant development or declared a project to which Part 3A applies, or
c) an application for approval of a concept plan or project under Part 3A (or for the modification of a concept plan or of the approval for a project), or
d) an application for development consent under Part 4 (or for the modification of a development consent), or
e) any other application or request under or for the purposes of this Act that is prescribed by the regulations as a relevant planning application,

but does not include:

f) an application for (or for the modification of) a complying development certificate, or
g) an application or request made by a public authority on its own behalf or made on behalf of a public authority, or
h) any other application or request that is excluded from this definition by the regulations.

relevant period is the period commencing 2 years before the application or submission is made and ending when the application is determined.

relevant public submission means a written submission made by a person objecting to or supporting a relevant planning application or any development that would be authorised by the granting of the application.

reportable political donation means a reportable political donation within the meaning of Part 6 of the *Election Funding and Disclosures Act 1981* that is required to be disclosed under that Part. Note. Reportable political donations include those of or above $1,000.

> Note: Under section 86 of *the Election Funding and Disclosures Act 1981* reportable political donation is defined as follows:
>
> **86 Meaning of "reportable political donation"**
>
> (1) For the purposes of this Act, a reportable political donation is:
> - (a) in the case of disclosures under this Part by a party, elected member, group or candidate—a political donation of or exceeding $1,000 made to or for the benefit of the party, elected member, group or candidate, or
> - (b) in the case of disclosures under this Part by a major political donor—a political donation of or exceeding $1,000:
>   - (i) made by the major political donor to or for the benefit of a party, elected member, group or candidate, or
>   - (ii) made to the major political donor.
>
> (2) A political donation of less than an amount specified in subsection (1) made by an entity or other person is to be treated as a reportable political donation if that and other separate political donations made by that entity or other person to the same party, elected member, group, candidate or person within the same financial year (ending 30 June) would, if aggregated, constitute a reportable political donation under subsection (1).
>
> (3) A political donation of less than an amount specified in subsection (1) made by an entity or other person to a party is to be treated as a reportable political donation if that and other separate political donations made by that entity or person to an associated party within the same financial year (ending 30 June) would, if aggregated, constitute a reportable political donation under subsection (1). This subsection does not apply in connection with disclosures of political donations by parties.
>
> (4) For the purposes of subsection (3), parties are associated parties if endorsed candidates of both parties were included in the same group in the last periodic Council election or are to be included in the same group in the next periodic Council election.

a person has a financial interest in a relevant planning application if:

a) the person is the applicant or the person on whose behalf the application is made, or
b) the person is an owner of the site to which the application relates or has entered into an agreement to acquire the site or any part of it, or
c) the person is associated with a person referred to in paragraph (a) or (b) and is likely to obtain a financial gain if development that would be authorised by the application is authorised or carried out (other than a gain merely as a shareholder in a company listed on a stock exchange), or
d) the person has any other interest relating to the application, the site or the owner of the site that is prescribed by the regulations.

persons are associated with each other if:

a) they carry on a business together in connection with the relevant planning application (in the case of the making of any such application) or they carry on a business together that may be affected by the granting of the application (in the case of a relevant planning submission), or
b) they are related bodies corporate under the *Corporations Act 2001* of the Commonwealth, or
c) one is a director of a corporation and the other is any such related corporation or a director of any such related corporation, or
d) they have any other relationship prescribed by the regulations.

Political Donations Disclosure Statement to Minister or the Director-General

If you are required under section 147(3) of the Environmental Planning and Assessment Act 1979 *to disclose any political donations (see Page 1 for details), please fill in this form and sign below.*

Disclosure statement details

Name of person making this disclosure: Bob Miller

Planning application reference (e.g. DA number, planning application title or reference, property address or other description): Springvale Colliery - Bore 8 Dewatering Facility Section 75W Modification.

Your interest in the planning application (circle relevant option below)

You are the APPLICANT [✓ YES] / NO OR You are a PERSON MAKING A SUBMISSION IN RELATION TO AN APPLICATION **YES / NO**

Reportable political donations made by person making this declaration or by other relevant persons

- *State below any reportable political donations you* ***have made*** *over the 'relevant period' (see glossary on page 2). If the donation was made by an entity (and not by you as an individual) include the Australian Business Number (ABN).*
- *If you are the* ***applicant*** *of a relevant planning application state below any reportable political donations that you know, or ought reasonably to know, were made by any persons with a financial interest in the planning application, OR*
- *If you are a* ***person making a submission*** *in relation to an application, state below any reportable political donations that you know, or ought reasonably to know, were made by an associate.*

Name of donor (or ABN if an entity)	Donor's residential address or entity's registered address or other official office of the donor	Name of party or person for whose benefit the donation was made	Date donation made	Amount/ value of donation
Centennial Coal Company Limited ABN: 30 003 714 538	Level 1, BT Tower 1 Market Street Sydney NSW 2000	Labour	04/08/10	$900
Centennial Coal Company Limited ABN: 30 003 714 538	Level 1, BT Tower 1 Market Street Sydney NSW 2000	Labour	14/10/10	$500
Centennial Coal Company Limited ABN: 30 003 714 538	Level 1, BT Tower 1 Market Street Sydney NSW 2000	Labour	25/11/10	$300
Centennial Coal Company Limited ABN: 30 003 714 538	Level 1, BT Tower 1 Market Street Sydney NSW 2000	National Party	13/12/10	$750

Please list all reportable political donations—additional space is provided overleaf if required.

By signing below, I/we hereby declare that all information contained within this statement is accurate at the time of signing.

Signature(s) and Date: Miller 11th September, 2012.

Name(s): ROBERT JOHN MILLER

Cont...

Political Donations Disclosure Statement to Minister or the Director-General

Name of donor (or ABN if an entity)	Donor's residential address or entity's registered address or other official office of the donor	Name of party or person for whose benefit the donation was made	Date donation made	Amount/ value of donation
Centennial Coal Company Limited ABN: 30 003 714 538	Level 1, BT Tower 1 Market Street Sydney NSW 2000	Independent	10/02/11	$450
Centennial Coal Company Limited ABN: 30 003 714 538	Level 1, BT Tower 1 Market Street Sydney NSW 2000	National Party	30/06/11	$75
Centennial Coal Company Limited ABN 30 003 714 538	Level 1, BT Tower 1 Market Street Sydney NSW 2000	Liberal	03/08/11	$1,000
Centennial Coal Company Limited ABN: 30 003 714 538	Level 1, BT Tower 1 Market Street Sydney NSW 2000	Labour	16/08/11	$85
Centennial Coal Company Limited ABN: 30 003 714 538	Level 1, BT Tower 1 Market Street Sydney NSW 2000	Labour	27/10/11	$500
Centennial Coal Company Limited ABN: 30 003 714 538	Level 1, BT Tower 1 Market Street Sydney NSW 2000	Labour	09/11/11	$500
Centennial Coal Company Limited ABN: 30 003 714 538	Level 1, BT Tower 1 Market Street Sydney NSW 2000	Nationals	19/04/12	$1,100

EPL 3607

Appendix - D

Section 55 Protection of the Environment Operations Act 1997

Environment Protection Licence

Licence - 3607

Licence Details	
Number:	3607
Anniversary Date:	01-January
	10-Sep-2014

Licensee

SPRINGVALE COAL PTY LIMITED
LEVEL 18, BT TOWER, 1 MARKET STREET
SYDNEY NSW 2000

Licence Type

Premises

Premises

SPRINGVALE COLLIERY
CASTLEREAGH HIGHWAY
LIDSDALE NSW 2790

Scheduled Activity

Mining for coal
Coal works

Fee Based Activity	**Scale**
Mining for coal	> 2000000 - 3500000 T produced
Coal works	> 2000000 - 5000000 T loaded

Region

North West - Bathurst
Lvl 2, 203-209 Russell Street
BATHURST NSW 2795
Phone: 02 6332 7600
Fax: 02 6332 7630

PO Box 1388 BATHURST
NSW 2795

Information about this licence

Dictionary

A definition of terms used in the licence can be found in the dictionary at the end of this licence.

Responsibilities of licensee

Separate to the requirements of this licence, general obligations of licensees are set out in the Protection of the Environment Operations Act 1997 ("the Act") and the Regulations made under the Act. These include obligations to:

- ensure persons associated with you comply with this licence, as set out in section 64 of the Act;
- control the pollution of waters and the pollution of air (see for example sections 120 - 132 of the Act); and
- report incidents causing or threatening material environmental harm to the environment, as set out in Part 5.7 of the Act.

Variation of licence conditions

The licence holder can apply to vary the conditions of this licence. An application form for this purpose is available from the EPA.

The EPA may also vary the conditions of the licence at any time by written notice without an application being made.

Where a licence has been granted in relation to development which was assessed under the Environmental Planning and Assessment Act 1979 in accordance with the procedures applying to integrated development, the EPA may not impose conditions which are inconsistent with the development consent conditions until the licence is first reviewed under Part 3.6 of the Act.

Duration of licence

This licence will remain in force until the licence is surrendered by the licence holder or until it is suspended or revoked by the EPA or the Minister. A licence may only be surrendered with the written approval of the EPA.

Licence review

The Act requires that the EPA review your licence at least every 5 years after the issue of the licence, as set out in Part 3.6 and Schedule 5 of the Act. You will receive advance notice of the licence review.

Fees and annual return to be sent to the EPA

For each licence fee period you must pay:

- an administrative fee; and
- a load-based fee (if applicable).

The EPA publication "A Guide to Licensing" contains information about how to calculate your licence fees.

The licence requires that an Annual Return, comprising a Statement of Compliance and a summary of any monitoring required by the licence (including the recording of complaints), be submitted to the EPA. The Annual Return must be submitted within 60 days after the end of each reporting period. See condition R1 regarding the Annual Return reporting requirements.

Usually the licence fee period is the same as the reporting period.

Transfer of licence

The licence holder can apply to transfer the licence to another person. An application form for this purpose is available from the EPA.

Public register and access to monitoring data

Part 9.5 of the Act requires the EPA to keep a public register of details and decisions of the EPA in relation to, for example:

- licence applications;
- licence conditions and variations;
- statements of compliance;
- load based licensing information; and
- load reduction agreements.

Under s320 of the Act application can be made to the EPA for access to monitoring data which has been submitted to the EPA by licensees.

This licence is issued to:

SPRINGVALE COAL PTY LIMITED
LEVEL 18, BT TOWER, 1 MARKET STREET
SYDNEY NSW 2000

subject to the conditions which follow.

1 Administrative conditions

A1 What the licence authorises and regulates

A1.1 Not applicable.

A1.2 This licence authorises the carrying out of the scheduled activities listed below at the premises specified in A2. The activities are listed according to their scheduled activity classification, fee-based activity classification and the scale of the operation.

Unless otherwise further restricted by a condition of this licence, the scale at which the activity is carried out must not exceed the maximum scale specified in this condition.

Scheduled Activity
Mining for coal
Coal works

Fee Based Activity	Scale
Mining for coal	> 2000000 - 3500000 T produced
Coal works	> 2000000 - 5000000 T loaded

A1.3 Not applicable.

A2 Premises to which this licence applies

A2.1 The licence applies to the following premises:

Premises Details
SPRINGVALE COLLIERY
CASTLEREAGH HIGHWAY
LIDSDALE
NSW
2790
ML 1303, ML 1323, ML 1326, ML1352, ML1537, ML1588, MPL314, EL6974, MLA326, A460, CCL 733, ML204, ML1319, ML564, CL394 and CL361 as shown on map titled 'Figure no. 1 - Plan of Operations' provided to the EPA on 4 September 2009

A3 Other activities

A3.1 Not applicable.

A4 Information supplied to the EPA

A4.1 Works and activities must be carried out in accordance with the proposal contained in the licence application, except as expressly provided by a condition of this licence.

In this condition the reference to "the licence application" includes a reference to:

(a) the applications for any licences (including former pollution control approvals) which this licence replaces under the Protection of the Environment Operations (Savings and Transitional) Regulation 1998; and

(b) the licence information form provided by the licensee to the EPA to assist the EPA in connection with the issuing of this licence.

2 Discharges to air and water and applications to land

P1 Location of monitoring/discharge points and areas

P1.1 The following points referred to in the table below are identified in this licence for the purposes of monitoring and/or the setting of limits for the emission of pollutants to the air from the point.

Air

EPA Identi-fication no.	Type of Monitoring Point	Type of Discharge Point	Description of Location
8	Dust monitoring network		Dust deposition gauge monitoring network as shown on Springvale Coal's Figure 3.3.1 titled Dust Monitoring Locations, forwarded to the EPA on 20/6/01

P1.2 The following points referred to in the table are identified in this licence for the purposes of the monitoring and/or the setting of limits for discharges of pollutants to water from the point.

P1.3 The following utilisation areas referred to in the table below are identified in this licence for the purposes of the monitoring and/or the setting of limits for any application of solids or liquids to the utilisation area.

Water and land

EPA identi-fication no.	Type of monitoring point	Type of discharge point	Description of location
1	Discharge to waters Discharge quality monitoring Volume monitoring	Discharge to waters Discharge quality monitoring Volume monitoring	Overflow from Dam 3 at Springvale pit top labelled as LD001 on Springvale Coal's Diagram titled "Discharge Points LD001, LD002 & LD003", dated 18-November-99.
2	Discharge to utilisation area		Area labelled as LD002 on Springvale Coal's Diagram titled "Discharge Points LD001, LD002 & LD003", dated 18-November-99.
4	Discharge to waters Discharge quality monitoring Volume monitoring	Discharge to waters Discharge quality monitoring Volume monitoring	Emergency discharge point on unnamed creek leading to Wolgan River, labelled as LDP 004 on State Forest's Figure 3.2.4 titled 'Softwoods Region Occupation Permit No. 02349.
5	Discharge to waters Discharge quality monitoring Volume monitoring	Discharge to waters Discharge quality monitoring Volume monitoring	Emergency discharge point on unnamed creek leading to Wolgan River, labelled as LDP 005 on State Forest's Figure 3.2.4 titled 'Softwoods Region Occupation Permit No. 02349.
6	Discharge to waters Discharge quality monitoring Volume monitoring	Discharge to waters Discharge quality monitoring Volume monitoring	Drain from final filter lagoon at Western Main labelled as LD006 in Springvale Coal's Diagram titled Discharge Point LD006, dated 18-November-99.
7	Discharge to waters Discharge quality monitoring	Discharge to waters Discharge quality monitoring	Duncan Street coal conveyor transfer drain from final filter lagoon at Western Main labelled as LD007 in Springvale Coal's Diagram titled as LD007, dated 18-November-99

Note: Licensed discharge points 4 (LD4) and 5 (LD5) are only to be used for emergency discharges as defined in condition E1.1.

3 Limit conditions

L1 Pollution of waters

L1.1 Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.

L2 Load limits

L2.1 Not applicable.

L2.2 Not applicable.

L3 Concentration limits

L3.1 For each monitoring/discharge point or utilisation area specified in the table\s below (by a point number), the concentration of a pollutant discharged at that point, or applied to that area, must not exceed the concentration limits specified for that pollutant in the table.

L3.2 Where a pH quality limit is specified in the table, the specified percentage of samples must be within the specified ranges.

L3.3 To avoid any doubt, this condition does not authorise the pollution of waters by any pollutant other than those specified in the table\s.

Water and Land

POINT 1

Pollutant	Units of Measure	50 percentile concentration limit	90 percentile concentration limit	3DGM concentration limit	100 percentile Concentration Limit
Oil and Grease	milligrams per litre				10
pH	pH				6.5-8.5
Total suspended solids	milligrams per litre				30

POINT 6

Pollutant	Units of Measure	50 percentile concentration limit	90 percentile concentration limit	3DGM concentration limit	100 percentile Concentration Limit
Oil and Grease	milligrams per litre				10
pH	pH				6.5-8.5
Total suspended solids	milligrams per litre				30

POINT 7

Pollutant	Units of Measure	50 percentile concentration limit	90 percentile concentration limit	3DGM concentration limit	100 percentile Concentration Limit
Oil and Grease	milligrams per litre				10
pH	pH				6.5-8.5
Total suspended solids	milligrams per litre				30

For discharge points 1, 6 and 7, where the pH of the receiving waters is outside the pH range 6.5-8.5, the licensee may discharge water that is outside the above pH range of 6.5-8.5, provided any water discharged does not vary the pH of the receiving waters by more than 0.5 pH units.

L4 Volume and mass limits

L4.1 For each discharge point or utilisation area specified below (by a point number), the volume/mass of:

(a) liquids discharged to water; or;

(b) solids or liquids applied to the area;

must not exceed the volume/mass limit specified for that discharge point or area.

Point	Unit of measure	Volume/Mass Limit
1	kilolitres per day	10000
4	kilolitres per day	15000
5	kilolitres per day	15000
6	kilolitres per day	10000

During emergency discharges (as defined in condition E1.1) the licensee may exceed the 15000kL/day limit for points 4 or 5, however the combined total daily limit for these two points must not exceed 30000kL/day. All practical steps must be taken to ensure that there is equilibrium of flow between these two discharge points.

L5 Waste

L5.1 Not applicable.

L6 Noise Limits

L6.1 Noise from the upcast ventilation shaft must not exceed an LAeq (15 minute) noise emission criterion of 35 dB(A), except as expressly provided by this licence.

L6.2 Noise from the premises is to be measured or computed at the nearest or most affected residence to determine compliance with condition L6.1. .

L6.3 The noise emission limits identified in this licence apply under all meteorological conditions except:
(a) during rain and wind speeds (at 10m height) greater than 3m/s; and
(b) under "non-significant weather conditions".

Note: Field meteorological indicators for non-significant weather conditions are described in the NSW Industrial Noise Policy, Chapter 5 and Appendix E in relation to wind and temperature inversions.

4 Operating conditions

O1 Activities must be carried out in a competent manner

O1.1 Licensed activities must be carried out in a competent manner.

This includes:
(a) the processing, handling, movement and storage of materials and substances used to carry out the activity; and
(b) the treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity.

O2 Maintenance of plant and equipment

O2.1 All plant and equipment installed at the premises or used in connection with the licensed activity:
(a) must be maintained in a proper and efficient condition; and
(b) must be operated in a proper and efficient manner.

O3 Dust

O3.1 The premises must be maintained in a condition which minimises or prevents the emission of dust from the premises.

O3.2 Trucks entering and leaving the premises that are carrying loads must be covered at all times, except during loading and unloading.

O4 Incineration or open burning

O4.1 There must be no incineration or burning of any waste at the premises.

O5 Management of utilisation area

O5.1 Effluent application must not occur in a manner which causes surface runoff.

O5.2 Spray from effluent application must not drift beyond the boundary of the premises.

O5.3 Livestock access to any effluent application area must be denied during irrigation and until the applied effluent has dried.

O5.4 The quantity of effluent/solids applied to the utilisation area must not exceed the capacity of the area to effectively utilise the effluent/solids.

For the purpose of this condition, 'effectively utilise' include the use of the effluent/solids for pasture or crop production, as well as the ability of the soil to absorb the nutrient, salt, hydraulic load and organic material.

5 Monitoring and recording conditions

M1 Monitoring records

M1.1 The results of any monitoring required to be conducted by this licence or a load calculation protocol must be recorded and retained as set out in this condition.

M1.2 All records required to be kept by this licence must be:
(a) in a legible form, or in a form that can readily be reduced to a legible form;
(b) kept for at least 4 years after the monitoring or event to which they relate took place; and
(c) produced in a legible form to any authorised officer of the EPA who asks to see them.

M1.3 The following records must be kept in respect of any samples required to be collected for the purposes of this licence:
(a) the date(s) on which the sample was taken;
(b) the time(s) at which the sample was collected;
(c) the point at which the sample was taken; and
(d) the name of the person who collected the sample.

M2 Requirement to monitor concentration of pollutants discharged

M2.1 For each monitoring/discharge point or utilisation area specified below (by a point number), the licensee must monitor (by sampling and obtaining results by analysis) the concentration of each pollutant specified in Column 1. The licensee must use the sampling method, units of measure, and sample at the frequency, specified opposite in the other columns:

POINT 1

Pollutant	Units of measure	Frequency	Sampling Method
Conductivity	microsiemens per centimetre	Weekly during any discharge	Grab sample
Filterable iron	milligrams per litre	Monthly during discharge	Grab sample
Filterable manganese	milligrams per litre	Monthly during discharge	Grab sample
Oil and Grease	milligrams per litre	Monthly during discharge	Grab sample
Total suspended solids	milligrams per litre	Monthly during discharge	Grab sample
Zinc (total)	milligrams per litre	Monthly during discharge	Grab sample
pH	pH	Weekly during any discharge	Grab sample

POINTS 4,5

Pollutant	Units of measure	Frequency	Sampling Method
Conductivity	microsiemens per centimetre	Daily during any discharge	Probe
Filterable iron	milligrams per litre	Weekly during any discharge	Grab sample
Filterable manganese	milligrams per litre	Weekly during any discharge	Grab sample
Oil and Grease	milligrams per litre	Weekly during any discharge	Grab sample
Temperature	degrees Celsius	Daily during any discharge	Probe
Total suspended solids	milligrams per litre	Weekly during any discharge	Grab sample
Turbidity	nephelometric turbidity units	Daily during any discharge	Grab sample
pH	pH	Daily during any discharge	Probe

POINT 6

Pollutant	Units of measure	Frequency	Sampling Method
Conductivity	microsiemens per centimetre	Monthly during discharge	Grab sample
Filterable iron	milligrams per litre	Monthly during discharge	Grab sample
Filterable manganese	milligrams per litre	Monthly during discharge	Grab sample
Nickel (total)	milligrams per litre	Monthly during discharge	Grab sample
Oil and Grease	milligrams per litre	Monthly during discharge	Grab sample
Total Hardness	milligrams per litre	Monthly during discharge	Grab sample
Total suspended solids	milligrams per litre	Monthly during discharge	Grab sample
Zinc (total)	milligrams per litre	Monthly during discharge	Grab sample
pH	pH	Monthly during discharge	Grab sample

POINT 7

Pollutant	Units of measure	Frequency	Sampling Method
Conductivity	milligrams per litre	Daily during any discharge	Grab sample
Total suspended solids	milligrams per litre	Daily during any discharge	Grab sample
pH	pH	Daily during any discharge	Grab sample

POINT 8

Pollutant	Units of measure	Frequency	Sampling Method
Particulates - Deposited Matter	grams per square metre per month	Monthly	AM-19

M3 Testing methods - concentration limits

M3.1 Monitoring for the concentration of a pollutant emitted to the air required to be conducted by this licence must be done in accordance with:

(a) any methodology which is required by or under the Act to be used for the testing of the concentration of the pollutant; or

(b) if no such requirement is imposed by or under the Act, any methodology which a condition of this licence requires to be used for that testing; or

(c) if no such requirement is imposed by or under the Act or by a condition of this licence, any methodology approved in writing by the EPA for the purposes of that testing prior to the testing taking place.

Note: The Protection of the Environment Operations (Clean Air) Regulation 2002 requires testing for certain purposes to be conducted in accordance with test methods contained in the publication "Approved Methods for the Sampling and Analysis of Air Pollutants in NSW".

M3.2 Subject to any express provision to the contrary in this licence, monitoring for the concentration of a pollutant discharged to waters or applied to a utilisation area must be done in accordance with the Approved Methods Publication unless another method has been approved by the EPA in writing before any tests are conducted.

M4 Recording of pollution complaints

M4.1 The licensee must keep a legible record of all complaints made to the licensee or any employee or agent of the licensee in relation to pollution arising from any activity to which this licence applies.

M4.2 The record must include details of the following:
(a) the date and time of the complaint;
(b) the method by which the complaint was made;
(c) any personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect;
(d) the nature of the complaint;
(e) the action taken by the licensee in relation to the complaint, including any follow-up contact with the complainant; and
(f) if no action was taken by the licensee, the reasons why no action was taken.

M4.3 The record of a complaint must be kept for at least 4 years after the complaint was made.

M4.4 The record must be produced to any authorised officer of the EPA who asks to see them.

M5 Telephone complaints line

M5.1 The licensee must operate during its operating hours a telephone complaints line for the purpose of receiving any complaints from members of the public in relation to activities conducted at the premises or by the vehicle or mobile plant, unless otherwise specified in the licence.

M5.2 The licensee must notify the public of the complaints line telephone number and the fact that it is a complaints line so that the impacted community knows how to make a complaint.

M5.3 Conditions M5.1 and M5.2 do not apply until 3 months after:
(a) the date of the issue of this licence or
(b) if this licence is a replacement licence within the meaning of the Protection of the Environment Operations (Savings and Transitional) Regulation 1998, the date on which a copy of the licence was served on the licensee under clause 10 of that regulation.

M6 Requirement to monitor volume or mass

M6.1 For each discharge point or utilisation area specified below, the licensee must monitor:

(a) the volume of liquids discharged to water or applied to the area;
(b) the mass of solids applied to the area;
(c) the mass of pollutants emitted to the air;

at the frequency and using the method and units of measure, specified below.

POINT 1

Frequency	Unit Of Measure	Sampling Method
Daily	kilolitres per day	Flow meter and continuous logger

POINT 2

Frequency	Unit Of Measure	Sampling Method
Daily	kilolitres per day	Flow meter and continuous logger

POINT 4

Frequency	Unit Of Measure	Sampling Method
Daily during any discharge	kilolitres per day	By Calculation (volume flow rate or pump capacity multiplied by operating time)

POINT 5

Frequency	Unit Of Measure	Sampling Method
Daily during any discharge	kilolitres per day	By Calculation (volume flow rate or pump capacity multiplied by operating time)

POINT 6

Frequency	Unit Of Measure	Sampling Method
Daily	kilolitres per day	Flow meter and continuous logger

POINT 7

Frequency	Unit Of Measure	Sampling Method
Daily during any discharge	kilolitres per day	Estimate

M7 Meteorological Monitoring

M7.1 The licensee must ensure that the following meteorological parameters are monitored on site and the results recorded:-

- daily rainfall;
- daily evaporation;
- continuous wind speed and direction.

6 Reporting conditions

R1 Annual return documents

What documents must an Annual Return contain?

R1.1 The licensee must complete and supply to the EPA an Annual Return in the approved form comprising:
(a) a Statement of Compliance; and
(b) a Monitoring and Complaints Summary.
A copy of the form in which the Annual Return must be supplied to the EPA accompanies this licence. Before the end of each reporting period, the EPA will provide to the licensee a copy of the form that must be completed and returned to the EPA.

Period covered by Annual Return

R1.2 An Annual Return must be prepared in respect of each reporting period, except as provided below.

Note: The term "reporting period" is defined in the dictionary at the end of this licence. Do not complete the Annual Return until after the end of the reporting period.

R1.3 Where this licence is transferred from the licensee to a new licensee:
(a) the transferring licensee must prepare an Annual Return for the period commencing on the first day of the reporting period and ending on the date the application for the transfer of the licence to the new licensee is granted; and
(b) the new licensee must prepare an Annual Return for the period commencing on the date the application for the transfer of the licence is granted and ending on the last day of the reporting period.

Note: An application to transfer a licence must be made in the approved form for this purpose.

R1.4 Where this licence is surrendered by the licensee or revoked by the EPA or Minister, the licensee must prepare an Annual Return in respect of the period commencing on the first day of the reporting period and ending on:
(a) in relation to the surrender of a licence - the date when notice in writing of approval of the surrender is given; or
(b) in relation to the revocation of the licence - the date from which notice revoking the licence operates.

Deadline for Annual Return

R1.5 The Annual Return for the reporting period must be supplied to the EPA by registered post not later than 60 days after the end of each reporting period or in the case of a transferring licence not later than 60 days after the date the transfer was granted (the 'due date').

Notification where actual load can not be calculated

R1.6 Not applicable.

Licensee must retain copy of Annual Return

R1.7 The licensee must retain a copy of the Annual Return supplied to the EPA for a period of at least 4 years after the Annual Return was due to be supplied to the EPA.

Certifying of Statement of Compliance and signing of Monitoring and Complaints Summary

R1.8 Within the Annual Return, the Statement of Compliance must be certified and the Monitoring and Complaints Summary must be signed by:
(a) the licence holder; or
(b) by a person approved in writing by the EPA to sign on behalf of the licence holder.

R1.9 A person who has been given written approval to certify a certificate of compliance under a licence issued under the Pollution Control Act 1970 is taken to be approved for the purpose of this condition until the date of first review of this licence.

R2 Notification of environmental harm

Note: The licensee or its employees must notify the EPA of incidents causing or threatening material harm to the environment as soon as practicable after the person becomes aware of the incident in accordance with the requirements of Part 5.7 of the Act.

R2.1 Notifications must be made by telephoning the Environment Line service on 131 555.

R2.2 The licensee must provide written details of the notification to the EPA within 7 days of the date on which the incident occurred.

R3 Written report

R3.1 Where an authorised officer of the EPA suspects on reasonable grounds that:
(a) where this licence applies to premises, an event has occurred at the premises; or
(b) where this licence applies to vehicles or mobile plant, an event has occurred in connection with the carrying out of the activities authorised by this licence,
and the event has caused, is causing or is likely to cause material harm to the environment (whether the harm occurs on or off premises to which the licence applies), the authorised officer may request a written report of the event.

R3.2 The licensee must make all reasonable inquiries in relation to the event and supply the report to the EPA within such time as may be specified in the request.

R3.3 The request may require a report which includes any or all of the following information:

- (a) the cause, time and duration of the event;
- (b) the type, volume and concentration of every pollutant discharged as a result of the event;
- (c) the name, address and business hours telephone number of employees or agents of the licensee, or a specified class of them, who witnessed the event;
- (d) the name, address and business hours telephone number of every other person (of whom the licensee is aware) who witnessed the event, unless the licensee has been unable to obtain that information after making reasonable effort;
- (e) action taken by the licensee in relation to the event, including any follow-up contact with any complainants;
- (f) details of any measure taken or proposed to be taken to prevent or mitigate against a recurrence of such an event; and
- (g) any other relevant matters.

R3.4 The EPA may make a written request for further details in relation to any of the above matters if it is not satisfied with the report provided by the licensee. The licensee must provide such further details to the EPA within the time specified in the request.

General conditions

G1 Copy of licence kept at the premises

G1.1 A copy of this licence must be kept at the premises to which the licence applies.

G1.2 The licence must be produced to any authorised officer of the EPA who asks to see it.

G1.3 The licence must be available for inspection by any employee or agent of the licensee working at the premises.

G2 Signage

G2.1 The location of EPA point number(s) 4 (LD4) and 5 (LD5) must be clearly marked by signs that indicate the point identification number used in this licence and be located as close as practical to the point.

Pollution studies and reduction programs

U1 Implementation of discharge water quality improvements works

U1.1 The licensee must undertake the following works within the time frame indicated:-

1. Modify the site water management arrangements at the premises as follows;
   - (i) Establishing pumping capacity directly from Cooks Dam to the coal washery and, during times of low consumption at the washery, pump water from Cooks Dam to the DML Dam – following receipt of water licence from NSW Office of Water – **by 30 July 2011**.
   - (ii) Establish the Retention Dam as a rainfall runoff silt trap prior to discharge through licensed discharge point 6 (LDP 6) – following receipt of water licence from NSW Office of Water – **by 1 July 2011**.
   - (iii) Establish controlled discharge from Main Sedimentation Dam and Water Treatment Dam including the construction of a spillway, drainage channel, treatment facility and new sediment pond – to be completed by **31 December 2010**.
   - (iv) Decant water from the Co-disposal (Tailings) Operation Area is to be directed back to the coal washery for reuse, rather than being discharged through LDP 6 – by **1 November 2010**.
   - (v) Water spillage and rainfall run-off from the immediate coal washery area is to be collected and reused, rather than being discharge through LDP 6 – by **31 December 2010**.
   - (vi) Rainfall runoff contained in the Main Sedimentation Pond is to be regularly discharged through LDP 6 in order to maintain free board in the dam for periods of higher intensity rainfall events – by **1 November 2010**.

   The Lambert Gully/Springvale Coal Handling Preparation Plant's water management plan must be progressively updated to incorporate these revised site water management arrangements (including diagrams as appropriate).

2. Investigate the source of seepage from the Cooks Dam wall area and identify options to prevent or minimise the amount of this seepage that discharges from the site via licensed discharge point LDP 6.

   This study must be completed, and a report prepared and provided to the Bathurst Office of the EPA, by **31 June 2011**.

U2 Investigation into elevated Heavy Metals in discharge from Lamberts Gully

U2.1 Determine appropriate discharge quality targets for nickel, zinc, aluminium, iron, manganese and electrical conductivity for licensed discharge point LDP006 using the ANZECC 2000 Water Quality Guidelines. Report on the findings of the investigation, which should include data and process for determining targets.

Completion date: **30 July 2011**

U3 Surface Water Quality Improvements at LDP1

U3.1 The licensee must modify the existing site water management arrangements at the premises to establish a temporary pH adjustment system to enable the licensee to meet water quality limits at LDP1.

This system shall be installed and commissioned by 30 August 2011

The efficacy and/or applicability of this system will be reviewed following the outcomes of the study to be commissioned below in Condition U3.2.

U3.2 The licensee will undertake a holistic review of the site to review current management practices and to investigate potential causes of inherently high pH levels in discharge water at LDP1. At the conclusion of the review a report will be prepared that discusses the sustainable and long term options / strategies to better manage pH levels of discharge waters at LDP1.

This report will be provided to the Bathurst Office of the EPA by 29 February 2012.

Special conditions

E1 Emergency Discharges to Wolgan River

E1.1 ***Definition of emergency discharge***

For the purposes of this licence, an "emergency discharge" is defined as the release of groundwater, sourced from the licensee's underground workings, through licensed discharge points 4 (LD4) and 5 (LD5) in the event of a shutdown of the Springvale Colliery to Delta Water Transfer Scheme for circumstances either beyond the licensee's control or for essential maintenance purposes.

E1.2 ***Prior to discharge***:

The licensee must ensure that appropriate measures are taken prior to any emergency water discharge to minimise erosion and sedimentation at the discharge points (LD4 and LD5)and of the drainage lines downstream of LD4 and LD5.

E1.3 ***Notifying the EPA of emergency discharge***

The licensee shall inform the EPA in writing (fax to 6332 2387):

a. within 24 hours of a failure in the Springvale to Delta Water Transfer Scheme;
b. no later than 48 hours prior to a scheduled pipeline shutdown;
c. no later than 48 hours prior to the requirement to continue the emergency discharge for a period greater than 2 weeks; and
d. within 24 hours following the reinstatement of the pipeline.

The notification of a failure or planned shutdown of the pipeline must include details of the nature of the failure/shutdown and the expected timeframe to restore the pipeline.

E1.4 ***Monitoring during emergency discharge***

In addition to the monitoring required by condition M2.1, the licensee shall undertake the following monitoring during and following an emergency discharge event:

a. daily inspections of the discharge points (LD4 and LD5) and the drainage lines downstream of LD4 and LD5;
b. daily monitoring (visual) of the equilibration of the flow rate between emergency discharge points LD4 and LD5; and
c. a photographic survey along the length of the flow lines, beneath the discharge points, likely to be affected during periods of emergency discharge. This survey must be conducted either immediately prior to or during the emergency discharge event and no later than 6 months following the cessation of the emergency discharge event.

E1.5 ***Emergency discharge reporting***

A report shall be prepared by the licensee, following the recommissioning of the pipeline, which shall include but not be limited to:

a. the cause of the pipe failure/shutdown;
b. the duration of the emergency discharge (in days);
c. the total volume of water discharged from LD4 and LD5 (in kL/day);
d. the results of all monitoring undertaken;
e. any remedial measures required on the drainage line(s) below the emergency discharge points that have been or will require implementation;
f. any measures to be taken to prevent a recurrence in the case the emergency discharge event was a result of a pipe failure; and
g. all appropriate photos and figures.

The report must be sent to the EPA's Bathurst office within four (4) weeks of the recommissioning of the Springvale to Delta Water Transfer Scheme.

Dictionary

General Dictionary

In this licence, unless the contrary is indicated, the terms below have the following meanings:

3DGM [in relation to a concentration limit]	Means the three day geometric mean, which is calculated by multiplying the results of the analysis of three samples collected on consecutive days and then taking the cubed root of that amount. Where one or more of the samples is zero or below the detection limit for the analysis, then 1 or the detection limit respectively should be used in place of those samples
Act	Means the Protection of the Environment Operations Act 1997
activity	Means a scheduled or non-scheduled activity within the meaning of the Protection of the Environment Operations Act 1997
actual load	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 1998

AM	Together with a number, means an ambient air monitoring method of that number prescribed by the *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales*.
AMG	Australian Map Grid
anniversary date	The anniversary date is the anniversary each year of the date of issue of the licence. In the case of a licence continued in force by the Protection of the Environment Operations Act 1997, the date of issue of the licence is the first anniversary of the date of issue or last renewal of the licence following the commencement of the Act.
annual return	Is defined in R1.1
Approved Methods Publication	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 1998
assessable pollutants	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 1998
BOD	Means biochemical oxygen demand
CEM	Together with a number, means a continuous emission monitoring method of that number prescribed by the *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales*.
COD	Means chemical oxygen demand
composite sample	Unless otherwise specifically approved in writing by the EPA, a sample consisting of 24 individual samples collected at hourly intervals and each having an equivalent volume.
cond.	Means conductivity
environment	Has the same meaning as in the Protection of the Environment Operations Act 1997
environment protection legislation	Has the same meaning as in the Protection of the Environment Administration Act 1991
EPA	Means Environment Protection Authority of New South Wales.
fee-based activity classification	Means the numbered short descriptions in Schedule 1 of the Protection of the Environment Operations (General) Regulation 1998.
flow weighted composite sample	Means a sample whose composites are sized in proportion to the flow at each composites time of collection.
general solid waste (non-putrescible)	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
general solid waste (putrescible)	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
grab sample	Means a single sample taken at a point at a single time
hazardous waste	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
licensee	Means the licence holder described at the front of this licence
load calculation protocol	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 1998
local authority	Has the same meaning as in the Protection of the Environment Operations Act 1997
material harm	Has the same meaning as in section 147 Protection of the Environment Operations Act 1997

MBAS	Means methylene blue active substances
Minister	Means the Minister administering the Protection of the Environment Operations Act 1997
mobile plant	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
motor vehicle	Has the same meaning as in the Protection of the Environment Operations Act 1997
Noise	Means “sound pressure levels”
Noise sensitive locations	Means buildings used as residence, hospital, school, child care centre, places of public worship and nursing homes. A noise sensitive location includes the land within 30 metres of the building
NSW Industrial Noise Policy	Means the document titled “NSW Industrial Noise Policy” published by the Environment Protection Authority in January 2000
O&G	Means oil and grease
percentile [in relation to a concentration limit of a sample]	Means that percentage [eg.50%] of the number of samples taken that must meet the concentration limit specified in the licence for that pollutant over a specified period of time. In this licence, the specified period of time is the Reporting Period unless otherwise stated in this licence.
plant	Includes all plant within the meaning of the Protection of the Environment Operations Act 1997 as well as motor vehicles.
pollution of waters [or water pollution]	Has the same meaning as in the Protection of the Environment Operations Act 1997
premises	Means the premises described in condition A2.1
public authority	Has the same meaning as in the Protection of the Environment Operations Act 1997
regional office	Means the relevant EPA office referred to in the Contacting the EPA document accompanying this licence
reporting period	For the purposes of this licence, the reporting period means the period of 12 months after the issue of the licence, and each subsequent period of 12 months. In the case of a licence continued in force by the Protection of the Environment Operations Act 1997, the date of issue of the licence is the first anniversary of the date of issue or last renewal of the licence following the commencement of the Act.
restricted solid waste	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
scheduled activity	Means an activity listed in Schedule 1 of the Protection of the Environment Operations Act 1997
special waste	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
TM	Together with a number, means a test method of that number prescribed by the *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales*.
TSP	Means total suspended particles
TSS	Means total suspended solids
Type 1 substance	Means the elements antimony, arsenic, cadmium, lead or mercury or any compound containing one or more of those elements
Type 2 substance	Means the elements beryllium, chromium, cobalt, manganese, nickel, selenium, tin or vanadium or any compound containing one or more of those elements
utilisation area	Means any area shown as a utilisation area on a map submitted with the application for this licence
waste	Has the same meaning as in the Protection of the Environment Operations Act 1997

waste type	Means liquid, restricted solid waste, general solid waste (putrescible), general solid waste (non-putrescible), special waste or hazardous waste

Ms Debbie Maddison

Environment Protection Authority

(By Delegation)

Date of this edition - 05-Jul-2011

End Notes

1	Licence varied by notice V/M upgrade, issued on 08-Jul-2000, which came into effect on 08-Jul-2000.
2	Licence varied by notice 1008839, issued on 24-Sep-2001, which came into effect on 24-Sep-2001.
3	Licence varied by notice 1020230, issued on 04-Sep-2002, which came into effect on 29-Sep-2002.
4	Licence varied by notice 1025883, issued on 03-Apr-2003, which came into effect on 07-Apr-2003.
5	Licence varied by notice 1028983, issued on 19-Dec-2003, which came into effect on 13-Jan-2004.
6	Licence varied by notice 1034311, issued on 03-Sep-2004, which came into effect on 28-Sep-2004.
7	Licence varied by notice 1041194, issued on 11-Oct-2004, which came into effect on 11-Oct-2004.
8	Licence varied by notice 1046241, issued on 08-Aug-2005, which came into effect on 02-Sep-2005.
9	Licence varied by notice 1052295, issued on 26-Apr-2006, which came into effect on 26-Apr-2006.
10	Licence varied by notice 1063851, issued on 03-Oct-2006, which came into effect on 03-Oct-2006.
11	Licence varied by notice 1077081, issued on 21-Aug-2007, which came into effect on 21-Aug-2007.
12	Condition A1.3 Not applicable varied by notice issued on <issue date> which came into effect on <effective date>

End Notes

13	Licence varied by notice 1103012, issued on 09-Sep-2009, which came into effect on 09-Sep-2009.
14	Licence varied by notice 1114246, issued on 10-Sep-2010, which came into effect on 10-Sep-2010.
15	Licence varied by notice 1126999, issued on 05-Jul-2011, which came into effect on 05-Jul-2011.

Correspondence from Department of Planning and Infrastructure

"Howard Reed"
<Howard.Reed@planning.nsw.gov.au>

21/12/11 11:36 AM

To "Edwina White" <Edwina.White@centennialcoal.com.au>
cc "Carl Dumpleton" <Carl.Dumpleton@planning.nsw.gov.au>, "Colin Phillips" <Colin.Phillips@planning.nsw.gov.au>, "David Kitto" <David.Kitto@planning.nsw.gov.au>, "Mary-Anne Crawford" <maryanne.crawford@centennialcoal.com.au>, "Mick Cairney" <mick.cairney@centennialcoal.com.au>, "Richard Tacon" <richard.tacon@centennialcoal.com.au>
Subject Re: Springvale Bore 7 & 8 - proposed project

Hello Edwina,

sorry to take so long to respond.

A few things. Firstly, s. 96(2) doesn't apply. Sch 6A of the EP&A Act and cl. 8J(8) of the EP&A Reg have the effect that s.75W continues to apply to the proposed mod.

Secondly, I suggest you give careful consideration to the provisions of the Mining SEPP regarding exempt and complying development. Some of the proposals you raise below may well fall within either of these categories. That being said, there is no problem with including them within the scope of the application if you so wish.

Other than that, it looks like you are right on track. I agree with David that no formal DGRs are required, and advise you to provide a draft EA in line with the assessment considerations outlined in column 3 below.

Howard Reed
Manager Mining Projects
Major Project Assessments
Department of Planning & Infrastructure
ph 9228 6308 fax 9228 6466

>>> Edwina White <Edwina.White@centennialcoal.com.au> 10/12/2011 1:11 pm >>>

Dear Howard

I refer to a recent meeting (21 November 2011) held between Mary-Anne Crawford, Richard Tacon and David Kitto. A number of upcoming Centennial Coal projects were discussed including Springvale's proposed Bore 7 and 8 (**The Project**). It was discussed at that meeting that Springvale did not require Director General Requirements for The Project. It is expected that Springvale Coal will modify development consent s91/06569/001 determined by Robert Webster, Minister for planning on 27th July 1992 under Section 96(2) of the Environmental Planning and Assessment 1979.

To provide some context, the following dot points comprise the proposed Project:

- Construction and operation of two new dewatering bores and associated facilities (including power, shed, communications, secure compound and access)
- Delivery of water from the dewatering bores into the existing Springvale to Delta Water Transfer Scheme via pipeline (trenched underground)
- Increase in production from 3.4mtpa to 4mtpa.

It is noted that the increase in tonnage will not be caused by an increase in production rate (tonnes per hour), rather the purchase of a new longwall will remove the regular 6 week longwall move which will impact on production. The new longwall will also reduce maintenance downtime effectively increasing the number of shifts cutting coal. Mine scheduling predicts that as a result, Springvale will produce in excess of its currently approved 3.4mtpa approved limit.

The Table below presents how the existing operation will change as a result of the proposed Project. In light of the proposed Project, Springvale has commenced a number of impact assessments as also presented in the Table below.

I would appreciate your thoughts on the requirement (or not) for Springvale to request and obtain Director General Requirements for this Project. We agree with David Kitto, that due to the nature/scale of this Project, Director General Requirements are not necessary. I look forward to your response.

Key Feature	**Description of Existing Operations**	**Proposed Change**	**Springvale Response to Proposed Change (assessment considerations)**
Newnes Plateau Mine Services	Existing ventilation shaft complex, services boreholes and dewatering bore Dewatering Bore 5 facility (decommissioned) Dewatering Bore 6 facility Existing overhead and underground powerlines Existing access tracks and fire trails	Two additional dewatering facilities known as Bore 7 and Bore 8 Augmentation and upgrade of exiting access track and fire trails New pipelines to tee into the existing Springvale-Delta Water Transfer Scheme to be buried adjacent to existing access tracks 11kV underground powerlines to be buried in a common trench with the pipelines adjacent to existing access tracks	Groundwater assessment to investigate potential impacts resulting from water make and determine whether those impacts are acceptable or can be mitigated. Measures to manage water make also need to be confirmed. Erosion and sediment assessment. Flora and fauna, archaeological, air quality assessments (see land preparation section). Noise assessment to consider impacts from construction and operation of the installation(s). Visual impact assessment to consider impact of buildings and infrastructure on surrounding environment. Traffic impact assessment to consider the impacts resulting from both the construction and operational phases with respect to the existing infrastructure. Bushfire risk assessment Greenhouse assessment to model impacts arising from operation of the new facilities Waste management
Mine dewatering	Currently the Springvale Mine is dewatered using Bore 6, ventilation shaft bore and pit top collection system Water is discharged into the Coxs River via the Pit Top Collection System Water is transferred to Wallerawang Power Station via the Springvale to Delta Water Transfer Scheme Emergency discharge on the Newnes Plateau	No change to the Pit Top Collection system, or to current discharges into the Coxs River Two new dewatering facilities to be installed at Bore 7 and Bore 8 New pipelines to tee into the existing Springvale-Delta Water Transfer Scheme to be buried next to the proposed access track No other changes are	Groundwater assessment Surface water assessment including Site Water Balance which will assess discharge / transfer requirements Capacity of the Delta Water Transfer Scheme to manage the water make

		proposed to the Delta Water Transfer Scheme	
Production	Springvale is approved to produce 3.4mtpa	Increased production to 4.0 mtpa	GHG assessment
Hours of Operation	24 hours per day, 7 days per week	No change	No action
Employment	Springvale currently employs 270 personnel	No change	No action
ROM Stockpile	Current stockpile capacity at the pit top is 85,000t	No change to current stockpile capacity	Air Quality assessment (increased tonnes handled). Noise assessment
Coal Preparation	Coal is crushed at the on-site Crusher plant	Extended flow of coal to pass through the coal crusher	Air Quality assessment (increased tonnes handled). Noise assessment
Land Preparation	As the Springvale mine is a well established underground mine, with adequate supporting infrastructure minimal land preparation occurs. In recent years, minor land preparation has been for exploration purposes.	Land clearance will be required for the drill pad and supporting ancillary infrastructure. Existing access tracks will be augmented and upgraded.	Surface water assessment Erosion and sediment assessment – construction & final landscape Flora and Fauna assessment (biodiversity offset strategy) Air quality assessment to determine impact from disturbed land on surrounding environment/sensitive receptors. Archaeology assessment. Impact on existing landuse (forestry)
Product Coal Transport	Coal is transferred on to overland conveyors and transported to either Mount Piper or Wallerawang Power stations or to the Coal Services Site for washing.	No change with the exception of increased tonnage on a per annum basis	Air Quality assessment (increased tonnes handled). Noise assessment Infrastructure review to ensure current plant and equipment has sufficient capacity to manage tonnes (including reject emplacement area).
Site Water Management	The surface water management system at Springvale relies on the separation of clean and dirty water and the treatment of dirty water prior to discharge through LDP001. Current water management practise occurs in accordance with the site water management plan.	No change; utilise the existing Springvale infrastructure at the pit top. No change to the EPL or LDP001.	Surface water assessment including clean / dirty water management and erosion and sediment controls
Rehabilitation	Given that Springvale exists as an underground coal mine which tends not to alter in footprint, rehabilitation is currently limited to small areas in the Newnes State Forest following the cessation of exploration activities, or when surface infrastructure is decommissioned.	Rehabilitation of the Bore 5 and Bore 6 facilities. Partial rehabilitation of the Bore 7 and Bore 8 compounds following construction and commissioning Full rehabilitation of the site and ancillary infrastructure corridors following eventual facility decommissioning	Soil and land assessment and rehabilitation strategy for the dewatering borehole site and associated infrastructure.

Kind Regards

Edwina White
Regional Environmental Manager - Newnes
☎ (02) 6355 9804
📠 (02) 6355 9838
📱 0427 780 786
⌨ Edwina.White@centennialcoal.com.au
🖱 www.centennialcoal.com.au

Be green - read on the screen

Centennial Coal
West

Pre-Project

Risk Assessment Register

Dyadem Stature for Risk Management:

Risk Assessment Title: Bore 7 and 8 Project Approval
Version: 1
Region: West
Site: Springvale UG
Department: Surface
Equipment / Process: Process
Stature Risk Assessment No.: 1000218001
Study Lifecycle State: Risk Assessment In Progress
Potential Hazard No.:
PULSE Actions Required URL:
Site Risk Assessment Ref. No. (Optional):

Springvale Coal is seeking to prepare an Environmental Assessment (EA) to support an application for a Modification of the current development consent under the NSW *Environmental Planning and Assessment Act 1979* (**EP&A Act**). This modification (**The Project**) includes the construction and operation of additional surface mine dewatering facilities (Bores 7 and 8).

The following Hierarchy of Controls offers a framework for considering the effectiveness of controls. Note that the effectiveness of a control that is intended to reduce a risk decreases from top to bottom of the list. In other words, the closer the control type is to the top of the hierarchy, the more potentially effective the control.

·Eliminate the hazard or energy source (do not use the energy)
·Minimise or replace the hazard or energy source (reduce the amount of energy to a less damaging level or replace the energy with another that has less potential negative consequences)
·Control the hazard or energy using engineered devices (ex. Lock outs, chemical containers, mechanical roof support, gas monitors, etc.)
·Control the hazard or energy by using physical barriers (ex. machine guarding, warning signs, etc.)
·Control the hazard or energy with procedures (ex. Isolation procedures, standard operating procedures, etc.)
·Control the hazard or energy with personal protective equipment (ex. hard hats, boots with toe caps, gloves, safety glasses, welding gear, etc.)
·Control the hazard or energy with warnings and awareness (ex. posters, labels, stickers, verbal warnings, etc.)

The key objectives of the risk assessment are:

To identify, assess and prioritise environmental and community issues associated with the project to ensure they are assessed to an appropriate level within the environmental assessment process.
To identify any potential knowledge gaps requiring further assessment in the EA.

The following aspects will be assessed:

Tenure and land ownership
Ecology
Cultural Heritage
Noise
Traffic and transport
Air quality
Surface water (erosion and sediment control)
Groundwater
Greenhouse gas
Visual amenity
Landuse/land capability
Rehabilitation and closure
Community impacts
Bushfire
Waste management

The risk assessment will cover potential risks associated with the construction and operation of additional dewatering bores. Two facility footprints of 120m x 120m each will be assessed, in addition to a total of 5,110m of access track and power/pipe alignment. This equates to a total assessment area of 33.54ha, however it is expected that the actual area of initial disturbance will be limited to an area of approximately 10ha (of which approximately 2.5ha is pre-existing access track or forest fire trail).

Yes/No	Method
Yes	Workplace Risk Assessment and Control (WRAC)
No	Fault Tree Analysis (FTA)
No	Safety Integrity Level Analysis to Australian Standard 61508 (SIL)
No	Bow Tie Analysis (BTA)
No	Failure Modes and Effects Analysis (FMEA)
No	Hazard and Operability Analysis (HAZOP)

Document Name	Title	Version	Referenced Document Date
Project Description	Springvale Mine Dewatering Bore 8 Project Description	1	11-Aug-2011
Scope of Work	Springvale Mine Dewatering Bore Principal Consultant Scope of Work	1	01-Sep-2011

Date	Description	Location	Start Time	End Time	Comment
1. 16-Nov-2011	Scoping	Springvale Boardroom	12:00 PM	2:00 PM	
2. 17-Nov-2011	Assessment	Springvale Boardroom	9:00 AM	3:00 PM	
3.	Review				

Name	Title	Company	Industry Start Date	Yrs. of Exp.	Mobile Phone #	E-Mail Address	Pulse User No.	Role	Attendance		
									1. 16-Nov-2011	2. 17-Nov-2011	3.
Tony King	Environmental Coordinator	Springvale Mine UG Operation	05-Apr-1988	24		Tony.King@centennialcoal.com.au	140109				
Andrew Hutton	Facilitator	GSSE	27-Jan-1996	16	0409 288 909	hutton@gssenvironmental.com					
Nicole Armit	Facilitator	GSSE	24-Jan-2000	12	0407910841	armit@gssenvironmental.com					
Rebecca Pagan	Forester	Forests NSW	17-Jan-2006	6		rebecca.pagan@sf.nsw.gov.au					
Paul Rutzou	Senior Geologist	Springvale Mine UG Operation	20-Feb-2000	12	0428 668 069	paul.rutzou@centennialcoal.com.au	140077				
Tom Hollis	Graduate Environmental Officer	Centennial Coal	16-Jan-2011	1		tom.hollis@centennialcoal.com.au					
John Swane	Manager of Mechanical Engineering	Springvale Mine UG Operation	12-Nov-1974	37	0419 501655	john.swane@centennialcoal.com.au	140069				
Edwina White	Regional Environment Manager	Centennial Coal									
Rod Banks	Electrical Superintendent	Springvale Mine UG Operation	16-Aug-2004	7	0407 580349	Rod.Banks@centennialcoal.com.au	140111				
Sophie Whittaker	Environmental Scientist	GSSE	17-Apr-2009	3	0411788127	whittaker@gssenvironmental.com					
James Tomlin (by phone)	Hydrogeologist	AGE									

Approver	Scope Confirmation	Date	Comments
1. Richard Gelson	Yes	November 16, 2011	

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control	Bow Tie Extension
1. Land Tenure/ownership	There is a risk to Springvale UG from ::: Failure to achieve an occupation permit from Forests NSW ::: Caused by: Inadequate consultation and communication Resulting in: Failure to meet project timelines.	1.1.a. Existing occupation permit in place. 1.1.b. Consultation with Forests NSW and existing relationship	**D** (Pb)	3 (F)	17 (M)	2. Forests NSW require spatial information and Project Approval from DP&I. 3. Finalise stakeholder engagement strategy for the Project	
	There is a risk to Springvale UG from ::: Failure to identify native title ::: Caused by: Inadequate assessment of title over project area Resulting in: Failure to meet project timeframes and increased costs to the project associated with negotiations.	1.2.a. Engaged specialist archaeologists to undertake assessment. 1.2.b. Corporate awareness of issues. 1.2.c. Six-monthly meetings held with the Gundungarra 1.2.d. Existing agreements 1.2.e. Consultation has commenced in accordance with the ACHCRs	**D** (Pb)	3 (F)	17 (M)	3. Finalise stakeholder engagement strategy for the Project	
	There is a risk to Springvale UG from ::: Failure to identify crown roads within project area ::: Caused by: Inadequate assessment of project area Resulting in: Failure to meet project timelines.	1.3.a. Cadastre layers are available	**E** (Pb)	4 (F)	23 (L)	1. Confirm presence of crown roads in project area - source cadastre layers if required from Land and Property Management Authority.	
	There is a risk to Springvale UG from ::: Restricted access to the borehole site ::: Caused by: Change in tenure over the Project Area (from State Forest to State Conservation Area) Resulting in: Significant restriction to proposed operations.	1.4.a. Corporate awareness of potential change in land tenure 1.4.b. Existing relationship with Forests NSW	**C** (D)	3 (F)	13 (S)	4. Investigate possibility of obtaining an MPL over project area following granting of Project Approval from DP&I. 5. Include consultation with DPI (titles) in stakeholder consultation strategy	

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control	Bow Tie Extension
2. Ecology	There is a risk to Springvale UG from ::: NSW and/or federally listed endangered species found within project area ::: Caused by: Location of the project area (bore hole and infrastructure corridor) Resulting in: Delay to project approval due to referral process or failure to obtain approval.	2.1.a. Specialist consultant has been engaged to undertake ecological assessment 2.1.b. Surveys undertaken with sufficient lead time 2.1.c. Good understanding of the ecology of the area due to previous projects 2.1.d. Area being assessed is greater than required (i.e. 10m road/corridor with 60m being assessed)	**C** (Pb)	3 (F)	13 (S)	24. Review the project layout to minimise any interactions with endangered/listed species 25. Undertake a review of the preliminary outcomes of the ecology assessment prior to the end of 2011 to understand the impacts on the project layout	
	There is a risk to Springvale UG from ::: NSW and/or federally listed endangered species found within project areas ::: Caused by: Location of the project area (bore hole and infrastructure corridor) Resulting in: The need to establish substantial offsets.	2.2.a. Specialist consultant has been engaged to undertake ecological assessment 2.2.b. Surveys undertaken with sufficient lead time 2.2.c. Area being assessed is greater than required (i.e. 10m road/corridor with 60m being assessed)	**D** (Pb)	3 (F)	17 (M)	25. Undertake a review of the preliminary outcomes of the ecology assessment prior to the end of 2011 to understand the impacts on the project layout 26. If offsets are required; discuss with CEY whether any offset opportunities are available (at what ratio).	
	There is a risk to Springvale UG from ::: Failure to identify all endangered/threatened species within project area ::: Caused by: Inadequate survey effort Resulting in: Failure to obtain workable approval.	2.3.a. Specialist consultant has been engaged to undertake ecological assessment 2.3.b. Good understanding of the ecology of the area due to previous projects 2.3.c. Area being assessed is greater than required (i.e. 10m road/corridor with 60m being assessed)	**E** (Pb)	3 (F)	20 (L)		
3. Traffic and transport	There is a risk to Springvale UG from ::: Temporary increase in traffic into project area ::: Caused by: Construction activities associated with the new bore and associated infrastructure corridor	3.1.a. Existing traffic management plan for operations on the Newnes Plateau 3.1.b. Existing relationship with Forests NSW (Western region) regarding track maintenance 3.2.b. No change to coal clearance	**D** (Pb)	4 (R)	21 (L)	6. Notify Forests NSW when drill rigs are to be moved into project area. 7. Review and update existing traffic management plan. Include commitment to abide by Forests NSW traffic management procedures i.e.: two way radio contact on entering area.	

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control	Bow Tie Extension
	Resulting in: Damage to local roads or unacceptable impacts on current forestry operations and the local community.	system (overland coal conveyor) proposed					
4. Noise	There is a risk to Springvale UG from ::: Exceedance of noise criteria at the nearest sensitive receptors ::: Caused by: Construction activities associated with the new bore and associated infrastructure corridor Resulting in: Onerous development consent conditions imposed or potential impacts on local community.	4.3.a. No sensitive receptors in vicinity of new bore site. Nearest receptors are approximately 9 km away. 4.3.b. Short term construction duration. 4.3.c. Noise levels limited by OH&S noise limits	**D** (D)	5 (R)	24 (L)	19. Construction noise to be included in Noise Assessment.	
5. Aboriginal and European heritage	There is a risk to Springvale UG from ::: Unavoidable impact to known or unknown Aboriginal / European sites ::: Caused by: Construction activities associated with the new bore and associated infrastructure corridor Resulting in: A change to the preferred project layout, e.g.: alignment of infrastructure corridor and/or bore.	5.1.a. Specialist consultant has been engaged 5.1.b. Area being assessed is greater than required (i.e. 10m road/corridor with 60m being assessed) 5.1.c. Stakeholder engagement strategy 5.1.d. Consultation has commenced in accordance with the ACHCRs 5.1.e. Six-monthly meetings held with the Gundungarra	**D** (Pb)	3 (F)	17 (M)	27. Review the project layout to minimise any interactions with the known Aboriginal sites (following survey) - complete by the end of Jan 2012.	
	There is a risk to Springvale UG from ::: Failure to obtain community support ::: Caused by: Inadequate consultation / impacts Resulting in: Failure to obtain approval.	5.2.a. Specialist consultant has been engaged 5.2.b. Area being assessed is greater than required (i.e. 10m road/corridor with 60m being assessed) 5.2.c. Stakeholder engagement strategy 5.2.d. Six-monthly meetings held with the Gundungarra 5.2.e. Consultation has commenced in accordance with the	**D** (Pb)	3 (F)	17 (M)	28. Confirm that the scope of works for RPS includes consideration for European heritage.	

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control	Bow Tie Extension
		ACHCRs					
6. Air Quality	There is a risk to Springvale UG from ::: Exceeding Air Quality Criteria ::: Caused by: Construction activities associated with the new bore and associated infrastructure corridor Resulting in: Onerous development consent conditions imposed.	6.1.a. Watercart 6.1.b. Availability of water in the area 6.1.c. Short term construction duration.	**E** (D)	5 (E)	25 (L)	21. Construction Management Plan 22. Engage specialist consultant to undertake Air Quality Assessment	
	There is a risk to Springvale UG from ::: Exceeding Air Quality Criteria ::: Caused by: Construction activities associated with the new bore and associated infrastructure corridor Resulting in: Unacceptable impacts on the community.	6.2.a. Availability of water in the area 6.2.b. Short term construction duration. 6.2.c. Watercart 6.4.b. No changes proposed to coal clearance system and stockpiles.	**D** (D)	5 (R)	24 (L)	21. Construction Management Plan 22. Engage specialist consultant to undertake Air Quality Assessment	
7. Surface Water	There is a risk to Springvale UG from ::: Discharge of sediment laden water from the bore hole site ::: Caused by: Construction activities associated with the new bore and associated infrastructure corridor (civil works) Resulting in: Unacceptable impacts on the environment.	7.1.a. Known industry guidelines for sediment control 7.1.b. Conditions relating to erosion and sediment control within Occupation Permit	**D** (Pb)	4 (E)	21 (L)	11. Inspection regime during construction 12. Document erosion and sediment controls, include in commitment in EA	
	There is a risk to Springvale UG from ::: Discharge of sediment laden water from the bore hole site ::: Caused by: Drilling activities (boreholes only) Resulting in:	7.2.a. Previous experience 7.2.b. Drilling sump design review undertaken by Aurecon 7.2.c. Known existing industry guidelines for sediment control 7.2.d. Allowing for larger drill pad for increased sump capacity	**D** (Pb)	4 (E)	21 (L)	16. Develop a sump management procedure, including possibility of installing pipeline to take water from sumps to bore 5	

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control	Bow Tie Extension
	Unacceptable impacts on the environment.						
8. Ground Water	There is a risk to Springvale UG from ::: Failure to meet dewatering expectations ::: Caused by: Inadequate assessment and update of the groundwater model Resulting in: Interruption to production.	8.1.a. Existing groundwater model 8.1.b. Groundwater monitoring network	**D** (D)	3 (BI)	17 (M)	13. Engage specialist consultant to peer review existing groundwater model to assess regional groundwater impacts associated with the project.	
	There is a risk to Springvale UG from ::: Unacceptable impacts on the regional groundwater system (other users) ::: Caused by: Inadequate assessment and update of the groundwater model Resulting in: Community opposition to the project or Failure to obtain approval.	8.2.a. No other known significant users	**D** (D)	4 (R)	21 (L)	13. Engage specialist consultant to peer review existing groundwater model to assess regional groundwater impacts associated with the project. 14. Conduct bore licence search to confirm presence of regional groundwater users	
	There is a risk to Springvale UG from ::: Unacceptable impacts on the regional groundwater dependant ecosystems (hanging swamps). ::: Caused by: Inadequate assessment and update of the groundwater model Resulting in: Failure to obtain approval or the need to establish substantial offsets.	8.3.a. Extensive monitoring system in place. 8.3.b. Good understanding of interactions between surface aquifers and groundwater dependant ecosystems 8.3.c. Good understanding of long-term impacts of mining on groundwater dependant ecosystems 8.3.d. New dewatering bore will be fully lined and grouted, therefore no direct connectivity	**D** (Pb)	4 (E)	21 (L)	13. Engage specialist consultant to peer review existing groundwater model to assess regional groundwater impacts associated with the project.	
	There is a risk to Springvale UG from ::: Unacceptable impacts on the regional groundwater dependant ecosystems (hanging swamps). :::	8.4.a. Stakeholder engagement strategy 8.4.b. Extensive groundwater monitoring network	**B** (Pb)	4 (R)	14 (S)	13. Engage specialist consultant to peer review existing groundwater model to assess regional groundwater impacts associated with the project. 3. Finalise stakeholder engagement strategy for the Project	

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control	Bow Tie Extension
	Caused by: Inadequate assessment and update of the groundwater model Resulting in: Community opposition to the project.						
	There is a risk to Springvale UG from ::: Inability to transfer existing bore licence allocation to new facility ::: Caused by: Change in legislation from Water Act 1912 to Water Management Act 2000 Resulting in: Failure to meet project timelines.	8.5.a. Relationship with the NSW Office of Water 8.5.b. Understanding of legislation changes	**D** (D)	2 (BI)	12 (S)	3. Finalise stakeholder engagement strategy for the Project 15. Engage and consult with the NSW Office of Water regarding transfer of water allocation	
	There is a risk to Springvale UG from ::: New groundwater model indicates substantial increase in water make requiring an increase in volume allocation ::: Caused by: Review and update of groundwater model Resulting in: Need to seek new increased licence allocation.	8.6.a. Existing groundwater model 8.6.b. Spare capacity within existing licence allocation 8.6.c. Trend analysis	**D** (D)	4 (F)	21 (L)	13. Engage specialist consultant to peer review existing groundwater model to assess regional groundwater impacts associated with the project.	
9. Greenhouse Gas	There is a risk to Springvale UG from ::: Greater than expected GHG emissions ::: Caused by: Increase release of gas due to construction and installation of bore and associated infrastructure. Resulting in: Community opposition to the project.	9.1.a. Current NGERs reporting 9.1.b. Stakeholder engagement strategy 9.1.c. Corporate awareness of issues.	**D** (Pb)	5 (R)	24 (L)	29. Engage specialist consultant to undertake a GHG assessment and provide advice on mitigation options	
10. Visual Amenity	There is a risk to Springvale UG from ::: Unacceptable impact on the visual amenity of the area :::	10.1.a. No sensitive receptors in vicinity of new bore site. Nearest receptors are approximately 9 km away.	**D** (Pb)	5 (R)	24 (L)		

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control	Bow Tie Extension
	Caused by: Construction and installation of bore and associated infrastructure Resulting in: Onerous development consent conditions imposed.	10.1.b. Site located in the forest away from residential areas 10.1.c. Minor temporary buildings and infrastructure which are coloured to blend into the surroundings					
11. Land Use / Land Capability	There is a risk to Springvale UG from ::: Current land use compromised (Ag land, etc) ::: Caused by: Construction and installation of bore and associated infrastructure Resulting in: Onerous development consent conditions imposed.	11.1.a. Site currently used as a State Forest, it is not suitable for agriculture 11.1.b. Bore is temporary and rehabilitation commitments are to return the site to as similar to the previous land use as possible 11.1.c. Centennial have experience in rehabilitation of drilling and bore hole sites on the plateau	**D** (Pb)	5 (E)	24 (L)		
12. Bushfire	There is a risk to Springvale UG from ::: Bushfire ::: Caused by: Construction, installation and operation of bore and associated infrastructure Resulting in: Damage to the company's reputation or impact on local community / environment.	12.1.a. Bushfire management plan 12.1.b. Hot work permit system 12.1.c. Guidelines from Forests NSW regarding bushfire preparedness 12.1.d. Fire fighting capabilities will be installed at dewatering site, including water fill points. 12.1.e. Fire fighting capabilities at existing dewatering bores, as well as dams for fire fighting. 12.1.f. Previous experience and safety record - no bushfire related incidents to date	**D** (Pb)	4 (R)	21 (L)	8. Confirm required asset protection zone around infrastructure. 9. Confirm assessments (ecology and archaeology) cover required asset protection zone as soon as possible.	
	There is a risk to Springvale UG from ::: Damage or loss of dewatering infrastructure ::: Caused by: Bushfire in the vicinity (not started by project) or hazard reduction burn by Forests NSW Resulting in:	12.2.a. Notification from Forests NSW on high risk days which limits activities that can be undertaken. 12.2.b. Bushfire management plan. 12.2.c. Fire fighting capabilities will be installed at dewatering sites, including water fill points. 12.2.d. Fire fighting capabilities at	**D** (IF)	2 (BI)	12 (S)	8. Confirm required asset protection zone around infrastructure. 10. Supply spatial information to Forest NSW detailing location of infrastructure on a regular basis (six monthly) and as part of EA process.	

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control	Bow Tie Extension
	Financial loss (reinstallation of infrastructure and loss of production) or inability to dewater the pit.	existing dewatering bores, as well as dams for fire fighting. 12.2.e. Contractor management plan, includes requirement to have EPERB and satellite phone on site					
13. Waste Management general/recyclable - (to include bore hole cuttings)	There is a risk to Springvale UG from ::: Inadequate management of waste material during construction and operation ::: Caused by: waste generated during construction Resulting in: Impact on local community / environment.	13.1.a. Management of cuttings from existing dewatering bores	**C** (Pb)	4 (E)	18 (M)	17. Construction management plan to address management of drill cuttings.	
14. Rehabilitation and closure	There is a risk to Springvale UG from ::: Failure to adequately rehabilitate the site once no longer required ::: Caused by: Inadequate rehabilitation effort Resulting in: Damage to the company's reputation.	14.1.a. Bore is temporary and rehabilitation commitments are to return the site to as similar to the previous land use as possible 14.1.b. Centennial have experience in rehabilitation of drilling and bore hole sites on the plateau 14.1.c. Stakeholder engagement strategy	**D** (Pb)	4 (R)	21 (L)		
15. Community identification and engagement	There is a risk to Springvale UG from ::: Vocal community opposition (e.g. active NGOs) ::: Caused by: Inadequate identification and engagement of the appropriate stakeholders Resulting in: Damage to the company's reputation or failure to obtain approval.	15.1.a. Stakeholder engagement strategy 15.1.b. Active engagement strategy already in place (regular scheduled meetings)	**B** (Pb)	5 (R)	19 (M)	31. Ensure stakeholder engagement plan is executed	

Risk Register in Order of Risk Ranking

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
8. Ground Water	There is a risk to Springvale UG from ::: Inability to transfer existing bore licence allocation to new facility ::: Caused by: Change in legislation from Water Act 1912 to Water Management Act 2000 Resulting in: Failure to meet project timelines.	8.5.a. Relationship with the NSW Office of Water 8.5.b. Understanding of legislation changes	**D** (D)	2 (BI)	12 (S)	3. Finalise stakeholder engagement strategy for the Project 15. Engage and consult with the NSW Office of Water regarding transfer of water allocation
12. Bushfire	There is a risk to Springvale UG from ::: Damage or loss of dewatering infrastructure ::: Caused by: Bushfire in the vicinity (not started by project) or Hazard reduction burn by Forests NSW Resulting in: Financial loss (reinstallation of infrastructure and loss of production) or inability to dewater the pit.	12.2.a. Notification from Forests NSW on high risk days which limits activities that can be undertaken. 12.2.b. Bushfire management plan. 12.2.c. Fire fighting capabilities will be installed at dewatering sites, including water fill points. 12.2.d. Fire fighting capabilities at existing dewatering bores, as well as dams for fire fighting. 12.2.e. Contractor management plan, includes requirement to have EPERB and satellite phone on site	**D** (IF)	2 (BI)	12 (S)	8. Confirm required asset protection zone around infrastructure. 10. Supply spatial information to Forest NSW detailing location of infrastructure on a regular basis (six monthly) and as part of EA process.
1. Land Tenure/ownership	There is a risk to Springvale UG from ::: That access is restricted to the borehole site ::: Caused by: Change in tenure over the Project Area (from State Forest to State Conservation Area) Resulting in: Significant restriction to proposed operations.	1.4.a. Corporate awareness of potential change in land tenure 1.4.b. Existing relationship with Forests NSW	**C** (D)	3 (F)	13 (S)	4. Investigate possibility of obtaining an MPL over project area following granting of Project Approval from DP&I. 5. Include consultation with DPI (titles) in stakeholder consultation strategy
2. Ecology	There is a risk to Springvale UG from ::: NSW and/or federally listed	2.1.a. Specialist consultant has been engaged to undertake ecological assessment	**C** (Pb)	3 (F)	13 (S)	24. Review the project layout to minimise any interactions with endangered/listed species

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
	endangered species found within project areas ::: Caused by: Location of the project area (bore hole and infrastructure corridor) Resulting in: Delay to project approval due to referral process or failure to obtain approval.	2.1.b. Surveys undertaken with sufficient lead time 2.1.c. Good understanding of the ecology of the area due to previous projects 2.1.d. Area being assessed is greater than required (i.e. 10m road/corridor with 60m being assessed)				25. Undertake a review of the preliminary outcomes of the ecology assessment prior to the end of 2011 to understand the impacts on the project layout
8. Ground Water	There is a risk to Springvale UG from ::: Unacceptable impacts on the regional groundwater dependant ecosystems (hanging swamps). ::: Caused by: Inadequate assessment and update of the groundwater model Resulting in: Community opposition to the project.	8.4.a. Stakeholder engagement strategy 8.4.b. Extensive groundwater monitoring network	**B** (Pb)	4 (R)	14 (S)	13. Engage specialist consultant to peer review existing groundwater model to assess regional groundwater impacts associated with the project. 3. Finalise stakeholder engagement strategy for the Project
1. Land Tenure/ownership	There is a risk to Springvale UG from ::: Failure to achieve an occupation permit from Forests NSW ::: Caused by: Inadequate consultation and communication Resulting in: Failure to meet project timelines.	1.1.a. Existing occupation permit in place. 1.1.b. Consultation with Forests NSW and existing relationship	**D** (Pb)	3 (F)	17 (M)	2. Forests NSW require spatial information and the Project Approval from DP&I. 3. Finalise stakeholder engagement strategy for the Project
1. Land Tenure/ownership	There is a risk to Springvale UG from ::: Failure to identify native title ::: Caused by: Inadequate assessment of title over project area Resulting in: Failure to meet project timeframes and increased costs to the project associated with negotiations.	1.2.a. Engaged specialist archaeologists to undertake assessment. 1.2.b. Corporate awareness of issues. 1.2.c. Six-monthly meetings held with the Gundungarra 1.2.d. Existing agreements 1.2.e. Consultation has commenced in accordance with the ACHCRs	**D** (Pb)	3 (F)	17 (M)	3. Finalise stakeholder engagement strategy for the Project
2. Ecology	There is a risk to Springvale UG from	2.2.a. Specialist consultant has	**D**	3	17	25. Undertake a review of the preliminary outcomes of the ecology assessment

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
	::: NSW and/or federally listed endangered species found within project areas ::: Caused by: Location of the project area (bore hole and infrastructure corridor) Resulting in: The need to establish substantial offsets.	been engaged to undertake ecological assessment 2.2.b. Surveys undertaken with sufficient lead time 2.2.c. Area being assessed is greater than required (i.e. 10m road/corridor with 60m being assessed)	(Pb)	(F)	(M)	prior to the end of 2011 to understand the impacts on the project layout 26. If offsets are required; discuss with CEY whether any offset opportunities are available (at what ratio).
5. Aboriginal and European heritage	There is a risk to Springvale UG from ::: Unavoidable impact to known or unknown Aboriginal / European sites ::: Caused by: Construction activities associated with the new bore and associated infrastructure corridor Resulting in: A change to the preferred project layout, e.g.: alignment of infrastructure corridor and/or bore.	5.1.a. Specialist consultant has been engaged 5.1.b. Area being assessed is greater than required (i.e. 10m road/corridor with 60m being assessed) 5.1.c. Stakeholder engagement strategy 5.1.d. Consultation has commenced in accordance with the ACHCRs 5.1.e. Six-monthly meetings held with the Gundungarra	**D** (Pb)	3 (F)	17 (M)	27. Review the project layout to minimise any interactions with the known Aboriginal sites (following survey) - complete by the end of Jan 2012.
5. Aboriginal and European heritage	There is a risk to Springvale UG from ::: Failure to obtain community support ::: Caused by: Inadequate consultation / impacts Resulting in: Failure to obtain approval.	5.2.a. Specialist consultant has been engaged 5.2.b. Area being assessed is greater than required (i.e. 10m road/corridor with 60m being assessed) 5.2.c. Stakeholder engagement strategy 5.2.d. Six-monthly meetings held with the Gundungarra 5.2.e. Consultation has commenced in accordance with the ACHCRs	**D** (Pb)	3 (F)	17 (M)	28. Confirm that the scope of works for RPS includes considerations for European heritage.
8. Ground Water	There is a risk to Springvale UG from ::: Failure to meet dewatering expectations ::: Caused by: Inadequate assessment and update	8.1.a. Existing groundwater model 8.1.b. Groundwater monitoring network	**D** (D)	3 (BI)	17 (M)	13. Engage specialist consultant to peer review existing groundwater model to assess regional groundwater impacts associated with the project.

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
	of the groundwater model Resulting in: Interruption to production.					
9. Greenhouse Gas	There is a risk to Springvale UG from ::: Greater than expected GHG emissions ::: Caused by: Increase release of gas due to construction and installation of bore and associated infrastructure. Resulting in: Requirement to consider alternate abatement (particularly in lieu of the carbon price).	9.2.a. Current NGERs reporting 9.2.b. Corporate awareness of issues.	**D** (Pb)	3 (F)	17 (M)	29. Engage specialist consultant to undertake a GHG assessment and provide advice on mitigation options 30. Consider the flow on cost effects in the business case for the mine.
13. Waste Management general/recyclable - (to include bore hole cuttings)	There is a risk to Springvale UG from ::: Inadequate management of waste material during construction and operation ::: Caused by: waste generated during construction Resulting in: Impact on local community / environment.	13.1.a. Management of cuttings from existing dewatering bores	**C** (Pb)	4 (E)	18 (M)	17. Construction management plan to address management of drill cuttings.
15. Community identification and engagement	There is a risk to Springvale UG from ::: Vocal community opposition (e.g. active NGOs) ::: Caused by: Inadequate identification and engagement of the appropriate stakeholders Resulting in: Damage to the company's reputation or failure to obtain approval.	15.1.a. Stakeholder engagement strategy 15.1.b. Active engagement strategy already in place (regular scheduled meetings)	**B** (Pb)	5 (R)	19 (M)	31. Ensure stakeholder engagement plan is executed
2. Ecology	There is a risk to Springvale UG from ::: Failure to identify all endangered/threatened species within project area :::	2.3.a. Specialist consultant has been engaged to undertake ecological assessment 2.3.b. Good understanding of the ecology of the area due to	**E** (Pb)	3 (F)	20 (L)	

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
	Caused by: Inadequate survey effort Resulting in: Failure to obtain workable approval.	previous projects 2.3.c. Area being assessed is greater than required (i.e. 10m road/corridor with 60m being assessed)				
3. Traffic and transport	There is a risk to Springvale UG from ::: Temporary increase in traffic into project area ::: Caused by: Construction activities associated with the new bore and associated infrastructure corridor Resulting in: Damage to local roads or unacceptable impacts on current forestry operations and the local community.	3.1.a. Existing traffic management plan for operations on the Newnes Plateau 3.1.b. Existing relationship with Forests NSW (Western region) regarding track maintenance	**D** (Pb)	4 (R)	21 (L)	6. Notify Forests NSW when drill rigs are to be moved into project area. 7. Review and update existing traffic management plan. Include commitment to abide by Forests NSW traffic management procedures i.e.: two way radio contact on entering area.
7. Surface Water	There is a risk to Springvale UG from ::: Discharge of sediment laden water from the bore hole site ::: Caused by: Construction activities associated with the new bore and associated infrastructure corridor (civil works) Resulting in: Unacceptable impacts on the environment.	7.1.a. Known industry guidelines for sediment control 7.1.b. Conditions relating to erosion and sediment control within Occupation Permit	**D** (Pb)	4 (E)	21 (L)	11. Inspection regime during construction 12. Document erosion and sediment controls, include in commitment in EA
7. Surface Water	There is a risk to Springvale UG from ::: Discharge of sediment laden water from the bore hole site ::: Caused by: Drilling activities (boreholes only) Resulting in: Unacceptable impacts on the environment.	7.2.a. Previous experience 7.2.b. Drilling sump design review undertaken by Aurecon 7.2.c. Known existing industry guidelines for sediment control 7.2.d. Allowing for larger drill pad for increased sump capacity	**D** (Pb)	4 (E)	21 (L)	16. Develop a sump management procedure, including possibility of installing pipeline to take water from sumps to bore 5
8. Ground Water	There is a risk to Springvale UG from ::: Unacceptable impacts on the	8.2.a. No other known significant users	**D** (D)	4 (R)	21 (L)	13. Engage specialist consultant to peer review existing groundwater model to assess regional groundwater impacts associated with the project. 14. Conduct bore licence search to confirm presence of regional groundwater

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
	regional groundwater system (other users) ::: Caused by: Inadequate assessment and update of the groundwater model Resulting in: Community opposition to the project or Failure to obtain approval.					users
8. Ground Water	There is a risk to Springvale UG from ::: Unacceptable impacts on the regional groundwater dependant ecosystems (hanging swamps). ::: Caused by: Inadequate assessment and update of the groundwater model Resulting in: Failure to obtain approval or the need to establish substantial offsets.	8.3.a. Extensive monitoring system in place. 8.3.b. Good understanding of interactions between surface aquifers and groundwater dependant ecosystems 8.3.c. Good understanding of long-term impacts of mining on groundwater dependant ecosystems 8.3.d. New dewatering bore will be fully lined and grouted, therefore no direct connectivity	**D** (Pb)	4 (E)	21 (L)	13. Engage specialist consultant to peer review existing groundwater model to assess regional groundwater impacts associated with the project.
8. Ground Water	There is a risk to Springvale UG from ::: New groundwater model indicates substantial increase in water make requiring an increase in volume allocation ::: Caused by: Review and update of groundwater model Resulting in: Need to seek new increased licence allocation.	8.6.a. Existing groundwater model 8.6.b. Spare capacity within existing licence allocation 8.6.c. Trend analysis	**D** (D)	4 (F)	21 (L)	13. Engage specialist consultant to peer review existing groundwater model to assess regional groundwater impacts associated with the project.
12. Bushfire	There is a risk to Springvale UG from ::: Bushfire ::: Caused by: Construction, installation and operation of bore and associated infrastructure Resulting in:	12.1.a. Bushfire management plan 12.1.b. Hot work permit system 12.1.c. Guidelines from Forests NSW regarding bushfire preparedness 12.1.d. Fire fighting capabilities will be installed at dewatering sites, including water fill points.	**D** (Pb)	4 (R)	21 (L)	8. Confirm required asset protection zone around infrastructure. 9. Confirm assessments (ecology and archaeology) cover required asset protection zone as soon as possible.

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
	Damage to the company's reputation or Impact on local community / environment.	12.1.e. Fire fighting capabilities at existing dewatering bores, as well as dams for fire fighting. 12.1.f. Previous experience and safety record - no bushfire related incidents to date				
14. Rehabilitation and closure	There is a risk to Springvale UG from ::: Failure to adequately rehabilitate the site once no longer required ::: Caused by: Inadequate rehabilitation effort Resulting in: Damage to the company's reputation.	14.1.a. Bore is temporary and rehabilitation commitments are to return the site to as similar to the previous land use as possible 14.1.b. Centennial have experience in rehabilitation of drilling and bore hole sites on the plateau 14.1.c. Stakeholder engagement strategy	**D** (Pb)	4 (R)	21 (L)	
1. Land Tenure/ownership	There is a risk to Springvale UG from ::: Failure to identify crown roads within project area ::: Caused by: Inadequate assessment of project area Resulting in: Failure to meet project timelines.	1.3.a. Cadastre layers are available	**E** (Pb)	4 (F)	23 (L)	1. Confirm presence of crown roads in project area - source cadastre layers if required from land and Property Management Authority.
4. Noise	There is a risk to Springvale UG from ::: Exceedance of noise criteria at the nearest sensitive receptors ::: Caused by: Construction activities associated with the new bore and associated infrastructure corridor Resulting in: Onerous development consent conditions imposed or Potential impacts on local community.	4.3.a. No sensitive receptors in vicinity of new bore site. Nearest receptors are approximately 9 km away. 4.3.b. Short term construction duration. 4.3.c. Noise levels limited by OH&S noise limits	**D** (D)	5 (R)	24 (L)	19. Construction noise to be included in Noise Assessment.
6. Air Quality	There is a risk to Springvale UG from ::: Exceeding Air Quality Criteria :::	6.2.a. Availability of water in the area 6.2.b. Short term construction duration.	**D** (D)	5 (R)	24 (L)	21. Construction Management Plan 22. Engage specialist consultant to undertake Air Quality Assessment

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
	Caused by: Construction activities associated with the new bore and associated infrastructure corridor Resulting in: Unacceptable impacts on the community.	6.2.c. Watercart				
9. Greenhouse Gas	There is a risk to Springvale UG from ::: Greater than expected GHG emissions ::: Caused by: Increase release of gas due to construction and installation of bore and associated infrastructure. Resulting in: Community opposition to the project.	9.1.a. Current NGERs reporting 9.1.b. Stakeholder engagement strategy 9.1.c. Corporate awareness of issues.	**D** (Pb)	5 (R)	24 (L)	29. Engage specialist consultant to undertake a GHG assessment and provide advice on mitigation options
10. Visual Amenity	There is a risk to Springvale UG from ::: Unacceptable impact on the visual amenity of the area ::: Caused by: Construction and installation of bore and associated infrastructure Resulting in: Onerous development consent conditions imposed.	10.1.a. No sensitive receptors in vicinity of new bore site. Nearest receptors are approximately 9 km away. 10.1.b. Site located in the forest away from residential areas 10.1.c. Minor temporary buildings and infrastructure which are coloured to blend into the surroundings	**D** (Pb)	5 (R)	24 (L)	
11. Land Use / Land Capability	There is a risk to Springvale UG from ::: Current land use compromised (Ag land, etc) ::: Caused by: Construction and installation of bore and associated infrastructure Resulting in: Onerous development consent conditions imposed.	11.1.a. Site currently used as a State Forest, it is not suitable for agriculture 11.1.b. Bore is temporary and rehabilitation commitments are to return the site to as similar to the previous land use as possible 11.1.c. Centennial have experience in rehabilitation of drilling and bore hole sites on the plateau	**D** (Pb)	5 (E)	24 (L)	
6. Air Quality	There is a risk to Springvale UG from	6.1.a. Watercart 6.1.b. Availability of water in the	**E** (D)	5 (E)	25 (L)	21. Construction Management Plan 22. Engage specialist consultant to undertake Air Quality Assessment

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
	::: Exceeding Air Quality Criteria ::: Caused by: Construction activities associated with the new bore and associated infrastructure corridor Resulting in: Onerous development consent conditions imposed.	area 6.1.c. Short term construction duration.				

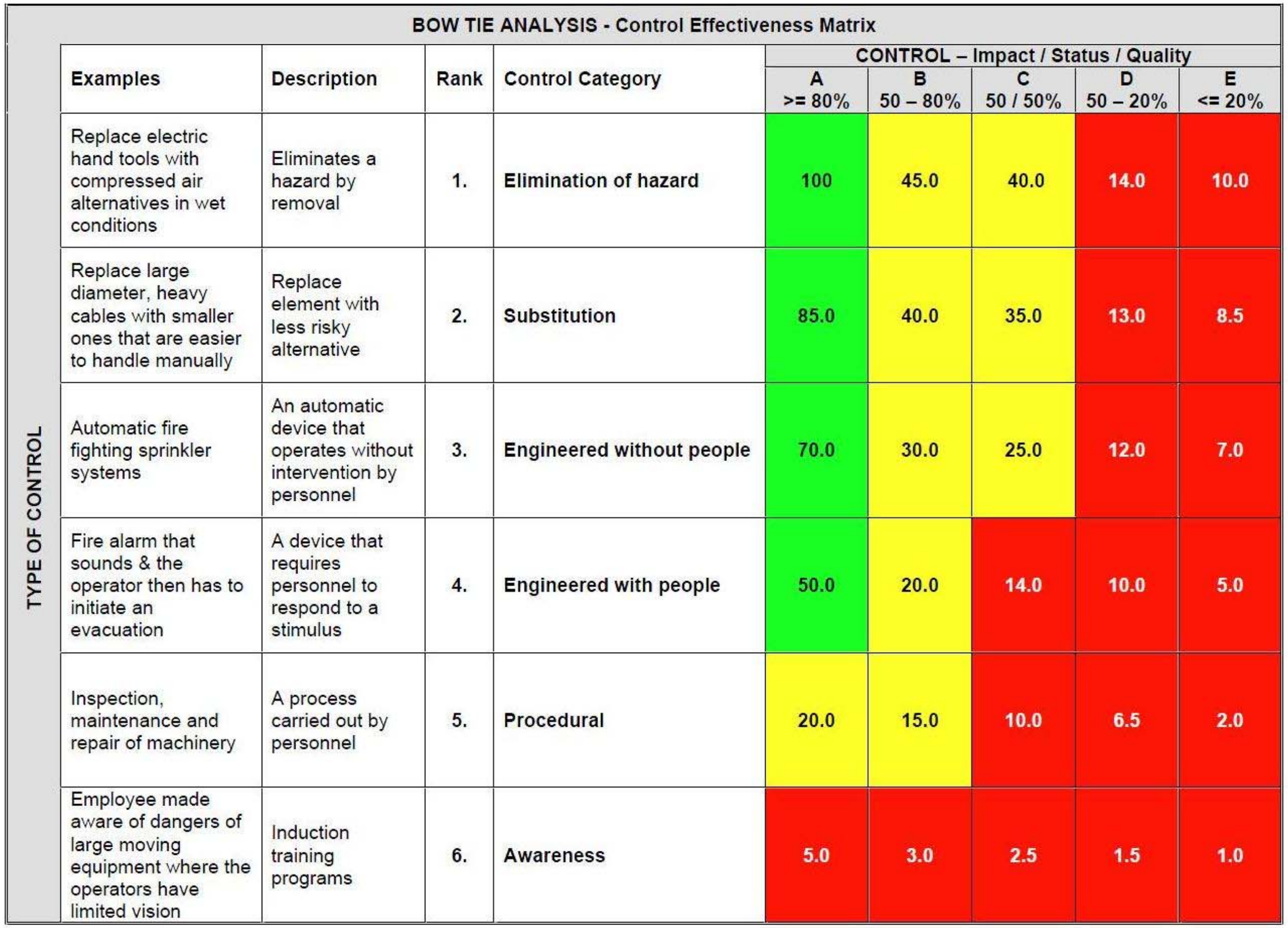
Recommended Controls Do NOT enter additional Recommended Controls on this sheet.	Place(s) Used	Allocated To (Only one SITE person for each Recommended Control)	Required By Date	Pulse User No.	PULSE Ref. No.
1. Confirm presence of crown roads in project area - source cadastre layers if required from Land and Property Management Authority.	Events: 1.3				
2. Forests NSW require spatial information and the Project Approval from DP&I.	Events: 1.1				
3. Finalise stakeholder engagement strategy for the Project	Events: 1.1, 1.2, 8.4, 8.5				
4. Investigate possibility of obtaining an MPL over project area following granting of Project Approval from DP&I.	Events: 1.4				
5. Include consultation with DPI (titles) in stakeholder consultation strategy	Events: 1.4				
6. Notify Forests NSW when drill rigs are to be moved into project area.	Events: 3.1				
7. Review and update existing traffic management plan. Include commitment to abide by Forests NSW traffic management procedures i.e.: two way radio contact on entering area.	Events: 3.1				
8. Confirm required asset protection zone around infrastructure.	Events: 12.1, 12.2				
9. Confirm assessments (ecology and archaeology) cover required assest protection zone as soon as possible.	Events: 12.1				
10. Supply spatial information to Forest NSW detailing location of infrastructure on a regular basis (six monthly) and as part of EA process.	Events: 12.2				
11. Inspection regime during construction	Events: 7.1				
12. Document erosion and sediment controls, include in commitment in EA	Events: 7.1				
13. Engage specialist consultant to peer review existing groundwater model to assess regional groundwater impacts associated with the project.	Events: 8.1, 8.2, 8.3, 8.4, 8.6				
14. Conduct bore licence search to confirm presence of regional groundwater users	Events: 8.2				
15. Engage and consult with the NSW Office of Water regarding transfer of water allocation	Events: 8.5				
16. Develop a sump management procedure, including possibility of installing pipeline to take water from sumps to bore 5	Events: 7.2				
17. Construction management plan to address management of drill cuttings.	Events: 13.1				

Recommended Controls Do NOT enter additional Recommended Controls on this sheet.	Place(s) Used	Allocated To (Only one SITE person for each Recommended Control)	Required By Date	Pulse User No.	PULSE Ref. No.
18. Undertake noise assessment targeting specific sources to recommend mitigation measures based on current monitoring.	Events: 4.2				
19. Construction noise to be included in Noise Assessment.	Events: 4.3				
20. Undertake noise assessment targeting specific sources to recommend mitigation measures based on current monitoring	Events: 4.1				
21. Construction Management Plan	Events: 6.1, 6.2				
22. Engage specialist consultant to undertake Air Quality Assessment	Events: 6.1, 6.2, 6.3				
23. Engage specialist consultant to undertake Air Quality Assessment	Events: 6.4				
24. Review the project layout to minimise any interactions with endangered/listed species	Events: 2.1				
25. Undertake a review of the preliminary outcomes of the ecology assessment prior to the end of 2011 to understand the impacts on the project layout	Events: 2.1, 2.2				
26. If offsets are required; discuss with CEY whether any offset opportunities are available (at what ratio).	Events: 2.2				
27. Review the project layout to minimise any interactions with the known Aboriginal sites (following survey) - complete by the end of Jan 2012.	Events: 5.1				
28. Confirm that the scope of works for RPS includes considerations for European heritage.	Events: 5.2				
29. Engage specialist consultant to undertake a GHG assessment and provide advice on mitigation options	Events: 9.1, 9.2				
30. Consider the flow on cost effects in the business case for the mine.	Events: 9.2				
31. Ensure stakeholder engagement plan is executed	Events: 15.1				

CENTENNIAL RISK MATRIX

	Consequence						Likelihood					
	Note: Consequence may result from a single event or may represent a cumulative impact over a period of 12 months. Use the worst case reasonable consequence if there is more than one.											
Rating	Impact to Annual Business Plan (F)	Personal Injury (PI)	Business Interruption (BI)	Legal (L)	Reputation (R)	Environment (E)	**A Certain**	**B Probable**	**C Possible**	**D Remote**	**E Improbable**	**Description (D)**
							Common”	Has Happened within Centennial”	“Could Happen & has happened in non-CEY operations	Not Likely	“Practically impossible	Probability (Pb)
							Frequent incidents	Regular incidents	Infrequent incidents	Unlikely to occur. Very few recorded or known incidents	May occur in exceptional circumstances. Almost no recorded incidents.	Incident Frequency (IF)
							Operations – within 3 months	Operations – within 2 years	Operations – within 5 years	Operations – within 10 years	Operations – within 30 years	Operations (Op)
							Project – Every project	Project – Every 2 projects	Project – Every 5 projects	Project – Every 10 projects	Project – Every 30 projects	Project (Pr)
1. Catastrophic	>$50m	Multiple Fatalities	> 1month	Prolonged litigation, heavy fines, potential jail term	Prolonged International media attention	Long term impairment habitats/ ecosystem	**1 (E)**	**2 (E)**	**5 (H)**	**7 (H)**	**11 (S)**	
2. Major	$10m - $50m	Single Fatality	1 week to 1 month	Major breach/ major litigation	International media attention	Long term effects of ecosystem	**3 (E)**	**4 (E)**	**8 (H)**	**12 (S)**	**16 (M)**	
3. Moderate	$1m - $10m	Serious/ Disabling Injury	1 day to 1 week	Serious breach of regulation. prosecution/ fine	National media attention	Serious medium term environmental effects	**6 (H)**	**9 (H)**	**13 (S)**	**17 (M)**	**20 (L)**	
4. Minor	$100k - $1m	Lost Time Injury	12 hrs to 1 day	Non-compliance, breaches in regulation	Adverse local public attention	Minor effects to physical environment	**10 (S)**	**14 (S)**	**18 (M)**	**21 (L)**	**23 (L)**	
5. Insignificant	<$100k	First Aid Treatment Only	< 12 hrs	Low level compliance issue	Local complaints	Limited physical damage	**15 (S)**	**19 (M)**	**22 (L)**	**24 (L)**	**25 (L)**	

Risk Rating	Risk Category		Generic Management Actions
1 to 4	E	Extreme	Immediate intervention required from senior management to eliminate or reduce this risk
5 to 9	H	High	Imperative to eliminate or reduce risk to a lower level by the introduction of control measures. Management planning required at senior levels
10 to 15	S	Significant	Corrective action required, senior management attention needed to eliminate or reduce risk
16 to 19	M	Moderate	Corrective action to be determined, management responsibility must be specified
20 to 25	L	Low	Monitor and manage by corrective action where practicable



BOW TIE ANALYSIS - Control Effectiveness Matrix

	Examples	Description	Rank	Control Category	CONTROL – Impact / Status / Quality				
					A >= 80%	B 50 – 80%	C 50 / 50%	D 50 – 20%	E <= 20%
TYPE OF CONTROL	Replace electric hand tools with compressed air alternatives in wet conditions	Eliminates a hazard by removal	1.	**Elimination of hazard**	100	45.0	40.0	14.0	10.0
	Replace large diameter, heavy cables with smaller ones that are easier to handle manually	Replace element with less risky alternative	2.	**Substitution**	85.0	40.0	35.0	13.0	8.5
	Automatic fire fighting sprinkler systems	An automatic device that operates without intervention by personnel	3.	**Engineered without people**	70.0	30.0	25.0	12.0	7.0
	Fire alarm that sounds & the operator then has to initiate an evacuation	A device that requires personnel to respond to a stimulus	4.	**Engineered with people**	50.0	20.0	14.0	10.0	5.0
	Inspection, maintenance and repair of machinery	A process carried out by personnel	5.	**Procedural**	20.0	15.0	10.0	6.5	2.0
	Employee made aware of dangers of large moving equipment where the operators have limited vision	Induction training programs	6.	**Awareness**	5.0	3.0	2.5	1.5	1.0

Hydrogeological Impact Assessment

(Aurecon, 2012)

Appendix - G

Bore 8 - assessment of potential hydrogeological impacts

Springvale Colliery

Report ref:
223986
31 July 2012
Revision 2

Centennial Coal

aurecon

Document prepared by:

Aurecon Australia Pty Ltd
ABN 54 005 139 873
116 Military Road
Neutral Bay
New South Wales 2089 Australia

T: +61 2 9465 5599
F: +61 2 9465 5598
E: Sydney@aurecongroup.com
W: aurecongroup.com

Document control

Document ID: 20120615 Springvale bores 7 & 8 hydrogeological impact report.doc

Rev No	Date	Revision details	Typist	Author	Verifier	Approver
0	8 June 2012	Draft	dbh	DBH	IF	LK
1	17 July 2012	Final Draft	dbh	DBH	IF	LK
2	31 July 2012	Final	dbh	DBH	IF	LK

Contents

Executive Summary

An assessment has been made of the potential for impacts on the local and regional hydrogeology from activities associated with the construction and commissioning of the proposed dewatering Bore 8 to progressively replace the current mine dewatering system at Springvale Colliery as their mining progresses further to the east of the current workings. The surface infrastructure for the bore site is located in the Newnes State Forest, which contains a number of groundwater dependent ecosystems classified as ‘Temperate Highland Peat Swamps on Sandstone’ (THPSS). These swamps include Newnes Plateau Shrub Swamps (NPSS) and Newnes Plateau Hanging Swamps (NPHS).

The surface infrastructure for Bore 8 will require a cleared area or final footprint of 0.32 ha. Activities will include upgrade of an existing access track to Bore 8 location, construction of drilling pad, installation of erosion and sediment controls, trenching for utilities (power and pipeline), drilling four boreholes, partial rehabilitation of the site, and installation of submersible pumps in the bores and their subsequent commissioning. Bore 8 location been chosen to avoid known THPSS and other threatened and endangered flora species on Newnes Plateau.

The proposed four boreholes will be constructed by the process of blind boring. This involves drilling a pilot hole to the desired depth, followed by boring with a blind boring head, guided by the pilot hole, to produce a borehole of the desired diameter. Drilling mud with a controlled density is fed into the void above the cutting head to lubricate cutting and balance the hydrostatic pore fluid pressure. On completion of boring, the steel borehole liner with a capped bottom is lowered down the hole, displacing the drilling mud. Finally the annulus between the liner and borehole is fully grouted.

There are essentially three basic groundwater systems that have been identified in the region, and all have the potential to be impacted by the installation and operation of the proposed boreholes. These groundwater systems include:

- **Perched groundwater system** – a discontinuous, near-surface system generally independent of the regional groundwater systems, which supports NPHS.
- **Shallow groundwater system** –a regional groundwater system located in the Narrabeen Group above the Mount York Claystone, largely in the Banks Wall Sandstone, which contains aquifer zones that support Newnes Plateau Shrub Swamps, including the Sunnyside, Sunnyside East and Carne West Swamps.
- **Deep groundwater system** – a less important, deeper groundwater system exists in the strata below the Mount York Claystone, and includes the Illawarra Coal Measures.

The potential hydrogeological risks associated with the proposed construction and operation of the dewatering Bore 8 were identified, and include both local and regional impacts as follows:

- Draining of perched groundwater into mine workings via the boreholes
- Draining of shallow groundwater into mine workings via the boreholes
- Drainage of deep groundwater into mine workings via the boreholes
- Contamination of perched and shallow aquifers with drilling fluid
- Additional underground water make and discharge due to groundwater drainage via the boreholes
- Damage to hanging swamps due to diversion of surface water from disturbed areas
- Possible long-term drainage of shallow groundwater into mine workings via the boreholes

All of these potential risks were examined in detail and none were found to pose a risk to the local or regional hydrogeological regime, or the groundwater dependant ecosystems that rely on these groundwater resources.

Several avoidance measures were identified that will ensure that the risk of any adverse hydrogeological outcomes is minimised.

An assessment of future mine water inflows into LWs 415 to 419 concluded that Springvale will need to increase its current licensed discharge volume from 5958 ML/year by 222 ML/year to 6180 ML/year. This increase in volume of less than 4% will set the rate at the 95th percentile of recorded flows rather than the current 93.8th percentile.

A review of the potential impacts of this increase in inflows to the mine concluded that, since almost all of the additional groundwater inflows will originate from the coal measure strata, the extraction of LWs 415 to 419 will further dewater the coal measures, which have been largely drained of groundwater in the vicinity of Springvale by previous mining in the region (at Springvale and other adjacent mines). Since there are no known groundwater users downdip of the project area that use groundwater from the coal measure strata, and the coal measure strata do not provide any significant contribution to base flow in the local streams, this additional dewatering will have a negligible impact.

The review also concluded that the hydrogeological regime in the Banks Wall Sandstone above the Mount York Claystone (more than 200 metres above the mine) will be unaffected by the proposed extraction. Consequently, the important upper aquifers in the Banks Wall Sandstone will be unaffected, and the flow from these aquifers will be unchanged. As a result, the swamps that rely on these flows will also be unaffected.

The overall conclusion can be drawn that the additional inflows to Springvale Colliery from the extraction of LWs 415 to 419 will have a negligible and unmeasurable impact on the local hydrogeological regime, and on surface water flows.

A review of *Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources, 2011* has indicated that it may not be applicable to the expected groundwater extraction within the proposed LWs 415 to 419. This should be confirmed by Centennial’s Legal Branch.

1. Introduction

Springvale Colliery (“Springvale”) and its parent company, Centennial Coal (“Centennial”) propose to construct and operate infrastructure at a dewatering bore site, designated as Bore 8. The purpose of this bores is to progressively replace the current mine dewatering system as mining progresses further to the east.

The proposal will require a modification to Springvale Mine’s Development Consent S91/06569//001, originally granted by the then Department of Planning in 1992 under the provisions of section 101 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). This consent was for the construction and operation of an underground coal mine to produce up to 4.5 million tonnes per year of the run-of-mine coal.

In order to assist in the preparation of an *Environmental Assessment* in support of the proposal, a number of specialist environmental studies are being undertaken. The final *Environmental Assessment* will be submitted to the Department of Planning and Infrastructure (DP&I) for assessment under transitional Part 3A arrangements. In accordance with clause 12 of Schedule 6A (Transitional arrangements – repeal of Part 3A) of the EP&A Act and clause 8J(8) of the *Environmental Planning and Assessment Regulation 2000,* section 75W of the EP&A Act would continue to apply to the proposed modification of Springvale Mine’s Development Consent.

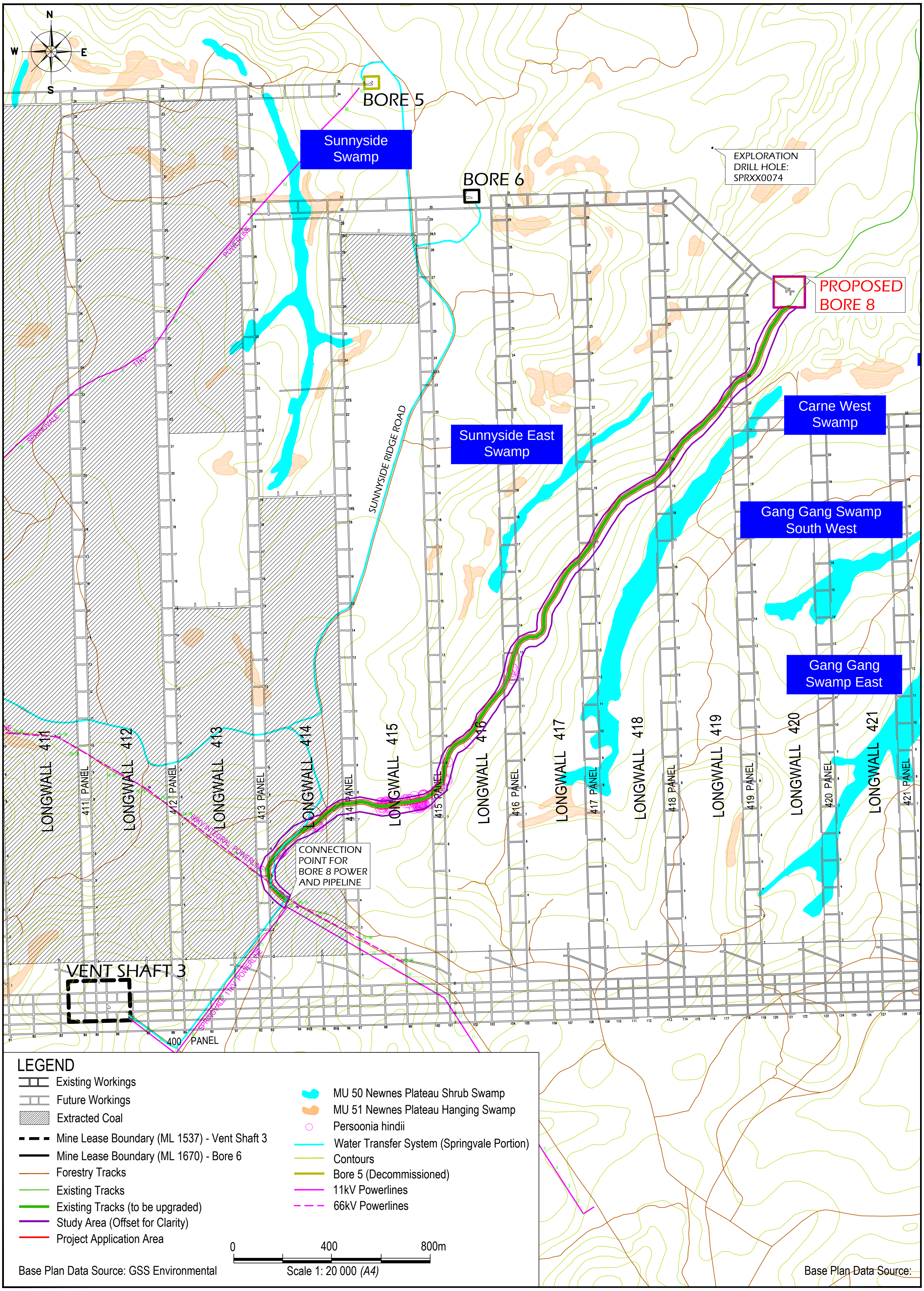
This report forms part of the overall *Environmental Assessment* and contains an assessment of the potential for impacts on the local and regional hydrogeology of the project area from activities associated with the construction and commissioning of Bore 8. This main report does not examine the issue of predicted groundwater inflow volumes from the extraction of the associated longwall panels. However, that issue is covered in Appendix A in this report (Merrick, 2012), which is a summary report from a more extensive review by the same author on the prediction of mine water inflows to the mine. The implications of the increase in predicted increase in mine water inflows are discussed in Section 5.

2. The proposal

Springvale currently operates one dewatering facility (Bore 6) on the Newnes Plateau (Figure 1), which comprises three submersible pumps. The Bore 6 facility delivers water into the Springvale-Delta Water Transfer Scheme for delivery to the Wallerawang Power Station. The Springvale-Delta Water Transfer Scheme has the capacity to manage 30 ML/day of the mine water.

Springvale’s proposal is to construct and operate one dewatering bore, identified as Bore 8 in Figure 1. This bore will form part of the mine’s groundwater dewatering strategy as longwall mining progresses from LW416 to LW419.

The regional dip of the coal seam at Springvale is to the north and the east. Bore 6 is currently located at the lowest point in the mine, near the northern end of LW415, and is the mine’s principal dewatering facility at present. However, as mine working progresses further to the east, additional dewatering facilities need to be established ahead of the workings to ensure water levels in the mine can be safely kept to manageable levels. Once Bore 8 is commissioned, the Bore 6 dewatering facility will be decommissioned.



Springvale Colliery
Bore 8 Project Application Area

FIGURE 1

The site for proposed dewatering Bore 8 has been selected to suit the anticipated seam floor contours and the proposed mine layout, together with suitable topography for the location of the surface facilities. Bore 8 is located at a low point in the mine workings, allowing water to drain under gravity to the dewatering point. A synclinal dip reversal trends E – W across the project area, located at the inbye end of LWs 414 – 418. These longwalls were terminated short to avoid mining through this structure, consequently reducing water management problems within the mine, and reduce potential safety problems.

The surface infrastructure for the Bore 8 site is to be located in the Newnes State Forest, which contains a number of groundwater dependent ecosystems classified as 'Temperate Highland Peat Swamps on Sandstone' (THPSS). These swamps include Newnes Plateau Shrub Swamps (NPSS) and Newnes Plateau Hanging Swamps (NPHS). The locations of the NPSS and NPHS in the vicinity of the bore site are shown on
Figure 1. Access to the surface facilities at the Bore 8 location will be largely via an existing track. This track will be upgraded and widened to establish an access track and ancillary infrastructure corridor totalling 10 m wide to Bore 8. 11 kV powerlines and water pipelines will be buried in the infrastructure corridor alongside the access track. Following installation of the pipelines and powerlines, the infrastructure corridor will be rehabilitated leaving a 5 m wide track to Bore 8.

The final footprint of the dewatering facility at Bore 8 will be approximately 0.32 ha. However, an area of approximately 0.77 ha will initially need to be cleared of vegetation and the area graded to form a level pad for construction of the boreholes, allowing for the movement of heavy vehicles and the installation of sumps to contain drilling fluids, as well as the storage of all required equipment and spares within the dewatering facility compound. Upon completion of construction and commissioning of the boreholes, the construction impact footprint of 0.77 ha will be partially rehabilitated leaving a final footprint of 0.32 ha, which will remain cleared and maintained for the duration of operation of Bore 8.

The Bore 8 site has been chosen to avoid known THPSS and other threatened and endangered flora species on Newnes Plateau.

Details of the proposed Bore 8 Facility are given in Table 1.

Table 1 - Details of Bore 8 Facility

Item	Specification
Number of dewatering holes at the site	four
Hole depth	470 m
Hole diameter	22" (c. 560 mm)
Collar casing	The collar of each hole is to be cased to the satisfaction of Springvale.
Downhole casing	Each hole is to be cased in its entirety with 18" OD (c. 460 mm) steel pipe: • 0 – 410 m, 10.3 mm thick casing • 410 – 470 m, 12.7 mm thick casing
Pressure cementing	Casing to hole wall annulus to be pressure cemented over the full length of each hole.
Hole deviation	< 12 m from target

The holes will be drilled using a conventional drill rig and additional plant and support vehicles as required. It is expected that it will take approximately one month to undertake pad set up, three months to construct, and two months to commission. Current mine scheduling indicates that Bore 8 will be required for use by May 2013.

3. Background

3.1 Geology

The plateau area has ridge crests up to 1160 m elevation, and is cut by several deeply incised creek valleys, which drain to the north and northeast of the lease area. The project area lies in the headwaters of the Wolgan River – Colo River catchment, which extends north and east from the project area. The local stratigraphy is summarised in Table 2, which also shows estimated heights of various horizons above the roof of the Lithgow seam at Springvale. Bedding generally dips northeast at about 1 to 2°. Structure contours on the seam are shown in Figure 2. A synclinal axis extends across the area at about the northern (inbye) end of LWs 414 – 418. The synclinal hinge plunges shallowly east. Closure on this structure decreases eastward, and the fold dies out by LW 419, where the strata dip uniformly northeast.

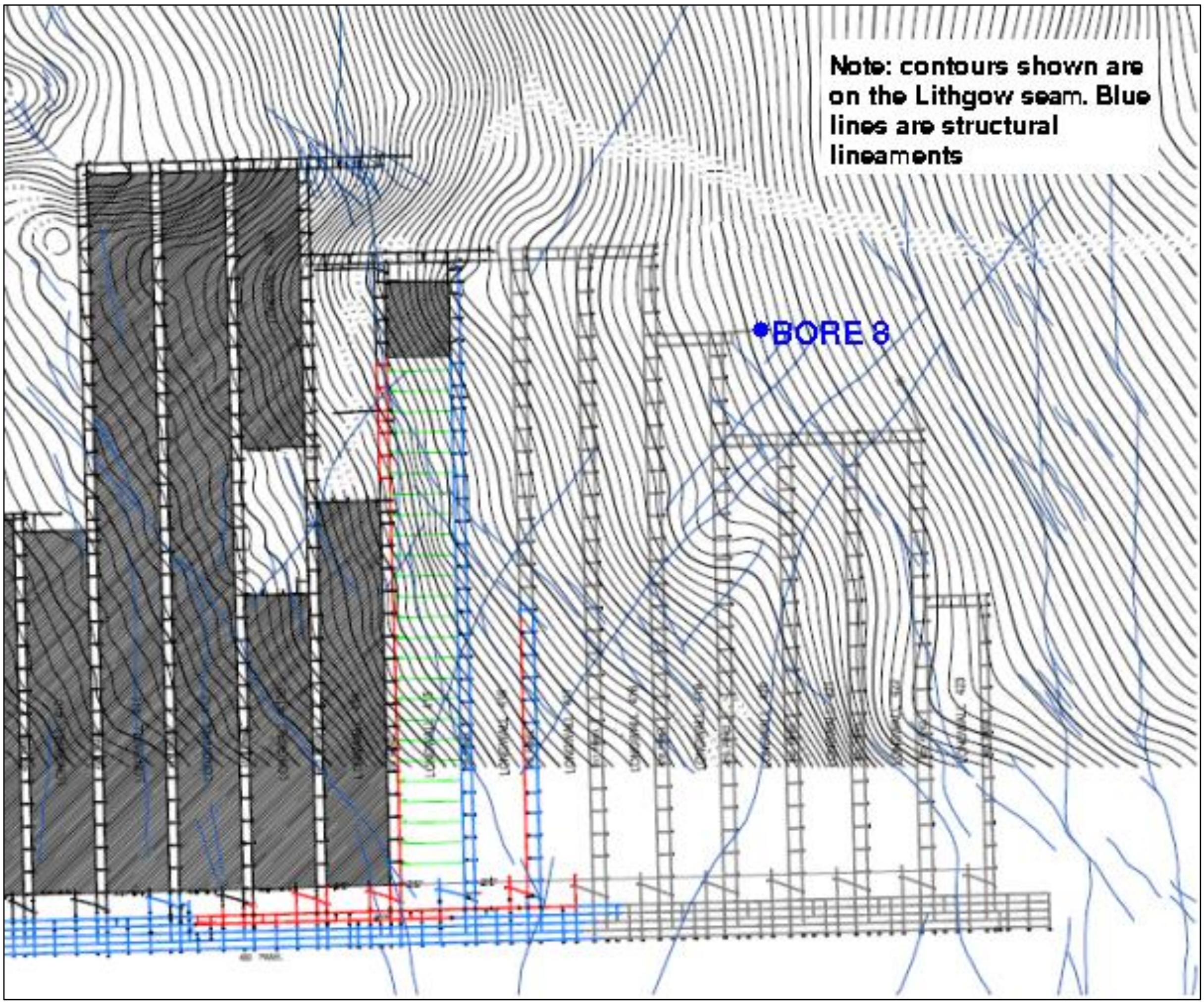

Note: contours shown are on the Lithgow seam. Blue lines are structural lineaments

Figure 2 - Geology of the Bore 8 area and adjacent longwalls

Strata underlying the Newnes Plateau comprise mostly sandstones of the Triassic Narrabeen Group, which are interbedded with shale and siltstone beds. Narrabeen Group rocks are underlain by the Illawarra Coal Measures, which comprise interbedded sandstone, siltstone, shale, and coal.

In this area, the Narrabeen Group rocks near the surface belong to the Grose Subgroup, and include the Banks Wall Sandstone, the uppermost part of which is deeply weathered and generally very friable. The sandstone, which is up to 200 m thick in this region, is underlain by the Mt York Claystone, a fine-grained unit, with a thickness in this area ranging up to 28 m, that limits vertical infiltration of groundwater from the overlying strata. The underlying Burra-Moko Head Sandstone and Caley Formation make up the remainder of the lower part of the Narrabeen Group.

The Narrabeen Group rocks are underlain by the Illawarra Coal measures which comprise claystone, siltstone, sandstone and coal seams with a total thickness of up to 175 m in this area. The Lithgow seam is the lowermost seam in the coal measures and is located just above the base of the coal measures.

Fault structures at seam level in the area are also shown in Figure 2. The structural pattern over the area of LWs 415 – 423 consists of normal faults in an orthogonal set, striking northwest and northeast. Faults have dips ranging from 45 to 80 degrees, and have observed displacements of up to 0.7 m . The nearest fault to Bore 8 is a northeast-trending fault c. 100 m to the southeast. Thus there are no mapped faults in the immediate vicinity of the proposed dewatering bore location.

There are no dykes or other igneous features mapped in the vicinity of Bore 8.

Table 2 - Generalised Middle Permian to Tertiary stratigraphy of the Western Coalfield

Period/ Age	Stratigraphy			Lithology	Approximate height above Lithgow seam roof*
	Group	Subgroup	Formation		
Tertiary			Basalt	Basalt	
Triassic	Wiannamatta		Ashfield Shale		
		Hawkesbury Sandstone			
	Narrabeen Group	Grose Subgroup	Burralow Formation		
			Banks Wall Sandstone		Surface 413 m
			Mt York Claystone		238 m
			Burra – Moko Head Sandstone		
			Caley Formation		158 m
Permian	Illawarra Coal Measures	Wallerawang Subgroup	Farmers Creek Formation	Katoomba seam, sandstone, claystone, siliceous claystone	
			Gap Sandstone	Sandstone	
		Charbon Subgroup	State Mine Creek Formation	Coal, mudstone, claystone	
			Watts Sandstone	sandstone	
			Denman Formation	Interbedded mudstone / sandstone, claystone, mudstone	
			Glen Davis Formation	Coal, claystone	
			Newnes Formation	Coal, sandstone	
			Irondale seam	Coal	25 m
			Long Swamp Formation	Interbedded sandstone and siltstone	24 m
		Cullen Bullen Subgroup	Lidsdale Coal	Coal and claystone bands	0 m
			Blackmans Flat Formation	Sandstone, conglomerate	
			Lithgow seam	**Coal, claystone**	**-7 m**
			Marrangaroo Formation	Sandstone, conglomerate	
		Nile Subgroup	Gundangaroo Formation	Coal, sandstone claystone	-24 m
			Coorongooba Creek Sandstone	Sandstone	
			Mount Marsden Claystone	Claystone	
	Shoalhaven Group		Berry Siltstone		
			Snapper Point Formation		

* Heights based on Bore 6 stratigraphy

3.2 Hydrogeology

In general, the sedimentary strata in the Western Coalfield, comprise a non-uniform sequence of interbedded rocks of differing grainsize and strength properties. This invariably gives rise to layers of rock with a wide range of permeabilities, which form a sequence of aquifers and aquitards/aquicludes in the overburden. The term “aquifer”, as it is used here, is generally applied to any stratum that has a high groundwater carrying capacity relative to the surrounding rocks.

There are essentially three basic groundwater systems that have been identified in the region. These include:

- **Perched groundwater system** – a discontinuous, near-surface system generally independent of the regional groundwater systems, and located within 15 m of the ground surface. The perched groundwater is derived from excess rainfall which is largely prevented from infiltrating deeper down into the regional systems by the presence of near-surface fine grained beds, such as shale or siltstone. The occurrence of a perched groundwater system may produce lateral seepage which supports hanging swamps.
- **Shallow groundwater system** – this system is a regional groundwater system located in the Narrabeen Group, largely in the Banks Wall Sandstone. This system generally extends to a depth of up to 100 m. The CSIRO identified at least three main aquifer zones in the Banks Wall Sandstone system that are of high importance (AQ4-A, AQ4B and AQ5 on Figure 4), since they support groundwater dependent ecosystems such as the Newnes Plateau Shrub Swamps. Investigations have indicated that Sunnyside, Sunnyside East and Carne West Swamps (refer Figure 1) are supported by the same aquifer zone. Further to the east, another of these water-bearing zones, the Clarence Aquifer, provides a potable water supply for the village of Clarence. Most groundwater flow in the water-bearing sequence is generally in the horizontal direction along bedding planes, with some vertical flow occurring from the ground surface infiltration. A limited volume of groundwater may also flow vertically from one water-bearing zone to another, depending on the permeability of the intervening strata, and the degree of vertical jointing and faulting in the system. The Mount York Claystone forms a low permeability barrier to this vertical infiltration, so that most of the natural groundwater flow in the shallow groundwater system occurs above this horizon in aquifers in the Banks Wall Sandstone. The general flow direction in the aquifers in this system is sub-horizontally towards the northeast, away from the subcrop zone, where recharge to the lower aquifers can occur. This potential recharge zone is located to the west and southwest of the existing workings.
- **Deep groundwater system** – a less important, deeper groundwater system exists in the strata below the Mount York Claystone, and includes the Illawarra Coal Measures, which generally lie at a depth of more than 200 m. The majority of the coal measure strata overlying the Lithgow Seam in this area have a low permeability, however one or two beds have a slightly higher permeability, and could represent water-bearing zones (AQ1, AQ2 and AQ3 on Figure 4). The few water-bearing zones that do occur at depth in these strata are usually fractured rock aquifers. These include jointed coal seams and localised jointed or fractured zones, often adjacent to faults. The general flow direction in the water-bearing zones in this system is also sub-horizontally towards the northeast, away from the subcrop zone, where recharge can occur. The groundwater in this system is largely drained into the goaf following longwall mining and produces the majority of mine water inflows. There are no known local or regional users of this groundwater source.

A diagrammatic section of the local hydrogeological regime showing the three groundwater systems is included in Figure 3, while the aquifer zones identified by CSIRO are shown in Figure 4.

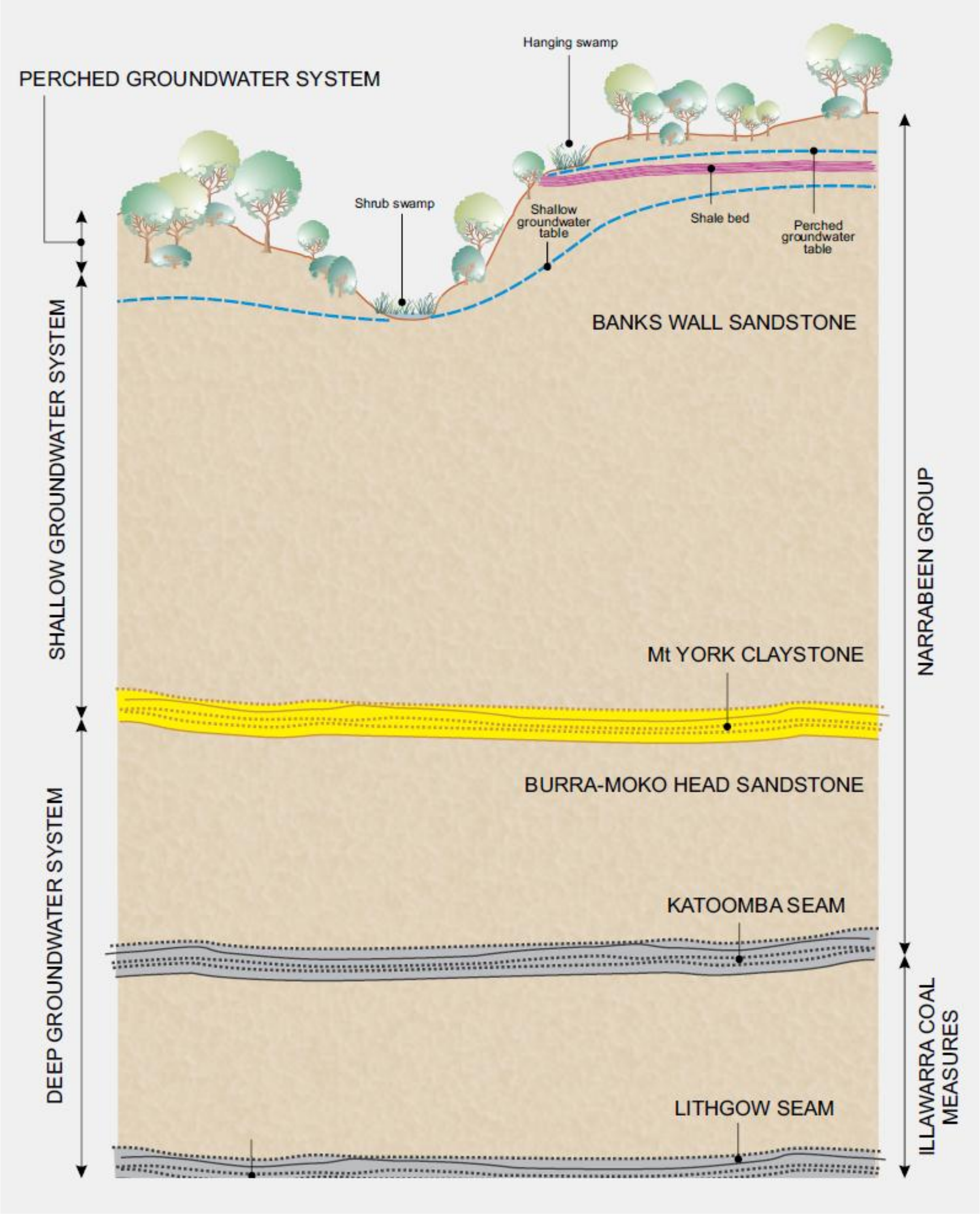


Figure 3 - Local hydrogeological regime

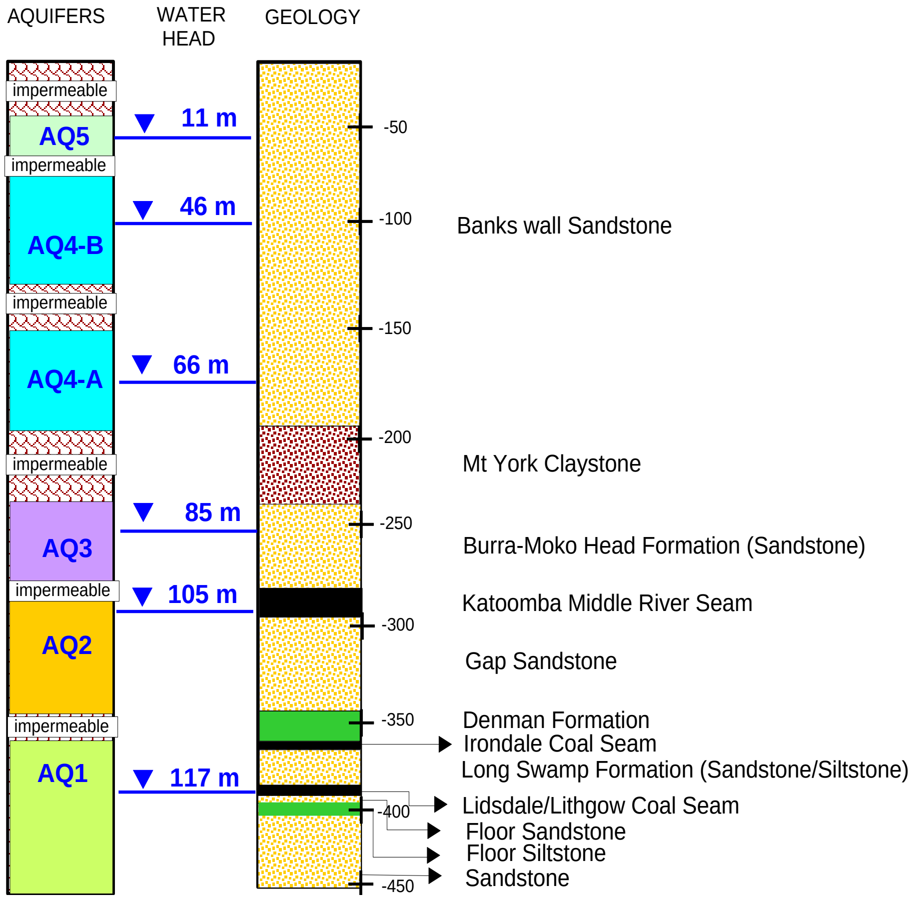


Figure 4 - Inferred hydrogeological section (CSIRO, 2010)

While no detailed permeability testing has been carried out in the Banks Wall Sandstone in the project area to confirm the presence of aquifers, continuous, full-depth permeability testing was carried out on this formation in borehole APR1PR located 3.2 km north northwest of the Bore 8 site, during exploration. This testing showed that the permeability of the Banks Wall Sandstone is mostly low (<10^{-7} m/s), although three horizons showed a slightly higher permeability of between 10^{-6} and 10^{-7} m/s, and could be considered to be “relative” aquifers. Two of these horizons appear to correspond approximately with the CSIRO aquifer zone AQ4-A and one with AQ4-B. Although there is no certainty that these “aquifer” zones are present at the same horizons in the area of LWs 415 – 421, the presence of permanently waterlogged swamps (see below) in the area provides evidence of the existence of at least one major aquifer in this part of the section.

Limited investigations at Springvale have shown that the coal measure strata overlying the Lithgow seam in this area also have low permeabilities (<10^{-8} m/s), however one or two layers may have a slightly higher permeability (up to 10^{-6} m/s), and could represent aquifers (Golder Associates, 2002). The few aquifers that do occur at depth in these strata are usually fractured rock aquifers (Bish, 1999). These include jointed coal seams and localised jointed or fractured zones, often adjacent to faults.

3.3 Swamps

The surface infrastructure for Bore 8 will be located in the Newnes State Forest, which contains a number of groundwater dependent ecosystems classified as ‘Temperate Highland Peat Swamps on Sandstone’ (**THPSS**). The THPSS are listed as an Endangered Ecological Community (**EEC**) under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (**EPBC Act**). The Newnes Plateau Shrub Swamp (NPSS) and Newnes Plateau Hanging Swamp (NPHS) both form part of the THPSS community and are therefore also part of the listing. The NPSS is also listed as an EEC under the NSW *Threatened Species Conservation Act 1995* (TSC Act). The location of NPSS and NPHS in the vicinity of Bore 8 is shown on Figure 1.

Generally, Newnes Plateau Shrub Swamps have developed on the Newnes Plateau at altitudes in excess of 1,100 m, in valleys underlain by Narrabeen Group strata. The swamps have formed in areas which are subject to periodic or permanent waterlogging caused by a supply of water including groundwater, surface runoff, and rainfall.

The groundwater source is initiated when rainfall infiltrates the sandy soils and the permeable sandstone on the adjacent ridges. At relatively shallow depths in the sandstone there may be a thin layer of tightly cemented sandstone or claystone which is impervious to vertical groundwater percolation and forms an aquitard, confining the vertical movement of the water. The groundwater then travels laterally along the top of the aquitard, and exits the ridge in the floor of the flanking creek valley, which often has the same strong, tightly cemented sandstone layer forming the base. This shallow groundwater system can provide a constant source of moisture to the valley floors. Over a long period of time, flora species have gradually colonised these sites. Where the dip of the aquitard layer in the valley floor is relatively flat (<3%) in the downstream direction, these vegetation communities can form over several kilometres along the watercourses, given the right conditions. The constant saturation of the valley floor creates anaerobic conditions inhibiting the microbial breakdown of plant material. This organic matter accumulates in a partly decomposed state as peat. This material has an extraordinary ability to absorb water and acts like a sponge retaining rainfall and run-off for slow release. The peat material is often mixed with the sediment that is eroded from the ridges on either side of the swamp.

In general, 20% to 30% of the total rainfall in the area runs off the surface of the ridges and into the swamps. When this occurs, any voids in the dry peat fill up with water. When the peat is saturated, the excess water then discharges into the drainage lines. In contrast, less than 5% of the rainfall infiltrates the ground surface on the ridges and enters the local groundwater system. Some of this water then enters the swamp by seepage into the margins as described above. Unlike rainfall, the groundwater seepage is generally continuous and is proportional to the hydraulic head in the aquifer beneath the ridges.

The proportional contribution of groundwater to the swamp hydrology, relative to the rainfall/run-off contribution, can vary considerably between swamps, depending on the permeability of the overburden, the lateral hydraulic gradient and the efficiency of the aquifer feeding the swamp. While there are numerous swamps in this region that are primarily sustained by groundwater flow, in some swamps groundwater flow may represent only a small proportion of the total inflow, with runoff and rainfall providing the bulk of the water sustaining the swamp ecology. Any shortfall in groundwater in these circumstances may be wholly or partially made up by excess runoff that would have otherwise discharged into the watercourse.

The groundwater monitoring to date has confirmed that there is a range of swamp types, which appear to differ essentially in the relative contributions of groundwater and rainfall/run-off to the swamp hydrology (Aurecon, 2011). Those swamps that have a proportionately large groundwater contribution (ie. fed in large part by underground water) are resistant (to a large extent) to the natural variations that may occur in the local rainfall patterns. They are termed **permanently waterlogged** swamps, and generally have a constant water base flow from their downstream end and/or usually have persistent/recurring surface water expressions within the swamp. These swamps have a relatively stable, near-surface groundwater table that shows no major fluctuations, even after heavy rainfall or during prolonged dry periods. They are located mostly in broad deep valleys with a relatively large catchment. Both swamps (Sunnyside East and Carne West Swamps) close to the Bore 8 site are permanently waterlogged.

The swamps that have a relatively poor groundwater contribution are obviously more sensitive to the natural variations in rainfall patterns. These **periodically waterlogged** swamps normally do not have a constant flow from their downstream extremity, and show large variations in groundwater level, particularly after major rainfall events. They also tend to have small catchment areas, and can be located at the upstream end of permanently waterlogged swamps, or at high elevations with no significant flanking ridges or obvious drainage lines through the swamp. Because of the different hydrogeological conditions, these swamps support different vegetation communities to the permanently waterlogged swamps.

Newnes Plateau Hanging Swamps are supported by perched shallow aquifers or seeps (in the upper perched groundwater system) that provide a periodically waterlogged environment, and are usually located higher in the landscape on the flanks of ridges (as opposed to being located at the base of drainage lines). As a result, these swamps are heavily reliant on rainfall and can dry out during periods of below average rainfall, when there is no recharge to the shallow perched aquifers.

There are only two hanging swamps within the vicinity of the infrastructure for the Bore 8 site. One of these is located to the east of Bore 8 at the downstream end of the Carne West Swamp, and a second is located at the upstream end of Carne West Swamp to the east of the access road. These swamps are formed when infiltrating groundwater moves down through both the unconsolidated and consolidated porous sandstones and conglomerates of the Narrabeen Group until it encounters a claystone/shale horizon. Where the claystone/shale crops out in a topographically suitable location, the groundwater moves horizontally towards the valley side slope, forming an ideal environment for a swamp to form (McHugh, 2011).

The hanging swamps are mostly peat-based, but the peat layer is generally relatively thin due to the slope of the ground surface on the flanks of the ridges, which is not conducive to deep peat formation. The swamps develop over a long period of time from decaying swamp vegetation. They then progress down the gully side as the seeping water continues to travel further downslope encouraging the swamp vegetation to establish further downslope. Because the hanging swamps are stratigraphically controlled by the location of the claystone/shale layers, they often occur in a linear pattern along the sub-crop zone of the bedding.

Normally, the catchment area for most of the hanging swamps is relatively small, so that the groundwater flow dries up reasonably quickly following rainfall. This period will obviously vary and depends on a number of factors, including rainfall duration and intensity, catchment area, strata dip and overburden permeability. Nevertheless, the presence of the claystone/shale beds is the critical factor in directing any subsurface rainwater infiltration horizontally to the outcrop zone where the swamps form. Without the claystone/shale beds, which act as an aquitard, there would be no swamps.

The lack of large volumes of groundwater in hanging swamps is evidenced in the drilling of exploration boreholes in the region. Drillers very rarely report any high level water flow into the boreholes during drilling. This is because there is no aquifer as such, but just a periodically perched water table on top of the aquiclude (following rainfall) which seeps relatively quickly out to the subcrop zone. There is very rarely any free water flow from the downstream end of these swamps as there is from the permanently waterlogged shrub swamps.

4. Potential impacts of new dewatering bore 8

4.1 Risk assessment

A brief risk assessment was carried out and identified two main activities associated with the Bore 8 installation that have the potential to impact the local and regional hydrogeology:

- Construction and operation of the bores
- Construction of the drilling pad and access roads

The potential hydrogeological risks associated with these activities have been identified and can be categorised into local and regional impacts as follows:

Local impacts

- Draining of perched groundwater into mine workings via the boreholes
- Draining of shallow groundwater into mine workings via the boreholes
- Drainage of deep groundwater into mine workings via the boreholes
- Contamination of perched and shallow aquifers with drilling fluid
- Additional underground water make and discharge due to groundwater drainage via the boreholes
- Damage to hanging swamps due to diversion of surface water from disturbed areas

Regional impacts

- Possible long-term drainage of shallow groundwater into mine workings via the boreholes

These risks are discussed below, and where necessary, avoidance measures have been identified to minimise the risk of any adverse impacts on the hydrogeology and/or the swamps.

4.2 Potential local impacts of the proposed activities

4.2.1 Drainage of perched groundwater into the workings

Boring of the dewatering boreholes at the Bore 8 site is the main activity that has the potential to impact on the local hydrogeology. Four boreholes will be drilled between the ground surface and the seam to provide access for the submersible pumps. While this activity should cause no disruption to the overburden strata, the boreholes will intersect the perched groundwater system that supports many of the hanging swamps. Any disruption to this groundwater system could result in an adverse impact on the hanging swamps supported by the groundwater.

The proposed boreholes (4 at each bore site) will be constructed by the process of blind boring. This involves drilling a pilot hole, followed by boring with a blind boring head, following the pilot hole, to produce a borehole of the desired diameter. Drilling mud with a controlled density is fed into the void above the cutting head to lubricate cutting and balance the hydrostatic pore fluid pressure. Cuttings report to the surface where they are excavated from the process ponds and piled up. On completion of boring, the head is removed on the surface, and the borehole liner with a capped bottom is lowered down the hole, displacing the drilling mud. Finally the annulus between the liner and borehole is grouted. When the liner bottom is exposed by the underground mining operation, it must be removed to open up the borehole for dewatering purposes.

During construction of the bores using this method, it is unlikely that there will be any depletion of the perched groundwater in the boreholes. Whilst construction is in progress, the bores will form a void, into which there will be negligible drainage of groundwater, since the bores will be full of drilling fluids which are designed to block the pores in the strata so that there is minimal drilling fluid loss into the strata, and mud conditions are adjusted to equalise hydrostatic pore pressures. It is possible that if the fluid level in the borehole is lowered for some reason during drilling (such as when the rod string is withdrawn), that a small volume of groundwater will drain into the borehole through the mud cake on the borehole walls. The volume of groundwater inflow will be limited to the volume required to restore the borehole level to the groundwater level in the perched groundwater system. The disturbance to the groundwater system will therefore be minimal, temporary and restricted to a small area around the perimeter of the borehole (Figure 5).

The time for the groundwater level in the aquifer to recover will be probably within one day to one week. Any impact on the hanging swamp vegetation will be negligible, and would be limited to any swamps in the immediate vicinity of the boreholes. Since there are no hanging swamps in the immediate vicinity of the proposed bore sites, there will be no impacts on the swamps from the construction of the bores.

Once completed, the dewatering bores are fully cased, with the annulus between the casing and the borehole wall pressure grouted, to ensure that any aquifers are isolated from the future mine workings, and drainage into the workings does not occur during the operation period of the dewatering bores. The maintenance of groundwater systems in the area of the bores also depends on the integrity of the bore lining. It will therefore be necessary to maintain the steel/concrete lining during the life of the project to eliminate any impact on groundwater systems. This will form part of the normal maintenance regime for the bores.

Based on the above, it is possible to conclude that the risk of drainage of perched groundwater into mine workings via the boreholes is negligible.

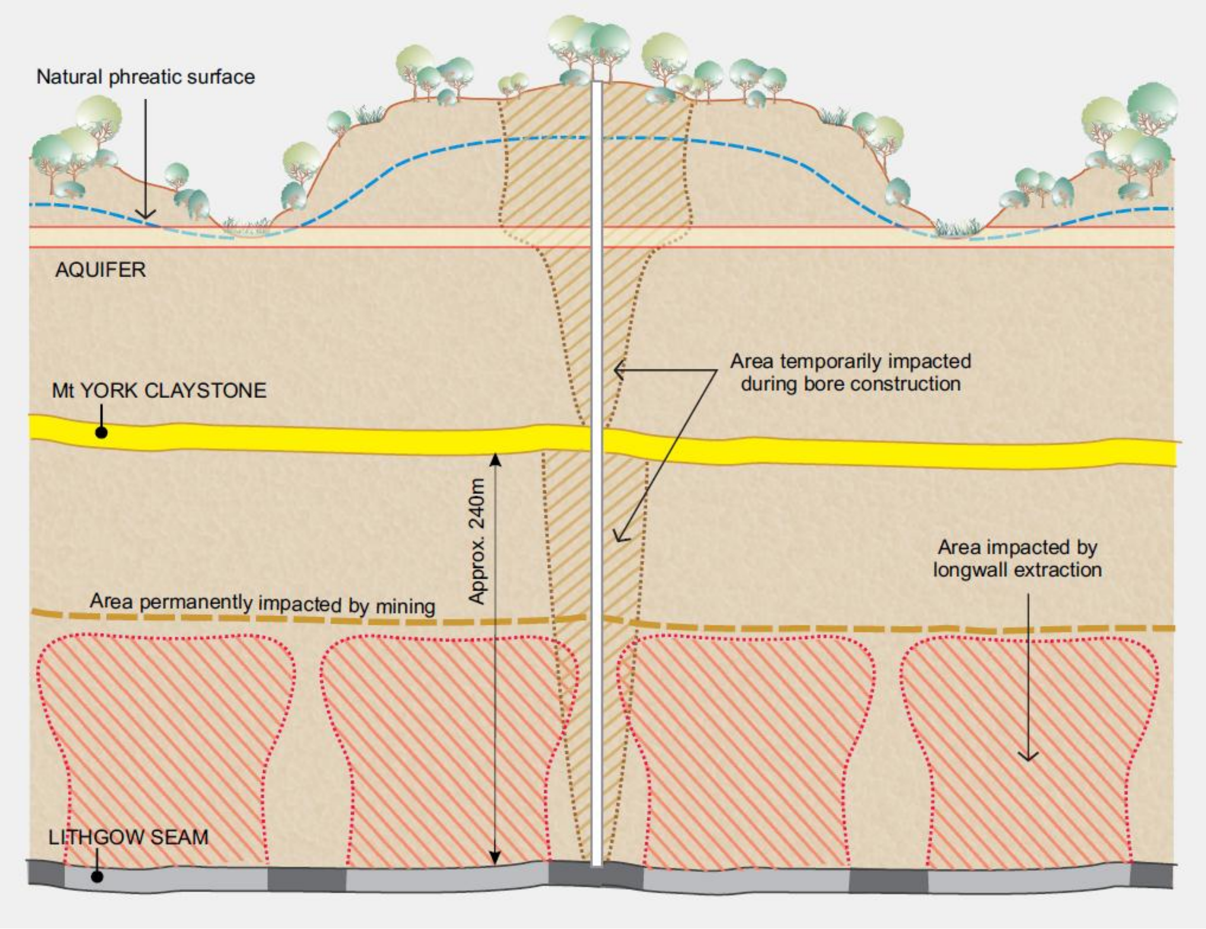


Figure 5 - Schematic diagram showing the extent of disturbance of strata related to construction of a dewatering bore, and progressive extraction of longwall panels. Not to scale.

4.2.2 Drainage of shallow groundwater into the workings

Any significant drainage of groundwater from the shallow groundwater table into the mine workings is to be avoided if at all possible, as this would have the potential to interfere with groundwater feed to the shrub swamps that are located in the watercourses on either side of the Bore 8 site. However, it should be noted, that the risk of any impacts on the shrub swamps is very low, as the bore site is located down-dip of the major shrub swamps in the area. Consequently, even if groundwater was drained from the shallow aquifer through the boreholes, it is highly unlikely that there would be any impact at all on the shrub swamps.

The discussion in Section 4.2.1 above on the perched groundwater system outlined the reasons why the proposed construction of the bores will have a negligible impact on the perched groundwater system, and why the construction of the boreholes will not result in any drainage of groundwater into the boreholes or the mine workings. These reasons are also relevant to the shallow groundwater system. The drilling and lining method that will be utilised for the construction of the bores (described in Section 4.2.1 above) precludes any significant drainage of groundwater from the shallow groundwater system. Consequently, no impacts are expected on the shallow groundwater system either during or after construction, and hence no impact is expected on the adjacent shrub swamps which depend on this groundwater source.

Based on the above, it is possible to conclude that the risk of drainage of shallow groundwater into mine workings via the boreholes is negligible.

4.2.3 Drainage of deep groundwater into the workings

The consequences of drainage of deep groundwater into the mine workings via the boreholes, either during or after construction, are negligible. This is because a large portion of the deep groundwater is drained into the mine opening as a result of the extraction of the longwall panels (Figure 5). In addition to this, the drilling and lining method that will be utilised for the construction of the bores precludes any large scale impacts on the deep groundwater system.

Based on the above, it is possible to conclude that the risk of drainage of deep groundwater into mine workings via the boreholes is negligible.

4.2.4 Contamination of perched and shallow aquifers with drilling fluid

It is normal practice for drilling fluids to be used to assist in the drilling process of large diameter bores. Since the bores will be topped up with drilling fluid during drilling, the flow direction will generally be from the borehole into the formation. This could lead to a small amount of drilling fluid entering the perched and shallow groundwater systems. However, since the drilling fluids are designed to block the pores in the strata and form a “skin” on the borehole walls, there is normally minimal drilling fluid loss to the strata, unless very open joints or faults are encountered.

The only materials that will be used in drilling of the bores are the commonly used polymer drilling muds or natural bentonite-based muds, which are not hazardous. These fluids have been used in drilling exploration bores around the site for many years, and are designed to be used for drilling through water-bearing strata without long-term impact. The polymer materials used are designed to increase the viscosity of the drilling fluid, and will degrade to water after a period of a few days. The bentonite material is naturally occurring clay and will not enter the pores in the strata, but will form a cake on the borehole wall.

An appropriate blend of drilling fluid additives is typically selected by first conducting a program of pilot testing using various compositions of drilling fluid and fresh samples of the strata, usually obtained from recent core. Data from previous well drilling or coring operations is also useful in developing the optimum fluid composition. For Springvale, previous experience in the area suggests that the heavily weathered strata through the top 60 to 80 m will require a bentonite based mud system to protect the un-cemented sands from unravelling and consequently undermining the weak clay and shale. Drilling without using bentonite or some other additives to the drilling fluid could perhaps lead to the bore walls collapsing before an intermediate casing could be installed.

There are a number of additives that may be used during the drilling process. All of the proposed additives in the muds are commonly used for drilling potable water wells in the Sydney catchment area. The additives may include the following: bentonite, polyanionic cellulose (PAC), gypsum, lime, potassium chloride (or low sodium alternatives that mimic the properties of potassium chloride), partially hydrolyzed polyacrylamide (also known as liquid polymer, PHPA, flocculant or ‘Quick Mud’), and carboxymethyl cellulose (CMC). The additives were reviewed in a hazard screening assessment and none were identified as posing a risk to groundwater quality.

Based on the above, the risk of contamination of perched and shallow aquifers with drilling fluid is considered to be negligible.

4.2.5 Additional underground water make and discharge due to groundwater drainage via the boreholes

If large volumes of groundwater are allowed to enter the bores from the local groundwater systems, this water will need to be removed from the mine by pumping. In extreme circumstances, this may necessitate an increase in the required pumping capacity in the mine. As indicated above, the drilling and lining method that will be utilised for the construction of the bores precludes any additional inflow of groundwater to the mine.

Based on the above, the risk of any additional underground water make and discharge from the mine due to groundwater drainage via the boreholes is considered to be negligible.

4.2.6 Damage to hanging swamps due to diversion of surface water from disturbed areas

Hanging swamps rely on the infiltration of rainfall to the perched groundwater system as a source of water. Any disruption to this process could result in a change to the recharge to the perched groundwater system and may have a deleterious impact on the swamp vegetation. Because of this, it will be necessary to ensure that run-off from large areas is not directed away from the catchment of any hanging swamps in the vicinity of the roads or drilling pads.

The hard stand areas and roadways will need to be designed to:

- minimise the area of impermeable surfaces
- allow run-off to drain naturally to the swamp catchment
- not direct large volumes of run-off away from the swamp catchments
- have appropriate erosion and sediment controls in place to prevent silt entering the hanging swamps

Nevertheless, provided appropriate measures are taken in the design and construction of the roads and drilling pads, it is unlikely that the infiltration and run-off to the hanging swamps will be materially affected. In addition, the two hanging swamps identified in the vicinity are sufficiently removed from the proposed works that the catchments will be only minimally impacted by the works.

Consequently, the risk of damage to hanging swamps due to diversion of surface water from disturbed areas can be managed by appropriate measures, and is considered to be negligible.

4.3 Potential regional impacts of the proposed activities

4.3.1 Possible long-term drainage of shallow groundwater into mine workings via the boreholes

Based on the conclusions in the previous section, there appears to be no possibility of any regional impacts from the proposed construction of the boreholes at the Bore 8 site. There will be no impact on the aquifer in the shallow groundwater system that is a groundwater source for a large number of the shrub swamps in the region. There will also be no connection established between the proposed bores and regionally significant aquifers such as the Clarence Aquifer, which supplies domestic groundwater for the village of Clarence, over 16 km to the southeast. This is because there is no hydraulic connection between this aquifer at Clarence and the same aquifer horizon at Springvale, due to the presence of the valley of Farmers Creek, which truncates the aquifer between the two sites.

A search of the NSW Office of Water database of groundwater bores has shown that there are no domestic, industrial or agricultural users of the groundwater resources in these aquifers in the area surrounding the Springvale Colliery, probably due to their depth, variable water quality, and the fact that most of the area is covered by the Newnes State Forest. As there will be no impact on the groundwater, there will be no impact on surface water flows that rely to some extent on groundwater feed. Consequently, there will be no impact on Forests NSW assets.

Despite the fact that no impacts are predicted, if the bores are left open in the longer term, the steel casing could rust out and a connection could be formed between the shallow and perched groundwater systems and the mine workings. This has the potential for depletion of groundwater from these systems. In order to prevent this occurring, during rehabilitation at the end of mine life, the shafts and bores will be fully backfilled with impermeable material, such as concrete to ensure no leakage occurs. Rehabilitation will be carried out in accordance with Division of Resources and Energy requirements at the time.

4.4 Cumulative effects

The Bore 8 site lies to the north and east of the existing Springvale Colliery workings. Since a number of other activities and projects, that have the potential to impact on the local regional hydrogeology, are located in the vicinity of Springvale, it is necessary to consider the cumulative effect of the impact of the current project with these other developments, both at Springvale and elsewhere.

At Springvale, the mine workings include both currently approved mining activities and the future longwalls 415 to 419.

In the vicinity of Springvale, activities and projects include:

- Forestry and recreational activities on the Newnes Plateau, including the immediate project area and further afield
- Clarence Colliery mine workings
- Angus Place Colliery mine workings, including proposed LW 900W and LW 910 to the west of the project area.
- Angus Place Colliery also proposes a number of ventilation shafts and service bores in the general area.
- Open cut mining at Pine Dale Coal Mine, 17 km west of the project area.

The blind boring method of borehole construction means that the impacts on groundwater during construction and operation will be negligible. The boreholes will be lined and grouted, and any changes in the groundwater level are expected to recover in a short time (< 1 week) after construction. The very limited extent of groundwater impact out from the footprint of mining activities means that the project is will not have an impact on other projects identified in the area.

There are no known groundwater users downslope of the project area. Agricultural activities in the Wolgan River valley may make use of river water, which includes a contribution of groundwater derived from the local strata over Springvale. By far the greatest groundwater contribution to the Wolgan River flow is from aquifers in the Banks Wall Sandstone. Since these will be unaffected by the installation of the bores, no adverse impacts will ensue. Outflows of groundwater from the coal measures into the Wolgan River are negligible compared to the flow from the upper aquifers, due to the lower permeability of the coal seams and their very limited sub-crop when compared to the sandstone aquifers. Coal measure groundwater drainage into the bores will also be negligible and hance will be unaffected by the installation of the bores. If any drainage does occur, the drawdown adjacent to the boreholes will extend for significantly shorter distances than the distance to Wolgan River outflow sites, and will be limited to during the construction period, after which lining of the bores will prevent groundwater drainage.

As a result, the cumulative impact of the project together with the other local activities is regarded to be no different to the impact from the currently approved workings alone, from a groundwater perspective.

4.5 Avoidance measures

Even though no cumulative, regional or local hydrogeological impact is expected from the proposed installation of bores at the Bore 8 site, the low level of risk relies on several avoidance measures that have been identified in Section 4 above. It is therefore appropriate to identify these avoidance measures to ensure that the potential for impacts on the groundwater and the groundwater dependent ecosystems is minimised.

Avoidance measures that can be used to minimise risk include:

- Use the blind boring method for construction of the bores, which reduces groundwater impacts by maintaining the borehole void full of drilling fluids, thereby preventing loss of groundwater into the void;
- Ensure that the borehole casing is fully grouted in the boreholes to ensure that there is no drainage of groundwater into the underground workings during the operation period of the dewatering bores;
- Use only approved drilling fluids in the borehole installation process;
- Minimise the area of any hardstand or road located in the catchment of identified Newnes Plateau Hanging Swamps;
- The access road to Bore 8 should be constructed to allow run-off to drain naturally to the swamp catchment, so that large volumes of run-off are not directed away from the swamp catchment;
- Roads and hardstands should have appropriate erosion and sediment controls in place to prevent silt entering the hanging swamps.

5. Potential impacts of increased water inflows

An assessment of future mine water inflows into Springvale Colliery has been undertaken by Dr Noel Merrick, and a summary report is included in Appendix A to this report. In this assessment, mine dewatering rates out to LW419 have been projected by means of two models currently used by Springvale Colliery to predict operational water make. The conclusion of the study is that Springvale will need to increase its current licensed discharge volume from 5958 ML/year by 222 ML/year to 6180 ML/year. This increase in volume of less than 4% sets the rate at the 95th percentile of recorded flows rather than the current 93.8th percentile. The potential impacts of this increase is discussed below.

5.1 Previous mining-related impacts on the hydrogeological regime

Underground mining in this region has been carried out for over a century, and longwall mining for more than 30 years, so that it is reasonable to assume that there has been some impact on the local hydrogeological regime due to the drainage of groundwater into these mines. There have been no fewer than seven mines operating in the immediate vicinity of Angus Place during this period. These include Springvale Colliery, Clarence Colliery, Lithgow State Mine (abandoned), Fernbrook Colliery (abandoned), Renown Colliery (abandoned), Kerosene Vale Open Cut (abandoned) and Newcom Colliery (abandoned). All of these have had some impact on the hydrogeological regime.

While bord and pillar mining does not result in any significant impacts on the hydrogeological regime, previous studies in the area (Aurecon, 2010 and 2011) have shown that the fractured zone above the longwall panels could extend up to 150 m above the extracted coal seam. If this is the case, then any water-bearing zones in the coal measures would be drained and depressurised some distance from the mine opening. Previous experience with extensometer and piezometric monitoring at Springvale Colliery (Aurecon, 2009) shows that the fractured zone extends to at least 100 metres above the longwalls (and possibly higher), resulting in the drainage of coal measure groundwater into the mine.

Based on these data, it is reasonable to assume that the strata for a height of up to 150 m above the Lithgow Seam may have already been depressurised and partially drained of groundwater by previous longwall mining in the area. While the exact height of depressurisation is not certain, it is highly likely that it is limited to the strata below the Mount York Claystone, which is more than 200 m above the coal seam and acts as a regional aquiclude (see Table 2). Consequently, the hydrogeological regime in the Banks Wall Sandstone above the Mount York Claystone has been relatively unaffected by the mining to date.

Since the hydrogeological regime in the Banks Wall Sandstone above the Mount York Claystone has most likely been unaffected, the upper aquifers in the Banks Wall Sandstone are unlikely to have suffered any significant long-lasting impacts due to the mining. As a result, the flow from these aquifers is unchanged, and the swamps that rely on these flows have also been unaffected. Because of this, the regional consequences on these aquifers from the previous mining in the area are judged to be negligible.

5.2 Additional impacts on the hydrogeological regime from LWs 415-419

The extraction of LW415 to 419 will further dewater the coal measures, and result in a small increase in the inflows to the mine from about 190 L/sec to 200 L/sec. Since it has been shown that the upper aquifers in the Banks Wall Sandstone are unaffected by mining, it is apparent that the increased inflows are derived from the coal measure strata, which will lead to an increased drawdown area where the coal measures are dewatered. It therefore needs to be established that this will not have any wide-ranging impacts on the local hydrological regime.

It has been shown in previous studies (CWPPI, 2005) that the drawdown in the coal measure strata can extend up to 1200 m from the workings, and continuous pumping in the future may extend the drawdown somewhat. Nevertheless, even if the drawdown radius expands, the impact should be minimal, as the water in these lower aquifers represents a negligible contribution to stream flow and vegetation support in the region, since their depth and the presence of the Mount York Claystone effectively prevents any significant upwards groundwater flow to local creeks or downwards flow from the important aquifers in the Banks Wall Sandstone. As for the previous mining, there will be no measurable impacts on these upper aquifers from the additional inflows due to the proposed extraction of LWs 415 to 419.

Previous investigations have indicated that there are no known groundwater users downdip of the project area that use groundwater from the coal measure strata. Agricultural activities in the Wolgan River valley may make use of river water, which comprises mostly rainfall runoff with a small contribution of groundwater derived from the local strata over Springvale. By far the greatest proportion of the groundwater contribution to the Wolgan River flow is from aquifers in the Banks Wall Sandstone. Since these will be unaffected by the extraction of the additional longwall panels, No adverse impacts will ensue. Outflows of groundwater from the coal measures into the Wolgan River are negligible compared to the flow from the upper aquifers, due to the lower permeability of the coal seams and their very limited sub-crop when compared to the sandstone aquifers.

The conclusion can therefore be drawn that the additional inflows to Springvale Colliery from the extraction of LWs 415 to 419 will have a negligible and unmeasurable impact on the local hydrogeological regime, and on surface water flows.

5.3 Other implications

The removal of groundwater inflows to a mine can trigger regulation of the discharge under the *Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources, 2011,* which is a regulation made under the *Water Management Act 2000*. This Plan establishes a bulk access regime for the extraction of water under access licences to 13 specified groundwater sources (Part 1 Cl.4). One of the nominated groundwater sources, the *Sydney Basin Blue Mountains Groundwater Source*, is relevant to the extraction of LWs 415 to 419, as this water source lies in the Narrabeen Group rocks including the Banks Wall Sandstone. Two other groundwater sources in the region, the *Coxs River Fractured Rock Water Source* and the *Sydney Basin Coxs River Groundwater Source* do not apply as the proposed longwall panels are located in the Colo River Catchment.

Since the investigations have concluded that the aquifers in the Banks Wall Sandstone will be unaffected by the mining, it seems unlikely that the Plan will apply to the proposed extraction. However, there are two issues that reduce the certainty of this contention:

1. Part 1 Cl.4 (3) of the Plan notes that the specified groundwater sources " include all water contained within all aquifers below the surface of the ground shown on the Registered Map". Consequently, if the water-bearing zones in the coal measure strata are deemed to be aquifers, then technically they will be captured by the Plan as they lie below the Narrabeen Group aquifers.
2. The *Water Management (General) Regulation 2004* defines an "aquifer" as "a geological structure or formation, or an artificial landfill, that is permeated with water or is capable of being permeated with water". This is of little assistance in determining whether the coal measures contain any "aquifers" or just interstitial groundwater.

The vision statement for the plan states that it "is to provide for healthy and enhanced water sources and water dependent ecosystems and equitable water sharing among users in these groundwater sources". Since there are GDEs in this area then there may be additional scrutiny on the extraction of the water inflows to the mine.

It is also important to note that the performance indicators for the Plan, amongst other things, include the:

- extent of groundwater level fluctuations,
- change in the ecological condition of representative groundwater dependent ecosystems, where groundwater extraction is recognised as the primary risk to their condition,

Obviously, the water level fluctuations in the coal measures are significant due to the undermining, but there has never been any change in the ecological condition of GDEs due to depletion of the groundwater.

While it seems unlikely that the *Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources, 2011* would be applicable to the expected groundwater extraction within the proposed LWs 415 to 419, this should be confirmed by Centennial's Legal Branch.

6. Conclusions

An assessment has been made of the potential for impacts on the local and regional hydrogeology from activities associated with the construction and commissioning of Bore 8. The main findings are as follows:

1. The surface infrastructure for the bore sites is located in the Newnes State Forest, which contains a number of groundwater dependent ecosystems classified as 'Temperate Highland Peat Swamps on Sandstone' (THPSS). These swamps include Newnes Plateau Shrub Swamps (NPSS) and Newnes Plateau Hanging Swamps (NPHS).

2. The surface infrastructure for the bores will require a final cleared area of about 0.32 ha. Activities will include clearing of access tracks, construction of drilling pads, installation of erosion and sediment controls, trenching for utilities, drilling the bores, partial rehabilitation of the site, and installation and commissioning of the bores. The Bore 8 site has been chosen to avoid known NPHS and other threatened and endangered flora species.

3. The proposed four boreholes at the Bore 8 site will be constructed by the process of blind boring. This involves drilling a pilot hole, followed by boring with a blind boring head, following the pilot hole, to produce a borehole of the desired diameter. Drilling mud with a controlled density is fed into the void above the cutting head to lubricate cutting and balance the hydrostatic pore fluid pressure. On completion of boring, the borehole liner with a capped bottom

is lowered down the hole, displacing the drilling mud. Finally the annulus between the liner and borehole is fully grouted.

4. There are essentially three basic groundwater systems that have been identified in the region, and all have the potential to be impacted by the installation and operation of the proposed boreholes. These groundwater systems include:

   - **Perched groundwater system** – a discontinuous, near-surface system generally independent of the regional groundwater systems, which supports NPHS.
   - **Shallow groundwater system** –a regional groundwater system located in the Narrabeen Group above the Mount York Claystone, largely in the Banks Wall Sandstone, which contains aquifer zones that support Newnes Plateau Shrub Swamps, including the Sunnyside, Sunnyside East and Carne West Swamps.
   - **Deep groundwater system** – a less important, deeper groundwater system exists in the strata below the Mount York Claystone, and includes the Illawarra Coal Measures.

5. The potential hydrogeological risks associated with the proposed construction and operation of the dewatering bores were identified and can be categorised into local and regional impacts as follows:

   Local impacts

   - Draining of perched groundwater into mine workings via the boreholes
   - Draining of shallow groundwater into mine workings via the boreholes
   - Drainage of deep groundwater into mine workings via the boreholes
   - Contamination of perched and shallow aquifers with drilling fluid
   - Additional underground water make and discharge due to groundwater drainage via the boreholes
   - Damage to hanging swamps due to diversion of surface water from disturbed areas

   Regional impacts

   - Possible long-term drainage of shallow groundwater into mine workings via the boreholes

6. All of these potential risks were examined in detail and none were found to pose a risk to the local or regional hydrogeological regime, or the groundwater dependant ecosystems that rely on these groundwater resources.

7. Several avoidance measures have been identified that will ensure that the risk of any adverse hydrogeological outcomes is minimised.

8. An assessment of future mine water inflows into LWs 415 to 419 concluded that Springvale will need to increase its current licensed discharge volume from 5958 ML/year by 222 ML/year to 6180 ML/year. This increase in volume of less than 4% will set the rate at the 95th percentile of recorded flows rather than the current 93.8th percentile.

9. A review of the potential impacts of this increase in inflows to the mine concluded that, since almost all of the additional groundwater inflows will originate from the coal measure strata, the extraction of LWs 415 to 419 will further dewater the coal measures, which have been largely drained of groundwater in the vicinity of Springvale by previous mining in the region (at Springvale and other adjacent mines). Since there are no known groundwater users downdip of the project area that use groundwater from the coal measure strata, and the coal measure strata do not provide any significant contribution to base flow in the local streams, this additional dewatering will have a negligible impact.

10. The review also concluded that the hydrogeological regime in the Banks Wall Sandstone above the Mount York Claystone (more than 200 m above the mine) will be unaffected by the proposed

extraction. Consequently, the important upper aquifers in the Banks Wall Sandstone will be unaffected, and the flow from these aquifers will be unchanged. As a result, the swamps that rely on these flows will also be unaffected.

11. The overall conclusion can be drawn that the additional inflows to Springvale Colliery from the extraction of LWs 415 to 419 will have a negligible and unmeasurable impact on the local hydrogeological regime, and on surface water flows.

12. A review of *Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources, 2011* has indicated that it may not be applicable to the expected groundwater extraction within the proposed LWs 415 to 419. This should be confirmed by Centennial's Legal Branch.

7. References

Aurecon 2009, *Newnes Plateau Shrub Swamp Management Plan, Investigation of Irregular Surface Movement in East Wolgan Swamp, Aurecon*, September 2009

Aurecon, 2010, *Assessment of Hydrogeological Impacts Angus Place Project Modification, Centennial Angus Place, Aurecon*, October 2010

Aurecon, 2011, *Springvale Colliery, Hydrogeological Assessment, Longwalls 415, 416 and 417 Proposed Action Referral,* Aurecon, April 2011

Bish, 1999, *Hydrogeological Assessment for Coxs River Catchment*, Sydney-South Coast Region, Department of Land and Water Conservation, October 1999

CSIRO, 2010, *Hydrological Assessment for LW910 and LW900W at Angus Place Colliery*, CSIRO Report No. P2010/291, March 2010.

Connell Wagner PPI, 2005, *Springvale Colliery Longwalls 411 to 418 Summary Report on Impact of Mining on Aquifers and Shrub Swamps,* CWPPI, April 2005

DGS, 2011, *Subsidence Prediction and Impact Assessment for the Proposed Longwalls 415 to 417 at Springvale Colliery, Wallerawang,* DGS Report No. SPV-003/1, February 2011

Golder Associates, 2002, *Geotechnical and Hydrogeological Investigation Ventilation Shaft, Newnes Springvale Colliery*, Golder Associates, August 2002.

McHugh, B, 2011, *Hanging Swamps within the Angus Place/Springvale Lease Area – Preliminary Report*, August 2011

Merrick, N, 2012, *Springvale Mine Modelling Review and Groundwater Mine Inflow Assessment for the Borehole 8 Modification*, Heritage Computing Report HC 2012/14, July 2012.

Appendix A

Springvale Colliery, Groundwater Mine Inflow Assessment for the Borehole 8 Modification
N Merrick

HERITAGE COMPUTING REPORT

APPENDIX A

SPRINGVALE COLLIERY

GROUNDWATER MINE INFLOW ASSESSMENT FOR THE BOREHOLE 8 MODIFICATION

FOR

SPRINGVALE PTY LTD

PO Box 198, WALLERAWANG NSW 2845

By

Dr N. P. Merrick

Report Number: HC2012/17
Date: July 2012

HERITAGE COMPUTING PTY LTD
ABN 75 392 967 126
143 Singles Ridge Road, Winmalee. N.S.W. 2777
Phone (02) 47541259
Fax (02) 47545259

DOCUMENT REGISTER

REVISION	DESCRIPTION	DATE	COMMENTS
A	DRAFT	13 JUNE 2012	Original
B	FINAL	30 JULY 2012	Review comments incorporated

TABLE OF CONTENTS

1.0 INTRODUCTION

This report provides a component of the groundwater assessment being undertaken by Aurecon for Springvale Colliery for the proposed dewatering Bore 8. Bore 8 will form part of Springvale Collierys's groundwater dewatering strategy as longwall mining progresses downdip to the east from LW416 to LW419. An additional dewatering facility needs to be established ahead of the workings to ensure water levels in the mine can be kept to safe manageable levels.

Springvale Colliery currently operates one dewatering facility (Bore 6) on the Newnes Plateau. Three submersible pumps exist at the “Bore 6” facility. Bore 6 is located at what is currently the lowest point in the mine, near the northern end of LW416, and is the mine's principal dewatering facility at the present time.

Mine dewatering rates out to LW419 have been projected by means of two models currently used by Springvale Colliery to predict operational water make.

2.0 SCOPE OF WORK

The relevant component of the Scope of Works for the groundwater assessment for construction and operation of Springvale's Bore 8 is:

- *Quantification of the groundwater inflow into mine workings.*

A review of the numerical model developed by CSIRO for Springvale has been conducted according to established industry guidelines for reviewing groundwater flow models (MDBC, 2001). The results of the review are reported elsewhere (Merrick, 2012).

3.0 QUANTIFICATION OF MINE INFLOWS

Mine dewatering rates out to LW419 have been projected by means of three models: (1) An empirical algorithm (developed by Springvale Colliery) based on the perimeter of active workings; (2) A revised empirical algorithm also based on the perimeter of active workings; and (3) A coupled geomechanical - water flow numerical model developed by CSIRO.

For the revised empirical algorithm, the total mine inflow at the end of longwall panel *n+1* is:

$$\boldsymbol{Q_{n+1} = 14.2 * \{ P_n + 0.13\, P_{n-1} + 0.10\, P_{n-2} + 0.12\, P_{n-3} + 0.30\, P_{n-4} + 0.04 \sum_{i=1}^{n-5} P_i \}}$$

where P_i is the perimeter for longwall panel *i*. A comparison between actual mine inflow from 1996 to 2010 and the empirical estimate is shown in **Figure 1**.

Projected estimates of mine inflow for longwalls 415 to 419 are shown also in **Figure 1** for the revised empirical algorithm and the numerical model.

Due to the difficulty in fitting the mine inflow trend with a single mining attribute, there remains substantial uncertainty in projecting mine inflow estimates by an empirical method. However, the mine inflow at LW419 in 2018 is likely to be in the range 150-250 L/s, say 200±50 L/s (13-22 ML/day). On the other hand, the algorithm provides a very simple and rapid method of estimation for future longwalls, compared with the substantial effort required to satisfy a similar objective using a numerical model. The numerical model estimates will have lower uncertainty as other mining attributes, including geological structure, can be taken into account.

The numerical model estimates of mine inflow for LW416-LW419 range from about 160 L/s (14 ML/day) to about 220 L/s (19 ML/day), as panel averages, for two cases (Case 1 and Case 2) which differ in the degree of permeability enhancement due to rock deformation.

Figure 1 shows that the revised empirical model estimate of mine inflow for LW416-LW419 lies roughly midway between the Case 1 and Case 2 estimates, and both approaches have fairly steady inflow over the duration of LW416-LW419.

The separate mine inflow estimates for LW416 to LW419 are consistent (**Table 1**). The most likely average rate is about 200 L/s (about 17 ML/day) with an uncertainty range in the order of 50 L/s (about 5 ML/day).

Table 1. Springvale Mine Inflow Estimates for LW416-LW419

MODELLING METHOD	MINE INFLOW [L/s]	MINE INFLOW [ML/day]
Revised Empirical Algorithm	200 ± 50 L/s	17.5 ± 4.5 ML/day
Coupled Numerical Model	190 ± 30 L/s	16.5 ± 2.5 ML/day

The current licensed volume attached to Bore 6 is 5958 ML/year. This is close to the most likely annual volume expected for LW416-419, which is 6000-7000 ML/year as shown in **Table 2**. The upper limits of possible volumes are 7000-8000 ML/year. It is expected that the volumes will not vary appreciably for the duration of the future longwall panels.

The precautionary approach would be to seek an increase in the Bore 6 licence, when transferring to Bore 8, from 5958 to 8000 ML/year. This volume lies at the 99.8th percentile of recorded inflows.

Alternatively, it could be argued that the licensed volume should be set at the 95th percentile of recorded flows. This is 6180 ML/year, an increase of 222 ML/year. The current licence is at the 93.8th percentile.

Table 2. Springvale Mine Inflow Licence Estimates for LW416-LW419

MODELLING METHOD	EXPECTED AVERAGE INFLOW VOLUME [ML/a]	EXPECTED MAXIMUM INFLOW VOLUME [ML/a]
Revised Empirical Algorithm	6400	8000
Coupled Numerical Model	6000	7000

4.0 REFERENCES

Leah, P., 2010, Springvale Mine: Water Make Investigation 2010. Internal PowerPoint presentation, 62 slides, 9 September 2010.

MDBC, 2001, Groundwater flow modelling guideline. Murray-Darling Basin Commission. URL: www.mdbc.gov.au/nrm/water_management/groundwater/groundwater_guides

Merrick, N.P., 2012. Springvale Mine Modelling Review and Groundwater Mine Inflow Assessment, June 2012 (Report Number HC2012/14).

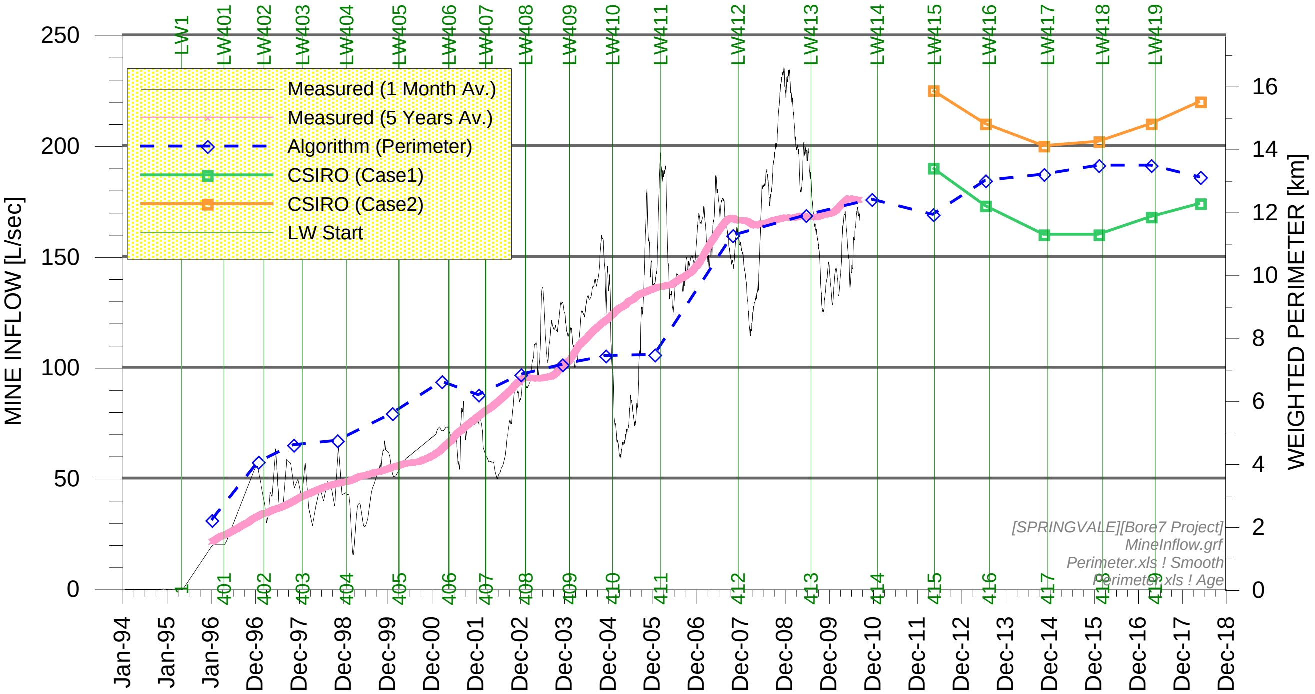


Figure 1. Actual mine inflow and projected mine inflow estimates

Flora and Fauna Assessment

(RPS, 2012)

Appendix - H

Flora and Fauna Assessment

Proposed Surface Mine Dewatering Facility
Bore 8
Springvale Colliery

Prepared by:

RPS AUSTRALIA EAST PTY LTD

241 Denison Street
Broadmeadow NSW 2292

T: +61 2 4940 4200
F: +61 2 4961 6794
E: newcastle@rpsgroup.com.au

Prepared for:

SPRINGVALE COAL PTY LTD

Castlereagh Highway
Lidsdale, NSW 2845

Client Manager:	Toby Lambert
Report Number:	110382
Version / Date:	September 2012

Document Status

Version	*Purpose of Document*	*Orig*	*Review*	*Review Date*	*Format Review*	*Approval*	*Issue Date*
Draft A	*Draft for client review*	*CM/JS*	*PH*	*5-4-12*	*-*	*T. Lambert*	*24-4-12*
Prelim Draft	*Issue for Client Information Only*	*CM/JS*	*AB*	*13-6-12*	*-*	*T.Lambert*	*13-6-12*
Final	*Final for Issue*	*CM/JS/AB*	*TL*	*4-9-12*	*-*	*T.Lambert*	*4-9-12*

Disclaimers

Executive Summary

RPS Australia East Pty Ltd (RPS) was engaged by Centennial Springvale Pty Ltd to undertake a Flora and Fauna Assessment for the construction an additional surface mine dewatering facility (Bore 8) and associated road infrastructure (the Project), within Newnes State Forest.

Ecological investigations included diurnal field studies and desktop assessments over the 'Study Area' as conducted by RPS. The 'Study Area' is comprised of the 'Project Application Area' (the impact areas associated with the construction of the dewatering bore site and access track) and the surrounding areas which were surveyed in order to inform the design of the access route and dewatering bore. The surveys conducted throughout the Study Area included diurnal bird surveys, targeted surveys for threatened plants, location of hollow-bearing trees and delineation of Threatened Ecological Communities (TECs) within the Study Area. Desktop investigations represented the results as contained in the Atlas of NSW Wildlife (NSW NPWS) and the records obtained from the Protected Matters search tool (SEWPAC). In addition, records were added from other ecological investigations from the area (Denny 2004a, 2004b, 2005, 2006a, 2006b, 2007a, 2007b, 2008a, 2008b, 2008c, 2009, 2010a, 2010b, 2010c, 2010d, 2010e, 2011a, 2011b, 2011c, 2011d, RPS 2010).

This assessment aims to examine the likelihood of the Project to impact upon any threatened species, populations or ecological communities listed within the *Threatened Species Conservation Act 1995* (*TSC Act 1995*). This report recognises the relevant requirements of the *Environmental Planning and Assessment Act 1979* (*EP&A Act 1979*) as amended by the *Environmental Planning and Assessment Amendment Act 1997* (*EP&AA Act 1997*). Assessment is also made with regard to those threatened entities listed federally under the *Environment Protection and Biodiversity Conservation Act 1999* (*EPBC Act 1999*).

VEGETATION

Four vegetation communities were recorded within the Study Area (ground-truthed mapping after DEC 2006), including:

- MU 30 Exposed Blue Mountains Sydney Peppermint-Silvertop Ash Shrubby Woodland;
- MU 28 Sandstone Plateau and Ridge Scribbly Gum Silvertop Ash Shrubby Woodland;
- MU 26 Newnes Plateau Narrow Leaved Peppermint- Silvertop Ash Layered Open Forest; and
- MU 7 Newnes Plateau Narrow Leaved Peppermint- Mountain Gum- Brown Stringybark Layered Forest.

A total of 4 ha of native vegetation will be cleared for this Project, with 2.34 ha of this area to be rehabilitated after the initial construction phase.

Significant Flora

A number of threatened flora species were targeted during flora investigations. These investigations found that 93 individual *Persoonia hindii*, a species listed as Endangered under the *TSC Act 1995*, were likely to be removed as a result of this Project.

Fauna Habitat

Open Forest habitat occurred across all the Study Area along with several outcrops of Hanging Swamp, which provides potential fauna habitat to a range of birds, amphibians, reptiles and invertebrates. A relatively low density of hollow-bearing trees occurred across the Study Area, as a consequence of past logging disturbance, however habitat still occurs for arboreal marsupials, hollow dependent microchiropteran bat fauna and large forest owls. No hollow bearing trees were recorded within the development footprint for this Project.

The understorey diversity and habitat complexity is relatively high and would provide habitat for small native mammals including Antechinus and for small insectivorous and nectivorous birds.

Significant fauna

A range of threatened fauna species occur within the Study Area and its surrounds, including the Gang Gang Cockatoo (*Callocephalon fimbriatum*), Scarlet Robin (*Petroica boodang*), Flame Robin (*Petroica phoenicea*) and Masked Owl (*Tyto novaehollandiae*). Due to the high degree of connectivity to surrounding habitat and the limited amount of clearing for this Project, no significant impact on any threatened fauna is expected.

CORRIDORS AND HABITAT LINKAGES

The Project will be located within contiguous wooded habitats of the Newnes Plateau, an area of native vegetation covering ~25,000 hectares. The location of the proposed surface mine dewatering facility and associated infrastructure has been designed to minimise the impact on the ecology of the area through having the smallest possible footprint and to avoid the majority of the *P. hindii* population, hollow-bearing trees and areas of Newnes Plateau Hanging Swamp.

ENVIRONMENTAL LEGISLATION ASSESSMENT

Section 5A of the EP&A Act 1979

Assessment of potential impacts likely to be associated with the Project Application Area and the ecological requirements of locally occurring native flora and fauna found that no threatened species, population or community is likely to be adversely affected by proposed geotechnical works, provided that adequate sediment controls (as developed by GSSE (2012)) are established and areas of *P. hindii* are avoided to a level that is unlikely to significantly impact upon the local population.

Key Threatening Processes

Key Threatening Processes (KTPs) are listed in Schedule 3 of the *TSC Act 1995*. Six KTPs have the potential to affect the Project Application Area as a consequence of the Project, being:

- Infection of native plants by *Phytophthora cinnamomi*;
- Removal of native vegetation ;
- Removal of dead wood and trees;
- Anthropogenic climate change;
- Loss of hollow-bearing trees; and
- Alternation to the natural flow regimes of rivers, streams, floodplains and wetlands.

No other KTPs are believed to be likely as a consequence of the proposed surface mine dewatering facilities. Due to the small scale of the Project, it is not expected that it will significantly contribute towards any KTP.

SEPP 44 'Koala Habitat Protection'

One Koala feed tree species (*Eucalyptus viminalis*) occurred across the Study Area, however the density of *E. viminalis* (<15%) suggest that the Study Area is not core Koala habitat as defined in SEPP 44.

EPBC Act 1999

Five threatened fauna species, no threatened flora species and no TEC are considered to potentially occur within the Study Area. No significant impacts are expected to occur on any of the threatened fauna species provided the mitigation measures stipulated within this report are adhered to.

CONCLUSIONS AND RECOMMENDATIONS

The proposed dewatering borehole location and associated access track has been designed based on minimum impact to significant surface features.

The access road to Bore 8 is mostly already formed and it was considered that the least sensitive route was to utilise existing alignment as the constraints of *P. hindii* are present on both sides of the track and realignment will not result in a significant difference in impacts.

One threatened flora species and two threatened bird species listed under the *TSC Act 1995* have been recorded within the Study Area during recent surveys (RPS 2011 and 2012) whilst an additional 23 threatened species have been identified in the locality during monitoring work by Martin Denny. Habitat within the Project Application Area is considered suitable for several other threatened species that may use the area on an intermittent basis.

93 individual *P. hindii* are proposed to be removed in this Project, representing the removal of less than 0.8% of the known population of approximately 12,000 individuals that are located within 2.8km of the Study Area.

A significant impact is considered unlikely to occur to any species, population, or endangered ecological community as a result of the proposal.

Recommendations

The following recommendations have been outlined to provide ecological guidelines and Study Area management strategies that may prevent any ongoing detrimental impacts upon habitat surrounding the proposed surface mine dewatering facilities.

- Sediment and erosion control should be a focus when undertaking access track upgrade;
- During removal of habitat trees an environmental representative or ecologist should be present to ensure that fauna are handled appropriately;
- Any hollow-bearing trees removed by clearing activities along with valuable fauna habitat within displaced ground debris should be retained and collected for fauna conservation activities off-site;
- Hollow-bearing trees adjacent to the impact footprint should be retained where possible;
- Populations of *P. hindii* should be avoided where possible;
- All disturbed areas outside of the impact footprint should be rehabilitated with endemic native vegetation;
- Adequate sediment control be employed adjacent to all areas of soil disturbance; and
- Appropriate measures should be employed to ensure that machinery utilised for the Project are free of materials (soils etc.) such that they do not infect vegetation within the Study Area with *Phytophthora cinnamomi*, or cause the distribution of weed species.

Terms and Abbreviations

Abbreviation	**Meaning**
DECCW	NSW Department of Environment, Climate Change and Water (now OEH)
OEH	Office of Environment and Heritage
DP&I	NSW Department of Planning and Infrastructure
EP&AA Act 1979	*Environmental Planning and Assessment Act 1979*
EP&AA Act 1997	*Environmental Planning and Assessment Amendment Act 1997*
EPBC Act 1999	Commonwealth *Environment Protection Biodiversity Conservation Act 1999*
ha	hectare
RPS Australia East Pty Ltd	RPS
SEWPAC	Commonwealth Department of Sustainability, Environment, Water, Population and Communities
TEC	*Threatened Ecological Community*
TSC Act 1995	NSW *Threatened Species Conservation Act 1995*

Table of Contents

Tables

1.0 Introduction

RPS Australia East Pty Ltd (RPS) was engaged by Springvale Coal Pty Ltd to undertake a Flora and Fauna Assessment for a proposed surface mine dewatering facility (Bore 8), as well as associated infrastructure (power and water pipelines) and an access road within the Springvale mining lease area (herewith referred to as 'the Study Area'). The ‘Study Area’ is comprised of the ‘Project Application Area’ (the impact areas associated with the construction of the dewatering bore site and access track) and the surrounding areas which were surveyed in order to inform the design of the access route and dewatering bore. This included the mapping of the buffer areas surrounding the track alignment and dewatering bore pad area of approximately 120m x 120m.

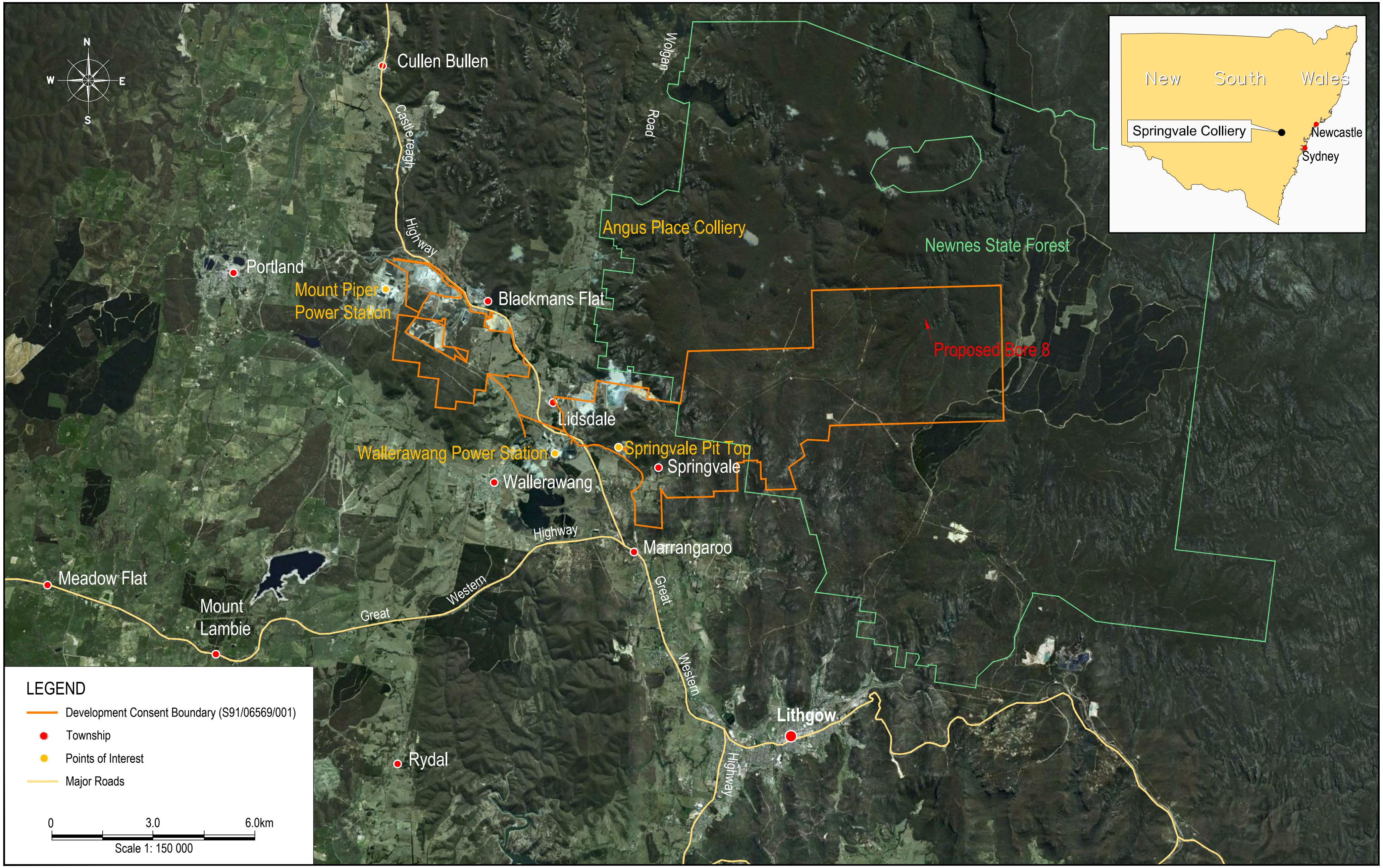
The Project Application Area consists of an access track of which the entire length is along an existing track; however it will require widening from approximately 3m to 10m. The area of impact at the pad site is going to be 1.44 ha. Areas within the initial development footprint of the access track to be decommissioned after the construction phase (including the reduction in width of the access track from 10m to 5m) will be rehabilitated with native, endemic vegetation. Therefore, 2.34 ha of the vegetation clearing will only be a temporary impact.

The borehole location and its proposed access track was investigated in order to assess the potential for supporting threatened species, populations and ecological communities known or likely to occur within the region. These field investigations were used to examine the likelihood of any significant impact of the proposed dewatering bore and associated infrastructure on any threatened species, populations or ecological communities listed within the *Threatened Species Conservation Act 1995* (*TSC Act 1995*). This report recognises the relevant requirements of the *Environmental Planning and Assessment Act 1979* (*EP&A Act 1979*) as amended by the *Environmental Planning and Assessment Amendment Act 1997* (*EP&AA Act 1997*). Assessment is also made with regard to those threatened entities listed federally under the *Environment Protection and Biodiversity Conservation Act 1999* (*EPBC Act 1999*).

Figure 1-1 shows the regional location of the project.

Figure 1-2 shows the Project Application Area and project design.

Figure 1-3 shows an aerial photo of the study area.



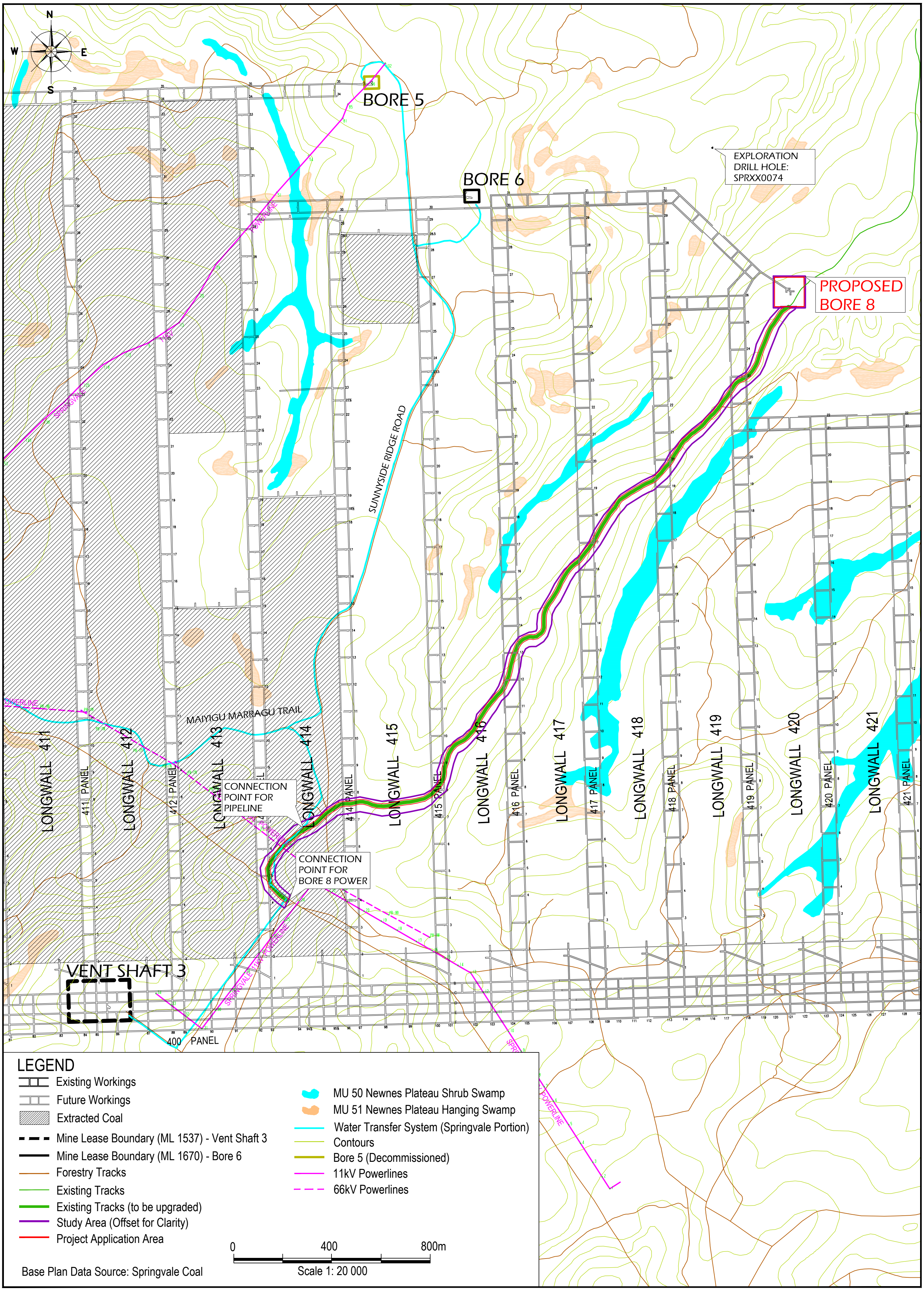
To be printed A4

GSS ENVIRONMENTAL
Environmental, Land and Project Management Consultants

Springvale Colliery
Regional Locality Plan

FIGURE 1-1

V:\CCC15-005\Figures\Final\CAD\RPS_120904\Fg1-1_CCC15-005_Location Plan_120904.dwg



V:\CCC15-005\Figures\Final\CAD\RPS_120904\Fg1-2_CCC15-005_Project Application Area_120904.dwg

To be printed A4

GSS ENVIRONMENTAL
Environmental, Land and Project Management Consultants

Springvale Colliery
Project Application Area

FIGURE 1-2

TITLE: FIGURE 1-3: STUDY AREA AERIAL PHOTO

LOCATION: SPRINGVALE DEWATERING BORE 8

DATUM: GDA 94
PROJECTION: MGA ZONE 56

DATE: 04/09/2012
PURPOSE: REPORT FIGURE

LAYOUT REF: J:\JOBS\Centennial\All Jobs\110382 Springvale Dewatering Bores 7 & 8\Drafting\Workspaces\Eco
VERSION (PLAN BY): A A4 (PH)

CLIENT: CENTENNIAL SPRINGVALE
JOB REF: 110382

RPS AUSTRALIA EAST PTY LTD (ABN 44 140 292 762)
241 DENISON STREET BROADMEADOW PO BOX 428 HAMILTON NSW 2303
T: 02 4940 4200 F: 02 4961 6794 www.rpsgroup.com.au

RPS

1.1 Study Area Particulars

Locality – Springvale Mine, Newnes Plateau NSW

LGA – Lithgow City Council.

Area – The total area considered covers 19.3ha (the Study Area), which includes the proposed dewatering bore site of 120m x 120m and the access track with associated buffer on either side.

Boundaries – The Study Area is wholly within the Springvale Coal mining lease.

Current Land Use – The Study Area lies with the Newnes State Forest Estate, an area of State Forest that covers ~25,000 hectares.

Topography – The Study Area is situated on the lower and mid-slopes of the small valley formed by a perennial drainage line.

Vegetation – The proposed dewatering bore site and access track is located within remnant vegetation that is selectively logged under State Forest tenure. Vegetation communities within the immediate area as described in DEC (2006) include Exposed Blue Mountains Sydney Peppermint – Silvertop Ash Shrubby Woodland, Newnes Plateau Narrow-leaved Peppermint – Silvertop Ash Layered Open Forest, Newnes Plateau Narrow-leaved Peppermint – Mountain Gum – Brown Stringybark Layered Forest and Sandstone Plateau and Ridge Scribbly Gum – Silvertop Ash Shrubby Woodland.

1.2 Description of the Project

An additional surface mine dewatering facility (Bore 8) is to be established ahead of current mine workings as the workings progress east along the coal seam, to ensure water levels in the mine are safely maintained at manageable levels. The Project Application Area has been selected to suit the anticipated seam floor contours as well as the proposed mine layout and topography for surface infrastructure.

A low level of impact is expected due to the clearing works required for the bore pad, access track, powerline and pipeline installation. Large construction and maintenance machinery will be operated in these areas but are expected to have minimal impacts.

1.3 Scope of the Study

The scope of this flora, fauna and ecological constraints assessment report is to:

Undertake a desktop review of previous ecological assessments (with regard to recorded threatened species) located in the vicinity of the Study Area and to also review records of threatened species from the NSW Atlas of Wildlife and a SEWPAC Protected Matters Search;

- Identify vascular plant species found within the Study Area;
- Identify and map existing vegetation communities;
- Assess the status of identified plant species and vegetation communities under relevant legislation;
- Identify existing habitat types within the Study Area and assess the habitat potential for threatened

species, populations, or ecological communities known from the proximate area;

- Through preliminary research identify threatened fauna potentially using the Study Area;
- Employ targeted habitat survey techniques to identify fauna, in particular threatened species potentially using the Study Area; and
- Assess the potential of the Project to have a significant impact on any threatened species, populations or ecological communities identified during field surveys or as having potential habitat in the Study Area.

Whilst survey work has been undertaken within the bounds of the Study Area (as outlined in Section 1.0), consideration has been afforded to areas within the surrounding landscape in order to appreciate the environmental context at a regional scale. This has included assessment of potential indirect impacts.

The purpose of this report is to:

- Ensure planning, management and development decisions are based on sound scientific information and advice by documenting the presence of any biodiversity components or potential significant impacts that may exist within the Study Area; and
- Provide information to enable compliance with applicable assessment requirements contained within the *TSC Act 1995*, *EP&A Act 1979*, the Commonwealth *EPBC Act 1999*, and any other relevant state, regional and local environmental planning instruments.

1.4 Qualifications and Licensing

Qualifications

This report was written by Arne Bishop BEnvSc, Chris McLean BEnSc (hons), PhD candidate and Joel Stibbard BSc and reviewed by Paul Hillier BEnvSc and Toby Lambert BEnvSc of RPS. The academic qualifications and professional experience of all RPS consultants involved in the Project are documented in Appendix 3.

Licensing

Research was conducted under the following licences:

- NSW National Parks and Wildlife Service Scientific Investigation Licence S100536 (Valid 31 December 2012);
- Animal Research Authority (Trim File No: 01/1142) issued by NSW Agriculture (Valid 12 March 2013);
- Animal Care and Ethics Committee Certificate of Approval (Trim File No: 01/1142) issued by NSW Agriculture (Valid 12 March 2013); and
- Certificate of Accreditation of a Corporation as an Animal Research Establishment (Trim File No: 01/1522 & Ref No: AW2001/014) issued by NSW Agriculture (Valid 22 May 2014).

2.0 Methodology

A variety of field survey techniques were employed over the course of fieldwork for this assessment to record the suites of flora species and the fauna guilds likely to occur across the Study Area.

Trapping and other intensive survey techniques were not conducted due to the occurrence of extensive previous survey work on the Newnes Plateau by RPS and others (see Denny 2004a, 2004b, 2005, 2006a, 2006b, 2007a, 2007b, 2008a, 2008b, 2008c, 2009, 2010a, 2010b, 2010c, 2010d, 2010e, 2011a, 2011b, 2011c, 2011d). These surveys were undertaken in accordance with guidelines outlined in DEC (2004a). Targeted habitat searches and assessment of previous surveys were used to assess the Study Area in place of trapping surveys.

2.1 Flora Survey

2.1.1 Vegetation Mapping

Flora surveys and vegetation mapping carried out within the Study Area has been undertaken. The vegetation mapping comprised mapping from the survey undertaken for this Project plus data from previous mapping as follows.

Review of previous ecological works in the vicinity of the Study Area include:

DEC (2006). *The Vegetation of the Western Blue Mountains*. Unpublished report funded by the Hawkesbury – Nepean Catchment Management Authority. Department of Environment and Conservation, Hurstville.

RPS (2010). *Flora and Fauna Assessment for Proposed Longwalls 910 and 900W*. Report for Centennial Angus Place Colliery, RPS, Newcastle.

2.1.2 Vegetation survey

This survey required confirmation of the community type(s) present (based on dominant species) by undertaking flora surveys and community identification throughout the Study Area.

Flora surveys were conducted throughout the Study Area, with an emphasis on potentially significant species as outlined below. The flora survey also included the consideration of the Study Area in line with methodology such as the “Random Meander Technique” described by Cropper (1993).

Map the type and general extent of the community(s) present into definable map units where appropriate.

2.1.3 Survey Limitations

Timing limitations are often encountered during ecological surveys due to the seasonality of activity and detectability for a number of flora and fauna species being studied. There is a range of common albeit cryptic plant species that have a brief flowering period and hence small ‘window’ of effective detectability. In addition, the seasonality of surveys also places limits on the number of flora species identified in the

Study Area. Therefore, some threatened species not detected cannot be discounted off-hand due to seasonality and other factors, and are therefore addressed in terms of their potential for occurrence within the Study Area based on ecological factors. As such, the precautionary principle is applied and for some species, where appropriate, assumed presence is made for assessment purposes.

2.1.4 Significant Flora Survey

A list of potentially occurring significant flora species from the locality, specifically the Project Application Area, (>10km radius) was compiled, which included threatened species, populations and ecological communities listed under the *TSC Act 1995*, those species listed under the *EPBC Act 1999*, as well as any other species deemed to be of local importance.

A detailed survey of the threatened species *Persoonia hindii* was undertaken once the plant was first observed. This was undertaken to ensure appropriate consideration of its location as part of the impact assessment and to inform potential project refinement if required.

2.2 Habitat Survey

An assessment of the relative value of the habitat present within the Study Area was carried out. This assessment focused primarily on the identification of specific habitat types and resources favoured by known threatened species from the region. The assessment also considered the potential habitat value of the Study Area (and surrounds) for all major guilds of native flora and fauna.

Habitat assessment was based on the specific habitat requirements of each threatened fauna species in regards to home range, feeding, roosting, breeding, movement patterns and corridor requirements. Consideration was given to contributing factors including topography, soil, light and hydrology for threatened flora and assemblages.

2.3 Fauna Survey

The fauna survey methodology initially consisted of the review of existing ecological surveys conducted on the Newnes Plateau, especially with regard to recorded threatened species. This information based on searches on the NSW Atlas of Wildlife and a SEWPAC Protected Matters Search provided a baseline for which fauna species are expected to occur on or in the vicinity of the Study Area. Combined with an opportunistic diurnal fauna survey of the Study Area, an observed and expected fauna species list for the area was able to be compiled from these records (Appendix 1). An assessment of the potential use of the Study Area by threatened fauna species (as listed under the *TSC Act 1995* and the *EPBC Act 1999*) was undertaken based on these records.

2.3.1 Avifauna Survey

The presence of avifauna within the Study Area was carried out via opportunistic diurnal observations during Study Area fieldwork visits. Birds were identified by direct observation or by recognition of calls or distinctive features such as nests, feathers, and owl regurgitation pellets etc. The potential for threatened avifauna to use the Study Area was also assessed by habitat attributes occurring within the Study Area and their capacity to support threatened species that are known to occur in the wider locality. Assessment of the Study Area's potential to provide opportunities for Large Forest Owl species was based on previous records of Large Forest Owls on the Newnes Plateau and supported through knowledge of the known habitat requirements of these species (Kavanagh et al. 1995, Kavanagh and Bambkin 1995, Kavanagh and Stanton 1998).

2.3.2 Herpetofauna Survey

Opportunistic diurnal amphibian and reptile searches were conducted during the survey. Known occurrences of threatened herpetofauna species from the region were taken into account during assessment of habitat, to determine the potential for the Study Area to support such species.

2.3.3 Secondary Indications and Incidental Observations

Opportunistic sightings of secondary indications (scratches, scats, diggings, tracks etc.) of resident fauna were noted. Such indicators may include:

- Distinctive scats and scents left by mammals.
- Nests made by various guilds of birds;
- Potential whitewash, regurgitation pellets and prey remains from owls;
- Skeletal material of vertebrate fauna;
- The calls of fauna; and
- Footprints and tracks.

Any other incidental observations of fauna were recorded during all phases of fieldwork.

3.0 Results

The prevailing weather conditions during the survey periods are presented in Table 3-1 below.

Table 3-1: Prevailing Weather Conditions

	DATE		
	4/7/11	31/10/11 – 4/11/11 (Average)	19/1/12
Min. Temperature	6.8ºC	7.3ºC	11.5ºC
Max. Temperature	9.9ºC	20.1ºC	24.6ºC
Wind	Low	Low	Low
Rain(24 hrs to 9:00am)	1.0 mm	0 mm	0 mm

3.1 Flora Survey

3.1.1 Vegetation Community Mapping

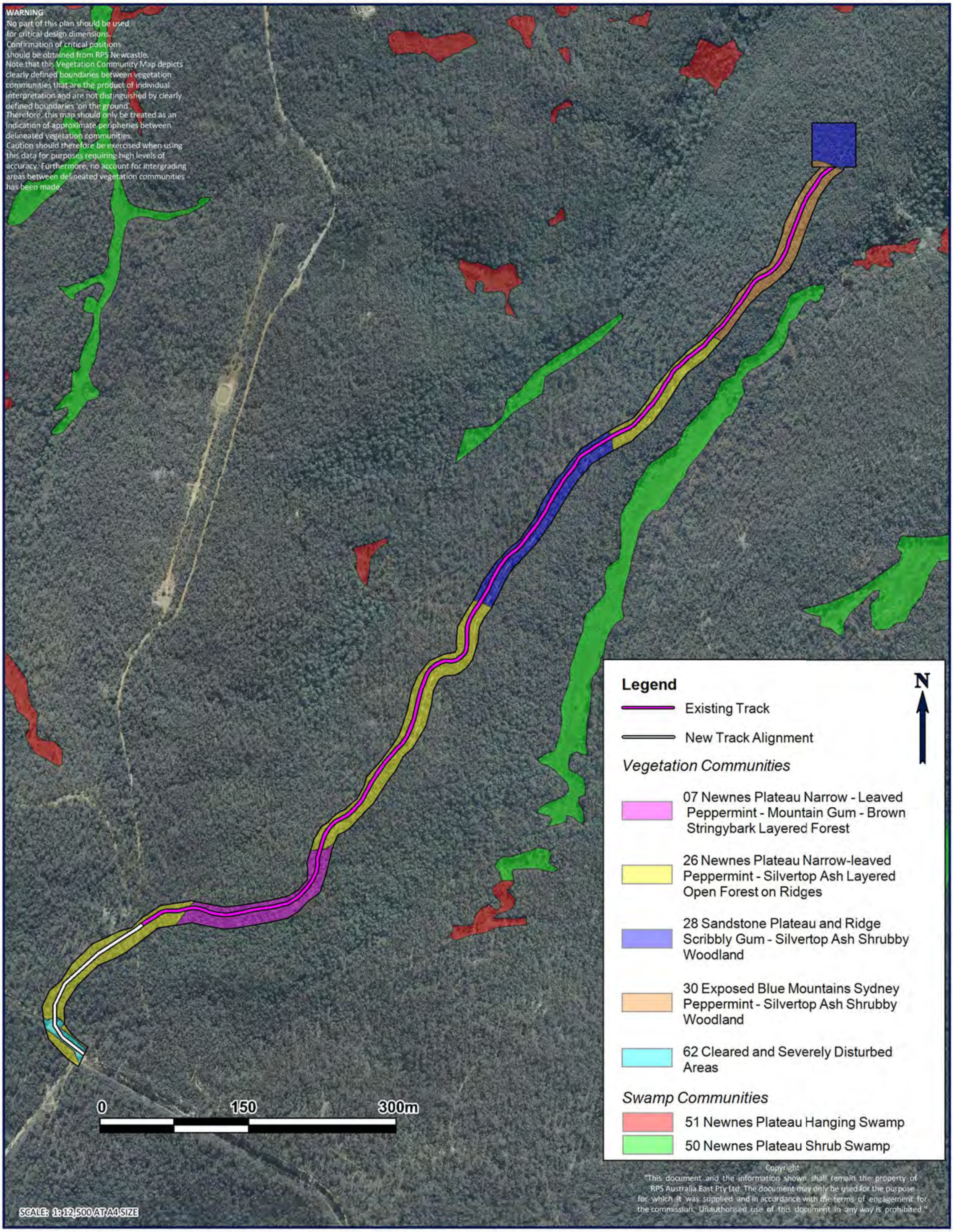
A report "*The Vegetation of the Western Blue Mountains including the Capertee, Coxs, Jenolan and Gurnang Areas*" was prepared by the Department of Environment and Conservation in November 2005 (DEC 2006). The areas within the Newnes State Forest are covered by that report.

Previous vegetation mapping (DEC 2006) in conjunction with ground-truthing during surveys noted in Table 3-1 identified four vegetation communities within the Study Area.

The vegetation communities that occur within the Study Area include:

- MU 7 Newnes Plateau Narrow-leaved Peppermint – Mountain Gum – Brown Stringybark Layered Forest occurs along a section of the existing access track;
- MU 26 Newnes Plateau Narrow-leaved Peppermint – Silvertop Ash Layered Open Forest occupies several areas along the existing access track for Bore 8;
- MU 28 Sandstone Plateau and Ridge Scribbly Gum – Silvertop Ash Shrubby Woodland that occupies the majority of the proposed location for the dewatering facility as well as an area along the existing access track; and
- MU 30 Exposed Blue Mountains Sydney Peppermint – Silvertop Ash Shrubby Woodland that occupies a small area of the proposed drill pad location as well as some of the adjacent access track.

The location of each vegetation community that occurs within the Study Area is included in Figure 3-1.



WARNING

No part of this plan should be used for critical design dimensions. Confirmation of critical positions should be obtained from RPS Newcastle. Note that this Vegetation Community Map depicts clearly defined boundaries between vegetation communities that are the product of individual interpretation and are not distinguished by clearly defined boundaries 'on the ground'. Therefore, this map should only be treated as an indication of approximate peripheries between delineated vegetation communities. Caution should therefore be exercised when using this data for purposes requiring high levels of accuracy. Furthermore, no account for intergrading areas between delineated vegetation communities has been made.

FIGURE 3-1: VEGETATION COMMUNITIES

LOCATION: SPRINGVALE DEWATERING BORE 8

DATUM: GDA 94
PROJECTION: MGA ZONE 56

DATE: 19/07/2012
PURPOSE: REPORT FIGURE

LAYOUT REF: J:\JOBS\Centennial\All Jobs\110382 Springvale Dewatering Bores 7 & 8\Drafting\Workspaces\Eco
VERSION (PLAN BY): D A4 (AB-JS)

CLIENT: CENTENNIAL SPRINGVALE
JOB REF: 110382

RPS AUSTRALIA EAST PTY LTD (ABN 44 140 292 762)
241 DENISON STREET BROADMEADOW PO BOX 428 HAMILTON NSW 2303
T: 02 4940 4200 F: 02 4961 6794 www.rpsgroup.com.au

1. MU 7 – Newnes Plateau Narrow-leaved Peppermint – Mountain Gum – Brown Stringybark Layered Forest (refer to Plate 3-1)

Description: This vegetation community occurred throughout large areas of the Study Area and is located predominantly on the ridgetops and central parts of the plateau. This is a tall forest with a relatively open or sparse shrub layer and a variably dense to sparse ground layer.

Canopy Layer: 18m to 20m – 35% Percentage Foliage Cover (PFC). Dominant species include *Eucalyptus radiata* (Narrow-leaved Peppermint), *Eucalyptus blaxlandii* (Blaxland's Stringybark), *Eucalyptus sieberi* (Silvertop Ash), *E. dalrympleana* (Mountain Gum), with *Eucalyptus oreades* (Blue Mountains Ash) also occurring in parts of this community.

Sub Canopy Layer: 10m to 15m – 20% PFC. Dominant species included juvenile canopy species *Eucalyptus radiata* (Narrow-leaved Peppermint), *Eucalyptus blaxlandii* (Blaxland's Stringybark), *E. dalrympleana* (Mountain Gum) and occasional *Eucalyptus oreades* (Blue Mountains Ash).

Shrub Layer: 0.5m to 2m – 5 to 20% PFC. Dominant shrub species included *Daviesia latifolia, Monotoca scoparia* (Prickly Broom Heath), *Acacia terminalis* (Sunshine Wattle), *Lomatia silaifolia* (Crinkle Bush), *Polyscias sambucifolia* (Elderberry Panax), *Leucopogon lanceolatus* (Lance-leaf Beard-heath), *Boronia microphylla* (Small-leaved Boronia) and *Banksia cunninghamii*. Dominant small shrub species included; *Persoonia chamaepitys* (Mountain Geebung), *Phyllota squarrosa* (Dense Phyllota) and *Hibbertia obtusifolia* (Grey Guinea Flower).

Ground Layer: 0m to 1.2m – 35% PFC. Dominant species included *Poa sieberiana* var. *cyanophylla*, *Lomandra glauca* (Pale Mat-rush), *Dianella revoluta* (Spreading Flax Lily), *Arrhenechthites mixta* (Purple Fireweed), *Gonocarpus tetragynus* (Poverty Raspwort), *Joyceae pallida* (Silvertop Wallaby Grass), *Lomandra multiflora* (Many-flowered Mat-rush) and *Viola hederacea* (Ivy-leaved Violet). The climber, *Billardiera scandens* (Hairy Appleberry) was also recorded within this community.

Classification: This vegetation community is not considered to be commensurate with any Threatened Ecological Community listed under the *TSC Act 1995* or *EPBC Act 1999*.

Plate 3-1: MU 7 - Newnes Plateau Narrow-leaved Peppermint – Mountain Gum – Brown Stringybark Layered Forest

2. MU 26 – Newnes Plateau Narrow-leaved Peppermint – Silvertop Ash Layered Open Forest (refer to Plate 3-2)

Description: This vegetation community is generally open in structure with a sparse shrub layer. This vegetation community predominantly occurred in patches on the ridge-tops and side-slopes of the plateau and occupies small areas along the existing access track for bore 8. The dominant canopy species were *E. blaxlandii* (Blaxland's Stringybark), *E. radiata* (Narrow-leaved Peppermint), *E. sieberi* (Silvertop Ash) and *E. oreades* (Blue Mountains Ash) sometimes sparsely / dominantly present. This vegetation community often has a wide ecotone with Map Unit 7 - Newnes Plateau Narrow-leaved Peppermint – Mountain Gum – Brown Stringybark Layered Forest. As a result it is difficult to determine the boundaries at the interface of these individual communities. In addition, the ecotone of the community boundaries is enhanced by previous logging activities and subsequent regrowth.

Canopy Layer: 18m to 20m – 30 to 40% PFC. Dominant species included; *E. blaxlandii* (Blaxland's Stringybark), *E. radiata* (Narrow-leaved Peppermint), *E. sieberi* (Silvertop Ash), with *E. oreades* (Blue Mountains Ash) and to a lesser extent *E. dives* (Broad-leaved Peppermint) sometimes present.

Sub Canopy Layer: 8m to 15m – 30% PFC. Dominant species were mostly juvenile canopy species.

Shrub Layer: 1m to 4m – 2 to 5% PFC. Dominant shrub species included; *Monotoca scoparia* (Prickly Broom Heath), *Boronia microphylla* (Small-leaved Boronia), *Daviesia* *latifolia*, *Hakea dactyloides* (Broad-leaved Hakea), *Lomatia silaifolia* (Crinkle Bush), *Isopogon anemonifolius* (Flat-leaved Drumsticks), *Petrophile sessilis* (Conesticks), *Acacia terminalis* (Sunshine Wattle) and *Banksia cunninghamii*.

Ground Layer: 0m to 1.2m – variable 20 to 60% PFC. Dominant species included; *Joyceae pallida* (Silvertop Wallaby Grass), *Patersonia sericea* (Wild Iris), *Pimelea linifolia* (Slender Rice Flower), *Dianella revoluta* (Spreading Flax Lily), *Amperea xiphoclada* (Broom Spurge), *Dampiera stricta* (Blue Dampiera), *Austrostipa pubescens* (Tall Speargrass), *Gonocarpus tetragynus* (Poverty Raspwort) and *Lomandra glauca* (Pale Mat-rush). The climber, *Billardiera scandens* (Hairy Appleberry) was also recorded within this community.

Classification: This vegetation community is not considered to be commensurate with any Threatened Ecological Community listed under the *TSC Act 1995* or *EPBC Act 1999*.

Plate 3-2: MU 26 – Newnes Plateau Narrow-leaved Peppermint – Silvertop Ash Layered Open Forest

3. MU 28 – Sandstone Plateau and Ridge Scribbly Gum – Silvertop Ash Shrubby Woodland (refer to Plate 3-2)

Description:	This vegetation community is in the footprint proposed for the construction of bore 8 along with a section of the access track. This community is generally found on the shallow soils and rocky sites across the upper Blue Mountains sandstones. It is typically an open forest or woodland community characterised by a diverse and quite dense midstratum.
Canopy Layer:	To 20m – 25 to 30% PFC. Dominant species included; *Eucalyptus radiata* (Narrow-leaved peppermint), *Eucalyptus sieberi* (Silvertop Ash) and *Eucalyptus sclerophylla* (Scribbly Gum).
Shrub Layer:	0.5m to 6.0m – 5 to 15% PFC. Dominant shrub species included; *Lomandra glauca*, *Acacia terminalis* (Sunshine Wattle), *Banksia ericifolia* (Heath-leaved Banksia), *Hakea dactyloides* (Broad-leaved Hakea) and *Leptospermum trinervium* (Slender Tea-tree).
Ground Layer:	0m to 1.0m – 30 to 65% Percentage Foliage Cover (PFC). *Lomandra glauca*, *Entolasia stricta* (Wiry Panic) and *Goodenia bellidifolia* and *Patersonia sericea* (Silky Purple-Flag).
Classification:	This vegetation community is not considered to be commensurate with any Threatened Ecological Community listed under the *TSC Act 1995* or *EPBC Act 1999*.

Plate 3-3 – MU 28 – Sandstone Plateau and Ridge Scribbly Gum – Silvertop Ash Shrubby Woodland

5. MU 30 – Exposed Blue Mountains Sydney Peppermint – Silvertop Ash Shrubby Woodland (refer to Plate 3-5)

Description:	This community is commonly found on the broad sandstone ridges of the Newnes Plateau and occupies a large area proposed for construction of bore 7 as well as access tracks for both bores 7 and 8.
Canopy Layer:	14m – 30m – 5 to 45% PFC. Dominant tree species included *Eucalyptus piperita* (Sydney Peppermint) and *Eucalyptus sieberi* (Silvertop Ash), whilst *Eucalyptus sclerophylla* (Scribbly Gum) and *Eucalyptus sparsifolia* (Narrow-leaved Stringybark) was also common.
Shrub Layer:	0.5m to 15m – 5 to 60% PFC. Dominant shrub species included *Acacia terminalis* (Sunshine Wattle), *Boronia microphylla* (Small-leaved Boronia), *Daviesia latifolia*, *Isopogon anemonifolius* (Flat-leaved Drumsticks), *Lomatia silaifolia* (Crinkle Bush), *Monotoca scoparia* (Prickly Broom-heath), *Leucopogon lanceolatus*, *Leucopogon* muticus (Blunt Beard-heath), *Monotoca scoparia* (Prickly Broom-heath) and *Persoonia linearis* (Narrow-leaved Geebung).
Ground Layer:	0m to 1.0m – 5 to 30% PFC. Dominant species include *Amperea xiphoclada* (Broom Spurge), *Caustis flexuosa* (Curly Wig), *Lomandra glauca* (Pale Mat-rush) and *Platysace lanceolata*.
Classification:	This vegetation community is not considered to be commensurate with any Threatened Ecological Community listed under the *TSC Act 1995* or *EPBC Act 1999*.

Plate 3-4: MU 30 – Exposed Blue Mountains Sydney Peppermint – Silvertop Ash Shrubby Woodland

3.1.2 Significant Flora

The results of database searches (NPWS Atlas of NSW Wildlife and EPBC Protected Matters Search) indicated that 20 threatened flora species have been previously recorded within at least 10 km of the Study Area and/or have potential habitat within the Study Area. A list of these species is provided in Table 3-2. Where suitable habitat for potentially occurring significant flora species was found in the area, targeted surveys were conducted during field surveys.

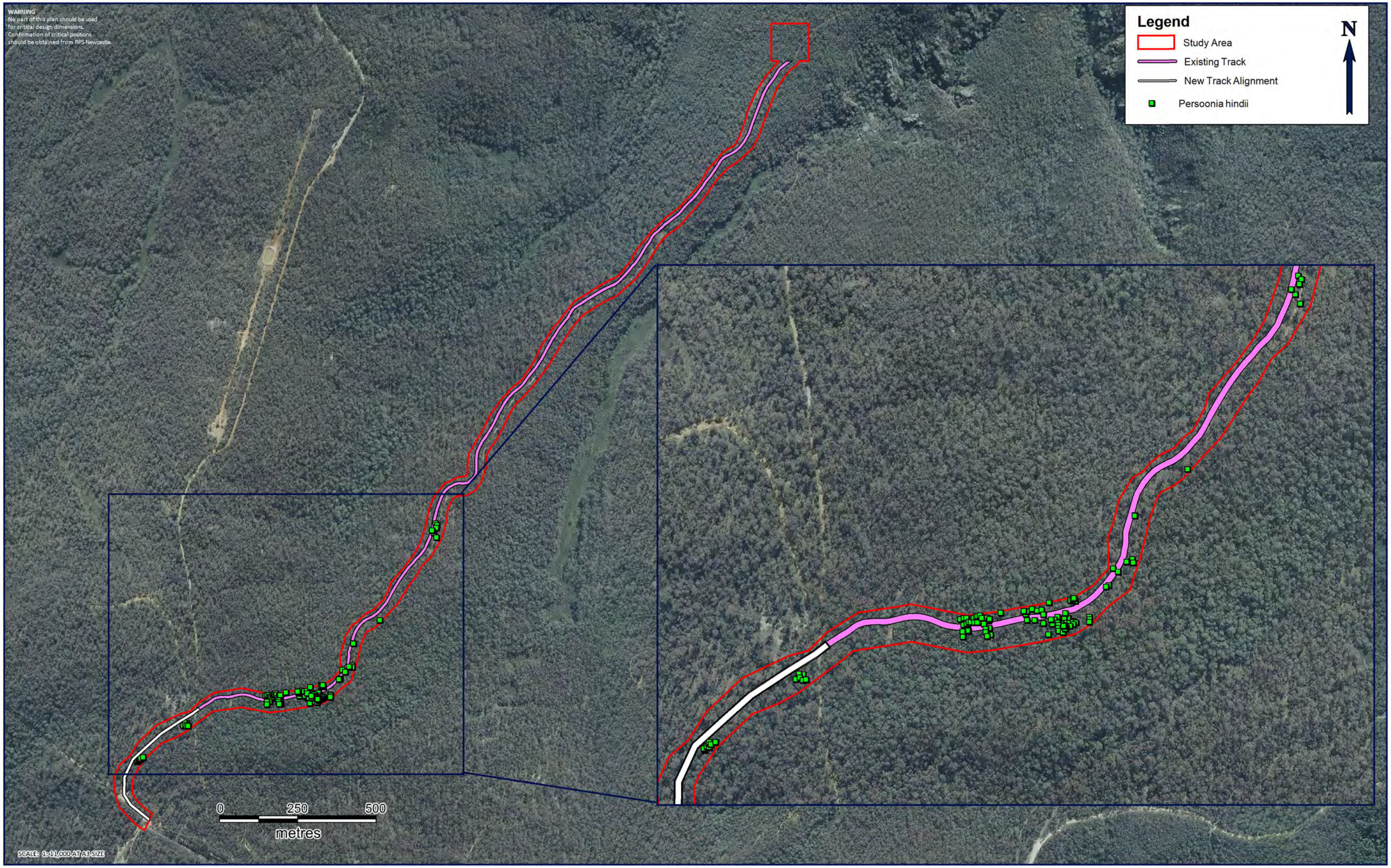
Table 3-2: Threatened Flora found or potentially occurring within the Study Area

Scientific Name	Common Name	TSC Act Status	EPBC Act Status
Acacia flocktoniae	Flockton's Wattle	V	V
Asterolasia elegans	-	E	E
Boronia deanei	Deane's Boronia	V	V
Caesia parviflora var. minor	Small Pale Grass-lily	E	-
Derwentia blakelyi	-	V	-
Eucalyptus pulverulenta	Silver-leafed Gum	V	V
Eucalyptus aggregata	Black Gum	V	-
Eucalyptus cannonii	Capertee Stringybark	V	V
Euphrasia arguta	-	PD-CE	CE
Galium australe	Tangled Bedstraw	E	-
Genoplesium superbum	Superb Midge Orchid	E	-
Haloragodendron lucasii	-	E	E
Lastreopsis hispida	Bristly Shield Fern	E	-
Persoonia acerosa	Needle Geebung	V	V
Persoonia hindii	-	E	-
Persoonia marginata	Clandulla Geebung	V	V
Prasophyllum sp. Wybong	A leek-orchid	-	V
Pultenaea glabra	Smooth Bush-pea	V	V
Thesium australe	Austral Toadflax	V	V
Wollemia nobilis	Wollemi Pine	E	E

Notes: (PD) = Preliminary determination
(V) = Vulnerable Species listing
(E) = Endangered Species listing
(CE) = Critically Endangered Species listing

Targeted surveys resulted in the identification of one threatened flora species, *Persoonia hindii*, which is listed as Endangered under the *TSC Act 1995. P. hindii* was identified in several patches along the existing access track for bore 8.

Persoonia hindii is an erect to spreading shrub 0.3 to 1m tall with upwardly-curving linear-oblong leaves usually concave on the upper surface. Numerous shoots arise from underground rhizomes with reddish young shoots often hairy. Mature leaves are glabrous. This species flowers from January to March with possible sporadic flowering in other months. Distribution is limited to the Newnes Plateau in the Upper Blue Mountains where it occurs in dry forest habitats.



TITLE: FIGURE 3-2: THREATENED FLORA LOCATIONS

LOCATION: SPRINGVALE DEWATERING BORE 8

DATUM: GDA 94
PROJECTION: MGA ZONE 56

DATE: 19/07/2012
PURPOSE: REPORT FIGURE

LAYOUT REF: J:\JOBS\Centennial\All Jobs\110382 Springvale Dewatering Bores 7 & 8\Drafting\Workspaces\Eco
VERSION (PLAN BY): B A3 (AB-NW-JS)

CLIENT: CENTENNIAL COAL
JOB REF: 110382

RPS AUSTRALIA EAST PTY LTD (ABN 44 140 292 762)
241 DENISON STREET BROADMEADOW PO BOX 428 HAMILTON NSW 2303
T: 02 4940 4200 F: 02 4961 6794 www.rpsgroup.com.au

creativepeople
making a difference

RPS

A total of 93 *P. hindii* individuals were located within the Project Application Area, however 1352 *P. hindii* individuals were located adjacent to the development footprint (and will be retained), producing a total Study Area population of *P. hindii* of 1445 plants.

No other threatened flora species were recorded during the targeted surveys.

3.2 Habitat Survey

Habitats within the Study Area were assessed for their potential to support native flora and fauna species including threatened flora and fauna species for which records occur within the wider locality. The vegetation communities found within the Study Area can be broadly categorised as open forest/woodland habitat and swamp habitat.

Terrestrial Habitats

The open forest/woodland vegetation communities found in the Study Area contain an understory predominantly comprised of native grasses, herbs and ferns at varying densities. These provide suitable habitat for a number of terrestrial mammals including macropods and wombats. Large amounts of forest debris, partially resulting from forestry activities, also provide foraging opportunities for small marsupial mammals and rats.

Understorey structure is generally determined to have sufficient structural and species diversity to provide foraging and nesting opportunities for a range of woodland bird species and reptiles.

Vegetation within the surrounding swamp habitats contain high densities of proteaceous plants, that provide foraging opportunities for nectivorous mammals and birds, whilst the dense cover provides cover for more secretive understorey bird species. The damp ground cover is suited to a range of reptiles and amphibians that typically occur in higher altitude areas.

Arboreal Habitats

Canopy tree species and understorey proteaceous shrubs provide abundant foraging resources such as foliage, seeds, pollen, nectar and invertebrates for a range of faunal guilds, including arboreal mammals, bats and birds.

Despite a general paucity of large hollow-bearing trees as a result of selective logging activities within Newnes State Forest, they do occur in lower densities within the vicinity of the Study Area and across the Newnes Plateau. The hollow-bearing trees provide valuable nesting opportunities for arboreal mammals and birds including cockatoos and forest owls. No hollow bearing trees were identified within the Study Area during field surveys.

Open woodlands and forests across the Study Area, and the plateau in general, provide foraging opportunities for a range of microchiropteran bats that occur within the locality. Although the forests within and surrounding the Study Area only exhibit a low to moderate density of hollow-bearing trees, there are sufficient quantities to provide roosting and nesting habitat for a diversity of hollow-dwelling microchiropteran bat species. There is also abundant roosting and den habitat for cave dwelling species within rocky outcrops around the edges of the plateau and within the deeper gullies and associated escarpments throughout the area. Older mine subsidence areas located in the wider locality may also provide habitat for these species.

The cleared areas (mostly tracks, fire-trails and powerline easements) occurring within the Study Area are considered to be insignificant in terms of providing habitat for native fauna species aside from providing foraging habitat along the ecotone between cleared and forested areas (such as for foraging by owls and microchiropteran bat species).

Corridors and Habitat Linkages

The Study Area is located within the Newnes State Forest and contains native vegetation which is unbroken over a large area apart from occasional access tracks and fire trails. The native vegetation is selectively logged intermittently under State Forest tenure with no areas being subjected to clear-felling.

As a result of the almost complete vegetative cover within and external to the Study Area, the habitat linkages throughout the Study Area and surrounding area are excellent. The mostly linear impacts of the Project are unlikely to substantially change this existing connectivity.

3.3 Fauna Survey

3.3.1 Desktop Fauna Literature Review

The results of database searches (NPWS Atlas of NSW Wildlife (Accessed 22/03/12), EPBC Protected Matters Search (Accessed 22/03/12) and recent RPS Threatened species records) indicated that 46 threatened fauna and two insect species have been previously recorded within at least 10km of the Study Area and/or have potential habitat within the Study Area. A list of these species is provided in **Error! Reference source not found.**. Those species that have been identified within the Study Area during RPS surveys are highlighted in bold.

Table 3-3 Relevant Threatened Species and Threatened Ecological Communities Identified During a Review of Local Ecological Studies, records from the NSW Atlas of Wildlife and an EPBC Act Protected Matters Report

Scientific Name	Common Name	TSC Act	EPBC Act	Notes and Source
Fauna Species				
Birds				
Glossopsitta pusilla	Little Lorikeet	V	-	NSW Atlas of Wildlife22
Anthochaera phrygia	Regent Honeyeater	CE	E	Protected Matters Search21
Botaurus poiciloptilus	Australasian Bittern	E	E	Protected Matters Search21
Lathamus discolor	Swift Parrot	E	E	Protected Matters Search21
Leipoa ocellata	Malleefowl	E	V	Protected Matters Search21
Rostratula australis	Australian Painted Snipe	E	V	Protected Matters Search21
Calyptorhynchus lathami	Glossy Black Cockatoo	V	-	Clarence Western SMP1, Springvale SMP area8, AP SMP14, 15, 17, 20, NSW Atlas of Wildlife22
Callocephalon fimbriatum	Gang Gang Cockatoo	V	-	Clarence Western SMP1, SV SMP5,6,7,8,9,10,11,12, AP SMP13,14,15,16,17,20, NSW Atlas of Wildlife22
Stagonopleura guttata	Diamond Firetail	V	-	NSW Atlas of Wildlife22
Ninox strenua	Powerful Owl	V	-	Clarence Western SMP1, Clarence Eastern SMP3, SV SMP area6,7,11,12. AP SMP14,15,16,17,20 , NSW Atlas of Wildlife22
Tyto novaehollandiae	**Masked Owl**	**V**	**-**	**Clarence Western SMP1, NSW Atlas of Wildlife22**
Tyto tenebricosa	Sooty Owl	V	-	SV SMP11, NSW Atlas of Wildlife22
Ninox connivens	Barking Owl	V	-	AP SMP14, NSW Atlas of Wildlife22
Hieraaetus morphnoides	Little Eagle	V	-	AP SMP15,18, NSW Atlas of Wildlife22
Chthonicola sagittata	Speckled Warbler	V	-	Recorded within the AP SMP area in 200514, NSW Atlas of Wildlife22
Climacteris picumnus	Brown Treecreeper	V	-	Clarence Western SMP1, SV SMP5, Junction Swamp and Carne West Swamp5, SV SMP6,9,10,11. AP SMP 14,16,17,20, NSW Atlas of Wildlife22
Melanodryas cucullata	Hooded Robin	V	-	Clarence Western SMP1, SV SMP6, 8, AP SMP13, AP SMP14, NSW Atlas of Wildlife22

Scientific Name	Common Name	TSC Act	EPBC Act	Notes and Source
Petroica phoenicea	Flame Robin	V	-	Clarence Western SMP1, Clarence Eastern SMP3, SV SMP6,8,10,11,12. AP SMP13,14,15,16,18 ,NSW Atlas of Wildlife22
Petroica boodang	**Scarlet Robin**	**V**	**-**	**Clarence Western SMP1,2, Clarence Eastern SMP3, SV SMP6,8,9,10,11,12. AP SMP13,14,15,16,17,19,20. AP 'New Area' 19, NSW Atlas of Wildlife22**
Daphoenositta chrysoptera	Varied Sittella	V	-	Clarence Western SMP1,2, SV SMP10,11,12. AP SMP16,17,20, AP 'New Area'19, NSW Atlas of Wildlife22
Melithreptus gularis gularis	Black Chinned Honeyeater	V	-	SV SMP8, AP SMP13, NSW Atlas of Wildlife22
Pomatostomus temporalis	Grey-crowned Babbler	V	-	SV SMP6, NSW Atlas of Wildlife22
Mammals				
Dasyurus maculatus	Spotted-tail Quoll	V	E	Protected Matters Search21, NSW Atlas of Wildlife22
Petrogale penicillata	Brush-tailed Rock-wallaby	E	-	NSW Atlas of Wildlife22
Pseudomys fumeus	Smokey Mouse	CE	E	Protected Matters Search21
Pseudomys novaehollandiae	New Holland Mouse	-	V	Protected Matters Search21
Isoodon obesulus obesulus	Southern Brown Bandicoot	E	E	Protected Matters Search21
Phascolarctos cinereus	Koala	V	V	AP SMP16, NSW Atlas of Wildlife22
Cercartetus nanus	Eastern Pygmy Possum	V	-	Clarence Western SMP1, SV SMP5, SV SMP6, 10, NSW Atlas of Wildlife22
Petaurus norfolcensis	Squirrel Glider	V	-	Clarence Western SMP1, SV SMP5, SV SMP6,8, AP SMP14 , NSW Atlas of Wildlife22
Petaurus australis	Yellow-bellied Glider	V	-	Adjacent to Clarence Colliery23, NSW Atlas of Wildlife22
Potorous tridactylus tridactylus	Long Nosed Potoroo	V	V	Protected Matters Search21
Pteropus poliocephalus	Grey Headed Flying Fox	V	V	Protected Matters Search21
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	-	Clarence Western SMP1, Clarence Eastern SMP3, Clarence Colliery 'Area 800'4, SV SMP6, 9,10,11,12. AP SMP 13, 15, 17, NSW Atlas of Wildlife22
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	SV SMP9, 10, 11, AP SMP15, Protected Matters Search21 NSW Atlas of Wildlife22
Scoteanax rueppellii	Greater Broad Nosed Bat	V	-	SV SMP8, 11, AP SMP17, NSW Atlas of Wildlife22
Chalinolobus picatus	Little Pied Bat	V	-	Clarence Western SMP1
Miniopterus schreibersii oceanensis	Eastern-bent Wing Bat	V	-	Clarence Western SMP1,2,, Clarence East SMP4, SV SMP5,6,8,9,10,12. AP SMP13,15,17, NSW Atlas of Wildlife22

Scientific Name	Common Name	TSC Act	EPBC Act	Notes and Source
Saccolaimus flaviventris	Yellow-bellied Sheathtail Bat	V	-	NSW Atlas of Wildlife22
Vespadelus troughtoni	Eastern Cave Bat	V	-	NSW Atlas of Wildlife22
Reptiles				
Eulamprus leuraensis	Blue Mountains Water Skink	V	-	Clarence Western SMP1, Protected Matters Search21 NSW Atlas of Wildlife22
Hoplocephalus bungaroides	Broad Headed Snake	E	V	Protected Matters Search21 NSW Atlas of Wildlife22
Varanus rosenbergi	Rosenberg's Monitor	V	-	NSW Atlas of Wildlife22
Amphibians				
Litoria booroolongensis	Booroolong Frog	E	E	Protected Matters Search21
Litoria littlejohni	Littlejohn's Tree Frog	V	V	Protected Matters Search21
Mixophyes balbus	Stuttering Frog	E	V	SV SMP5, Protected Matters Search21, NSW Atlas of Wildlife22
Heleioporus australiacus	Giant Burrowing Frog	V	V	AP SMP18. Protected Matters Search21
Pseudophryne australis	Red-crowned Toadlet	V	-	NSW Atlas of Wildlife22
Invertebrates				
Paralucia spinifera	Bathurst Copperwing Butterfly	E	V	Protected Matters Search21 NSW Atlas of Wildlife22
Petalura gigantea	Giant Dragonfly	E	-	NSW Atlas of Wildlife22

Key:

AP= Angus Place
SV= Springvale
SMP= Subsidence Management Plan
V= vulnerable species
E= endangered species
CE= critically endangered species
Under consideration= species currently being considered for listing as vulnerable under the EPBC Act 1999.

Footnotes

[1] Denny, M. (2008) Clarence Colliery- Western SMP Area Fauna Monitoring 2008, unpublished report to Centennial Coal, Biodiversity Monitoring Services, Oberon.

[2] Denny, M. (2010) 2010 Fauna monitoring within the Western Subsidence Management Plan Application Area at Clarence Colliery, unpublished report to Centennial Coal, Biodiversity Monitoring Services, Oberon.

[3] Denny, M. (2010) 2010 Fauna monitoring within the Eastern Subsidence Management Plan Application Area at Clarence Colliery, unpublished report to Centennial Coal, Biodiversity Monitoring Services, Oberon.

[4] Denny, M. (2010) Area 800 (Eastern Portion) Autumn 2010 Fauna Monitoring Survey, unpublished report to Centennial Coal, Biodiversity Monitoring Services, Oberon.

[5] Denny, M. (2004) 2004 Fauna monitoring within the subsidence management plan area at Springvale Colliery, unpublished report to Centennial Coal, Mount King Ecological Surveys, Oberon.

[6] Denny, M. (2005) 2005 Fauna monitoring within the subsidence management plan application area at Springvale Colliery, unpublished report to Centennial Coal, Mount King Ecological Surveys, Oberon.

[7] Denny, M. (2006) 2006 Fauna monitoring within the subsidence management plan application area at Springvale Colliery, unpublished report to Centennial Coal, Mount King Ecological Surveys, Oberon.

[8] Denny, M. (2007) 2007 Fauna monitoring within the subsidence management plan application area at Springvale Colliery, unpublished report to Centennial Coal, Mount King Ecological Surveys, Oberon.

[9.] Denny, M. (2008) 2008 Fauna monitoring within the subsidence management plan application area at Springvale Colliery, unpublished report to Centennial Coal, Biodiversity Monitoring Services, Oberon.

[10] Denny, M. (2010) 2009 Fauna monitoring within the subsidence management plan application area at Springvale Colliery, unpublished report to Centennial Coal, Biodiversity Monitoring Services, Oberon.

[11] Denny, M. (2011) 2010 Fauna monitoring within the subsidence management plan application area at Springvale Colliery, unpublished report to Centennial Coal, Biodiversity Monitoring Services, Oberon.

[12] Denny, M. (2011) 2011 Fauna monitoring within the subsidence management plan application area at Springvale Colliery, Autumn 2011 Sample, unpublished report to Centennial Coal, Biodiversity Monitoring Services, Oberon.

[13] Denny, M. (2004) 2004 Fauna monitoring within the subsidence management plan area at Angus Place Colliery, unpublished report to Centennial Coal, Mt King Ecological Surveys, Oberon.

[14] Denny, M. (2006) 2005 Fauna monitoring within the subsidence management plan area at Angus Place Colliery, unpublished report to Centennial Coal, Mt King Ecological Surveys, Oberon.

[15] Denny, M. (2007) 2006 Fauna monitoring within the subsidence management plan area at Angus Place Colliery, unpublished report to Centennial Coal, Mt King Ecological Surveys, Oberon.

[16] Denny, M. (2008) 2007 Fauna monitoring within the subsidence management plan area at Angus Place Colliery, unpublished report to Centennial Coal, Mt King Ecological Surveys, Oberon.

[17] Denny, M. (2009) Fauna monitoring during 2008 within the subsidence management plan application area at Angus Place Colliery, unpublished report to Centennial Coal, Mt King Ecological Surveys, Oberon.

[18] Denny, M. (2010) 2009 Fauna monitoring within the subsidence management plan application area at Angus Place Colliery, unpublished report to Centennial Coal, Biodiversity Monitoring Services, Oberon.

[19] Denny, M. (2011) Angus Place Colliery New Area Fauna Monitoring Surveys for Autumn 2011, unpublished report to Centennial Coal, Biodiversity Monitoring Services, Oberon.

[20] Denny, M. (2011) Fauna monitoring within the subsidence management plan application area at Angus Place Colliery, Autumn 2011 Sample, unpublished report to Centennial Coal, Biodiversity Monitoring Services, Oberon.

[21] SEWPAC (2012) EPBC Protected Matters Report, accessed 22nd March 2012

[22] Office of Environment and Heritage (2012) NSW Atlas of Wildlife, accessed 22nd March 2012

[23] International Environmental Consultants (2000) *Clarence Colliery Lease Extension - Environmental Impact Statement*, International Environmental Consultants.

3.3.2 Terrestrial Mammal Species

No terrestrial mammal species were recorded within the Project Application Area for the bore sites or access tracks, however several species of macropod have been observed by RPS within the locality including the Red-necked Wallaby (*Macropus rufogriseus*), Eastern Grey Kangaroo (*Macropus giganteus*) and Swamp Wallaby (*Wallabia bicolor*). Additionally, signs of habitation by the Common Wombat (*Vombatus ursinus*) have been frequently encountered in the vicinity of the Study Area by RPS staff.

No threatened terrestrial mammal species have been recorded by RPS in the locality, however the habitat of the Spotted-tail Quoll (*Dasyurus maculatus*) within the Study Area is of sufficient quality and isolation to support this species. Although plateau forests characterise much of the surface areas of the Study Area and offer sufficient isolation from human habitation, the occurrence of ongoing timber harvesting, wildlife disease and reduction in old growth attributes may limit the potential for this species to occur over much of the Study Area.

3.3.3 Arboreal Mammal Species

Canopy tree species and understorey proteaceous shrubs provide abundant foraging resources such as foliage, seeds pollen, nectar and invertebrates for possums, gliders and bats. Arboreal mammal species common to the locality that have been detected during previous RPS surveys (see RPS 2010) include the Greater Glider (*Petauroides volans*), Common Ringtail Possum (*Pseudocheirus peregrinus*) and Common Brushtail Possum (*Trichosurus vulpecula*). Although not observed during surveys, there is suitable habitat within the Study Area for smaller gliders such as the Sugar Glider (*Petaurus breviceps*) and the TSC-listed Squirrel Glider (*P. norfolcensis*). During field surveys on the Newnes Plateau for monitoring of the potential impact of longwall mining on fauna communities, Martin Denny has recorded Squirrel Glider on a number of occasions, a species listed as Vulnerable under the *TSC Act 1995*.

One threatened species, Eastern Pygmy Possum (*Cercartetus nanus*), is listed as Vulnerable under the *TSC Act 1995* and was detected on the Newnes Plateau approximately 1.5km northwest of the Study Area during recent RPS surveys (2012). During surveys by Martin Denny breeding Eastern Pygmy Possum has been previously recorded. Similar vegetation communities and high connectivity between the Study Area and those known to be utilised by this species suggests it is likely that the Eastern Pygmy Possum would inhabit the Study Area on either a temporary or permanent basis.

Records for the Yellow-bellied Glider (*Petaurus australis*) are sparse on the Newnes Plateau and this highly vocal species has not been observed during any RPS spotlighting and/or call playback surveys. This species has also not been recorded on the Newnes Plateau during extensive field surveys for monitoring of longwall mining impact by Martin Denny.

No other arboreal mammals have been recorded during previous RPS spotlighting surveys.

3.3.4 Bats

Several species of microchiropteran bats have been positively identified in the locality by RPS through either Anabat echolocation call recordings or physical capture in harp traps. These species include the threatened Large Eared Pied Bat (*Chalinolobus dwyeri*; RPS 2010), Eastern False Pipistrelle

(*Falsistrellus tasmaniensis*; RPS 2010) and Yellow-bellied Sheathtail Bat (*Saccolaimus flaviventris*; RPS 2011). These species are listed as Vulnerable under the *TSC Act 1995* whilst the Large Eared Pied Bat is also listed as Vulnerable under the *EPBC Act 1999*. Surveys by Martin Denny have also regularly recorded the Eastern Bent Wing Bat (*Miniopterus schreibersii oceanensis*).

3.3.5 Avifauna Survey

Bird species recorded within the Study Area included many common woodland and forest species, including several threatened species. Two species listed as Vulnerable under the *TSC Act 1995*, Scarlet Robin (*Petroica boodang*) and Masked Owl (*Tyto novaehollandiae*) have been identified within the boundaries of the Study Area during both opportunistic bird surveys and previous RPS surveys (2012) in the locality. During field surveys monitoring potential longwall mining impacts, Martin Denny has recorded a number of threatened bird species within 5km of the Study Area including Gang Gang Cockatoo (*Callocephalon fimbriatum*), Scarlet Robin, Flame Robin (*Petroica phoenicea*), Hooded Robin (*Melanodryas cucullata*) and the Varied Sittella (*Daphoenositta chrysoptera*). Additionally, the Varied Sittella has been identified in the locality (the Newnes Plateau) by RPS previously (2010) whilst the Flame Robin and Gang-gang Cockatoo (both listed as Vulnerable under the *TSC Act 1995*) have been identified within 1km of the Study Area.

No *Allocasuarina* tree species favoured by Glossy Black-Cockatoos were present within vegetation communities within the Study Area.

One threatened forest owl species, the Masked Owl (*Tyto novaehollandiae*), was detected within the Study Area during related ecological surveys for Centennial by RPS in 2012. Two other species, the Powerful Owl (*Ninox strenua*) and Sooty Owl (*Tyto tenebricosa*) have been recorded by RPS within the locality through either visual identification or call playback methods in late 2011 and early 2012 respectively. Field surveys by Martin Denny on the Newnes Plateau have recorded these owl species along with the Barking Owl (*Ninox connivens*), with all four owl species being listed as Vulnerable under the *TSC Act 1995*. It is likely that the Study Area represents a portion of the local foraging range for these species given the presence or likely presence of small terrestrial and arboreal mammals. However, the quality of the Study Area as habitat for the Powerful Owl (a species that almost exclusively utilises arboreal prey) is potentially reduced due to the low abundance of arboreal prey compared to less disturbed and more productive forests.

3.3.6 Herpetofauna Survey

Opportunistic diurnal observations of reptiles and amphibians were conducted during field assessments of the Study Area. Species identified include the Common Brown Snake (*Pseudonaja textilis*) and Common Death Adder (*Acanthopis antarcticus*).

Targeted and opportunistic searches have been undertaken in the locality during previous RPS surveys for the Blue Mountains Water Skink (*Eulamprus leuraensis)*, which is listed as Endangered under both the *TSC Act 1995* and the *EPBC Act 1999*. However, only a number of common skink species were recorded, including two species related to the Blue Mountains Water Skink being Yellow-bellied Water Skink (*E. heatwolei*) and Eastern Water Skink (*E. quoyii*).

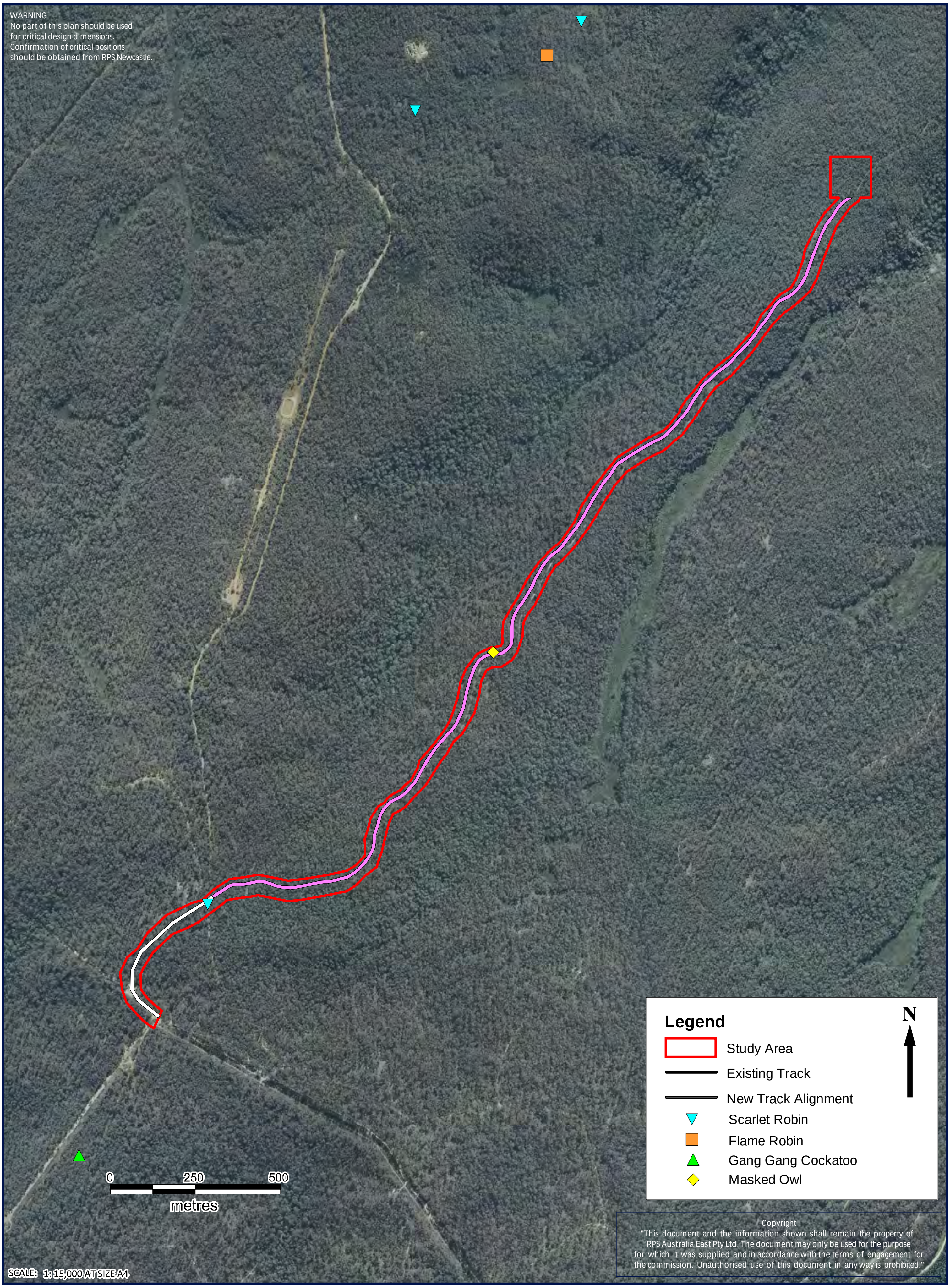
During nocturnal surveys around the Study Area in 2012, RPS ecologists recorded common amphibian species including the Common Eastern Froglet (*Crinia signifera*), Eastern Banjo Frog (*Lymnodynastes dumerilli*) and Striped Marsh Frog (*Lymnodynastes peroni*). Previous surveys by Martin Denny in the locality have recorded the threatened Giant Burrowing Frog (*Heleioporus australiacus*) and the Stuttering Frog (*Mixophyes balbus*). Even though suitable streamside breeding habitat does not exist within the Study Area, the use of the Study Area by non-breeding Giant Burrowing Frogs cannot be entirely discounted (Penman et al. 2006).

3.3.7 Insect Searches

Opportunistic searches were made for the Giant Dragonfly and the Bathurst Copper Butterfly. However, the Study Area does not occur in proximity to aquatic habitats where it may be possible for the dragonfly to live out its life cycle. The favoured larval feed plant species of the Bathurst Copper Butterfly, being *Bursaria spinosa*, was not present in the Study Area or observed elsewhere in the locality. Neither of these two species was observed during the surveys undertaken.

3.3.8 Secondary Indications and Incidental Observations

Opportunistic sightings of secondary indications (scratches, scats, skeletal remains, diggings, tracks etc.) did note signs that suggested the presence of mammal species. The scats and tunnels of Common Wombat and scats of various sized macropods were noted at numerous locations throughout the Study Area.



TITLE: FIGURE 3-3: THREATENED FAUNA LOCATIONS

LOCATION: SPRINGVALE DEWATERING BORE 8

DATUM: GDA 94
PROJECTION: MGA ZONE 56

DATE: 19/07/2012
PURPOSE: REPORT FIGURE

LAYOUT REF: J:\JOBS\Centennial\All Jobs\108478 Angus Place - Was 109034\Drafting\Workspaces
VERSION (PLAN BY): JS (A A4)

CLIENT: CENTENNIAL
JOB REF: 110382

RPS AUSTRALIA EAST PTY LTD (ABN 44 140 292 762)
241 DENISON STREET BROADMEADOW PO BOX 428 HAMILTON NSW 2303
T: 02 4940 4200 F: 02 4961 6794 www.rpsgroup.com.au

4.0 Threatened Species and Communities Assessment

4.1 Identification of Subject Species and Communities

Threatened flora and fauna species (listed under the *TSC Act 1995* and/or the *EPBC Act 1999*) that have been recorded and/or have suitable habitat within at least a 10km radius of the Study Area have been considered within this assessment. TECs known from the broader area have also been addressed. Each species / community is considered for its potential to occur in the Study Area and the likely level of impact as a result of the Project. This assessment deals with each species / community separately and identifies the ecological parameters of significance associated with the Project.

Those species / communities that have been identified as having a 'greater than low' chance of being impacted upon within the Study Area or that have been recorded within the Study Area during field investigations are subject to 7-part tests of significance and have been recorded in Appendix 1.

The *Assessment of Likelihood of Occurrence of Threatened Species and Communities and Assessment of Potential Impacts* deals with the following topics of consideration in tabulated form (refer to Table 4-1):

'Species / Community' – Lists each threatened species / TECs known from the locality. The status of each threatened species under the *TSC Act 1995* and the Commonwealth *EPBC Act 1999* are also provided.

'Habitat Description' – Provides a brief account of the species / community and the preferred habitat attributes required for their existence / survival.

'Likelihood of Occurrence' – Assesses the likelihood of each species / community to occur along or within the locality of the Study Area in terms of the aforementioned habitat description and taking into account local habitat preferences, results of current field investigations, data gained from various sources (such as Atlas of NSW Wildlife etc) and previously gained knowledge via fieldwork undertaken within other ecological assessments in the locality.

'Potential for Impact' – Assesses the likely level / significance of impacts to each species / community that would result from the Project, taking into account both short and long-term impacts. This assessment is largely based on the chance of occurrence of each species / community in Study Area with due recognition to other parameters such as home range, habitat utilisation, connectivity etc. It also considers the scope of the Project, including the likely extent of disturbance, duration of construction works etc.

Table 4-1: Assessment of Likelihood of Occurrence of Threatened Species and Communities and Assessment of Potential Impacts

Species / Community	Habitat Description	Likelihood of Occurrence	Potential for Impact
Plants			
Acacia flocktoniae Flockton Wattle (V, V*)	Found only in the Southern Blue Mountains (at Mt Victoria, Megalong Valley and Yerranderie). Grows in dry sclerophyll forest on sandstone.	This species was not detected during targeted field surveys and has not been recorded within a 10 km radius of the Study Area. However, it has been recorded within Lithgow LGA. While the habitat in the Study Area has the potential to support this species, the Study Area is outside its known distribution. Therefore, it is **unlikely** to occur within the Study Area.	As this species has a low likelihood of occurring in the Study Area, it is considered **unlikely** to be impacted on by the Project.
Asterolasia elegans (E, E*)	This species is found in the northern hills of Sydney, and only currently known from 7 populations in the Central Coast botanic subdivision.	This species was not detected during targeted field surveys and has not been recorded within a 10 km radius of the Study Area. While the habitat in the Study Area has the potential to support this species, the Study Area is outside its known distribution. Therefore, it is **unlikely** to occur within the Study Area.	As this species has a low likelihood of occurring in the Study Area, it is considered **unlikely** to be impacted on by the Project.
Boronia deanei Deane's Boronia (V, V*)	Occurs in wet heath appearing to prefer the margins of open forest where it adjoins swamps and streams. It is known to occur in the Blue Mountains in the upper Kangaroo River near Carrington falls, the Endrick River near Nerriga and on the Nalbaugh Plateau.	This species was not detected during targeted field surveys. Although this species has been recorded within a 10 km radius of the Study Area, there is no damp riparian habitat within the vicinity of the Study Area. Therefore, it is **unlikely** to occur within the Study Area.	As this species has a low likelihood of occurring in the Study Area, it is considered **unlikely** to be impacted on by the Project.
Caesia parviflora var. *minor* Small Pale Grass-lily (E)	A little known species, Found in damp places in open forest on sandstone south from Corindi. The species has the potential to occur within the Newnes Pateau Hanging Swamp communities and adjoining habitats.	This species was not detected during targeted field surveys. Although this species has been recorded within a 10 km radius of the Study Area, there are no damp places in open forest on sandstone habitat within the Study Area. Therefore, it is **unlikely** to occur within the Study Area.	As this species has a low likelihood of occurring in the Study Area, it is considered **unlikely** to be impacted on by the Project.

Species / Community	Habitat Description	Likelihood of Occurrence	Potential for Impact
Derwentia blakelyi (V)	Occurring in small numbers, often in moister areas of Eucalypt forest, this species flowers in summer and is known from fewer than 20 locations. It is known to occur in the Western Blue Mountains near Clarence, near Mt Horrible, Nullo Mountain and in the Coricudgy Range.	This species was not detected during targeted field surveys. Although this species has been recorded within a 10 km radius of the Study Area, there are moister areas of Eucalypt forest within the the Study Area. Therefore, it is **unlikely** to occur within the Study Area.	As this species has a low likelihood of occurring in the Study Area, it is considered **unlikely** to be impacted on by the Project.
Eucalyptus pulverulenta Silver-leafed Gum (V, V*)	Grows in shallow soils as an understorey plant in open forest, typically dominated **by Brittle Gum (***Eucalyptus mannifera*), Red Stringybark (*E. macrorhyncha*), Broad-leafed Peppermint (*E. dives*), Silvertop Ash (*E. sieberi*) and Apple Box (*E. bridgesiana*). Often occurs on granite substrates.	This species was not detected during targeted field surveys and has not been recorded within a 10 km radius of the Study Area. While the habitat within the Study Area has the potential to support this species, the Study Area is outside its known distribution. Therefore, it is **unlikely** to occur within the Study Area.	As this species has a low likelihood of occurring within the Study Area, it is considered **unlikely** to be impacted on by the Project.
Eucalyptus aggregata Black Gum (V)	In NSW it occurs in the South Eastern Highlands Bioregion and on the western fringe of the Sydney Basin Bioregion. It grows in the lowest parts of the landscape on alluvial soils, on cold, poorly-drained flats and hollows adjacent to creeks and small rivers.	The frost hollows or flats preferred by this species was not recorded within the Study Area. This species is **unlikely** to occur within the Study Area.	Due to this species being unlikely to occur, it is considered **unlikely** to be impacted upon by this Project.
Eucalyptus cannonii Capertee Stringybark (V, V*)	Regionally restricted north of Wallerawang to Capertee, found growing in drier conditions on rocky outcrops, often with *Eucalyptus macroryncha,* often in vegetation map unit MU 35.	This species was not detected during targeted field surveys but has been recorded within a 10 km radius of the Study Area. The Study Area occurs outside of the main distribution of this species, therefore it is considered **unlikely** to occur within the Study Area.	Due to this species being unlikely to occur, it is considered **unlikely** to be impacted upon by this Project.
Euphrasia arguta (Preliminary determination to be CE, CE*)	The current known populations are located in the Nundle State Forest in eucalypt forest with a mixed grass and shrub understorey. This area is located at the junction of the New England Tableland, NSW North Coast, and Nandewar. Ecological information from historical herbarium records is scarce. Three collections noted the following habitat, 'in the open forest country around Bathurst in subhumid places', 'on the grassy country near Bathurst', 'in meadows near rivers'.	This species was not detected during targeted field surveys and has not been recorded within a 10 km radius of the Study Area. While the habitat within the Study Area has the potential to support this species, the Study Area is outside its known distribution. Therefore, it is **unlikely** to occur within the Study Area.	As this species has a low likelihood of occurring in the Study Area, it is considered **unlikely** to be impacted on by the Project.
Galium australe Tangled Bedstraw (E)	*Galium australe* has been recorded from a range of habitats in NSW including a valley floor, alluvial soil beside a creek, heathland in a rocky gully, and the top of an escarpment above a creek. It has a patchy distribution, with low numbers of plants recorded at most locations and with the total number currently estimated to be less than 200.	This species was not detected during field surveys. This species has been recorded within 10 km of the Study Area (Wildlife Atlas, 2012 however this record is potentially incorrect. Refer to section 6). It has **potential** to occur within the Study Area.	As this species has potential to occur within the Study Area and thereby be affected by the Project, this species is further assessed in **Sections 6 and 7.**
Genoplesium superbum Superb Midge Orchid (E)	A terrestrial orchid restricted to the southern tablelands of NSW where it has been recorded from two locations near Nerriga, approximately 20 km apart. The species occurs predominantly in wet heathland on shallow soils above a sandstone cap but has also been found in open woodland interspersed with heath. Flowers – Sep to Mar.	This species was not detected during targeted field surveys which were conducted during the flowering season. Although the species has been recorded within 10 km of the Study Area, no wet heath habitat occurs within the Study Area. Therefore, it is **unlikely** to occur within the Study Area.	As this species has a low likelihood of occurring within the Study Area, it is considered **unlikely** to be impacted on by the Project.
Haloragodendron lucasii (E, E*)	Confined to a very narrow distribution on the north shore of Sydney. Is known to grow in moist sandy loam soils in sheltered aspects, and on gentle slopes below cliff-lines near creeks in low open woodland. Is associated with high moisture and high soil-phosphorus soils.	This species was not detected during targeted field surveys. Also this species has not been recorded within a 10 km radius of the Study Area. Therefore, it is **unlikely** to occur within the Study Area.	As this species has a low likelihood of occurring within the Study Area, it is considered **unlikely** to be impacted on by the Project.

Species / Community	Habitat Description	Likelihood of Occurrence	Potential for Impact
Lastreopsis hispida Bristly Shield Fern (E)	Is rare in NSW with the only recent confirmed records from Mt Wilson in the Blue Mountains. It grows in moist humus-rich soils in wet forest and rainforest gullies. At Mt Wilson, associated species include *Ceratopetalum apetalum, Elaeocarpus holopetalus, Fieldia australis, Cyathea australis, Blechnum nudum, B. patersonii and Leptopteris fraseri.*	This species was not detected during targeted field surveys. Although this species has been recorded within 10 km of the Study Area, suitable habitat of moist forest or rainforest does not occur within the Study Area. Therefore, it is **unlikely** to occur within the Study Area.	As this species has a low likelihood of within the Study Area, it is considered **unlikely** to be impacted on bythe Project.
Persoonia acerosa Needle Geebung (V, V*)	An erect shrub between 1 and 2 m with characteristic needle-like leaves that are deeply channelled above. It has been recorded in dry-sclerophyll forest, low scrubby-woodland and heath growing on low-fertility soils. This species prefers open habitat with lower competition and increased light, hence its presence in roadside habitats. It occurs on the Central Coast and in the Blue Mountains largely in the Katoomba, Wentworth Falls and Springwood areas, but once occurred as far north as Mount Tomah where it is now considered to be absent.	This species has been recorded within 10 km of the Study Area (Wildlife Atlas, 2012). Some areas of habitat within the vicinity of the Study Area are suitable for this species. This species has **potentia**l to occur within the Study Area but was not observed.	As this species has potential to occur within the Study Area and thereby be affected by the Project, this species is further assessed in **Sections 6 and 7.**
Persoonia hindii (E)	Distribution is limited to the Newnes plateau in the Upper Blue Mountains where it occurs in dry forest and woodlands on sandy soils. Flowers January to March.	The species was **recorded** within the Project Application Area.	This species was detected within the Project Application Area along the ridge line habitat. Therefore, this species is likely to be affected by the Project and is further assessed in **Sections 6 and 7.**
Persoonia marginata (V, V*)	Found on the Central Tablelands and South Coast of NSW, including in the Ben Bullen State Forest. Its preferred habitat is dry sclerophyll forest	This species has been recorded within 10 km of the Study Area (Wildlife Atlas, 2012). Some areas of habitat within the vicinity of the Study Area are suitable for this species. This species has **potentia**l to occur within the Study Area but was not observed.	As this species has potential to occur within the Study Area and thereby be affected by the Project, this species is further assessed in **Sections 6 and 7.**
Prasophyllum sp. *Wybong* (CE*)	It is known from seven populations in open eucalypt woodland and grassland in New South Wales. The species' area of occupancy is estimated to be 1.5 km^2 with an estimated population size based on surveys in 2006 of 460 mature individuals. This species occurs within the Sydney Basin, New England Tablelands, Brigalow Belt South and NSW South Western Slopes IBRA Bioregions and the Border Rivers–Gwydir, Namoi, Hunter–Central Rivers and Central West Natural Resource Management Regions.	This species was not detected during targeted field surveys. Also, this species has not been previously detected within 10 km of the Study Area. Therefore, it is **unlikely** to occur within the Study Area.	As this species has a low likelihood of occurring within the Study Area, it is considered **unlikely** to be impacted on by the Project.
Pultenaea glabra Smooth Bush-pea (V, V*)	Restricted to the higher Blue Mountains and has been recorded from the Katoomba-Hazelbrook and Mount Victoria areas, with unconfirmed sightings in the Mount Wilson and Mount Irvine areas. All known populations occur within the Blue Mountains Local Government Area. Grows in swamp margins, hill slopes, gullies and creek banks and occurs within dry sclerophyll forest and tall damp heath on sandstone. Flowers September to November, fruit matures October to December.	This species was not detected during targeted field surveys. Also, this species has not been previously detected within 10 km of the Study Area. Therefore, it is **unlikely** to occur within the Study Area.	As this species has a low likelihood of occurring within the Study Area, it is considered **unlikely** to be impacted on by the Project.
Thesium australe Austral Toadflax (V, V*)	Grows in grassland or woodland, often in damp sites in association with Kangaroo Grass (*Themeda australis*).	This species was not detected during targeted field surveys and the preferred damp grassy habitats do not occur within the Study Area. Additionally this species has not been recorded within a 10 km radius of the Study Area. Therefore, it is **unlikely** to occur within the Study Area.	As this species has a low likelihood of occurring within the Study Area, it is considered **unlikely** to be impacted on by the Project.

Species / Community	Habitat Description	Likelihood of Occurrence	Potential for Impact
Wollemia nobilis Wollemi Pine (E, E*)	Little is known about the ecology of this recently-discovered species; ecological research is currently ongoing. Occurs in warm temperate rainforest and rain forest margins in remote sandstone canyons.	This species was not detected during targeted field surveys and the preferred remote rainforest canyon habitats do not occur within the Study Area. Additionally this species has not been recorded within a 10 km radius of the Study Area. Therefore, it is **unlikely** to occur within the Study Area.	As this species has a low likelihood of occurring within the Study Area, it is considered **unlikely** to be impacted on by the Project.
Herpetofauna			
Eulamprus leuraensis Blue Mountains Water Skink (E, E*)	Occurs at high elevations between 560 m and 1060 m from the Newnes Plateau to just south of Hazelbrook. It is restricted to an isolated and naturally fragmented habitat of sedge and shrub swamps that have boggy soils and appear to be permanently wet. The vegetation in these swamps typically takes the form of a sedgeland interspersed with shrubs, but may occur as a dense shrub thicket. This species has been recorded from 8 locations on the Newnes Plateau, all within Shrub Swamp communities (DEC 2001a). Elsewhere within its distribution (eg in the Eastern Blue Mountains) the species is known from Hanging Swamps, although mostly from larger swamps with standing water (DEC 2001a).	Although Hanging Swamps occur within the Study Area, these swamps are relatively small without standing water. While a small possibility occurs to these swamps being used by this species, it is **unlikely** to occur within the Study Area.	As this species has a low likelihood of occurring within the Study Area, it is considered **unlikely** to be impacted on by the Project.
Heleioporus australiacus Giant Burrowing Frog (V, V*)	The current distribution of *H. australiacus* is south-eastern NSW to Vic. Locally it occurs north to Jervis Bay (Daly 1996), and is mostly restricted to sandy creek banks, often in association with crayfish burrows in this area (Robinson 1996). The northern population has a marked preference for sandstone ridge-top habitat and broader upland valleys. In these locations the frog is associated with small headwater creek lines and along slow flowing to intermittent creek-lines. *H. australiacus* is grey to dark chocolate brown or black above with a white belly, a few yellow spots along the flanks. During the summer, males call like an owl hoot, from burrows within creek banks. Females lay eggs in a foamy nest in the burrow, and the developing tadpoles are washed from the burrows into the creeks during heavy rain.	This species was not detected during targeted field surveys, however it has been recorded twice within the vicinity of the Study Area during monitoring surveys in recent years, including a site near Angus Place Longwall 900W at Kangaroo Creek (Denny 2011). Additional scattered records occur throughout the Blue Mountains National Park. Woodland habitat within the Study Area may provide suitable substrates for the burrowing habits of this species; however, the stream characteristics (running water) are not suited to the breeding requirements of this species. However its occurrence within the Study Area cannot be entirely discounted at non breeding times, thus this species could **potentially** occur within the Study Area.	As this species has potential to occur within the Study Area and thereby be affected by the Project, this species is further assessed in **Sections 6 and 7.**
Hoplocephalus bungaroides Broad-headed Snake (E, V*)	Largely confined to Triassic sandstones, including the Hawkesbury, Narellan and Shoalhaven formations, within the coast and ranges. Nocturnal, sheltering by day in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring. In summer it is known to become semi-arboreal in its search for prey including geckos and skinks, and will shelter in hollows in large trees within 200 m of rocky escarpments. The Broad-headed Snake is regarded as potentially dangerous, although it has not been attributed to any human fatalities. Destruction of habitat, particularly the removal of sandstone slabs has lead to a decline in numbers.	This species was not detected during targeted field surveys. The preferred exfoliating sandstone habitat of this species does not occur within the Project Application Area and no records occur within the vicinity of the Project Application Area. Therefore, it is **unlikely** to occur within the Study Area.	As this species has a low likelihood of occurring within the Study Area, it is considered **unlikely** to be impacted on by the Project.
Varanus rosenbergi Rosenberg's Monitor (V)	The Rosenberg's Monitor is a species found throughout southeastern Australia, but locally is restricted to the Sydney Basin and southern escarpment forests where terrestrial termite mounds occur (used for breeding).	This species was not detected during field surveys. While suitable habitat does occur, records do not occur for the Newnes Plateau. Therefore it is **unlikely** to occur within the Study Area.	As this species has a low likelihood of occurring within the Study Area, it is considered **unlikely** to be impacted on by the Project.

Species / Community	Habitat Description	Likelihood of Occurrence	Potential for Impact
Litoria booroolongensis Booroolong Frog (E, E*)	Live along permanent streams with some fringing vegetation cover such as ferns, sedges or grasses. Adults occur on or near cobble banks and other rock structures within stream margins. Shelter under rocks or amongst vegetation near the ground on the stream edge. Sometimes bask in the sun on exposed rocks near flowing water during summer. Breeding occurs in spring and early summer and tadpoles metamorphose in late summer to early autumn. Eggs are laid in submerged rock crevices and tadpoles grow in slow-flowing connected or isolated pools.	This species was not detected during targeted field surveys whilst stream-side habitats favoured by this species are not present within the Study Area. Therefore, it is **unlikely** to occur within the Study Area.	As this species has a low likelihood of occurring within the Study Area, it is considered **unlikely** to be impacted on by the Project.
Litoria littlejohni Little John's Tree Frog (V, V*)	Occurs on the plateaus and eastern plains of the Great Dividing Range from scattered locations between the Watagan Mountains NSW south to Buchan in Victoria. It is pale brown dark speckles. Occurs along permanent rocky creeks with thick fringing vegetation associated with eucalypt woodlands and heaths among sandstone outcrops. Despite its very large distribution there are very few records of the *Litoria littlejohni*. It is known to call through most of the year with a peak in summer. Clusters of up to 60 eggs are attached to submerged twigs, stems or branches, often near the banks of still pools or clear, slowly flowing streams. Metamorphosis occurs mostly in the months of December and January.	This species was not detected during targeted field surveys. Although this species is known to occur in open woodland habitat there are no records for this species from the Newnes Plateau. Therefore, it is **unlikely** to occur within the Study Area.	As this species has a low likelihood of occurring within the Study Area, it is considered **unlikely** to be impacted on by the Project.
Mixophyes balbus Stuttering Frog (E, V*)	Found in rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range. Breeds in streams during summer after heavy rain, outside the breeding season adults live in deep leaf litter and thick understorey vegetation on the forest floor. Eggs are laid on rock shelves or shallow riffles in small, flowing streams.	This species was not detected during targeted field surveys. This species has been recorded within 10 km of the Study Area and the non breeding habitat for this species is poorly understood. Subsequently the habitat within the Study Area may occur as non breeding habitat. Thus there is a very small likelihood that this species could **potentially** occur within the Study Area.	As this species has potential to occur within the Study Area and thereby be affected by the Project, this species is further assessed in **Sections 6 and 7.**

Species / Community	**Habitat Description**	**Likelihood of Occurrence**	**Potential for Impact**
Pseudophryne australis Red Crowned Toadlet (V)	Restricted to the Sydney Basin with strongholds around the Hawkesbury River. It occurs in soaks and other damp areas in forest.	This species has not been detected during targeted field surveys of the Newnes Plateau by Martin Denny, however a single record of the species occurs on the NSW Atlas of Wildlife. It is considered **unlikely** to occur within the Study Area.	As this species has a low likelihood of occurring within the Study Area, it is considered **unlikely** to be impacted on by the Project.
Insects			
Paralucia spinifera Bathurst Copper Butterfly (E, V*)	A small sized butterfly with a wingspan of 20–30 mm, occurring on the Central Tablelands of NSW in an area approximately bounded by Oberon, Hartley and Bathurst. This species is known at 35 locations, all within the Greater Lithgow, Bathurst Regional and Oberon local government areas. It favours sites with a southwest to north-west aspect, usually where direct sunlight reaches the habitat, and with extremes of cold such as regular winter snowfalls or heavy frosts.	This species was not observed within the Study Area and known populations of this species are from a small area to the south and east of Bathurst. The preferred larval feed plant of this butterfly, *Bursaria spinosa* (Native Blackthorn), does not occur in the vicinity of the Study Area. Therefore, it is **unlikely** to occur within the Study Area.	As this species has a low likelihood of occurring within the Study Area, it is considered **unlikely** to be impacted on by the Project.
Petalura gigantea Giant Dragonfly (E)	*Petalura gigantea* can be found along the east coast of NSW, from the Victorian border to northern NSW. There are only a handful of known locations in NSW. They occur in permanent swamps and bogs with some water and open vegetation.	Although this species has been recorded within 10km of the Study Area, this species was not observed during targeted field surveys. A lack of habitat for this species within the Study Area has determined it is **unlikely** to occur within the Study Area.	As this species has a low likelihood of occurring within the Study Area, it is considered **unlikely** to be impacted on by the Project.
Avifauna			
Anthochaera phrygia Regent Honeyeater (CE, E*)	Occurs in temperate woodlands and open forest, including forest edges. Seasonal movements appear to be dictated by the flowering of various species of *Eucalyptus* sp. that are characteristic of the dry forests and woodlands of South-Eastern Australia. The Regent Honeyeater prefers to forage on large-flowered *Eucalypts*. They also forage on mistletoe and *Banksia* flowers, and arthropods. Nesting occurs mainly between November and January, but breeding has been recorded in all months between July and February.	This species was not detected during targeted field surveys. Well known as occurring in the Capertee area, individuals are recorded in more easterly habitat, particularly in areas characterised by winter flowering *Eucalyptus* ssp. when westerly habitats are experiencing extended dry periods. As such this species may occur in Newnes Plateau forests on an intermittent basis. Therefore, this species could **potentially** occur within the Study Area.	As this species has potential to occur within the Study Area and thereby be affected by the Project, this species is further assessed in **Sections 6 and 7.**
Botaurus poiciloptilus Australasian bittern (V, E*)	This species occurs across southern Australia including Tasmania and the south-west of Western Australia. Within New South Wales it occupies discrete wetland systems of the coast and floodplain wetlands of the more inland areas of its range.	This species was not detected during targeted field surveys, and has not been recorded within a 10 km radius of the Study Area. A lack of available wetland habitat on the Newnes Plateau has determined it **unlikely** for the species to occur within the Study Area.	As this species has a low likelihood of occurring within the Study Area, it is considered **unlikely** to be impacted on by the Project.
Callocephalon fimbriatum Gang-Gang Cockatoo (V)	Found in the summer months in tall mountain forests and woodlands, and mature wet sclerophyll forests. In winter, may occur at lower altitudes in drier more open Eucalypt forests and woodlands, and often found in urban areas in some districts.	The species has been recorded within 10km of the Study Area multiple times during fieldwork by RPS in 2010, 2011 and 2012. Suitable habitat exists within the Study Area and this species is therefore **likely** to occur within the Study Area.	As this species has potential to occur within the Study Area and thereby be affected by the Project, this species is further assessed in **Sections 6 and 7.**
Calyptorhynchus lathami Glossy Black-Cockatoo (V)	Occurs in forests and woodlands where it forages predominantly on *Allocasuarina* cones, particularly those of *A. littoralis*, *A. torulosa* and at time *A. distyla*. Requires large Eucalypt tree hollows for nesting. Local records occur on the Newnes Plateau.	This species was not detected during targeted field surveys. Also no preferred habitat of *Allocasuarina* species (*A. littoralis*, *A. torulosa* and/or *A. distyla*), were observed within the Study Area and there are limited hollow-bearing trees to represent breeding opportunities for this species. Therefore the Project Application Area is **unlikely** to represent suitable habitat for this species.	As this species has a low likelihood of occurring within the Study Area, it is considered **unlikely** to be impacted on by the Project.

Species / Community	Habitat Description	Likelihood of Occurrence	Potential for Impact
Chthonicola sagittata Speckled Warbler (V)	Occupies Eucalypt and Cypress woodlands in drier areas and on the western/eastern slopes of the Great Dividing Range. More commonly found on the western slopes, mainly due to habitat. Requires a grassy understorey, a sparse shrub layer and an open canopy. Most foraging takes place on ground around tussocks, around bushes and trees. Appears unable to persist in districts where no forested fragments larger than 100ha remain.	This species was not detected during targeted field surveys. A dry open woodland bird favouring habitats with dense understorey areas, this species is only likely to sparsely occur in western areas of the Newnes Plateau. Therefore the Project Application Area is **unlikely** to represent suitable habitat for this species.	As this species has a low likelihood of occurring within the Study Area, it is considered **unlikely** to be impacted on by the Project.
Climacteris picumnus victoriae Brown Treecreeper (V)	Frequents drier forests and woodlands, particularly open woodland lacking a dense understorey. Also found in grasslands in proximity to wooded areas where there are sufficient logs, stumps and dead trees nearby. Feeds on invertebrate larvae and small insects, particularly ants. Utilises hollows for roosting/nesting. Appears not to persist in remnants less than 200 ha. A number of records exist on the Newnes Plateau to the northwest of the Study Area (Atlas of NSW Wildlife Data 2009).	This species was not detected during targeted field surveys. However, there are a large number of records of the species within the locality and potential habitat therefore occurs within the Project Application Area. Therefore, this species has **potential** to occur within the Study Area.	As this species has potential to occur within the Study Area and thereby be affected by the Project, this species is further assessed in **Sections 6 and 7.**
Daphoenositta chrysoptera Varied Sittella (V)	A canopy species occurring across a wide variety of wooded habitats including wet and dry forests / woodlands and in some areas, tall heathlands. Forages for a range of invertebrate prey and differs from Treecreeper species in foraging in both up and down orientations on trunks and branches. Occurs widely across mainland Australia in suitable habitat.	The species was recorded within 10 km of the Study Area by RPS during fieldwork in 2010. Suitable habitat also exists within the Study Area and this species is therefore **likely** to occur within the Study Area	As this species has potential to occur within the Study Area and thereby be affected by the Project, this species is further assessed in **Sections 6 and 7.**
Heiraaetus morphonoides Little Eagle (V)	The Little Eagle is found throughout the Australian mainland excepting the most densely forested parts of the Dividing Range escarpment. It occurs as a single population throughout NSW. Occupies open eucalypt forest, woodland or open woodland. Sheoak or acacia woodlands and riparian woodlands of interior NSW are also used. Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter. Lays two or three eggs during spring, and young fledge in early summer. Preys on birds, reptiles and mammals, occasionally adding large insects and carrion (DECCW 2010).	This species was not recorded within the Study Area during fieldwork. This species is known to occur in open eucalypt forest and has been previously recorded from the Newnes Plateau. The species has the **potential** to occur within the Study Area.	As this species has potential to occur within the Study Area and thereby be affected by the Project, this species is further assessed in **Sections 6 and 7.**
Leipoa ocellata Malleefowl (E, V*)	Although historically widespread, Malleefowl are now currently restricted to mallee areas of inland semi-arid scrub. They feed on ants and seeds of *Acacia* and *Senna* sp. during the summer and autumn, whilst varying their diet to include flower blossoms and other invertebrates during the cooler, damper months.	This species was not recorded within the Study Area during fieldwork and has not been observed within a 10 km radius of the Study Area. Additionally, given a lack of suitable habitat for this species within the Study Area or on the Newnes Plateau in general, the Project Application Area is **unlikely** to represent suitable habitat for this species.	As this species has a low likelihood of occurring within the Study Area, it is considered **unlikely** to be impacted on by the Project.
Glossopsitta pusilla Little Lorikeet (V)	The Little Lorikeet is a species found throughout the Eucalypt forests and woodlands of Eastern Australia, however can potentially occur further inland. They are considered to be nomadic, following flowering Eucalypts. In recent times this species has declined as a result of habitat modification and the removal of nesting hollow-bearing trees.	This species was not recorded within the Study Area during fieldwork. This species is known to occur in open eucalypt forest, woodland or open woodland. Due to the contiguous nature of suitable habitat on the Newnes Plateau, the species is **likely** to occur within the Study Area.	As this species has potential to occur within the Study Area and thereby be affected by the Project, this species is further assessed in **Sections 6 and 7.**
Stagonopleura guttata Diamond Firetail (V)	The Diamond Firetail is found throughout central and eastern NSW, where it occupies drier forests, woodland and mallee. Due to the extensive clearance of suitable habitat for agriculture, this species has declined in recent years.	This species was not recorded within the Study Area during fieldwork. Due to the species preference for drier habitats, it is **unlikely** to occur within the Study Area.	As this species has a low likelihood of occurring within the Study Area, it is considered **unlikely** to be impacted on by the Project.

Species / Community	Habitat Description	Likelihood of Occurrence	Potential for Impact
Lathamnus discolor Swift Parrot (E, E*)	The Swift Parrot is an austral migrant, widely dispersing from breeding grounds in Tasmania to areas of mainland Australia including South Australia, Victoria, the ACT, eastern New South Wales and into South-east Queensland. They feed on nectar and lerp (carbohydrates produced by sap sucking insects on leaves) associated with eucalypts, and their dispersal and distribution is highly variable between years depending on food availability (TSSC 2012).	This species was not recorded within the Study Area during fieldwork and has not been observed within a 10 km radius of the Study Area. Additionally, the species predominantly prefers coastal woodlands and forests of New South Wales, preferring eucalypt species typically not found on the Newnes Plateau. Therefore the Project Application Area is **unlikely** to represent suitable habitat for this species	As this species has a low likelihood of occurring within the Study Area, it is considered **unlikely** to be impacted on by the Project.
Melanodryas cucullata Hooded Robin (V)	Primarily known from Eucalypt forest, woodland and scrub, although has been known to use cleared paddocks with regrowth or stumps in close proximity to wooded areas. Favours areas with sparse shrub cover and fallen timber. Appears unable to persist in remnants less than 100-200 ha.	This species was not recorded within the Study Area during fieldwork. This species is generally a more western species, occurring in open woodlands with diverse understorey attributes. The habitat within the Study Area is not considered suitable for this species, despite the occurrence of records further to the east in the wider locality. Therefore the Project Application Area is **unlikely** to represent suitable habitat for this species.	There is limited opportunity for species to occur within the Study Area, and as such the Project is **unlikely** to affect a significant area of potential habitat.
Melithreptus gularis gularis Black-chinned Honeyeater (V)	In NSW this species occurs in eastern Australia, along the inland slopes of the Great Dividing Range, extending to the coast between Sydney and Newcastle, NSW, Occupies dry Eucalypt woodland within an annual rainfall range between 400-700 mm, particularly within associations containing Ironbark and Box species (Garnett and Crowley 2000). It is estimated that the Black-chinned Honeyeater spends 60% of its time searching foliage for such food as insects, nectar and lerp.	This species was not recorded within the Study Area during fieldwork. A woodland / open forest bird, this species may sparsely occur in Newnes Plateau forests in areas where habitat structural diversity is high. The habitat within the Study Area is not considered to offer sufficient structural diversity to suit this species. Therefore the Project Application Area is **unlikely** to represent suitable habitat for this species.	There is limited opportunity for species to occur within the Study Area, therefore the Project is **unlikely** to affect a significant area of potential habitat.
Ninox connivens Barking Owl (V)	Occurs mainly in dry sclerophyll woodland. Nests in large Eucalypt hollows, and roosts in hollows or thick vegetation. Can be found roosting in dense *Acacia* sp. and *Casuarina* sp. or the dense clumps of Eucalypt trees. More commonly found west of the divide and on the slopes. Favours tree lined watercourses, with hollow-bearing tress. Hunts a range of prey species including birds and both terrestrial and arboreal mammals.	This species was not recorded within the Study Area during fieldwork. This species is generally a more western species, individuals are occasionally recorded in more easterly habitat, particularly those areas characterised by large expanses of wooded habitat. As such this species may sparsely occur in Newnes Plateau forests on an intermittent basis. Therefore the Project Application Area is **unlikely** to represent suitable habitat for this species.	Due to the low likelihood of occurrence it is **unlikely** that this species will be adversely affected by the Project.
Ninox strenua Powerful Owl (V)	Occurs in coastal and adjacent ranges of eastern Australia in sclerophyll forests and woodlands where suitable prey species occur (being predominantly arboreal mammals such gliders and flying foxes, but also preys on birds). Requires large and specific hollow characteristics for nesting. Pairs appear to mate for life and occupy exclusive territories in the order of 1000 ha in size.	The species was recorded within 10 km the Study Area by RPS during fieldwork in 2011. It is likely that the Study Area occurs within the foraging range and perhaps the breeding territory of locally occurring Powerful Owl individuals. Therefore, this species could **potentially** occur within the Study Area.	As this species has potential to occur within the Study Area and thereby be affected by the Project, this species is further assessed in **Sections 6 and 7.**
Petroica boodang Scarlet Robin (V)	A woodland and open forest species, which forages in the mid to lower storeys on a variety of invertebrate prey. Generally an altitudinal migrant the Scarlet Robin spends the warmer months in the ranges and winters in lowland dry open forests and woodland. Occurs patchily in eastern Australia across wooded habitats.	This species was **recorded** within the Study Area.	As this species was recorded within the Study Area and thereby has potential to be affected by the Project, this species is further assessed in **Sections 6 and 7.**
Petroica phoenicea Flame Robin (V)	A woodland and open forest species, which prefers the wooded edges of open areas and forages in the lower storey on a variety of invertebrate prey. Generally an altitudinal migrant the Flame Robin, like a number of other robin species spends the warmer months in the ranges and winters in more lowland open country and woodlands. Usually encountered in high altitudinal areas including above snowline habitat in some regions.	This species was recorded within 1km of the Study Area by RPS ecologists during fieldwork in 2012. It is likely that the Study Area represents breeding and foraging habitat for this species. Due to the contiguous nature of suitable habitat on the Newnes Plateau, the species is **likely** to occur within the Study Area.	As this species was recorded within close vicinity of the Study Area and thereby has potential to be affected by the Project, this species is further assessed in **Sections 6 and 7.**

Species / Community	Habitat Description	Likelihood of Occurrence	Potential for Impact
Pomatostomus temporalis temporalis Grey-crowned Babbler (eastern subspecies) (V)	Occupies open forests and woodlands, *Acacia* shrubland and adjoining farmland. Also Box-Gum Woodlands on the divide slopes and Box-Cypress Pine and open Box Woodlands on the plains. They feed on terrestrial invertebrates and insects on lower trunks and branches. Generally they prefer wooded areas with an intact ground cover, although in such areas as the Hunter Valley they occur in sparsely vegetated areas such as properties and golf courses. Appears unable to persist in cleared and highly fragmented habitats. Nest comprise of a dome shape stick nest which is often only a couple of metres from the ground in shrubs or Eucalypt saplings.	This species was not recorded within the Study Area during fieldwork. A dry open woodland bird favouring habitats with open understorey areas, this species may sparsely occur in western areas of the Newnes Plateau. However there are no habitat opportunities for this species within the Study Area and this species was not observed during avian surveys. Therefore the Project Application Area is **unlikely** to represent suitable habitat for this species.	Due to the low likelihood of occurrence it is **unlikely** that this species will be adversely affected by the Project.
Rostratula australis Australian Painted Snipe (E, V*)	Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Forages nocturnally on mud-flats and in shallow water. Feeds on worms, molluscs, insects and some plant-matter.	This species was not detected during targeted field surveys, and has not been recorded within a 10 km radius of the Study Area. A lack of available wetland habitat on the Newnes Plateau has determined it **unlikely** for the species to occur within the Study Area.	Due to the low likelihood of occurrence it is **unlikely** that this species will be adversely affected by the Project.
Tyto novaehollandiae Masked Owl (V)	Found in a range of habitats, more commonly found in dry eucalypt forests and woodlands. A forest owl which often hunts on forest edges and also roadsides. Requires large Eucalypt hollows for nesting and these hollows are also preferred for roosting sites. Breeding has also been recorded in caves.	The species was **recorded** within the Study Area during RPS fieldwork in February 2012.	As this species was recorded within the Study Area and thereby has potential to be affected by the Project, this species is further assessed in **Sections 6 and 7.**
Tyto tenebricosa Sooty Owl (V)	Occurs in tall, moist eucalypt forests and rainforests of the escarpment, eastern tablelands and coastal areas of NSW. They are found in areas of steep and/or undulating topography however they are strongly associated with sheltered gullies with a typically tall, rainforest understory.	This species was recorded within 10 km of the Study Area by RPS during fieldwork in 2012. It is therefore likely that the Study Area occurs within foraging and potentially breeding territory of locally occurring Sooty Owl individuals. Therefore, this species could **potentially** occur within the Study Area.	As this species has potential to occur within the Study Area and thereby be affected by the Project, this species is further assessed in **Sections 6 and 7.**
Mammals			
Phascolarctos cinereus Koala (V, V*)	Occurs throughout Eastern Australia, including Queensland, New South Wales, Victoria and South Australia in more productive forests and woodlands. Populations are impacted upon by collisions, dog attacks, fires, habitat destruction and disease. There is a north-south range retraction with significant declines occurring in New South Wales and Queensland, however southern populations are more stable.	This species has been recorded on one occasion on the Newnes Plateau. Due to the occurrence of Eucalyptus viminalis within the Study Area (a potential feed tree), the species could **potentially** occur within the Study Area.	As this species has potential to occur within the Study Area and thereby be affected by the Project, this species is further assessed in **Sections 6 and 7.**
Vespadelus troughtoni Eastern Cave Bat (V)	This species is a cave dwelling bat found throughout Eastern Australia. It occurs within sclerophyll forests foraging for insects.	This species has not been recorded during extensive surveys on the Newnes Plateau by Martin Denny. It is considered **unlikely** that it occurs within the Study Area.	Due to the low likelihood of occurrence it is **unlikely** that this species will be adversely affected by the Project.
Cercartetus nanus Eastern Pygmy Possum (V)	Occurs from rainforest through sclerophyll forest to tree heath. Favoured food being banksias, myrtaceous shrubs and trees and insects. Nesting sites are generally in drier habitats (Strahan 2004). Records exist from the Watagan Mountains (Atlas of NSW Wildlife data).	This species was recorded within 10 km of the Study Area by RPS during fieldwork in 2010 and 2012. Coupled with the existence of suitable habitat within the Study Area, this species is **likely** to occur within the Study Area.	As this species has potential to occur within the Study Area and thereby be affected by the Project, this species is further assessed in **Sections 6 and 7.**

Species / Community	Habitat Description	Likelihood of Occurrence	Potential for Impact
Chalinolobus dwyeri Large-eared Pied Bat (V, V*)	Found in well-timbered areas containing gullies. The relatively short, broad wing combined with the low weight per unit area of wing indicates manoeuvrable flight. This species probably forages for small, flying insects below the forest canopy.	This species was recorded within 10 km of the Study Area by RPS during fieldwork in 2010. Suitable habitat also occurs and this species is therefore **likely** to occur within the Study Area.	As this species has potential to occur within the Study Area and thereby be affected by the Project, this species is further assessed in **Sections 6 and 7.**
Dasyurus maculatus Spotted-tailed Quoll (V, E*)	Found in a variety of forested habitats from sclerophyll forests, rainforests and coastal woodlands. This species creates a den in fallen hollow logs or among rocky outcrops. Generally does not occur in otherwise suitable habitats that are in close proximity to urban development. A number of records occur across the Newnes Plateau; however no records exist for within 10km of the Study Area (Atlas of NSW Wildlife data). It is an opportunistic hunter of a variety of prey.	This species was not recorded within the Study Area during fieldwork, whilst no records exist for this species within 10 km of the Study Area. However this species has been recorded elsewhere on the Newnes Plateau. Given that suitable habitat occurs within the Study Area, it has the **potential** to occur within the Study Area.	As this species has potential to occur within the Study Area and thereby be affected by the Project, this species is further assessed in **Sections 6 and 7.**
Falsistrellus tasmaniensis Eastern False Pipistrelle (V)	This species is found in a variety of forest types such as open forests, woodlands and wetter sclerophyll forests (usually with trees >20m). This species roosts in tree hollows. Hunts beetles, moths, weevils and other flying insects below or just above the canopy.	This species was recorded within 10 km of the Study Area by RPS during fieldwork in 2010. Suitable habitat also occurs and this species is therefore **likely** to occur within the Study Area.	As this species has potential to occur within the Study Area and thereby be affected by the Project, this species is further assessed in **Sections 6 and 7.**
Chalinolobus pictatus *Little Pied Bat* (V)	This species is an inland species found throughout Central New South Wales and Queensland occurring in drier habitat types.	While a record of this species occurs from nearby Clarence Colliery, due to the preferred inland habitat for the species, it is considered **unlikely** to occur within the Study Area.	Due to the low likelihood of occurrence it is **unlikely** that this species will be adversely affected by the Project.
Isoodon obesulus obesulus Southern Brown Bandicoot (E, E*)	The Southern Brown Bandicoot has a patchy distribution. It is found in south-eastern NSW, east of the Great Dividing Range south from the Hawkesbury River, southern coastal Victoria and the Grampian Ranges, south-eastern South Australia, south-west Western Australia and the northern tip of Queensland. They are generally only found in heath or open forest with a heathy understorey on sandy or friable soils.	This species was not recorded within the Study Area during fieldwork. Also this species is not known to occur in the area. Therefore it is considered **unlikely** that the species occurs within the Study Area.	Due to the low likelihood of occurrence it is **unlikely** that this species will be adversely affected by the Project.
Miniopterus schreibersii subsp. *oceanensis* Eastern Bentwing Bat (V)	Prefers to forage in well-vegetated areas, such as within wet and dry sclerophyll forests and rainforests and also dense coastal Banksia scrub. Requires caves or similar structures for roosting habitat. Occasionally roost in tree hollows. Largely confined to more coastal areas.	This species was not recorded within the Study Area during fieldwork, although potential foraging and roosting habitat are widespread within the locality. Also due to its mobility, it has the **potential** to occur within the Study Area on at least an intermittent basis.	As this species has potential to occur within the Study Area and thereby be affected by the Project, this species is further assessed in **Sections 6 and 7.**
Petaurus australis Yellow-bellied Glider (V)	Usually associated with tall, mature wet Eucalypt forest usually with high rainfall and nutrient rich soils. Also known from tall dry open forest and mature woodland. In the north of NSW they favour mixed coastal forests to dry escarpment forests and in the south they prefer moist coastal gullies to creek flats and tall montane forests. The diverse diet of this species is primarily made up of Eucalypt nectar, sap, honey dew, manna and invertebrates found under decorticating bark and pollen. Tree hollows for nest sites are essential, as are suitable food trees in close proximity.	This species was not recorded within the Study Area during fieldwork. There are few records for this species in the wider locality. Chance of occurrence is low, but cannot be entirely discounted. Therefore, this species could **potentially** occur within the Study Area.	As this species has potential to occur within the Study Area and thereby be affected by the Project, this species is further assessed in **Sections 6 and 7.**

Species / Community	Habitat Description	Likelihood of Occurrence	Potential for Impact
Petaurus norfolcensis Squirrel Glider (V)	Occurs in eucalypt forests and woodlands where it feeds on sap exudates and blossoms. In these areas tree hollows are utilised for nesting sites. Also requires winter foraging resources when the availability of normal food resources may be limited, such as winter-flowering shrub and small tree species.	Although suitable habitat for this species occurs within the Study Area, it or its close relative the Sugar Glider were not observed during nocturnal spotlighting surveys or arboreal trapping. This species has been recorded by Martin Denny during biodiversity monitoring surveys on the Newnes Plateau. However, as suitable habitat occurs within the Study Area, it has the **potential** to occur within the Study Area.	As this species has potential to occur within the Study Area and thereby be affected by the Project, this species is further assessed in **Sections 6 and 7.**
Petrogale penicillata Brush-tailed Rock-wallaby (E, V*)	Occurs in forests and woodlands along the Great Divide and on the western slopes in escarpment country with suitable caves and rocky overhangs for shelter. Records exist from the Watagan Mountains where it is associated with the above habitats (DEC 2005; RPS pers. obs.).	This species was not recorded within the Study Area during fieldwork. Given that the Study Area does not include suitable habitat for *P. penicillata* it is considered **unlikely** that the species occurs within the Study Area.	Due to the low likelihood of occurrence it is **unlikely** that this species will be adversely affected by the Project.
Potorous tridactylus Long-nosed Potoroo (V, V*)	Prefers cool rainforest, wet sclerophyll forest and heathland. Essentially, requires dense understorey with occasional open areas. These open areas most likely consist of sedges, ferns, heath or grass-trees. Sleeps by day in a nest on the ground, and digs for succulent roots, tubers, fungi and subterranean insects. Some diggings seemingly attributable to this species may belong to *Isoodon macrourus* (Northern Brown Bandicoot). Generally east of the divide, hides by day in dense vegetation, sometimes feeds during winter during daylight hours during overcast or low light conditions.	This species was not recorded within the Study Area during fieldwork. Also this species is not known to occur within 10 km of the Study Area. Therefore, it is considered **unlikely** that the species occurs within the Study Area.	Due to the low likelihood of occurrence it is **unlikely** that this species will be adversely affected by the Project.
Pseudomys fumeus Smoky Mouse (CE, E*)	In NSW there are 3 records from Kosciuszko National Park and 2 records adjacent to the park in Bondo and Ingbyra State Forests; the remainder are centred around Mt Poole, Nullica State Forest and the adjoining S. E. Forests National Park. They appear to prefer heath habitat on ridge tops and slopes in sclerophyll forest, heathland and open-forest from the coast (in Victoria) to sub-alpine regions of up to 1800 m, but sometimes occurs in ferny gullies.	This species was not recorded within the Study Area during fieldwork. Also this species is not known to occur in the region. Therefore it is considered **unlikely** that the species occurs within the Study Area.	Due to the low likelihood of occurrence it is **unlikely** that this species will be adversely affected by the Project.
Pseudomys novaehollandiae New Holland Mouse (V*)	Across the species' range the New Holland Mouse is known to inhabit open heathlands, open woodlands with a heathland understorey and vegetated sand dunes. It is a social animal, living predominantly in burrows shared with other individuals. Their home range is from 0.44 ha to 1.4 ha. The species peaks in abundance during early to mid stages of vegetation succession typically induced by fire.	This species was not recorded within the Study Area during fieldwork. Also this species is not known to occur in the region. Therefore it is considered **unlikely** that the species occurs within the Study Area.	Due to the low likelihood of occurrence it is **unlikely** that this species will be adversely affected by the Project.
Pteropus poliocephalus Grey-headed Flying-fox (V, V*)	Forages over a large area for nectar / fruits etc. Occurs across subtropical and temperate forest, sclerophyll forest and woodlands, heaths, swamps, urban gardens and cultivated crops. Frequently observed to forage in flowering Eucalypts. Seasonally roosts in communal base camps situated within wet sclerophyll forests or rainforest. These camps are usually located within 20km's of their food source. Frequently observed to forage in flowering Eucalypts.	This species was not recorded within the Study Area during fieldwork. Also this species is not known to occur in the region. Therefore it is considered **unlikely** that the species occurs within the Study Area.	Due to the low likelihood of occurrence it is **unlikely** that this species will be adversely affected by the Project.
Saccolaimus flaviventris Yellow-bellied Sheathtail-bat (V)	Range of habitats from rainforest to arid shrubland, roosts in tree-hollows, sometimes roosts in mammal burrows when no hollows available. Seasonal movements are unknown, may migrate to southern Australia in summer. Feeds by foraging for insects over the canopy, but flies low in arid shrubland.	This species was recorded within 10 km of the Study Area by RPS during fieldwork in 2010 and 2011. Suitable habitat also occurs and this species is therefore it is **likely** to occur within the Study Area.	As this species has potential to occur within the Study Area and thereby be affected by the Project, this species is further assessed in **Sections 6 and 7.**

Species / Community	Habitat Description	Likelihood of Occurrence	Potential for Impact
Scoteanax rueppellii Greater Broad-nosed Bat (V)	Forages in moister gullies and wet sclerophyll forests as well as in lightly wooded areas and open spaces/ ecotones, most commonly found in tall wet forest. Open woodland and habitat and dry open forest suits the direct flight of this species as it searches for beetles and other larvae. This species roosts in tree hollows, although has been recorded in buildings.	This species was not recorded within the Study Area during fieldwork, although potential foraging and roosting habitat are widespread within the locality. Also due to its mobility, it has the **potential** to occur within the Study Area on at least an intermittent basis.	As this species has potential to occur within the Study Area and thereby be affected by the Project, this species is further assessed in **Sections 6 and 7.**
Threatened Ecological Communities			
Newnes Plateau Shrub Swamp in the Sydney Basin Bioregion (E) Note: this community also corresponds to; Temperate Highland Peat Swamps on Sandstone (E*)	This community occurs in the headwaters of water courses draining the Newnes Plateau. It occurs where low slope gradients and vegetation impede water flow in headwater valleys and is dominated by sedges and shrubs that favour poorly drained sites. The community occurs at higher elevations than Blue Mountains sedge swamps and in the Bell and Clarence area the transition between these communities occurs at approximately 850-950 m. Newnes Plateau shrub swamp has a greater dominance of shrubs when compared to Blue Mountains Sedge Swamps.	Vegetation mapping (DEC 2006) has identified this community within close proximity (approximately >110m to Carne West Swamp and 210 m to Sunnyside East Swamp) to the access road to Bore 8. MU 50 corresponds to the Newnes Plateau Shrub Swamp in the Sydney Basin Bioregion (TSC listed TEC) as well as the Temperate Highland Peat Swamps on Sandstone (EPBC listed TEC). This Community is considered **unlikely** to occur within the Study Area.	Due to the low likelihood of occurrence within the Study Area, it is considered that provided the sediment and erosion controls developed for the Project (GSSE, 2012) are adhered to, this vegetation community is **unlikely** to be impacted on by the Project. However, this community occurs within close proximity to the Study Area and thereby has potential to be indirectly affected by the Project. Therefore, this community is further assessed in **Sections 6.**
Newnes Plateau Hanging Swamp in the Sydney Basin Bioregion (E) Note: this community also corresponds to; Temperate Highland Peat Swamps on Sandstone (E*)	This vegetation community occurs in gully heads and ridge-top sites where groundwater seepage travelling through permeable rock layers is directed laterally by impermeable layers. These form wet peaty soils in which a range of swamp heath flora species grow.	Vegetation mapping (DEC 2006) and ground-truthing by RPS ecologists have identified patches of this community within close proximity to the north of the Study Area (~300m) and to the south (~150m). This community corresponds to MU 51 within DEC (2006) (TSC listed TEC) along with the Temperate Highland Peat Swamps on Sandstone community (EPBC listed TEC). This community is considered **unlikely** to occur within the Study Area.	Due to the low likelihood of occurrence within the Study Area, it is considered that provided the sediment and erosion controls developed for the Project (GSSE, 2012) are adhered to, this vegetation community is **unlikely** to be impacted on by the Project. However, this community occurs within close proximity to the Study Area and thereby has potential to be indirectly affected by the Project. Therefore, this community is further assessed in **Sections 6.**

Species / Community	Habitat Description	Likelihood of Occurrence	Potential for Impact
Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps bioregions (E) Note: this community also corresponds to; Temperate Highland Peat Swamps on Sandstone (E*)	This community is associated with accumulated peaty or organic-mineral sediments on poorly drained flats in the headwaters of streams. It occurs on undulating tablelands and plateaus, above 400-500 m elevation, generally in catchments with basic volcanic or fine-grained sedimentary substrates or, occasionally, granite. It comprises a dense, open or sparse layer of shrubs with soft-leaved sedges, grasses and forbs. It is the only type of wetland that may contain more than trace amounts of *Sphagnum* spp., the hummock peat-forming mosses. This community is known to occur within the Lithgow LGA.	The vegetation composition used to determine the presence of this ecological community was not found to occur within the Study Area. Therefore, it is considered **unlikely** to occur within the Study Area.	Due to the low likelihood of occurrence within the Study Area, it is considered that this vegetation community is **unlikely** to be impacted on by the Project.
White Box – Yellow Box – Blakeley's Red Gum Grassy Woodland and derived native Grassland (E, CE*)	This community is dominated by *Eucalyptus albens, E. melliodora* and *E. blakelyi* and has an open grassy understorey with sparsely scattered shrubs. It can also take the form of grassland wherever the trees have been removed.	The vegetation composition used to determine the presence of this ecological community was not found to occur within the Study Area. Therefore, it is considered **unlikely** to occur within the Study Area.	Due to the low likelihood of occurrence within the Study Area, it is considered that this vegetation community is **unlikely** to be impacted on by the Project.

Notes:		
	(V)	= Vulnerable Species listed under the *Threatened Species Conservation Act 1995*.
	(E)	= Endangered Species listed under the *Threatened Species Conservation Act 1995*.
	(CE)	= Critically Endangered Species listed under the *Threatened Species Conservation Act 1995*.
	(V*)	= Vulnerable Species listed under the *Commonwealth EPBC Act 1999*.
	(E*)	= Endangered Species/Community listed under the *Commonwealth EPBC Act 1999*.
	(CE*)	= Critically Endangered Species/Community listed under the *Commonwealth EPBC Act 1999*.

4.2 Key Threatening Processes

Key Threatening Processes (KTPs) are listed in Schedule 3 of the *TSC Act 1995*. Six KTPs have the potential to affect the Study Area as a consequence of the Project, being:

- Anthropogenic climate change
- Clearing of Native Vegetation
- Infection of native plants by *Phytophthora cinnamomi*
- Loss of hollow-bearing trees
- Removal of dead wood and dead trees
- Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands

"Anthropogenic Caused Climate Change"

The Project is likely to contribute to the Key Threatening Process "Anthropogenic Caused Climate Change", which has the potential to impact upon the Sooty Owl (DEC 2000), a species that may utilise the Study Area for foraging and/ or roosting. The Project contributes to this KTP as a result of clearing a small amount (4 ha) of native vegetation. The extent to which the Project could contribute to this process is considered unlikely to be significant.

"Clearing of Native Vegetation"

The Project will require the removal of a relatively small area (4 ha) of native vegetation, which has the potential to impact upon the Eastern Pygmy Possum, Large Eared Pied Bat, Spotted Tail Quoll, Yellow Bellied Gilder, Squirrel Glider, Koala, Yellow Bellied Sheathtail Bat, Greater Broad Nosed Bat, Powerful Owl, Masked Owl, Sooty Owl and Regent Honeyeater (DEC 2001b). This clearing will incrementally contribute to the Key Threatening Process "Clearing of Native Vegetation". The extent to which the Project could contribute to this process is considered unlikely to be significant, particularly given 2.34 ha of the vegetation clearing will be rehabilitated after the initial construction phase and therefore will only be a temporary impact. .

"Infection of native plants by *Phytophthora cinnamomi*"

The Project has the potential to result in the importation of this pathogen, which has the potential to impact upon populations of *Persoonia hindii* (DEC 2003). It is considered that with the correct hygiene protocols in place, the Project is unlikely to significantly contribute to this process.

"Loss of hollow-bearing trees"

Despite there being no hollow bearing trees identified within the Study Area, obscure hollows unidentifiable by ecologists on the ground may exist and subsequently contribute to this Key Threatening Process. Potentially this may impact upon the Gang Gang Cockatoo, Brown Treecreeper, Powerful Owl, Masked Owl, Sooty Owl, Eastern Pygmy Possum, Spotted Tail Quoll, Eastern False Pipistrelle, Yellow Bellied Glider, Squirrel Glider, Yellow Bellied Sheathtail Bat and Greater Broad Nosed Bat (DEC 2007). Hollow-bearing trees provide habitat for many diurnal and nocturnal birds and arboreal mammals. Being under State Forest tenure, the area has had a long history of clearing of trees before they reach a level of maturity where hollows develop. There is a subsequent lack of hollow-bearing trees in the locality, and given the extensive amounts of habitat surrounding the Project Application Area that include hollow-bearing trees, it is considered unlikely that the removal of a small number of hollows would significantly impact those hollow dependent species that are considered to potentially utilise the Study Area.

Opportunities exist for any displaced hollows to be collected and transported for use as valuable habitat in off-site fauna conservation activities. This could effectively provide a positive outcome for endemic threatened fauna species as a result of Project workings.

"Removal of dead wood and dead trees"

The Project will require the removal of ground debris in areas of disturbance. This has the potential to impact upon the Masked Owl, Spotted Tail Quoll, Eastern False Pipistrelle, Eastern Pygmy Possum, Squirrel Glider and Brown Treecreeper (DEC 2004b). Reptiles, frogs and ground foraging birds may be affected by the removal of this habitat. However, a vast amount of ground debris exists in the area surrounding the Project Application Area, particularly as a result of logging activities within the State Forest. It is therefore unlikely that the relatively small disturbance to ground debris as a result of the Project would contribute to this process.

Opportunities exist for displaced ground debris to be collected and transported for use as valuable habitat in off-site fauna conservation activities. This could effectively provide a positive outcome for endemic threatened fauna species as a result of Project workings.

"Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands"

The Project requires the clearing of a small area (4 ha) along a ridgeline and therefore has the potential to increase and alter natural overland flow. Any alteration may, in turn, impact upon surrounding swamp communities located within the adjacent valleys. However, under the premise that the stringent erosion and sedimentation controls developed (GSSE, 2012) are effectively adhered to and given that 2.34 ha of the cleared areas will be rehabilitated post construction, the contribution of clearing activities to this KTP will be minimised and it is unlikely that the Project would contribute to this process.

5.0 Additional Legislative Considerations

5.1 Considerations under the State Environmental Planning Policy 44 – Koala Habitat Protection

5.1.1 First Consideration – is the Land subject to SEPP-44?

The Study Area is located within Greater Lithgow LGA which is listed within Schedule 1 of State Environmental Planning Policy 44 (SEPP 44) – 'Koala Habitat Protection'. Therefore SEPP-44 applies to the land.

5.1.2 Second Consideration – is the Land 'Potential Koala Habitat'?

Schedule 2 of the State Environmental Planning Policy 44 (SEPP 44) – 'Koala Habitat Protection' lists 10 tree species that are considered indicators of 'Potential Koala Habitat'. The presence of any of the species listed on a site proposed for development triggers the requirement for an assessment for 'Potential Koala Habitat'. SEPP 44 defines potential Koala Habitat as:

> *"areas of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component".*

No Schedule 2 feed tree species were recorded within the Study Area, however one feed tree species, *Eucalyptus viminalis*, does occur sporadically across the vegetation communities located within the Study Area. This species is found at densities less than 15% of the total number of trees, therefore the Study Area and its surrounds do not constitute Potential Koala Habitat and no further provisions of this policy apply. Importantly, given the nature of the Project and limited impacts on vegetation and in turn habitat, it is considered unlikely that impacts to the Koala would result.

5.2 Considerations under the Environment Protection and Biodiversity Conservation Act 1999

Considerations have been made under the *EPBC Act 1999*. An EPBC Act Protected Matters Search was undertaken within the SEWPAC on-line database (accessed 22/3/2012) to generate a list of those Matters of National Environmental Significance (MNES) from within 10 km of the Study Area, which may have the potential to occur within the Study Area. This data, combined with other local knowledge and records, was utilised to assess whether the type of activity proposed within the Project Application Area will have, or is likely to have a significant impact upon any MNES, or on the environment of Commonwealth land.

Commonwealth Land

The land within the Study Area is not owned by the Commonwealth, and hence this portion of the Act is not applicable.

World Heritage Properties

The Study Area is not a World Heritage Property; however The Gardens of Stone National Park which forms part of the Greater Blue Mountains Area of NSW (a World Heritage Property) is located approximately 7 km to the north of the Study Area. It is expected that the Project will not have a significant impact upon The Greater Blue Mountains Area of NSW.

National Heritage Places

The Study Area is not a National Heritage Place; however The Greater Blue Mountains Area of NSW (a National Heritage Place) is located approximately 7 km to the north of the Study Area. It is expected that the Project will not have a significant impact upon The Greater Blue Mountains Area of NSW.

Wetlands protected by international treaty (the Ramsar convention)

There are no wetlands protected by international treaty (the Ramsar convention) arising from the EPBC Act Protected Matters Report generated for an area within 10 km of the Study Area.

Nationally listed threatened species and ecological communities

Thirty one threatened species and two Threatened Ecological Communities are considered to potentially occur (TEC) within 10 km of the Study Area (EPBC Protected Matters Search). However, Seven threatened fauna species and two threatened flora species (listed under the *EPBC Act 1999)* are considered to have potential to occur, or do occur, within the Study Area. (see Table 4-1 for likelihood of occurrence of threatened species listed under *EPBC Act 1999*).

The threatened flora and fauna listed under the EPBC Act with the potential to occur within the Study Area include:

Flora

- *Persoonia acerosa* (Needle Geebung)
- Persoonia marginata

Fauna

- Giant Burrowing Frog
- Southern Barred Frog, Stuttering Frog
- Regent Honeyeater
- Large-eared Pied Bat
- Spotted-tailed Quoll
- Brush-tailed Rock-wallaby
- Koala

The potential for impact upon the species listed above are assessed individually below in Section 6.

Nationally listed migratory species

A total of 15 migratory species listed under the *EPBC Act 1999* have been recorded or have suitable habitat within at least a 10 km radius of the Study Area. The Project is unlikely to substantially modify, destroy or isolate an area of important habitat, result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat or seriously disrupt the lifecycle of an ecologically significant proportion of the population of a migratory species.

All nuclear actions

No type of nuclear activity is proposed for the Study Area.

The environment of Commonwealth marine areas

No Commonwealth marine areas exist within or adjacent to the Study Area.

Summary Statement:

Based on the above, it is considered the current project is unlikely to result in significant impact on Matters of National Environmental Significance (MNES). It is therefore reasonable to conclude that this project would not result in a Controlled Action with SEWPAC.

No other considerations under the EPBC Act 1999 are deemed likely to have a significant impact on MNES.

6.0 Potential Impacts

6.1 Threatened Flora

A range of threatened flora species were detected or are expected to occur within the proximity of the Study Area. These include:

- Galium australe
- Persoonia acerosa
- Persoonia hindii
- Persoonia marginata

The potential for impact upon the species listed above are assessed individually below;

***Persoonia acerosa* (Needle Geebung)**

Persoonia acerosa is an erect shrub between 1 and 2 m with characteristic needle-like leaves that are deeply channelled above. It has been recorded in dry-sclerophyll forest, low scrubby-woodland and heath growing on low-fertility soils. This species prefers open habitat with lower competition and increased light, hence its presence in roadside habitats. It occurs on the Central Coast and in the Blue Mountains largely in the Katoomba, Wentworth Falls and Springwood areas, but once occurred as far north as Mount Tomah where it is now considered to be absent.

P. acerosa was not detected during field surveys yet this species has suitable habitat on site and has the potential to occur on site within the Study Area on the ridge line habitat. However, this species is not cryptic and therefore is likely to have been detected during field surveys. Therefore, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Persoonia hindii

Persoonia hindii was detected during the current field surveys. During the current field survey for bore 8, 1,649 individual plants were recorded in the vicinity of the Study Area.

A total of approximately 93 *P. hindii* individuals are expected to be removed across the Project Application Area for the access road construction for Bore 8. A total of 4 ha of suitable habitat will be removed across the Project Application area, however 2.34 ha of the vegetation clearing will be rehabilitated after the initial construction phase.

For context purposes, RPS is aware that approximately 10,600 individual plants have been recorded approximately 500 m from the Study Area (adjacent to Sunnyside Ridge Road) by RPS for another project in 2012. This translates to up to 25,000 hectares of habitat across the Newnes Plateau.

Due to the presence of over 12,000 individual *P. hindii* plants within 2.8 km of the current Project, the removal of 93 plants (or less than 0.8% of the local population) is not expected to result in a significant impact on the future viability of *P. hindii* in the local area. Therefore, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Persoonia marginata

Persoonia marginata is found on the Central Tablelands and South Coast of NSW, including in the Ben Bullen State Forest. Its preferred habitat is dry sclerophyll forest. This species has been recorded within 10 km of the Study Area (Wildlife Atlas, 2012). Although *P. marginata* was not detected during field surveys this species has suitable habitat on site and has the potential to occur on site and be affected by the Project. However, this species is not cryptic and therefore is likely to have been detected during field surveys. Given that *P. marginata* is not a cryptic species and should have been distinctive and apparent at the time of surveys. Therefore, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Galium australe

A known population occurs within Bird's Rock Flora Reserve on the Newnes Plateau. RPS targeted flora surveys detected what was thought to be this species at two locations within the Subsidence Assessment Area. This was done by targeting the known record (NSW Atlas Data Base) within close proximity to the site (approximately 2km north of bore 8) after visiting that known site an additional record was recorded within 200m of the Atlas record. However, plant specimens were taken and sent off to the Royal Botanic Gardens for identification and this resulted in identification of a very similar species namely *Galium leiocarpum* syn. *G. propinquum* (refer to Appendix 4 for the identification letter) Both records occurred approximately 200m apart within MU7 Newnes Plateau Narrow-leaved Peppermint – Mountain Gum – Brown Stringybark Layered Forest. Whilst there was a potential for *G. australe* to occur within the Study Area, it was not detected during targeted surveys.

Given the precautionary approach it can be assumed that the Atlas record was correct and based on this assumption it can still be stated that no potential specimens of *G. australe* exist within the Study Area. Therefore, it is unlikely that they will be subject to any direct or indirect effects as a result of the surface works. Furthermore, extensive suitable habitat occurs in the surrounding area. Therefore, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

6.2 Potential Impacts to Temperate Highland Peat Swamps on Sandstone (THPSS)

Vegetation mapping over the Study Area (DEC 2006) has identified several patches of Newnes Plateau Shrub Swamp (MU 50) and Newnes Plateau Hanging Swamp (MU 51) approximately 100 – 300m away from the Project Application Area. These communities correspond to the Temperate Highland Peat Swamps on Sandstone (THPSS) vegetation community which is listed as a TEC within the EPBC Act 1999.

The distances between the small-scale clearing activities proposed for this Project and THPSS in the vicinity are deemed adequate to prevent impacts occurring in these areas. Provided that adequate erosion and sedimentation controls developed for this Project (GSSE, 2012) are adhered to, there is unlikely to be any impact on these areas as a result of the Project.

The following general recommendations should be implemented to ensure that no detrimental impacts occur to the THPSS:

- Clearing should be maintained to an absolute minimal area fit for the project purpose;
- The detailed Sediment and Erosion Control Plan (GSSE, 2012) should be effectively implemented to

ensure that no erosion and / or sediment liberation occurs as a result of the proposed construction;

- An environmental induction to construction staff should occur by an environmental officer or ecologist prior to works commencing.

Furthermore, ongoing monitoring should be carried out so that where the potential for impacts are identified, measures may be adopted to mitigate and minimise these impacts. This is in the overall interests of the protection and understanding of these species and their habitats.

6.3 Threatened fauna

A range of threatened fauna were detected or are expected to occur within the proximity of the Study Area. These include:

- Giant Burrowing Frog
- Southern Barred Frog, Stuttering Frog
- Regent Honeyeater
- Gang Gang Cockatoo
- Brown Treecreeper
- Varied Sittella
- Little Eagle
- Little Lorikeet
- Powerful Owl
- Scarlet Robin
- Flame Robin
- Masked Owl
- Sooty Owl
- Koala
- Eastern Pygmy Possum
- Large Eared Pied Bat
- Spotted -tailed Quoll
- Eastern False Pipistrelle
- Eastern Bent Wing Bat
- Yellow Bellied Glider
- Squirrel Glider
- Yellow Bellied Sheathtail Bat
- Greater Broad Nosed Bat

The potential for impact upon the species listed above are assessed individually below;

Giant Burrowing Frog (*Heleioporus australiacus)*

The current distribution of *H. australiacus* is south-eastern NSW to Vic. Locally it occurs north to Jervis Bay (Daly 1996), and is mostly restricted to sandy creek banks, often in association with crayfish burrows in this area (Robinson 1996). The northern population has a marked preference for sandstone ridge-top habitat and broader upland valleys. In these locations the frog is associated with small headwater creek lines and along slow flowing to intermittent creek-lines. *H. australiacus* is grey to dark chocolate brown or black above with a white belly, a few yellow spots along the flanks. During the summer, males call like an owl hoot, from burrows within creek banks. Females lay eggs in a foamy nest in the burrow, and the developing tadpoles are washed from the burrows into the creeks during heavy rain.

This species was not detected during targeted field surveys, however it has been recorded twice within the vicinity of the Study Area during monitoring surveys in recent years, including a site near Angus Place Longwall 900W at Kangaroo Creek (Denny 2011). Additional scattered records occur throughout the Blue Mountains National Park. Woodland habitat within the Study Area may provide suitable substrates for the burrowing habits of this species; however, the stream characteristics (running water) are not suited to the breeding requirements of this species. However its occurrence within the Study Area cannot be entirely discounted at non breeding times, thus this species could potentially occur within the Study Area.

Giant Burrowing Frog may occur within the Study Area in non breeding habitat. However, the Project is unlikely to have a direct or indirect impact upon a significant amount of habitat provided adequate sediment control measures (as developed by GSSE (2012)) are implemented and maintained. Consequently, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Southern Barred Frog (*Mixophyes balbus)*

Southern Barred Frog is found in rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range. Breeds in streams during summer after heavy rain, outside the breeding season adults live in deep leaf litter and thick understorey vegetation on the forest floor. Eggs are laid on rock shelves or shallow riffles in small, flowing streams.

Southern Barred Frog may occur within the Study Area in non breeding habitat. However, the Project is unlikely to have a direct or indirect impact upon a significant amount of habitat provided adequate sediment control measures (developed by GSSE (2012)) are implemented and maintained. Consequently, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Regent Honeyeater *(Anthochaera Phrygia*)

Regent Honeyeaters occur in temperate woodlands and open forest, including forest edges. Seasonal movements appear to be dictated by the flowering of various species of Eucalyptus sp. that are characteristic of the dry forests and woodlands of South-Eastern Australia. The Regent Honeyeater prefers to forage on large-flowered Eucalypts. They also forage on mistletoe and Banksia flowers, and arthropods. Nesting occurs mainly between November and January, but breeding has been recorded in all months between July and February.

This species was not detected during targeted field surveys. Well known as occurring in the Capertee area, individuals are recorded in more easterly habitat, particularly in areas characterised by winter flowering Eucalyptus ssp. when westerly habitats are experiencing extended dry periods. As such this species may occur in Newnes Plateau forests on an intermittent basis. Given this a precautionary approach can be taken and presence is assumed to be within the Study Area. However, the proposed direct surface impacts associated with the Project Application Area are relatively small (4 ha), narrow and linear in nature, whilst 2.34 ha of the vegetation clearing will be rehabilitated after the initial construction phase and will therefore only be a temporary impact. In addition, there is larger areas of more suitable habitat nearby (Newnes Plateau is ~25,000 hectares) and the proposal is unlikely to affect a significant area of potential habitat. Therefore, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Gang-Gang Cockatoo (*Callocephalon fimbriatum*)

Gang-Gang Cockatoos are found in the summer months in tall mountain forests and woodlands, and mature wet sclerophyll forests. In winter, they may occur at lower altitudes in drier more open Eucalypt forests and woodlands, and often found in urban areas in some districts.

The species was recorded within approximately 1km of the Study Area. Although foraging habitat occurs widely within the Study Area and the wider locality, the Study Area provides limited breeding opportunities due to the relatively low density of large breeding hollows suited to this species for breeding purposes. Given this a precautionary approach can be taken and presence is assumed to be within the Study Area. However, the proposed direct surface impacts associated with the Project Application Area are relatively small (4 ha), narrow and linear in nature, whilst 2.34 ha of the vegetation clearing will be rehabilitated after the initial construction phase and will therefore only be a temporary impact. In addition, there is larger areas of more suitable habitat nearby (Newnes Plateau is ~25,000 hectares) and the proposal is unlikely to affect a significant area of potential habitat. Therefore, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Brown Treecreeper *(Climacteris picumnus victoriae)*

The Brown Treecreeper frequents drier forests and woodlands, particularly open woodland lacking a dense understorey. Also found in grasslands in proximity to wooded areas where there are sufficient logs, stumps and dead trees nearby. The species feeds on invertebrate larvae and small insects, particularly ants, and utilises hollows for roosting/nesting. The Brown Treecreeper appears not to persist in remnants less than 200ha.

A number of records exist on the Newnes Plateau to the northwest of the Study Area (Atlas of NSW Wildlife Data 2012). This species was not detected during targeted field surveys. However, there are a large number of records of the species within the area and potential habitat occurs within the Study Area. Therefore, this species has potential to occur within the Study Area. Given this a precautionary approach can be taken and presence is assumed to be within the Study Area. However, the proposed direct surface impacts associated with the Project Application Area are relatively small (4 ha), narrow and linear in nature, whilst 2.34 ha of the vegetation clearing will be rehabilitated after the initial construction phase and will therefore only be a temporary impact. In addition, there is larger areas of more suitable habitat nearby (Newnes Plateau is ~25,000 hectares) and the proposal is unlikely to affect a significant area of potential habitat. Therefore, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Varied Sittella *(Daphoenositta chrysoptera)*

The Varied Sittella is a canopy species occurring across a wide variety of wooded habitats including wet and dry forests / woodlands and in some areas, tall heathlands. It forages for a range of invertebrate prey and differs from Treecreeper species in foraging in both up and down orientations on trunks and branches. The species occurs widely across mainland Australia in suitable habitat.

This species has previously been recorded within 10km of the Study Area by RPS staff during 2010. A precautionary approach can therefore be taken and presence is assumed to be within the Study Area. However, the proposed direct surface impacts associated with the Project Application Area are relatively small (4 ha), narrow and linear in nature, whilst 2.34 ha of the vegetation clearing will be rehabilitated after the initial construction phase and will therefore only be a temporary impact. In addition, there is larger areas of more suitable habitat nearby (Newnes Plateau is ~25,000 hectares) and the proposal is unlikely to affect a significant area of potential habitat. Therefore, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Little Lorikeet (*Glossopsitta pusilla)*

Glossopsitta pusilla extends from Cairns to Adelaide coastally and to inland locations. Commonly found in dry, open eucalypt forests and woodlands, yet can be found in roadside vegetation to woodland remnants. *G. pusilla* feeds on abundant flowering Eucalypts, but will also take nectar from *Melaleuca* sp and species of Mistletoe. *Eucalyptus albens* (White Box) and *E. melliodora* (Yellow Box) are favoured food sources on the western slopes in NSW. On the eastern slopes and coastal areas favoured food sources are *Corymbia maculata* (Spotted Gum), *E. fibrosa* (Broad-leaved Ironbark), *E. robusta* (Swamp Mahogany) and *E. pilularis* (Blackbutt). Nesting takes place in hollow bearing trees.

This species was not detected during targeted field surveys. A wide ranging species in wooded areas across eastern Australia due to its nectivorous habits, this species may use surrounding forests and woodlands for foraging purposes on at least a seasonal basis. Therefore, this species could potentially occur within the Study Area. Given this a precautionary approach can be taken and presence is assumed to be within the Study Area. However, the proposed direct surface impacts associated with the Project Application Area are relatively small (4 ha), narrow and linear in nature, whilst 2.34 ha of the vegetation clearing will be rehabilitated after the initial construction phase and will therefore only be a temporary impact. In addition, there is larger areas of more suitable habitat nearby (Newnes Plateau is ~25,000 hectares) and the proposal is unlikely to affect a significant area of potential habitat. Therefore, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Powerful Owl (Ninox strenua)

This species occurs in coastal and adjacent ranges of eastern Australia in sclerophyll forests and woodlands where suitable prey species occur (being predominantly arboreal mammals such gliders and flying foxes, but also preys on birds). The Powerful Owl requires large and specific hollow characteristics for nesting. Pairs appear to mate for life and occupy exclusive territories in the order of 1000 ha in size.

This species was not recorded within the Study Area during fieldwork, however it has been recorded within 10km of the Study Area during RPS surveys in 2012. It is therefore likely that the Study Area occurs within the foraging range and perhaps the breeding territory of locally occurring Powerful Owl individuals. Therefore, this species could potentially occur within the Study Area. Despite this, due to the long history of logging practices within the Study area, the general paucity of large hollows places limitations on breeding opportunities within the Study Area. A precautionary approach can be taken and presence is assumed to be within the Study Area. However, the proposed direct surface impacts associated with the Project Application Area are relatively small (4 ha), narrow and linear in nature, whilst 2.34 ha of the vegetation clearing will be rehabilitated after the initial construction phase and will therefore only be a temporary impact. In addition, there is larger areas of more suitable habitat (with higher densities of hollow bearing trees for breeding) nearby (Newnes Plateau is ~25,000 hectares) and the proposal is unlikely to affect a significant area of potential habitat. Therefore, it is considered that the proposed development is unlikely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Scarlet Robin (*Petroica boodang*)

Scarlet Robins are a woodland and open forest species, which forages in the mid to lower stories on a variety of invertebrate prey. Generally an altitudinal migrant the Scarlet Robin spends the warmer months in the ranges and winters in lowland dry open forests and woodland. Scarlet Robins have a patchy distribution in eastern Australia across wooded habitats.

The species was recorded within the Study Area. However, the proposed direct surface impacts associated with the Project Application Area are relatively small (4 ha), narrow and linear in nature, whilst 2.34 ha of the vegetation clearing will be rehabilitated after the initial construction phase and will therefore only be a temporary impact. In addition, there is larger areas of more suitable habitat nearby (Newnes Plateau is ~25,000 hectares) and the proposal is unlikely to affect a significant area of potential habitat. Therefore, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Flame Robin (Petroica phoenicea)

Flame Robins are a woodland and open forest species, which prefers the wooded edges of open areas and forages in the lower storey on a variety of invertebrate prey. Generally an altitudinal migrant, the Flame Robin, like a number of other robin species spends the warmer months in the ranges and winters in more lowland open country and woodlands. This species is usually encountered in high altitudinal areas including above snowline habitat in some regions.

This species was located within 1km of the Study Area during previous RPS surveys and is therefore considered likely to utilise the Study Area as part of its foraging and/or breeding habitat. However, the proposed direct surface impacts associated with the Project Application Area are relatively small (4 ha), narrow and linear in nature, whilst 2.34 ha of the vegetation clearing will be rehabilitated after the initial construction phase and will therefore only be a temporary impact. In addition, there is larger areas of more suitable habitat nearby (Newnes Plateau is ~25,000 hectares) and the proposal is unlikely to affect a significant area of potential habitat. Therefore, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Masked Owl (Tyto novae-hollandiae)

This species is found in a range of habitats but is more commonly found in dry eucalypt forests and woodlands This forest owl often hunts on forest edges and roadsides but requires large eucalypt hollows for nesting, with these hollows also being preferred for roosting sites. Breeding has also been recorded in caves.

This species was recorded within the Study Area during fieldwork by RPS (2012). It is likely that the Study Area is utilised as a foraging range and perhaps the breeding territory of locally occurring individuals. Although this species occurs within the Study Area, due to the long history of logging practices within the Study area the general paucity of large hollows places limitations on breeding opportunities within the Study Area. In addition, the proposed direct surface impacts associated with the Project Application Area are relatively small (4 ha), narrow and linear in nature, whilst 2.34 ha of the vegetation clearing will be rehabilitated after the initial construction phase and will therefore only be a temporary impact. Given that there are larger areas of more suitable habitat (with higher densities of hollow bearing trees for breeding) nearby (Newnes Plateau is ~25,000 hectares), the proposal is unlikely to affect a significant area of potential habitat. Therefore, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Sooty Owl (*Tyto tenebricosa)*

Sooty Owls occur in tall, moist eucalypt forests and rainforests of the escarpment, eastern tablelands and coastal areas of NSW. They are found in areas of steep and/or undulating topography however, they are strongly associated with sheltered gullies with a typically tall, rainforest understory.

This species was recorded within 10km of the Study Area by RPS during fieldwork in 2012. It is therefore likely that the Study Area occurs within foraging and potentially breeding territory of locally occurring Sooty Owl individuals. Therefore, this species could potentially occur within the Study Area. Despite this, due to the long history of logging practices within the Study area the general paucity of large hollows places limitations on breeding opportunities within the Study Area. In addition, the proposed direct surface impacts associated with the Project Application Area are relatively small (4 ha), narrow and linear in nature, whilst 2.34 ha of the vegetation clearing will be rehabilitated after the initial construction phase and will therefore only be a temporary impact. Given that there are larger areas of more suitable habitat (with higher densities of hollow bearing trees for breeding) nearby (Newnes Plateau is ~25,000 hectares), the proposal is unlikely to affect a significant area of potential habitat. Therefore, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Little Eagle (*Heiraaetus morphonoides*)

The Little Eagle is found throughout the Australian mainland except in the most densely forested parts of the Dividing Range escarpment. It occurs as a single population throughout NSW, Occupying open eucalypt forest, woodland or open woodland. Sheoak or acacia woodlands and riparian woodlands of interior NSW are also utilised. The species nests in tall living trees within a remnant patch where pairs build a large stick nest in winter. It preys on birds, reptiles and mammals, occasionally adding large insects and carrion (DECCW 2010).

This species was not recorded within the Study Area during fieldwork yet is known to occur in open eucalypt forest and has been previously recorded from the Newnes Plateau. Given that the proposed direct surface impacts associated with the Project Application Area are relatively small (4 ha), narrow and linear in nature and there is larger areas of more suitable habitat nearby (Newnes Plateau is ~25,000 hectares), the proposal is unlikely to affect a significant area of potential habitat. Therefore, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Koala (Phascolarctos cinereus)

Koalas occur throughout Eastern Australia, including Queensland, New South Wales, Victoria and South Australia in more productive forests and woodlands where they require suitable feed trees (particular Eucalyptus spp.) and habitat linkages. Populations are impacted upon by collisions, dog attacks, fires, habitat destruction and disease. There is a north-south range retraction with significant declines occurring in New South Wales and Queensland, however southern populations are more stable. This species has been recorded on one occasion on the Newnes Plateau.

Schedule 2 of the State Environmental Planning Policy 44 (SEPP 44) – 'Koala Habitat Protection' lists 10 tree species that are considered indicators of 'Potential Koala Habitat'. The presence of any of the species listed on a site proposed for development triggers the requirement for an assessment for 'Potential Koala Habitat'. SEPP 44 defines potential Koala Habitat as:

> *"areas of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component".*

One Schedule 2 feed tree species (Eucalyptus viminalis) was recorded within the Study Area at densities of less than 15% of the total number of trees, therefore the Study Area does not constitute Potential Koala Habitat and no further provisions of this policy apply. Importantly given the nature of the proposal and likelihood of impacts on vegetation and in turn habitat, it is considered unlikely that impacts to the Koala would result.

Although Koalas have potential to occur within the Study Area they were not detected during field work. The proposed Project Application Area (direct surface impacts) is narrow and linear in nature. In addition, there are larger areas of preferred habitat nearby (Newnes Plateau is ~25,000 hectares) and the proposal is unlikely to affect a significant area of suitable habitat. Therefore, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Eastern Pygmy Possum (Cercartetus nanus)

Eastern Pygmy Possums occur from rainforest through sclerophyll forest to tree heath. Favoured food for the species includes banksias, myrtaceous shrubs and trees, and insects. Nesting sites are generally in drier habitats (Strahan, 1995a) Records exist from the Newnes Plateau (Atlas of NSW Wildlife data).

This species was not recorded within the Study Area during fieldwork. However, this species has been recorded within close proximity to the Study Area (approximately 1.5km) by RPS (2012). Therefore, this species could potentially occur within the Study Area. Given this, a precautionary approach can be taken and presence is assumed to be within the Study Area. However, the proposed direct surface impacts associated with the Project Application Area are relatively small (4 ha), narrow and linear in nature and the proposal is unlikely to affect a significant area of potential habitat. Therefore, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Large-eared Pied Bat (*Chalinolobus dwyeri*)

This species is likely to occur and has been recorded near Carne West Swamp by Biodiversity Monitoring Services during seasonal monitoring and by RPS (2010). *C. dwyeri* is found in well-timbered areas containing gullies and possess relatively short, broad wings that indicate manoeuvrable flight. This species probably forages for small, flying insects below the forest canopy and would be wide-ranging throughout the Newnes Plateau. Ongoing monitoring of the woodland habitat preferred by the Large-eared Pied Bat within previously extracted areas has shown that it is not affected by subsidence from the Angus Place Mine.

Given that the species was previously recorded within 10km of the Study Area, there is potential for the Large-eared Pied Bat to utilise the Study Area as breeding and/or foraging habitat. However, the proposed direct surface impacts associated with the Project Application Area are relatively small (4 ha), narrow and linear in nature, whilst 2.34 ha of the vegetation clearing will be rehabilitated after the initial construction phase and will therefore only be a temporary impact. In addition, there are larger areas of suitable habitat nearby (Newnes Plateau is ~25,000 hectares) and the proposal is unlikely to affect a significant area of suitable roosting or feeding habitat. Therefore, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Spotted-tailed Quoll (*Dasyurus maculatus*)

Found in a variety of forested habitats from sclerophyll forests to rainforests and coastal woodlands. This species creates a den in fallen hollow logs or among rocky outcrops and generally does not occur in otherwise suitable habitats that are in close proximity to urban development. A number of records occur across the Newnes Plateau, however no records exist for within 10km of the Study Area (Atlas of NSW Wildlife data). It is an opportunistic hunter of a variety of prey.

This species was not recorded within the Study Area during fieldwork. However, this species has been recorded within the Newnes Plateau and suitable habitat occurs within the Study Area. Therefore, Spotted-tailed Quolls may occur within the Study Area. However, the proposed direct surface impacts associated with the Project Application Area are relatively small (4 ha), narrow and linear in nature, whilst 2.34 ha of the vegetation clearing will be rehabilitated after the initial construction phase and will therefore only be a temporary impact. In addition, there are larger areas of suitable habitat nearby (Newnes Plateau is ~25,000 hectares) and the proposal is unlikely to affect a significant area of suitable habitat. Therefore, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Eastern False Pipistrelle (Falsistrellus tasmaniensis)

This species is found in a variety of forest types such as open forests, woodlands and wetter sclerophyll forests (usually with trees >20m). This species roosts in tree hollows and hunts beetles, moths, weevils and other flying insects below or just above the canopy.

This species was recorded within 10km of the Study Area by RPS staff (2010). Suitable habitat for this species exists within the Study Area, therefore this species is likely to occur within the Study Area. However, the proposed direct surface impacts associated with the Project Application Area are relatively small (4 ha), narrow and linear in nature, whilst 2.34 ha of the vegetation clearing will be rehabilitated after the initial construction phase and will therefore only be a temporary impact. In addition, there are larger areas of suitable habitat nearby (Newnes Plateau is ~25,000 hectares) and the proposal is unlikely to affect a significant area of suitable habitat. It is subsequently considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Eastern Bentwing Bat (Miniopterus schreibersii subsp. oceanensis)

Eastern Bentwing Bats prefer to forage in well-vegetated areas, such as within wet and dry sclerophyll forests and rainforests and also dense coastal Banksia scrub. This species require caves or similar structures for roosting habitat, although they occasionally roost in tree hollows. They are largely confined to more coastal areas, often found roosting with Miniopterus schreibersii (Eastern Bentwing-bat).

This species was not recorded within the Study Area during fieldwork, although potential foraging and roosting habitat are widespread within the locality. Also due to its mobility, it has the potential to occur within the Study Area on at least an intermittent basis. Although this species has potential to occur within the study area it has a low likelihood of roosting within the Study Area because of a lack of cave structures and would have more suitable habitat within the surrounding areas. In Addition, the proposed direct surface impacts associated with the Project Application Area are relatively small (4 ha), narrow and linear in nature, whilst 2.34 ha of the vegetation clearing will be rehabilitated after the initial construction phase and will therefore only be a temporary impact. Therefore, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Yellow-bellied Glider (Petaurus australis)

Yellow-bellied Gliders are usually associated with tall, mature wet Eucalypt forest usually with high rainfall and nutrient rich soils. Yellow-bellied Gliders are also known from tall dry open forest and mature woodland. In the north of NSW they favour mixed coastal forests to dry escarpment forests and in the south they prefer moist coastal gullies to creek flats and tall montane forests. The diverse diet of this species is primarily made up of Eucalypt nectar, sap, honeydew, manna and invertebrates found under decorticating bark and pollen. Tree hollows for nest sites are essential, as are suitable food trees in close proximity.

This species was not recorded within the Study Area during fieldwork. There are few records for this species in the wider locality. Chance of occurrence is low, but cannot be entirely discounted. Therefore, this species could potentially occur within the Study Area. However, due to the long history of logging practices within the Study Area the general paucity of tree hollows places limitations on availability of suitable nest sites within the Study Area. In Addition, the proposed direct surface impacts associated with the Project Application Area are relatively small (4 ha), narrow and linear in nature, whilst 2.34 ha of the vegetation clearing will be rehabilitated after the initial construction phase and will therefore only be a temporary impact. Therefore, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Squirrel Glider (Petaurus norfolcensis)

Squirrel Gliders occur in eucalypt forests and woodlands where it feeds on sap exudates and blossoms. In these areas tree hollows are utilised for nesting sites. Also requires winter foraging resources when the availability of normal food resources may be limited, such as winter-flowering shrub and small tree species.

Although suitable habitat for this species occurs within the Study Area, it or its close relative the Sugar Glider were not observed during nocturnal spotlighting surveys or arboreal trapping. As suitable habitat occurs within the Study Area, it has the potential to occur within the Study Area, however the proposed direct surface impacts associated with the Project Application Area are relatively small (4 ha), narrow and linear in nature, whilst 2.34 ha of the vegetation clearing will be rehabilitated after the initial construction phase and will therefore only be a temporary impact. In addition, there are larger areas of suitable habitat nearby (Newnes Plateau is ~25,000 hectares) and the proposal is unlikely to affect a significant area of suitable habitat. Therefore, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Yellow-bellied Sheathtail-bat (Saccolaimus flaviventris)

Yellow-bellied Sheathtail-bats inhabit a range of habitats from rainforest to arid shrubland. They roost in tree-hollows and sometimes roost in mammal burrows when no hollows are available. Seasonal movements are unknown and they may migrate to southern Australia in summer. Yellow-bellied Sheathtail-bats feed by foraging for insects over the canopy, but fly low in arid shrubland.

This species was recorded within 2km of the Study Area during fieldwork (RPS 2010, RPS 2012), and potential foraging and roosting habitat are widespread within the locality. However, the proposed direct surface impacts associated with the Project Application Area are relatively small (4 ha), narrow and linear in nature, whilst 2.34 ha of the vegetation clearing will be rehabilitated after the initial construction phase and will therefore only be a temporary impact. In addition, there are larger areas of suitable roosting habitat nearby (Newnes Plateau is ~25,000 hectares) and the proposal is unlikely to affect a significant area of suitable roosting and foraging habitat. Therefore, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Greater Broad-nosed Bat (Scoteanax rueppellii)

Greater Broad-nosed Bats forage in moister gullies and wet sclerophyll forests as well as in lightly wooded areas and open spaces/ ecotones, most commonly found in tall wet forest. Open woodland and dry open forest habitat suits the direct flight of this species as it searches for beetles and other larvae. This species roosts in tree hollows, although has been recorded in buildings.

This species was not recorded within the Study Area during fieldwork, although potential foraging and roosting habitat are widespread within the locality. Given its mobility it has the potential to occur within the Study Area on at least an intermittent basis. However, the proposed direct surface impacts associated with the Project Application Area are relatively small (4 ha), narrow and linear in nature, whilst 2.34 ha of the vegetation clearing will be rehabilitated after the initial construction phase and will therefore only be a temporary impact. In addition, there are larger areas of suitable habitat nearby (Newnes Plateau is ~25,000 hectares) and the proposal is unlikely to affect a significant area of suitable roosting and foraging habitat. Therefore, it is considered that the proposed development is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

6.4 Groundwater Dependent Ecosystems (GDEs)

The NSW Groundwater Dependent Ecosystem (GDE) Policy (DLWC 2002) is part of a coordinated strategy at Commonwealth, State and local levels and is specifically designed to protect ecosystems which rely on groundwater for their survival, so that wherever possible the ecological processes and biodiversity of these dependent ecosystems are maintained or restored. The policy provides guidance on how to protect and manage these valuable natural systems in a practical sense. The range of tools includes a rapid assessment process that provides information on the type and susceptibility of the GDE being assessed. This assessment also provides information on the strengths, weaknesses and opportunities for preserving and managing GDEs.

Map Units 50 - Newnes Plateau Shrub Swamp (NPSS) and 51 - –Newnes Plateau Hanging Swamp (NPHS; which do notoccur within the Study Area) are vegetation communities classified as GDEs as they are at least partially dependent on the groundwater sourced from the locally occurring bedding planes with permeable and impermeable layers.

A rapid assessment of the GDEs known in the local area in accordance with the NSW Groundwater Dependent Ecosystem Policy is as follows:

6.4.1 Geographical Area

The NPSS and NPHS vegetation communities occur within the Newnes Plateau and associated drainage lines to the north-east of Lithgow in NSW.

6.4.2 Types of GDEs Present

The GDEs within the locality of the Study Area were assessed in detail by Connell Wagner (2005 in Centennial Angus Place Pty Ltd 2005) of the Subsidence Management Plan (SMP) produced by Centennial Angus Place Pty Ltd (2005). The following is an extract from Connell Wagner (2005 in Centennial Angus Place Pty Ltd 2005):

“Generally, shrub swamps have developed in the application area at altitudes in excess of 1100 metres, in valleys underlain by Narrabeen Group strata. The swamps develop in areas which are subject to a constant supply of water - both groundwater and surface runoff.

The groundwater source is initiated when rainfall infiltrates the sandy soils and the sandstone on the adjacent ridges. At relatively shallow depths in the sandstone is a thin layer of claystone, or tightly cemented sandstone which is impervious to vertical groundwater percolation and forms an aquitard. The groundwater, when it meets this impermeable barrier, travels laterally until it reaches the edge of the impervious layer, which has been exposed by geological erosion in an adjacent valley. In conjunction with rainfall runoff, this produces a condition of constant moisture, which has allowed a range of plant species to gradually colonise these sites over long periods of time, forming a rare plant community.

The constant saturation of the valley floor creates anaerobic (oxygen starved) conditions in the soil, which inhibit the microbial breakdown and decomposition of dead plant material. This organic matter accumulates in a partly decomposed state as peat. Peat has an extraordinary ability to absorb water, and so the swamp soil acts as a sponge, retaining much rainwater for later slow release. The peat is generally mixed with sand derived from the weathering of the soft sandstone on the ridges, which is washed into the valley by rainfall run-off.

Since the shrub swamps are supplied by two water sources (rainfall runoff and groundwater), and they store large quantities of water, they are resistant to some extent to natural variations in flow from either of the water sources (eg drought conditions will reduce runoff). In general, rainfall runoff provides the greatest water volume to the swamps. Normally, between 20% and 30% of the total rainfall in the area runs off the ground surface and into the swamps. When this occurs, any voids in the dry peat at the surface soak up the water, and any excess runoff flows down the creek channel and into the Wolgan River.

In contrast, less than 5% of rainfall infiltrates the ground surface and enters the groundwater system. Most of this water then enters the swamp by seepage at the margins, although a small proportion leaks through the aquitard and into the underlying strata. Unlike rainfall, the seepage is continuous, and is proportional to the hydraulic head in the aquifer beneath the flanking ridges. During droughts, the seepage from the aquifer keeps the swamp supplied with groundwater, albeit at a reduced rate, so that under normal climatic conditions, the plants are continuously supplied with water.”

The NPSS and NPHS vegetation communities are classified as ‘Wetlands’ according to the criteria in Section 2.3 of the NSW Groundwater Dependent Ecosystem Policy (DLWC 2002).

The type of groundwater system is classified as a Sedimentary Rock Aquifer according to Section 2.4 of the NSW Groundwater Dependent Ecosystem Policy (DLWC 2002).

6.4.3 Vulnerability of the GDEs

The NPSS and NPHS GDEs are highly dependent on the continuous flow of groundwater into the swamps. The swamps themselves are situated on deep beds of peat which absorb and hold large quantities of water which is slowly released over time to the lower catchment. These GDEs are reliant on the groundwater infiltration to a greater extent than overland flow resulting from rainfall events. The recharging and holding of large amounts of water by the surrounding geology as well as the peat within the swamps and the subsequent very slow release of the water by the geology and swamp ensure that a constant flow of water is permeating the area.

6.4.4 Assess the value of the GDEs

The NPSS and NPHS vegetation communities are very valuable from several viewpoints:

- These vegetation communities provide the only known habitat for the Blue Mountains Water Skink (*Eulamprus leuraensis*) which is listed as an endangered species under the NSW *TSC Act 1995* and as an endangered species under the Commonwealth *EPBC Act 1999*.
- These vegetation communities provide high value habitat or resources for a number of flora and fauna species and provide a refuge during times of drought due to the water holding capacity of the underlying peat.
- The NPSS and NPHS vegetation communities act as repositories for nutrients by absorbing them and converting them into vegetation or otherwise locking or trapping these nutrients within the natural processes within the swamps.
- The swamp communities act as large filters by removing nutrients and minerals from the water.
- The swamp communities have a high aesthetic value.

6.4.5 List management tools for protecting and managing GDEs

Management tools for GDEs within the Newnes Plateau area are generally those of retention, buffering and monitoring within the Newnes State Forest. These strategies are utilised by Forests NSW in addition to several underground mining companies within the area. NPSS and NPHS have a high priority with respect to conservation and every effort to avoid significant impacts of any type are taken by these industries. Threats to these communities include: mining for coal leading to changes to the hydrology of catchments and the associated swamps and severe and rapid erosion, roadworks, quarrying and periodic timber harvesting from adjacent plantations all leading to incremental clearing, fragmentation, erosion and sedimentation, invasion of exotic species, including species of *Pinus*, and changes to fire regimes.

Forests NSW have standard operating procedures for selective logging which include buffers located around any steep slopes and also creeklines. These buffers are not logged and are left in their natural state to control erosion and avoid any impacts such as sedimentation of creeklines. In addition the practice of selective logging ensures that areas of vegetation are not clear-felled which contributes to negative impacts on creeklines and associated swamps.

Centennial Springvale Pty Ltd has a comprehensive water table monitoring program in place as well as regular monitoring of flora and fauna within its lease area. This enables collection of a large amount of data that is collated, analysed and presented within an annual monitoring report.

6.4.6 Prioritise Management Actions

Management actions such as the retention and buffering around the swamp vegetation communities within the Newnes State Forest will retain these communities in an as near natural state as possible. Regular monitoring provides comprehensive data for use in determining if any changes are taking place. These management actions are at present the least invasive or damaging and are also the most cost effective. If any change is detected within the environment of the swamp vegetation communities then active remedial action is an option, however, it is expected that this will be costly and will require very strict procedures and monitoring to achieve. Presently the status of the NPSS and NPHS communities has been maintained within expected annual and longer term climatic changes (such as the recent drought).

6.4.7 Implement Management Actions

All management actions that are conceivably possible are presently being enacted. This comprises of retention, monitoring, research and planning for minor impacts as a result of the Project.

Pro-active management such as water allocations, water rights and the like do not apply to these GDEs as there is no water extraction proposed for the swamps or the associated groundwater flows.

6.4.8 Review of management actions

It is essential to review management actions to assess their effectiveness. Changes may need to be reflected in management actions to bring about greater resource protection. Reviews should be undertaken at regular intervals of 2 years or at the most every 5 years. This review should consider the extent to which the management actions were implemented and whether they have succeeded in achieving their goals.

7.0 Part 3A Key Thresholds Assessment

As required by the Draft Guidelines for Threatened Species Assessment for Part 3A Applications (DEC / DPI 2005), the following assessment of Key Thresholds is provided for the Project.

The following threatened flora may occur within the vicinity of the Study Area:

- Persoonia hindii
- Galium australe
- Persoonia acerosa

The following threatened fauna may occur in the vicinity of the Study Area:

- Giant Burrowing Frog
- Stuttering Frog
- Regent Honeyeater
- Gang Gang Cockatoo
- Brown Treecreeper
- Varied Sittella
- Little Eagle
- Little Lorikeet
- Powerful Owl
- Scarlet Robin
- Flame Robin
- Masked Owl
- Sooty Owl
- Koala
- Eastern Pygmy Possum
- Large Eared Pied Bat
- Spotted Tail Quoll
- Eastern False Pipistrelle
- Eastern Bent Wing Bat
- Yellow Bellied Glider
- Squirrel Glider
- Yellow Bellied Sheathtail Bat
- Greater Broad Nosed Bat

Whether or not the Proposal, including actions to avoid or mitigate impacts or compensate to prevent unavoidable impacts will maintain or improve biodiversity values.

The Project is unlikely to reduce the viability of any species, population or ecological community, given the low level of impact and the extensive expanse of similar habitat (the Newnes Plateau covers an area of ~25,000 hectares) in the broader locality. No TECs will be cleared for this Project, with all areas of THPSS being retained.

Flora species

Due to the clearing of a relatively small 4 ha of native vegetation and the rehabilitation of 2.34 ha after the initial construction phase, the retention of the majority of *P. hindii* plants and no other removal of threatened flora species, any impact on flora biodiversity values of the area will be negligible.

Fauna species

Due to the removal of a relatively small 4 ha of native vegetation and the rehabilitation of 2.34 ha after the initial construction phase, the Project is unlikely to affect the biodiversity values of the area in the long term.

2. Whether or not the Proposal is likely to reduce the long-term viability of a local population of the species, population or ecological community.

The Project is unlikely to reduce viability of any species, population or ecological community, given the low level of impact and the extensive expanse of similar habitat in the broader locality. The only threatened flora species proposed to be removed (*P. hindii*) has a local population within 2.8 km of at least 12,000 known plants, with less than 0.8% of that population proposed for removal.

The Project will remove 4 ha of habitat for some threatened fauna species with 2.34 ha of this area to be rehabilitated after the initial construction phase. Due to the proximity of ~25,000 ha of native vegetation on the Newnes Plateau; it is unlikely that the Project will reduce the long term viability of any local population of any threatened fauna species.

3. Whether or not the Proposal is likely to accelerate the extinction of the species, population or ecological community or place it at risk of extinction.

The removal of the relatively small area of habitat for the Project is considered unlikely to accelerate the extinction or place at risk of extinction any species, population or ecological community, given the extensive expanse of similar habitat in the broader locality.

The proposed direct surface impacts associated with the Project Application Area will result in the removal of ~93 *P. hindii* plants, from a known local population of over 12,000 plants (within 2.8 km of the Study Area).

4. Whether or not the Proposal will adversely affect critical habitat.

There is no declared “Critical Habitat” within the locality, and subsequently the Project will not adversely affect any such habitat.

8.0 Conclusion and Recommendations

8.1 Conclusion

The access road to Bore 8 is mostly already formed and it was considered that the least sensitive route was to utilise existing alignment as the constraints of *P. hindii* are present on both sides of the track and realignment will not result in a significant difference in impacts.

One threatened flora species and two threatened bird species listed under the TSC Act 1995 have been recorded within the Study Area during recent surveys (RPS 2011 and 2012) whilst an additional 23 threatened species have been identified in the locality during monitoring work by Martin Denny. Habitat within the Project Application Area is considered suitable for several other threatened species that may use the area on an intermittent basis.

93 individual P. hindii are proposed to be removed in this Project, representing the removal of less than 0.8% of the known population of approximately 12,000 individuals that are located within 2.8km of the Study Area.

A significant impact is considered unlikely to occur to any species, population, or endangered ecological community as a result of the proposal.

8.2 Recommendations

The following recommendations have been outlined to provide ecological guidelines and Study Area management strategies that may prevent any ongoing detrimental impacts upon habitat surrounding the proposed surface mine dewatering facility.

- Sediment and erosion control should be a focus when undertaking access track construction;
- During removal of habitat trees an environmental representative or ecologist should be present to ensure that fauna are handled appropriately;
- Any hollow-bearing trees removed by clearing activities along with valuable fauna habitat within displaced ground debris should be retained and collected for fauna conservation activities off-site;
- Hollow-bearing trees adjacent to Project Application Area boundary be retained where possible;
- Populations of *P. hindii* be avoided where possible;
- All disturbed areas outside of the required functional road and borehole areas should be rehabilitated with endemic native vegetation.
- Adequate sediment control be employed adjacent to all areas of soil disturbance; and
- It is recommended that appropriate measures be employed to ensure that machinery working within the Study Area do not bring materials (soils etc.) onto the Study Areas that may infect onsite vegetation with *Phytophthora cinnamomi*, or cause the distribution of weed species.

9.0 Bibliography

Aurecon (2012). Assessment of hydrogeological impacts Angus Place Colliery Ventilation Facility Project. Centennial — Angus Place Project Modification.

Centennial Angus Place (2005). Longwalls 411- 418 Subsidence Management Plan Application, unpublished report, Centennial Angus Place.

Christidis, L. and Boles, W. (1994). The Taxonomy and Species of Birds of Australia and Its Territories, Royal Australasian Ornithologists Union, Melbourne.

Churchill, S. (1998). Australian Bats. Reed New Holland Publishers, Sydney, Australia.

Cogger, H.G. (1996).. Reptiles and Amphibians of Australia. Fifth edition. Reed International, Chatswood, N.S.W.

Cropper, S. (1993). Management of Endangered Plants. CSIRO Publications, East Melbourne, Victoria.

Daly, G. (1996). Observations on the eastern owl frog Heleioporous australiacus (Anura: Myobatrachidae) in southern New South Wales. Herpetofauna. 26:33-42.

DEC (2000). Anthropogenic climate change, key threatening process listing, DEC, Sydney.

DEC (2001a). Blue Mountains Water Skink (Eulamprus leuraensis) Recovery Plan, DEC, Sydney.

DEC (2001b). Clearing of native vegetation, key threatening process listing, DEC, Sydney.

DEC (2003). Infection of native plants by Phytophthora cinnamomi, key threatening process listing, DEC, Sydney.

DEC (2004a) Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities, Working Draft, DEC, Hurstville.

DEC (2004b). Removal of dead wood and dead trees- key threatening process listing, DEC, Sydney.

DEC (2005). Draft Recovery Plan for the Brush-tailed Rock-wallaby, Petrogale penicillata. DEC, Sydney, NSW.DEC (2006). The Vegetation of the Western Blue Mountains. Unpublished report funded by the Hawkesbury – Nepean Catchment Management Authority. Department of Environment and Conservation, Hurstville.

DEC (2006). The Vegetation of the Western Blue Mountains. Unpublished report funded by the Hawkesbury – Nepean Catchment Management Authority. Department of Environment and Conservation, Hurstville.

DEC (2007). Loss of hollow bearing trees, key threatening process listing, DEC, Sydney.

DEC/ DPI (2005). Draft Guidelines for Threatened Species Assessment for Part 3A Applications, DEC/ DPI, Sydney.

Denny, M. (2004a). 2004 Fauna monitoring within the subsidence management plan area at Angus Place Colliery, unpublished report to Centennial Coal, Mt King Ecological Surveys, Oberon.

Denny, M. (2004b). 2004 Fauna monitoring within the subsidence management plan area at Springvale Colliery, unpublished report to Centennial Coal, Mount King Ecological Surveys, Oberon.

Denny, M. (2005). 2005 Fauna monitoring within the subsidence management plan application area at Springvale Colliery, unpublished report to Centennial Coal, Mount King Ecological Surveys, Oberon.

Denny, M. (2006a). 2005 Fauna monitoring within the subsidence management plan area at Angus Place Colliery, unpublished report to Centennial Coal, Mt King Ecological Surveys, Oberon.

Denny, M. (2006b). 2006 Fauna monitoring within the subsidence management plan application area at Springvale Colliery, unpublished report to Centennial Coal, Mount King Ecological Surveys, Oberon.

Denny, M. (2007a). 2006 Fauna monitoring within the subsidence management plan area at Angus Place Colliery unpublished report to Centennial Coal, Mt King Ecological Surveys, Oberon.

Denny, M. (2007b). 2007 Fauna monitoring within the subsidence management plan application area at Springvale Colliery, unpublished report to Centennial Coal, Mount King Ecological Surveys, Oberon.

Denny, M. (2008a). 2007 Fauna monitoring within the subsidence management plan area at Angus Place Colliery, unpublished report to Centennial Coal, Mt King Ecological Surveys, Oberon.

Denny, M. (2008b). 2008 Fauna monitoring within the subsidence management plan application area at Springvale Colliery, unpublished report to Centennial Coal, Biodiversity Monitoring Services, Oberon.

Denny, M. (2008c). Clarence Colliery- Western SMP Area Fauna Monitoring 2008, unpublished report to Centennial Coal, Biodiversity Monitoring Services, Oberon.

Denny, M. (2009). Fauna monitoring during 2008 within the subsidence management plan application area at Angus Place Colliery, unpublished report to Centennial Coal, Mt King Ecological Surveys, Oberon.

Denny, M. (2010a). 2009 Fauna monitoring within the subsidence management plan application area at Angus Place Colliery, unpublished report to Centennial Coal, Biodiversity Monitoring Services, Oberon.

Denny, M. (2010b). 2009 Fauna monitoring within the subsidence management plan application area at Springvale Colliery, unpublished report to Centennial Coal, Biodiversity Monitoring Services, Oberon.

Denny, M. (2010c). 2010 Fauna monitoring within the Eastern Subsidence Management Plan Application Area at Clarence Colliery, unpublished report to Centennial Coal, Biodiversity Monitoring Services, Oberon.

Denny, M. (2010d). 2010 Fauna monitoring within the Western Subsidence Management Plan Application Area at Clarence Colliery, unpublished report to Centennial Coal, Biodiversity Monitoring Services, Oberon.

Denny, M. (2010e) Area 800 (Eastern Portion) Autumn 2010 Fauna Monitoring Survey, unpublished report to Centennial Coal, Biodiversity Monitoring Services, Oberon.

Denny, M. (2011a). 2010 Fauna monitoring within the subsidence management plan application area at Springvale Colliery, unpublished report to Centennial Coal, Biodiversity Monitoring Services, Oberon.

Denny, M. (2011b). 2011 Fauna monitoring within the subsidence management plan application area at Springvale Colliery, Autumn 2011 Sample, unpublished report to Centennial Coal, Biodiversity Monitoring Services, Oberon.

Denny, M. (2011c). Angus Place Colliery New Area Fauna Monitoring Surveys for Autumn 2011, unpublished report to Centennial Coal, Biodiversity Monitoring Services, Oberon.

Denny, M. (2011d). Fauna monitoring within the subsidence management plan application area at Angus Place Colliery, Autumn 2011 Sample, unpublished report to Centennial Coal, Biodiversity Monitoring Services, Oberon.

DLWC (2002). The NSW State Groundwater dependent Ecosystem policy: A component policy of the NSW State Groundwater Policy Framework Document, NSW Government.

DECCW (2010). Vulnerable species listing; Little Eagle Heiraetus morphnoides, DEECW, accessed 2nd April 2012, http://www.environment.nsw.gov.au/determinations/littleeagleFD.htm

Garnett, S. and Crowley, G. (2000). The Action Plan for Australian Birds 2000. Environment Australia, Canberra, ACT.

GSSE (2012). Surface Water Assessment Springvale Colliery – Bore 8 Installation Project. Unpublished report to Centennial Coal.

Harden, G. (ed) (2002). Flora of New South Wales, Volume 2. Revised edition. New South Wales University Press, NSW.

Harden, G. (ed) (2000). Flora of New South Wales, Volume 1. Revised edition. New South Wales University Press, NSW.

Harden, G. (ed) (1993). Flora of New South Wales, Volume 4. New South Wales University Press, NSW.

Harden, G. (ed) (1992.) Flora of New South Wales, Volume 3. New South Wales University Press, NSW.

International Environmental Consultants (2000). Clarence Colliery Lease Extension - Environmental Impact Statement, International Environmental Consultants.

Kavanagh, R.P. and Bamkin, K.L. (1995). Distribution of nocturnal forest birds and mammals in relation to the logging mosaic in southeastern New South Wales, Australia. Biological Conservation 71, 41–53.

Kavanagh, R.P., Debus, S., Tweedie, T. and Webster, R. (1995). Distribution of nocturnal forest birds and mammals in north-eastern New South Wales: relationships with environmental variables and management history. Wildlife Research 22, 359–377.

Kavanagh, R.P. and Stanton, M.A. (1998) Nocturnal forest birds and arboreal marsupials of the southwestern slopes, New South Wales. Australian Zoologist 30, 449–466.

Office of Environment and Heritage (2012) NSW Atlas of Wildlife, accessed 22nd March 2012

Penman, T., Lemckert, F., Slade, C. and Mahony, M. (2006) Non-breeding habitat requirements of the giant burrowing frog (Helioporus australiacus) in south-eastern Australia, Australian Zoologist 33, 251–257.

Robinson, M .(1996) A field guide to frogs of Australia from Port Augusta to Fraser Island including Tasmania, Australian Museum and Reed Books/New Holland, Sydney.

RPS (2010). Flora and Fauna Assessment for Proposed Longwalls 910 and 900W. Report for Centennial Angus Place Colliery, RPS, Newcastle.

RPS (2011) Unpublished data collected during ecological surveys on the Newnes Plateau, RPS, Newcastle.

RPS (2012) Unpublished data collected during ecological surveys on the Newnes Plateau, RPS, Newcastle.

SEWPAC (2012). EPBC Protected Matters Report, accessed 22nd March 2012

Strahan, R. (Ed) (2004). The Mammals of Australia. Reed New Holland Books, Australia.

TSSC – Threatened Species Scientific Committee (2012). Advice to the Minister for Sustainability, Environment, Water, Population and Communities from the Threatened Species Scientific Committee (the Committee) on Amendment to the list of Threatened Species under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act 1999).

Appendix I

Fauna Species List

Known and Expected Fauna Species List

Below is a list of fauna species that could be *reasonably* expected to be found within the Study Area. Such an approach has been taken given the unlikelihood to record *all* potentially occurring species within an area during formal fauna surveys (due to seasonality, climatic limitations, crypticism etc).

Family sequencing and taxonomy follow for each fauna class:

Birds – Christidis and Boles (1994).

Herpetofauna - Cogger (1996).

Mammals - Strahan (ed.) (1995) and Churchill (1998).

✓ - Species observed or indicated by scats, tracks etc. within the Study Area during this investigation or investigations undertaken within 1km of this Study Area for other projects.

* - Indicates an introduced species

Known and Expected Bird List

Appendix Key:	**1** = Results of ecological investigations conducted within the study area ✓ = Species Detected * = introduced species (C) = listed as CAMBA species (J) = listed as JAMBA species (E) = listed as Endangered in NSW (TSC Act). (V) = listed as Vulnerable in NSW (TSC Act). (EV) = Species listed under the Commonwealth EPBC Act as Vulnerable (EE) = Species listed under the Commonwealth EPBC Act as Endangered (EM) = Species listed under the Commonwealth EPBC Act as Migratory (EMa) = Species listed under the Commonwealth EPBC Act as Marine Species indicated in **BOLD** font are those threatened species known to occur within Lithgow LGA (Atlas of NSW Wildlife data)
Data Source:	✓ = Species recorded during this survey or from other RPS surveys that have occurred recently surrounding the Study Area.

Family Name	Scientific Name	Common Name	Recorded
Acanthizidae	*Acanthiza chrysorrhoa*	Yellow-rumped Thornbill	
	Acanthiza lineata	Striated Thornbill	✓
	Acanthiza nana	Yellow Thornbill	✓
	Acanthiza pusilla	Brown Thornbill	✓
	Acanthiza reguloides	Buff-rumped Thornbill	
	Aphelocephala leucopsis	Southern Whiteface	
	Calamanthus pyrrhopygius	Chestnut-rumped Heathwren	
	Gerygone fusca	Western Gerygone	
	Gerygone mouki	Brown Gerygone	✓
	Gerygone olivacea	White-throated Gerygone	
	Origma solitaria	Rockwarbler	
	Pycnoptilus floccosus	Pilotbird	
	Pyrrholaemus saggitatus	**Speckled Warbler (V)**	
	Sericornis citreogularis	Yellow-throated Scrubwren	
	Sericornis frontalis	White-browed Scrubwren	✓
	Sericornis magnirostris	Large-billed Scrubwren	
	Smicrornis brevirostris	Weebill	
Accipitridae	*Accipiter cirrocephalus*	Collared Sparrowhawk	
	Accipiter fasciatus	Brown Goshawk	
	Accipiter novaehollandiae	Grey Goshawk	
	Aquila audax	Wedge-tailed Eagle	
	Elanus axillaris	Black-shouldered Kite	
	Haliaeetus leucogaster	White-bellied Sea-Eagle	
	Haliastur sphenurus	Whilstling Kite	
	Lophoictinia isura	**Square-tailed Kite (V)**	
Aegothelidae	*Aegotheles cristatus*	Australian Owlet-nightjar	
Alaudidae	*Alauda arvensis**	Eurasian Skylark	
	Mirafra javanica	Horsfield's Bushlark	
Alcedinidae	*Alcedo azurea*	Azure Kingfisher	
	Dacelo novaeguineae	Laughing Kookaburra	✓
	Todiramphus sanctus	Sacred Kingfisher	
Anatidae	*Anas gracilis*	Grey Teal	
	Anas rhynchotis	Australasian Shoveler	
	Anas superciliosa	Pacific Black Duck	
	Aythya australis	Hardhead	
	Biziura lobata	Musk Duck	
	Chenonetta jubata	Australian Wood Duck	
	Cygnus atratus	Black Swan	
	Malacorhynchus membranaceus	Pink-eared Duck	
	Oxyura australis	**Blue-billed Duck (V)**	
Apodidae	*Hirundapus caudacutus*	White-throated Needletail (EM)	
Ardeidae	*Ardea pacifica*	White-necked Heron	
	Egretta novaehollandiae	White-faced Heron	
	Nycticorax caledonicus	Nankeen Night Heron	
Artamidae	*Artamus cinereus*	Black-faced Woodswallow	
	Artamus cyanopterus	Dusky Woodswallow	
	Artamus leucorynchus	White-breasted Woodswallow	
	Artamus superciliosus	White-browed Woodswallow	
	Cracticus nigrogularis	Pied Butcherbird	
	Cracticus torquatus	Grey Butcherbird	
	Gymnorhina tibicen	Australian Magpie	
	Strepera graculina	Pied Currawong	✓
	Strepera versicolor	Grey Currawong	✓
Cacatuidae	*Cacatua galerita*	Sulphur-crested Cockatoo	

Family Name	Scientific Name	Common Name	Recorded
	Cacatua sanguinea	Little Corella	
	Callocephalon fimbriatum	**Gang-Gang Cockatoo (V)**	
	Calyptorhynchus funereus	Yellow-tailed Black-Cockatoo	✓
	Calyptorhynchus lathami	**Glossy Black-Cockatoo (V)**	
	Eolophus roseicapillus	Galah	
Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike	✓
	Coracina papuensis	White-bellied Cuckoo-shrike	
	Coracina tenuirostris	Cicadabird	✓
	Lalage tricolor	White-winged Triller	
Caprimulgidae	*Eurostopodus mystacalis*	White-throated Nightjar	
Charadriidae	*Elseyornis melanops*	Black-fronted Dotterel	
	Vanellus miles	Masked Lapwing	
Cisticolidae	*Cisticola exilis*	Golden-headed Cisticola	
Climacteridae	*Climacteris erythrops*	Red-browed Treecreeper	
	Climacteris picumnus victoriae	**Brown Treecreeper (eastern subspecies) (V)**	
	Cormobates leucophaea	White-throated Treecreeper	✓
Columbidae	*Geopelia cuneata*	Diamond Dove	
	Geopelia humeralis	Bar-shouldered Dove	
	Geopelia placida	Peaceful Dove	
	Leucosarcia melanoleuca	Wonga Pigeon	
	Macropygia amboinensis	Brown Cuckoo-Dove	
	Ocyphaps lophotes	Crested Pigeon	
	Phaps chalcoptera	Common Bronzewing	
	Phaps elegans	Brush Bronzewing	
Coraciidae	*Eurystomus orientalis*	Dollarbird	
Corcoracidae	*Corcorax melanorhamphos*	White-winged Chough	✓
Corvidae	*Corvus coronoides*	Australian Raven	✓
	Corvus mellori	Little Raven	
Cuculidae	*Cacomantis flabelliformis*	Fan-tailed Cuckoo	✓
	Cacomantis variolosus	Brush Cuckoo	
	Chalcites basalis	Horsfield's Bronze-Cuckoo	
	Chalcites lucidus	Shining Bronze-Cuckoo	
	Chalcites osculans	Black-eared Cuckoo	
	Cuculus pallidus	Pallid Cuckoo	
	Cuculus saturatus	Oriental Cuckoo	
	Eudynamys orientalis	Pacific Koel	
	Scythrops novaehollandiae	Channel-billed Cuckoo	
Dicaeidae	*Dicaeum hirundinaceum*	Mistletoebird	✓
Dicruridae	*Grallina cyanoleuca*	Magpie-lark	
	Monarcha melanopsis	Black-faced Monarch	
	Monarcha trivirgatus	Spectacled Monarch	
	Myiagra cyanoleuca	Satin Flycatcher	
	Myiagra inquieta	Restless Flycatcher	
	Myiagra rubecula	Leaden Flycatcher	✓
	Rhipidura albiscapa	Grey Fantail	✓
	Rhipidura leucophrys	Willie Wagtail	
	Rhipidura rufifrons	Rufous Fantail	
Estrildidae	*Lonchura castaneothorax*	Chestnut-breasted Mannikin	
	Neochmia modesta	Plum-headed Finch	
	Neochmia temporalis	Red-browed Finch	
	Stagonopleura bella	Beautiful Firetail	
	Stagonopleura guttata	**Diamond Firetail (V)**	
	Taeniopygia bichenovii	Double-barred Finch	
	Taeniopygia guttata	Zebra Finch	
Eupetidae	*Cinclosoma punctatum*	Spotted Quail-thrush	✓

Family Name	Scientific Name	Common Name	Recorded
	Psophodes olivaceus	Eastern Whipbird	✓
Falconidae	*Falco berigora*	Brown Falcon	
	Falco cenchroides	Nankeen Kestrel	
	Falco longipennis	Australian Hobby	
	Falco peregrinus	Peregrine Falcon	
	Falco subniger	Black Falcon	
Fringillidae	*Carduelis carduelis**	European Goldfinch	
Hirundinidae	*Cheramoeca leucosterna*	White-backed Swallow	
	Hirundo neoxena	Welcome Swallow	✓
	Petrochelidon ariel	Fairy Martin	
	Petrochelidon nigricans	Tree Martin	
Laridae	*Larus novaehollandiae*	Silver Gull	
Maluridae	*Malurus cyaneus*	Superb Fairy-wren	✓
	Malurus lamberti	Variegated Fairy-wren	
	Stipiturus malachurus	Southern Emu-wren	
Megapodiidae	*Alectura lathami*	Australian Brush-turkey	
Meliphagidae	*Acanthagenys rufogularis*	Spiny-cheeked Honeyeater	
	Acanthorhynchus tenuirostris	Eastern Spinebill	✓
	Anthochaera carunculata	Red Wattlebird	✓
	Anthochaera chrysoptera	Little Wattlebird	
	Entomyzon cyanotis	Blue-faced Honeyeater	
	Epthianura albifrons	White-fronted Chat	
	Gliciphila melanops	Tawny-crowned Honeyeater	
	Grantiella picta	**Painted Honeyeater (V)**	
	Lichenostomus chrysops	Yellow-faced Honeyeater	✓
	Lichenostomus fuscus	Fuscous Honeyeater	
	Lichenostomus leucotis	White-eared Honeyeater	✓
	Lichenostomus melanops	Yellow-tufted Honeyeater	
	Lichenostomus penicillatus	White-plumed Honeyeater	
	Manorina melanocephala	Noisy Miner	✓
	Manorina melanophrys	Bell Miner	
	Meliphaga lewinii	Lewin's Honeyeater	
	Melithreptus brevirostris	Brown-headed Honeyeater	
	Melithreptus gularis gularis	**Black-chinned Honeyeater (eastern subspecies) (V)**	
	Melithreptus lunatus	White-naped Honeyeater	✓
	Myzomela sanguinolenta	Scarlet Honeyeater	
	Philemon citreogularis	Little Friarbird	
	Philemon corniculatus	Noisy Friarbird	✓
	Phylidonyris niger	White-cheeked Honeyeater	
	Phylidonyris novaehollandiae	New Holland Honeyeater	✓
	Phylidonyris pyrrhoptera	Crescent Honeyeater	
	Plectorhyncha lanceolata	Striped Honeyeater	
	*Anthochaera **phrygia***	**Regent Honeyeater (CE, E*)**	
Menuridae	*Menura novaehollandiae*	Superb Lyrebird	✓
Meropidae	*Merops ornatus*	Rainbow Bee-eater	
Motacillidae	*Anthus australis*	Australian Pipit	
Muscicapidae	*Turdus merula**	Eurasian Blackbird	
	Zoothera lunulata	Bassian Thrush	
Neosittidae	***Daphoenositta chrysoptera***	**Varied Sittella (V)**	
Oriolidae	*Oriolus sagittatus*	Olive-backed Oriole	
Pachycephalidae	*Colluricincla harmonica*	Grey Shrike-thrush	✓
	Falcunculus frontatus	Eastern Shrike-tit	
	Pachycephala pectoralis	Golden Whilstler	
	Pachycephala rufiventris	Rufous Whilstler	✓
Pardalotidae	*Pardalotus punctatus*	Spotted Pardalote	✓

Family Name	Scientific Name	Common Name	Recorded
	Pardalotus striatus	Striated Pardalote	✓
Passeridae	*Passer domesticus**	House Sparrow	
Pelecanidae	*Pelecanus conspicillatus*	Australian Pelican	
Petroicidae	*Eopsaltria australis*	Eastern Yellow Robin	✓
	Melanodryas cucullata	Hooded Robin	
	Melanodryas cucullata cucullata	**Hooded Robin (south-eastern form) (V)**	
	Microeca fascinans	Jacky Winter	
	Petroica boodang	**Scarlet Robin (V)**	✓
	Petroica goodenovii	Red-capped Robin	
	Petroica phoenicea	**Flame Robin (V)**	
	Petroica rosea	Rose Robin	
Phalacrocoracidae	*Phalacrocorax carbo*	Great Cormorant	
	Phalacrocorax melanoleucos	Little Pied Cormorant	
	Phalacrocorax sulcirostris	Little Black Cormorant	
	Phalacrocorax varius	Pied Cormorant	
Phasianidae	*Coturnix pectoralis*	Stubble Quail	
	Coturnix ypsilophora	Brown Quail	
Podargidae	*Podargus strigoides*	Tawny Frogmouth	
Podicipedidae	*Podiceps cristatus*	Great Crested Grebe	
	Poliocephalus poliocephalus	Hoary-headed Grebe	
	Tachybaptus novaehollandiae	Australasian Grebe	
Pomatostomidae	*Pomatostomus superciliosus*	White-browed Babbler	
	Pomatostomus temporalis temporalis	**Grey-crowned Babbler (eastern subspecies) (V)**	
Psittacidae	*Alisterus scapularis*	Australian King-Parrot	✓
	Glossopsitta concinna	Musk Lorikeet	
	Glossopsitta pusilla	**Little Lorikeet (V)**	
	Lathamus discolor	**Swift Parrot (E, E*)**	
	Neophema pulchella	**Turquoise Parrot (V)**	
	Platycercus adscitus eximius	Eastern Rosella	
	Platycercus elegans	Crimson Rosella	✓
	Psephotus haematonotus	Red-rumped Parrot	
	Trichoglossus chlorolepidotus	Scaly-breasted Lorikeet	
	Trichoglossus haematodus	Rainbow Lorikeet	
Ptilonorhynchidae	*Ptilonorhynchus violaceus*	Satin Bowerbird	
Pycnonotidae	*Pycnonotus jocosus**	Red-whiskered Bulbul	
Rallidae	*Fulica atra*	Eurasian Coot	
	Gallinula tenebrosa	Dusky Moorhen	
	Gallirallus philippensis	Buff-banded Rail	
	Porphyrio porphyrio	Purple Swamphen	
	Pozana fluminea	Australian Spotted Crake	
	Pozana pusilla	Baillon’s Crake	
	Pozana tabuensis	Spotless Crake	
	Rallus pectoralis	Lewin’s Rail	
Scolopacidae	*Calidris acuminata*	Sharp-tailed Sandpiper (EM)	
	Gallinago hardwickii	Latham's Snipe (EM)	
Strigidae	*Ninox boobook*	Southern Boobook	
	Ninox connivens	**Barking Owl (V)**	
	Ninox strenua	**Powerful Owl (V)**	
Sturnidae	*Acridotheres tristis**	Common Myna	
	*Sturnus vulgaris**	Common Starling	
Sylviidae	*Acrocephalus australis*	Australian Reed-Warbler	
	Cincloramphus cruralis	Brown Songlark	
	Cincloramphus mathewsi	Rufous Songlark	
	Megalurus gramineus	Little Grassbird	

Family Name	Scientific Name	Common Name	Recorded
Threskiornithidae	*Platalea flavipes*	Yellow-billed Spoonbill	
	Platalea regia	Royal Spoonbill	
	Threskiornis molucca	Australian White Ibis	
	Threskiornis spinicollis	Straw-necked Ibis	
Turnicidae	*Turnix varia*	Painted Button-quail	
Tytonidae	*Tyto alba*	Barn Owl	
	Tyto novaehollandiae	**Masked Owl (V)**	✓
	Tyto tenebricosa	**Sooty Owl (V)**	
Zosteropidae	*Zosterops lateralis*	Silvereye	✓

Known and Expected Mammal List

Appendix Key:	**1** = Results of ecological investigations conducted within the Study Area ✓ = Species Detected * = introduced species **(E)** = listed as Endangered in NSW (TSC Act). **(V)** = listed as Vulnerable in NSW (TSC Act). **(EV)** = Species listed under the Commonwealth EPBC Act as Vulnerable **(EE)** = Species listed under the Commonwealth EPBC Act as Endangered Species indicated in **BOLD** font are those threatened species known to occur within Lithgow LGA (Atlas of NSW Wildlife)
Data Source:	✓ = Species recorded during this survey

Family Name	Scientific Name	Common Name	Recorded
Acrobatidae	*Acrobates pygmaeus*	Feathertail Glider	
Bovidae	*Bos taurus**	European Cattle	
	*Capra hircus**	Goat	
Burramyidae	***Cercartetus nanus***	**Eastern Pygmy-possum (V)**	
Canidae	*Canis lupus familiaris**	Dog	
	*Canis lupus**	Dingo, domestic dog	
	*Vulpes vulpes**	Fox	
Cervidae	*Cervus sp.**	Deer	
Dasyuridae	*Antechinus agilis*	Agile Antechinus	
	Antechinus flavipes	Yellow-footed Antechinus	
	Antechinus stuartii	Brown Antechinus	
	Antechinus swainsonii	Dusky Antechinus	
	Antechinus/Sminthopsis sp.	unidentified 'Marsupial Mouse'	
	Dasyurus maculatus	**Spotted-tailed Quoll (V, V*)**	
Emballonuridae	***Saccolaimus flaviventris***	**Yellow-bellied Sheathtail-bat (V)**	
Equidae	*Equus caballus**	Horse	
Felidae	*Felis catus**	Cat	
Leporidae	*Lepus capensis**	Brown Hare	
	*Oryctolagus cuniculus**	Rabbit	
Macropodidae	*Macropus giganteus*	Eastern Grey Kangaroo	✓
	Macropus robustus	Common Wallaroo	
	Macropus rufogriseus	Red-necked Wallaby	✓
	Petrogale penicillata	**Brush-tailed Rock-wallaby (E, V*)**	
	Wallabia bicolor	Swamp Wallaby	✓
Molossidae	*Mormopterus* "Species 2"	Undescribed Freetail Bat	
	Mormopterus norfolkensis	**Eastern Freetail-bat (V)**	
	Mormopterus planiceps	Little Mastiff-bat	
	Mormopterus sp.	Mastiff-bat	
	Austronomus australis	White-striped Freetail-bat	
Muridae	*Hydromys chrysogaster*	Water-rat	
	*Mus musculus**	House Mouse	
	Rattus fuscipes	Bush Rat	
	Rattus lutreolus	Swamp Rat	
	*Rattus rattus**	Black Rat	
Ornithorhynchidae	*Ornithorhynchus anatinus*	Platypus	

Family Name	Scientific Name	Common Name	Recorded
Peramelidae	*Isoodon/Perameles sp.*	unidentified Bandicoot	
Petauridae	***Petaurus australis***	**Yellow-bellied Glider (V)**	
	Petaurus breviceps	Sugar Glider	
	Petaurus norfolcensis	**Squirrel Glider (V)**	
Phalangeridae	*Trichosurus caninus*	Short-eared Possum	
	Trichosurus sp.	Brushtail Possum	
	Trichosurus vulpecula	Common Brushtail Possum	
Phascolarctidae	***Phascolarctos cinereus***	**Koala (V)**	
Potoroidae	*Bettongia gaimardi*	Tasmanian Bettong	
Pseudocheiridae	*Petauroides volans*	Greater Glider	
	Pseudocheirus peregrinus	Common Ringtail Possum	✓
Rhinolophidae	*Rhinolophus megaphyllus*	Eastern Horseshoe-bat	
Suidae	*Sus scrofa**	Pig	
Tachyglossidae	*Tachyglossus aculeatus*	Short-beaked Echidna	
Vespertilionidae	***Chalinolobus dwyeri***	**Large-eared Pied Bat (V, V*)**	
	Chalinolobus gouldii	Gould's Wattled Bat	
	Chalinolobus morio	Chocolate Wattled Bat	
	Falsistrellus tasmaniensis	**Eastern False Pipistrelle (V)**	
	Miniopterus australis	**Little Bentwing-bat (V)**	
	Miniopterus schreibersii oceanensis	**Eastern Bentwing-bat (V)**	
	Myotis adversus	**Large-footed Myotis (V)**	
	Nyctophilus geoffroyi	Lesser Long-eared Bat	
	Nyctophilus gouldi	Gould's Long-eared Bat	
	Nyctophilus sp.	Long-eared bat	
	Scoteanax rueppellii	**Greater Broad-nosed Bat (V)**	
	Scotorepens balstoni	Inland Broad-nosed Bat	
	Scotorepens orion	Eastern Broad-nosed Bat	
	Vespadelus darlingtoni	Large Forest Bat	
	Vespadelus pumilus	Eastern Forest Bat	
	Vespadelus regulus	Southern Forest Bat	
	Vespadelus vulturnus	Little Forest Bat	
Vombatidae	*Vombatus ursinus*	Common Wombat	

Known and Expected Reptile List

Appendix Key:
1 = Results of ecological investigations conducted within the Study Area
✓ = Species Detected
* = introduced species
(E) = listed as Endangered in NSW (TSC Act).
(V) = listed as Vulnerable in NSW (TSC Act).
(EV) = Species listed under the Commonwealth EPBC Act as Vulnerable
(EE) = Species listed under the Commonwealth EPBC Act as Endangered
(EMa) = Species listed under the Commonwealth EPBC Act as Marine
Species indicated in **BOLD** font are those threatened species known to occur
within Lithgow LGA (Atlas of NSW Wildlife)

Data Source:
✓ = Species recorded during this survey

Family Name	Scientific Name	Common Name	Recorded
Agamidae	*Amphibolurus muricatus*	Jacky Lizard	✓
	Amphibolurus nobbi	Nobbi	
	Physignathus lesueurii	Eastern Water Dragon	
	Pogona barbata	Bearded Dragon	
	Rankinia diemensis	Mountain Dragon	
Chelidae	*Chelodina longicollis*	Eastern Snake-necked Turtle	
	Acanthophis antarcticus	Death Adder	✓
Elapidae	*Austrelaps ramsayi*	Highland Copperhead	
	Austrelaps superbus	Lowland Copperhead	
	Cryptophis nigrescens	Eastern Small-eyed Snake	
	Drysdalia rhodogaster	Mustard-bellied Snake	
	Furina diadema	Red-naped Snake	
	Hoplocephalus bungaroides	**Broad-headed Snake (E, V*)**	
	Notechis scutatus	Tiger Snake	
	Parasuta dwyeri	Dwyer's Snake	
	Parasuta spectabilis	Mallee Black-headed Snake	
	Pseudechis guttatus	Spotted Black Snake	
	Pseudechis porphyriacus	Red-bellied Black Snake	
	Pseudonaja textilis	Eastern Brown Snake	✓
	Vermicella annulata	Bandy-bandy	
Gekkonidae	*Diplodactylus vittatus*	Wood Gecko	
	Oedura lesueurii	Lesueur's Velvet Gecko	
	Phyllurus platurus	Broad-tailed Gecko	
	Underwoodisaurus milii	Thick-tailed Gecko	
Pygopodidae	*Pygopus lepidopodus*	Common Scaly-foot	
Scincidae	*Acritoscincus duperreyi*	Eastern Three-lined Skink	
	Acritoscincus platynota	Red-throated Skink	
	Carlia tetradactyla	Southern Rainbow-skink	
	Cryptoblepharus virgatus	Cream-striped Shinning-skink	
	Ctenotus robustus	Robust Ctenotus	
	Ctenotus taeniolatus	Copper-tailed Skink	✓
	Egernia cunninghami	Cunningham's Skink	
	Egernia saxatilis	Black Rock Skink	
	Egernia saxatilis intermedia		
	Egernia striolata	Tree Skink	
	Egernia whitii	White's Skink	
	Eulamprus heatwolei	Yellow-bellied Water-skink	
	Eulamprus leuraensis	**Blue Mountains Water skink (E, E*)**	

Family Name	Scientific Name	Common Name	Recorded
	Eulamprus quoyii	Eastern Water-skink	✓
	Eulamprus tenuis	Barred-sided Skink	
	Eulamprus tympanum	Southern Water-skink	
	Hemiergis decresiensis	Three-toed Earless Skink	
	Lampropholis delicata	Dark-flecked Garden Sunskink	✓
	Lampropholis guichenoti	Pale-flecked Garden Sunskink	
	Lampropholis sp.	unidentified grass skink	
	Lerista bougainvillii	South-eastern Slider	
	Lygisaurus foliorum	Tree-base Litter-skink	
	Morethia boulengeri	South-eastern Morethia Skink	
	Pseudemoia entrecasteauxii	Tussock Cool-skink	
	Pseudemoia pagenstecheri	Tussock Skink	
	Saiphos equalis	Three-toed Skink	
	Saproscincus mustelinus	Weasel Skink	
	Tiliqua nigrolutea	Blotched Blue-tongue	
	Tiliqua scincoides	Eastern Blue-tongue	
Typhlopidae	*Ramphotyphlops nigrescens*	Blackish Blind Snake	
Varanidae	***Varanus rosenbergi***	**Rosenberg's Goanna (V)**	
	Varanus sp.	Unidentified Goanna	
	Varanus varius	Lace Monitor	

Known and Expected Frog List

Appendix Key:	**1** = Results of ecological investigations conducted within the Study Area ✓ = Species Detected * = introduced species **(E)** = listed as Endangered in NSW (TSC Act). **(V)** = listed as Vulnerable in NSW (TSC Act). **(EV)** = Species listed under the Commonwealth EPBC Act as Vulnerable **(EE)** = Species listed under the Commonwealth EPBC Act as Endangered Species indicated in **BOLD** font are those threatened species known to occur within Lithgow LGA (Atlas of NSW Wildlife)
Data Source:	✓ = Species recorded during this survey

Family Name	*Scientific Name*	Common Name	Recorded
Hylidae	***Litoria booroolongensis***	**Booroolong Frog (E, E*)**	
	Litoria caerulea	Green Tree Frog	
	Litoria citropa	Blue Mountains Tree Frog	
	Litoria dentata	Bleating Tree Frog	
	Litoria ewingii	Brown Tree Frog	
	Litoria fallax	Eastern Dwarf Tree Frog	
	Litoria latopalmata	Broad-palmed Frog	
	Litoria lesueuri	Lesueur's Frog	
	Litoria peronii	Peron's Tree Frog	
	Litoria phyllochroa	Leaf-green Tree Frog	
	Litoria sp.	Unidentified Tree Frog	
	Litoria verreauxii	Verreaux's Frog	
	Litoria wilcoxii		
Myobatrachidae	*Crinia parinsignifera*	Eastern Sign-bearing Froglet	
	Crinia signifera	Common Eastern Froglet	
	Heleioporus australiacus	**Giant Burrowing Frog (V, V*)**	
	Limnodynastes dumerilii	Eastern Banjo Frog	
	Limnodynastes fletcheri	Long-thumbed Frog	
	Limnodynastes ornatus	Ornate Burrowing Frog	
	Limnodynastes peronii	Striped Marsh Frog	
	Limnodynastes tasmaniensis	Spotted Grass Frog	
	Mixophyes balbus	**Stuttering Frog (E, V*)**	
	Neobatrachus sudelli	Sudell's Frog	
	Pseudophryne australis	**Red-crowned Toadlet (V)**	
	Pseudophryne bibronii	Bibron's Toadlet	
	Pseudophryne sp.		
	Uperoleia laevigata	Smooth Toadlet	

Appendix 2

Flora Species List

Flora Species List

Family	Scientific Name	Common Name
TREES		
Myrtaceae	*Eucalyptus blaxlandii*	Blaxland's Stringybark
	Eucalyptus dalrympleana	Mountain Gum
	Eucalyptus dives	Broad-leaved Peppermint
	Eucalyptus oreades	Blue Mountains Ash
	Eucalyptus piperita	Sydney Peppermint
	Eucalyptus radiata	Narrow-leaved Peppermint
	Eucalyptus sclerophylla	Scribbly Gum
	Eucalyptus sieberi	Silvertop Ash
SHRUBS		
Apiaceae	*Platysace linearifolia*	Narrow-leafed Platysace
Araliaceae	*Polyscias sambucifolia*	Elderberry Panax
	Cassinia cunninghamii	Cunningham's Everlasting
Epacridaceae	*Brachyloma daphnoides*	Daphne Heath
	Epacris microphylla	Coral Heath
	Epacris pulchella	Wallum Heath
	Leucopogon lanceolatus	Lance-leaf Beard-heath
	Monotoca scoparia	Prickly Broom-heath
Euphorbiaceae	*Amperea xiphoclada* var. *xiphoclada*	Broom Spurge
Fabaceae	*Daviesia latifolia*	-
	Daviesia squarrosa	-
	Gompholobium huegelii	Pale Wedge Pea
	Phyllota squarrosa	Dense Phyllota
	Acacia buxifolia	Box-leaf Wattle
	Acacia terminalis	Sunshine Wattle
Myrtaceae	*Baeckea linifolia*	Weeping Baeckea
	Leptospermum arachnoides	-
	Leptospermum grandifolium	Woolly Tea-tree
	Leptospermum obovatum	-
	Leptospermum polygalifolium subsp. *polygalifolium*	Tantoon
	Leptospermum trinervium	Slender Tea-tree
Proteaceae	*Banksia spinulosa*	Hairpin Banksia
	Banksia marginata	Silver Banksia
	Grevillea laurifolia	Laurel-leaf Grevillea
	Hakea dactyloides	Broad-leaved Hakea
	Hakea sericea	Needlebush
	Isopogon anemonifolius	Flat-leaved Drumsticks
	Lomatia silaifolia	Crinkle Bush
	Persoonia chamaepitys	Mountain Geebung
	***Persoonia hindii* (E)**	**-**
	Persoonia oblongata	-

Family	Scientific Name	Common Name
	Petrophile pulchella	Conesticks
	Petrophile sessilis	Conesticks
Rhamnaceae	*Pomaderris andromedifolia*	-
Rutaceae	*Boronia microphylla*	Small-leaved Boronia
Santalaceae	*Leptomeria acida*	Native Currant
Santalaceae	*Omphacomeria acerba*	-
GROUNDCOVERS		
Cyperaceae	*Gahnia aspera*	Saw Sedge
	Gahnia sieberiana	Red-fruited Saw-sedge
	Lepidosperma laterale	Variable Sword-sedge
	Lepidosperma limicola	-
Dennstaedtiaceae	*Pteridium esculentum*	Bracken
Dilleniaceae	*Hibbertia obtusifolia*	Grey Guinea Flower
Droseraceae	*Drosera peltata*	Sundew
Droseraceae	*Drosera spathulata*	Common Sundew
Euphorbiaceae	*Poranthera microphylla*	-
Gentianaceae	*Centaurium erythraea**	Common Centaury
Gleicheniaceae	*Gleichenia dicarpa*	Pouched Coral Fern
Goodeniaceae	*Dampiera stricta*	Blue Dampiera
	Goodenia bellidifolia	Daisy-leaved Goodenia
Goodeniaceae	*Goodenia hederacea* subsp. *hederacea*	Ivy-leaved Goodenia
Haloragaceae	*Gonocarpus tetragynus*	Poverty Raspwort
	Gonocarpus teucroides	Raspwort
Iridaceae	*Patersonia glabrata*	Leafy Purple-flag
	Patersonia sericea	Wild Iris
Lomandraceae	*Lomandra filiformis* subsp. *coriacea*	Wattle Mat-rush
	Lomandra filiformis subsp. *filiformis*	Wattle Mat-rush
	Lomandra glauca	Pale Mat-rush
	Lomandra longifolia	Spiky-headed Mat-rush
	Lomandra multiflora	Many-flowered Mat-rush
Orchidaceae	*Dipodium punctatum*	Hyacinth Orchid
Oxalidaceae	*Oxalis perrenans*	Yellow-flowered Wood Sorrel
	Dianella revoluta var. *revoluta*	Spreading Flax Lily
Poaceae	*Austrodanthonia racemosa var. racemosa*	Wallaby Grass
	Austrostipa pubescens	Tall Speargrass
	Joycea pallida	Silvertop Wallaby Grass
	Microlaena stipoides var. *stipoides*	Weeping Rice Grass
	Poa seiberiana var. *cyanophylla*	-
Proteaceae	*Grevillea laurifolia*	Laurel-leaf Grevillea
Restionaceae	*Baloskion australe*	-
	Empodisma minus	-
Stylidiaceae	*Stylidium graminifolium*	Grass Trigger Plant
	Stylidium lineare	Narrow-leaved Trigger Plant
Thymelaeaceae	*Pimelea linifolia* subsp. *linifolia*	Slender Rice Flower
	Tetratheca rupicola	Black-eyed Susan

Family	Scientific Name	Common Name
	Viola betonicifolia	Native Violet
	Viola hederacea	Ivy-leaved Violet
Xanthorrhoaceae	*Xanthorrhoea resinosa*	-
CLIMBERS		
Pittosporaceae	*Billardiera scandens*	Hairy Appleberry

Appendix 3

Personnel involved in the Project and their Qualifications

Curriculum Vitae

TOBY LAMBERT

Principal Ecologist

Newcastle, NSW

Bachelor of Environmental Science, University of Newcastle, 1993 - 1996

Accredited BioBanking Assessor, Tafe NSW – Ryde, 2009

NSW Driver's Licence (Class C)

OH&S Induction Training (Green Card)

NPWS Scientific Investigation Licence and NSW Animal Ethics Research Authority

AREAS OF EXPERTISE:

Toby has over fifteen years experience in undertaking and managing a diverse array of ecological and environmental surveys and assessments. As a Principal Ecologist, he supervises all facets of flora and fauna assessment and related reports: planning, supervision of field and reporting staff, project scheduling, budget management, liaising with clients and Government departments and providing advice of all kinds. He has also been called upon to prepare expert evidence for matters at the NSW Land and Environment Court. Toby has produced ecological and environmental documentation for private and public projects ranging in complexity. These include a number of wind farms throughout Australia and New Zealand, coal mines and a range of infrastructure projects within the Hunter region. Toby has also managed ecological master planning for residential projects in Sydney, the Central Coast and the Hunter. Toby's fields of expertise are Environmental Impact Assessment and mediation, flora, fauna and habitat survey method, design and identification, detailed understanding of legislation and threatened species issues, terrestrial fauna surveys and project management. He has experience in conducting comprehensive fauna surveys and preparing related documentation in a broad array of environments throughout New South Wales, with most projects located in the greater Sydney area, Mid-West, Blue Mountains, Central Coast, Hunter and Forster / Great Lakes regions. Toby has also undertaken ecological projects in Western Australia, Queensland, the ACT and New Zealand.

SELECTED PROJECT EXPERIENCE:

Ecology

- **Centennial Coal -** Environmental Project Manager for consultancy works to Centennial Coal covering a broad range of disciplines, but primarily focussed on ecological impact assessments, monitoring and management at numerous coal mines in the Mid-West, western Blue Mountains and Lake Macquarie NSW.
- **Peabody Energy Australia -** Senior Project Manager for project specific and ongoing monitoring requirements for Wambo Coal Mine at Warkworth in the Upper Hunter Valley, Toby liases directly with the Environmental Manager of the mine in relation to requirements to fulfil consent conditions for the ongoing development and operation of the project.
- **Allco Wind Energy -** This involved undertaking fauna surveys for a 100 turbine wind farm on the North Island of New Zealand and coordinating other ecological specialists to prepare an ecological impact assessment for submission to Taranaki Council. Aspects included regular liason with the Department of Conservation regarding issues of significance, survey methodology, and mitigation and management measures to protect significant ecological features. Local bird groups were also involved and Toby was involved in the public consultation sessions.
- **Stockland Wallarah Peninsula -** This Lake Macquarie, NSW project required a multi-disciplinary approach to an innovative residential proposal on environmentally sensitive land. Project management of, and participation in, a large and diverse planning team were major features of this work. Toby was a pivotal member of the

project management team that provided the detailed ecological input and advice that was required from the early stages of the planning process to the point of submission to determining authorities. The proposal required sophisticated and creative impact assessment and reporting. Toby made a major contribution to the production of a series of comprehensive ecological reports that ensured the ecological integrity of the site was maintained in the post-development landscape.

- **Hunter Economic Zone Industrial Estate -** Project Manager for the environmental component of the development of the Hunter Economic Zone industrial estate at Kurri Kurri, to be the largest industrial estate in NSW.

PREVIOUS EXPERIENCE:

Senior Project Manager - Cumberland Ecology, Epping **2005**
Duties included flora and fauna surveying and survey design; overseeing and contribution to the preparation of complex ecological and environmental reports for both small and large projects; flora and fauna surveying and survey design; liaison with both the private sector and federal, state and local government departments.

Principal Consultant / Co-Founder - Keystone Ecological, Kariong **2004 - 2005**
Preparation and development of Keystone Ecological Flora and Fauna Impact Assessment report format; development of client database, including organisation of promotional material, logo design and customer relations; administration including preparation of quotes and invoices and organising accounts and BAS statements; Flora and fauna surveying and survey design; along with Anabat II Data Analysis.

Project Manager - Ecology - Conacher Travers Environmental, Somersby **1998 - 2004**
Supervision of flora and fauna survey design; report quality control; production of technical reports such as Review of Environmental Factors, Flora & Fauna Assessments, Statement of Environmental Effects, Species Impact Statements and Plans of Management, Land and Environment Court Evidence preparation, EPBC Act Referrals and Preliminary Information preparation; Flora & fauna surveying; liaison with Department of Environment and Conservation, Department of Environment and Heritage, Department of Infrastructure, Planning and Natural Resources, Department of Agriculture, Local Governments and private clients; Anabat II Data Analysis; Water Testing; Data Recording and Statistical Analysis.

Volunteer for Green and Golden Bell Frog Survey - Australian Museum, North Avoca **1999 - 2001**
Survey and searches for the endangered species Green & Golden Bell Frog; assisting in weighing, measuring and micro-chipping frogs for on-going research purposes.

Environmental Scientist - Australian Defence Industries (ADI), St Marys **1998**
Bore Water Sampling; statistical analysis of test results; and report production.

Environmental Scientist - Anne Clements & Associates, North Sydney **1997**
Field Assistant to Botanist and data recording.

Research Assistant - University of Newcastle **1996**
Initiation of design of final year project for Biology Dept; research into fire regimes on species composition & regeneration in open woodland; use of advanced scientific equipment including infra red gas analyser in the field, and replication of experiments using computer database; theoretical knowledge on soils, nutrient cycles & vegetation types.

MEMBERSHIPS & ACHIEVEMENTS:

- Ecological Consultants Association of NSW (ECA) – Council Member
- Newcastle Green Drinks for Environmental Professionals organising committee

Curriculum Vitae

PAUL HILLIER

Senior Ecologist

Newcastle, NSW

Bachelor of Environmental Science (Environmental Management)

NSW Driver's Licence (Class C)

OH&S Induction Training (White Card)

Senior First Aid

Dive Master (PADI Scuba Diver)

AREAS OF EXPERTISE:

Paul has broad range of Ecological Assessment reporting experience from 8 years of professional ecological work both in Australia and abroad. Project experience has primarily included a range of flora and fauna assessment disciplines as required by a wide range of corporate and domestic client requirements. Paul has been employed both within the private and public sector, providing a strong knowledge and understanding of the role of both developers and government in legislation and planning.

Paul has the majority of his experience within the consultancy industry, primarily focussing on the preparation of Flora and Fauna Assessments, Environmental Assessments, Environmental Impact Statements, Review of Environmental Factors and Statement of Environmental Effects. Paul has experience with targeted threatened flora and fauna surveys, including a strong knowledge of Geographic Information Systems mapping and analyses.

SELECTED PROJECT EXPERIENCE:

Ecology

- Ecological Constraints Master Plan – Huntlee, Singleton and Cessnock, NSW (2007-2010)
- Ecosystem Function Analysis – Wambo Coal, Singleton NSW (2010).
- Ecological Assessment Report – White Rock Wind Farm, Glen Innes, NSW (2011).

PREVIOUS EXPERIENCE:

Ecological Records Officer – West Yorkshire Ecology (2007-2009)
Duties included collection and collation of ecological records from across West Yorkshire, United Kingdom; Preparation of fee proposals for ecological services; GIS/ spatial analysis and database management; Database searches and reporting; Liaison with client, stakeholder groups, state and local governing bodies; Review of local planning applications and consequent consultations to local councils.

Ecologist – Harper Somers O'Sullivan (2004-2006)
Duties included flora and fauna surveying and survey design; overseeing and contribution to the preparation of complex ecological and environmental reports for both small and large projects; liaison with both the private sector and federal, state and local government department.

MEMBERSHIPS & ACHIEVEMENTS:

- For Australian Wildlife Needing Aid (FAWNA), NSW Australia

Curriculum Vitae

ARNE BISHOP

Field Ecologist

Newcastle, NSW

Bachelor of Environmental Science/Landscape Architecture, University of Canberra, 2009

Cert IV Horticulture (Landscape) Canberra Institute of Technology, 2003

Cert III Horticulture (Landscape), Canberra Institute of Technology, 2002

Cert II Australian Land Conservation and Restoration, Conservation Volunteers Australia, 2001

NSW Driver's Licence (Class C)

AREAS OF EXPERTISE:

Arne began paid employment in environmental management as a part time field assistant for Alison Rowell Environmental Consultancy in 1999. This role included working on flora and fauna surveys, and habitat/vegetation assessment and mapping. The knowledge and experience Arne gained from this role progressed and developed into a sub-consultancy role with full time employment over spring- summer every year.

In 2001 Arne completed a six month environmental traineeship with Green Corps. This course involved learning about environmental issues and how best to manage them in a practical sense. Arne performed duties such as: pest and weed identification and control; bush regeneration; and natural area restoration.

In addition to the above, Arne has also completed several contracts as an environmental consultant for Eco Logical Australia, assisting with threatened species identification and monitoring on a range of projects. All of these roles have been focused on collating and interpreting scientific information in order to produce recommendations on and resolutions to environmental issues.

SELECTED PROJECT EXPERIENCE:

- Flora and fauna identification and habitat assessment
- Targeted threatened flora and fauna surveys
- Delineation and mapping of vegetation communities
- Endangered Ecological Community (EEC) assessment
- Experience with GPS/GIS for project design and mapping
- Conducting Field Surveys for Flora, Fauna and Habitat Identification
- Report Preparation including Fauna and Flora Assessments
- Ecological Monitoring and Reporting
- Vegetation Management Plan Reporting
- Understanding of environmental legislation

PREVIOUS EXPERIENCE:

Ecologist – RPS Australia East Pty Ltd. **2011 - Current**
This role included working on flora and fauna surveys, and habitat/vegetation assessment and mapping.

Part-time field assistant/consultant – Alison Rowell **1999 - 2010**
This role included working on flora and fauna surveys, and habitat/vegetation assessment and mapping. The knowledge and experience I have gained from this role has progressed and developed into a sub-consultancy role with full time employment over spring- summer every year.

Environmental consultancy work - Eco Logical Australia **2008 - 10**
Arne completed several contracts as an environmental consultant for Eco Logical Australia, assisting with threatened species identification and monitoring on a range of projects.

Green Corps Traineeship - Conservation Volunteers Australian (CVA) **2001**
Arne received accredited practical and theoretical training in; First Aid (Level 2, St Johns); Occupational Health and Safety and Environmental Concepts. This training contributed to Certificate II in Australian Land Conservation and Restoration.

MEMBERSHIPS & ACHIEVEMENTS:

- Award of Excellence for first place in Conservation Biology and Genetics – University of Canberra.
- Landscape Functional Analysis Training
- First Aid Certification (expires 25/01/2015)
- Four Wheel Drive Training
- Royal Zoological Society NSW membership
- Ecological Consultants Association membership
- Birds Australia membership
- Frog & Tadpole Study Group NSW membership

Curriculum Vitae

CHRIS MCLEAN

Ecologist

Bachelor of Environmental Science, majoring in Environmental Management, University of Newcastle 2007

Bachelor of Environmental Science (Honours Class 1, F), University of Newcastle 2008

Doctor of Philosophy 2009-current, University of Wollongong, Thesis topic: Effect of fire regimes and logging on tree hollows, arboreal marsupials and owls in Eucalypt forests. To be completed end of 2011

Conservation and Land Management Certificate II, OTEN TAFE, 2004

Tourism (Guiding) Certificate III, Northern Beaches Institute TAFE, 2009

Advanced Four Wheel Drive operation course

Senior First Aid

AREAS OF EXPERTISE:

Chris has 10 years experience in natural resource management, community engagement and environmental education, developed through working as a natural resource project coordinator at Lake Macquarie Landcare and as a Discovery Ranger and Volunteer Coordinator the NSW National Parks and Wildlife Service. Chris has five years experience in ecological survey, sampling and experimental design. He has extensive experience in the survey of nocturnal fauna, in particular arboreal marsupials and forest owls. This experience has been developed through his PhD studies on the effect of fire and logging on hollow trees and hollow dependent fauna in north-eastern New South Wales. Chris has extensive experience in conducting landscape scale experiments and in the use of multivariate statistical data analysis methods.

SELECTED PROJECT EXPERIENCE:

- **Investigation of the seasonal effect of fire on small mammal communities in heathland** – report to the NSW National Parks and Wildlife Service 2006
- **Investigation of the correlation between mammalian hair and soil heavy metal concentration** – Honours thesis, 2008.
- **Management of PhD research at the University of Wollongong** – coordination of field logistics, data management, chapter writing and presentations to a range of audiences.

SELECTED PREVIOUS EXPERIENCE:

PhD candidate, Centre for the Environmental Risk Management of Bushfires, University of Wollongong 2008-current
Involved the design of a landscape scale experiment to investigate the effect and interaction between logging intensity and fire frequency on hollow bearing tree and arboreal marsupial abundance within wet and dry sclerophyll forest in northeastern New South Wales. This research produced a comprehensive dataset that was analysed using contemporary multivariate methods including Generalised Linear Modelling and Regression Trees.

Volunteer Coordinator, NSW National Parks and Wildlife Service February 2008-August 2009

Involved developing work plans with existing volunteer bushland regeneration groups working within Endangered Ecological Communities throughout the Hunter Region. Weed populations were also mapped using GPS and GIS technology.

Landcare in Schools Coordinator, Lake Macquarie Landcare Network February 2006-February 2008

Involved developing school based natural resource management projects in 50 schools throughout the Lake Macquarie Region. Work involved contract administration of ordered materials and ensuring the project ran to budget.

Discovery Ranger, NSW National Parks and Wildlife Service 2003-current

Role consists of developing environmental interpretive tours throughout the Hunter and Central Coast region. Examples of tours include four wheel drive tag along tours, spotlighting and day walks.

MEMBERSHIPS & ACHIEVEMENTS:

- Bayer-UNEP Ecominds Delegate 2009 – participation in a forum in New Zealand on Sustainable Energy Supply solutions

Curriculum Vitae

JOEL STIBBARD

Field Ecologist

Newcastle, New South Wales

Masters of Environmental Management, University of Queensland, 2009 - Present

Bachelor of Science, University of Queensland, 2001 - 2004

AREAS OF EXPERTISE:

I have had over 5 years of ecological experience around the world in both aquatic and terrestrial environments. I have spent the last 12 months working as an ecologist in Queensland, focussing on botany, vegetation mapping and environmental legislation.

SELECTED PROJECT EXPERIENCE:

Resource Sector

Northern Energy Corporation: Elimatta Project – This project is located 30km west of Wandoan in Queensland and is the site of a large resource of thermal coal. I was involved in the ecological surveys, GIS work and flora and fauna assessment reporting of this project as part of the Environmental Impact Assessment process.

Hancock Coal Pty Ltd: Alpha Coal Project – The site of a well known thermal coal deposit in the Galilee Basin of Queensland, I was involved in terrestrial and aquatic flora and fauna surveys, habitat assessments and reporting.

Hancock Coal Pty Ltd: Kevins Corner Project – Situated to the north of the Alpha Coal Project, I was involved in flora and fauna surveys as well as ecological assessment reporting.

Perilya – Mount Oxide – A copper mine is to be developed on this site; 140km northwest of Mount Isa in Queensland. I was part of a four-man ecology team employed to investigate local flora and fauna as part of the Environmental Impact Assessment process

Ecological Sector

Kalahari Meerkat Project – This project was collaboratively run by the University of Cambridge in the UK and the University of Zurich in Switzerland. I was an ecological researcher on this project in the Northern Cape of South Africa for 1.5 years, assessing the behavioural and reproductive ecology of the Meerkat *Suricatta suricatta*.

Great Barrier Reef Monitoring Program – I was a Project Officer for Reef Check Australia in Townsville throughout 2009. I was primarily responsible for organising and implementing monitoring surveys, data collection and reporting to the Great Barrier Reef Marine Park Authority on the health of reefs across the entire GBR.

Meso-American Barrier Reef Monitoring Program – I was a volunteer surveyor for Global Vision International in the Yucatan Peninsula of Mexico during 2008, primarily involved in dive surveys, data collection and ecotourism as a part of a long-term monitoring program.

PREVIOUS EXPERIENCE:

Ecologist – Australasian Resource Consultants **1 year**

I was employed at AARC as an ecologist at the beginning of 2011. My role primarily involved ecological field surveys, EIA reporting and GIS mapping within a consultancy role that required initiative, efficiency and innovation. A valued member of the team, I left AARC to pursue a similar role with RPS in my hometown of Newcastle.

Lab Technician – Fisheries Resource Consultants **0.5 years**

My role in the laboratory for FRC in 2010 involved the sorting and identification of macro-invertebrates as an indication of aquatic waterway health. This was a casual position that ended upon gaining employment full-time at AARC.

Ecologist – Environmental, Ground & Water Consultants **0.5 years**

I was employed at EGC whilst completing my Masters at the University of Queensland in 2010. This was a project-based role on Curtis Island off of Gladstone in Central Queensland. My role involved ecological surveys, identification of fauna habitat and assessment reporting prior to the development of the QCG LNG plant on Curtis Island.

MEMBERSHIPS & ACHIEVEMENTS:

Deans' Commendation for High Achievement – University of Queensland (2009 -2010)

Appendix 4

Flora Species Identification Letter

The Royal
BOTANIC GARDENS
& Domain Trust

National Herbarium of New South Wales

ECEIVED
11 MAY 2012
BY: MMc

Mr Arne BISHOP
RPS Australia Asia Pacific P/L
PO Box428
(241 Denison St
Hamilton, NSW 2303
AUSTRALIA

Enquiry No: 17288
Botanical.Is@rbgsyd.nsw.gov.au
Fax No: (02) 9251 1952
Ph No: (02) 9231 8111
Date: 7 May 2012

Dear Mr BISHOP,

Thank you for your enquiry of 20-Apr-12. We are happy to provide the following information:

I have identified your plant specimen as *Galium leiocarpum* syn. *G. propinquum*. No doubt you were confused by the "hooked hairs" description to be found in the Flora. The hairs on this specimen are merely curved! New descritpions and better illustrations of these characters will appear on line soon.

An invoice for $44.00 (incl. GST) will be forwarded to you separately by our finance section to cover cost of identification.

Please send us the ABN for your company so we can process your invoice.

Thank you for your enquiry.

Yours sincerely

Barbara Wiecek
Identification Botanist
Botanical Information Service

Go to our online Botanical Information Services at plantnet.rbgsyd.nsw.gov.au to find out more about plants of New South Wales

NSW GOVERNMENT | Office of Environment & Heritage

The Botanical Information Email address is Botanical.Is@rbgsyd.nsw.gov.au
Mrs Macquaries Road Sydney NSW 2000 Australia • Telephone (02) 9231 8111 • Fax (02) 9251 1952

An estate of the Royal Botanic Gardens and Domain Trust, a statutory body within the Office of Environment and Heritage, Department of Premier and Cabinet.

Noise and Vibration
Impact Assessment
(SLR, 2012)

Springvale Colliery

Bore 8 Dewatering Facility

Noise and Vibration Impact Assessment

Report Number 630.10123.00320R1

22 August 2012

Springvale Coal Pty Ltd
PO Box 198
Wallerawang NSW 2845

Version: Revision 1

Springvale Colliery

Bore 8 Dewatering Facility

Noise and Vibration Impact Assessment

PREPARED BY:

SLR Consulting Australia Pty Ltd
ABN 29 001 584 612
Level 1, 14 Watt Street Newcastle NSW 2300 Australia

(PO Box 1768 Newcastle NSW 2300 Australia)
T: 61 2 4908 4500   F: 61 2 4908 4501
E: newcastleau@slrconsulting.com   www.slrconsulting.com

This report has been prepared by SLR Consulting Australia Pty Ltd with all reasonable skill, care and diligence, and taking account of the manpower and resources devoted to it by agreement with the Client. Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of Springvale Coal Pty Ltd. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR Consulting.

SLR Consulting disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

DOCUMENT CONTROL

Reference	Status	Date	Prepared	Checked	Authorised
630.10123.00320 R1	Revision 1	22 August 2012	Martin Davenport	John Cotterill	John Cotterill
630.10123.00320 R1	Revision 0	19 July 2012	Martin Davenport	John Cotterill	John Cotterill

Table of Contents

Table of Contents

TABLES

FIGURES

1 INTRODUCTION

SLR Consulting Australia Pty Ltd (SLR Consulting) has been commissioned by Springvale Coal Pty Ltd (Springvale Coal) to provide a Noise and Vibration Impact Assessment (NVIA) for the proposed installation of the Bore 8 dewatering facility associated with the Springvale Colliery. This report presents the results and findings of the NVIA.

The noise assessment has been prepared with reference to Australian Standard AS 1055:1997 *Description and Measurement of Environmental Noise* Parts 1, 2 and 3 and in accordance with the Environment Protection Authority (EPA) NSW Industrial Noise Policy (INP) (and associated Application Notes). Where issues relating to noise are not addressed in the INP, such as construction noise and road traffic noise, reference has been made to the Interim Construction Noise Guideline (ICNG) and NSW Road Noise Policy (RNP).

2 PROJECT DESCRIPTION

2.1 Bore 8

Springvale Colliery (Springvale) is an underground coal mine located within the NSW Western Coalfield, approximately 15 kilometres north-west of Lithgow.

Springvale seeks to modify development consent S91/06569/001 under section 75W of the *Environmental Planning and Assessment Act 1979* to allow for the construction and operation of the additional dewatering facility within the Newnes State Forest on the Newnes Plateau.

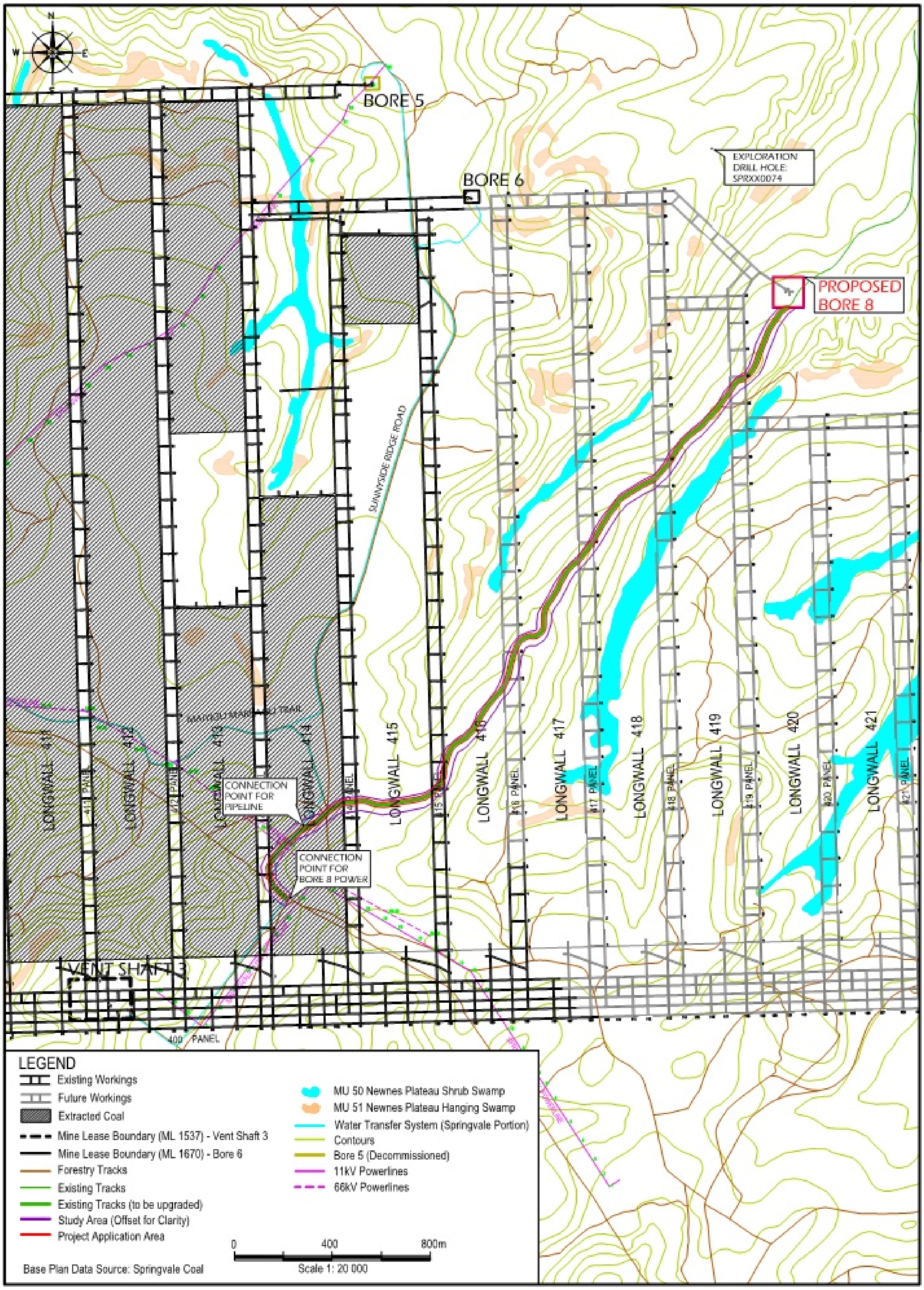
The proposed Bore 8 dewatering facility is required to facilitate the progress of mine workings further to the east of existing workings at Springvale, and need to be established ahead of the workings to ensure water levels in the mine can be safely kept at manageable levels. The bore will form a critical part of Springvale's existing dewatering system as longwall mining progresses. Water pumped out of the underground workings at Bore 8 will be transferred via predominantly underground pipelines to Wallerawang Power Station, as part of the existing Springvale - Delta Water Transfer Scheme (DWTS).

Bore 8 will be constructed as per Bore 6, the existing dewatering facility in use at Springvale Colliery, and will include the construction of a facility consisting of four dewatering boreholes each with a submersible pump. Establishment of access tracks and ancillary infrastructure corridor totalling 10 m wide will also be required, utilising existing tracks where possible. 11 kV powerlines and water pipelines will be buried in the infrastructure corridor alongside the access tracks. Following installation of the pipelines and powerlines, the infrastructure corridor will be rehabilitated leaving a 5 m wide track to Bore 8.

The final footprint of Bore 8 will be approximately 0.32 hectares (ha). However, an area of 0.77 ha will initially need to be cleared of vegetation and the area graded to form a level pad for construction of the boreholes, allowing for the movement of heavy vehicles and the installation of sumps to contain drilling fluids, as well as the storage of all required equipment and spares within the dewatering facility compound. Surface water controls will also need to be installed on the outside of this footprint, with construction disturbance therefore occurring within an area totalling 1.44 ha.

The Bore 8 Project Application area is illustrated in **Figure 1**.

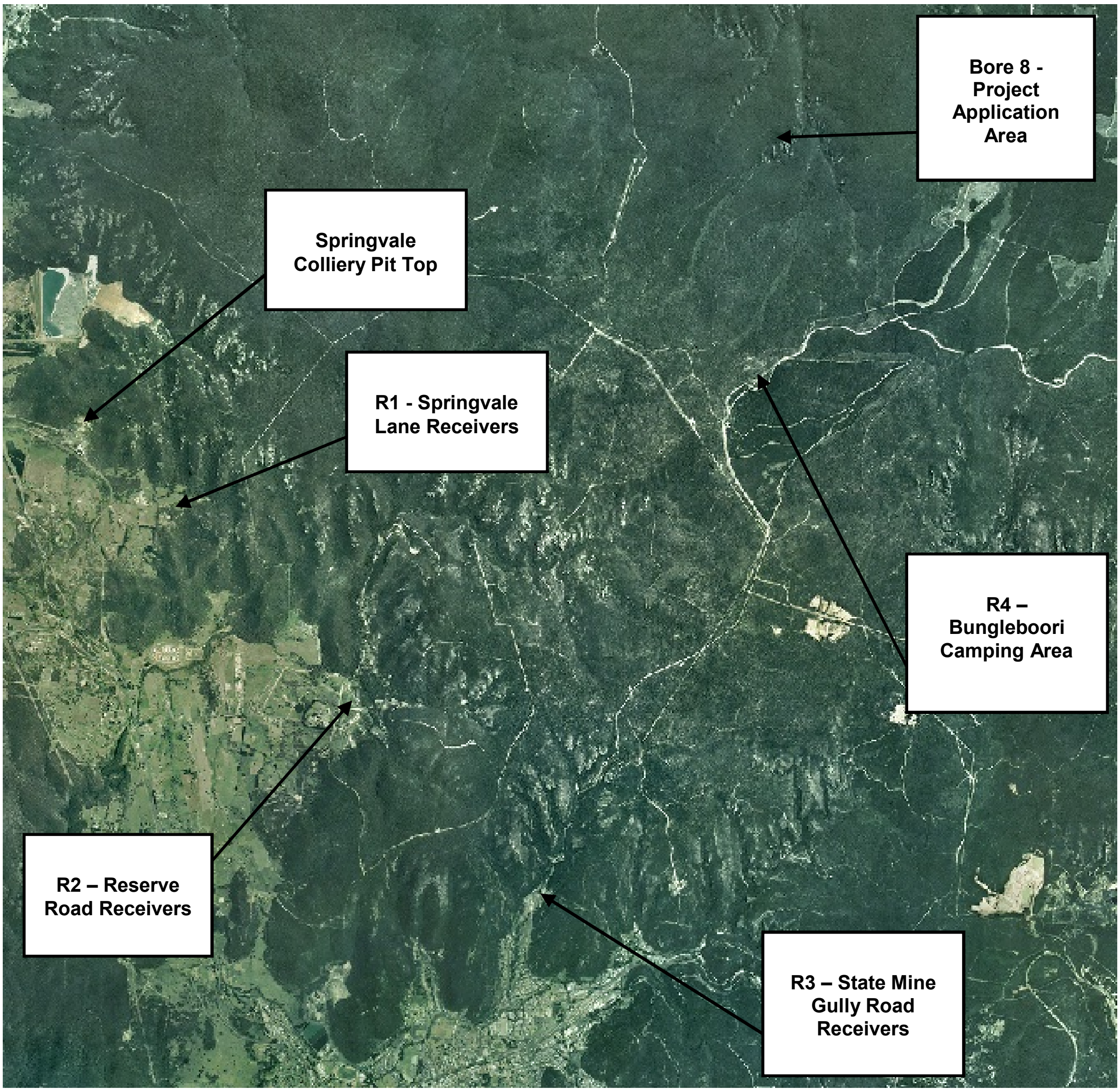
Figure 1 Project Application Area



2.2 Location of Project Receivers

The nearest residential receivers to the site are located approximately 9 km to 10 km to the south west off Spring Vale Lane, Reserve Road and State mine Gully Road. Also approximately 3.6 km south of Bore 8 within the Newness State Forest is the Bungleboori camping area. The locations of sensitive receiver areas located in the vicinity of the Project Application Area are shown in **Figure 2**.

Figure 2 Project Locality Map



Within the project area the Newness State forest is used for recreational purposes other than camping such as walking, picnicking, mountain bike riding, trail bike riding and four wheel drive touring. Therefore it should be noted that any of the roads or tracks surrounding the Project Area could potentially be utilised for recreational purposes.

3 EXISTING CONSENT CONDITIONS

Development Consent S91/06569/001 does not contain any consent conditions with regard to noise emissions from Springvale Colliery operations at surrounding residential receivers. Notwithstanding the above, noise emissions from the operation of the proposed Bore 8 dewatering facility have been assessed in **Section 7** of this report.

4 METEOROLOGY - INP ASSESSMENT OF PREVAILING WEATHER CONDITIONS

4.1 Wind

Wind has the potential to increase noise at a receiver when it is light and stable and blows from the direction of the source of the noise. As the strength of the wind increases the noise produced by the wind will obscure noise from most industrial and transport sources.

Wind effects need to be considered when wind is a feature of the area under consideration (in accordance with the INP). Where wind blows from the source to the receiver at speeds up to 3 m/s for more than 30% of the time in any season, then wind is considered to be a feature of the area and noise level predictions must be made under these conditions.

Synthetically generated meteorological data has been produced for the site using the CALMET meteorological model as part of the Springvale Air Quality and Greenhouse Gas Assessment (refer SLR Consulting report *630.10123.00330-R1 Springvale Bores Air Quality Impact Assessment & Greenhouse Gas Assessment*). The modelling process has provided a meteorological dataset for the 2008 calendar years, over the Bore 8 Project Application Area.

Wind speed and direction data produced by the CALMET run for the 2008 calendar year was analysed to determine the frequency of occurrence of winds up to speeds of 3 m/s for daytime, evening and night in each season. A summary of the most frequently occurring winds is contained within **Table 1**, **Table 2** and **Table 3**.

The percentage occurrence figures provided in bold are those that exceed the 30% threshold.

Table 1 Seasonal Frequency of Occurrence of Wind Speed Intervals – Daytime

Period	Calm	Wind Direction	0.5 to 2 m/s	2 to 3 m/s	0.5 to 3 m/s
Summer	0.4%	ENE±45	2.7%	7.5%	10.2%
Autumn	1.9%	NE±45	5.6%	6.5%	12.1%
Winter	0.8%	W±45	3.6%	7.3%	10.8%
Spring	0.9%	NNE±45	3.9%	6.1%	10.0%

Table 2 Seasonal Frequency of Occurrence of Wind Speed Intervals – Evening

Period	Calm	Wind Direction	0.5 to 2 m/s	2 to 3 m/s	0.5 to 3 m/s
Summer	1.1%	ESE±45	5.2%	20.0%	25.2%
Autumn	2.5%	ESE±45	7.2%	16.5%	23.7%
Winter	1.6%	WSW±45	3.4%	11.9%	15.3%
Spring	1.4%	E±45	4.3%	15.2%	19.4%

Table 3 Seasonal Frequency of Occurrence of Wind Speed Intervals – Night

Period	Calm	Wind Direction	0.5 to 2 m/s	2 to 3 m/s	0.5 to 3 m/s
Summer	3.5%	ESE±45	11.8%	15.8%	27.6%
Autumn	2.4%	SSW±45	21.3%	14.6%	**35.9%**
Winter	2.1%	SW±45	9.5%	13.4%	22.9%
Spring	1.5%	WSW±45	7.0%	12.1%	19.1%

Seasonal wind records indicate that winds are a feature of the area during the night-time period as they exceed the 30% threshold. Therefore, winds during the night-time have been considered as part of this assessment.

4.2 Temperature Inversion

Temperature inversions, when they occur, have the ability to increase noise levels by focusing sound waves. Temperature inversions occur predominantly at night during the winter months.

The INP Section 5.2, Temperature Inversions, states:

> *"Assessment of impacts is confined to the night noise assessment period (10.00 pm to 7.00 am), as this is the time likely to have the greatest impact - that is, when temperature inversions usually occur and disturbance to sleep is possible."*
>
> *"Where inversion conditions are predicted for at least 30% (or approximately two nights per week) of total night-time in winter, then inversion effects are considered to be significant and should be taken into account in the noise assessment".*

An assessment of atmospheric stability conditions has also been prepared from the meteorological data set described above. The annualised night-time frequency of occurrence of atmospheric stability classes are presented in **Table 4**, together with estimated Environmental Lapse Rates (ELR).

Table 4 Winter Night-time Atmospheric Stability Frequency of Occurrence

Stability Class	Occurrence Percentage Night-time	Estimated ELR[1] °C/100 m	Qualitative Description
A	0.0%	<-1.9	Lapse
B	0.0%	-1.9 to-1.7	Lapse
C	1.8%	-1.7 to-1.5	Lapse
D	39.0%	-1.5 to-0.5	Neutral
E	19.9%	-0.5 to 1.5	Weak Inversion
F	39.3%	1.5 to 4.0	Moderate Inversion
G	0.0%	>4.0	Strong Inversion

[1] ELR (Environmental Lapse Rate).

In accordance with the INP the frequency of occurrence of moderate or F Class (ie 1.5 °C/100 m up to 4.0°C/100 m) temperature inversions is greater than 30% during the winter night-time period and therefore this weather condition is included in the assessment.

5 NOISE MODELLING METHODOLOGY

A computer model was used to predict noise emissions from the operation and construction of the Bore 8 dewatering facility. The operational noise modelling was undertaken using SoundPLAN v7.0 software, developed by Braunstein and Berndt Gmbh in Germany. A three-dimensional digital terrain map giving all relevant topographic information was used in the modelling process. The model used this map, together with noise source data, ground cover, shielding by barriers and/or adjacent buildings and atmospheric information to predict noise levels at the nearest potentially affected receivers.

Topographic contours and drawings of the proposed modification site were supplied by Springvale Coal for the purpose of modelling noise from the proposed construction and operation of Bore 8. Prediction of noise under calm and prevailing atmospheric conditions was conducted. Atmospheric parameters under which noise predictions were made are given in **Table 5**.

Table 5 Meteorological Parameters for Noise Predictions

	Temperature	Humidity	Wind Speed	Wind Direction	Temperature Inversion
Calm (All periods)	20^{o}C	65%	N/A	N/A	N/A
Easterly Winds (Night-time)	10^{o}C	85%	3 m/s	S, SSW, SW	N/A
Inversion (Night-time)	10^{o}C	85%	N/A	N/A	F Class

6 CONSTRUCTION NOISE ASSESSMENT

Construction is estimated to take approximately six (6) months consisting of one (1) month to construct the pad, three (3) months to construct the boreholes and two (2) months for the installation and commission of Bore 8. Three (3) construction scenarios have been modelled for the project and are provided in **Table 6**.

Table 6 Construction Noise Modelling Scenarios

Scenario	Description	Proposed construction hours
Scenario 1	Establishment of access roads and ancillary infrastructure corridors. Formation a level pad for the construction of the bores including the clearing of vegetation and earthworks.	Monday to Friday 7am to 6pm Saturday 8am to 1pm No work Sundays or public holidays
Scenario 2	Drilling four (4) dewatering boreholes at Bore 8.	24 hours per day, 7 days per week.
Scenario 3	Civil works for the construction and commissioning of infrastructure at Bore 8	Monday to Friday 7am to 6pm Saturday 8am to 1pm No work Sundays or public holidays

Equipment in operation for each scenario is provided in **Table 7**. Equipment considered in operation is marked with a 'tick' (✓) and those not considered to be in operation are marked with a 'cross' (×). Where a 'tick' or 'cross' are separated by a slash indicates whether the selected equipment is operational during the day, evening period and night-time period respectively. For instance ✓/✓/× would indicate that the equipment is operational during the day and evening periods but not during the night-time period.

Table 7 Construction Equipment Considered

Equipment	Considered Onsite Activity		
	Scenario 1	**Scenario 2**	**Scenario 3**
Dozer	✓/×/×	×/×/×	×/×/×
Compactor	✓/×/×	×/×/×	×/×/×
Excavator	✓/×/×	×/×/×	×/×/×
Grader	✓/×/×	×/×/×	×/×/×
Water Cart	✓/×/×	✓/✓/✓	✓/×/×
Truck	✓/×/×	✓/✓/✓	✓/×/×
All Terrain Forklift	×/×/×	✓/✓/✓	✓/×/×
Drill Rig	×/×/×	✓/✓/✓	×/×/×
Generator	×/×/×	✓/✓/✓	✓/×/×
Compressor	×/×/×	✓/✓/✓	✓/×/×
Mud Pump	×/×/×	✓/✓/✓	×/×/×
Transit Mixer	×/×/×	×/×/×	✓/×/×
Crane	×/×/×	×/×/×	✓/×/×
Hand Tools (Grinder)	×/×/×	✓/✓/✓	✓/×/×
Hammering	×/×/×	✓/✓/✓	✓/×/×

Construction noise modelling has assumed that all the plant and equipment detailed in **Table 7** are operating simultaneously for a 15 minute period. As such, this provides a conservative assessment approach; actual noise levels are likely to be lower than predicted for much of the time. It should also be noted that only works associated with the drilling of the dewatering bores will be conducted outside of the ICNG recommended construction hours of 7:00 am to 6:00 pm Monday to Friday, 8:00am to 1:00 pm on Saturdays with no construction work on Sundays or public holidays.

Construction noise modelling has been carried out under the meteorological parameters identified in **Table 5**.

6.1 Sound Power Levels

The Sound Power Levels (SWL's) of the proposed construction plant and equipment have been obtained from a SLR Consulting database of similar plant and equipment and are provided in **Table 8**. Details of these levels are given in **Appendix A**.

Table 8 Construction Plant Sound Power Levels

Equipment	L_{Aeq} Sound Power Level (dBA)
Dozer	118
Compactor	110
Excavator	113
Grader	113
Water Cart	105
Truck	102
All Terrain Forklift	107
Drill Rig	104
Generator	95
Compressor	89
Mud Pump	99
Transit Mixer	109
Crane	106
Hand Tools (Grinder)	104
Hammering	98

6.2 Construction Noise Assessment Criteria

The ICNG sets out noise management levels, in relation to construction type activities, for residential and other sensitive receivers and how they are to be applied. A summary of the noise management levels from the ICNG is contained in **Table 9** and **Table 10**.

Table 9 Interim Construction Noise Guideline (Residences)

Time of day	Management level LAeq(15minute)	How to apply
Recommended standard hours Monday to Friday 7am to 6pm Saturday 8am to 1pm No work Sundays or public holidays	Noise affected RBL[1] + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. • Where the predicted or measured LAeq (15 min) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. • The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75 dBA	The highly noise affected level represents the point above which there may be strong community reaction to noise. • Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: 1. times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences. 2. if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise affected RBL[1] + 5 dB	A strong justification would typically be required for works outside the recommended standard hours. • The proponent should apply all feasible and reasonable work practices to meet the noise affected level. • Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community.

[1]Rating Background Level as described by the NSW INP

Table 10 Interim Construction Noise Guideline at Sensitive Land Uses (other than residences)

Land Use	Management Level, LAeq(15minute) (applies when properties are being used)
Classrooms at schools and other educational institutions	Internal noise level 45 dBA
Hospital wards and operating theatres	Internal noise level 45 dBA
Places of worship	Internal noise level 45 dBA
Active recreation areas[1]	External noise level 65 dBA
Passive recreation areas[2]	External noise level 60 dBA
Community Centres	Depends on the intended use of the centre Refer to the recommended ‘maximum’ internal levels in AS2107 for specific uses.

1. Characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion.
2. Characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, for example, reading, meditation.

In the absence of background noise monitoring at the nearest sensitive receivers, a Rating Background Level (RBL) of 30 dBA has been adopted at the nearest potentially affected residences during the daytime, evening and night-time periods.

The INP provides detailed methodology to determine the RBL and in cases where the RBL is found to be less than 30 dBA states the following:

> *Where the rating background level is found to be less than 30 dB(A), then it is set to 30 dB(A).*

Therefore the use of an RBL of 30 dBA will result in conservative intrusive noise criteria for the development.

The project specific construction noise goals, presented in **Table 11** are applicable for the Project.

Table 11 Project Specific Construction Noise Goals

Receiver Location	Period	**Construction Noise Goal $L_{Aeq(15minute)}$**	
		Noise Affected	**Highly Noise Affected**
R1, R2, R3	Recommended standard hours	40 dBA	75 dBA
	Outside recommended standard hours	35 dBA	
R4	When in Use	60 dBA	

6.3 Construction Noise Assessment

The predicted intrusive $L_{Aeq(15\ minute)}$ construction noise level for each construction scenario at the nearest potentially affected receivers are presented in **Table 12** to **Table 14** together with the construction noise goals.

Table 12 Scenario 1 - Predicted Construction Noise Levels

Location	**Period**	**Predicted Noise Level $L_{Aeq(15minute)}$ (dBA)**			**Construction Noise Goal $L_{Aeq(15minute)}$**	
		Calm	**Prevailing Wind**	**Temperature Inversion**	**Noise Affected**	**Highly Noise Affected**
R1	Day	<20	N/A	N/A	40	75
R2		<20			40	75
R3		<20			40	75
R4		<20			60	

Table 13 Scenario 2 - Predicted Construction Noise Levels

Location	Period	Predicted Noise Level $L_{Aeq(15minute)}$ (dBA)			Construction Noise Goal $L_{Aeq(15minute)}$	
		Calm	Prevailing Wind	Temperature Inversion	Noise Affected	Highly Noise Affected
R1	Day	<20	N/A	N/A	40	75
	Evening	<20	N/A	N/A	35	N/A
	Night	<20	<20	<20	35	N/A
R2	Day	<20	N/A	N/A	40	75
	Evening	<20	N/A	N/A	35	N/A
	Night	<20	<20	<20	35	N/A
R3	Day	<20	N/A	N/A	40	75
	Evening	<20	N/A	N/A	35	N/A
	Night	<20	<20	<20	35	N/A
R4	Day	<20	N/A	N/A	60	
	Evening	<20	N/A	N/A	60	
	Night	<20	<20	<20	60	

Table 14 Scenario 3 - Predicted Construction Noise Levels

Location	Period	Predicted Noise Level $L_{Aeq(15minute)}$ (dBA)			Construction Noise Goal $L_{Aeq(15minute)}$	
		Calm	Prevailing Wind	Temperature Inversion	Noise Affected	Highly Noise Affected
R1	Day	<20	N/A	N/A	40	75
R2		<20			40	75
R3		<20			40	75
R4		<20			60	

As indicated in **Table 12** to **Table 14** the predicted construction noise levels are significantly below the respective construction noise goals at the nearest potentially affected receivers and any potential construction noise impacts are negligible.

7 OPERATIONAL NOISE ASSESSMENT

As outlined in **Section 2.1** the Bore 8 dewatering facility will form a critical part of Springvale's existing dewatering system as longwall mining progresses.

Four (4) submersible pumps along with two (2) 11kV to 3.3 kV transformers and ancillary equipment such as a high voltage switch room and control equipment will be located at the Bore 8 dewatering facility.

The SWL of the plant and equipment proposed for use at Bore 8 is provided in **Table 15**. Details of these levels are given in **Appendix A.**

Table 15 Bore 8 Plant and Equipment Sound Power Levels

Equipment	L_{Aeq} Sound Power Level (dBA)
Submersible pump (each)	93
11kV to 3.3kV transformer (ODAF[1])	83
High Voltage switching and control equipment	77

[1] ODAF – Oil Directed Air Forced (high noise level operational mode only used during periods of high load under high ambient air temperatures)

In order to provide a conservative prediction of noise levels from the operation of Bore 8 it has been assumed that all operational equipment is operating simultaneously with no attenuation from equipment enclosures. Operational noise modelling has been carried out under the meteorological parameters identified in **Table 5**. Predicted noise levels from the operation of Bore 8 at the nearest residential receivers is provided in **Table 16**.

Table 16 Bore 8 - Predicted Operational Noise Level

Location	Period	Predicted Noise Level $L_{Aeq(15minute)}$ (dBA)		
		Calm	Prevailing Wind	Temperature Inversion
R1	Day	<20	N/A	N/A
	Evening	<20	N/A	N/A
	Night	<20	<20	<20
R2	Day	<20	N/A	N/A
	Evening	<20	N/A	N/A
	Night	<20	<20	<20
R3	Day	<20	N/A	N/A
	Evening	<20	N/A	N/A
	Night	<20	<20	<20
R4	Day	<20	N/A	N/A
	Evening	<20	N/A	N/A
	Night	<20	<20	<20

As can be seen the noise level from operation of Bore 8 is negligible at all nearest noise sensitive receivers. Such a noise level is highly likely to be inaudible at all receivers and would have a negligible impact on cumulative industrial noise levels at these locations.

8 TRAFFIC NOISE ASSESSMENT

8.1 Transport and Personnel Movements

Access to the site by heavy vehicles will be via the Old Bells Line of Road at the Zig Zag Railway, Clarence. It is proposed that light vehicles will access the site either by the Old Bells Line of Road from Clarence or via the State Mine Gully Road from Lithgow. Both routes then converge with final access to the site off Blackfellows Hand Road on the Newnes State Forest.

There will be an increase in traffic (along public roads and Forest NSW tracks) and personnel during the six (6) months (approximately) of construction. Outside of this period traffic and personnel movements associated with the dewatering sites are minimal with the occasional light vehicle trip required for maintenance and inspection purposes only.

During the construction phase of the modification, it is envisioned that no more than eight (8) people (assumed 16 return vehicle trips) will be present on site. On occasion, this may peak higher with the requirements for crane operators, concrete truck deliveries, etc.

8.2 Road Traffic Noise Criteria

The RNP presents guidelines for road traffic noise assessment. The policy document provides road traffic noise criteria for proposed road, residential and industrial developments, as well as criteria for other sensitive land uses.

Table 17 presents the most relevant RNP criteria for the proposed construction activities that have the potential to increase road traffic noise levels.

Table 17 Road Traffic Noise Assessment Criteria for Residential Land Uses

Road Category	Type of Project/Land Use	Assessment Criteria (dBA)	
		Day (7am to 10pm)	Night (10pm to 7am)
Local Roads	Existing residences affected by additional traffic on existing local roads generated by land use developments	$L_{Aeq(1hour)}$ 55 dBA (external)	$L_{Aeq(1hour)}$ 50 dBA(external)

8.3 Road Traffic Noise Assessment

8.3.1 Construction

Old Bells Line of Road

Based upon the expected road traffic movements presented in **Section 8.1** it has been assumed that eight (8) light vehicle movements and two (2) heavy vehicle movements may occur on the Old Bells Line of Road during a "worst case" hourly period. Typical L_{Amax} passby noise levels of heavy and light vehicles were used to predict road traffic noise levels from the roadway.

The calculated $L_{Aeq(1hour)}$ noise level at the nearest receiver (approximately 100m from the Old Bells Line of Road) is 38 dBA. This is significantly below the numerical criteria detailed in the RNP.

State Mine Gully Road

Based upon the expected road traffic movements presented in **Section 8.1** it has been assumed that eight (8) light vehicle movements may occur on the State Mine Gully Road and associated local roads in Lithgow during a "worst case" hourly period. Typical L_{Amax} passby noise levels of light vehicles were used to predict road traffic noise levels from the roadway.

The calculated $L_{Aeq(1hour)}$ noise level at the nearest roadside receivers (assumed to be approximately 5m from the edge of the road) is 44 dBA. This is significantly below the numerical criteria detailed in the RNP.

8.3.2 Operation

Traffic movements associated with the Bore 8 dewatering site will be minimal with the occasional light vehicle trip required for maintenance and inspection purposes and as such there will not be any significant road traffic noise associated with the operation of the Bore 8 dewatering facility.

9 VIBRATION ASSESSMENT

The main vibration generating activities will occur during the construction phase of the modification including the operation of mobile earthmoving equipment such as dozers, excavators, graders, compactors and trucks. Given the minimum separation distance of approximately 9 km between Bore 8 construction activities and the nearest potentially affected residential locations vibration levels from these activities is predicted to be negligible and below levels of human perception at the nearest residential receivers.

10 CONCLUSIONS

SLR Consulting has prepared a NVIA for the proposed construction and operation of the Bore 8 dewatering facility associated with the Springvale Colliery. The objectives of the NVIA were to identify the potential impacts of noise and vibration due to the construction and operation of Bore 8 at the nearest noise sensitive receivers.

Noise modelling has indicated that the noise emissions from the construction and operation of the Bore 8 dewatering facility would have a negligible impact at the nearest noise sensitive receivers.

Traffic generated by the construction of and operation of the Bore 8 dewatering facility is predicted to be within the NSW RNP criteria at all receiver locations.

Vibration levels from the construction and operation of the Bore 8 dewatering facility is predicted to be negligible and significantly below levels of human perception at the nearest residential receivers.

Equipment Sound Power Levels

Equipment Description	Octave Band Centre Frequency (Hz) – dB re 1pW										dB	dBA
	31.5	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	**16000**		
Construction Equipment												
Dozer	111	112	109	113	116	113	111	108	98		121	118
Compactor	99	104	109	112	107	105	102	96	90		116	110
Excavator	112	105	116	108	111	107	105	100	93		119	113
Grader	97	100	109	104	108	109	106	103	103	103	116	113
Water Cart	105	105	102	104	101	99	98	91	86	86	111	105
Truck	96	104	106	99	100	98	92	85	77	77	110	102
All Terrain Forklift	101	102	113	107	105	101	98	90	84	84	115	107
Drill Rig	97	108	102	102	100	100	98	92	82	71	111	104
Generator	105	100	95	90	91	86	91	73	69	59	107	95
Compressor	93	90	87	89	85	83	79	70	65	60	97	88
Mud Pump	70	81	91	96	93	96	92	83	75	67	101	99
Transit Mixer	105	112	107	109	104	104	101	97	88		116	109
Crane	104	112	106	102	102	101	97	97	77		114	106
Hand tools (grinder)	63	67	65	67	75	84	95	100	100	95	104	104
Hammering	108	107	87	93	89	94	93	88	94	79	111	98
Submersible pump (each)	94	75	85	90	87	90	86	77	69	61	95	93
Transformer ODAF	81	88	95	86	77	74	70	65	61	61	96	83
Control equipment	75	82	89	80	71	68	64	59	55	55	90	77

Cultural Heritage Assessment
(RPS, 2012)

Appendix - J

Aboriginal Cultural Heritage Assessment

Springvale Mine Dewatering Bore 8

Lithgow Local Government Area

Prepared by:

RPS
241 Denison St
Broadmeadow NSW 2292
PO Box 428, HAMILTON 2303
T: +61 2 4940 4200
F: +61 2 4961 6794
E: newcastle@rpsgroup.com.au
W: rpsgroup.com.au

Report No: 110382
Version/Date: Final, July 2012

Prepared for:

Springvale Coal Pty Limited

Castlereagh Highway
LIDSDALE NSW 2790

Document Status

Version	Purpose of Document	Orig	Review	Review Date
Draft A	Draft for client comments	DF	SW	2/4/2012
Rev 0	Draft for Aboriginal Community Stakeholders incorporating client comments	DF	DR	30/5/2012
Final	Final version incorporating Aboriginal community Stakeholders' comments.	DF	DR	11/07/2012

Approval for Issue

Name	Date
T.Boer-Mah	13/7/2012

Executive Summary

RPS has been engaged by Springvale Coal Pty Limited, to prepare an Aboriginal Cultural Heritage Assessment (ACHA) for the construction of Dewatering Bore 8 at Springvale Mine. Springvale Coal Pty Limited is the proponent of this project. The study area, located at Springvale within the Lithgow Local Government Area (LGA), falls within the existing Springvale mining lease and is located entirely within the Newnes State Forest.

Springvale seeks to modify development consent S91/06569/001 under section 75W of the *Environmental Planning and Assessment Act 1979* to allow for the construction and operation of an additional dewatering facility (Bore 8) within the Newnes State Forest on the Newnes Plateau. No further changes to the operations at Springvale are proposed. No changes are proposed to the mining method, mine layout, life of consent, operating hours, workforce, management of rejects and tailings, or coal production, handling and transport. These aspects will not be altered and will remain as approved by development consent S91/06569/001, as modified.

A search of the AHIMS register was conducted on 21 July 2011 for a 5 km radius centred over the study area. The results showed a total of 41 sites within that search radius. The most common site types within the local landscape are shelters with deposit (51.21%), followed by artefact scatters (17.07%) and shelters with art (12.20%). There are no sites recorded within the immediate vicinity of the study area, with the closest site located approximately 500 m to the west of the study area.

On 12 January 2012 a site inspection was conducted over the entirety of the study area by Deborah Farina, archaeologist of RPS in conjunction with Aboriginal community stakeholders. No Aboriginal sites were identified.

As a result of a desktop assessment comprising a review of local archaeological studies, a search of the AHIMS register and the site inspection, there are no constraints to the project in respect of Aboriginal heritage. Accordingly, the following general recommendations are made:

Recommendation 1

No Aboriginal objects or places have been identified within the study area and therefore an Aboriginal Impact Permit (AHIP) is not required for the proposed activity.

Recommendation 2

All relevant Springvale Coal Pty Limited staff, contractors, subcontractors and consultants should be made aware of their statutory obligations for heritage under NSW *National Parks & Wildlife Act 1974* and the NSW *Heritage Act 1977*, which may be implemented as a heritage induction.

Recommendation 3

If during the proposed works further Aboriginal sites are identified in the study area, then all works in the area should cease, the area cordoned off and contact made with the Office of Environment and Heritage (OEH) Enviroline 131 555. A suitably qualified archaeologist and the relevant Aboriginal stakeholders should be subsequently engaged, so that the Aboriginal sites can be adequately assessed and managed.

Recommendation 4

In the unlikely event that skeletal remains are identified within the study area, work must cease immediately in the vicinity of the remains and the area cordoned off. The proponent will need to contact the NSW Police Coroner to determine if the material is of Aboriginal origin. If determined to be Aboriginal, the proponent, must contact the OEH Enviroline 131 555, and subsequently engage a suitably qualified archaeologist and representatives of the local Aboriginal Community Stakeholders to determine an action plan for the management of the skeletal remains, formulate management recommendations and to ascertain when work can recommence.

Recommendation 5

If, during the course of the project, suspected European cultural heritage material is uncovered, work should cease in that area immediately. The Heritage Branch of OEH should be notified, and works should only recommence when an appropriate and approved management strategy has been instigated, and the relevant consents/permits are in place.

Contents

Figures

Tables

Plates

Appendices

1 Introduction

RPS has been engaged by Springvale Coal Pty Limited to prepare a Cultural Heritage Impact Assessment (CHIA) for the construction of dewatering bore 8 at Springvale Mine and an associate access track.

This report has considered the environmental and archaeological context of the study area and developed a predictive model of archaeological sites. It also reports on the results of an archaeological survey of the study area, provided an assessment of archaeological significance for Aboriginal heritage, as well as providing management recommendations which address potential impacts of the proposed works. This report has been prepared in accordance with the relevant legislation and regulations, including the *Code of Practice for Archaeological Investigation of Aboriginal Objects* in New South Wales (Department of Environment Climate Change & Water, 2010b).

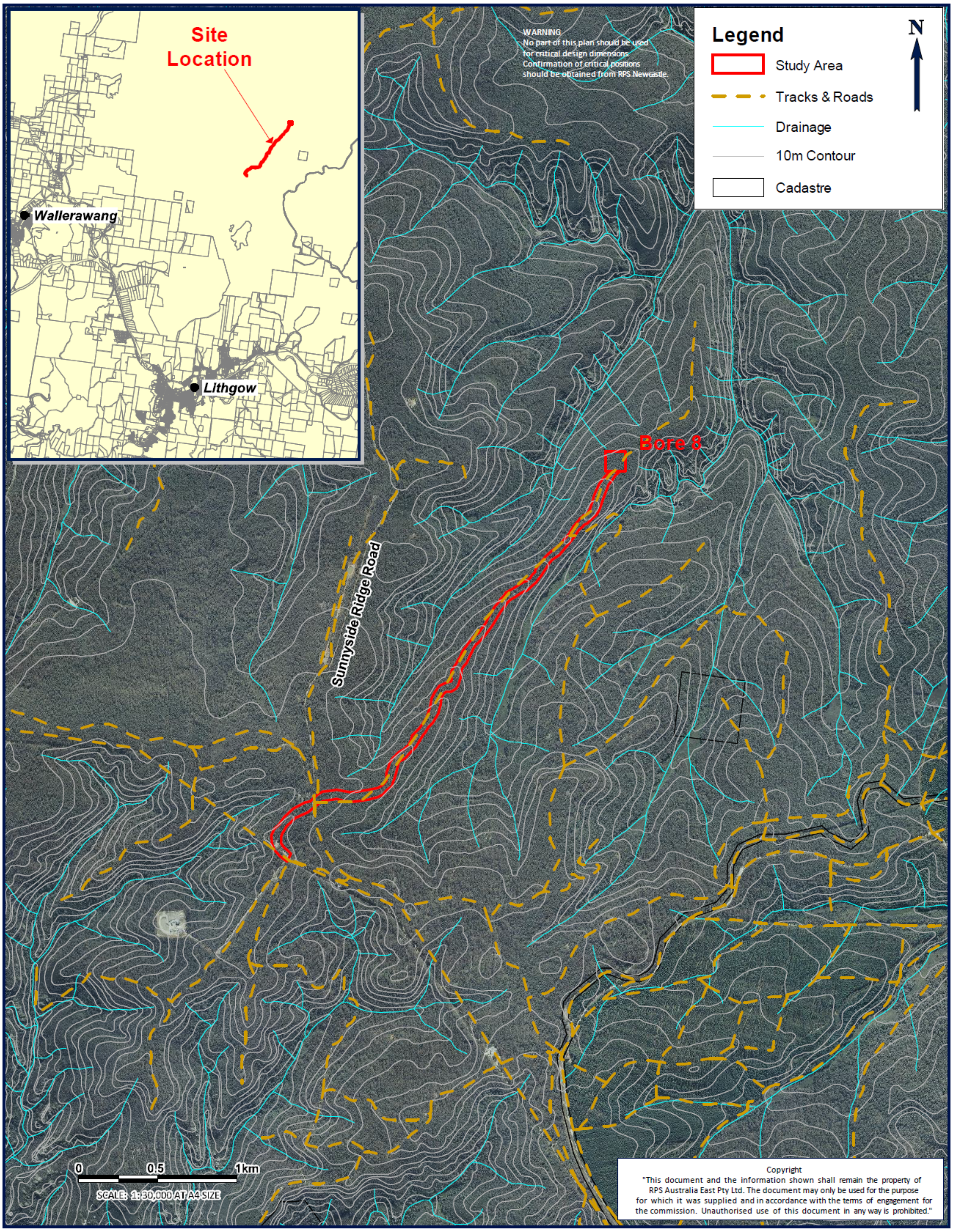
1.1 Background

Springvale seeks to modify development consent S91/06569/001 under section 75W of the *Environmental Planning and Assessment Act 1979* to allow for the construction and operation of an additional dewatering facility (Bore 8) within the Newnes State Forest on the Newnes Plateau. No further changes to the operations at Springvale are proposed. No changes are proposed to the mining method, mine layout, life of consent, operating hours, workforce, management of rejects and tailings, or coal production, handling and transport. These aspects will not be altered and will remain as approved by development consent S91/06569/001, as modified.

The final footprint of Bore 8 will be approximately 0.32 hectares (ha). However, a construction footprint of 0.77 ha will initially need to be cleared of vegetation to allow sufficient room for the movement of heavy vehicles and the installation of sumps to contain drilling fluids, as well as the storage of all required equipment and spares within the dewatering facility compound. Surface water controls will also need to be installed on the outside of this footprint, with disturbance therefore occurring within an area totalling 1.44 ha (120 m x 120 m). In addition, a trench will be excavated along the existing access track leading to the proposed bore location to accommodate the required powerlines and water pipelines. The access track will also need to be augmented to accommodate safe access for large construction and maintenance equipment.

1.2 The Study Area

The study area is located at Springvale within the Lithgow Local Government Area (LGA). The borehole locations are on the eastern side of Sunnyside Ridge Road on the Newnes Plateau, within the Newnes State Forest and entirely within the Springvale mining lease (see Figure 1-1). The study area for the project encompasses the construction footprint for Bore 8 (1.44 ha), along with an additional approximate 30 m on each side of the existing track to be upgraded to provide a suitable access track and services corridor to the dewatering facility. This larger area was surveyed to ensure all land that has the potential to be impacted by the project both directly and indirectly was surveyed.



TITLE: FIGURE 1-1: STUDY AREA

LOCATION: NEWNES PLATEAU

DATUM: (GDA 94)
PROJECTION: MGA ZONE 56

DATE: 12/07/2012
PURPOSE: HERITAGE

LAYOUT REF: J:\JOBS\Centennial\All Jobs\110382 Springval Dewatering Bores 7&8\10. Drafting\MapInfo Workspaces\Arch
VERSION (PLAN BY):D A4 (DF-NW)

CLIENT: SPRINGVALE COAL PTY LTD
JOB REF: 110382

RPS AUSTRALIA EAST PTY LTD (ABN 44 140 292 762)
241 DENISON STREET BROADMEADOW PO BOX 428 HAMILTON NSW 2303
T: 02 4940 4200 F: 02 4961 6794 www.rpsgroup.com.au

RPS

Figure 1-1: Study Area

1.3 Legislative Context

The following overview of the legal framework is provided solely for information purposes for the client, it should not be interpreted as legal advice. RPS will not be liable for any actions taken by any person, body or group as a result of this general overview, and recommend that specific legal advice be obtained from a qualified legal practitioner prior to any action being taken as a result of the summary below.

Aboriginal heritage (places, sites and objects) in NSW are protected by the *National Parks and Wildlife Act 1974*, which is overseen by the Office of Environment and Heritage (formerly Department of Environment, Climate Change and Water (DECCW)), now a part of the Department of Premier and Cabinet. In some cases, Aboriginal heritage may also be protected under the *Heritage Act 1977*, which is also overseen by the Office of Environment and Heritage (formerly the Heritage Branch of the Department of Planning). The *Environmental Planning and Assessment Act 1979*, overseen by the Department of Planning and Infrastructure, along with other environmental planning instruments, trigger the requirement for the investigation and assessment of Aboriginal heritage as part of the development approval process. For crown land, provisions under the *Aboriginal Land Rights Act 1983* and the *Native Title Act 1993* (overseen by the Office of the Registrar of the Aboriginal Land Rights Act 1983) may also apply.

1.3.1 National Parks and Wildlife Act 1974 (NPW Act)

The NSW Government is working towards stand alone legislation to protect Aboriginal cultural heritage which will be a significant reform for NSW. The first stage of this work has been completed and includes significant changes in relation to the regulation of Aboriginal cultural heritage management. The primary state legislation relating to Aboriginal cultural heritage in NSW is the *National Parks and Wildlife Act 1974* (NPW Act). The legislation is now overseen by the Office of Environment and Heritage (OEH) (formerly DECCW) as part of the NSW Department of Premier and Cabinet.

Changes to the NPW Act were made effective on 1 October 2010 and include:

- increased penalties for Aboriginal heritage offences, in some cases from $22,000 up to $1.1 million in the case of companies who do not comply with the legislation;
- prevention of companies or individuals claiming ‘no knowledge’ in cases of serious harm to Aboriginal heritage places and objects by creating new strict liability offences under the Act;
- introduction of remediation provisions to ensure people who illegally harm significant Aboriginal sites are forced to repair the damage, without need for a court order; and
- unification of Aboriginal heritage permits into a single, more flexible permit; and
- strengthened offences around breaches of Aboriginal heritage permit conditions.

1.3.2 Heritage Act 1977

Historical archaeological relics, buildings, structures, archaeological deposits and features are protected under the *Heritage Act 1977* and may be identified on the State Heritage Register (SHR) of New South Wales or by an active Interim Heritage Order (IHO). Certain types of historic Aboriginal sites may be listed on the SHR or subject to an active IHO; in such cases they would be protected under the *Heritage Act 1977* and may require approvals or excavation permits from the Heritage Branch, OEH.

1.3.3 Environmental Planning & Assessment Act 1979 (EP&A Act)

This Act regulates a system of environmental planning and assessment for NSW. Land use planning requires that environmental impacts are considered, including the impact on cultural heritage and specifically Aboriginal heritage. Assessment documents prepared to meet the requirements of the EP&A Act 1979 include Reviews of Environmental Factors (REF) and Environmental Impact Statements (EIS). These documents are required to assess impacts of activities on Aboriginal heritage. Local Environment Plans (LEP) and some State Environmental Planning Policies (SEPPs) contain provisions for Aboriginal heritage where relevant.

1.3.4 Aboriginal Land Rights Act 1983

The purpose of this legislation is to provide land rights for Aboriginal people within New South Wales and to establish Local Aboriginal Land Councils. The land able to be claimed by Aboriginal Land Councils on behalf of Aboriginal people is certain Crown land that (s36):

- (a) Is able to be lawfully sold, leased, reserved or dedicated;
- (b) Is not lawfully used or occupied;
- (c) Will not, or not likely, in the opinion of the Crown Lands Minister, be needed for residential purposes;
- (d) Will not, or not likely, be needed for public purposes;
- (e) Does not comprise land under determination by a claim for native title;
- (f) Is not the subject of an approved determination under native title.

Claims for land are by application to the Office of the Registrar, *Aboriginal Land Rights Act 1983*.

1.3.5 Native Title Act 1993

The Commonwealth Government enacted the *Native Title Act 1993* to formally recognise and protect native title rights in Australia following the decision of the High Court of Australia in *Mabo & Ors v Queensland (No. 2) (1992)* 175 CLR 1 (“Mabo”).

Although there is a presumption of native title in any area where an Aboriginal community or group can establish a traditional or customary connection with that area, there are a number of ways that native title is taken to have been extinguished. For example, land that was designated as having freehold title prior to 1 January 1994 extinguishes native title, as does any commercial, agricultural, pastoral or residential lease. Land that has been utilised for the construction or establishment of public works also extinguishes any native title rights and interests for as long as they are used for that purpose. Other land tenure, such as mining leases, may be subject to native title, depending on when the lease was granted.

Further details on the relevant legislative Acts are provided in Appendix 1.

1.4 Authorship and Acknowledgements

This report was prepared by Deborah Farina, Archaeologist, with assistance from Ali Byrne, Graduate Archaeologist and Natalie Wood, GIS/draftsperson and reviewed by Sarah Ward, Senior Archaeologist all from RPS. The project was managed by RPS Technical Director and Archaeology Manager, Darrell Rigby. Fieldwork was undertaken by Deborah Farina.

The project team acknowledges the assistance in preparing this report of various organisations and individuals, including but not limited to:

Table 1-1: Acknowledgements

Name	Organisation
Edwina White	Centennial Coal
Tom Hollis	Centennial Coal
Richard Peters	Bathurst Local Aboriginal Land Council
Kevin Williams	Warrabinga/North East Wiradjuri
Jack Pennell	Warrabinga/North East Wiradjuri
Trevor Brown	Gundungurra Tribal Council Aboriginal Corporation
Elwin Wolfenden	Mingaan Aboriginal Corporation

2 Aboriginal Consultation

The purpose of Aboriginal community consultation is to provide an opportunity for the relevant Aboriginal stakeholders to have input into the heritage management process. OEH encourages consultation with Aboriginal people for matters relating to Aboriginal heritage. If an Aboriginal Heritage Impact Permit (AHIP) is required, then specific Aboriginal Cultural Heritage Consultation Requirements (ACHCRs) for Proponents (DECCW, 2010a) are triggered in respect to Aboriginal consultation.

In the case of this project, the ACHCRs have been followed. These comprise a four stage Aboriginal consultation process and stipulate specific timeframes for each stage. Stage 1 requires that Aboriginal people who hold cultural information are identified, notified and invited to register an expression of interest in the assessment. This identification process should draw on reasonable sources of information including: the relevant OEH regional office, the relevant Local Aboriginal Land Council(s), the Register of Aboriginal Owners, the Native Title Tribunal, Native Title Services Corporation Limited, the relevant local council(s) and the relevant Catchment Management Authority, as well as placing an advertisement in a local newspaper circulating in the general location of the study area. Aboriginal organisations and/or individuals identified should be notified of the project and invited to register an expression of interest for Aboriginal consultation. Once a list of Aboriginal stakeholders has been compiled from the expression of interest process they need to be consulted in accordance with stage 2, 3 and 4 of the ACHCRs.

As there are a number of concurrent projects occurring across the Centennial Coal Western Region mine leases, the consultation process has been streamlined to include all active projects, rather than running multiple individual consultation processes. To this end, letters were sent to the relevant OEH regional office, the Bathurst Local Aboriginal Land Council, the registrar of Aboriginal owners, the Native Title Tribunal, Native Title Services Corporation Limited, Lithgow City Council and the Blue Mountains Catchment Management Authority requesting the identification of interested Aboriginal groups for projects involving Springvale, Angus Place, Neubecks, Clarence, Lidsdale and Coal Services. As a result of contacting these organisations Aboriginal community groups were identified as potentially having an interest in the project (see Table 2-1).

An advertisement was also placed in the Lithgow Mercury on 6 October 2011 (see Appendix 2) calling for registration of interest for Aboriginal Cultural Knowledge Holders in the Capertee, Blackmans Flat, Lidsdale and Newnes Plateau localities.

Table 2-1 Letters inviting expressions of interest were sent to the following Aboriginal community groups on the advice of relevant organisations

Organisation	Name of Representative	Date contacted
Dhuuluu Yala Aboriginal Corporation	-	8/11/2011
Wiradjuri Council of Elders	Helen Riley; Robert Clegg	8/11/2011
Wiradjuri Traditional Owners Central West Aboriginal Corporation		8/11/2011
Wiray-dyuraa Ngambaay-dyil	Bill Allen	8/11/2011
Gundungurra Tribal Council Aboriginal Corporation	-	8/11/2011
Gundungurra Aboriginal Heritage Association Inc.	-	8/11/2011
Mingaan Aboriginal Corporation	Sharon Riley	8/11/2011
Hawkesbury-Nepean Catchment Management Authority (Aboriginal Reference Group)	-	8/11/2011
Bathurst Local Aboriginal Land Council	Tonilee Scott	8/11/2011
Warrabinga Native Title Claimants Aboriginal Corporation	Wendy Lewis	8/11/2011
North-East Wiradjuri	Lyn Syme	8/11/2011
Mooka Traditional Owners	Neville Williams	8/11/2011
Blackshield Lawyers (on behalf of Warrabinga/Wiradjuri people represented by Wendy Lewis, Marvia Agnew, Martin de Launey)	-	8/11/2011
Eddy Neuman Lawyers (on behalf of the Gundungurra Tribal Council Aboriginal Corporation represented by Mervyn Trindall, Elsie Stockwell and Pamela Stockwell)	-	8/11/2011
Teitzel & Partners (on behalf of the Wiray-dyuraa Ngambaay-dyil and the Wiray-dyuraa Maying-gu represented by Mr William (Bill) Allen, Mr Joe Bugg, Mr Stephen Riley and Mr John Brasher)	-	8/11/2011

As a result of the invitation for expression of interest letters and the advertisement ten (10) Aboriginal Community Stakeholders registered their interest in the project (see Table 2-2).

Table 2-2: Aboriginal stakeholders who registered their interest in the project.

Organisation	Name of Representative	Date of Registration
Warrabinga Native Title Claimants Aboriginal Corporation	Wendy Lewis	16/11/2011
North-East Wiradjuri	Lyn Syme	16/11/2011
Bathurst Local Aboriginal Land Council	Tonilee Scott	16/11/2011
Gundungurra Tribal Council Aboriginal Corporation	Sharon Brown	18/11/2011
Mingaan Aboriginal Corporation	Helen Riley	18/11/2011
Eddy Neuman Lawyers (representing Gundungurra Tribal Council Aboriginal Corporation)	-	21/11/2011
Teitzel & Partners (representing Wiray-dyuraa Ngambaay-dyil and Wiray-dyuraa Maying-gu)	-	21/11/2011
Mooka Traditional Owners	Sharon Williams	21/11/2011
Wiradjuri Council of Elders	Sharon/Helen Riley	21/11/2011
Blackshield Lawyers (representing Warrabinga/Wiradjuri people)	-	22/11/2011

Information regarding the proposed heritage assessment methodology and strategy for collecting information on cultural heritage significance was provided in writing to the Aboriginal stakeholders on 23 November 2011. Six groups returned their comments on the methodology by the closing date for comments (Table 2-3).

Table 2-3: Aboriginal stakeholders who responded to the methodology by the due date

Organisation	Name of Representative	Date of Reply for Methodology (due 23/12/2011)
Mingaan Aboriginal Corporation	Helen Riley	07/12/2011
Warrabinga Native Title Claimants Aboriginal Corporation	Wendy Lewis	07/12/2011
Gundungurra Tribal Council Aboriginal Corporation	Jason Brown	21/12/2011
North East Wiradjuri	Lyn Syme	21/12/2011
Wiray-dyuraa Ngambaay-dyil and Wiray-dyuraa Maying-gu	Sharon Riley	20/12/2011
Bathurst Local Aboriginal Land Council	Tonilee Scott	21/12/2011

In addition, the letter of 23 November 2011 invited registered Aboriginal stakeholders to attend an information session at Black Gold Cabins on 7 December 2011. This information session included a formal presentation of the relevant upcoming Centennial projects as well as a Questions and Answers session in order to allow Aboriginal stakeholders to clarify any heritage, methodological or timing issues regarding the projects. The following representatives attended the information session on 7 December 2011.

Table 2-4: Stakeholders who participated in information session on 7 December 2011

Organisation	Name of Representative
Gundungurra Tribal Council Aboriginal Corporation	Jason Brown
Mingaan Aboriginal Corporation	Elwin Wolfenden
North East Wiradjuri	Robyn Williams
Warrabinga Native Title Claimants Aboriginal Corporation	Wendy Lewis
Wiradjuri Council of Elders	Helen Riley

According to the ACHCR process a site survey should be undertaken with reference to the nature, scale and complexity of the project. With these factors considered, five stakeholders were invited to participate in the survey which was undertaken on 12 January 2012.

Table 2-5: Stakeholders who participated in the survey

Organisation	Name of Representative
Gundungurra Tribal Council Aboriginal Corporation	Trevor Brown
North East Wiradjuri	Jack Pennell
Warrabinga Native Title Claimants Aboriginal Corporation	Kevin Williams
Bathurst Local Aboriginal Land Council	Richard Peters
Mingaan Aboriginal Corporation	Elwin Wolfenden

A copy of the draft report was provided to the following Aboriginal stakeholders on 1 June 2012 (Table 2-6). Gundungurra Tribal Council Aboriginal Corporation returned their comments on the draft report by the closing date for comments. All other stakeholders were contacted by telephone on 29 June 2012 requesting their comments verbally. No issues were raised by any stakeholders with the draft report. Please see Aboriginal consultation log for further details (Appendix 4)

Table 2-6: Aboriginal stakeholders who responded to the methodology by the due date

Organisation	Name of Representative	Date of Reply for draft report (due 29/06/2012)
Mingaan Aboriginal Corporation	Helen Riley	29/06/2012
Warrabinga Native Title Claimants Aboriginal Corporation	Wendy Lewis	02/07/2012
Gundungurra Tribal Council Aboriginal Corporation	Jason Brown	05/06/2012
North East Wiradjuri	Lyn Syme	29/06/2012
Wiray-dyuraa Ngambaay-dyil and Wiray-dyuraa Maying-gu	Sharon Riley	29/06/2012
Bathurst Local Aboriginal Land Council	Tonilee Scott	29/06/2012
Eddy Neuman Lawyers (representing Gundungurra Tribal Council Aboriginal Corporation)	-	29/06/2012
Teitzel & Partners (representing Wiray-dyuraa Ngambaay-dyil and Wiray-dyuraa Maying-gu)	-	29/06/2012
Wiradjuri Council of Elders	Sharon/Helen Riley	29/06/2012
Blackshield Lawyers (representing Warrabinga/Wiradjuri people)	-	29/06/2012

3 Environmental Context

An understanding of environmental context is important for the predictive modelling and interpretation of Aboriginal sites. The local environment provided natural resources for Aboriginal people, such as stone (for manufacturing stone tools), food and medicines, wood and bark (for implements such as shields, spears, canoes, bowls, shelters, amongst others), as well as areas for camping and other activities. The nature of Aboriginal occupation and resource procurement is related to the local environment and it therefore needs to be considered as part of the cultural heritage assessment process. The reporting of environmental context is required under the *Code of Practice for Archaeological Investigation of Aboriginal Objects*.

3.1 Geology and Soils

Aboriginal people often made stone tools using siliceous, metamorphic or igneous rocks and therefore understanding the local geology can provide important information regarding resources in a study area. The nature of stone exploitation by Aboriginal people depends on the characteristics of the source, for example whether it outcrops on the surface (a primary source), or whether it occurs as gravels (a secondary source) (Doelman, Torrence et al. 2008).

The Blue Mountains area comprises typically of deep incised gorges with sandstone bed-rock, steep sided cliffs and pagodas, narrow incised valleys with spring fed creek lines and inter-bedded sandstone conglomerate rocks. The geology for the study area is primarily an undifferentiated mix of sandstone, shale and tuff, formed on the Narrabeen Group, laid down in the Triassic period. This is bounded by nearby deposits of the Illawarra Coal Measures laid down in the Permian period, comprising shale, sandstone, conglomerate and chert, with coal and torbanite seams and a quaternary alluvium of gravel, sand, silt and clay, found mainly along watercourses (Bryan, 1966).

The relevant soil landscapes of the study area are the Lithgow and Cullen Bullen soil landscapes. The study area is situated on the Lithgow soil landscape, described as having moderately deep (<20 cm) soils, comprising red podzolic soils, yellow podzolic soils and yellow leached earths on upper slopes and well drained areas. Moderately deep to deep (<170 cm) solods/yellow solodic soils are found on lower slopes and in areas of poor drainage. Immediately adjacent is the Cullen Bullen soil landscape comprising shallow to moderately deep (<100 cm) yellow podzolic soils and yellow earths on crests, moderately deep (<100 cm) yellow podzolic soils, soloths and yellow leached earths on upper and mid slopes, and moderately deep to deep (50-100 cm) yellow solodic soils and yellow podzolic soils on lower slopes near and along narrow drainage lines. Shallow yellow earths and lithosols are associated with low scarps (King, 1992:29).

3.2 Topography and Hydrology

The topography of the Newnes Plateau landscape generally incorporates broad, level and gently inclined plateau surfaces. Slope gradients range up to 10%, with <20 m of local relief and elevation typically >1000 m. Swampy drainage depressions are common and on ridgelines localised sandstone outcrops are rare (King 1992:29).

The topography of the Lithgow soil landscape is generally flat to undulating rises and broad valley floors on Illawarra Coal Measures and the Berry formation. Local relief is up to 20m, with slope gradients of <10% and elevation approximately 800-1000 m AHD. The landscape is generally cleared open forest and open woodland.

The topography expected of the Cullen Bullen soil landscape is rolling low hills and rises on Illawarra Coal Measures and the Berry formation. Slopes are 10-25%, local relief <50 m, elevation 550-1,050 m. Localised rock outcrop occurs as small isolated low scarps (<5 m), with extensively cleared open woodland and open forest.

The hydrology of the study area is defined by several creek lines and rivers. The closest water source is the Wolgan River western branch, located approximately 7 km from the proposed location of bore 8. The Wolgan River eastern branch is located approximately 1 km to the east of both ESA8 and ESA9. Various tributaries of these two watercourses are also located in the vicinity. These resource zones are large enough to provide reliable water for most of the year.

The topography and hydrology suggest that the local environment would have been favourable to past Aboriginal occupation and in most cases utilised for transitory activity through the landscape. Parts of the landscape that incorporate narrow ridgelines and steep cliffs made access difficult. The availability of fresh water in the study area locality would have contributed to a diverse local habitat providing a variety of food and other exploitable resources.

3.3 Climate

Approximately 18,000 years ago, climatic conditions began to alter which affected the movement and behaviour of past populations within their environs. During this time, notably at the start of the Holocene (more than 11,000 years ago), the melting of the ice sheets in the Northern Hemisphere and Antarctica caused the sea levels to rise, with a corresponding increase in rainfall and temperature. The change in climatic conditions reached its peak about 6,000 years ago (Short, 2000:19-21). Between 6,000 and 1,500 years ago there was a slight decrease in average temperature, which then stabilised about 1,000 years ago and has remained, since then, similar to the temperatures currently experienced. Consequently, the climate of the study area for the past 1,000 years would probably have been much the same as present day, providing a year round habitable environment.

The climate of the Newnes Plateau area is cool temperate climate, characterised by cold winters and warm summers. The warmest month is January, with an average maximum temperature of 23.9°C, whilst the coldest is July, with an average minimum temperature of 2.5°C. Snow and/or sleet are common in the winters. The wettest month is February, with an average of 113.9 mm, and the driest month is July, with an average monthly rainfall of 44.5 mm (BOM, ud).

3.4 Flora and Fauna

The Blue Mountains are generally populated by the Sydney Montane Dry Sclerophyll Forest which is characterised by a range of plant communities including the Blue Mountain ash and Sydney peppermint (Keith 2006:161). The ridges are dominated by hard leaved scribbly gum and silvertop ash (Keith 2006:161). The study area also contains shrubs such as Dorothy's wattle and sunshine wattle and herbs such as blue flax lily (Keith 2006:161). The Gooches Swamp topographical feature is characterised by closed wet heath.

Geebung is also known in the local area and this species was often utilised by Aboriginal people for food, medicine and strengthening fishing line (Percival and Stewart, 1997:42). The Newnes Plateau Woodland community is chiefly located on soils derived from Narrabeen sandstone.

Fauna species encountered within the study area include a number of macropods, such as Swamp Wallaby and Red-necked Wallaby, arboreal mammals and the Greater Glider (Keith 2006) and a moderate diversity of open forest birds including those characterising elevated habitats, being Grey Currawongs, Red-browed Treecreepers, Scarlet Robins and Flame Robins. The Gang-Gang cockatoo has also been identified in the vicinity of the study area.

The diversity of flora and fauna species may have provided seasonal food resources for small Aboriginal groups or communities moving throughout the region.

3.5 Synthesis

Overview of the environmental context indicates that there are rich food and raw material sources available on the plateau and in the nearby valleys and thus would have been a favourable area for Aboriginal occupation. In particular, the location of the plateau between two reliable water sources and the abundance of plant and animal life, in addition to rock shelters would have provided adequate food, water and shelter. In addition, the Illawarra Coal Measures in the area are known to produce chert, a favourable raw material for tool production.

4 Historic Heritage Context

4.1 Historical overview

The initial discovery of Botany Bay in 1770 was followed by the arrival of the First Fleet in January 1788. Later the fleet moved further north to Port Jackson where the colony of Sydney Cove was founded (NSW National Parks and Wildlife Service 1991). In the first few years of British contact the new colonists quickly began to explore their new surroundings extending to the north, south and west out of Sydney Town.

Under the advice of local Aborigines, in 1813 explorers Blaxland, Wentworth and Lawson made an efficient job of traversing the southern watershed landscape of the Grose catchment. They descended the western sandstone escarpment at Mount York, then travelled onto Mount Blaxland besides the upper Coxs River where they crossed the Blue Mountains barrier. Within two years William Cox constructed the first road along the explorers' route that extended over the Great Divide reaching the fertile plains of the Lithgow valley and Bathurst.

4.2 Local history

The Lithgow valley was first settled in 1824 and was named by Surveyor General John Oxley, after William Lithgow, Governor Brisbane's private secretary. It was not until 1869 that the town began to prosper following the construction of the western railway line (Lithgow Tourism 1996 - 1999).

The Zig Zag Railway was engineered and completed in 1869 this allowed for the movement of trains into the valley. The combination of great coal reserves and rail service provided Lithgow with the ideal location for industries dependent on these resources (Lithgow Tourism 1996 - 1999).

Coal mining in Lithgow began with the first cut in Bowenfels and was used to run the steam engine at the local flour mill from the 1850s. The Lithgow coal reserves were important for the development of the Great Western Railway. Coal for trading purposes was first mined at Lithgow in 1868.

Coal mining began in the Wallerawang district around 1873 with a number of mines being operated on the Lithgow seam and in the area of Lidsdale and Wallerawang. The major working mines at the time in the Wallerawang district were The Irondale Colliery, Cullen Bullen Colliery, The Ivanhoe Colliery, The Commonwealth Colliery, The Great Western Mine and The Invincible Colliery.

Between 1900 and 1910 several smaller mines were opened between Piper's Flat and Blackman's Flat, which incorporated The Angus Colliery (Lithgow Tourism 1996 - 1999).

4.3 Analysis of physical and documentary research

The Australian Heritage Database is an online database of items listed under the Commonwealth Heritage List, National Heritage List and the Register of the National Estate. The Commonwealth Heritage List relates to Commonwealth owned property and is not applicable for this assessment.

The National Heritage List is now the lead statutory document for the protection of places considered to have national importance. Previous to this the Register of the National Estate was the primary document. While the Register of the National Estate still exists it is now frozen, and as of February 2012 no longer has statutory status.

The State Heritage Inventory database is maintained by the NSW Heritage Office and lists all items that have been identified as of heritage value throughout NSW. Items listed on the Heritage Inventory include those which have been listed by local councils (local significance) and also those which are listed on the State Heritage Register (items of state significance).

4.3.1 National Heritage

The National Heritage List is now the lead statutory document for the protection of heritage places considered to have national importance. This list comprises Indigenous, natural and historic places that are of outstanding national heritage significance to Australia. Listed places are protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). There are no items within the Lithgow LGA on the National Heritage List.

Prior to this the Register of the National Estate was the primary document. While the Register of the National Estate still exists in archival form, items can no longer be registered and as of 19 February 2012 no longer has statutory status. The Minister is required to consider the Register when making some decisions under the EPBC Act. The Register of the National Estate includes 18 heritage sites within the Lithgow LGA, but none are located near the study area.

The Commonwealth Heritage List comprises natural, Indigenous and historic heritage places owned or controlled by the Commonwealth. These include places connected to defence, communications, customs and other government activities that also reflect Australia's development as a nation. Places on this list are also protected under the EPBC Act.

A search of the Australian Heritage Database which incorporates all the above lists shows no additional items registered that would be affected by the proposed works.

4.3.2 Local and State Significant Heritage in NSW

Heritage items in NSW may be registered as important at the State level and/or at the local level. The Heritage Council has developed criteria to help determine whether an item is State significant. Items of State significance are registered by the Heritage Council of New South Wales under the NSW *Heritage Act 1977*. Those items are listed on the State Heritage Register as being under an Interim Heritage Order or protected under section 136 of the NSW *Heritage Act 1977*.

Some heritage places and items that do not reach the threshold for listing on the State Heritage Register may be of heritage significance within a local government area. These places are listed by local council under their LEP and additionally may be included on the NSW Heritage Inventory database.

The NSW Heritage Inventory database is maintained by the NSW Heritage Office and lists items that have been identified as of State and local heritage value throughout NSW.

A search of the NSW Heritage Inventory shows no heritage items listed within the vicinity of the study area.

4.3.3 Lithgow City Council Local Environmental Plan

The study area is wholly located within the bushland of the Newnes Plateau, with the closest European settlement at Lidsdale, approximately 9.7 km to the west. As such, a review of the *Lithgow City Local Environmental Plan 1994* shows the closest heritage item to the study area as the State Mine Site at State Mine Gully, approximately 12 km to the south west.

4.4 Discussion

Research of listed Heritage Items has shown that there are no heritage items in the vicinity of the study area or at threat of impact.

4.5 Conclusion

As there are no registered heritage items within the vicinity of the study area, it is considered that there are no European heritage constraints associated with the project.

5 Aboriginal Heritage Context

Aboriginal heritage assessment process requires that the significance of Aboriginal sites within a study area is assessed. It is important that Aboriginal sites are contextualised within the local and regional landscape in order to inform the assessment of significance. The Aboriginal heritage context is also needed in order to develop a predictive model of Aboriginal sites in the study area. Historical information also provides additional information for the interpretation of archaeological sites. A glossary of Aboriginal site types is provided in Appendix 6.

5.1 Historic Records of Aboriginal Occupation

It is important to acknowledge that early historical documents were produced for a number of reasons and thus may contain inaccuracies and/or bias in their reporting of events or other aspects of Aboriginal culture (L'Oste Brown 1998). Nonetheless, some historical documents provide important information and insights into local Aboriginal customs and material culture at the time of non-Indigenous settlement and occupation of region.

5.2 Ethnohistory

5.2.1 Pre European contact

The study area is located in the Sydney Basin Bioregion of the Blue Mountains of NSW. A number of distinct Aboriginal groups occupied the Sydney Basin when the First Fleet arrived in 1788. The Blue Mountains region was home to three large language groups: the Dharug, the Wiradjuri and the Gundungurra.

Although tribal boundaries are now uncertain, it is thought that the Dharug people occupied much of the Sydney area. It is known that there were two Dharug dialects, one used between Sydney Harbour and Botany Bay, and the other spoken to the west towards the Hawkesbury, Blue Mountains and Nepean districts (the latter known as Muru-Murak or ‘Mountain pathway’) (Murray & White 1988). The Wiradjuri people were the largest language group in New South Wales, with dialects spoken from Coonabarabran in the north, the Murray River to the south, western Blue Mountains in the east and Condobolin in the west. The Gundungurra people lived chiefly in the southern highlands, but reached as far north as western Sydney near Liverpool, west to parts of the Blue Mountains and south to Lake George.

Although separate nations, all three language groups were neighbours and shared certain similarities with other Aboriginal groups in south-eastern Australia. Plants were used for food, as well as in the manufacture utilitarian items, decorative items and medicines, with some species providing more than one resource. Grass stalks could be used for weaving or basketry. Large trees provided bark and fibres which were used for tools, containers and possibly the construction of watercraft, whilst resinous saps from Grass Trees for example were an adhesive used in the hafting process. Bark fibres were twisted into twine which could then be woven into traps, containers or baskets and a variety of wooden tools. Stone was also used for tools.

Aboriginal people used many native plants and animals. The Blue Mountains and their surrounds offered a variety of food, and these resources changed seasonally, though were more reliable in summer than in winter. Inland communities generally relied on foods such as possum, vegetable roots, seeds and berries as well as mullet, eel and kangaroo (Murray & White 1988).

Men and women in Aboriginal communities had distinct roles in the hunting and gathering of food resources. Men were responsible for hunting possums, fish, birds and kangaroo, and at times collaborated with other bands to hunt and eat the larger animals. Fire was used at times to reduce the vegetation in order to catch game. Women often harvested plant foods especially yams by means of digging sticks as these were generally the communities' staple diet (DECC 2008).

Gunyahs or bark huts were usually made from the broad leafed paperbark, box or stringybark trees and were erected mostly by women. They were generally located close to a reliable fresh water source or opportunistically situated on trade routes. Rock shelters are common in the Blue Mountains region, and would have been occupied as shelter or in association with open camp sites. Campsites were not only the place for sleeping, eating, tool making and social activity, but were also the centre for hunter-gathering in the local area (Mid Mountains Historical Society 2007). Resources gathered within an area may have been reserved to be traded with members from neighbouring tribes for items not readily available to them.

Summer weather would generally have required little in the way of protective clothing, the milder days of autumn and spring required more in the way of protection against frequent cool winds. Winter however saw the intense use of animal skins for both clothing and as blankets. These resources were exploited seasonally and included using the by-products of hunting activities, such as the skins from Possum, Kangaroo and probably Koala for items such as cloaks (Murray & White1988).

5.2.2 Post European contact

Initial contact between the European settlers and the Dharug people occurred in 1791 when Phillip's party arrived at the banks of the Hawkesbury and greetings were exchanged with the natives, peacefully sharing their campfire on the river bank at Pitt Town. Tench and Dawes made plans to explore the Blue Mountains and were ferried across the river by Aborigines in bark canoes (Mid Mountains Historical Society 2007).

In 1794, 22 settlers obtained land along the shorelines of the Hawkesbury-Nepean. Within a year there were 546 people occupying the banks of the river which accounted for the main source of the colony's food supply. This area was also an important source of food for the Dharug people (Mid Mountains Historical Society 2007).

Initially, when white explorers entered the Blue Mountains they did not record any large groups of 'Aborigines' being in residence. Aboriginal presence was noted by Blaxland in 1814 in the valleys where he heard people calling (Gollan 1987). However, an earlier expedition by Barrallier in 1802, who met and observed Aborigines in the Wollondilly Valley, was escorted out of the Blue Mountains by an Aboriginal guide who had knowledge of the tracks leading to the coast. This first contact record and contemporary opinion suggests that the identity of the mountain people adjacent to the Cumberland Plain were the Dharug (Gollan 1987).

Three Frenchmen; Quoy, Gaudichaud and Pellion travelled across the Blue Mountains to Bathurst where they encountered Aborigines in the Springwood area. Pellion made drawings of the natives, including Karadra, a sick old man lying on kangaroo skins near a fire and receiving attentions from a younger man. It was recorded that a local native man was peacefully disposed towards the explorers (Mid Mountains Historical Society 2007).

Windradyne (c.1800-1829), was an Aboriginal resistance leader, whom was also known as "Saturday". He was a northern Wiradjuri man of the upper Macquarie River region in central-western New South Wales (First Australians ND).

On arrival of the first settlers, Windradyne attempted to peacefully communicate with the European counterparts. Windradyne had Wiradjuri people befriend the new settlers and assist them with areas to camp. However, when the Europeans began to clear the land it became obvious to the Aborigines that their arrival to Australia was not on a temporary basis. The settlers started destroying the environment and places that were sacred to the natives. Windradyne was determined to not let these people destroy local families and their society. After the conflict many of the Wiradjuri surrendered to the British, but Windradyne was able to elude capture, and later in 1824 Windradyne and 130 Wiradjuri warriors walked for 17 days from Bathurst across the Blue Mountains and into the settlement of Paramatta to attend the annual native feast. On arrival to the feast Windradyne had the word peace stuck in his hat (Australians ND). He was accepted by the British as a result of this encounter.

However, as Europeans moved inland, many Aboriginal groups either dispersed or were displaced from their traditional lands. In the 1891 Census, only five people were recorded as being of Aboriginal descent in the County of Cook. In 2001, 520 people were recorded as being of indigenous background, and 604 indigenous people in 2006.

5.3 Regional Archaeological Heritage Context

The majority of the archaeological surveys and excavations in the Blue Mountains region have been in conjunction with environmental assessments for the coal mines, installation of power lines, telecommunications, and state forest works. Based on the information available, a number of trends in site location and patterning are evident.

A regional based study undertaken by Gollan (1987) conducted archaeological investigations in the Newnes Plateau region in order to provide a comprehensive assessment of the archaeological resources of the plateau and regional and local significance. This report was undertaken for the NPWS.

Gollan (1987:114-120) concluded, at a regional level, that the plateau area, being of relatively flat lying and gently sloping land, provided suitable resources for Aboriginal occupation. Gollan (1987:118) suggested that artefact scatters (and isolated finds) are likely to be found on the fringes of swamps because lithic material and food resources were available in these areas. This is evidenced by the predominance of sites in association with these areas. Gollan also found that there was evidence of the grinding of stone artefacts on the Plateau with several grinding groove sites and ground edged artefacts recorded. Shelters with art were also predominant in areas of the plateau where suitable rock types such as pagodas and inter-bedded sandstone and claystone rock outcrops were found.

Gollan (1987:130) considered the plateau to be of high scientific and social significance based on the diversity of Aboriginal cultural heritage sites in the area. At a regional level Gollan was of the opinion that the plateau area was important with respect to both inter-site as well as intra-site diversity (1987:131). Gollan (1987:114) described the forested upland areas as having the potential to have provided substantial archaeological resources for an upland hunter/ gatherer economy.

A predictive archaeological model undertaken in the Clarence Outbye Area (HSO 2008) showed that 80% of shelter sites were located along minor drainage lines and 20% along major drainage lines; 80% of artefact scatters were identified near smaller tributaries and only 16% along major drainage lines. Scarred trees were found on moderate slopes close to the 1000 m elevation and axe grinding grooves were located just below ridges at high elevations.

At a regional level, the Blue Mountains area was therefore able to provide shelter and a resource-rich habitat as evidenced by the distribution of sites in the gently sloping and relatively flat swamp margins, low lying crest areas, flat lying ridge tops, and rocky outcrops lining the various water courses.

5.4 Local Archaeological Heritage Context

The local Aboriginal heritage context provides a review of previous archaeological work conducted in the local landscape, determines whether Aboriginal sites have been previously identified (AHIMS search) in the study area and informs the predictive model of Aboriginal sites for the study area. The review of previous archaeological work includes relevant local research publications and archaeological consultancy reports. Two types of archaeological investigations are generally undertaken: excavations and surveys. Archaeological excavations can provide high resolution data regarding specific sites, such as the dates or chronology of Aboriginal occupation and information on stone tool technology (reduction sequences, raw material use, tool production, usewear and similar). Archaeological surveys generally cover wider areas than excavations and can provide important information on the spatial distribution of sites. The detection of sites during survey can be influenced by the amount of disturbance or erosion and therefore sensitivity mapping is sometimes also required to interpret survey results. The local Aboriginal heritage context also provides a context for assessing archaeological significance of sites.

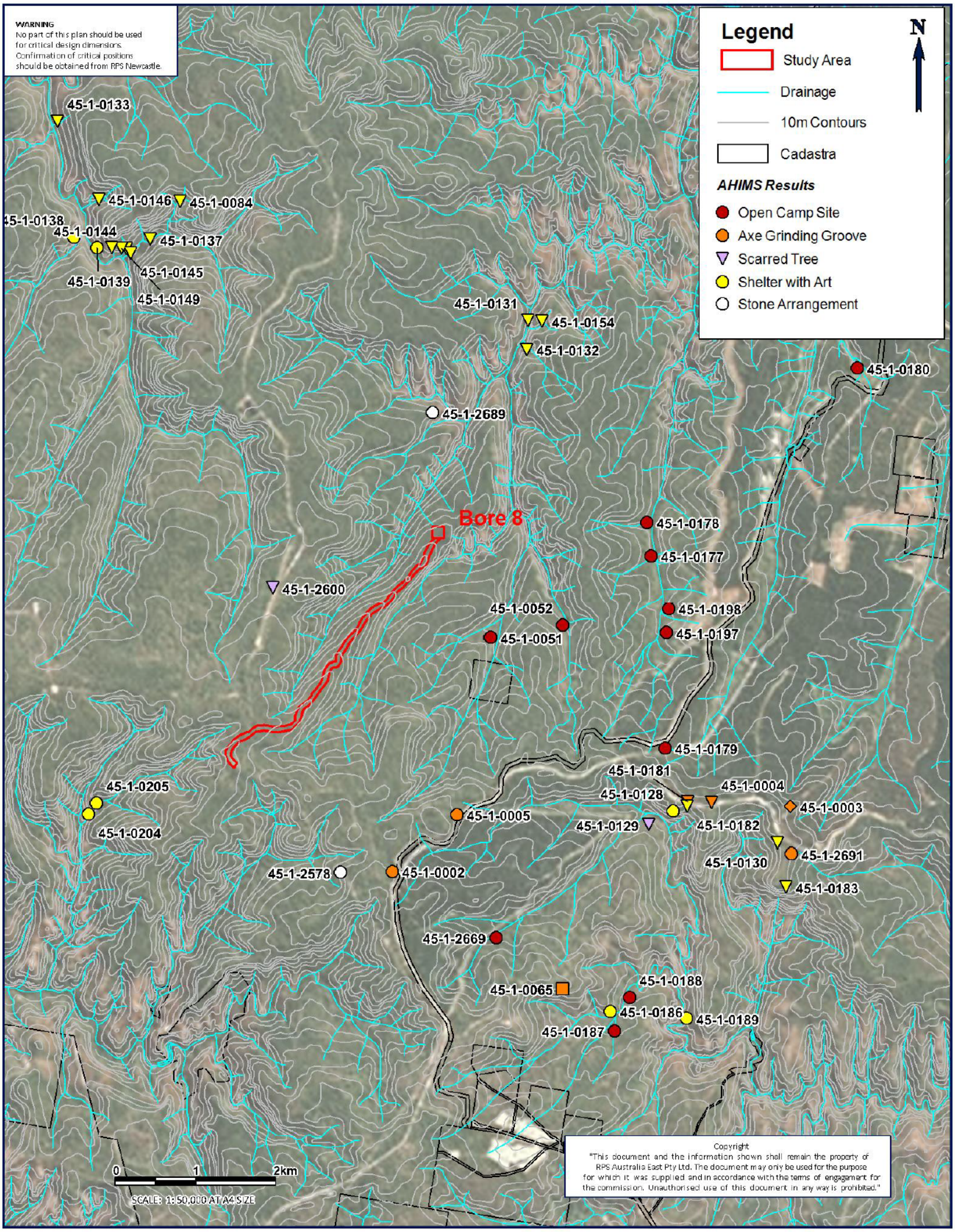
5.4.1 Aboriginal Heritage Information Management System (AHIMS)

A search was undertaken of the OEH Aboriginal Heritage Information Management System (AHIMS) on 31 January 2012 for a 5 km radius centred on the area and identified a total of 44 sites in the vicinity of the study area (see Table 5-1; Figure 5-1).

The most common site types within the local landscape are shelters with deposit (51.21%), followed by artefact scatters (17.07%) and shelters with art (12.20%) (Table 5-1). As can be seen from Figure 5-2 below, there are no sites recorded within the immediate vicinity of the study area. The nearest recorded sites to the borehole portion of the study area is a stone arrangement, approximately 1.3 km north west and two artefact sites (#45-1-0051 and #45-1-0052) approximately 1.7 km to the east, whilst two shelters with art (#45-1-0204 and #45-1-205) are located approximately 2 km south west of the junction of the access track with Sunnyside Ridge Road and a scarred tree site (#45-1-2600) approximately 1.5 km to the north of that junction. None of these sites will be impacted by the proposed works.

Table 5-1: AHIMS results summarised by site types.

Site Type	Frequency	Percent
Shelter with deposit	15	34.09%
Artefact sites	11	25.00%
Shelter with art	7	15.90%
Axe grinding groove	3	6.82%
Scarred tree	2	4.55%
Axe grinding groove/shelter with art	2	4.55%
Stone arrangement	2	4.55%
Axe grinding groove; shelter with deposit	1	2.27%
Axe grinding groove; rock engraving; shelter with deposit	1	2.27%
Total	44	100%



Copyright
"This document and the information shown shall remain the property of RPS Australia East Pty Ltd. The document may only be used for the purpose for which it was supplied and in accordance with the terms of engagement for the commission. Unauthorised use of this document in any way is prohibited."

TITLE: FIGURE 5-1: LOCAL AREA WITH AHIMS RESULTS
LOCATION: NEWNES PLATEAU
DATUM: (GDA 94)
PROJECTION: MGA ZONE 56
DATE: 12/07/2012
PURPOSE: HERITAGE
LAYOUT REF: J:\JOBS\Centennial\All Jobs\110382 Springval Dewatering Bores 7 8 & 10. Drafting\MapInfo Workspaces\Arch
VERSION (PLAN BY)B A4 (DF-NW)

CLIENT: SPRINGVALE COAL PTY LTD
JOB REF: 110382

RPS AUSTRALIA EAST PTY LTD (ABN 44 140 292 762)
241 DENISON STREET BROADMEADOW PO BOX 428 HAMILTON NSW 2303
T: 02 4940 4200 F: 02 4961 6794 www.rpsgroup.com.au

RPS

Figure 5-1: Local Area with AHIMS results

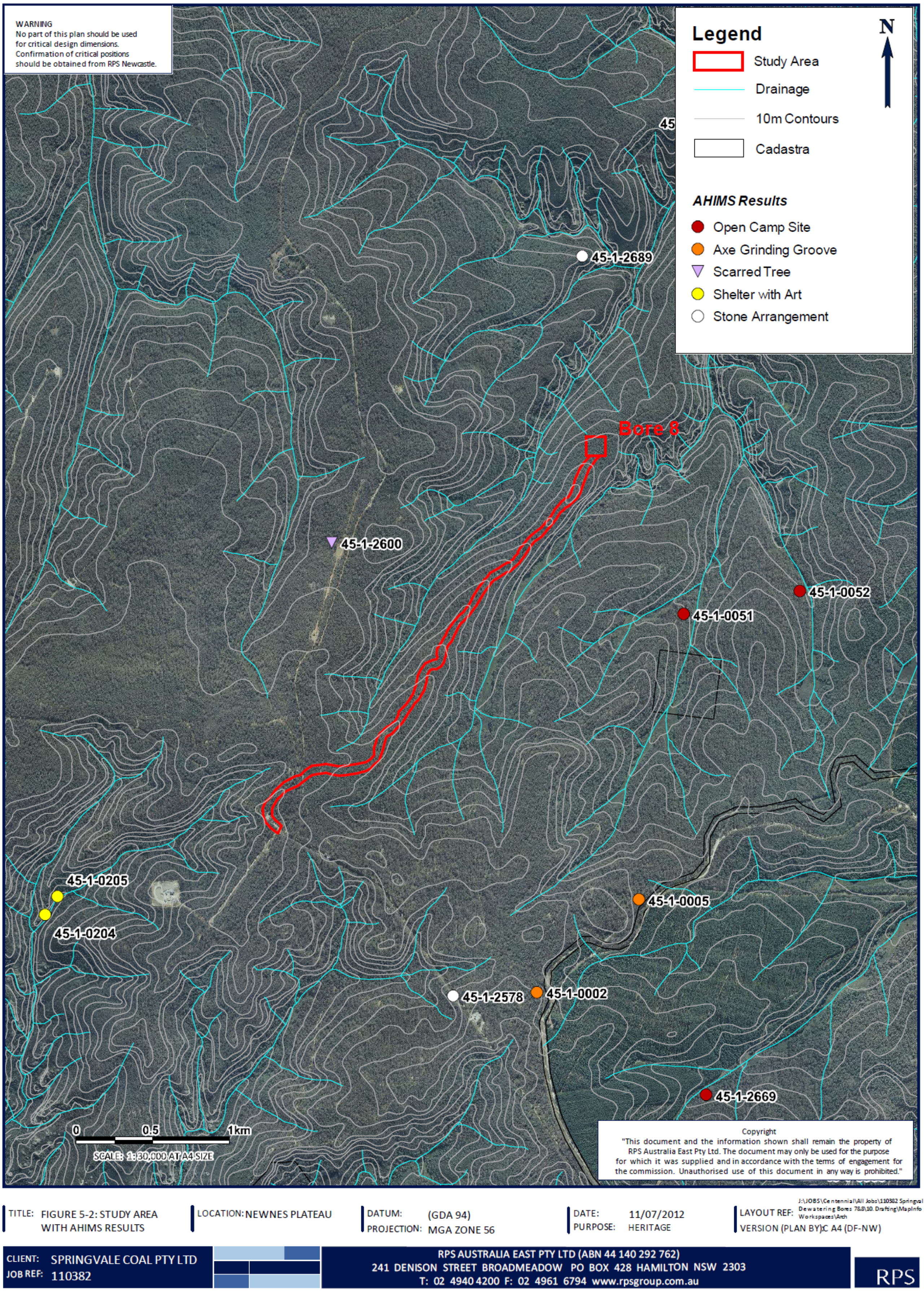


Figure 5-2: Study Area with AHIMS results

5.4.2 Local Archaeological Studies

Gaul, post 1980. Prehistoric Archaeology 391-1, Assignment 2: Black-Fellows Hands Shelter and Environs. University of New England.
This site was recorded pre 1979 but was not registered until Gaul undertook research in the 1980s. It has since been recorded with OEH AHIMS #45-1-0007 (Gaul, post 1980). The assignment was aimed at recording the art component of a group of three rock shelters at the western escarpment of the Blue Mountains, west of Sydney. Three shelters were surveyed using a 20 m tape, string level and a camera.

Site A – Blackfellows Hand Shelter was located 1km north east from the start of Blackfellows Hand Track. It comprised a large open shelter with the main section being 60m long. The shelter contained occupational deposit slopes that continued for about 40m and also included a small number of chert flakes near the entrance of the shelter. The art panel contained a combination of motifs including arms, feet, weapons and kangaroo appendages. The colours of the motifs comprised of white, yellow and red.

Site B – Shelter was located approximately 700 m down Black Fellows Hands Track. The area contained a 40 m long shelter with a low overhanging roof. The floor contained a deposit suspected to be 50 cm – 1 m in depth. Red hand stencils were found on walls and ceiling. Those on the ceiling were the best preserved art motifs.

Site C – Shelter was situated approximately 300 m further down the track. The shelter was 30 m long and strewn with large rocks from roof-fall. There was little space for deposit with the majority of it having eroded down the slope. The numbers of stencils were difficult to measure and contained mainly fingertips. The stencils were coloured white and yellow but many of them were faded (Gaul post 1980).

Gorecki, 1983. Archaeological Survey Kariwara Colliery Lease, Lithgow NSW.
A field survey was undertaken from January 24th to January 29th 1983 commissioned by Longworth and McKenzie Pty Limited. The survey was conducted on the Newnes Plateau approximately nine kilometres north of Lithgow in the Newnes State Forest. The survey aimed to locate and establish archaeological significance of Aboriginal relics and provide recommendations regarding protective measures for Aboriginal relics. Gorecki's previous assessment was situated immediately east of the current study area.

The survey area in the study was divided into four environmental zones based upon geology, topography, vegetation cover and ground cover visibility. The archaeological potential of these zones were assessed. The four zones incorporated the following:

- Zone 1. Lagoon paddock
- Zone 2. Valley floors. These included Sawyers Swamp Creek, Kangaroo Creek and Wolgan River.
- Zone 3. Escarpments

- Zone 4. Plateau

The results of the survey found five archaeological sites and 19 potential occupation sites. Common sites found were a combination of shelters with art and deposit, with the deposited raw material consisting of quartz, chert, indurated mudstone, quartzite and fine grained igneous inclusions. Potential occupation sites were referred to as shelters which were possibly used in the past, but had no deposit at all; some may have had the potential for relics in their deposit.

Stockton, 1983. A Survey for Prehistoric Sites on the proposed Clarence Transfer for the Lithgow Water Supply, NSW.

This study was conducted to support the water requirements of the City of Greater Lithgow due to the rapid increase in coal mining and power generation in the area. Groundwater would be used from Clarence Colliery to supplement natural surface flows into council's Farmer's Creek Dam. The project requirements were a rising dam, settling ponds and a lined channel. The project was located 7 km north east of Lithgow Post Office and incorporated the gently sloping ridge of the undulating surface of the Newnes Plateau.

The field survey was conducted in three stages. The creek channel section uncovered one isolated find comprised of grey chert and small artefact scatter comprised of two grey quartzite pieces.

Stockton recommended that additional archaeological surveys should always be carried out prior to any clearing or construction work in relation to the project.

Rich, 1988. Proposed Prison at Marrangaroo Creek near Lithgow, NSW.

The archaeological assessment for the proposed construction works were located 6 km north of Lithgow. The proposed development included prison construction, access roads, additional buildings, car parks and a lake. This study was located approximately 5 km south of the current study area.

Two known Aboriginal sites were previously recorded in the survey area (#45-1-89 and #45-1-90) in 1983. Transects were made between the creek in the south and the railway line in the north. Sandstone ledges north of the railway line were inspected for shelters.

The survey uncovered eight open sites, and ground truthing of the two sites as mentioned above. The isolated finds and artefacts identified in the open sites were generally small to medium size and were manufactured from quartz, quartzite and mudstone. Existing registered sites in the area were relocated and audited: Marrangaroo Creek Site #45-1-89 was located along a track and eroded bank of a small gully. Five artefacts were identified comprising of flaked pieces of chert, milky and yellow quartz. Marrangaroo Creek Site #45-1-90 was located on a levee bank between Marrangaroo Creek and a flood overflow channel. The artefact scatter site contained approximately 11 artefacts comprising flakes of indurated mudstone, quartz and milky quartz. A previously recorded (1983) quartzite multifaceted core could not be relocated in the survey.

The natural presence of quartz and quartzite for stone tool manufacture in the survey area indicates that the pebbles may have been readily available

Rich and Gorman, 1992. Proposed Springvale Colliery and Conveyor, Wallerawang: Archaeological Survey for Aboriginal Sites.
An archaeological assessment was conducted for the proposed Springvale Colliery and related facilities located near Wallerawang in the Blue Mountains. The survey was divided into four locations; Springvale Pit Top Area 500 m x 350 m, Proposed Springvale Longwall Mine Area 7.5 km x 5 km, Proposed Conveyor Route measuring less than 10 m wide and approximately 10km long and the Proposed Washery covering an area of 1 km x 500 m, including the reject emplacements and dams.

The field survey uncovered 11 artefact scatter sites, an isolated find, two possible site locations, and three shelters with PAD (Potential Archaeological Deposit).

The artefact scatters were generally located on well exposed areas containing several artefacts with dominant raw materials comprising of quartz, quartzite and mudstone. Shelters were predominantly composed of sandstone pagodas which are typical for the regional landscape and commonly located along tributary lines. Two of the shelters contained evidence of rock art.

Archaeological test excavations were recommended to be carried out at the two potential site locations to determine the presence of sites and if proposed works will impact on them.

Rich, 1993. Springvale Coal Project, Wallerawang, NSW: Archaeological Inspection of Aboriginal Sites affected by Construction Works.
This report was undertaken by Rich subsequent to the 1992 archaeological assessment undertaken by Rich and Gorman (1992). An assessment was made of existing recorded sites that had been, or were likely to be, affected by development works.

Several recommendations were made additional to those outlined in the 1992 report. These included the updating of existing recorded site cards where necessary (Rich 1993).

Central West Archaeological and Heritage Services Pty Ltd, 2000. An Aboriginal Archaeological Study of the Marangaroo Department of Defence Site, Lithgow, NSW
Central West Archaeological and Heritage Services Pty Ltd carried out an Aboriginal archaeological study of the Marrangaroo Department of Defence Site. The site entrance was located approximately 2.2 km east of the Great Western Highway and 10 km north of Lithgow. The study area was approximately 1,700 ha. The survey was both by vehicle and on foot.

The survey yielded 17 Aboriginal sites which consisted of 10 rock shelter sites, two rock shelter sites with art and one with deposits. Four artefact scatter sites and one isolated artefact were also found. In addition 12 Potential Archaeological Deposits were recorded in the survey area.

It was recommended that protective buffer zones be established for the rock shelter sites and that if the proposed works were likely to impact on a site then a S87 and/or S90 Permit should be obtained.

OzArk Environmental & Heritage Managament P/L, 2007. Flora/ Fauna and Heritage Assessment: Eight Proposed Dewatering Borehole Sites, Newnes State Forest, Lithgow, NSW.

The report was commissioned by Centennial Coal, Clarence and details the results of a heritage assessment of approximately 1 ha of land in the Newnes State Forest, Lithgow. The survey was conducted by pedestrian transects.

The survey recorded no Aboriginal sites in the locations of the eight proposed dewatering boreholes and associated easement and access tracks. There were no constraints to the proposed development and no further archaeological investigation was considered necessary.

OzArk Environmental and Heritage Management P/L, 2007. Indigenous Heritage Assessment for Subsidence Management Plan over Three Proposed Longwalls (29 – 31), Baal Bone Colliery.

OzArk Environmental and Heritage Management P/L was commissioned by Xstrata Coal Pty Ltd for the preparation of a Subsidence Management Plan (SMP) over proposed longwalls 29 – 31 located beneath the Ben Bullen State Forest, Cullen Bullen, NSW. This Study Area was located 7 km north west of the current study area. OzArk's study comprised an extensive plateau of erosion resistant Triassic sandstone dissected by steep – sided valleys. The area contains remnant surface layers of weathered sandstone and shales of the Narrabeen Group overlaying a complex stratigraphical sequence including the Lidsdale and Lithgow Seams, which are both sub – groups of the Illawarra coal Measures.

A pedestrian field survey of a 250 ha area was conducted and yielded one isolated find and one rock shelter with no surface evidence of Aboriginal occupation. The report stated that if subsidence predictions indicate that the location of the shelter is likely to suffer extensive disturbance, and plans of the underlying longwalls cannot be altered, then a programme of limited sub surface test excavation in the rock shelter and its immediate environment should occur to determine the presence or absence of Aboriginal occupation.

RPS (2010) Cultural Heritage Impact Assessment, Angus Place Colliery, s75W modification.

RPS was commissioned by Centennial Angus Place to prepare a CHIA for proposed modifications under s75W of the EPA Act to the existing approval for works associated with Longwalls 910 and 900W within the Angus Place coal lease. The proposed amendments related to the construction of a de-watering plant, a borehole and associated infrastructure.

A pedestrian survey identified a single site, being a rock shelter with PAD. The site was identified within the western section of the proposed Longwall 910. A subsidence study predicted that the site would not be affected by subsidence, nor would the proposed works impact upon the site.

It was therefore recommended that the site be monitored periodically, in association with the Bathurst Local Aboriginal Land Council.

5.5 Predictive Model for Archaeology in the Study Area

A predictive model is created to provide an indication of Aboriginal sites likely to occur within the study area. It draws on the review of the existing information from the regional and local archaeological context and from the environmental context. The predictive model is necessary for the formulation of appropriate field methodologies and to provide information for the assessment of archaeological significance.

There are a number of factors which influence Aboriginal occupation of an area. These include essential subsistence resources such as food (flora and fauna) and fresh water. However, other resources such as raw stone materials, wood and bark, animal skins and reeds for basket weaving, string, clothing and similar, were also used. Landscape features such as ridges, flat elevated areas, rockshelters and similar, may have also influenced Aboriginal occupation of an area. In addition, cultural activities may have also taken place at certain locations in the landscape for example corroborees, mythological places and initiation sites.

5.6 Site Predictions

The following site predictions for the have been made on the basis of the environmental context, available historic observations of Aboriginal people in the region, archaeological studies, as well as, analysis of the AHIMS data.

5.6.1 Site Type

Based on previous archaeological investigations and Aboriginal sites recorded on the AHIMS database, the most likely site type to be encountered within the study area is the shelter with art and/or deposit. Artefact scatters are also likely. In areas where old growth vegetation remains, scarred trees are also possible.

5.6.2 Site Locations

Shelter sites are usually identified in cliff faces and rock overhangs. As the study area is situated on a plateau, the topography is not conducive to these types of sites being identified.

However, artefact scatters and isolated finds may be found in any landscape, but more often within 100 m of a watercourse. It is therefore predicted that the locations near watercourses within the study area will have a higher potential for containing artefact scatters and/or isolated finds.

5.6.3 Site Contents

A review of previous archaeological investigations indicates that artefact scatters and isolated finds generally comprise flaked stone artefacts made from the following stone raw materials: chert, silicified tuff, quartzite and silcrete. It is therefore predicted that sites with artefacts within the study area will comprise flaked stone tools, cores and flakes and that they will likely be made from chert, silicified tuff, quartzite and silcrete.

6 Archaeological Field Survey

6.1 Survey Methodology

The study area was surveyed in accordance with the requirements set out in the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW 2010).

6.1.1 Survey Aims

The purpose of the survey was to inspect visible ground surfaces, observe exposed soil profiles or other visible features such as rockshelters, scarred trees and rock art, in addition to assessing whether potential archaeological deposits are present in the study area. The survey also aimed to record any cultural sites or Aboriginal landscapes, if identified by the Aboriginal stakeholders.

6.1.2 Survey Strategy

As the study area is relatively small, it was decided to survey it in its entirety. This included both the existing track and bore location. For a description of the survey area and survey methodology, please see Section 6.2.

6.1.3 Field Methods

The survey was conducted on foot (pedestrian) and targeted the landforms identified in the survey strategy above. The area surveyed was recorded in survey units. Each survey unit was mapped and recorded in accordance with landforms, study area boundaries, impact area boundaries, changes in survey conditions (such as visibility or ground surface exposure) and/or other relevant considerations. The mapping of survey units was undertaken on the basis of GPS recorded data and with reference to aerial and topographic information. The recording of survey units was undertaken using representative digital photographs and field notes which included observations of soils, ground surface exposure and visibility, vegetation cover, rock outcrops, levels of ground surface disturbance, erosion and similar observations. The field notes provide a basis for the reporting of survey coverage and calculating survey effectiveness as presented in the survey results section. It is required that any Aboriginal sites identified are recorded and submitted to the AHIMS database. Such recording involves the documentation of the material traces of past Aboriginal land use, including the spatial extent of sites and any other obvious physical boundaries. Aboriginal cultural sites identified by Aboriginal stakeholders may not always involve material traces and boundaries of such sites need to be mapped on the basis of information provided by the stakeholders. The position of such sites need to be recorded by GPS receivers and mapped accordingly.

6.2 Survey Units

A pedestrian survey of the study area was undertaken by RPS archaeologist, Deborah Farina, and Aboriginal stakeholders representing Bathurst Local Aboriginal Land Council, Gundungurra Tribal Council Aboriginal Corporation, Wiradjuri Council of Elders, Mingaan Aboriginal Corporation, Warrabinga Native Title Claimants Aboriginal Corporation and North East Wiradjuri Aboriginal Corporation on 12 January 2012. The study area was surveyed in two survey units; exposure and visibility for each survey unit was assessed according to the criteria listed in Table 6-1 and the survey coverage for the study area was recorded in Figure 6-1 and Table 6-2. With regard to the existing access track, although it is proposed to widen the existing track to 10 m, a total of 10 m either side of the track was surveyed, over and above the necessary coverage.

Survey Unit 1

This unit comprised the access track to dewatering borehole 8. This track measured approximately 5 m wide and is graded along the entire route to the borehole location. The length of the track from near the junction of Sunnyside Ridge Road near Blackfellows Hands Road is approximately 3.5 km.

The track forming this survey unit is well formed the entire length to the bore site, although some parts consisted of a sand base, whilst other sections were affected by erosion from runoff. The alignment of the track from Sunnyside Ridge Road was undulating, though generally moved downhill to the bore location.

Leaf litter was thick along the verges of the track, with very little ground surface visible. Pebbles were noted infrequently on the surface both along the tracks and in the impact zones either side of the tracks, however no Aboriginal artefactual material was observed. The vegetation is regrowth, with evidence of previous clearance. Very few examples of old growth trees were observed and those that were noted were located outside of the impact area proposed by this project. No culturally modified trees were identified.

No Aboriginal sites were identified within this survey unit.

Survey Unit 2

Survey Unit 2 comprised an area of 120 m x 120 m to be utilised for the proposed dewatering bore #8. It was located on mostly level ground on a mid-slope and bisected by the access track.

Two survey marker trees were noted on the eastern side of the track, both pointing inwards to a survey marker with the identification of “ELN 85”. The inspection focussed on the western side of the track owing to a steep slope on the eastern side, approximately 20 m east of the track.

The vegetation on both sides of the track was a mix of regrowth vegetation, with thick, shrubs in the understory. Access was varied; in some places the thickness of the understory prevented proper inspection, in others, grasses and thick leaf litter obscured much of the ground surface. Visibility was therefore low, with the largest exposure being the access track.

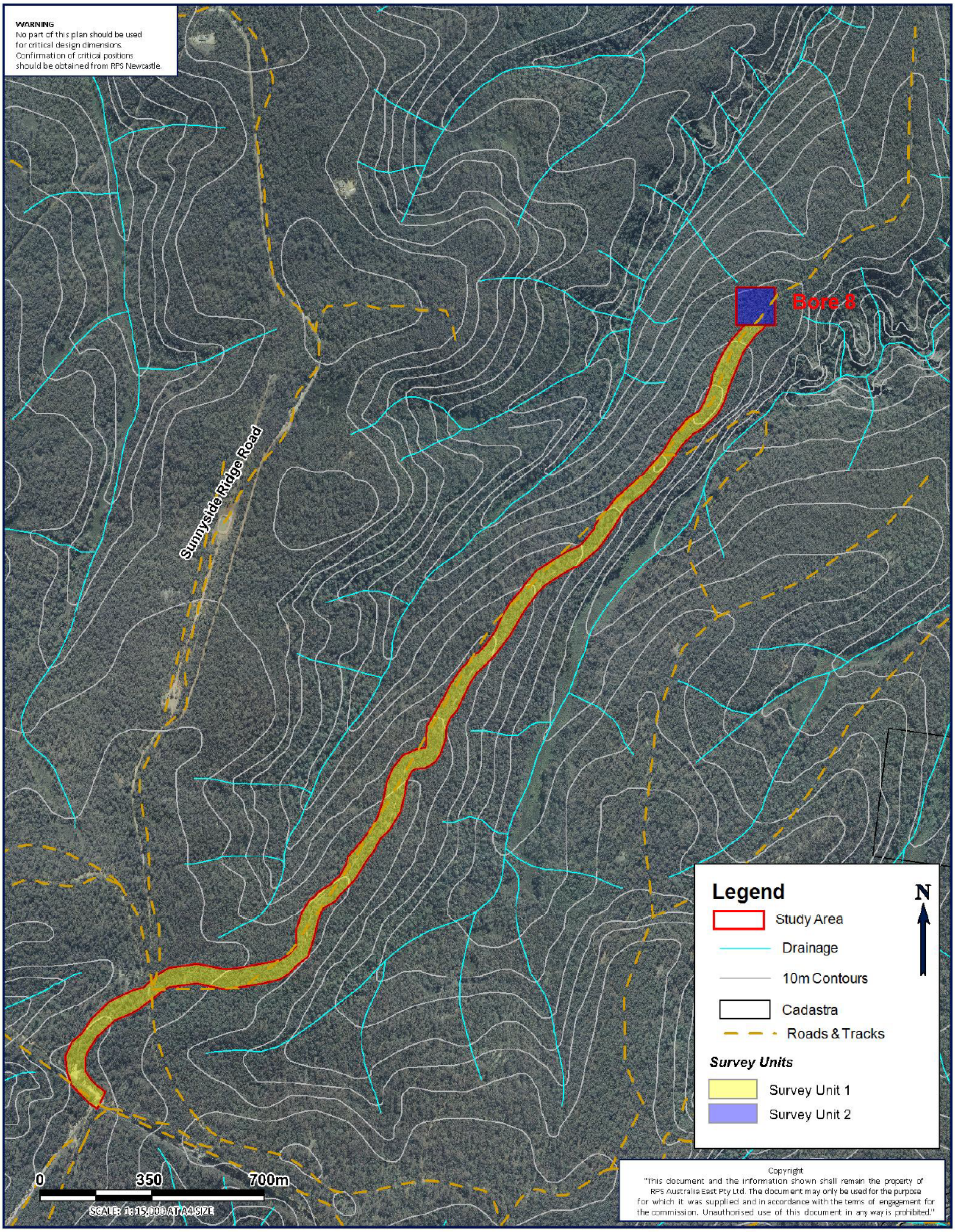
No Aboriginal sites were identified within this survey unit.

Table 6-1: Ground Surface Visibility Rating

GSV Rating	Overall Rating	Description
0 – 9%	Low	Heavy vegetation with scrub foliage, debris cover and/or dense tree cover. Ground surface not clearly visible.
10 – 29%	Low	Moderate level of vegetation, scrub or tree cover. Small patches of soil surface visible resulting from animal tracks, erosion or blowouts. Patches of ground surface visible.
30 – 49%	Moderate	Moderate levels of vegetation, scrub and/or tree cover. Moderate sized patches of soil surface visible possibly associated with animal tracks, walking tracks and erosion surfaces. Moderate to small patches across a larger section of the study area.
50 – 59%	Moderate	Moderate to low level of vegetation, tree and/or scrub. Greater amounts of areas of ground surface visible in the form of erosion scalds, recent ploughing, grading or clearing.
60 – 79%	High	Low levels of vegetation and scrub cover. High incidence of ground surface visible due to recent or past land–use practices such as ploughing, grading and mining. Moderate level of ground surface visibility due to sheet wash erosion, erosion scalds and erosion scours.
80 – 100%	High	Very low to nonexistent levels of vegetation and scrub cover. High incidence of ground surface visible due to past or recent land use practices, such as ploughing, grading and mining. Extensive erosion such as rill erosion, gilgai, sheet wash, erosion scours and scalds.

Table 6-2: Survey Coverage Data.

Survey Unit	Landform	Survey Unit Area (Square metres)	Exposure (%)	Visibility (%)	Effective Coverage Area (square metres)	Effective Coverage (percent)
1	Track; variable	178,900	10	10	1,789	1%
2	Lower slope	14,400	30	10	432	3%



WARNING
No part of this plan should be used
for critical design dimensions.
Confirmation of critical positions
should be obtained from RPS Newcastle.

TITLE: FIGURE 6-1: SURVEY UNITS
LOCATION: NEWNES PLATEAU
DATUM: (GDA 94)
PROJECTION: MGA ZONE 56
DATE: 11/07/2012
PURPOSE: HERITAGE
LAYOUT REF: J:\JOBS\Centennial\All Jobs\110382 Springvale Dewatering Bores 7&8\10. Drafting\MapInfo Workspaces\Arch
VERSION (PLAN BY):D A4 (DF-NW)

CLIENT: SPRINGVALE COAL PTY LTD
JOB REF: 110382

RPS AUSTRALIA EAST PTY LTD (ABN 44 140 292 762)
241 DENISON STREET BROADMEADOW PO BOX 428 HAMILTON NSW 2303
T: 02 4940 4200 F: 02 4961 6794 www.rpsgroup.com.au

RPS

Figure 6-1: Survey Units

6.3 Survey Results

No Aboriginal sites were identified during the survey.

6.4 Discussion of Survey Results

On the basis of a review of the relevant environmental and archaeological information a predictive model of the study area was formulated. Based on AHIMS data and previous archaeological investigations in the vicinity of the study area, it was predicted that the most common types of sites would be shelters with/without art and/or deposit and artefact scatters/isolated finds. It was predicted further that the archaeological contents of such artefact sites would comprise flaked stone artefacts; that up to 30 artefacts would be expected as a maximum frequency for artefact scatters and that raw materials would include silcrete, mudstone, tuff and chert. It was also predicted that the location of the sites would be within 200 m of watercourses.

The majority of the study area is a plateau, it is unsuitable for rock overhangs needed for shelters. Further, the nearest watercourse was 250 m to the west of the study area, and therefore outside the predicted maximum of 200 m. The absence of sites within the study area would therefore appear to support the predictive model.

It should be borne in mind that heavy vegetation across the study area obscured much of the ground surface, thereby limiting the ability to identify sites such as artefact scatters and/or isolated finds. As these sites can be in any landscape, it may be that these types of sites are present within the study area, beneath the leaf litter.

On the other hand, the dominant site types identified within the vicinity of the study area as demonstrated by the AHIMS results are shelters, either with/without art and/or deposit and/or grinding grooves. Artefact scatters are located in the vicinity of the study area, as shown in Figure 5-2, however, they are exclusively located in association with watercourses. Whilst this may be the result of survey bias, i.e. the intensive surveying of watercourses for various projects, it is nonetheless plausible that even with optimum visibility, such site types would not be present on the plateau.

Whilst modified trees are present in AHIMS results, much of the vegetation in the study area is regrowth vegetation and therefore not suitable for the presence of such sites. However, where old growth trees were observed, they were checked for scars and/or carving, particularly in areas where the proposed works would impact upon the vegetation. No culturally modified trees were identified in the study area.

7 Conclusions and Recommendations

This report has considered the environmental and archaeological context of the study area, developed a predictive model and reported on the results of an archaeological survey of the study area. The survey did not locate any items of Aboriginal significance within the study area, and as such the assessment concludes there are no constraints to the project in respect of Aboriginal heritage.

The following recommendations apply to the overall management of proposed works within the study area.

Recommendation 1

No Aboriginal objects or places have been identified within the study area and therefore an Aboriginal Impact Permit (AHIP) is not required for the proposed activity.

Recommendation 2

All relevant Centennial Coal staff should be made aware of their statutory obligations for heritage under NSW *NPW Act 1974* and the NSW *Heritage Act 1977* which may be implemented as a heritage induction.

Recommendation 3

If during the proposed works further Aboriginal sites are identified in the study area, then all works in the area should cease, the area cordoned off and contact made with OEH Enviroline 131 555, a suitably qualified archaeologist and the relevant Aboriginal stakeholders, so that it can be adequately assessed and managed.

Recommendation 4

In the unlikely event that skeletal remains are identified, work must cease immediately in the vicinity of the remains and the area cordoned off. The proponent will need to contact the NSW Police Coroner to determine if the material is of Aboriginal origin. If determined to be Aboriginal, the proponent, must contact the OEH Enviroline 131 555, a suitably qualified archaeologist and representatives of the local Aboriginal Community Stakeholders to determine an action plan for the management of the skeletal remains, formulate management recommendations and to ascertain when work can recommence.

Recommendation 5

If, during the course of development works, suspected European cultural heritage material is uncovered, work should cease in that area immediately. The NSW Heritage Branch should be notified and works only recommence when an appropriate and approved management strategy instigated.

8 References

Bryan, J. H. (1966). Sydney 1:250 000 Geological Sheet SI/56-05, 3rd ed., Geological Survey of New South Wales, Sydney.

Bureau of Meteorology (2011). Climate Statistics for Australian Locations. Retrieved on 5 January 2012 from http://www.bom.gov.au/climate/averages/tables/cw_063292.shtml.

Burke, H. and C. Smith (2004). The Archaeologist's Field Handbook. Crows Nest, Allen and Unwin.

Central West Archaeological and Heritage Services Pty Ltd, 2000. An Aboriginal Archaeological Study of the Marangaroo Department of Defence Site, Lithgow, NSW. Unpublished report to Dames & Moore Pty Ltd.

DECC (2008) Sydney Basin - Regional History. Retrieved on 5 January 2011 from http://www.environment.nsw.gov.au/bioregions/SydneyBasinRegionalHistory.htm.

DECCW (2010a). Aboriginal Cultural Heritage Consultation Requirements for Proponents – Part 6 *National Parks & Wildlife Act 1974*, Department of Environment, Climate Change and Water, Hurstville.

DECCW (2010b). Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales. Part 6 National Parks and Wildlife Act 1974.

Doelman, T., R. Torrence, et al. (2008). Source selectivity: An assessment of Volcanic Glass Sources in the Southern Primorye Region, Far East Russia. Geoarchaeology: An International Journal **23**: 243-273.

First Australians (ND). Windradyne - First Australians. www.firstaustralians.com.au First Australians Retrieved 4 March, 2010.

Gaul, post 1980. Prehistoric Archaeology 391-1, Assignment 2: Black-Fellows Hands Shelter and Environs. University of New England, Armidale.

Gollan, K. (1987). Archaeological investigations on Newnes Plateau: A Report to the National Parkes and Wildlife Service, NSW.

Gorecki, P. (1983). Archaeological Survey Kariwara Colliery Lease, Lithgow NSW. Unpublished report to NPWS.

Harper Somers O'Sullivan, (2008). Clarence Colliery – Partial Extraction of CCL705 Outbye Areas; A Predictive Archaeological Model. Unpublished Report to GSS Environmental.

Keith, D. (2006). Ocean Shores to Desert Dunes – The Native Vegetation of New South Wales and the ACT. Department of Environment & Conservation, Hurstville.

King, D. P. (1992). Soil Landscapes of the Wallerawang 1:100 000 Sheet. Report. Department of Conservation and Land Management, Sydney.

Lithgow Tourism (1996 - 1999) Lithgow Living History, Lithgow Steeped in History, Surrounded by Nature: Lithgow History http://www.lithgotourism.com/history.htm

L'Oste Brown, S., Godwin, Poter, C. (1998). Towards an Aboriginal Social and Cultural Landscape of the Bowen Basin Aboriginal Cultural Heritage Project. Cultural Heritage Monograph Series Volume 2. Brisbane, Queensland Department of Environment and Heritage, Brisbane. 2.

Mid Mountains Historical Society (2007). The First Inhabitants. Retrieved on 5 January 2011 from http://www.midmountainshistory.org/first_inhabitants.html.

Mulvaney, K. and J. Kamminga (1999). Prehistory of Australia. Sydney, Allen and Unwin.

Murray, R. White, K (1988a). Dharug and Dungaree: The History of Penrith and St Mary's to 1860. Penrith, Hargreen Publishing Company in conjunction with the Council of the City of Penrith.

NSW National Parkes and Wildlife Service (1991). An Outdoor Museum: Historic places in the NPWS estate. H. NPWS.

NSW State Heritage Office (2011). State Heritage Register.

OzArk Environmental & Heritage Managament P/L, 2007. Flora/ Fauna and Heritage Assessment: Eight Proposed Dewatering Borehole Sites, Newnes State Forest, Lithgow, NSW. Unpublished report to Centennial Coal, Clarence.

OzArk Environmental and Heritage Management P/L, 2007. Indigenous Heritage Assessment for Subsidence Management Plan over Three Proposed Longwalls (29 – 31), Baal Bone Colliery. Unpublished report to Xstrata Coal.

Percival, R & Stewart, K (1997). Bush Foods of New South Wales - A Botanic Record and an Aboriginal Oral History, Royal Botanic Gardens, Sydney.

Rich, E. (1988). Proposed Prison at Marangaroo Creek near Lithgow, NSW. Unpublished report to NSW Department of Public Works.

Rich, E. & Gorman, A. (1992). Proposed Springvale Colliery and Conveyor, Wallerawang: Archaeological Survey for Aboriginal Sites. Unpublished report to Sinclair Knight.

Rich, E. (1993). Springvale Coal Project, Wallerawang, NSW: Archaeological Inspection of Aboriginal Sites affected by Construction Works. Unpublished report to Howie Herring and Forsyth Pty Ltd.

RPS Group, (2010). Cultural Heritage Impact Assessment, Angus Place Colliery, s75W modification. Unpublished report to Centennial Coal Angus Place.

Short, A (2000). *Sydney's Dynamic Landscape* in "Sydney - Emergence of a World City", Connell J (ed.), Oxford University Press, Melbourne.

Stockton, J. (1983). A Survey for Prehistoric Sites on the proposed Clarence Transfer for the Lithgow Water Supply, NSW. Unpublished report to NSW Department of Public Works.

9 Plates

Plate 1: Survey Unit 1; looking east

Plate 2: Survey unit 1 looking west. Note survey tree adjacent to track.

Plate 3: Survey marker in the eastern portion of survey unit 2.

Plate 4: Survey unit 2 – western portion.

Appendix I

Legislative Requirements

Summary of Statutory Controls

The following overview of the legal framework is provided solely for information purposes for the client, it should not be interpreted as legal advice. RPS will not be liable for any actions taken by any person, body or group as a result of this general overview and recommend that specific legal advice be obtained from a qualified legal practitioner prior to any action being taken as a result of the summary below.

COMMONWEALTH

Aboriginal and Torres Strait Islander Heritage Protection Act 1984 (ATSIHP Act),

The purpose of this Act is to preserve and protect all heritage places of particular significance to Aboriginal and Torres Strait Islander people. This Act applies to all sites and objects across Australia and in Australian waters (s4).

It would appear that the intention of this Act is to provide national baseline protection for Aboriginal places and objects where State legislation is absent. It is not to exclude or limit State laws (s7(1)). Should State legislation cover a matter already covered in the Commonwealth legislation and a person contravenes that matter, that person may be prosecuted under either Act, but not both (s7(3)).

The Act provides for the preservation and protection of all Aboriginal objects and places from injury and/or desecration. A place is construed to be injured or desecrated if it is not treated consistently with the manner of Aboriginal tradition or is or likely to be adversely affected (s3).

Australian Heritage Commission Act 1975

Australian Heritage Commission Act 1975 established the Australian Heritage Commission which assesses places to be included in the National Estate and maintains a register of those places. Places maintained in the register are those which are significant in terms of their association with particular community or social groups and they may be included for social, cultural or spiritual reasons. The Act does not include specific protective clauses.

The *Australian Heritage Council Act 2003* together with the *Environment Protection & Biodiversity Conservation Act 1999* includes a National Heritage List of places of National heritage significance, maintains a Commonwealth Heritage List of heritage places owned or managed by the Commonwealth and ongoing management of the Register of the National Estate.

STATE

It is incumbent on any land manager to adhere to state legislative requirements that protect Aboriginal Cultural heritage. The relevant legislation in NSW includes but is not limited to:

National Parks & Wildlife Act 1974 (NPW Act)

The NPW Act provides statutory protection for all Aboriginal heritage, places and objects (not being a handicraft made for sale), with penalties levied for breaches of the Act. This legislation is overseen by the Office of Environment & Heritage (OEH) (formerly Department of Environment, Climate Change and Water (DECCW)). The relevant portion of the Act is Part 6 and is concerned with Aboriginal objects and places, with Sections 86 and 90 being the most pertinent. In 2010, this Act was substantially amended, particularly with respect to Aboriginal cultural heritage requirements. Relevant sections include:

Section 86

This section now lists four major offences:

(2) A person must not harm an object that the person knows is an Aboriginal object;

(3) A person must not harm an Aboriginal object;

(4) For the purposes of s86, “circumstances of aggravation” include (a) the offence being committed during the course of a commercial activity; or (b) that the offence was the second or subsequent offence committed by the person.

(5) A person must not harm or desecrate an Aboriginal place.

Offences under s86 (2) and (4) are now strict liability offences, i.e., knowledge that the object or place harmed was an Aboriginal object or place needs to be proven. Penalties for all offences under Part 6 of this Act have also been substantially increased, depending on the nature and severity of the offence.

Section 87

This section now provides defences to the offences of s86. These offences chiefly consist of having an appropriate Aboriginal Heritage Impact Permit (AHIP), not contravening the conditions of the AHIP or demonstrating that due diligence was exercised prior to the alleged offence.

Section 87A & 87B

These sections provide exemptions from the operation of s86: Section 87A for authorities such as the Rural Fire Service, State Emergency Services and offices of the National Parks & Wildlife Service in the performance of their duties and s87B for Aboriginal people performing traditional activities.

Section 89A

This section provides that a person who knows of an Aboriginal object or place and does not advise the Director-General of that object or place within a reasonable period of time, is guilty of an offence.

Section 90

This section authorises the Director-General to issue an AHIP.

Section 90A-90R

These sections govern the requirements relating to applying for an AHIP. In addition to the amendments to the Act, DECCW have issued three new policy documents clarifying DECCW's requirements with regards to Aboriginal archaeological investigations: *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010*, *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* and *Code of Practice for Archaeological Investigations in NSW*. The Consultation Requirements formalise the consultation with Aboriginal community groups into four main stages and include details regarding the parties required to be consulted and the methods of establishing the necessary stakeholders to be consulted, advertisements inviting Aboriginal community groups to participate in the consultation process, requirements regarding the provision of methodologies, draft and final reports to the Aboriginal stakeholders and timetables for the four stages. The Due Diligence Code of Practice sets out the minimum requirements for investigation, with particular regard as to whether an AHIP is required. The Code of Practice for Archaeological Investigation sets out the minimum requirements for archaeological investigation of Aboriginal sites.

Aboriginal Heritage Impact Permits (AHIP)

DECCW encourages consultation with relevant Aboriginal stakeholders for all Aboriginal Heritage assessments. However, if an Aboriginal Heritage Impact Permit (AHIP) is required for an Aboriginal site, then specific DECCW guidelines are triggered for Aboriginal consultation.

Aboriginal Cultural Heritage Consultation Requirements for Proponents

In 2010, the *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (ACHCRs) were issued by DECCW (12th of April, 2010). These consultation requirements replace the previously issued *Interim Community Consultation Requirements* (ICCR) for Applicants (DEC 2004). These guidelines apply to all AHIP applications prepared after April 12, 2010; for projects commenced prior to April 12, 2010 transitionary arrangements have been stipulated in a supporting document, Questions and Answers 2: Transitional Arrangements.

The ACH Consultation Requirements 2010, include a four stage Aboriginal consultation process and stipulates specific timeframes for each stage. Stage 1 requires that Aboriginal people who hold cultural information are identified, notified and invited to register an expression of interest in the assessment. Stage 1 includes the identification of Aboriginal people who may have an interest in the study area and hold information relevant to determining the cultural significance of Aboriginal objects or places. This identification process should draw on reasonable sources of information including: the relevant DECCW EPRG regional office, the relevant Local Aboriginal Land Council(s), the registrar, Aboriginal Land Rights Act 1983, the Native Title Tribunal, Native Title Services Corporation Limited, the relevant local council(s) and the relevant catchment management authority. The identification process should also include an advertisement placed in a local newspaper circulating in the general location of the study area. Aboriginal organisations and/or individuals identified should be notified of the project and invited to register an expression of interest (EoI) for Aboriginal consultation. Once a list of Aboriginal stakeholders has been compiled from the EOIs, they need to be consulted in accordance with ACHCRs Stages 2, 3 and 4.

For projects commenced before the 12 April, 2010, Section 1 (Q1) of the transitional arrangements indicates that if Aboriginal consultation was commenced prior to the 12 April 2010 (including advertising and notification of stakeholders) then consultation is to be continued under the previous ICCR guidelines.

*Interim Community Consultation Requirements (ICCR) for Applicant*s (DEC 2004) required a three stage process of which timeframes were stipulated for specific components. Stage 1 required the notification and registration of interests. Notification included an advertisement in a local print media, as well as, as contacting the Local Aboriginal Land Council(s), the registrar of Aboriginal Owners, Native Title Services, local council(s) and the Department of Environment and Conservation. Stage 1 also required the invitation for expressions of interest (EoI) to be sent to interested Aboriginal parties and an Aboriginal stakeholder list compiled. Stage 2 required the preparation of an assessment design to be sent to the Aboriginal stakeholders for comment and review. Stage 3 required that the assessment report be provided to registered Aboriginal stakeholders for review and comment.

Environmental Planning & Assessment Act 1979 (EP&A Act)

This Act regulates a system of environmental planning and assessment for New South Wales. Land use planning requires that environmental impacts are considered, including the impact on cultural heritage and specifically Aboriginal heritage. Within the *EP&A Act (1979)*, Parts 3, 4 and 5 relate to Aboriginal heritage.

Part 3 regulates the preparation of planning policies and plans. Part 4 governs the manner in which consent authorities determine development applications and outlines those that require an environmental impact statement. Part 5 regulates government agencies that act as determining authorities for activities conducted by that agency or by authority from the agency. The National Parks & Wildlife Service is a Part 5 authority under the *EP&A Act (1979)*.

In brief, the *NPW Act (1974)* provides protection for Aboriginal objects or places, while the *EP&A Act (1979)* ensures that Aboriginal cultural heritage is properly assessed in land use planning and development.

Heritage Act 1977

This Act protects the natural and cultural history of NSW with emphasis on non-indigenous cultural heritage through protection provisions and the establishment of a Heritage Council. Although Aboriginal heritage sites and objects are primarily protected by the *National Parks & Wildlife Act 1974*, if an Aboriginal site, object or place is of great significance, it may be protected by a heritage order issued by the Minister subject to advice by the Heritage Council.

Other legislation of relevance to Aboriginal cultural heritage in NSW includes the *NSW Local Government Act 1993*. Local planning instruments also contain provisions relating to indigenous heritage and development conditions of consent.

Appendix 2

Aboriginal Consultation – Published Advertisement

PUBLIC NOTICES

Centennial Coal

Registration of Interest
for Aboriginal Cultural Knowledge Holders
Centennial Coal Western Region

Centennial Coal is requesting registrations of interest from Aboriginal Stakeholders for projects in the Capertee, Blackmans Flat, Lidsdale and Newnes Plateau localities.

The purpose of this community consultation with Aboriginal people is to assist the proposed applicant in the potential preparation of applications for Aboriginal Heritage Impact Permits and to assist the Director General of Office of Environment and Heritage in his or her consideration and determination of the applications.

As per Department of Environment Climate Change and Water (now Office of Environment and Heritage) 2010 Aboriginal Cultural Heritage Consultation Requirements for Proponents responses are to be received before **Friday 21 October 2010**. *Written applications* should be forwarded to:

Tony Seibel-Barnes
Centennial Coal Company
Locked Bag 1002
Wallerawang NSW 2845
Mobile: 0448 443864
tony.seibel-barnes@centennialcoal.com.au

Further information will be provided upon registration.

9392-121

Appendix 3

Aboriginal Consultation – Written Responses from the Aboriginal Community Stakeholders

1. Gundungurra Tribal Council Aboriginal Corporation

Springvale Mine Dewatering Bores 7 & 8
Aboriginal Culture & Heritage Survey Assessment
May 2012

Introduction:

Springvale Coal Pty Limited requested Gundungurra cultural site officers to attend an Aboriginal Cultural Heritage Consultation and Investigation for the construction of Dewatering Bores 7 & 8 at Springvale Mine Springvale Coal Pty Limited.

The main objective of the Aboriginal Heritage Assessment is to assess the proposal for its likely and potential impacts on places or items of significance to Gundungurra Heritage.

Project Location:

The project location is situated at Springvale within the Lithgow Local Government Area (LGA). Wywandy Clan of the Gundungurra people's traditional land makes up a major part of the projects location. The specific area also is a part of the east coast of Australia Aboriginal song line and boarders on the connection between the North Coast and South Coasts of New South Wales trade route and traditional walkways.

Project Description:

The study area, located at Springvale within the Lithgow Local Government Area (LGA), falls within the existing Springvale mining lease and is located entirely within the Newnes State Forest. Springvale seeks to modify development consent S91/06569/001 to allow for the construction and operation of two additional dewatering facilities (Bores 7 and 8) within the Newnes State Forest on the Newnes Plateau, as well as an increase in Run of Mine (ROM) coal production from 3.4 Mtpa to 4 Mtpa (the Project).

Disturbance Area:

A review of the disturbance history in discussion with relevant personnel of RPS and Springvale Coal indicates that the proposed site and surrounding areas have been subject to disturbance of varying types over a significantly long period. Given the location and the significance of the cultural connection of the area, it is imperative that consultation between stakeholders occurs as a matter of priority if there are any changes in the study area and surrounding boundaries.

Legislation Requirements:

Commonwealth Legislation:

The Native Title Act 1993 provides recognition of the indigenous inhabitation of this land prior to the arrival of European settlement. In terms of this project, the application of this act has occurred previously in the advertising of all relevant details required under Section 29 by Enhance Place Pty Ltd in which all crown lands contained within the boundary of the assessment lease was advertised for Native title claimants. Gundungurra Tribal Council Aboriginal Corporation has a registered claim for native title. To date successful negotiations have occurred between relevant parties.

State Legislation:

The legislative requirement for the protection and management of Aboriginal heritage and more specific Gundungurra Heritage is facilitated under various Acts. This proposed development is subject to the various provisions within these legislations pertaining to the assessment of potential impacts of the development on our Heritage being Gundungurra Heritage within the Project Site.

Gundungurra Tribal Council Aboriginal Corporation:

The Gundungurra Tribal Council is the recognised representative Corporation on behalf of all of our members and Gundungurra descendants that belong to and reside in our traditional boundary area that include the Blue Mountains; Wollondilly; Burragorang Valley & Lithgow and surrounding areas.

The management of our country and the protection of our cultural and heritage is of critical and fundamental importance to Gundungurra Tribal Council and our members.

The proposed development site is within the traditional boundary area of Gundungurra Aboriginal Nation and our members and Gundungurra descendants are the key stakeholders in the conduct of this cultural and heritage assessment.

Background:

Gundungurra Culture & Heritage Investigations/Assessments:

Our culture and heritage assessments take into consideration various facets of Gundungurra cultural and heritage and include Aboriginal sites; our history both verbal and written knowledge of specific areas and our social and spiritual connection of our traditional lands.

Field Survey Findings:

- High volume of vegitation and ground coverage, which impacted upon visual of artifact reminants and other cultural activities and evidence of sites of cultural significance or otherwise.
- No evidents of flakes; artifact reminants and other cultural activities and evidence of sites of cultural significance or otherwise.

- No sites of cultural significance were identified during the survey.
- Sites that have already been recorded were apart of the site survey.

Conclusion: Gundungurra Tribal Council Aboriginal Corporation advise that the proposed development site carries no potential for direct impacts on the cultural heritage values of Gundungurra by the proposed work activities.

Recommendations:

The following recommendations are made by Gundungurra Tribal Council to account for any risidual risks:

- Gundungurra Tribal Council are consulted when any changes are made to the proposed locations or where the project scope is altered in any way.
- Where changes are made to the project plans in regard to the proposed disturbance zones, further field surveying is carried out.
- If any potential places, sites or items of cultural signifcance are identified, all activities are to cease until such time as the appropriate representatives of Gundungurra Tribal Council have assessed the site in assistance with archaeological investigation ensuring adequaste site management plans have been devised.

SUMMARY

Gundungurra Tribal Council Aboriginal Corporation are of the opinion that Springvale Mine will make every effort to preserve any potential places, sites or items of cultural significance if they are identified as recommended.

We are very keen to support and work with Springvale Mine with preserving our heritage and culture.

Thanking you in anticipation to Springvale Mine for giving us the opportunity of being involved with this stage and we look forward to working together again.

This report will be presented to the next Gundungurra Tribal Council Aboriginal Corporation meeting.

Appendix 4

Aboriginal Consultation Log

Aboriginal Consultation Log

Date	Consultation Description	Method of Contact	Outcomes
04/11/2011	From Tonilee Scott of Bathurst LALC	Email	Registered interest
08/11/2011	To Dhuuluu-Yala Aboriginal Corporation	Letter	Invitation to express interest
08/11/2011	To Wiradjuri Council of Elders	Letter	Invitation to express interest
08/11/2011	To Robert Clegg	Letter	Invitation to express interest
08/11/2011	To Wiradjuri Traditional Owners Central West Aboriginal Corporation	Letter	Invitation to express interest
08/11/2011	To Wiray-dyuraa Ngumbaay-dyil	Letter	Invitation to express interest
08/11/2011	To Gundungurra Tribal Council Aboriginal Corporation	Letter	Invitation to express interest
08/11/2011	To Gundungurra Aboriginal Heritage Association Inc.	Letter	Invitation to express interest
08/11/2011	To Mingaan Aboriginal Corporation	Letter	Invitation to express interest
08/11/2011	Aboriginal Reference Group of Hawkesbury-Nepean Catchment Management Authority	Letter	Invitation to express interest
08/11/2011	To Warrabinga Native Title Claimants Aboriginal Corporation	Letter	Invitation to express interest
08/11/2011	To North East Wiradjuri	Letter	Invitation to express interest
08/11/2011	To Blackshield Lawyers on behalf of the Warrabinga-Wiradjuri People	Letter	Invitation to express interest
08/11/2011	To Eddy Neumann Lawyers on behalf of GTCAC (represented by Mervynn Trindall, Elsie Stockwell and Pamela Stockwell)	Letter	Invitation to express interest
21/11/2011	To Blackshield Lawyers	Phone	Following up letter of 08/11/2011; left message
21/11/2011	To GTCAC	Phone/ email	Following up letter of 08/11/2011; left message
21/11/2011	To Wendy Lewis of Warrabinga	Phone	Said she had moved and did not receive the first letter. Explained contents and she confirmed she wished to register
21/11/2011	To Lyn Syme of North East Wiradjuri	Phone	Stated she wished to register interest
21/11/2011	To Sharon Riley of Mingaan	Phone	Following up letter of 08/11/2011. Left message
21/11/2011	To Teitzel & Partners (representing Wiray-dyuraa Ngumbaay-dyil and Wiray-dyuraa Maying-gu	Email/ Phone	Following up letter of 08/11/2011. Left message and re-sent email.
21/11/2011	To Eddy Neumann Lawyers representing native title claimants from GTCAC	Email	Following up letter of 08/11/2011. Attaching copy of letter and requesting response ASAP.
21/11/2011	From Sharon Brown of GTCAC	Email	Registered interest and requesting emailed copy of original letter.

21/11/2011	To Helen Riley of Mingaan	Phone	Confirmed Mingaan wished to register interest
21/11/2011	To Eddy Neumann Lawyers	Phone	Confirmed GTCAC wished to register interest
21/11/2011	From Eddy Neumann Lawyers	Email	Confirmed in writing GTCAC wished to register interest
21/11/2011	To Robert Clegg	Email	Attaching copy of letter of 08/11/2011 requesting a response ASAP
21/11/2011	To Dhuuluu-Yala Aboriginal Corporation	Email	Attaching copy of letter of 08/11/2011 requesting response ASAP
21/11/2011	To Rochelle of Dhuuluu-Yala Aboriginal Corporation	Phone	Stated she did not remember the letter but said she would check her email and respond. She also believed that they would not have a sites officer available.
21/11/2011	To Neville Williams of Mooka	Email	Attaching copy of letter of 08/11/2011 requesting response ASAP
21/11/2011	To Neville Williams of Mooka	Phone	Said he did not remember receiving the letter but would check his email and respond
21/11/2011	From Neville Williams on behalf of Sharon Williams of Mooka	Email	Registering interest.
21/11/2011	To Wiradjuri Traditional Owners Central West Aboriginal Corporation	Email	Following up on letter of 08/11/2011. Sent copy of letter and requesting response ASAP
21/11/2011	To Brian Grant of Wiradjuri Traditional Owners Central West Aboriginal Corporation.	Phone	No response. No voice mail to leave message.
21/11/2011	Attempted to contact Gundungurra Aboriginal Heritage Association Inc.	Phone	Was informed this group may no longer exist.
22/11/2011	From Rochelle of Dhuuluu-Yala Aboriginal Corporation	Phone	Advised that as they don't have a sites officer available they would not be registering interest
22/11/2011	To Simon of Blackshield Lawyers	Phone	Said the Warrabinga-Wiradjuri people would like to register their interest
22/11/2011	To Brian Grant of Wiradjuri Traditional Owners Central West Aboriginal Corporation	Phone	Left message on home phone; mobile engaged.
28/11/2011	From Robert Clegg of Wiradjuri Traditional Owners Central West Aboriginal Corporation	Email	Advice that Sharon Riley or Helen Riley will be their representatives for registration
28/11/2011	From John Lennis of Hawkesbury-Nepean Catchment Management Authority	Phone	Confirmed they did not wish to register interest in any of the projects
23/11/2011	Letter to Bathurst LALC	Email	Attaching methodology of Western Holdings Project

			including Springvale Bores 7 & 8; requesting comments by 23/12/2011
23/11/2011	Letter to GTCAC	Email	Attaching methodology of Western Holdings Project including Springvale Bores 7 & 8; requesting comments by 23/12/2011
23/11/2011	Letter to Mingaan Aboriginal Corporation	Email	Attaching methodology of Western Holdings Project including Springvale Bores 7 & 8; requesting comments by 23/12/2011
23/11/2011	Letter to Mooka Traditional Owners	Email	Attaching methodology of Western Holdings Project including Springvale Bores 7 & 8; requesting comments by 23/12/2011
23/11/2011	Letter to Wiradjuri Council of Elders	Email	Attaching methodology of Western Holdings Project including Springvale Bores 7 & 8; requesting comments by 23/12/2011
23/11/2011	Letter to Warrabinga Native Title Claimants Aboriginal Corporation	Mail	Enclosing methodology of Western Holdings Project including Springvale Bores 7 & 8; requesting comments by 23/12/2011
23/11/2011	Letter to North East Wiradjuri	Mail	Enclosing methodology of Western Holdings Project including Springvale Bores 7 & 8; requesting comments by 23/12/2011
23/11/2011	Letter to Eddy Neumann Lawyers	Email	Attaching methodology of Western Holdings Project including Springvale Bores 7 & 8; requesting comments by 23/12/2011
23/11/2011	Letter to Teitzel & Partners	Mail	Enclosing methodology of Western Holdings Project including Springvale Bores 7 & 8; requesting comments by 23/12/2011
23/11/2011	Letter to Blackshield Lawyers	Email	Attaching methodology of Western Holdings Project including Springvale Bores 7 & 8; requesting comments by 23/12/2011
07/12/2011	Jason Brown on behalf of GTCAC	In person	Information session at Black Gold Cabins, Wallerawang, regarding Western Holdings Project, including Springvale Bores 7 & 8
07/12/2011	Elwin Wolfenden on behalf of Mingaan	In	Information session at Black

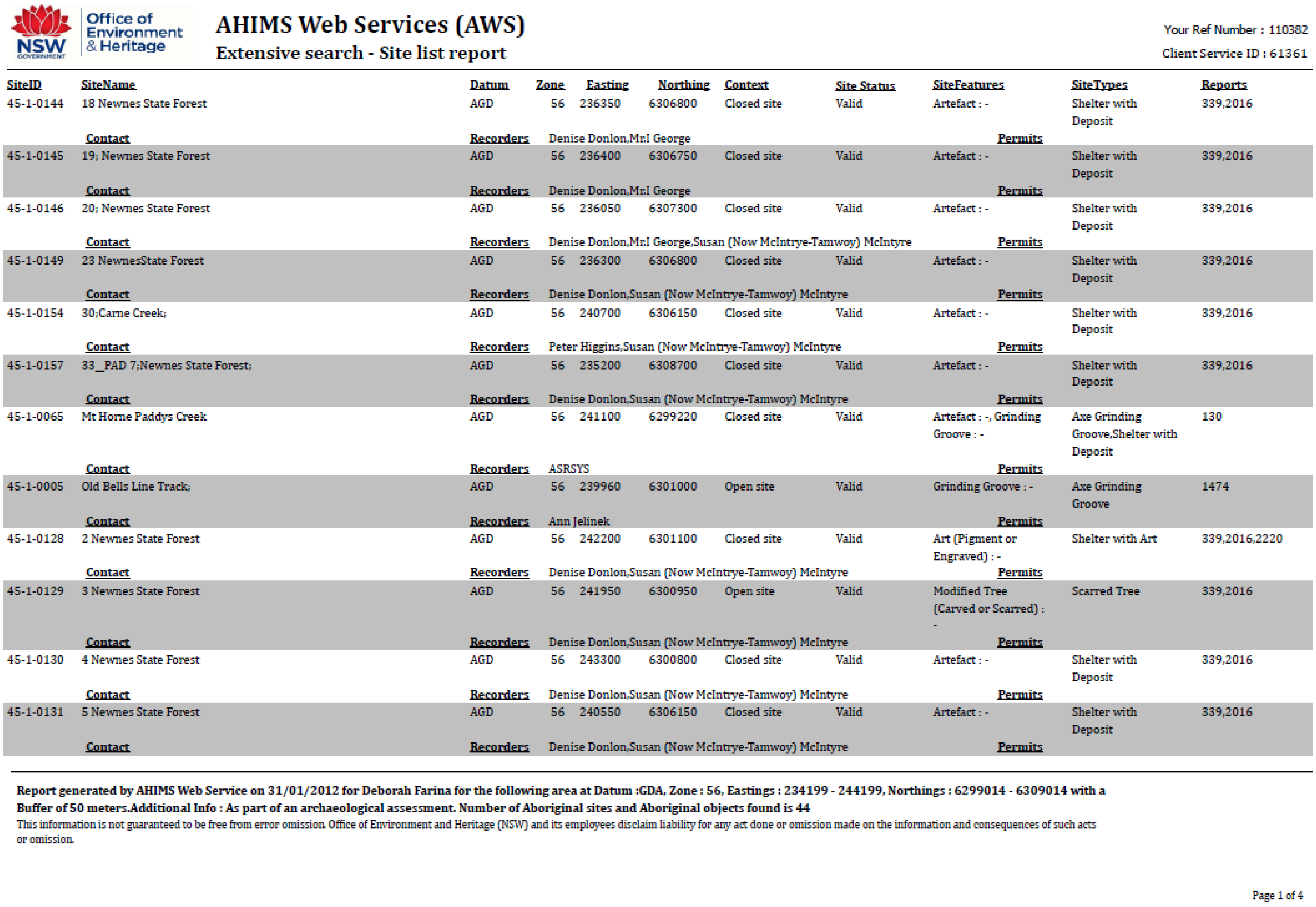
		person	Gold Cabins, Wallerawang, regarding Western Holdings Project, including Springvale Bores 7 & 8
07/12/2011	Robyn Williams on behalf of NE Wiradjuri	In person	Information session at Black Gold Cabins, Wallerawang, regarding Western Holdings Project, including Springvale Bores 7 & 8
07/12/2011	Wendy Lewis on behalf of Warrabinga Native Title Claimants Aboriginal Corporation	In person	Information session at Black Gold Cabins, Wallerawang, regarding Western Holdings Project, including Springvale Bores 7 & 8
07/12/2011	Helen Riley on behalf of Wiradjuri Council of Elders	In person	Information session at Black Gold Cabins, Wallerawang, regarding Western Holdings Project, including Springvale Bores 7 & 8
07/12/2011	Helen Riley on behalf of Wiradjuri Council of Elders	In person	Advice that they approved methodology
07/12/2011	Wendy Lewis of Warrabinga	In person	Approved methodology
16/12/2011	Letter to Bathurst LALC	Email	Asking whether they still wished to be involved with project
20/12/2011	Sharon Riley on behalf of Wiray-dyuraa Ngambaay-dyil and Wiray-dyuraa Maying-gu	Phone	Approving methodology
21/12/2011	Jason Brown on behalf of GTCAC	Email	Approving methodology
21/12/2011	Lyn Syme on behalf of NE Wiradjuri	Phone	Approving methodology
21/12/2011	Tonilee Scott, Bathurst LALC	Email	Approving methodology
22/12/2011	Letter to Bathurst LALC	Email	Advising of fieldwork and inductions
22/12/2011	Letter to GTCAC	Email	Advising of fieldwork and inductions
22/12/2011	Letter to GTCAC	Email	Requesting copies of Certificates of Currency
22/12/2011	Letter from Jason Brown of GTCAC	Email	Attaching copy of certificate of currency
22/12/2011	Letter to Mingaan	Email	Advising of fieldwork and inductions
22/12/2011	Letter to NE Wiradjuri	Mail	Advising of fieldwork and inductions
22/12/2011	Letter to Warrabinga Native Title Claimants Aboriginal Corporation	Mail	Advising of fieldwork and inductions
08/01/2012	Resending letter to Lyn Syme of NE Wiradjuri	Mail	Advising of fieldwork and inductions
09/01/2012	Letter to Jason Brown of GTCAC	Email	Requesting current copy of Certificate of Currency
10/01/2012	Attendance at inductions at Springvale mine	In person	Attendees: Deborah Farina (RPS); Chantel Peters-Chapman of Bathurst LALC, Jack Pennell (NE Wiradjuri),

			Kevin Williams (Warrabinga) and Elwin Wolfenden (Mingaan). Site reconnaissance conducted following formal induction
12/01/2012	Fieldwork	In person	Attendees: Deborah Farina (RPS), Richard Peters (Bathurst LALC), Trevor Brown (GTCAC), Jack Pennell (NE Wiradjuri), Kevin Williams (Warrabinga) and Elwin Wolfenden (Mingaan).
01/06/2012	Letter to Bathurst LALC	Email	Attaching draft report for comment; requesting comments by 29/06/2012
01/06/2012	Letter to GTCAC	Email	Attaching draft report for comment; requesting comments by 29/06/2012
01/06/2012	Letter to Mingaan	Email	Attaching draft report for comment; requesting comments by 29/06/2012
01/06/2012	Letter to Mooka	Email	Attaching draft report for comment; requesting comments by 29/06/2012
01/06/2012	Letter to Wiradjuri Council of Elders	Email	Attaching draft report for comment; requesting comments by 29/06/2012
01/06/2012	Letter to Warrabinga	Mail	Enclosing draft report for comment; requesting comments by 29/06/2012
01/06/2012	Letter to North East Wiradjuri	Mail	Enclosing draft report for comment; requesting comments by 29/06/2012
01/06/2012	Letter to Sharon Riley on behalf of Wiray-dyuraa Ngambaay-dyil and Wiray-dyuraa Maying-gu	Email	Attaching draft report for comment; requesting comments by 29/06/2012
01/06/2012	Letter to Eddy Neuman Lawyers	Email	Attaching draft report for comment; requesting comments by 29/06/2012
01/06/2012	Letter to Blackshield Lawyers	Email	Attaching draft report for comment; requesting comments by 29/06/2012
29/06/2012	To Helen Riley of Mingaan	Phone	Asked whether they had any comments regarding draft report; said she would need to speak to Elwin Wolfenden.
29/06/2012	To Neville Williams of Mooka	Phone	Asked whether they had any comments regarding draft report; said he would have to check his emails and get back to us.
29/06/2012	To Wendy Lewis of Warrabinga	Phone	No answer; left voice mail.
29/06/2012	To Lyn Syme of NE Wiradjuri	Phone	No answer; left voice mail
29/06/2012	From Lyn Syme of NE Wiradjuri	Phone	Said she was in Wollongong

			and would get back to me.
29/06/2012	From Helen Riley	Phone	Provided Elwin's number
29/06/2012	To Elwin Wolfenden	Phone	No answer.
02/07/2012	From Helen Riley	Phone	Said she spoke to Elwin, who said that he had no problems with the report.

Appendix 5

AHIMS Search



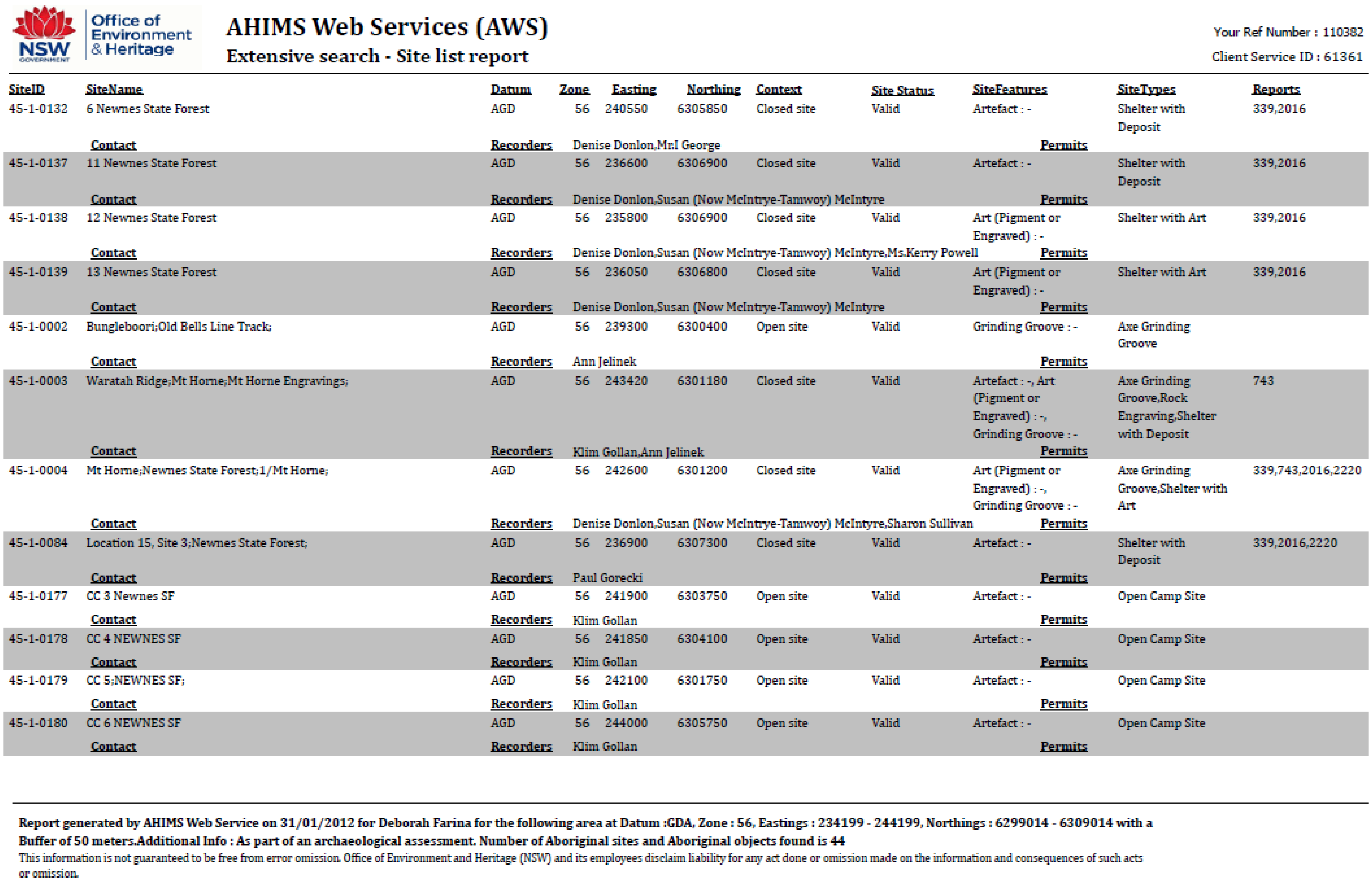
AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref Number : 110382
Client Service ID : 61361

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports	Contact	Recorders	Permits
45-1-0144	18 Newnes State Forest	AGD	56	236350	6306800	Closed site	Valid	Artefact : -	Shelter with Deposit	339,2016		Denise Donlon,Mr.I George	
45-1-0145	19; Newnes State Forest	AGD	56	236400	6306750	Closed site	Valid	Artefact : -	Shelter with Deposit	339,2016		Denise Donlon,Mr.I George	
45-1-0146	20; Newnes State Forest	AGD	56	236050	6307300	Closed site	Valid	Artefact : -	Shelter with Deposit	339,2016		Denise Donlon,Mr.I George,Susan (Now McIntrye-Tamwoy) McIntyre	
45-1-0149	23 NewnesState Forest	AGD	56	236300	6306800	Closed site	Valid	Artefact : -	Shelter with Deposit	339,2016		Denise Donlon,Susan (Now McIntrye-Tamwoy) McIntyre	
45-1-0154	30;Carne Creek;	AGD	56	240700	6306150	Closed site	Valid	Artefact : -	Shelter with Deposit	339,2016		Peter Higgins,Susan (Now McIntrye-Tamwoy) McIntyre	
45-1-0157	33_PAD 7;Newnes State Forest;	AGD	56	235200	6308700	Closed site	Valid	Artefact : -	Shelter with Deposit	339,2016		Denise Donlon,Susan (Now McIntrye-Tamwoy) McIntyre	
45-1-0065	Mt Horne Paddys Creek	AGD	56	241100	6299220	Closed site	Valid	Artefact : -, Grinding Groove : -	Axe Grinding Groove,Shelter with Deposit	130		ASRSYS	
45-1-0005	Old Bells Line Track;	AGD	56	239960	6301000	Open site	Valid	Grinding Groove : -	Axe Grinding Groove	1474		Ann Jelinek	
45-1-0128	2 Newnes State Forest	AGD	56	242200	6301100	Closed site	Valid	Art (Pigment or Engraved) : -	Shelter with Art	339,2016,2220		Denise Donlon,Susan (Now McIntrye-Tamwoy) McIntyre	
45-1-0129	3 Newnes State Forest	AGD	56	241950	6300950	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	339,2016		Denise Donlon,Susan (Now McIntrye-Tamwoy) McIntyre	
45-1-0130	4 Newnes State Forest	AGD	56	243300	6300800	Closed site	Valid	Artefact : -	Shelter with Deposit	339,2016		Denise Donlon,Susan (Now McIntrye-Tamwoy) McIntyre	
45-1-0131	5 Newnes State Forest	AGD	56	240550	6306150	Closed site	Valid	Artefact : -	Shelter with Deposit	339,2016		Denise Donlon,Susan (Now McIntrye-Tamwoy) McIntyre	

Report generated by AHIMS Web Service on 31/01/2012 for Deborah Farina for the following area at Datum :GDA, Zone : 56, Eastings : 234199 - 244199, Northings : 6299014 - 6309014 with a Buffer of 50 meters.Additional Info : As part of an archaeological assessment. Number of Aboriginal sites and Aboriginal objects found is 44



Office of Environment & Heritage

AHIMS Web Services (AWS)

Extensive search - Site list report

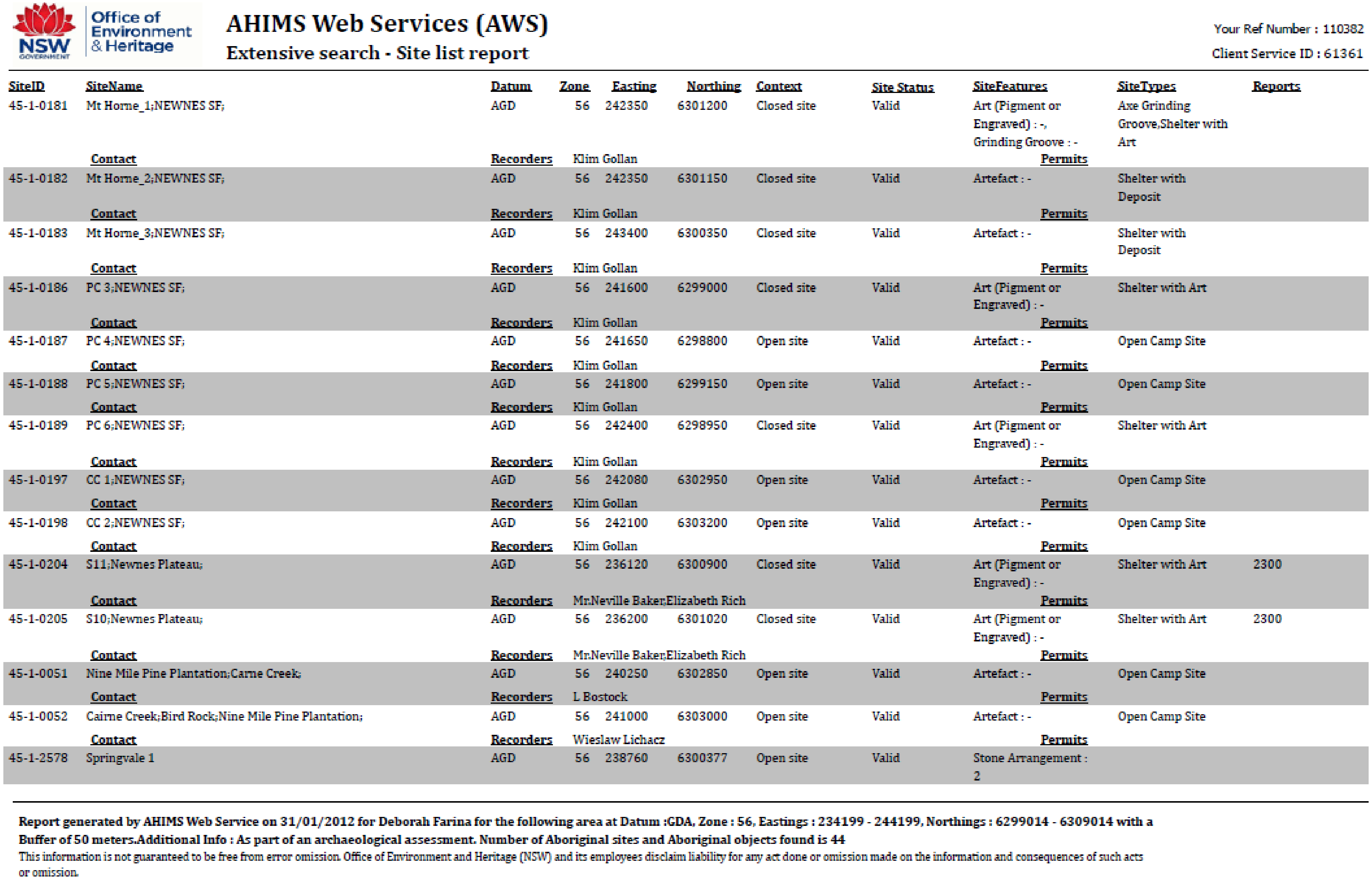
Your Ref Number : 110382
Client Service ID : 61361

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
45-1-0132	6 Newnes State Forest	AGD	56	240550	6305850	Closed site	Valid	Artefact : -	Shelter with Deposit	339,2016
	Contact	**Recorders**	Denise Donlon,Mr.I George					**Permits**		
45-1-0137	11 Newnes State Forest	AGD	56	236600	6306900	Closed site	Valid	Artefact : -	Shelter with Deposit	339,2016
	Contact	**Recorders**	Denise Donlon,Susan (Now McIntrye-Tamwoy) McIntyre					**Permits**		
45-1-0138	12 Newnes State Forest	AGD	56	235800	6306900	Closed site	Valid	Art (Pigment or Engraved) : -	Shelter with Art	339,2016
	Contact	**Recorders**	Denise Donlon,Susan (Now McIntrye-Tamwoy) McIntyre,Ms.Kerry Powell					**Permits**		
45-1-0139	13 Newnes State Forest	AGD	56	236050	6306800	Closed site	Valid	Art (Pigment or Engraved) : -	Shelter with Art	339,2016
	Contact	**Recorders**	Denise Donlon,Susan (Now McIntrye-Tamwoy) McIntyre					**Permits**		
45-1-0002	Bungleboori;Old Bells Line Track;	AGD	56	239300	6300400	Open site	Valid	Grinding Groove : -	Axe Grinding Groove	
	Contact	**Recorders**	Ann Jelinek					**Permits**		
45-1-0003	Waratah Ridge;Mt Horne;Mt Horne Engravings;	AGD	56	243420	6301180	Closed site	Valid	Artefact : -, Art (Pigment or Engraved) : -, Grinding Groove : -	Axe Grinding Groove,Rock Engraving,Shelter with Deposit	743
	Contact	**Recorders**	Klim Gollan,Ann Jelinek					**Permits**		
45-1-0004	Mt Horne;Newnes State Forest;1/Mt Horne;	AGD	56	242600	6301200	Closed site	Valid	Art (Pigment or Engraved) : -, Grinding Groove : -	Axe Grinding Groove,Shelter with Art	339,743,2016,2220
	Contact	**Recorders**	Denise Donlon,Susan (Now McIntrye-Tamwoy) McIntyre,Sharon Sullivan					**Permits**		
45-1-0084	Location 15, Site 3;Newnes State Forest;	AGD	56	236900	6307300	Closed site	Valid	Artefact : -	Shelter with Deposit	339,2016,2220
	Contact	**Recorders**	Paul Gorecki					**Permits**		
45-1-0177	CC 3 Newnes SF	AGD	56	241900	6303750	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	**Recorders**	Klim Gollan					**Permits**		
45-1-0178	CC 4 NEWNES SF	AGD	56	241850	6304100	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	**Recorders**	Klim Gollan					**Permits**		
45-1-0179	CC 5;NEWNES SF;	AGD	56	242100	6301750	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	**Recorders**	Klim Gollan					**Permits**		
45-1-0180	CC 6 NEWNES SF	AGD	56	244000	6305750	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	**Recorders**	Klim Gollan					**Permits**		

Report generated by AHIMS Web Service on 31/01/2012 for Deborah Farina for the following area at Datum :GDA, Zone : 56, Eastings : 234199 - 244199, Northings : 6299014 - 6309014 with a Buffer of 50 meters.Additional Info : As part of an archaeological assessment. Number of Aboriginal sites and Aboriginal objects found is 44

This information is not guaranteed to be free from error omission. Office of Environment and Heritage (NSW) and its employees disclaim liability for any act done or omission made on the information and consequences of such acts or omission.

Page 2 of 4



Office of Environment & Heritage

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref Number : 110382

Client Service ID : 61361

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
45-1-0181	Mt Horne_1;NEWNES SF;	AGD	56	242350	6301200	Closed site	Valid	Art (Pigment or Engraved) : -, Grinding Groove : -	Axe Grinding Groove,Shelter with Art	
	Contact	**Recorders**	Klim Gollan					**Permits**		
45-1-0182	Mt Horne_2;NEWNES SF;	AGD	56	242350	6301150	Closed site	Valid	Artefact : -	Shelter with Deposit	
	Contact	**Recorders**	Klim Gollan					**Permits**		
45-1-0183	Mt Horne_3;NEWNES SF;	AGD	56	243400	6300350	Closed site	Valid	Artefact : -	Shelter with Deposit	
	Contact	**Recorders**	Klim Gollan					**Permits**		
45-1-0186	PC 3;NEWNES SF;	AGD	56	241600	6299000	Closed site	Valid	Art (Pigment or Engraved) : -	Shelter with Art	
	Contact	**Recorders**	Klim Gollan					**Permits**		
45-1-0187	PC 4;NEWNES SF;	AGD	56	241650	6298800	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	**Recorders**	Klim Gollan					**Permits**		
45-1-0188	PC 5;NEWNES SF;	AGD	56	241800	6299150	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	**Recorders**	Klim Gollan					**Permits**		
45-1-0189	PC 6;NEWNES SF;	AGD	56	242400	6298950	Closed site	Valid	Art (Pigment or Engraved) : -	Shelter with Art	
	Contact	**Recorders**	Klim Gollan					**Permits**		
45-1-0197	CC 1;NEWNES SF;	AGD	56	242080	6302950	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	**Recorders**	Klim Gollan					**Permits**		
45-1-0198	CC 2;NEWNES SF;	AGD	56	242100	6303200	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	**Recorders**	Klim Gollan					**Permits**		
45-1-0204	S11;Newnes Plateau;	AGD	56	236120	6300900	Closed site	Valid	Art (Pigment or Engraved) : -	Shelter with Art	2300
	Contact	**Recorders**	Mr.Neville Baker,Elizabeth Rich					**Permits**		
45-1-0205	S10;Newnes Plateau;	AGD	56	236200	6301020	Closed site	Valid	Art (Pigment or Engraved) : -	Shelter with Art	2300
	Contact	**Recorders**	Mr.Neville Baker,Elizabeth Rich					**Permits**		
45-1-0051	Nine Mile Pine Plantation;Carne Creek;	AGD	56	240250	6302850	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	**Recorders**	L Bostock					**Permits**		
45-1-0052	Cairne Creek;Bird Rock;Nine Mile Pine Plantation;	AGD	56	241000	6303000	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	**Recorders**	Wieslaw Lichacz					**Permits**		
45-1-2578	Springvale 1	AGD	56	238760	6300377	Open site	Valid	Stone Arrangement : 2		

Report generated by AHIMS Web Service on 31/01/2012 for Deborah Farina for the following area at Datum :GDA, Zone : 56, Eastings : 234199 - 244199, Northings : 6299014 - 6309014 with a Buffer of 50 meters.Additional Info : As part of an archaeological assessment. Number of Aboriginal sites and Aboriginal objects found is 44

Office of Environment & Heritage

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref Number : 110382
Client Service ID : 61361

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
	Contact	**Recorders**	Leila McAdam					**Permits**		
45-1-2600	SV3-ST1	AGD	56	237975	6303313	Open site	Valid	Modified Tree (Carved or Scarred) : 1		
	Contact Bathurst LALC	**Recorders**	Doctor.Jodie Benton,Mr.Phillip Cameron					**Permits**		
45-1-0133	7 Newnes State Forest	AGD	56	235600	6308100	Closed site	Valid	Artefact : -	Shelter with Deposit	339,2016
	Contact	**Recorders**	Denise Donlon,Susan (Now McIntrye-Tamwoy) McIntyre					**Permits**		
45-1-2669	NPSPR55-OS1	GDA	56	240500	6299924	Open site	Valid	Artefact : 5		
	Contact	**Recorders**	OzArk Cultural Heritage Management					**Permits**		
45-1-0150	24 Newnes State Forest	AGD	56	236200	6306800	Closed site	Valid	Artefact : -	Shelter with Deposit	339,2016
	Contact	**Recorders**	Denise Donlon,Susan (Now McIntrye-Tamwoy) McIntyre					**Permits**		
45-1-2689	AngusPlaceStoneArrangement#1	GDA	56	239700	6305359	Open site	Valid	Stone Arrangement : 2		
	Contact	**Recorders**	Mr.Toivo Kim Tuovinen					**Permits**		
45-1-2691	BC1 (Lithgow)	AGD	56	243446	6300691	Open site	Valid	Grinding Groove : 1		
	Contact	**Recorders**	RPS Australia East Pty Ltd -Hamilton					**Permits**		

Report generated by AHIMS Web Service on 31/01/2012 for Deborah Farina for the following area at Datum :GDA, Zone : 56, Eastings : 234199 - 244199, Northings : 6299014 - 6309014 with a Buffer of 50 meters.Additional Info : As part of an archaeological assessment. Number of Aboriginal sites and Aboriginal objects found is 44

Appendix 6

Glossary of Site Types

Glossary of Site Types

Aboriginal site types

The following is a brief description of most Aboriginal site types.

Artefact Scatters

Artefact scatters are defined by the presence of two or more stone artefacts in close association (i.e. within fifty metres of each other). An artefact scatter may consist solely of surface material exposed by erosion, or may contain sub-surface deposit of varying depth. Associated features may include hearths or stone-lined fireplaces and heat treatment pits.

Artefact scatters may represent:

- Camp sites: involving short or long-term habitation, manufacture and maintenance of stone or wooden tools, raw material management, tool storage and food preparation and consumption;
- Hunting or gathering activities;
- Activities spatially separated from camp sites (e.g. tool manufacture or maintenance); or
- Transient movement through the landscape.

The detection of artefact scatters depends upon conditions of surface visibility, including vegetation cover, ground disturbance and recent sediment deposition. Factors such as poor light, vegetation, leaf litter may obscure artefact scatters and prevent their detection during surface surveys.

Bora Grounds

Bora grounds are a ceremonial site associated with initiations. They are usually comprise two circular depressions in the earth and may be edged with stone. Bora grounds generally occur on soft sediments in river valleys, although they may also be located on high, rocky ground in association with stone arrangements.

Burials

Human remains were often placed in hollow trees, caves or sand deposits and may have been marked by carved or scarred trees. Burials have been identified eroding out of sand deposits or creek banks, or when disturbed by development. The probability of detecting burials during archaeological fieldwork is extremely low.

Culturally Modified Trees

Culturally modified trees include scarred and carved trees. Scarred trees are caused by the removal of bark for use in manufacturing canoes, containers, shields or shelters. Notches were also carved in trees to permit easier climbing. Scarred trees are only likely to be present on mature trees remaining from original vegetation. Carved trees, the easiest to identify, are caused by the removal of bark to create a working surface on which engravings are incised. Carved trees were used as markers for ceremonial and symbolic purposes, including burials. Although, carved trees were relatively common in NSW in the early 20th century, vegetation removal has rendered this site type extremely rare. Modified trees, where bark was removed for often domestic use are less easily identified. Criteria for identifying modified trees include: the age of the tree; type of tree (the bark of many trees is not suitable, also introduced species would be unlikely subjects); axe marks (with the need to determine the type of axe - stone or steel – though Aborigines after settlement did use steel); shape of the scar (natural or culturally scarred); height of the scar above the ground (reasonable working height with consideration given to subsequent growth).

Fish Traps

Fish traps comprised arrangements of stone, branches and/or wickerwork placed in watercourses, estuaries and along coasts to trap or permit the easier capture of aquatic fauna.

Grinding Grooves

Grinding grooves are elongated narrow depressions in soft rocks (particularly sedimentary), generally associated with watercourses, that are created by the shaping and sharpening of ground-edge implements. To produce a sharp edge the axe blank (or re-worked axe) was honed on a natural stone surface near a source of water. The water was required for lubricating the grinding process. Axe grinding grooves can be identified by features such as a narrow short groove, with greatest depth near the groove centre. The grooves also display a patina developed through friction between stone surfaces. Generally a series of grooves are found as a result of the repetitive process.

Isolated Finds

An isolated find describes a site where only one artefact is visible. These finds are not found in apparent association with other evidence for prehistoric activity or occupation. Isolated finds occur anywhere and may represent loss, deliberate discard or abandonment of an artefact, or may be the remains of a dispersed artefact scatter. Numerous isolated finds have been recorded within the study area. An isolated find may flag the occurrence of other less visible artefacts in the vicinity or may indicate disturbance or relocation after the original discard.

Middens

Shell middens comprise deposits of shell remaining from consumption and are common in coastal regions and along watercourses. Middens vary in size, preservation and content, although they often contain artefacts made from stone, bone or shell, charcoal and the remains of terrestrial or aquatic fauna that formed an additional component of Aboriginal diet. Middens can provide significant information on land-use patterns, diet, chronology of occupation and environmental conditions.

Mounds

Aboriginal mounds are places where people lived and reflect a record of that living space. Mounds may be places where Aboriginal people lived over long periods of time. Mounds often contain charcoal, burnt clay or stone heat retainers from cooking ovens, animal bones, shells, stone tools and occasionally Aboriginal burials.

Mythological / Traditional Sites

Mythological and traditional sites of significance to Aboriginal people may occur in any location, although they are often associated with natural landscape features. They include sites associated with dreaming stories, massacre sites, traditional camp sites and contact sites. Consultation with the local Aboriginal community is essential for identifying these sites.

Ochre quarries

Ochre, iron oxide may in colours through brown, yellow to red. Ochre may have been used dry for colouring hair or skin or ground to a fine powder and mixed with mediums such as water, blood, fat, etc as a fixative. Ochre was used for decorating the body, artefacts and rock shelters. Quality deposits provided a valuable resource with evidence of wide spread trade of the substance.

Rock Shelters may contain Art and / or Occupation Deposit

Rock shelters occur where geological formations suitable for habitation or use are present, such as rock overhangs, shelters or caves. Rock shelter sites generally contain artefacts, food remains and/or rock art and may include sites with areas of potential archaeological deposit, where evidence of rock-art or human occupation is expected but not visible. The geological composition of a study area will indicate the likelihood for rock shelters to occur.

Stone Arrangements

Stone arrangements include lines, circles, mounds, or other patterns of stone arranged by Aboriginal people. These may be associated with bora grounds, ceremonial sites, mythological or sacred sites. Stone arrangements are more likely to occur on hill tops and ridge crests that contain stone outcrops or surface stone. Preservation of those sites is dependent on minimal impact from recent land use practices.

Stone Quarries

A stone quarry is a place at which stone resource exploitation has occurred. Quarry sites are only located where the exposed stone material is suitable for use either for ceremonial purposes (e.g. ochre) or for artefact manufacture.

Air Quality
Impact and greenhouse gas
Assessment
(SLR, 2012)

Appendix - K

Springvale Colliery

Bore 8 Dewatering Facility

Air Quality Impact Assessment and Greenhouse Gas Assessment

Report Number 630.10123.0330 R1

7 September 2012

Springvale Coal Pty Ltd
Locked Bag 1002
Wallerawang NSW 2845

Version: Revision 1

Springvale Colliery

Bore 8 Dewatering Facility

Air Quality Impact Assessment and Greenhouse Gas Assessment

PREPARED BY:

SLR Consulting Australia Pty Ltd
ABN 29 001 584 612
Units 7-8, 26-28 Napier Close Deakin ACT 2600 Australia

(PO Box 9344 Deakin ACT 2600 Australia)
T: 61 2 6287 0800 F: 61 2 6287 0801
E: canberra@slrconsulting.com www.slrconsulting.com

This report has been prepared by SLR Consulting Australia Pty Ltd with all reasonable skill, care and diligence, and taking account of the manpower and resources devoted to it by agreement with the Client. Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of Springvale Coal Pty Ltd. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR Consulting.

SLR Consulting disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

DOCUMENT CONTROL

Reference	Status	Date	Prepared	Checked	Authorised
630.10123.0330 R1	Revision 1	3 August 2012	Jason Watson	Martin Doyle	Jason Watson
630.10123.0330 R1	Revision 0	7 September 2012	Jason Watson and Varun Marwaha	Martin Doyle	Jason Watson

Non-Technical Summary

SLR Consulting Australia Pty Ltd (SLR Consulting) has been commissioned by Springvale Coal Pty Ltd (Springvale Coal) to provide an Air Quality Impact Assessment (AQIA) and Greenhouse Gas Assessment for the proposed construction and operation of the Bore 8 dewatering facility and the operations at Springvale Colliery (the Project).

Springvale seeks to modify development consent S91/06569/001 under section 75W of the *Environmental Planning and Assessment Act 1979* to allow for the construction and operation of an additional dewatering facility (Bore 8) within the Newnes State Forest on the Newnes Plateau. No further changes to the operations at Springvale are proposed. No changes are proposed to the mining method, mine layout, life of consent, operating hours, workforce, management of rejects and tailings, or coal production, handling and transport. These aspects will not be altered and will remain as approved by development consent S91/06569/001, as modified.

The proposed Bore 8 dewatering facility is required to facilitate the progress of coal extraction further to the east of existing workings at Springvale, and needs to be established ahead of the workings to ensure water levels in the mine can be kept at manageable levels for operational and mine personnel safety requirements. Bore 8 will form a critical part of Springvale's existing dewatering system as longwall mining progresses through longwalls (LWs) 416 to 419. Water pumped out of the underground workings at Bore 8 will be transferred via predominantly underground pipelines to Wallerawang Power Station, as part of the existing Springvale - Delta Water Transfer Scheme (DWTS).

Bore 8 will be constructed as per the existing dewatering facility at Bore 6 and will include the construction of four dewatering boreholes, each with a submersible pump. An existing track will be upgraded and widened to establish an access track and ancillary infrastructure corridor totalling 10 metres (m) wide to Bore 8. 11 kV power lines and water pipelines will be buried in the infrastructure corridor alongside the access track. Following installation of the pipelines and power lines, the infrastructure corridor will be rehabilitated leaving a 5 m wide track to Bore 8.

A Greenhouse Gas (GHG) Assessment was conducted in addition to a quantification of current emissions resulting from Project operation. The GHG emissions were calculated using the National Greenhouse Accounts (NGA) Factors (DCCEE, 2011). Scope 1, Scope 2 and Scope 3 emissions have been calculated to increase by 11,939 tonnes per annum with the operation of Bore 8. Scope 1 emissions associated with proposed operations at Bore 8 are anticipated to increase by approximately 46 tonnes CO_2-e per annum compared to current operations. Scope 1 GHG emissions for the proposed Project were calculated and compared against published net total GHG emissions for NSW and Australia during 2009. The total Scope 1 (Direct) GHG emissions from the operation of Bore 8 plus current operations would represent less than 0.02% of total NSW and 0.004% of Australian 2009 emissions. Given the Bore 8 Project results in an increase in 46 tonnes CO_2-e per annum (Scope 1) then the total GHG emissions from the Project would represent less than 0.00003% of total NSW and 0.0000008% of Australian 2009 emissions.

Table of Contents

Table of Contents

Table of Contents

TABLES

Table of Contents

FIGURES

Table of Contents

APPENDICES

ABBREVIATIONS

%	percent
°C	degrees Celsius
µg	microgram
$µg/m^3$	microgram per cubic metre of air
$µg/Nm^3$	microgram per normalised cubic metre of air (273K, 101.3kPa)
µm	micrometre or micron
AGL	above ground level
AHD	Australian Height Datum
AP-42	US EPA Emission Factor Handbook
AQIA	air quality impact assessment
ARM	Ambient Ratio Method
AWS	automatic weather station
CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
CO_2-e	carbon dioxide equivalent
CSIRO	Australian Commonwealth Scientific and Industrial Research Organisation
DECC	NSW Department of Environment and Climate Change (see OEH)
DECCW	NSW Department of Environment, Climate Change and Water (see OEH)
DDG	dust deposition gauge
EETM	Emission Estimation Technique Manual
EF	Emission Factor
EIS	Environmental Impact Statement
EHS	Environmental Health and Safety
FEL	front-end loader
g	gram
g/m^2/month	grams per square metre per month
GHG	Greenhouse Gas(es)
GJ	gigajoule: 1.0×10^9 J
GJ/s	gigajoule per second
GWP	Global Warming Potential
H_2S	hydrogen sulphide
ha	hectare
IFC	International Finance Corporation
IPCC	Inter Governmental Panel on Climate Change
J	joule
K	degrees Kelvin
kg	kilogram
kg/hr	kilogram per hour
km	kilometre
km E	kilometres east
km N	kilometres north
L	litre
m	metre
M	million
m/s	metre per second
m^2	square metre
m^3	cubic metre
min	minute
mm	millimetre
Mt	million tonnes
Mtpa	million tonnes per annum
MW	megawatt
MWh	megawatt-hour: 1 MWh = 3,600 J

N_2O	nitrous oxide
NAF	Non-Acid Forming
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
NO	nitric oxide
NO_2	nitrogen dioxide
NO_X	oxides of nitrogen
NPI	National Pollutant Inventory (Australia)
NSW	New South Wales
O_3	ozone
OEH	NSW Office of Environment and Heritage
Pa	pascal
PAF	Potentially Acid-Forming
PM	Particulate Matter
PM_{10}	particular matter with an equivalent aerodynamic diameter of 10 microns or less
$PM_{2.5}$	particular matter with an equivalent aerodynamic diameter of 2.5 microns or less
ppb	parts per billion (10^9)
ppm	parts per million (10^6)
ROM	run of mine
SI	Système International
SO_2	sulphur dioxide
t	tonne
TEOM	tapered element oscillating microbalance
TJ	terajoule: 1.0×10^{12} J
tpa	tonnes per annum
TSP	total suspended particulate matter
UNFCC	United Nations Framework Convention on Climate Change
US EPA	United States Environmental Protection Agency
UTM	Universal Transverse Mercator
VOC	volatile organic compound
W	watt
WGS	World Geodetic System

SI UNIT PREFIXES

SI Prefix	Name	Factor	SI Prefix	Name	Factor
T	tera	1×10^{12}	d	deci	1×10^{-1}
G	giga	1×10^{9}	c	centi	1×10^{-2}
M	mega	1×10^{6}	m	milli	1×10^{-3}
k	kilo	1×10^{3}	µ	micro	1×10^{-6}
h	hecto	1×10^{2}	n	nano	1×10^{-9}
da	deka	1×10^{1}	p	pico	1×10^{-12}

GLOSSARY

air dispersion model	A computer-based software program which provides a mathematical prediction of how pollutants from a source will be distributed in the surrounding area under specific conditions of wind, temperature, humidity and other environmental factors
airshed	The geographical area associated with a given air supply
algorithms	A step-by-step problem-solving procedure, especially an established, recursive computational procedure for solving a problem in a finite number of steps
ambient	Pertaining to the surrounding environment or prevailing conditions
anemometer	An instrument for measuring wind force and velocity
atmosphere	A gaseous mass surrounding the planet Earth that is retained by Earth's gravity. It is divided into five layers. Most of the weather and clouds are found in the first layer
atmospheric stability	The tendency of the atmosphere to resist or enhance vertical motion
atmospheric pressure	The force per unit area exerted against a surface by the weight of air above that surface in the Earth's atmosphere
background	The existing air quality in the Project area excluding the impacts from the proposed development
baseline monitoring program	A monitoring program designed to measure the ambient concentration levels which currently exist prior to the proposed development
CALMET	A meteorological model that develops wind and temperature fields on a three-dimensional gridded modelling domain
CALPOST	A post-processor used to process CALPUFF files, producing tabulations that summarize results of the simulation for user-selected averaging periods
CALPUFF	A transport and dispersion model that advects “puffs” of material emitted from modelled sources, simulating dispersion and transformation processes
climatological	The science dealing with climate and climatic phenomena
combustion	The process of thermal oxidation. A chemical change, especially oxidation, accompanied by the production of heat and light
commissioning	A systematic process of ensuring that a new facility performs according to the documented design intent and the owner’s operational needs, and that specified system documentation and training are provided to the facility staff
crushers	A machine designed to reduce large rocks into smaller rocks, gravel, or rock dust
decommissioning	Planned shut-down or removal of a building, equipment, plant, etc., from operation or usage
dust deposition	Settling of particulate matter out of the air through gravitational effects (dry deposition) and scavenging by rain and snow (wet deposition)
dispersion	The spreading and dilution of substances emitted in a medium (e.g. air or water) through turbulence and mixing effects
diurnal	Relating to or occurring in a 24-hour period; daily
downwash	The grounding of an air pollution plume as it flows over nearby buildings or other structures due to turbulent eddies being formed in the downwind side of the building, resulting in elevated ground level concentrations.
downwind	The direction in which the wind is blowing

emission factor	A measure of the amount of a specific pollutant or material emitted by a specific process, fuel, equipment, or source based on activity data such as the quantity of fuel burnt, hours of operation or quantity of raw material consumed.
emissions inventory	A database that lists, by source, the amount of air pollutants discharged into the atmosphere from a facility over a set period of time (e.g. per annum, per hour)
erodible	A term used to describe a soil that is vulnerable to erosion by the agents of wind, water, ice
evapotranspiration	The process by which water is transferred from the land to the atmosphere by evaporation from the soil and other surfaces
epidemiological	The branch of medicine that deals with the study of the causes, distribution, and control of disease in populations
fossil fuel	A natural fuel such as coal, diesel or gas, formed in the geological past from the remains of living organisms
fugitive emissions	Pollutants which escape from an industrial process due to leakage, materials handling, transfer, or storage
global warming potential	A measure of how much a given mass of greenhouse gas is estimated to contribute to global warming using a relative scale which compares the gas in question to that of the same mass of carbon dioxide (whose GWP is by convention equal to 1).
greenhouse gas	A gas that contributes to the greenhouse effect by absorbing infrared radiation, e.g. carbon dioxide
greenhouse gas intensity	The emissions of greenhouse gases from a power station per kilowatt of electricity generated
guideline	A general rule, principle, or piece of advice. A statement or other indication of policy or procedure by which to determine a course of action.
materiality threshold	Represents the amount of insignificant emissions allowed which do not need to be quantified and accounted for.
meteorological	The science that deals with the phenomena of the atmosphere, especially weather and weather conditions
mixing height	The height to which the lower atmosphere will undergo mechanical or turbulent mixing, producing a nearly homogeneous air mass
modelling domain	The area over which the model is making predictions
net calorific value	Calorific value is the amount of heat released during the combustion of a specified amount of a substance. The net calorific value treats any H_2O formed as a vapour hence the energy required to vaporize the water therefore is not realised as heat.
ozone depleting substances	Substances that cause the deterioration of the earth's protective ozone layer
particulate	Of, relating to, or formed of minute separate particles. A minute separate particle, as of a granular substance or powder
plume	A space in air, water, or soil containing pollutants released from a point source
point source	A pollution source that is fixed and/or uniquely identifiable, such as a stack, chimney, outlet pipe or vent
pollutant	A substance or energy introduced into the environment that has undesired effects, or adversely affects the usefulness of a resource
prognostic	A prediction of the value of variables for some time in the future on the basis of the values at the current or previous times

qualitative assessment	An assessment of impacts based on a subjective, non-statistical oriented analysis
quantitative assessment	An assessment of impacts based on estimates of emission rates and air dispersion modelling techniques to provide estimate values of ground level pollutant concentrations.
receptor	Coordinate locations specified in an air dispersion model where ground level pollutant concentrations are calculated by the model
sensitive receptor	Locations such as residential dwellings, hospitals, churches, schools, recreation areas etc where people (particularly the young and elderly) may often be present, or locations with sensitive vegetation and crops.
solar radiation	The total electromagnetic radiation emitted by the Sun
spatial variation	Pertaining to variations across an area
standard	The prescribed level of a pollutant in the outside air that should not be exceeded during a specific time period to protect public health
standard deviation of wind direction	A measure of the variation in wind direction
synoptic meteorological data	A surface weather observation, made at periodic times (usually at 3-hourly and 6-hourly intervals), of sky cover, state of the sky, cloud height, atmospheric pressure reduced to sea level, temperature, dew point, wind speed and direction, amount of precipitation, hydrometeors and lithometeors, and special phenomena that prevail at the time of the observation or have been observed since the previous specified observation
temporal variation	Pertaining to variations with time
topography	Detailed mapping or charting of the features of a relatively small area, district, or locality
volatile organic compounds	All organic compounds (substances made up of predominantly carbon and hydrogen) with boiling temperatures in the range of 50-260°C, excluding pesticides. This means that they are likely to be present as a vapour or gas in normal ambient temperatures.
wind direction	The direction from which the wind is blowing
wind erosion	Detachment and transportation of loose topsoil or sand due to action by the wind
wind rose	A meteorological diagram depicting the distribution of wind direction and speed at a location over a period of time

1 INTRODUCTION

SLR Consulting Australia Pty Ltd (SLR Consulting) has been commissioned by Springvale Coal Pty Ltd (Springvale Coal) to provide an Air Quality Impact Assessment (AQIA) and Greenhouse Gas Assessment for the proposed construction and operation of the Bore 8 dewatering facility and the operations at Springvale Colliery (the Project).

Springvale Colliery (Springvale) is an underground coal mine located within the NSW Western Coalfield, approximately 15 kilometres (km) north-west of Lithgow. Springvale operates in accordance with Development Consent S91/06569/001, originally granted on 27 July 1992.

Springvale seeks to modify development consent S91/06569/001 under section 75W of the *Environmental Planning and Assessment Act 1979* to allow for the construction and operation of an additional dewatering facility (Bore 8) within the Newnes State Forest on the Newnes Plateau. No further changes to the operations at Springvale are proposed. No changes are proposed to the mining method, mine layout, life of consent, operating hours, workforce, management of rejects and tailings, or coal production, handling and transport. These aspects will not be altered and will remain as approved by development consent S91/06569/001, as modified.

The NSW Environmental Protection Authority (EPA) "*Approved Methods for the Modelling and Assessment of Air Pollutants in NSW*" (DECCW, 2005) (the Approved Methods) outline the requirements for conducting an AQIA, as follows:

1) Description of local topographic features and sensitive receptor locations (**Section 3**).
2) Establishment of air quality assessment criteria (**Section 4).**
3) Analysis of climate and dispersion meteorology for the region (**Sections 6**).
4) Description of existing air quality environment (**Section 7).**
5) Compilation of a comprehensive emissions inventory for proposed operations (**Section 5**).
6) Completion of atmospheric dispersion modelling and analysis of results (**Section 8)**.
7) Preparation of an air quality impact assessment report comprising the above.

This assessment contains detailed information relating to items 1 to 6 above in the respective sections.

2 PROJECT DESCRIPTION

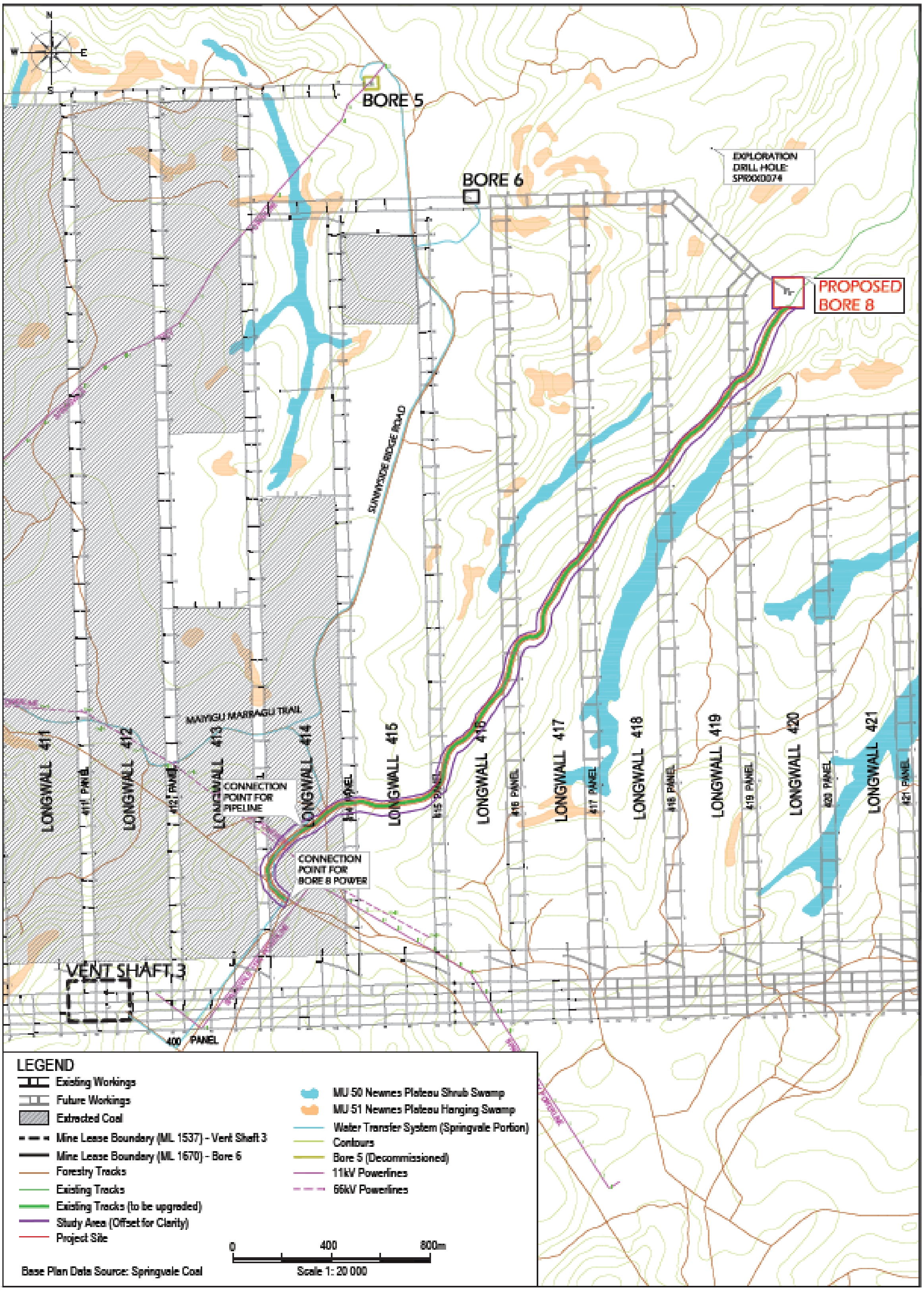
2.1 Proposed Bore 8 Dewatering Facility

The proposed Bore 8 dewatering facility is required to facilitate the progress of coal extraction further to the east of existing workings at Springvale, and needs to be established ahead of the workings to ensure water levels in the mine can be kept at manageable levels for operational and mine personnel safety requirements. The bore will form a critical part of Springvale's existing dewatering system as longwall mining progresses through longwalls (LWs) 416 to 419. Water pumped out of the underground workings at Bore 8 will be transferred via predominantly underground pipelines to Wallerawang Power Station, as part of the existing Springvale - Delta Water Transfer Scheme (DWTS).

Bore 8 will be constructed as per the existing dewatering facility at Bore 6 and will include the construction of four dewatering boreholes, each with a submersible pump. An existing track will be upgraded and widened to establish an access track and ancillary infrastructure corridor totalling 10 metres (m) wide to Bore 8. 11 kV power lines and water pipelines will be buried in the infrastructure corridor alongside the access track. Following installation of the pipelines and power lines, the infrastructure corridor will be rehabilitated leaving a 5 m wide track to Bore 8.

The final constructed footprint of the dewatering facility at Bore 8 will be approximately 0.32 hectares (ha). However, an area of 0.77 ha will initially need to be cleared of vegetation (construction footprint) and the area graded to form a level pad for construction of the boreholes, allowing for the movement of heavy vehicles and the installation of sumps to contain drilling fluids, as well as the storage of all required equipment and spares within the dewatering facility compound. Upon completion of construction and commissioning of the boreholes, the area will be partially rehabilitated leaving a semi-permanent footprint of 0.32 ha, which will remain cleared and maintained for the duration of operation of Bore 8. The Bore 8 Project Site is illustrated on **Figure 1**.

Figure 1 Project Site



2.2 Existing Site Operations

Environment Protection Licence (EPL) 3607 held by Springvale Coal Pty Ltd covers operations at the Springvale Colliery and the washery at the Springvale Coal Services. The Springvale Colliery is an underground mine which utilises the longwall method of mining to extract coal. There are no significant emissions to air of particulate matter from the extraction of coal from this underground operation, hence it is not considered further in this assessment.

The Springvale Colliery consists of a Coal Handling Plant (CHP) and mine support infrastructure which includes decline tunnels, coal stockpiles, conveyors, mine fan and workshop buildings. Current activities at Springvale include:

- Coal Receipt – raw coal is brought to the surface to a stackout/reclaim stockpile, which is equipped with underground feeders, enabling coal to be loaded onto the reclaim conveyor. The maximum capacity of the stockpile is 120,000 tonnes, but generally operates at 70,000 tonnes;
- Coal Handling and Storage – coal is handled on site using bulldozers on the main stockpile (pushed to reclaim tunnel) before it is transferred to the CHP and onto the conveyor;
- Coal is conveyed to the coal handling plant for screening and crushing;
    - Coal Screening – screening of the raw coal is conducted in the screen and rotary breaker.
    - Coal Crushing – crushing of the coal occurs within the crushing plant.
- 1.6 Mtpa of Crushed Coal is transferred to Mt Piper or Wallerawang Power stations via conveyor.
- 1.8 Mtpa of Crushed Coal is transferred to Springvale Coal services for washing and exported through Lidsdale Siding.

Emissions associated with operations at Springvale Coal Services are not considered within this assessment, given the large (>6 km) separation distance from the Springvale Pit Top.

Springvale extracted 3.26 million tonnes (Mt) of coal during the 2010/2011 Annual Environmental Management Report (AEMR 2011) reporting period, with 1,445,008 tonnes being washed at the Springvale Coal Services Site. The Springvale Colliery and Coal Services operate 7 days a week, 24 hours per day.

2.3 Project Location

Springvale is situated in New South Wales (NSW) approximately 115 km northwest of Sydney with the nearest town, Lidsdale, located 2 km to northwest of the Springvale Pit Top .

The Bore 8 construction and operation site (Project Site) is to be located approximately 10 km northeast of the Springvale Pit Top within the Newnes Forest. The location of the Project Site is shown in **Figure 3**.

A number of other industrial facilities located in the vicinity Springvale have been identified which may contribute to the cumulative impacts on the local airshed. The identified industrial facilities which are likely to have a cumulative impact on the local airshed are identified in **Table 1**.

Table 1 Identified Industrial Facilities in the Vicinity of the Springvale Colliery

Industrial Facility*	Location (Figure 2)	Impact Assessment
Springvale Pit Top	A	Section **8**
Springvale Coal Services, north of Blackmans Flat	B	Section **7.2.1**
Mount Piper Power Station (Mt Piper A)	C1	Section **7.2.2**
New Base Load Power Station (Mt Piper B)	C2	Section **7.2.2**

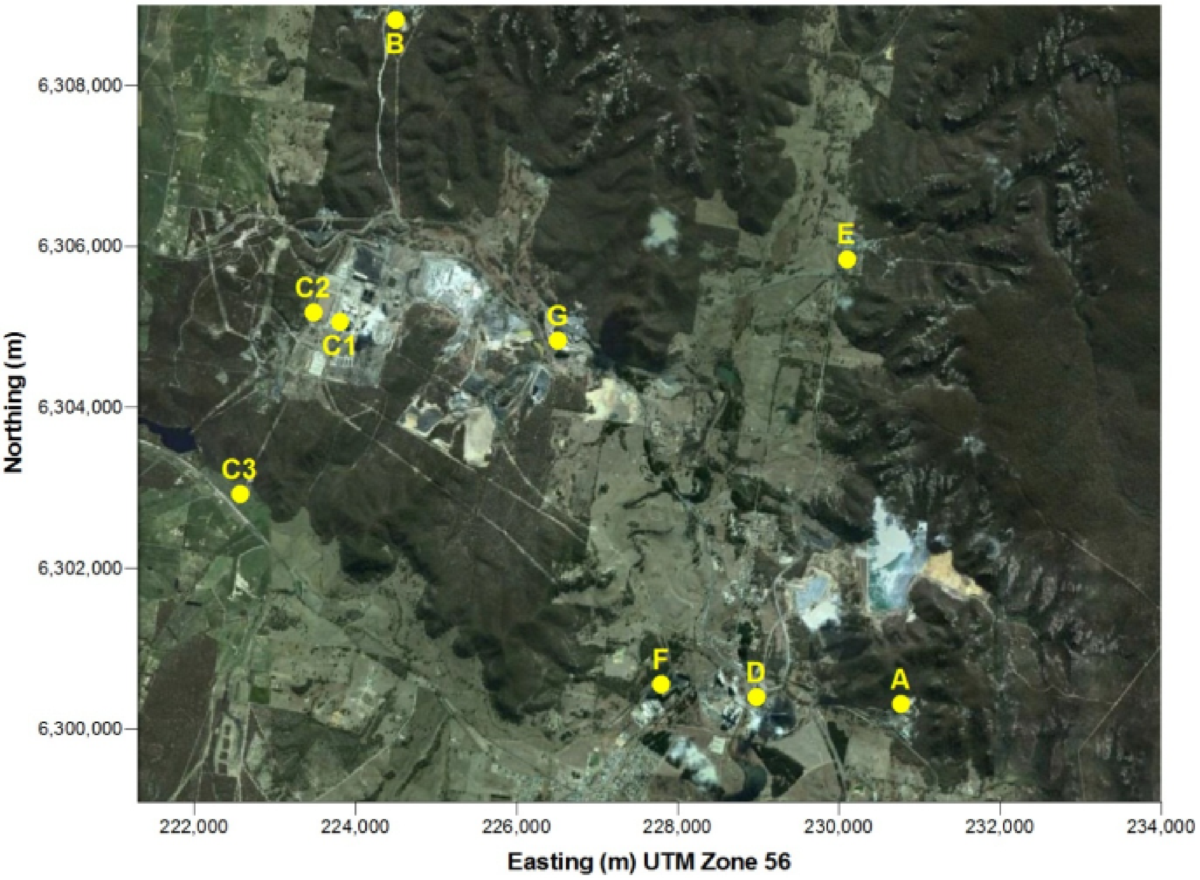
Industrial Facility*	**Location (Figure 2)**	**Impact Assessment**
Western rail coal unloader	C3	Section **7.2.3**
Wallerawang Power Station (WPS)	D	Section **7.2.2**
Angus Place Colliery	E	Section **7.2.4**
Lidsdale Siding Coal Loading Facility (LSCLF)	F	Section **7.2.5**
Pine Dale Coal Mine (Yarraboldy extension)	G	Section **7.2.6**

* The assessment of power stations includes the combustion emissions, associated ash emplacements and coal stockpiles.

The location of the Springvale Pit Top with respect to the location of other identified industrial facilities in its vicinity is shown in **Figure 2**. A detailed assessment of impacts due to these industrial facilities is conducted in **Section 7.2**.

It is noted that the Western rail coal unloader (C3) associated with Mount Piper Power Station was approved in June 2009 but the construction is yet to start on this facility. Also included in this assessment is the Mount Piper Base Load power station which was approved in January 2010. A detailed assessment of impacts due to these industrial facilities is conducted in **Section 7.2.**

Figure 2 Location of Springvale Colliery and other Industrial Facilities



2.4 Identification of Emission Sources

Atmospheric pollutants likely to be generated due to existing activities at the Colliery and proposed activities at the Project Site include fugitive emissions of particulate (PM_{10}, $PM_{2.5}$ and TSP[1] and deposited dust) in addition to those generated through the combustion of fuel in vehicles (NO_X, SO_2, VOCs, CO, PM_{10}).

The presence of Wallerawang Power Station (WPS) and Mount Piper Power station (MPPS) in the vicinity of the Colliery will have a significant impact on the existing air quality in the region. The methodology used to account for the cumulative impacts of WPS and MPPS emissions with those from the Colliery and the Project Site is presented in **Section 7.2**.

The identified emission sources and the major pollutants identified at the Colliery and Project Site due to the Colliery operations and the construction activities are summarised in **Table 2**.

Table 2 Summary of Potential Emission Sources

Emission Source	Emission Type	Pollutants
Construction at the Project Site		
Mobile Plant	Material Handling Combustion of fuel	TSP, PM_{10}, $PM_{2.5}$ NO_X, SO_2, VOCs, CO
Open Areas	Wind Erosion	TSP, PM_{10}, $PM_{2.5}$
Vehicle Movements	Wheel Generated Combustion of fuel	TSP, PM_{10}, $PM_{2.5}$ NO_X, SO_2, VOCs, CO
Drill Pads	Wind Erosion	TSP, PM_{10}, $PM_{2.5}$
Operations at the Colliery		
Crushing and Screening	Material Handling	TSP, PM_{10}, $PM_{2.5}$
ROM Coal Stockpile	Wind Erosion	TSP, PM_{10}, $PM_{2.5}$
Storage Areas	Wind Erosion	TSP, PM_{10}, $PM_{2.5}$
Miscellaneous Transfer Points (including conveying)	Material Handling	TSP, PM_{10}, $PM_{2.5}$
Vehicle Movements	Wheel Generated Combustion of fuel	TSP, PM_{10}, $PM_{2.5}$ NO_X, SO_2, VOCs, CO

Note: The Colliery will operate during construction – refer **Table 8** for more details

It is noted that the Colliery will be in operation during the construction of Bore 8.

2.5 Emission Controls

Based on the information provided by Springvale, the following emission control techniques will be employed at the Springvale Pit Top.

2.5.1 Coal Conveying Transfer Points

There are four coal transfer points within the Springvale Pit Top that have been considered within this assessment. These include:

- conveyor exiting the drift;
- top of conveyor unloading onto ROM stockpile;

---

[1] PM_{10} is used to describe particulate matter with an aerodynamic diameter of 10 microns (μm) or less. $PM_{2.5}$ is used to describe particulate matter with an aerodynamic diameter of 2.5 μm or less. TSP (Total Suspended Particulate) describes particulate matter which is less than 50 microns in diameter.

- conveyor transferring ROM coal to screen/primary crusher; and
- crushed material transfer onto conveyor system to WPS, MPPS.

The transfer points are enclosed on three sides. It is estimated that this will potentially reduce the particulate emissions by 30%[2] (Table 4, DSEWPC 2012).

2.5.2 Crushing and Screening

The crusher and screen is enclosed. It is estimated that this will potentially reduce the particulate emissions by 70%[3] (Table 4, DSEWPC 2012).

2.5.3 Mobile Plant

The mobile plant to be employed during various stages includes:

- 1 bulldozer on the ROM stockpile;
- 2 bulldozers during construction of Bore 8;
- 1 grader during the construction of Bore 8; and
- 2 excavators during the construction of Bore 8.

The pollutant emissions from the combustion of fuels in mobile plant are considered to be minor compared to emissions associated with coal combustion in the WPS and MPPS. The air impacts due to combustion of coal in WPS and MPPS are quantified and discussed in detail in **Section 7.2**. It is therefore concluded that emissions due to fuel combustion in mobile plant will have no significant cumulative impacts in the region and are not considered further within this assessment.

However, the particulate emissions arising due to the operation of the mobile plant on coal and other material have been quantified and assessed as part of this study.

2.5.4 Vehicle Movements

Vehicle movements on the roads within the Springvale Pit Top and the Project Site have the potential to result in particulate emissions in the form of wheel-generated dust and criteria pollutants from the combustion of fuels in the vehicles whilst on-site. Access roads to the Colliery are sealed including entry, exit and hardstand areas.

It has been advised by Springvale that the entire site will not be sealed. There will be vehicle movements on unsealed areas such as movements of the refuelling truck and mobile plant working around the stockpile area. Some light vehicles will also access the unsealed sections for reasons of safety, maintenance and operational inspections.

It is considered that the wheel generated particulate emissions will not have a significant cumulative impact with other sources at the Colliery. However, in order to provide a conservative assessment, the particulate emissions due to wheel generated dust from unpaved roads used by light duty vehicles have been quantified in this assessment.

---

[2] Table 4 of the NPI 2011 provides a control factor for ‘enclosure’ on handling, transferring and conveying including wheel and bucket.

[3] Table 4 of the NPI 2011 provides a control factor for ‘enclosure’ on handling, transferring and conveying including wheel and bucket.

2.6 Summary of Emission Sources and Control Measures Included in Assessment

Based on the information presented in **Section 2.4** and **Section 2.5**, a summary of the emission sources and the associated pollutants evaluated in this assessment is shown in **Table 3**. The estimation of these emissions and the subsequent emissions inventory are discussed in detail in **Section 5.4**.

Table 3 Summary of Project Emission Sources and Emission Controls

Emission Source	Emission Type	Pollutants	Controls
Construction at the Project Site			
Mobile Plant	Material Handling	TSP, PM_{10}, $PM_{2.5}$	No Control
Open Areas	Wind Erosion	TSP, PM_{10}, $PM_{2.5}$	No Control
Vehicle Movements	Wheel Generated	TSP, PM_{10}, $PM_{2.5}$	No Control
Drill Pads	Wind Erosion	TSP, PM_{10}, $PM_{2.5}$	No Control
Operations at the Colliery			
Crushing and Screening	Material Handling	TSP, PM_{10}, $PM_{2.5}$	Enclosed – 70%
ROM Coal Stockpile	Wind Erosion	TSP, PM_{10}, $PM_{2.5}$	Water Sprays – 50%
Storage Areas	Wind Erosion	TSP, PM_{10}, $PM_{2.5}$	No Control
Miscellaneous Transfer Points (including conveying)	Material Handling	TSP, PM_{10}, $PM_{2.5}$	Enclosed on 3 sides – 30%
Vehicle Movements	Wheel Generated	TSP, PM_{10}, $PM_{2.5}$	No Control

2.7 Hours of Operation

A summary of the hours of operation (as provided by Centennial) for each source is presented in **Table 4**.

Table 4 Hours of Operation

Process	Hours of Operation (per day)	Number of days (per week)
Construction Phase		
Mobile Plant Operations – Dozer and excavator	10	7
Mobile Plant Operations - Grader	10	7
Operational Phase		
Coal Conveying	24	7
Mobile Plant Operations - bulldozer	8	7

2.8 Coal Composition

The information provided by Springvale indicates that the moisture content and silt content of the coal are 10% and 6%, respectively. For the purpose of this AQIA, the moisture content and silt content of coal handled have been assumed to be constant throughout the handling and loading process.

As previously discussed, water sprays will be present on the conveyor transfer point above the main stockpile. This will result in an increase in the coal moisture content above the quoted 10%; however this has not been applied within this assessment. Therefore the resulting impacts of particulate can be viewed as conservative.

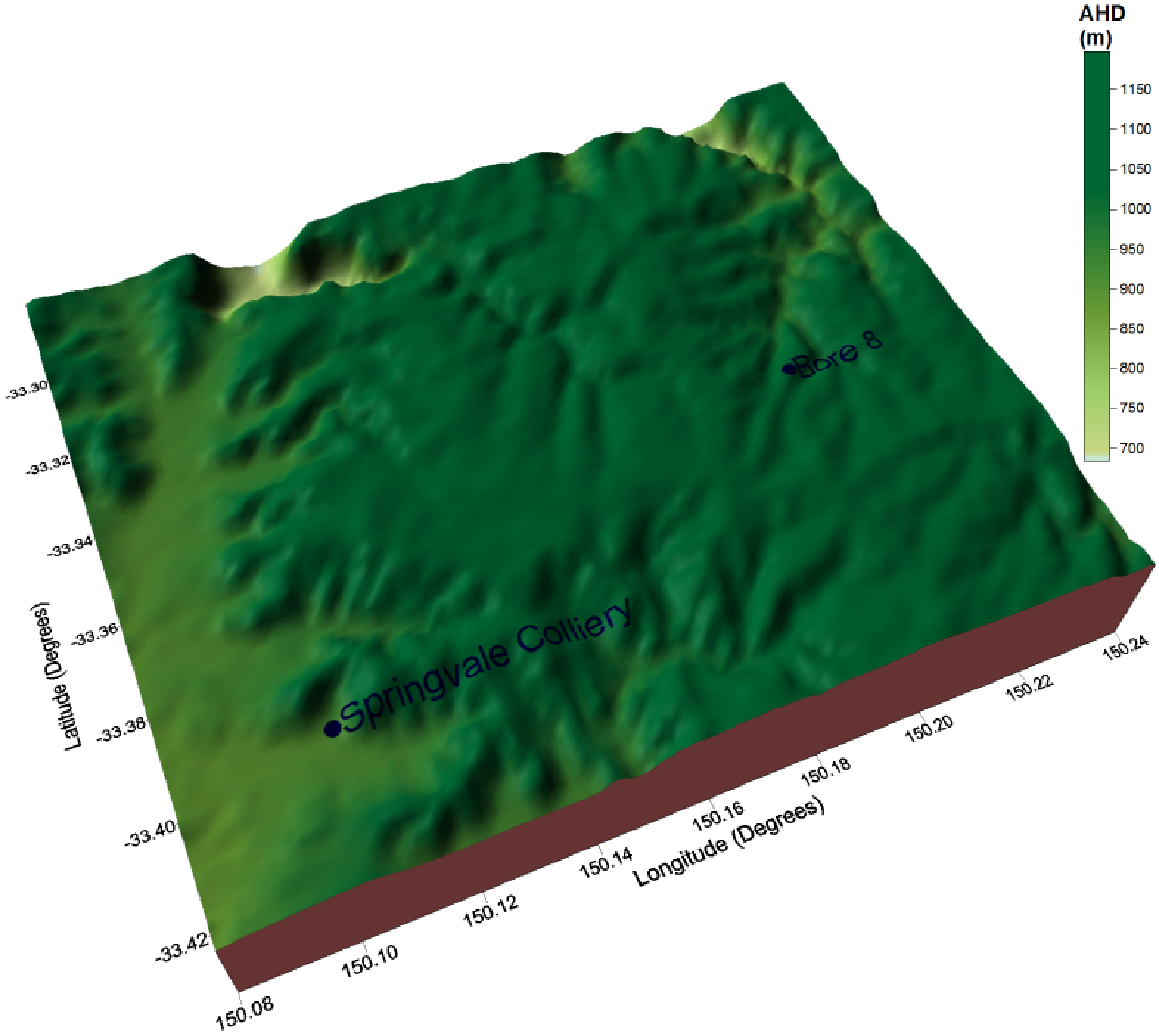
3 STUDY AREA

3.1 Local Topography

The topographical data used in the CALPUFF model was sourced from the United States Geological Service's Shuttle Radar Topography Mission database that has recorded topography across Australia with a 3 arc second (~90 m) spacing.

Figure 3 illustrates the topography of the region surrounding the Project site. Topographical effects have been included in the dispersion modelling.

Figure 3 Topography Surrounding the Project Site



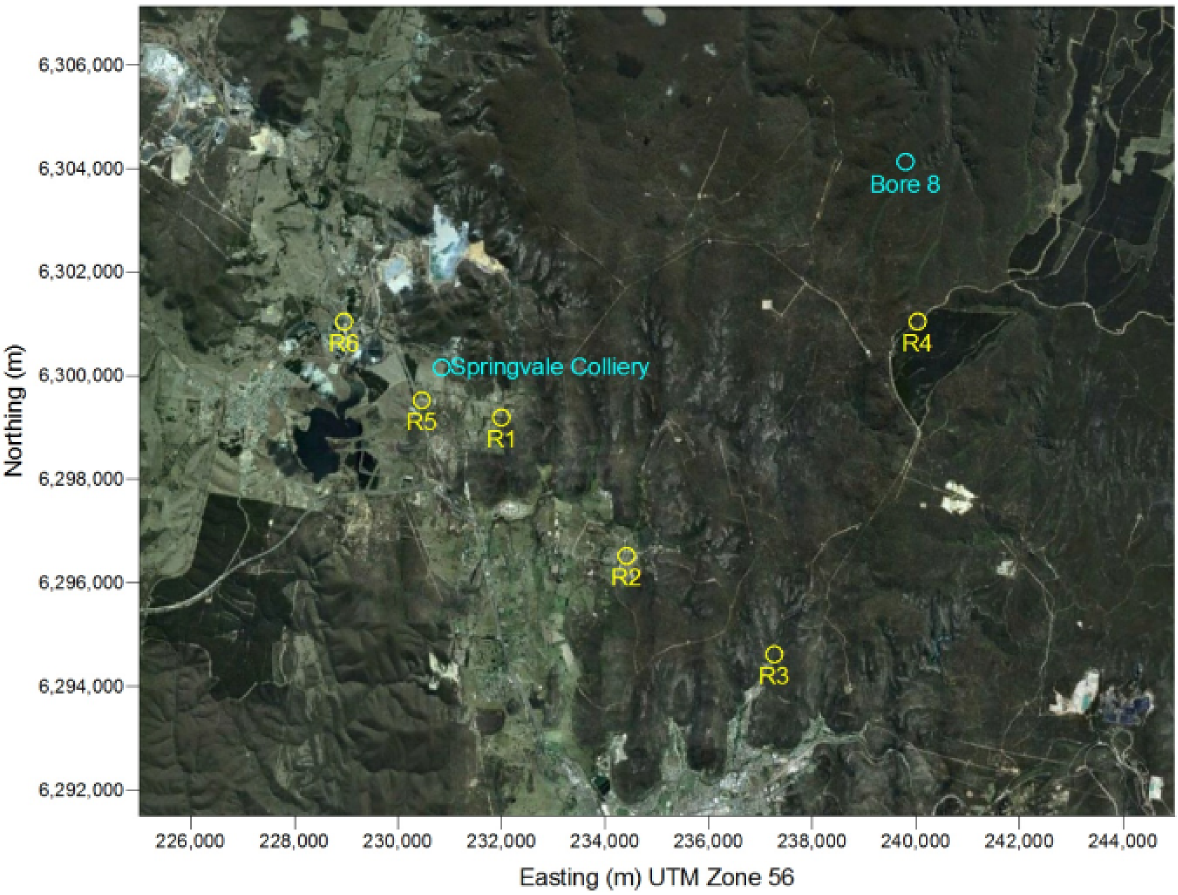
3.2 Sensitive Receptors

A number of sensitive areas have been identified as sensitive receptors in the area surrounding the Springvale Pit Top and the Project Site. The locations of the identified sensitive receptors located in the vicinity of the Colliery and the Project Site are shown in **Figure 4** and presented in **Table 5**.

Table 5 Locations of the identified Sensitive Receptors

Sensitive Receptor ID	Description	UTM Coordinates (Zone 56H)	
		Easting (m)	Northing (m)
R1	Springvale lane receivers	232,009	6,299,195
R2	Reserve road receivers	234,401	6,296,518
R3	State Mine Gully road receivers	237,261	6,294,641
R4	Bungleboori camping area	239,865	6,300,956
R5	Residential	230,459	6,299,532
R6	Residential	228,964	6,301,044

Figure 4 Locations of the Identified Nearest Sensitive Receptors



It is noted that the receptors R1 to R4 are consistent with those receptors assessed in the noise impact assessment (SLR 2012c). The receptors R5 and R6 are identified as additional sensitive receptors in this AQIA due to their locality adjacent to Springvale Pit Top.

4 AIR QUALITY CRITERIA

State air quality guidelines formulated by the NSW EPA (previously OEH) are published in the *Approved Methods For the Modelling and Assessment of Air Pollutants in New South Wales* (NSW DEC, 2005) (hereafter 'The Approved Methods').

4.1 Particulate Matter

Airborne contaminants that can be inhaled directly into the lungs can be classified on the basis of their physical properties as gases, vapours or particulate matter. In common usage, the terms "dust" and "particulates" are often used interchangeably. The term "particulate matter" refers to a category of airborne particles, typically less than 30 microns (µm) in diameter and ranging down to 0.1 µm and is termed total suspended particulate (TSP). The annual goal for TSP recommended by the NSW EPA is 90 micrograms per cubic metre of air (µg/m^3).

The TSP goal was developed before the more recent results of epidemiological studies which suggested a relationship between health impacts and exposure to concentrations of finer particulate matter.

Emissions of particulate matter less than 10 µm and 2.5 µm in diameter (referred to as PM_{10} and $PM_{2.5}$ respectively) are considered important air pollutants due to their ability to penetrate into the respiratory system. In the case of the $PM_{2.5}$ category, recent health research has shown that this penetration can occur deep into the lungs. Potential adverse health impacts associated with exposure to PM_{10} and $PM_{2.5}$ include increased mortality from cardiovascular and respiratory diseases, chronic obstructive pulmonary disease and heart disease, and reduced lung capacity in asthmatic children.

The NSW EPA PM_{10} assessment goals set out in the Approved Methods are as follows:

- a 24-hour maximum of 50 µg/m^3; and
- an annual average of 30 µg/m^3.

The Approved Methods do not set any assessment goals for $PM_{2.5}$. In December 2000, the National Environment Protection Council (NEPC) initiated a review to determine whether a national ambient air quality criterion for $PM_{2.5}$ was required in Australia, and the feasibility of developing such a criterion. The review found that:

- there are health effects associated with these fine particles;
- the health effects observed overseas are supported by Australian studies; and
- fine particle standards have been set in Canada and the USA, and an interim criterion is proposed for New Zealand.

The review concluded that there is sufficient community concern regarding $PM_{2.5}$ to consider it an entity separate from PM_{10}.

As such, in July 2003, a variation to the Ambient Air Quality National Environmental Protection Measure (NEPM) was made to extend its coverage to $PM_{2.5}$, setting the following Interim Advisory Reporting Standards for $PM_{2.5}$:

- a 24-hour average concentration of 25 µg/m^3; and
- an annual average concentration of 8 µg/m^3.

It is noted that the Advisory Reporting Standards relating to $PM_{2.5}$ particles are reporting guidelines only at the present time and not intended to represent air quality criteria.

4.2 Nuisance Impacts of Fugitive Emissions

The preceding section is concerned in large part with the health impacts of airborne particulate matter. Nuisance impacts need also to be considered, mainly in relation to deposited dust. In NSW, accepted practice regarding the nuisance impact of dust is that dust-related nuisance can be expected to impact on residential areas when annual average dust deposition rates exceed 4 g/m^2/month.

Table 6 presents the impact assessment goals set out in the Approved Methods for dust deposition, showing the allowable increase in dust deposition level over the ambient (background) level to avoid dust nuisance.

Table 6 EPA Goals for Allowable Dust Deposition

Averaging Period	Maximum Increase in Deposited Dust Level	Maximum Total Deposited Dust Level
Annual	2 g/m^2/month	4 g/m^2/month

Source: Approved Methods, NSW DEC 2005.

4.3 Summary of Project Air Quality Goals

The air quality goals adopted for this assessment, which conform to current OEH and Federal air quality criteria, are summarised in **Table 7**.

Table 7 Project Air Quality Goals

Pollutant	Averaging Time	Goal
TSP	Annual	90 µg/m^3
PM_{10}	24 Hours Annual	50 µg/m^3 30 µg/m^3
$PM_{2.5}$	24 Hours Annual	25 µg/m^3 (interim advisory reporting standard only) 8 µg/m^3 (interim advisory reporting standard only)
Dust Deposition	Annual	Maximum Incremental (Project only) increase of 2 g/m^2/month Maximum Total of 4 g/m^2/month (Project and other sources)

Source: Approved Methods, NSW DEC 2005.

5 ESTIMATION OF EMISSIONS

Particulate emissions from the Project Site have been calculated using default or calculated emission factors for the relevant emission sources. Emission factors were sourced from the National Pollutant Inventory (NPI) Emission Estimation Technique Manual for Mining version 3.1 (DSEWPC 2012), or from the US EPA AP-42 Emission Factor Handbook (US EPA, 2006) where suitable factors do not exist within the NPI documentation. Further details are provided below.

The following scenarios have been assessed in this study.

5.1 Construction Scenario (Scenario 1)

This scenario represents the construction of Bore 8 and includes the operations at the Springvale Pit Top, as this will be ongoing during the construction.

5.2 Operational Scenario (Scenario 2)

This scenario represents the normal operations at the Springvale Pit Top. This constitutes the handling and processing of up to 3.4 Mtpa of coal.

A summary of emission sources included in the two scenarios is shown in **Table 8**.

Table 8 Summary of Emission Sources by Scenarios Assessed

Emission Source	Emission Type	Scenario 1	Scenario 2
Mobile plant – bore construction	Material handling	✓	x
Drill rigs - bore construction	Material handling	✓	x
Drill pad - bore construction	Wind erosion	✓	x
Vehicle movements – bore construction	Wheel generated	✓	x
ROM stockpile	Wind erosion	✓	✓
Pit Top storage areas	Wind erosion	✓	✓
Miscellaneous transfer points – Pit Top	Material handling	✓	✓
Primary crusher and screen	Material handling	✓	✓
Vehicle movements - Pit Top	Wheel generated	✓	✓
Mobile plant – Pit Top	Material handling	✓	✓
Ventilation shaft no 3	Stack	✓	✓

5.3 Site Activity Data

5.3.1 Materials Handling

The specific activities identified as the material handling emissions sources during the construction of Bore 8 are:

- bulldozer operating on the access road to Bore 8;
- grader operating on the access road to Bore 8;
- bulldozer operating on the Bore 8 drill pad;
- excavator operating on the Bore 8 drill pad;

Table 9 lists the activity data used to estimate the particulate emissions from material handling activities during Scenario 1.

Table 9 Site Activity Data – Materials Handling – Scenario 1 - Construction

Parameter	Units	Value
Number of hours of operation of bulldozer – access road to Bore 8	hr/day	10
Total vehicle kilometres travelled – grader on access road to Bore 8	VKT/day	30
Number of hours of operation of bulldozer – Bore 8 drill pad	hr/day	10
Amount of material handled by the excavator - Bore 8 drill pad	tonnes/hr	100
Number of hours of operation of mobile plant – bulldozers at ROM stockpile	hr/day	8
Number of days of operation in a year	days/year	120
Silt content of the material during construction	%	3
Moisture content of the material during construction	%	4

Bulldozers, excavators and graders are assumed to be operational for 30 days of the year.

The vast majority of coal handling will be undertaken by conveyors at Springvale Pit Top. However some activities will require the use of mobile plant. The specific activities identified as the material handling emission sources are:

- bulldozer maintaining the ROM stockpile and push out area.

Table 10 lists the activity data used to estimate the particulate emissions from material handling activities at the Springvale Pit Top for Scenario 2.

Table 10 Site Activity Data – Materials Handling – Scenario 2 – Operation

Parameter	Units	Value
Number of hours of operation of Mobile Plant – bulldozers at main stockpile	hr/day	8
Number of days of operation in a year	days/year	365
Moisture content of the coal	%	10
Silt content of the coal	%	6

5.3.2 Miscellaneous Transfers/Conveying

The emissions from miscellaneous transfers and conveying are primarily associated with the transfer points along the conveyors employed to transfer the coal at Springvale Pit Top. The particulate emissions from the use of conveyors have been calculated for the following transfer points at:

- conveyor exiting the drift;
- top of conveyor unloading onto ROM stockpile;
- conveyor transferring ROM coal to screen/primary crusher; and
- screen/primary crusher.

The transfer points are enclosed on three (3) sides. This is estimated to reduce the particulate emissions by 30%[4] (Table 4, DSEWPC 2012).

It is noted that the same miscellaneous transfer points apply to Scenario 2.

---

[4] Table 4 the NPI 2011 provides a control factor for ‘enclosure’ on handling, transferring and conveying including wheel and bucket.

5.3.3 Vehicle Movements

During the construction of Bore 8, the vehicle movements identified to contribute to the impacts are as follows:

- vehicle movements on access road to Bore 8; and
- vehicle movements on the internal site road at Springvale Pit Top.

The vehicle movements on the roads within Springvale Pit Top have the potential to result in particulate emissions in the form of wheel-generated dust.

The parameters used in the calculation of emissions due to vehicle movements during construction phase are shown in **Table 11**.

Table 11 Site Activity Data – Vehicle Movements – Scenario 1 - Construction

Parameter	Units	Value
Number of days of construction in a year	day/year	120
Number of hours for vehicle movements	hr/day	8
Length of access road to Bore 8	m	3,478
Total number of vehicle kilometres travelled (VKT) – access road to Bore 8	VKT/day	56.0
Road silt content	%	3
Mean vehicle weight	tonnes	50

During normal operations at the Project Site, the vehicle movements identified to contribute to particulate emissions are:

- vehicle movements on the internal site road at Project Site.

The parameters used in the calculation of emissions due to vehicle movements during operational phase are shown in **Table 12**.

Table 12 Site Activity Data – Vehicle Movements – Scenario 2 – Operation

Parameter	Units	Value
Number of days of operation in a year	day/year	365
Number of hours for vehicle movements	hr/day	24
Length of unsealed roads at the Project Site	m	450
Total number of vehicle kilometres travelled (VKT)	VKT/day	43.2

5.4 Emission Estimation Techniques (EET)

5.4.1 TSP and PM_{10} Emission Factors

The emission factors used for the estimation of TSP and PM_{10} emissions from the Project Site are presented overleaf in **Table 13**.

Table 13 Summary of Emission Factors Used to Estimate Emissions

Activity	Emission Factor Equation	Units	Source	Variables	Controls Applied
Construction Scenario (Scenario 1)					
Bulldozer on material other than coal	$EF_{TSP} = 2.6 \times \frac{(s)^{1.2}}{M^{1.3}}$ $EF_{PM_{10}} = 0.34 \times \frac{(s)^{1.5}}{M^{1.4}}$	kg/h/vehicle	NPI EETM v3.1	M = Moisture content (%) s = silt content (%)	No Control
Grader	$EF_{TSP} = 0.0034 \times S^{2.5}$ $EF_{PM10} = 0.0034 \times S^{2.0}$	kg/VKT	NPI EETM v3.1	S = mean vehicle speed in km/h	No Controls
Excavator on overburden	$EF_{TSP} = 0.025$ $EF_{PM10} = 0.012$	kg/t	NPI EETM v3.1	-	No Controls
Wind Erosion	$EF_{TSP} = 1.9 \times \left(\frac{s}{1.5}\right) \times 365 \times \left(\frac{365-p}{235}\right) \times \left(\frac{f}{15}\right)$	kg/ha/year	NPI EETM v3.1	s = silt content (%) f = percentage of time when wind speeds is greater than 5.4 m/s at the mean height of the stockpile (14.2%) p = number of days with rainfall >0.25 mm (132 days)	No Controls
Operational Scenario (Scenario 2)					
Bulldozers on coal	$EF_{TSP} = 35.6 \times \frac{(s)^{1.2}}{M^{1.4}}$ $EF_{PM_{10}} = 6.33 \times \frac{(s)^{1.5}}{M^{1.4}}$	kg/h/vehicle	NPI EETM v3.1	M = Moisture content (%) s = silt content (%)	No Control
Miscellaneous Transfer Points	$EF = k \times 0.0016 \times \frac{\frac{U}{2.2}^{1.3}}{\frac{M^{1.4}}{2}}$	kg/t	NPI EETM v3.1	k = 0.74 (TSP) k = 0.35 (PM_{10}) U = mean wind speed (m/s) M = Moisture content (%)	Enclosed on three sides– 30%

Activity	Emission Factor Equation	Units	Source	Variables	Controls Applied
Primary Crusher	$EF_{TSP} = 0.01$ $EF_{PM10} = 0.004$	kg/t	NPI EETM v3.1	-	Enclosed – 70%
Screening	$EF_{TSP} = 0.0125$ $EF_{PM10} = 0.0043$	kg/t	USEPA AP42 11.19.2	-	Enclosed – 70%
Wheel generated dust from unpaved roads (used by light duty vehicles)	$EF = k \times \frac{\frac{s}{12} \times \frac{S}{48}^{a}}{\frac{M}{0.5}^{b}} - 0.0013$	kg/VKT	NPI EETM v3.1	k = 1.69 (TSP) k = 0.51 (PM_{10}) a = 0.3, b = 0.3 (TSP) a = 0.5, b = 0.2 (PM_{10}) S = mean wind speed (m/s) M = Moisture content (%) s = Silt Content (%)	No Control
Wind Erosion	$EF_{TSP} = 1.9 \times \left(\frac{s}{1.5}\right) \times 365 \times \left(\frac{365 - p}{235}\right) \times \left(\frac{f}{15}\right)$	kg/ha/year	NPI EETM v3.1	s = silt content (%) f = percentage of time when wind speeds is greater than 5.4 m/s at the mean height of the stockpile (14.2%) p = number of days with rainfall >0.25 mm (132 days)	Water Sprays – 50%

5.4.2 Estimation of $PM_{2.5}$ Emission Rates

The National Pollutant Inventory Manual for Mining, Version 3.1 (DSEWPC 2012) and US EPA AP 42 contain emission factors for TSP and PM_{10}. For the emission sources relevant to this project, no $PM_{2.5}$ emission factors are provided within the NPI or US EPA AP 42, as little research has been undertaken to assess the fraction of PM_{10} from the wide range of sources which would be emitted as $PM_{2.5}$.

Limited research has been conducted by the Midwest Research Institute (MRI) on behalf of the Western Regional Air Partnership (WRAP) with findings published within the document entitled *'Background Document for Revisions to Fine Fraction Ratios Used for AP-42 Fugitive Dust Emission Factors'* (MRI, 2006). This document provides five proposed $PM_{2.5}/PM_{10}$ ratios for fugitive dust source categories as presented in **Table 14.**

Table 14 Proposed Particle Size Ratios for AP-42

Fugitive Dust Source	AP-42 Section	Proposed $PM_{2.5}$ / PM_{10} Ratio
Paved Roads	13.2.1	0.15
Unpaved Roads	13.2.2	0.1
Aggregate Handling and Storage Piles	13.2.4	0.1
Industrial Wind Erosion	13.2.5	0.15
Open Area Wind Erosion	-	0.15

The $PM_{2.5}/PM_{10}$ ratios presented in **Table 14** have been used within this assessment to calculate the emissions of $PM_{2.5}$ attributable to the operations at the Project Site. The most appropriate ratio has been applied to each of the modelled sources.

5.4.3 Modelling of Wind Erosion Emissions

As shown in **Table 13** total annual wind erosion for each exposed area has been estimated using Equation 22 from the National Pollution Inventory (NPI) Emission Estimation Technique Manual for Mining v3.1 (DSEWPC 2012).

For dispersion modelling, an hourly varying emissions file has been generated based on threshold wind speeds needed for wind erosion to occur from open areas (taken to be 5.4 m/s). This also includes the area dependency of the total wind erosion emissions generated from a particular area.

An hourly emission ratio was developed from the total estimated annual emissions using a relationship between the cube of the hourly averaged wind speeds and sum of the hourly cubic wind speeds. The cubic relationship allows the distribution of emissions such that much larger emissions are calculated during high wind speed events and minimal emissions are calculated during lower wind speed events.

Based on the information presented above, a particulate emissions inventory has been compiled for the current operations. A detailed emissions inventory is attached in **Appendix A**.

The total particulate emissions (TSP, PM_{10} and $PM_{2.5}$) estimated for the two scenarios are presented in **Table 15**.

Table 15 Estimated Annual Particulate Emissions

Pollutant	Modelled Scenario (kg/year)	
	Scenario 1	**Scenario 2**
TSP	108,713	91,343
PM_{10}	32,856	27,829
$PM_{2.5}$	3,649	2,839

6 AIR DISPERSION MODELLING METHODOLOGY

6.1 Model Selection

Emissions from the sources identified in **Section 5** have been modelled using the US EPA's CALPUFF (Version 6) modelling system. CALPUFF is a transport and dispersion model that ejects "puffs" of material emitted from modelled sources, simulating dispersion and transformation processes along the way. In doing so it typically uses the fields generated by a meteorological pre-processor CALMET, discussed further below. Temporal and spatial variations in the meteorological fields selected are explicitly incorporated in the resulting distribution of puffs throughout a simulation period. The primary output files from CALPUFF contain either hourly concentration or hourly deposition fluxes evaluated at selected receptor locations. The CALPOST post-processor is then used to process these files, producing tabulations that summarise results of the simulation for user-selected averaging periods.

The advantages of using CALPUFF (rather than using a steady state Gaussian dispersion model such as Ausplume) is its ability to handle calm wind speeds (<0.5 m/s) and complicated terrain. Steady state models assume that meteorology is unchanged by topography over the modelling domain and may result in significant over or under estimation of air quality impacts.

More advanced dispersion models (such as CALPUFF) are approved for use by many regulatory authorities in situations where these models may be more appropriate than use of the Ausplume model. Such situations include those noted above (i.e. high frequency of calm wind conditions and/or complicated terrain).

6.2 Meteorological Modelling

6.2.1 Gridded Meteorological Data

To adequately characterise the dispersion meteorology of the Project Site and the study area, information is needed on the prevailing wind regime, ambient temperature, rainfall, relative humidity, mixing depth and atmospheric stability. In the absence of suitable local meteorological data, the meteorology of the study area was characterised based on a three-dimensional prognostic meteorological dataset for the region surrounding the study site. The three-dimensional prognostic dataset generated by the Pennsylvania State University/National Centre for Atmospheric Research, or MM5, model was created and assimilated in the CALMET modelling process. The MM5 model is a prognostic mesoscale wind field model with four-dimensional data assimilation. CALMET's wind model allows MM5 generated data to be used as initial pseudo-observations (Scire *et al.*, 2011).

For this study, an MM5 meteorological dataset was obtained for a 120 km x 120 km domain (study area) for the 2006, 2007 and 2008 calendar years, centred over the Project Site, with a spatial grid resolution of 12 km. The model has 40 vertical levels, with the lowest level beginning at 11 m above ground level ranging to 3,500 m. The MM5 dataset contains the two-dimensional and three-dimensional parameters listed in **Table 16**.

Table 16 MM5 Dataset Parameters

Hourly 3-Dimensional Parameters	Hourly 2-Dimensional Parameters
Wind speed and direction	Sea-level pressure
Temperature	Rainfall amount
Pressure	Snow cover
Geopotential height	Short wave and long wave radiation at the surface
Vertical velocity	Air temperature and specific humidity at 2m
Relative humidity	Wind speed and direction at 10m
Mixing ratios for water vapour, cloud water, rain and other precipitation	Sea surface temperature

6.2.2 CALMET

CALMET is a meteorological model that develops wind and temperature fields on a three-dimensional gridded modelling domain. Associated two-dimensional fields such as mixing height, surface characteristics, and dispersion properties are also included in the file produced by CALMET. The interpolated wind field is then modified within the model to account for the influences of topography, as well as differential heating and surface roughness associated with different land uses across the modelling domain. These modifications are applied to the winds at each grid point to develop a final wind field. The final wind field thus reflects the influences of local topography and land uses.

In this assessment, CALMET is run using MM5 gridded prognostic numerical model output (See **Section 6.2.1**). No surface, upper air or buoy observations are used ('No-Obs Mode' hereafter). This approach is recommended by Scire et al, 2011 as:

- No-Obs mode allows the important benefits of the non-steady-state approach in CALPUFF to be included in the dispersion modelling (e.g. spatially varying meteorology and dispersion, causality, recirculation, stagnation, pollutant build-up, fumigation, etc.);
- No-Obs mode makes use of three-dimensional, hourly prognostic meteorological data often available at high resolution to drive CALMET and CALPUFF;
- No-Obs mode greatly simplifies the preparation of the CALMET inputs because a large number of input variables dealing with observational data are not required and the difficulties of dealing with potentially incomplete observational datasets are eliminated; and,
- No-Obs mode provides a relatively straightforward approach that facilitates agency review and approval of the CALMET/CALPUFF simulations.

Table 17 details the parameters used in the meteorological modelling to drive the CALPUFF model.

Table 17 CALMET Configuration Used for this Study

Meteorological grid domain	20 km x 20 km
Meteorological grid resolution	0.2 km
TERRAD Value	0.5 km
Vertical Resolution (Cell Heights)	10 (0 m, 20 m, 40 m, 80 m, 160 m, 320 m, 640 m, 1,200 m, 2,000 m, 3,000 m and 4,000m)
Modelling Years	2006, 2007 and 2008

6.3 Meteorological Data Used in Modelling

The MM5 data generated by the Pennsylvania State University/National Centre for Atmospheric Research is used for input into CALMET. The CALMET model was run for 2006, 2007 and 2008.

It is concluded from the meteorological analysis for the years 2006 to 2008, that there was no apparent trend in the meteorological parameters suggesting the suitability of one year over the other. Therefore the meteorological conditions in the most recent year of available data (2008) will be used for CALPUFF dispersion modelling. The modelled data for year 2008 for Springvale Colliery and Springvale Bore 8 are presented in the following sections. The data for 2006 and 2007 can be found in **Appendix B**.

6.3.1 Wind Speed and Direction –Colliery and the Project Site

A summary of the annual wind behaviour predicted by CALMET for the Springvale Pit Top and the Project Site for the year 2008 are presented as wind roses in **Figure 5** and **Figure 6** respectively.

The wind roses for the Springvale Pit Top and Project Site indicate that the region is subjected to predominantly light to moderate (between 1.5 m/s and 8 m/s) winds and that the wind direction is seasonally dependent. Winds occur reasonably evenly from all quadrants. It is also noted that during summers, the region is subjected to winds dominated from the east quadrant and during winters the region is subjected to winds dominated from west-southwest quadrant. Calm wind conditions (wind speed less than 0.5 m/s) at the Colliery and the Project Site were predicted to occur approximately 3% and 2% of the time in 2008 respectively.

Figure 5 Annual Wind Roses for the Springvale Pit Top (CALMET predictions, 2008)

Figure 6 Annual Wind Roses for the Project Site (CALMET predictions, 2008)

6.3.2 Atmospheric Stability

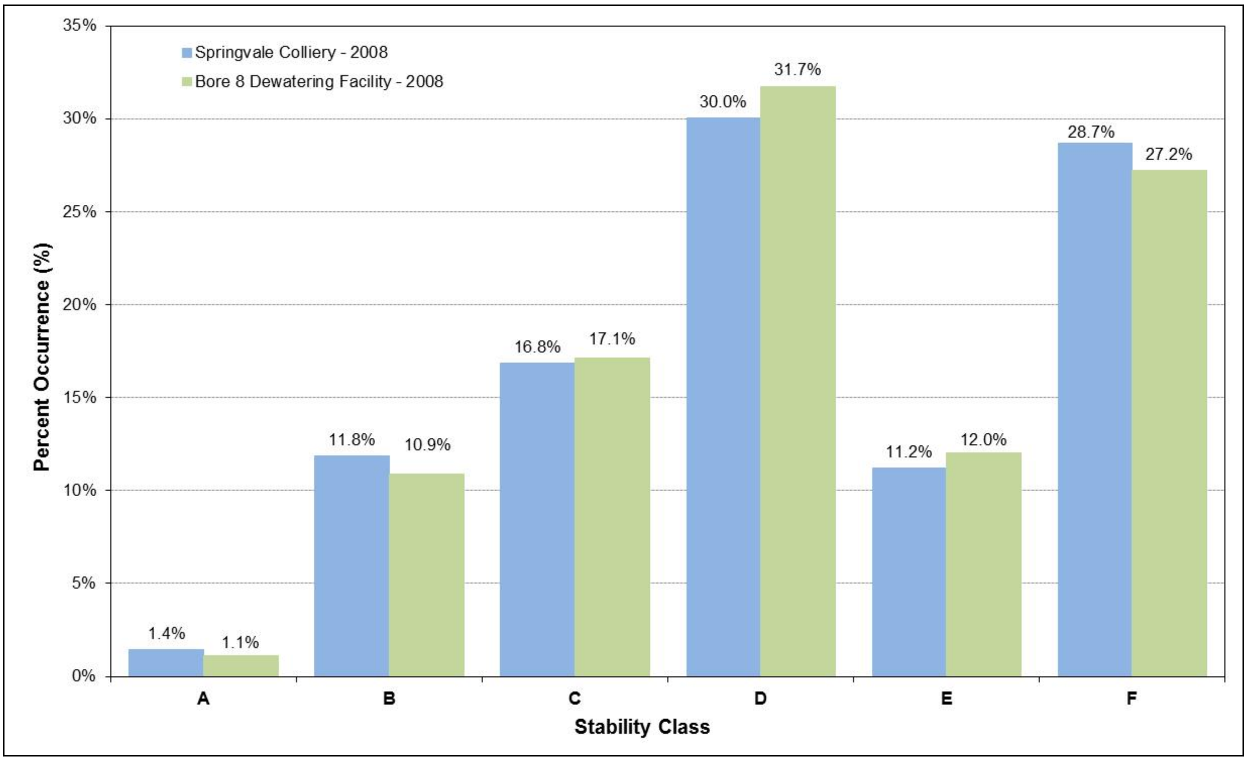
Atmospheric stability refers to the tendency of the atmosphere to resist or enhance vertical motion. The Pasquill-Turner assignment scheme identifies six Stability Classes, A to F, to categorise the degree of atmospheric stability (see **Table 18**). These classes indicate the characteristics of the prevailing meteorological conditions and are used as input into various air dispersion models.

Table 18 Description of Atmospheric Stability Classes

Atmospheric Stability Class	Category Description
A	Very unstable Low wind, clear skies, hot daytime conditions
B	Unstable Clear skies, daytime conditions
C	Moderately unstable Moderate wind, slightly overcast daytime conditions
D	Neutral High winds or cloudy days and nights
E	Stable Moderate wind, slightly overcast night-time conditions
F	Very stable Low winds, clear skies, cold night-time conditions

The frequency of each stability class predicted by CALMET at the Springvale Pit Top and the Project Site during 2008 is presented in **Figure 7**. The results indicate a high frequency of conditions typical to Stability Class D and F. Stability Class D is indicative of neutral conditions, conducive to a moderate level of pollutant dispersion due to mechanical mixing. Stability Class F is indicative of stable night time conditions, which will inhibit pollutant dispersion. The data for 2006 and 2007 can be found in **Appendix B**.

Figure 7 Stability Class Frequencies for the Colliery and the Project Site (CALMET predictions, 2008)



6.3.3 Mixing Heights

Diurnal variations in maximum and average mixing depths predicted by CALMET at the Springvale Pit Top and the Project Site during 2008 are illustrated in **Figure 8** and **Figure 9** respectively. As would be expected, an increase in the mixing depth during the morning is apparent, arising due to the onset of vertical mixing following sunrise. Maximum mixing heights occur in the mid to late afternoon, due to the dissipation of ground-based temperature inversions and the growth of the convective mixing layer. The data for 2006 and 2007 can be found in **Appendix B**.

Figure 8 Mixing Heights at the Springvale Pit Top (CALMET predictions, 2008)

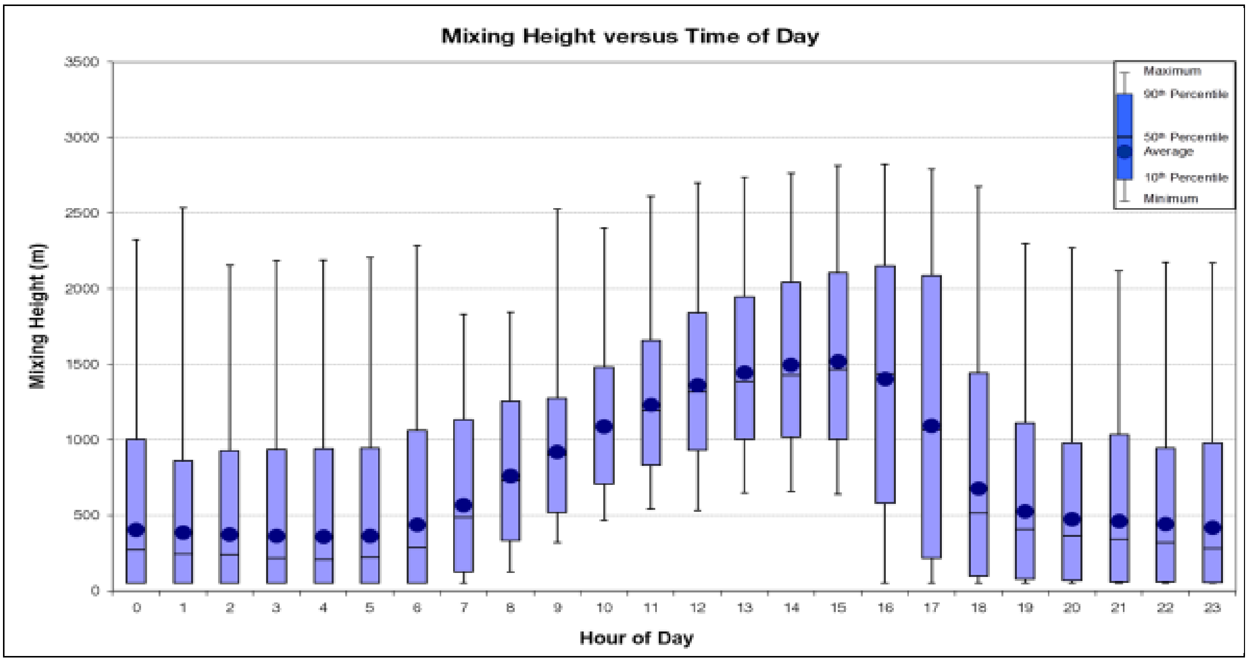
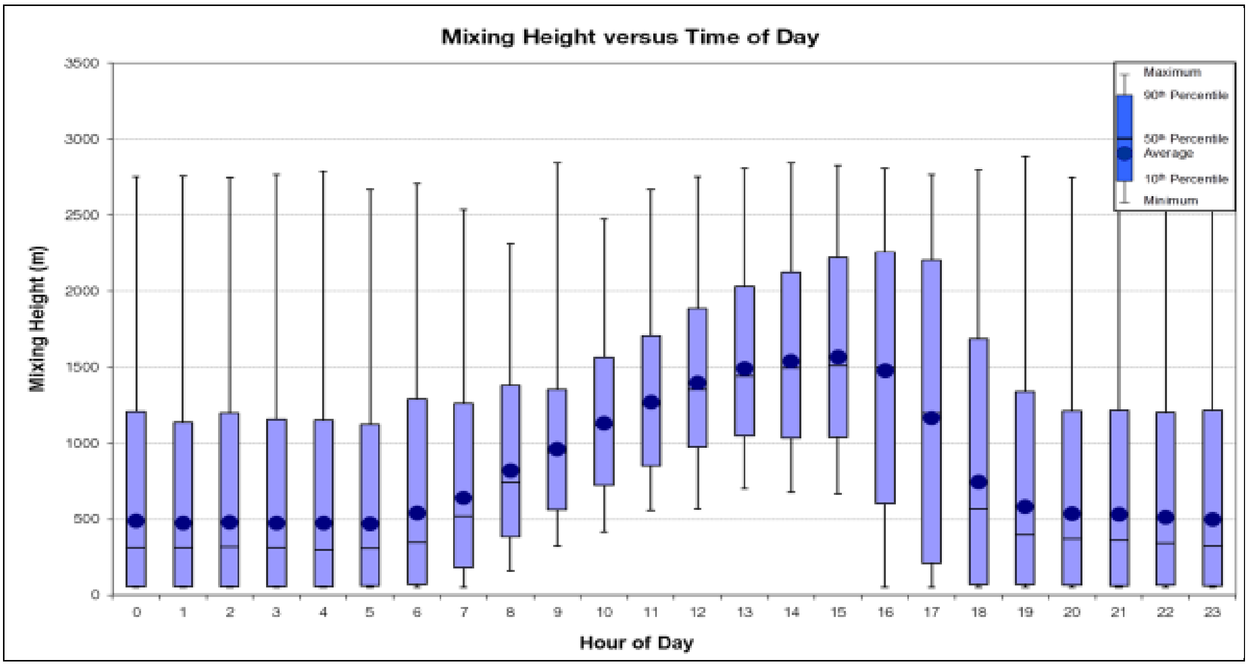


Figure 9 Mixing Heights at the Project Site (CALMET predictions, 2008)



7 BACKGROUND AIR QUALITY FOR ASSESSMENT OF CUMULATIVE IMPACTS

The air quality in the region surrounding the Project Site is influenced by emissions generated by a range of sources, originating from both within and outside of the local area. Specifically, for the area surrounding the Project Site, air quality will be influenced by emissions from power stations in the area, pollution transported into the area from more distant sources and pollution generated by the Project itself.

To determine the incremental impact of particulate emissions from the Project on the surrounding environment and sensitive receptors, a dispersion modelling exercise has been performed, as detailed in **Section 6**.

To appropriately assess the *cumulative* impact of the Project, this incremental impact needs to be added to a dataset which includes the influences of all other sources of particulate in the region, and is representative of the air quality likely to be experienced at sensitive receptor locations without the impact of the Project.

Given that air quality monitoring locations in the local area are limited to those close to major particulate sources (such as mine sites and power stations) the use of an alternative dataset has been investigated to avoid possible double-counting of Project-related emissions.

This section outlines the methodology used to generate the background particulate dataset used in this assessment. It involves the following steps:

- Selection of an appropriate background dataset representative of regional air quality without the influence of major industrial sources in the local area (i.e. power stations, other local emissions sources and Project-related emissions) – **Section 7.1**.
- Addition of an appropriate incremental contribution to ambient particulate levels due to stack and fugitive emissions from power stations and other emissions sources in the local area – **Section 7.2**.

7.1 Regional Background Air Quality

7.1.1 Particulate Matter

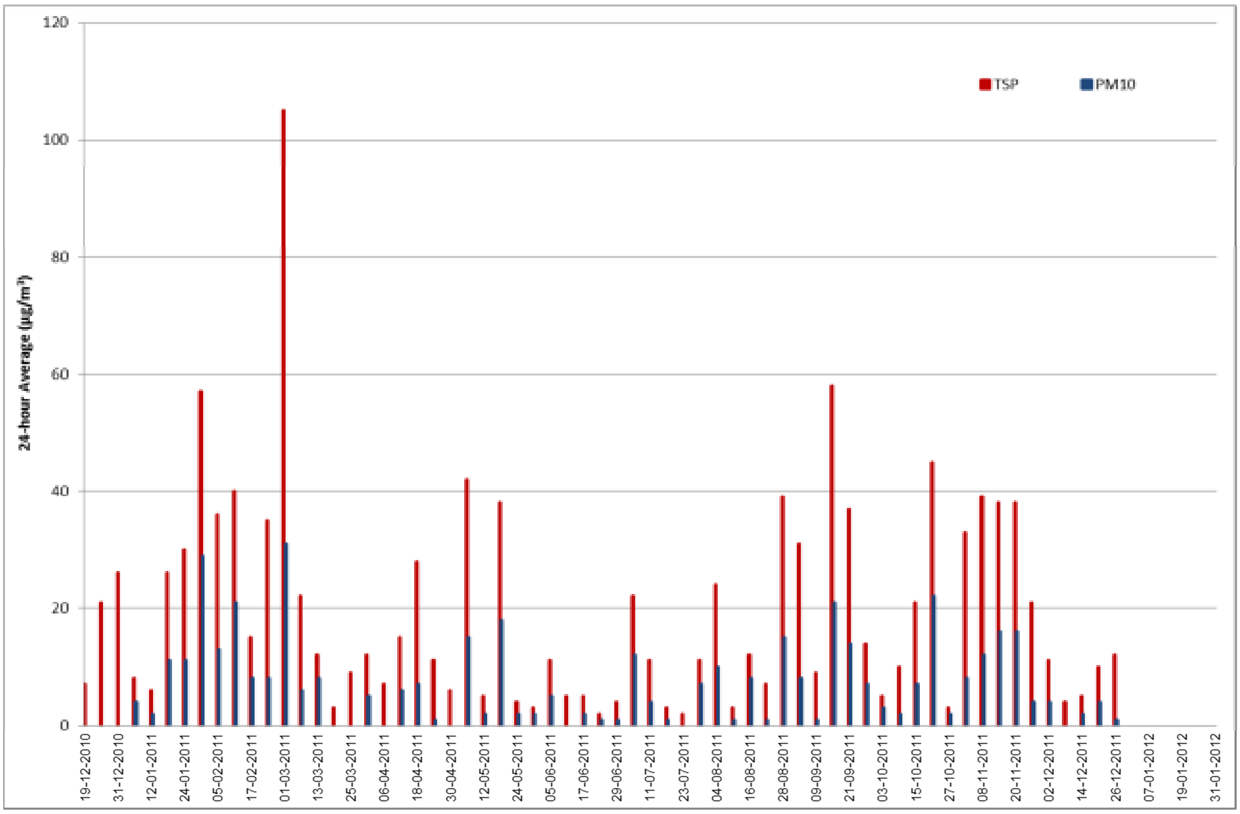
Site Specific Data

On-site ambient air quality continuous monitoring has been performed by Springvale since December 2010. The ambient air quality monitoring program has been incorporated into a wider environmental monitoring campaign, and includes PM_{10} and TSP measurements using two co-located High Volume Air Samplers (HVAS, refer **Figure 12**). The monitoring was undertaken in accordance with AS3580.9.3:2003 and AS3580.9.6:2003 for TSP and PM_{10}, respectively.

The monitoring data was measured on a 6-day cycle over the period 19 December 2010 to 31 January 2012 inclusive.

The measured 24-hour average PM_{10} and TSP concentrations are presented graphically in **Figure 10**.

Figure 10 24-Hour Average TSP and PM_{10} Concentrations Measured at the Springvale HVAS



The annual average TSP and PM_{10} concentrations for calendar year 2011 are detailed in **Table 19**.

Table 19 Springvale HVAS 2011 Annual Average Particulate Concentrations

Particulate Size	2011 Annual Average (µg/m^3)
TSP	19.7
PM_{10}	8.2

Of note, the ratio of mean TSP to PM_{10} measurements is of the order of 2.5 to 1. Also, it is noted that the monitored TSP and PM_{10} concentrations at Springvale HVAS includes contributions from Springvale Colliery and other industrial facilities in the region.

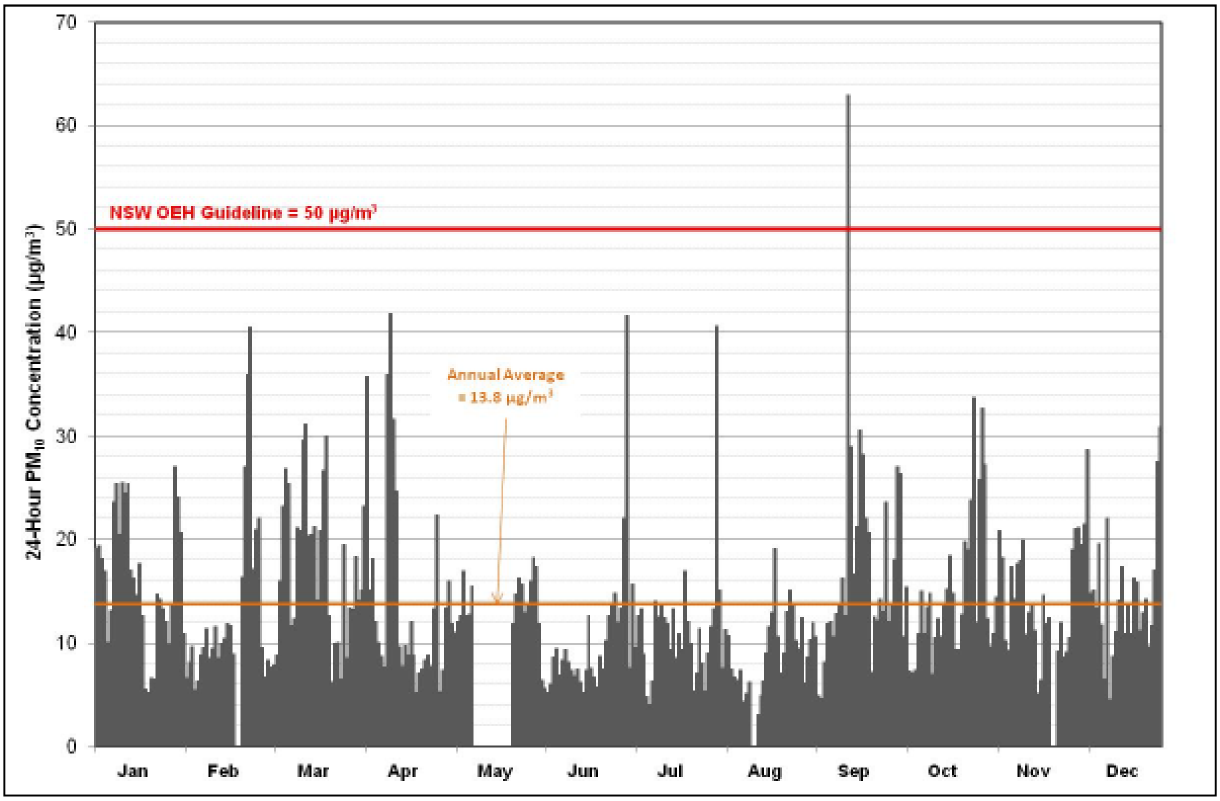
Nearest Regional EPA Monitoring site

The closest EPA air quality monitoring station to the Project Site is the Bathurst air quality monitoring site, located in a rural township at the Bathurst Sewage Treatment Plant, off Morisset Street, approximately 45 km to the west of the Project Site. The following air quality parameters are recorded at the monitoring station:

- Ozone (O_3).
- Fine particles (PM_{10} using a tapered element oscillating microbalance [TEOM]).
- Wind speed, wind direction and sigma theta (a measure of wind direction variability).

Verified 24-hour average PM_{10} concentration data from the Bathurst monitoring station for 2008 has been obtained from the NSW EPA, and is presented in **Figure 11**. Data for 2008 has been selected as this is contemporaneous with the meteorological dataset used in this assessment, as per the requirements for Level 2 modelling assessments listed in Section 5.1 of the Approved Methods.

Figure 11 24 Hour Average PM_{10} Concentration Recorded at Bathurst (2008)



Source: http://www.environment.nsw.gov.au/aqms/search.htm

Figure 11 shows that 24-hour average PM_{10} levels measured at Bathurst are generally well below the NSW OEH guideline of 50 µg/m^3. One exceedance of the guideline (63 µg/m^3) was recorded on 15 September. The NEPM *New South Wales Annual Compliance Report 2008* (DECC, 2009) reported that this exceedance was a result of a dust storm in the area on that day. The annual average was 13.8 µg/m^3.

TSP and $PM_{2.5}$ are not monitored at the NSW EPA Bathurst site.

As detailed above, the ratio of site specific mean TSP to PM_{10} measurements is of the order of 2.5 to 1. In the absence of any TSP data, it is proposed that an annual average TSP concentration of 34.5 µg/m^3 (13.8 µg/m^3 × 2.5) is appropriate for the region surrounding the Project site.

Given the absence of $PM_{2.5}$ monitoring data for the area, only incremental concentrations can be assessed within this report. However, as discussed further in **Section 5.4.2,** dispersion modelling of major $PM_{2.5}$ sources within the area has been performed, which will assist in the understanding of likely $PM_{2.5}$ concentrations in the local area, albeit without a regional background component.

Statistical Analysis of Site Specific data and EPA Monitoring data

A summary of the data used to provide a suitable description of background conditions is presented in **Table 20**.

All data is presented as 24-hour average concentrations in µg/m^3, except averaging period (hours), monitoring start and end dates (dates), skew and kurtosis (dimensionless), and data capture (percentage of the monitoring period).

It is noted that for the purposes of this statistical analysis, contemporaneous EPA data (19 December 2010 to 31 January 2012) has been used.

Table 20 Statistical Summary of On-Site Background Monitoring Data and Bathurst EPA Regional data

Statistic		**Springvale PM_{10}**	**Bathurst PM_{10}**
Averaging period		24 hours	24 hours
Monitoring data start		6 January 2011	6 January 2011
Monitoring data end		26 December 2011	26 December 2011
Data points		60	57
Mean		8.2	10.4
Standard deviation		7.3	4.1
Skew[1]		1.3	0.7
Kurtosis[2]		1.5	0.6
Minimum		1.0	4.9
Percentiles	1	1.0	5.0
	2	1.0	5.1
	3	1.0	5.4
	5	1.0	5.8
	10	1.0	5.9
	25	2.0	6.9
	50	7.0	10.0
	75	12.0	12.8
	90	17.6	17.4
	95	21.4	17.8
	97	25.1	18.1
	98	28.7	18.2
	99	30.0	18.9
Maximum		31.0	19.8
Data Capture		100	95

Notes 1 Skew represents an expression of the distribution of measured values around the derived mean. Positive skew represents a distribution tending towards values higher than the mean, and negative skew represents a distribution tending towards values lower than the mean. Skew is dimensionless.

2 Kurtosis represents an expression of the value of measured values in relation to a normal distribution. Positive skew represents a more pointed distribution, and negative skew represents a distribution more flattened than a normal distribution. Kurtosis is dimensionless.

Table 20 indicates that the mean PM_{10} 24-hour concentrations for both Springvale and Bathurst are relatively similar (8.2 µg/m^3 and 10.4 µg/m^3 respectively). The maximum PM_{10} 24-hour concentration for Springvale (31.0 µg/m^3) is significantly higher than Bathurst (19.8 µg/m^3). There are no exceedances of the Project Specific air quality goals. It is evident that whilst PM_{10} concentrations monitored at Bathurst on average are higher, PM_{10} concentrations monitored at Springvale are higher for the 90th to 100th percentile. It is considered that these higher concentrations are a result of the surrounding regional industrial sources.

Based on the above, and acknowledging that the HVAS data is not appropriate for use within Level 2 modelling assessments, it is considered that the use of Bathurst EPA PM_{10} data is appropriate for this assessment, if the surrounding regional sources are considered. This approach is detailed in **Section 7.3**.

This approach has also been adopted for the assessment of cumulative TSP concentrations, adopting an annual average concentration of 34.5 µg/m^3. This is considered conservative, in view of the site specific average TSP concentration presented in **Table 19** (19.7 µg/m^3).

In conclusion, the particulate concentrations adopted as regional background for this project are shown in **Table 21**.

Table 21 Adopted Regional Background Concentrations – Particulate

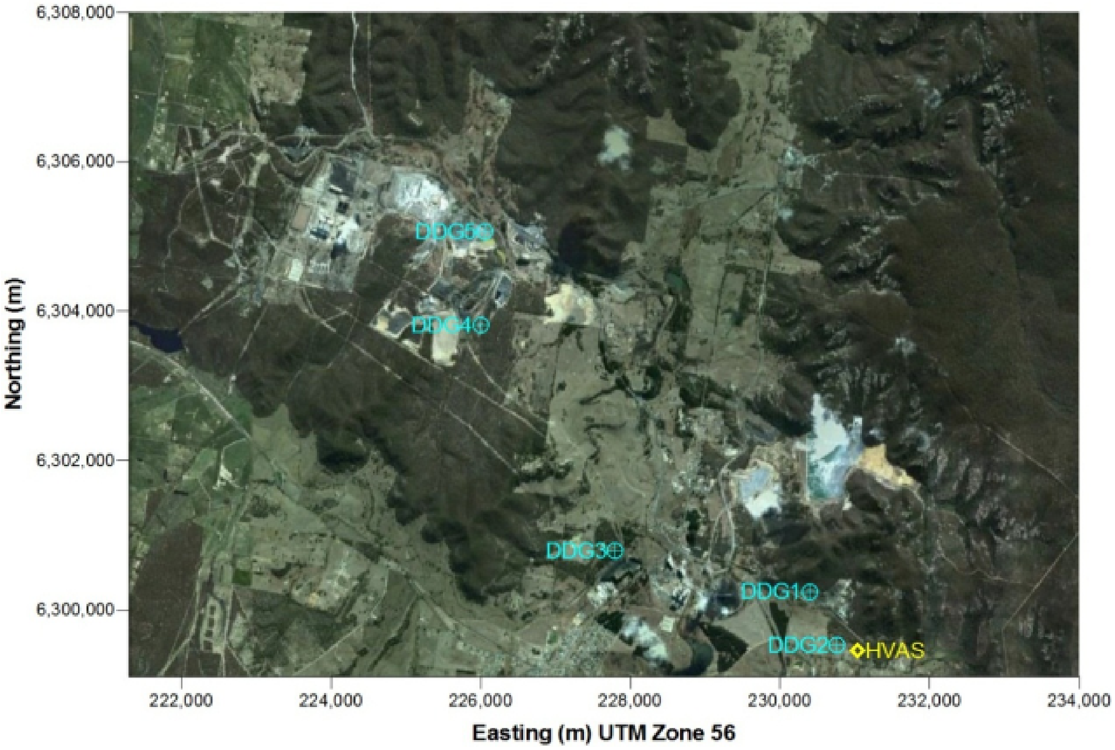
Particulate Type	Concentration (µg/m^3)	Averaging Period	Source
PM_{10}	13.8	Annual	Bathurst
PM_{10}	Varying	24-hour	Bathurst
$PM_{2.5}$	No Data	Annual	-
$PM_{2.5}$	No Data	24-hour	-
TSP[1]	34.5	Annual	Bathurst

[1] It was noted from the monitored TSP and PM_{10} data at Springvale HVAS that TSP:PM_{10} = 2.5:1 in the region. Hence, a factor of 2.5 is applied to the monitored annual average PM_{10} concentration at Bathurst.

7.1.2 Dust

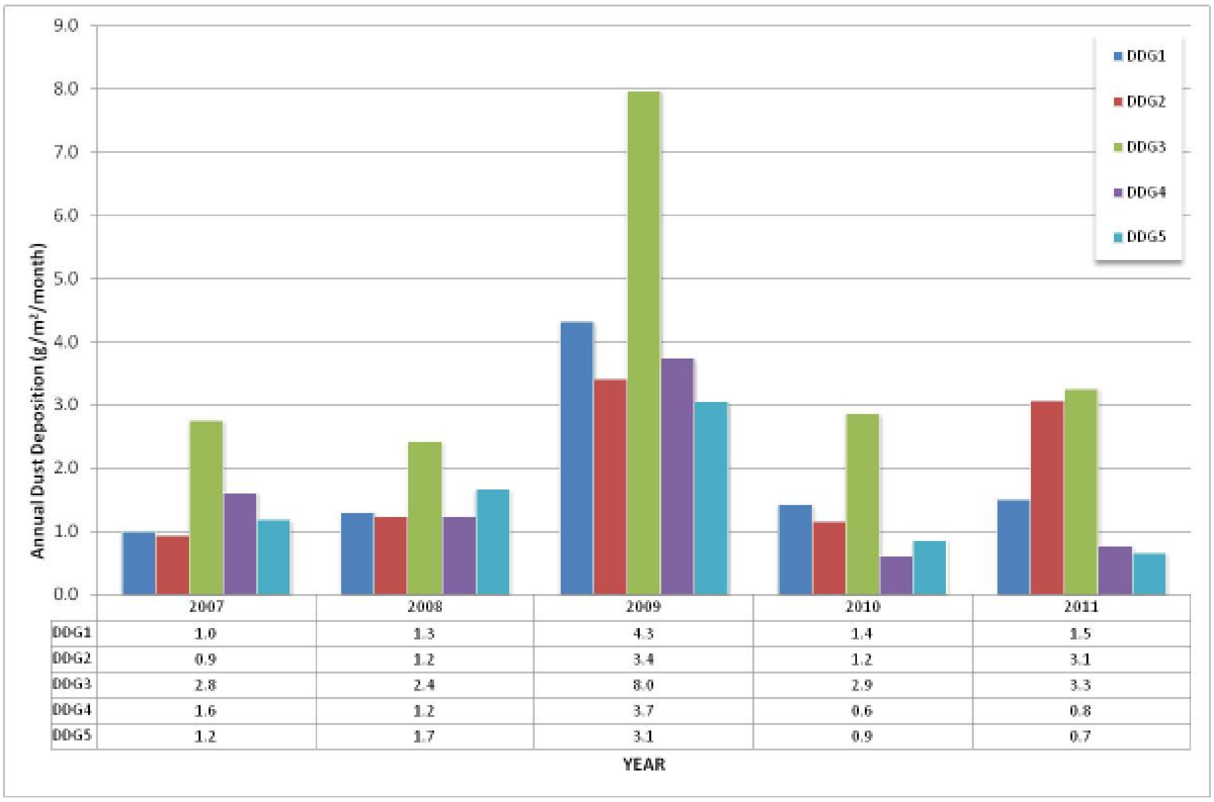
Static dust monitoring commenced in January 2007 at five monitoring locations (DDG1, DDG2, DDG3, DDG4 and DDG5) surrounding the Project Site. The location of the five dust deposition gauges along with the Springvale HVAS is shown in **Figure 12**.

Figure 12 Location of the Dust Deposition Gauges and Springvale HVAS



Monitoring results for dust deposition are presented in **Figure 13** for the years 2007 to 2011. All dust deposition results met the assessment criterion of 4 g/m^2/month with the exception of 2009. Monthly dust deposition results were shown to be elevated in September 2009 (between 10 g/m^2/month and 28 g/m^2/month) and October 2009 (between 7 g/m^2/month and 10 g/m^2/month) due to a severe dust storm experienced at the end of September 2009.

Figure 13 Monitoring Results for Dust Deposition – Springvale Colliery



	2007	2008	2009	2010	2011
DDG1	1.0	1.3	4.3	1.4	1.5
DDG2	0.9	1.2	3.4	1.2	3.1
DDG3	2.8	2.4	8.0	2.9	3.3
DDG4	1.6	1.2	3.7	0.6	0.8
DDG5	1.2	1.7	3.1	0.9	0.7

A summary of the dust deposition monitoring program undertaken is shown in **Table 22**.

Table 22 Summary of the Dust Deposition Monitoring Program at Springvale Colliery

Gauge	Monitoring Period	Number of Samples	Deposition Rate (g/m^2/month)
DG1	January 2007 to December 2011	58	1.9
DG2	January 2007 to December 2011	52	2.0
DG3	January 2007 to December 2011	58	3.9
DG4	January 2007 to December 2011	54	1.6
DG5	January 2007 to December 2011	56	1.5
Average			**2.2**

Table 22 indicates that the five monitoring locations had an overall average dust deposition rate of 2.2 g/m^2/month over the period January 2007 to December 2011.

It is also noted that over the same period, the dust deposition rate varied between 1.5 g/m^2/month and 3.9 g/m^2/month. It is noted that the measured dust deposition rates shown in **Table 22** include the contribution of operations at Springvale Colliery and the background dust levels.

It is considered appropriate and conservative that the average dust deposition rate of 2.2 g/m^2/month be adopted as a background dust deposition rate at all the identified sensitive receptors relevant for this assessment.

7.2 Incremental Impact of Major Industrial Sources Surrounding the Project Site

The existing or approved activities and projects located in the area surrounding the Project Site (including applications not approved but advanced within the planning system) that have been taken into account in this AQIA are shown in **Table 23**.

Table 23 Identified Industrial Facilities in the vicinity of the Project Site

Industrial Facility*	Impact Assessment
Springvale Coal Services Project, north of Blackmans Flat	Section **7.2.1**
Mount Piper Power Station (Mt Piper A)	Section **7.2.2**
New Base Load Power Station (Mt Piper B)	Section **7.2.2**
Western rail coal unloader	Section **7.2.3**
Wallerawang power station (WPS)	Section **7.2.2**
Angus Place Mine	Section **7.2.4**
Lidsdale Siding	Section **7.2.5**
Pine Dale coal mine (Yarraboldy extension)	Section **7.2.6**

* The assessment of power stations includes the combustion emissions, associated ash emplacements and coal stockpiles

To determine the background particulate concentrations experienced at the sensitive receptors identified in **Section 3.2**, the increment from these sources needs to be added to the regional background particulate concentrations from **Section 7.1**.

7.2.1 Coal Services Washery Upgrade and Coal Distribution Project

The Coal Services Upgrade Project is located approximately 10.5 km northwest of the Springvale Pit Top and is considered to be a source of particulate emissions in the region. Also, it is noted that at the time of completion of this AQIA, no impact assessment studies have been completed for the Upgrade Project and DGRs are yet to be issued for this project.

However, it is considered reasonable to assume that due to the large separation distance (approximately 10.5 km), the particulate emissions arising due to the activities at the Coal Services Upgrade Project will not have a significant cumulative impact at the identified sensitive receptors in **Section 3.2**.

7.2.2 Power Stations and Associated Coal Stockpiles & Ash Emplacements

A dispersion modelling exercise has been performed using publicly available information to determine the contribution from power station emissions to particulate concentrations within the modelling domain. The information in **Table 24** has been obtained for stack sources associated with the Wallerawang and Mount Piper Power Stations. Emission rates of $PM_{2.5}$ were not publicly available and therefore the WRAPAIR $PM_{2.5}/PM_{10}$ factor (refer **Section 5.4.2**) of 0.1 has been applied to the PM_{10} emission rates for all particulate emissions sources.

Table 24 Point Source Emissions from Wallerawang and Mount Piper Power Stations

Source	Easting (m)	Northing (m)	Stack Height (m)	Diameter (m)	Temperature (°C)	Velocity (m/s)	TSP (g/s)	PM_{10} (g/s)	$PM_{2.5}$ (g/s)	NO_X (g/s)	SO_2 (g/s)
Wallerawang Power Station											
W1	228,726	6,300,324	177	6.96	121	26.4	34.1	2.7	0.27	366	716
W2	228,795	6,300,279	177	6.96	121	23.2	34.0	2.7	0.27	369	720
Mount Piper A											
MA	223,805	6,305,070	250	13.0	124	22.0	23.0	1.3	0.13	1,422	1,550
Mount Piper B											
MB	223,476	6,305,183	250	11.1	124	22.8	32.6	1.8	0.18	1,040	2,195

Source: SKM, 2009

The influence of building wake effects on the power station stack emissions has been taken into account in the dispersion modelling. Building dimensions were estimated using Google Earth images and the relationship between known stack heights and associated shadow lengths. This relationship has then been applied to the building shadow lengths to estimate building heights. The building heights used in the modelling assessment are presented in **Table 25**.

Table 25 Details of Power Stations Building Coordinates and Dimensions

Site	Building	ID	Easting (m)	Northing (m)	Height (m)
Wallerawang	Powerhouse	WB1	228,573	6,300,238	66
			228,611	6,300,299	
			228,787	6,300,196	
			228,745	6,300,122	
Mt Piper A	Powerhouse	MB1	223,577	6,304,899	33
			223,718	6,305,171	
			223,884	6,305,014	
			223,808	6,304,819	
Mt Piper B *(assumed – not constructed)*	Powerhouse	MB2	223,248	6,305,012	33
			223,389	6,305,284	
			223,555	6,305,127	
			223,479	6,304,932	

Source: Google Earth, 2011

In addition to emissions from stack sources, emissions from coal stockpiles and ash emplacements have also been considered. Details of the stockpile and ash emplacement locations used in this assessment are presented in **Table 26**.

Table 26 Details of Coal Stockpile and Ash Emplacements at Mt Piper and Wallerawang Power Stations

Site	Stockpile	ID	Easting (m)	Northing (m)	Height (m)
Wallerawang	Coal	WPS1	229,194	6,300,211	7
			229,471	6,305,384	
			229,369	6,305,697	
			229,197	6,305,803	
	Ash	WA1	229,495	6,301,527	0
			229,773	6,301,595	
			229,861	6,301,917	
			229,477	6,301,856	
Mt Piper	Coal	MPSP1	223,793	6,305,506	7
			224,147	6,305,384	
			224,208	6,305,697	
			223,867	6,305,803	
	Ash	MPA1	225,341	6,304,291	20
			225,298	6,305,081	
			225,909	6,304,995	
			225,755	6,303,989	

The Mt Piper Power Station Ash Placement Project (August 2010) seeks approval for the placement of additional ash resulting from the operations of the approved Mt Piper B Project (SKM, 2010). The Ash Placement Project will utilise the mined out pit area of the surrounding open cut mines. Ash will not be placed within all pits simultaneously, and final ash placement areas will be rehabilitated progressively. For the purposes of this assessment, the current ash placement area (Area 1) has been assumed to be in continuous operation.

Locations and areas of coal stockpiles were obtained from Google Earth imagery. Heights of all coal stockpiles have been assumed to be 7 m above ground level (AGL).

Emission rates for all stockpiles and ash dams have been estimated based on the NPI default for wind erosion of 0.4 kg/ha/hr for TSP, 0.2 kg/ha/hr for PM_{10} and 0.02 kg/ha/hr for $PM_{2.5.}$ The emission rate for $PM_{2.5}$ has been calculated using the WRAPAIR emission factors as discussed in **Section 5.4.2**. It is acknowledged that the use of the default value may result in under- or over-estimation of 24-hour particulate concentrations at some locations, although taking into account the nature and scale of this assessment, it is considered to be appropriate.

7.2.3 Mt Piper Power Station Western Coal Unloader

The Western Coal Unloader (WCU) associated with the Mt Piper Power Station gained Project Approval in June 2009. The WCU is designed to enable the supply of coal by rail to the Power Station from a number of mines, mainly to the north of the Power Station (SKM, 2007). The WCU will be located approximately 2 km to the south of the Mt Piper Power Station and approximately 9 km northwest of the Project Site. The Environmental Assessment (SKM, 2007) for the WCU assessed the impact of particulate matter for the construction and operational scenarios.

It was concluded that during the operational scenario, maximum predicted 24-hour average incremental PM_{10} concentration at ‘Receiver 1’ was 9 µg/m^3 (SKM, 2007). The location of ‘Receiver 1’ is approximately 6 km from the Springvale Pit Top.

Given such low concentrations at these distances from the Springvale Pit Top, it is considered that the WCU will not have a cumulative impact on particulate concentrations associated with the Project. The WCU has therefore not been considered further within this report.

7.2.4 Angus Place Colliery

Angus Place Colliery is located approximately 6 km north of the Springvale Pit Top as shown in **Figure 2**. The surface operations at the Angus Place Colliery were the subject of a 75W Modification AQIA (SLR 2011b). Dispersion modelling predictions for the Angus place operations indicated maximum 24-hour average PM_{10} concentrations between 0.2 µg/m^3 and 0.6 µg/m^3 at locations which are approximately 5 km to the north of the Springvale Pit Top (refer **Figure 2**). Given the small predicted incremental impact from the Angus Place Colliery, it has not been considered further within this report.

Also considered is the Air Quality Impact Assessment for the proposed installation of a ventilation fan and infrastructure associated with the Angus Place Colliery (SLR 2012a). A dispersion modelling exercise has been performed, to assess the potential impacts of emissions of pollutants from the vent shaft and stand-by diesel generator associated with the proposed installation. The dispersion modelling study indicated maximum 24-hour average PM_{10} concentrations between 0.2 µg/m^3 and 0.6 µg/m^3 at locations which are approximately 5 km to the north of the Project Site. Given the small predicted incremental impact from the ventilation shaft, it has not been considered further within this report.

7.2.5 Lidsdale Siding

A dispersion modelling exercise has been performed by SLR Consulting (SLR 2012b) and the impacts from the upgraded project operations were assessed at ten identified sensitive receptors in the vicinity of the Lidsdale Siding Coal Loading Facility (LSCLF). The maximum incremental (Project only) 24-hour average PM_{10} concentrations (17.1 µg/m^3) were predicted to occur at a receptor which is approximately 4 km to the west from the Springvale Colliery.

Considering the large incremental concentration and relatively small distance of the LSCLF from sensitive receptors identified in **Section 3.2**, it is considered appropriate to quantitatively assess the impacts from LSCLF at the sensitive receptors for the inclusion in the background concentration.

A summary of the emission sources and emission controls at the LSCLF included as part of the background dispersion modelling is shown in **Table 27**.

Table 27 Summary of Emission Sources and Emission Controls - LSCLF

Emission Source	Emission Type	Pollutants	Controls
Mobile Plant	Material Handling	TSP, PM_{10}, $PM_{2.5}$	Water Sprays – 50%
Main Stockpile	Wind Erosion	TSP, PM_{10}, $PM_{2.5}$	Water Sprays – 50%
Auxiliary Coal Stockpile	Wind Erosion	TSP, PM_{10}, $PM_{2.5}$	No Control
Rail Loading Bin	Material Handling	TSP, PM_{10}, $PM_{2.5}$	Enclosed – 70%
Miscellaneous Transfer Points (including conveying)	Material Handling	TSP, PM_{10}, $PM_{2.5}$	Enclosed – 70%
Vehicle Movements	Wheel Generated	TSP, PM_{10}, $PM_{2.5}$	No Control

7.2.6 Pine Dale Coal Mine Extension Project

The Pine Dale Coal Mine is located approximately 6 km northwest of the Project Site as shown in **Figure 2**. Recently, an application has been submitted to the Department of Planning and Infrastructure to extend the Pine Dale Coal Mine (SLR 2011c). Dispersion modelling predictions of the proposed operations (Yarraboldy extension) indicated predicted maximum incremental 24-hour average PM_{10} concentrations of between 2 µg/m^3 and 5 µg/m^3 at locations which are approximately 6.5 km to the northwest of the Springvale Pit Top (refer **Figure 2**). Given the small predicted incremental impact from the Pine Dale Coal Mine Extension, the proposed expansion has not been considered further within this report.

7.3 Background Air Quality for Assessment Purposes

A summary of the emission sources in the area which may have the potential to impact upon the identified sensitive receptors (see **Section 3.2**) and how they have been considered within this assessment is presented in **Table 28**.

Table 28 Emissions Sources Considered in Cumulative Assessment

Source	Comments
Coal Services Upgrade, north of Blackmans Flat	Not modelled (refer **Section 7.2.1**)
Mount Piper Power Station (Mt Piper A)	Modelled using emission parameters from (SKM, 2009) (refer **Section 7.2.2)**
New Base Load Power Station (Mt Piper B)	Modelled using emission parameters from (SKM, 2009) (refer **Section 7.2.2)**
Western rail coal unloader	Not modelled (refer Section **7.2.3)**
Wallerawang Power Station (WPS)	Modelled using emission parameters from (SKM, 2009) (refer **Section 7.2.2)**
Angus Place Mine	Not modelled (refer **Section 7.2.4**)
Lidsdale Siding	Modelled (refer **Section 7.2.5)**
Pine Dale coal mine (Yarraboldy extension)	Not modelled (refer **Section 7.2.6**)

Through the dispersion modelling exercise, pollutant concentrations experienced at each of the identified sensitive receptor locations (refer **Section 3.2**) due to emissions from the modelled sources identified in **Table 28** have been estimated and presented in **Table 29**.

Table 29 Predicted Cumulative Background Particulate Concentrations

Receptor	TSP [1] (µg/m^3)	PM_{10} (µg/m^3)		$PM_{2.5}$ [2] (µg/m^3)		Dust Deposition (g/m^2/month)
	Annual Average	Maximum 24-hr Average	Annual Average	Maximum 24-hr Average	Annual Average	Annual Average
R1	36.4	45.4	14.7	2.0	0.17	2.2
R2	35.2	42.0	14.1	1.1	0.06	2.2
R3	34.9	41.9	13.9	0.6	0.03	2.2
R4	35.1	42.6	14.0	0.7	0.04	2.2
R5	39.2	54.6	16.1	4.9	0.45	2.2
R6	53.6	92.2	23.3	11.7	1.84	2.2
Criterion	**90**	**50**	**30**	**25**	**8**	**4**

[1] Regional background TSP concentrations taken to be 2.5 times the monitored regional background PM_{10} concentrations at Bathurst for the year 2008.

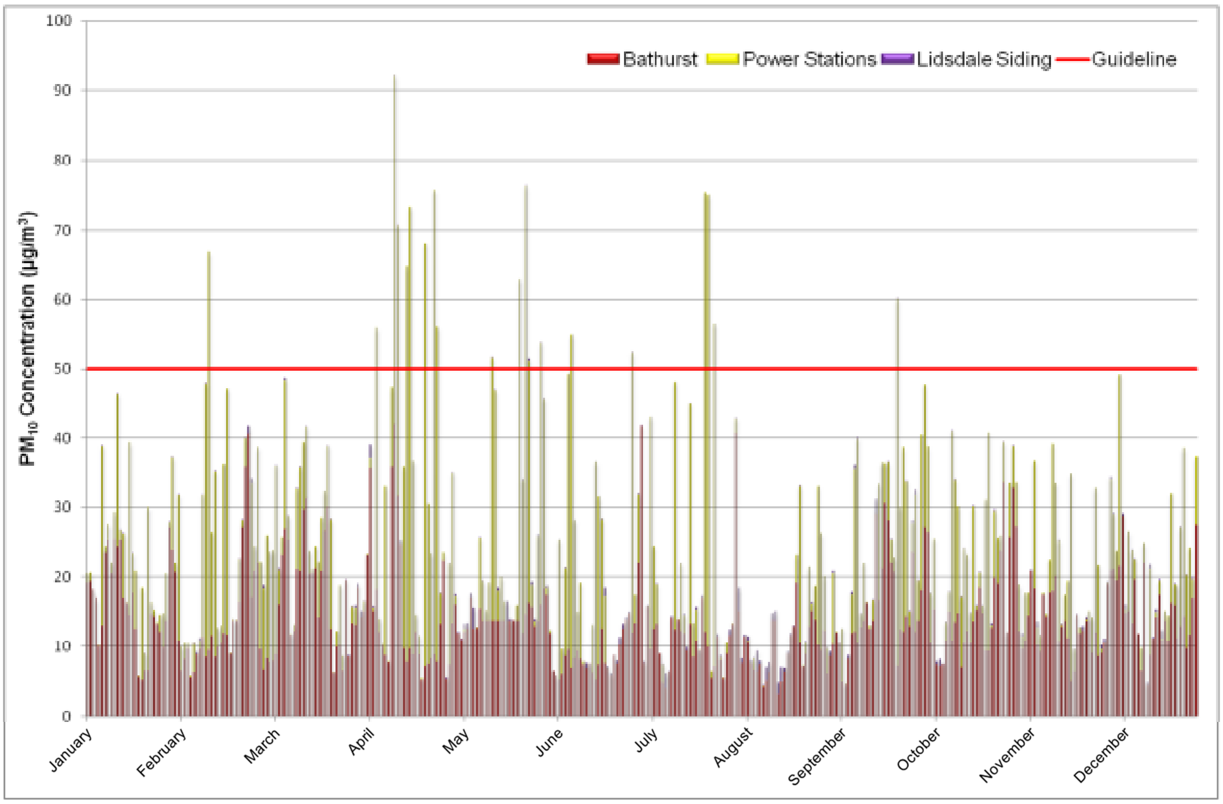
[2] No regional background $PM_{2.5}$ concentrations are available, therefore, regional background $PM_{2.5}$ concentrations are not considered.

The values presented in **Table 29** are the total predicted cumulative concentrations of pollutants, without the operation of the Project Site and can be considered to be a cumulative background concentration. It is noted that the maximum 24-hour average PM_{10} is predicted to exceed at two identified receptors due to the sources in the region other than the Project Site. The maximum 24-hour average PM_{10} concentration is predicted to occur at receptor 'R6' (92.2 µg/m^3). Based upon the data presented previously, it is concluded that due to the presence of a number industrial facilities in the region, the air quality criteria is likely to be exceeded, even without the contribution of the Project Site.

It is noted that the regional background concentrations (where included) and each modelled pollutant source contribute a varying amount to the total concentration at each receptor. This is demonstrated in **Figure 14** which presents the predicted incremental PM_{10} concentrations from the modelled operations at receptor 'R6' (maximum affected receptor for particulates) during 2008.

It is noted that 20 exceedances of the NSW OEH 24 hour PM_{10} criterion are predicted to occur at receptor 'R6', due to the cumulative impacts of the adopted background concentrations from the Bathurst monitoring station, the power stations in the region and LSCLF.

Figure 14 Predicted PM_{10} Concentrations at Receptor 'R6', 2008



8 AIR DISPERSION MODELLING RESULTS

Dispersion modelling predictions of dust deposition rates and TSP, PM_{10} and $PM_{2.5}$ concentrations at the residences/properties nominated in **Section 3.2** attributable to the Project Site are presented in **Section 8.1** to **Section 8.4**. Pollutant isopleth plots are also provided in **Appendix C** which show the maximum predicted cumulative (project operations and background combined) concentrations and deposition rates of the pollutants assessed.

As discussed in **Section 7** a detailed assessment of the background concentrations in the area surrounding the Project site has been performed. A regional background concentration has been determined, to which a contribution from local power stations has been added. Within this results section, a contribution from Project activities to this background dataset has been added to provide information on the impact of Project activities on the air quality within the local area. For TSP, PM_{10} and $PM_{2.5}$ concentration results, several values are presented. The value presented and an explanation of each is provided in **Table 30**.

Table 30 Results Presentation and Explanation

Description in Results Tables	Data Presented	Reason for Presentation
Increment Background	Maximum *Regional* Background Concentration	Allows identification of the maximum regional measured particulate concentration across the entire year without power station and Project related sources.
Increment Power Station	Maximum Incremental Contribution from *Power Stations*	Indicates the maximum impact at each receptor across the entire year from power station operation only.
Increment Project	Maximum Incremental Contribution from *Project*	Identifies the maximum impact across the entire year from Project related sources only.
Cumulative Total Background	Maximum Regional Background Concentration plus *Power Stations* Contribution	Allows identification of the maximum measured particulate concentration across the entire year with a likely contribution from power station sources but without Project related sources.
Cumulative Total Background + Project	Maximum Cumulative Concentration (ALL SOURCES)	Indicates the maximum particulate concentration when regional background, power station sources, LSCLF and Project sources are added together. However, the day of maximum impact from the Project may not fall on the same day as maximum impact from the power stations and regional background.
Cumulative Total Background on day of Maximum Increment from Project	Regional plus Power Station Background Concentration on day of Maximum Increment from Project	This shows the background particulate concentration on the day of the maximum predicted increment from Project operations.
Cumulative Maximum Cumulative Concentration on Day of Maximum Increment from Project	Maximum Cumulative Concentration on Day of Maximum Increment from Project	This allows examination of the day on which the maximum incremental particulate concentration falls and the likely cumulative impact (power stations plus regional background plus Project) on that day.

The following Sections detail the dispersion modelling results for dust deposition (**Section 8.1**), TSP (**Section 8.2**), PM_{10} (**Section 8.3**) and $PM_{2.5}$ (**Section 8.4**).

8.1 Dust Deposition

Table 31 shows the results of the dispersion modelling for dust deposition from the Project Site at each of the identified receptors using the emission rates calculated in **Section 5.** Contour plots of the incremental increase in dust deposition are also presented in **Appendix C.**

Table 31 Predicted Incremental Annual Average Dust Deposition Rates

Receptor ID	Annual Average Dust Deposition Rate (g/m^2/month)				
	Background	Scenario 1		Scenario 2	
		Increment	Cumulative	Increment	Cumulative
R1	2.2	<0.1	2.2	<0.1	2.2
R2	2.2	<0.1	2.2	<0.1	2.2
R3	2.2	<0.1	2.2	<0.1	2.2
R4	2.2	<0.1	2.2	<0.1	2.2
R5	2.2	0.1	2.3	0.1	2.3
R6	2.2	<0.1	2.2	<0.1	2.2

Note: Criteria – 2 g/m^2/month (incremental), 4 g/m^2/month (cumulative)

The results indicate that incremental and cumulative annual average dust deposition rates at all nominated residences/properties surrounding the Project Site are predicted to be well below the criterion of 2 g/m^2/month (incremental increase in dust deposition) and below 4 g/m^2/month (cumulative dust deposition) during Scenario 1 and Scenario 2.

8.2 Particles (as TSP)

8.2.1 Annual Average TSP Concentrations - Scenario 1 (Construction and Operation)

Table 32 presents the annual average TSP concentrations predicted by the dispersion modelling at each of the nominated residences/properties using the emission rates calculated in **Section 5** during Scenario 1. The calculated background TSP concentrations have been discussed in detail in **Section 7**. Contour plots of the predicted cumulative increase in TSP concentrations are presented in **Appendix C**.

Table 32 Predicted Annual Average TSP Concentrations – Scenario 1 (Construction and Operation)

Receptor ID	Increment	Increment	Increment	Increment	Cumulative	Cumulative
	Regional Background	Power Station	Lidsdale Siding	Project	Total Background	Total Background + Project
	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)
R1	34.5	1.9	<0.1	0.8	36.4	37.2
R2	34.5	0.7	<0.1	0.1	35.2	35.3
R3	34.5	0.4	<0.1	<0.1	34.9	34.9
R4	34.5	0.6	<0.1	0.7	35.1	35.8
R5	34.5	4.6	0.1	2.0	39.2	41.1
R6	34.5	18.6	0.5	0.7	53.6	54.3

Note: Project criterion – 90 µg/m^3

During Scenario 1 operations, annual average TSP concentrations are predicted to be well below the criterion of 90 µg/m^3 at all identified sensitive receptor locations.

8.2.2 Annual Average TSP Concentrations - Scenario 2 (Operation only)

Table 33 presents the annual average TSP concentrations predicted by the dispersion modelling at each of the nominated residences/properties using the emission rates calculated in **Section 5** for operation of Scenario 2. The calculated background TSP concentrations have been discussed in detail in **Section 7**. Contour plots of the predicted cumulative increase in TSP concentrations are presented in **Appendix C**.

Table 33 Predicted Annual Average TSP Concentrations – Scenario 2 (Operation only)

Receptor ID	Increment	Increment	Increment	Increment	Cumulative	Cumulative
	Regional Background	Power Station	Lidsdale Siding	Project	Total Background	Total Background + Project
	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)
R1	34.5	1.9	<0.1	0.8	36.4	37.2
R2	34.5	0.7	<0.1	0.1	35.2	35.2
R3	34.5	0.4	<0.1	<0.1	34.9	34.9
R4	34.5	0.6	<0.1	<0.1	35.1	35.1
R5	34.5	4.6	0.1	1.9	39.2	41.1
R6	34.5	18.6	0.5	0.7	53.6	54.3

Note: Project criterion – 90 µg/m^3

During Scenario 2 operations, annual average TSP concentrations are predicted to be well below the criterion of 90 µg/m^3 at all identified sensitive receptor locations.

8.3 Particles (as PM$_{10}$)

8.3.1 Annual Average PM$_{10}$ Concentrations – Scenario 1 (Construction and Operation)

Table 34 presents the annual average PM$_{10}$ concentrations predicted by the dispersion modelling at each of the nominated residences/properties using the emission rates calculated in **Section 5** for operation of Scenario 1. The calculated background PM$_{10}$ concentrations have been discussed in detail in **Section 7** Contour plots of the predicted cumulative increase in PM$_{10}$ concentrations are presented in **Appendix C**.

Table 34 Predicted Annual Average PM$_{10}$ Concentrations – Scenario 1 (Construction and Operation)

Receptor ID	Increment	Increment	Increment	Increment	Cumulative	Cumulative
	Regional Background	Power Station	Lidsdale Siding	Project	Total Background	Total Background + Project
	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)
R1	13.8	0.9	<0.1	0.3	14.7	14.9
R2	13.8	0.3	<0.1	<0.1	14.1	14.1
R3	13.8	0.2	<0.1	<0.1	13.9	13.9
R4	13.8	0.2	<0.1	0.2	14.0	14.2
R5	13.8	2.3	<0.1	0.6	16.1	16.6
R6	13.8	9.3	0.2	0.2	23.3	23.5

Note: Project criterion – 30 µg/m^3

During Scenario 1, annual average PM$_{10}$ concentrations are predicted to be below the criterion of 30 µg/m^3 at all identified sensitive receptor locations.

8.3.2 Annual Average PM_{10} Concentrations – Scenario 2 (Operation only)

Table 35 presents the annual average PM_{10} concentrations predicted by the dispersion modelling at each of the nominated residences/properties using the emission rates calculated in **Section 5** for operation of Scenario 2. The calculated background PM_{10} concentrations have been discussed in detail in **Section 7**.

Contour plots of the predicted cumulative increase in PM_{10} concentrations are presented in **Appendix C**.

Table 35 Predicted Annual Average PM_{10} Concentrations – Scenario 2 (Operation only)

Receptor ID	Increment	Increment	Increment	Increment	Cumulative	Cumulative
	Regional Background	Power Station	Lidsdale Siding	Project	Total Background	Total Background + Project
	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)
R1	13.8	0.9	<0.1	0.2	14.7	14.9
R2	13.8	0.3	<0.1	<0.1	14.1	14.1
R3	13.8	0.2	<0.1	<0.1	13.9	13.9
R4	13.8	0.2	<0.1	<0.1	14.0	14.0
R5	13.8	2.3	<0.1	0.6	16.1	16.6
R6	13.8	9.3	0.2	0.2	23.3	23.5

During Scenario 2 operations, annual average PM_{10} concentrations are predicted to be below the criterion of 30 µg/m^3 at all identified sensitive receptor locations.

8.3.3 Maximum 24-Hour Average PM_{10} Concentrations – Scenario 1 (Construction and Operation)

Table 36 presents the maximum 24-hour average PM_{10} concentrations predicted by the dispersion modelling at each of the nominated residences/properties using the emission rates calculated in **Section 5** for Scenario 1 operations. The calculated background PM_{10} concentrations have been discussed in detail in **Section 7**.

The maximum increment from the project (8.7 µg/m^3) is predicted to occur at receptor 'R5'. As stated in **Section 7**, cumulative total background in **Table 36** represents the maximum of the sum of contemporaneous increments of regional background and power station operations.

The predicted maximum cumulative impact in **Table 36** represents the maximum of the sum of contemporaneous increments of regional background, LSCLF, power stations and the Project Site. The maximum 24-hour average PM_{10} concentrations are predicted to exceed the criterion of 50 µg/m^3 at two identified sensitive receptor locations.

Further investigation reveals that the cumulative maximum 24-hour average concentrations are dominated by the background concentrations. The maximum cumulative concentrations on the day of maximum increments from the Project Site in **Table 36** show that the background concentrations contribute up to 99% (at receptor 'R3') of the total cumulative concentrations.

The total cumulative concentrations in **Table 36** are illustrated in **Figure 15** for Receptor 'R5'. It is noted that the cumulative concentrations at Receptor 'R6' are dominated by the background concentrations of 24-hour average PM_{10} and there are a total of twenty exceedances of the 24-hour average criterion.

Figure 15 Cumulative 24-hour Average PM_{10} Concentrations at Receptor 'R6' – Scenario 1 (Construction and Operation)

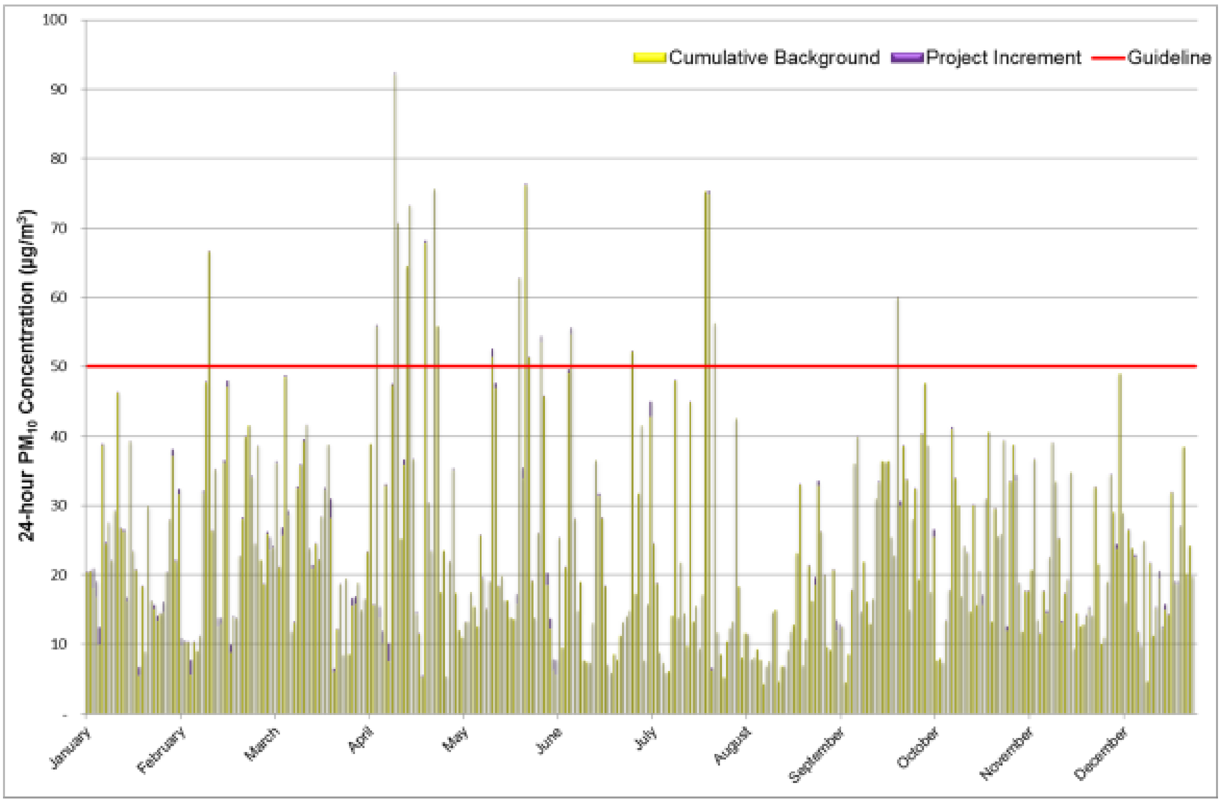


Table 36 Predicted 24-Hour Maximum PM_{10} Concentrations – Scenario 1 (Construction and Operation)

Receptor ID	**Increment**	**Increment**	**Increment**	**Increment**	**Cumulative**	**Cumulative**	**Cumulative**	**Cumulative**
	Regional Background *Maximum predicted incremental result from background only*	**Power Stations** *Maximum predicted incremental result from power stations only*	**Lidsdale Siding** *Maximum predicted incremental result from power stations only*	**Project** *Maximum predicted incremental result from project only*	**Total Background** *Maximum predicted concurrent and cumulative result from background and power stations*	**Total Background + Project** *Maximum predicted concurrent and cumulative result from background, power stations and project*	**Total Background on day of Maximum Increment from Project** *Maximum predicted concurrent and cumulative result from background and power stations on the day of the maximum predicted incremental result from the project*	**Maximum Cumulative Concentration on Day of Maximum Increment from Project** *Maximum predicted concurrent and cumulative result from background, power stations and the project on the day of the maximum predicted incremental result from the project*
	(µg/m³)	**(µg/m³)**	**(µg/m³)**	**(µg/m³)**	**(µg/m³)**	**(µg/m³)**	**(µg/m³)**	**(µg/m³)**
R1	41.9	11.2	0.2	6.3	45.4	46.2	30.4	36.6
R2	41.9	6.0	0.1	0.7	42.0	42.0	33.1	33.8
R3	41.9	2.9	<0.1	0.2	41.9	41.9	24.9	25.1
R4	41.9	3.1	<0.1	3.1	42.6	42.7	13.3	16.4
R5	41.9	24.2	0.5	8.7	54.6	54.6	16.4	25.1
R6	41.9	66.9	3.3	2.7	92.2	92.5	28.2	31.0

Note: The cumulative results columns may not be equal to the sum of the incremental results columns. This is because the incremental results are the maximum 24-hour average predicted over the entire year modelled as a result of the emissions from each source, while the cumulative results are the maximum 24-hour average predicted as a result of the combined emissions from each source. If the maximum incremental 24-hour impacts from each source occur on different days at a given receptor (i.e. under different meteorological conditions), then the maximum cumulative prediction may be lower than the sum of the maximum predicted incremental impacts. For further information, refer to **Table 30**.

8.3.4 Maximum 24-Hour Average PM_{10} Concentrations – Scenario 2 (Operation Only)

Table 37 presents the maximum 24-hour average PM_{10} concentrations predicted by the dispersion modelling at each of the nominated residences/properties using the emission rates calculated in **Section 5** for Scenario 2 operations. The calculated background PM_{10} concentrations have been discussed in detail in **Section 7**.

The maximum increment from the project (8.7 µg/m^3) is predicted to occur at receptor 'R5'. As stated in **Section 7**, cumulative total background in **Table 37** represents the maximum of the sum of contemporaneous increments of regional background and power station operations.

The predicted maximum cumulative impact in **Table 37** represents the maximum of the sum of contemporaneous increments of regional background, LSCLF, power stations and the Project Site. The maximum 24-hour average PM_{10} concentrations are predicted to exceed the criterion of 50 µg/m^3 at two identified sensitive receptor locations.

Further investigation reveals that the cumulative maximum 24-hour average concentrations are dominated by the background concentrations. The maximum cumulative concentrations on the day of maximum increments from the Project Site in **Table 37** show that the background concentrations contribute up to 99% (at receptor 'R3') of the total cumulative concentrations.

The total cumulative concentrations in **Table 37** are illustrated in **Figure 16** for Receptor 'R6'. It is noted that the cumulative concentrations at Receptor 'R6' are dominated by the background concentrations of 24-hour average PM_{10} and there are a total of twenty exceedances of the 24-hour average criterion.

Figure 16 Cumulative 24-hour Average PM_{10} Concentrations at Receptor 'R6' – Scenario 2 (Operation Only)

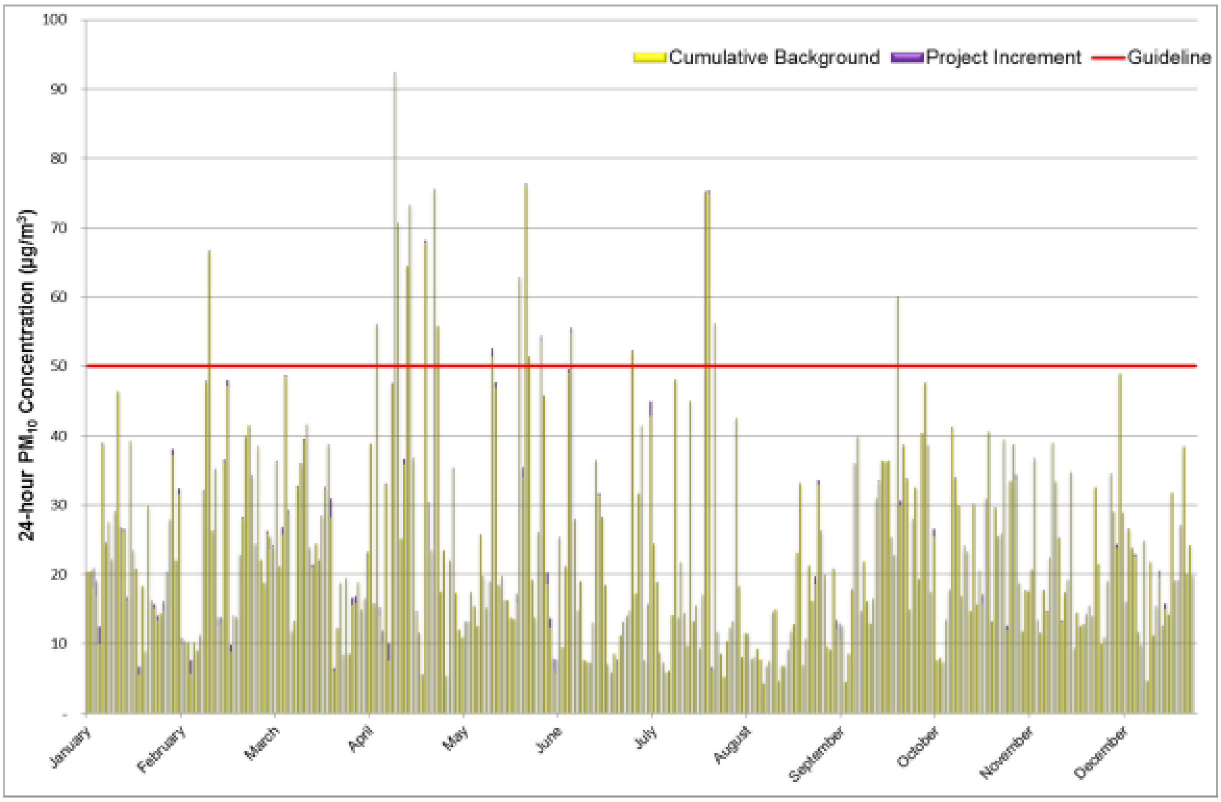


Table 37 Predicted 24-Hour Maximum PM_{10} Concentrations – Scenario 2 (Operation Only)

Receptor ID	**Increment**	**Increment**	**Increment**	**Increment**	**Cumulative**	**Cumulative**	**Cumulative**	**Cumulative**
	Regional Background *Maximum predicted incremental result from background only*	**Power Stations** *Maximum predicted incremental result from power stations only*	**Lidsdale Siding** *Maximum predicted incremental result from power stations only*	**Project** *Maximum predicted incremental result from project only*	**Total Background** *Maximum predicted concurrent and cumulative result from background and power stations*	**Total Background + Project** *Maximum predicted concurrent and cumulative result from background, power stations and project*	**Total Background on day of Maximum Increment from Project** *Maximum predicted concurrent and cumulative result from background and power stations on the day of the maximum predicted incremental result from the project*	**Maximum Cumulative Concentration on Day of Maximum Increment from Project** *Maximum predicted concurrent and cumulative result from background, power stations and the project on the day of the maximum predicted incremental result from the project*
	(µg/m³)	**(µg/m³)**	**(µg/m³)**	**(µg/m³)**	**(µg/m³)**	**(µg/m³)**	**(µg/m³)**	**(µg/m³)**
R1	41.9	11.2	0.2	6.3	45.4	46.2	30.4	36.6
R2	41.9	6.0	0.1	0.7	42.0	42.0	33.1	33.8
R3	41.9	2.9	<0.1	0.2	41.9	41.9	24.9	25.1
R4	41.9	3.1	<0.1	0.2	42.6	42.7	8.0	8.2
R5	41.9	24.2	0.5	8.7	54.6	54.6	16.4	25.1
R6	41.9	66.9	3.3	2.7	92.2	92.5	28.2	31.0

Note: The cumulative results columns may not be equal to the sum of the incremental results columns. This is because the incremental results are the maximum 24-hour average predicted over the entire year modelled as a result of the emissions from each source, while the cumulative results are the maximum 24-hour average predicted as a result of the combined emissions from each source. If the maximum incremental 24-hour impacts from each source occur on different days at a given receptor (i.e. under different meteorological conditions), then the maximum cumulative prediction may be lower than the sum of the maximum predicted incremental impacts. For further information, refer to **Table 30**.

8.4 Particles (as $PM_{2.5}$)

8.4.1 Annual Average $PM_{2.5}$ Concentrations – Scenario 1 (Construction and Operation)

Table 38 presents the annual average $PM_{2.5}$ concentrations predicted by dispersion modelling at each of the nominated residences/properties using the emission rates calculated in **Section 5** for operation of Scenario 1. The calculated background $PM_{2.5}$ concentrations have been discussed in detail in **Section 7**.

Contour plots of the predicted cumulative increase in PM_{10} concentrations are presented in **Appendix C**.

Table 38 Predicted Annual Average $PM_{2.5}$ Concentrations – Scenario 1 (Construction and Operation)

Receptor ID	Increment	Increment	Increment	Increment	Cumulative	Cumulative
	Regional Background	Power Station	Lidsdale Siding	Project	Total Background	Total Background + Project
	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)
R1	ND	0.2	<0.1	<0.1	0.2	0.2
R2	ND	0.1	<0.1	<0.1	0.1	0.1
R3	ND	<0.1	<0.1	<0.1	<0.1	<0.1
R4	ND	<0.1	<0.1	<0.1	<0.1	0.1
R5	ND	0.4	<0.1	0.1	0.4	0.5
R6	ND	1.8	<0.1	<0.1	1.8	1.9

Note: Project criterion – 8 µg/m^3
ND – No Data

During Scenario 1 operations, annual average $PM_{2.5}$ concentrations are predicted to be below the criterion of 8 µg/m^3 at all identified sensitive receptor locations.

8.4.2 Annual Average $PM_{2.5}$ Concentrations – Scenario 2 (Operation Only)

Table 39 presents the annual average $PM_{2.5}$ concentrations predicted by dispersion modelling at each of the nominated residences/properties using the emission rates calculated in **Section 5** for operation of Scenario 2. The calculated background $PM_{2.5}$ concentrations have been discussed in detail in **Section 7**.

Contour plots of the predicted cumulative increase in PM_{10} concentrations are presented in **Appendix C**.

Table 39 Predicted Annual Average PM_{10} Concentrations – Scenario 2 (Operation Only)

Receptor ID	Increment	Increment	Increment	Increment	Cumulative	Cumulative
	Regional Background	Power Station	Lidsdale Siding	Project	Total Background	Total Background + Project
	(µg/m³)	(µg/m³)	(µg/m³)	(µg/m³)	(µg/m³)	(µg/m³)
R1	ND	0.2	<0.1	<0.1	0.2	0.2
R2	ND	0.1	<0.1	<0.1	0.1	0.1
R3	ND	<0.1	<0.1	<0.1	<0.1	<0.1
R4	ND	<0.1	<0.1	<0.1	<0.1	<0.1
R5	ND	0.4	<0.1	0.1	0.4	0.5
R6	ND	1.8	<0.1	<0.1	1.8	1.9

Note: Project criterion – 8 µg/m³

ND – No Data

During Scenario 2 operations, annual average $PM_{2.5}$ concentrations are predicted to be below the criterion of 8 µg/m³ at all identified sensitive receptor locations.

8.4.3 Maximum 24-Hour Average $PM_{2.5}$ Concentrations – Scenario 1 (Construction and Operation)

Table 40 presents the maximum 24-hour average $PM_{2.5}$ concentrations predicted by the dispersion modelling at each of the nominated residences/properties using the emission rates calculated in **Section 5** for Scenario 1 operations. The calculated background $PM_{2.5}$ concentrations have been discussed in detail in **Section 7**.

During Scenario 1 operations, 24-hour average $PM_{2.5}$ concentrations are predicted to be well below the criterion of 25 µg/m³ at all identified sensitive receptor locations.

Table 40 Predicted 24-Hour Maximum $PM_{2.5}$ Concentrations – Scenario 1 (Construction and Operation)

Receptor ID	Increment	Increment	Increment	Increment	Cumulative	Cumulative	Cumulative	Cumulative
	Regional Background *Maximum predicted incremental result from background only*	**Power Stations** *Maximum predicted incremental result from power stations only*	**Lidsdale Siding** *Maximum predicted incremental result from power stations only*	**Project** *Maximum predicted incremental result from project only*	**Total Background** *Maximum predicted concurrent and cumulative result from background and power stations*	**Total Background + Project** *Maximum predicted concurrent and cumulative result from background, power stations and project*	**Total Background on day of Maximum Increment from Project** *Maximum predicted concurrent and cumulative result from background and power stations on the day of the maximum predicted incremental result from the project*	**Maximum Cumulative Concentration on Day of Maximum Increment from Project** *Maximum predicted concurrent and cumulative result from background, power stations and the project on the day of the maximum predicted incremental result from the project*
	(μg/m^3)	**(μg/m^3)**	**(μg/m^3)**	**(μg/m^3)**	**(μg/m^3)**	**(μg/m^3)**	**(μg/m^3)**	**(μg/m^3)**
R1	ND	2.0	<0.1	1.0	2.0	3.0	2.0	0.5
R2	ND	1.1	<0.1	0.1	1.1	1.1	1.0	1.9
R3	ND	0.6	<0.1	<0.1	0.6	0.6	0.1	0.4
R4	ND	0.7	<0.1	0.7	0.7	0.7	<0.1	<0.1
R5	ND	4.9	0.1	1.5	4.9	4.9	1.3	0.7
R6	ND	11.7	0.5	0.5	11.7	11.7	<0.1	<0.1

Note: The cumulative results columns may not be equal to the sum of the incremental results columns. This is because the incremental results are the maximum 24-hour average predicted over the entire year modelled as a result of the emissions from each source, while the cumulative results are the maximum 24-hour average predicted as a result of the combined emissions from each source. If the maximum incremental 24-hour impacts from each source occur on different days at a given receptor (i.e. under different meteorological conditions), then the maximum cumulative prediction may be lower than the sum of the maximum predicted incremental impacts. For further information, refer to **Table 30**.

8.4.4 Maximum 24-Hour Average $PM_{2.5}$ Concentrations – Scenario 2 (Operation Only)

Table 41 presents the maximum 24-hour average $PM_{2.5}$ concentrations predicted by the dispersion modelling at each of the nominated residences/properties using the emission rates calculated in **Section 5** for Scenario 2 operations. The calculated background $PM_{2.5}$ concentrations have been discussed in detail in **Section 7**.

During Scenario 2 operations, 24-hour average $PM_{2.5}$ concentrations are predicted to be well below the criterion of 25 µg/m^3 at all identified sensitive receptor locations.

Table 41 Predicted 24-Hour Maximum $PM_{2.5}$ Concentrations – Scenario 2 (Operation Only)

Receptor ID	**Increment**	**Increment**	**Increment**	**Increment**	**Cumulative**	**Cumulative**	**Cumulative**	**Cumulative**
	Regional Background *Maximum predicted incremental result from background only*	**Power Stations** *Maximum predicted incremental result from power stations only*	**Lidsdale Siding** *Maximum predicted incremental result from power stations only*	**Project** *Maximum predicted incremental result from project only*	**Total Background** *Maximum predicted concurrent and cumulative result from background and power stations*	**Total Background + Project** *Maximum predicted concurrent and cumulative result from background, power stations and project*	**Total Background on day of Maximum Increment from Project** *Maximum predicted concurrent and cumulative result from background and power stations on the day of the maximum predicted incremental result from the project*	**Maximum Cumulative Concentration on Day of Maximum Increment from Project** *Maximum predicted concurrent and cumulative result from background, power stations and the project on the day of the maximum predicted incremental result from the project*
	(µg/m^3)	**(µg/m^3)**	**(µg/m^3)**	**(µg/m^3)**	**(µg/m^3)**	**(µg/m^3)**	**(µg/m^3)**	**(µg/m^3)**
R1	ND	2.0	<0.1	0.9	2.0	2.9	2.0	0.5
R2	ND	1.1	<0.1	0.1	1.1	1.1	1.0	1.9
R3	ND	0.6	<0.1	<0.1	0.6	0.6	0.4	0.7
R4	ND	0.7	<0.1	<0.1	0.7	0.7	0.2	<0.1
R5	ND	4.9	0.1	1.4	4.9	4.9	1.3	<0.1
R6	ND	11.7	0.5	0.4	11.7	11.7	<0.1	<0.1

Note: The cumulative results columns may not be equal to the sum of the incremental results columns. This is because the incremental results are the maximum 24-hour average predicted over the entire year modelled as a result of the emissions from each source, while the cumulative results are the maximum 24-hour average predicted as a result of the combined emissions from each source. If the maximum incremental 24-hour impacts from each source occur on different days at a given receptor (i.e. under different meteorological conditions), then the maximum cumulative prediction may be lower than the sum of the maximum predicted incremental impacts. For further information, refer to **Table 30**.

8.5 Summary of Air Quality Impacts

The dispersion modelling was conducted to assess the air quality impacts of TSP, PM_{10}, $PM_{2.5}$ and deposited dust. It is concluded that the construction operations and the Project operations are unlikely to contribute to any exceedances of the relevant criteria for the pollutants assessed.

Also it is noted that the predicted pollutant concentrations from the two scenarios (Construction + Operation and Operation Only), are very similar. This is justified as the separation distance between locations of Bore 8 and Springvale Pit Top operations is considered too far to have a cumulative impact on the sensitive receptors.

8.5.1 Dust Deposition

The modelling results indicate that incremental and cumulative annual average dust deposition rates at all the identified sensitive receptors are predicted to be well below the criterion of 2 g/m^2/month (incremental increase in dust deposition) and below 4 g/m^2/month (cumulative dust deposition) during Scenario 1 and Scenario 2.

8.5.2 TSP

The annual average TSP concentrations are predicted to be below the criterion of 90 µg/m^3 at all identified sensitive receptor locations during Scenario 1 and Scenario 2.

8.5.3 PM_{10}

The maximum 24-hour average PM_{10} concentrations are predicted to exceed the criterion of 50 µg/m^3 at two identified sensitive receptor locations during Scenario 1 and at two identified sensitive receptor locations during Scenario 2.

On further investigation it was found that the predicted exceedances are caused due to the high background 24-hour average PM_{10} concentrations during both the scenarios.

The annual average PM_{10} concentrations are predicted to be below the criterion of 30 µg/m^3 at all identified sensitive receptor locations during Scenario 1 and Scenario 2.

8.5.4 $PM_{2.5}$

The maximum 24-hour average $PM_{2.5}$ concentrations are predicted to be well below the criterion of 25 µg/m^3 at all identified sensitive receptor locations during Scenario 1 and Scenario 2.

The annual average $PM_{2.5}$ concentrations are predicted to be well below the criterion of 8 µg/m^3 at all identified sensitive receptor locations during Scenario 1 and Scenario 2.

9 BEST PRACTICE DUST MITIGATION MEASURES

In August 2011 the NSW OEH implemented a Pollution Reduction Program that required Centennial to provide a report which examines in detail the potential measures that could be employed to further reduce particulate emissions from the individual site operations. This is part of a larger program which aims to reduce particulate emissions from the coal mining industry as a whole in NSW.

SLR Consulting has been commissioned to complete the Best Practice Assessment (BPA) of site specific particulate control for operations at the Project Site. However, at the time of completion of this report, the BPA has not been completed.

10 GREENHOUSE GAS ASSESSMENT

No Director-General's Requirements have been issued for the Project. However, the following have been performed in relation to greenhouse gas (GHG) emissions:

- A quantitative assessment of potential Scope 1, 2 and 3 GHG emissions;
- A qualitative assessment of the potential impacts of these emissions on the environment; and,
- An assessment of reasonable and feasible measures to minimise GHG emissions and ensure energy efficiency.

This GHG assessment has been performed with reference to the Australian Department of Climate Change and Energy Efficiency (DCCEE) document "*National Greenhouse Accounts Factors*" (July, 2011), the NSW Department of Energy, Utilities and Sustainability (DEUS) document "*Guidelines for Energy Savings Action Plans*" (2005), the National Greenhouse and Energy Reporting Act 2007, the Centennial Coal Greenhouse Gas Assessment Guidance Notes (Centennial Coal, 2010) and Climate Change Response Policy (Centennial Coal, 2012b).

This assessment considers the impact of the proposed Project and compares this predicted impact to that currently experienced at the Project site.

Activity data for the following have been obtained from the Proponent for the period 1 July 2010 to 31 June 2011:

- Total Run of Mine (ROM) Coal Production (tonnes[t]);
- Total Electricity Consumption (kilowatt-hours [kWh]);
- Total Diesel Consumption (litres[L]);
- Solid Waste to Landfill (t);
- Fugitive Emissions of Coal Seam Methane (CH_4) and CO_2 via ventilation shafts (m^3 and percentage content of CO_2 and CH_4 in ventilation return air);
- Emissions from the use of Liquid Petroleum Gas (LPG); and
- Emissions from the use of oils and greases (consumed without combustion).

Data have been sourced from Springvale provided spreadsheet 'SPJ Greenhouse Report 1011' (covering the period 1 July 2010 to 31 June 2011).

Data was made available for the period July 2010 to June 2011, being the most recent complete financial year of data which has been independently audited and verified to meet the requirements of the National Greenhouse and Energy Reporting System (NGERS) legislation. Data presented in this report for Scope 1 and 2 emissions is directly extracted from Springvale NGERS reports for the July 2010 to June 2011 period and utilises NGERS emission factors, and other acceptable NGERS emission calculation methodologies. Scope 3 emissions have been calculated using data provided by Springvale.

Although this report is concerned with the installation and operation of Dewatering Bore 8, data for all greenhouse gas generating processes are presented. A Development Application has recently been approved in relation to the construction of an upgraded ventilation shaft (No. 3 Ventilation Shaft) and a GHG assessment was performed for this proposed upgrade. Baseline GHG emissions are therefore considered to be current site operations plus emissions associated with the approved No. 3 Ventilation Shaft.

A GHG assessment is presented for the following:

1. Baseline GHG emissions (Current site operations plus No. 3 Ventilation Shaft – hereafter “Current Operations”).
2. Baseline GHG emissions plus No. 3 Ventilation Shaft Upgrade plus dewatering Bore 8 (hereafter “Proposed Operations”).

Relevant information relating to the approved upgrade to the No. 3 Ventilation Shaft is presented in **Table 42**.

Table 42 Activity Data relating to Approved Upgrade to No. 3 Ventilation Shaft

Upgrade	Activity Data	Data Source
No. 3 Ventilation Shaft	Electricity Consumption to increase by 15,592,800 kWh Diesel Consumption to increase by 22,114 L	Centennial Springvale – *“Springvale Coal Pty Ltd, Springvale Vent Shaft, Air Quality and GHG Assessment”*, November 2011

Relevant information relating to the proposed Dewatering Bore 8 Project is presented in **Table 43**.

Table 43 Activity Data relating to Proposed Dewatering Bore 8 Project

Upgrade	Activity Data	Data Source
Bore 8	Electricity Consumption to increase by 11,216,822 kWh Diesel Consumption to increase by 17 kL	Centennial Springvale, pers. Comm June 2012

Information for the No. 3 Ventilation Shaft upgrade is taken directly from the DA documentation (Springvale Coal Pty Ltd, Springvale Vent Shaft, Air Quality and GHG Assessment, November 2011).

Information relating to the anticipated electricity use as a result of the installation of Bore 8 has been provided by Springvale. Electricity use at the existing Bore 6 is available within the provided NGERS data for the Springvale Colliery, although approximately 25% of the electricity usage reported for this bore is associated with a dewatering bore at Angus Place Colliery. Therefore, 75% of the reported value is taken to be associated with Bore 6. Furthermore, Bore 8 is likely to deal with approximately 5% more mine inflow than Bore 6, and therefore the electricity consumption is assumed to be 5% higher. A figure of 11,216,822 kWh has been taken to be representative of the annual electricity consumption of Bore 8. Springvale has also advised that that a backup diesel generator will be associated with Bore 8, a similar generator used 17 kL of diesel at the Bore 6 site in the year 2010 – 2011.

Contractor diesel consumption, fugitive emissions through the ventilation shaft, LPG use and oil and grease consumption is not anticipated to change following either the approved ventilation shaft upgrade or proposed Bore 8 operation.

Table 44 Summary of Project Related Activity Data Relevant to GHG Emissions (Current and Proposed Operations)

Activity	Current Project Operations	Proposed Project Operations
Annual ROM production (Mt)	3.4 Mtpa	3.4 Mtpa
Annual Electricity Consumption (kWh)	80,442,771	91,659,593
Annual Diesel Consumption (litres) – Springvale Coal	678,583	695,583
Annual Diesel Consumption (litres) - Contractor	914,503	914,503
Annual Fugitive Emissions from Mine Ventilation Shaft (Million m^3)	57,259	57,259
Solid Waste to Landfill (t)	0	0
Liquid Petroleum Gas (LPG) (kg)	47,510	47,510
Petroleum Based Oil/ greases used (L)	203,686	203,686

Note: Values for Contractor Diesel Use, LPG Use and Oils/Grease Use are different to those quoted in "Springvale Vent Shaft, Air Quality and GHG Assessment, November 2011". NGER data was updated since this time following audit.

10.1 Direct and Indirect Emissions (Emissions Scope)

National Greenhouse and Energy Reporting Regulation 2008 defines Scope 1 and Scope 2 emissions as follows:

Division 2.5 Meaning of emissions, production and consumption: section 10

2.23 Meaning of *emissions*, *production* and *consumption*

(2) ***Emissions*** of greenhouse gas, in relation to a facility, means the release of greenhouse gas into the atmosphere as a direct result of one of the following:

(a) an activity, or series of activities (including ancillary activities) that constitute the facility (***scope 1 emissions***);

(b) 1 or more activities that generate electricity, heating, cooling or steam that is consumed by the facility but that do not form part of the facility (***scope 2 emissions***).

Meaning of production

(3) ***Production*** of energy, in relation to a facility, means 1 of the following:

(a) the extraction or capture of energy from natural sources for final consumption by or from the operation of the facility or for use other than in the operation of the facility;

(b) the manufacture of energy by the conversion of energy from 1 form to another form for final consumption by or from the operation of the facility or for use other than in the operation of the facility.

> ***Meaning of consumption***
>
> (4) ***Consumption*** of energy, in relation to a facility, means the use or disposal of energy from the operation of the facility including own-use and losses in extraction, production and transmission.

The NGERS legislation does not include Scope 3 emissions.

The Australian Government Department of Climate Change and Energy Efficiency (DCCEE) National Greenhouse Accounts Factors Workbook (DCCEE, 2011) has been used to define the methodology for estimating Scope 3 emissions in this assessment. The definition of Scope 3 emissions is defined as follows:

- Various emission factors can be used to calculate scope 3 emissions. For ease of use, this workbook reports specific 'Scope 3' emission factors for organisations that:
  - *(a) burn fossil fuels: to estimate their indirect emissions attributable to the extraction, production and transport of those fuels; or*
  - *(b) consume purchased electricity: to estimate their indirect emissions from the extraction, production and transport of fuel burned at generation and the indirect emissions attributable to the electricity lost in delivery in the T&D network.*

It is noted that Springvale Coal has a restricted capacity to reduce their GHG emissions under Scope 3 at the Springvale Colliery. Reductions in emissions of GHG resulting from the extraction and transport of fossil fuels for use in electricity production or on-site and off-site diesel combustion are beyond the control of Springvale Coal but are reported here for completeness.

10.2 Greenhouse Gas Calculation Methodology

Quantification of potential Project emissions has been undertaken in relation to both carbon dioxide (CO_2) and other non-CO_2 greenhouse gas emissions.

For comparative purposes, non-CO_2 greenhouse gases are awarded a "CO_2-equivalence" (CO_2-e) based on their contribution to the enhancement of the greenhouse effect. The CO_2-e of a gas is calculated using an index called the Global Warming Potential (GWP). The GWPs for a variety of non-CO_2 greenhouse gases are contained within the Intergovernmental Panel on Climate Change (IPCC), (1996) document "*Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*".

The GWPs of relevance to this assessment are:

- methane (CH_4): GWP of 21 (21 times more effective as a greenhouse gas than CO_2); and,
- nitrous oxide (N_2O): GWP of 310 (310 times more effective as a greenhouse gas than CO_2).

The short-lived gases such as carbon monoxide (CO), nitrogen dioxide (NO_2), and non-methane volatile organic compounds (NMVOCs) vary spatially and it is consequently difficult to quantify their global radiative forcing impacts. For this reason, GWP values are generally not attributed to these gases nor have they been considered further as part of this assessment.

The greenhouse gas emissions associated with the modified Project have been assessed in terms of direct (Scope 1) emission potential, indirect (Scope 2) emission potential and significant upstream/downstream (Scope 3) emission potential.

A summary of the potential Project GHG emission sources is provided in **Table 45**.

Table 45 Summary of Potential Project Greenhouse Gas Emissions

Project Component	Direct Emissions	Indirect Emissions	
	Scope 1	Scope 2	Scope 3
Fugitive Emissions	Emissions from the release of coal seam methane and carbon dioxide as a result of extraction activities.	N/A	N/A
Diesel	Emissions from the combustion of diesel at the Project in both mobile and fixed plant and equipment (Includes ROM coal transport by coal haulage contractor)	N/A	Estimated emissions attributable to the extraction, production and transport of diesel consumed at the Project Site.
Liquid petroleum gas	Emissions from the combustion of LPG at the Project in mobile equipment	N/A	N/A
Use of Oils and Greases	Consumption (non-combustion) of oils and greases	N/A	N/A
Electricity	N/A	Emissions associated with the consumption of generated and purchased electricity at the Colliery.	Estimated emissions from the extraction, production and transport of fuel burned for the generation of electricity consumed at the Colliery and the electricity lost in delivery in the transmission and distribution network.
Coal Combustion	N/A	N/A	Emissions from the combustion of coal from the Project.

N/A = Not applicable

10.2.1 Scope 1 (Direct) Emissions

Fugitive emissions - Coal Seam Methane and Carbon Dioxide

The process of coal formation creates significant amounts of CH_4. Some of this CH_4 remains trapped in the coal until the pressure on the coal is reduced, which occurs during the coal mining process. The stored CH_4 is then released to the atmosphere.

Fugitive emissions from extraction of coal as defined by NGERS were estimated for the 2010-11 financial year using Method 4, subdivision 3.2.2.2 of the NGERS Measurement Determination 2008.

Emissions of coal seam CH_4 and CO_2 are not expected to change due to the Project upgrade.

Diesel Usage

The primary fuel source for the vehicles operating at Springvale is diesel. Diesel consumption for all mobile and fixed equipment is calculated as 1,557,561 litres (L) used in the underground operation in the assessment year (July 2010 to June 2011). 656,469 L is used by Springvale Coal owned vehicles and equipment and 914,503 L used by contractors.

Scope 1 emissions from use of diesel fuel as defined by NGERS were estimated for the 2010-11 financial year using Method 1, Division 2.4.2 section 2.41 of the NGERS Measurement Determination 2008.

An additional 22,114 L per annum of diesel is expected to be required due to the No.3 Ventilation Shaft Project upgrade and an additional 17,000 L per annum for the diesel backup generator as discussed in **Section 10**.

Diesel fuel will be used in the construction of the Bore 8 facility. However, it is anticipated that the usage during the construction period will be significantly less than that used in the ongoing operation and is therefore not considered further.

Liquid Petroleum Gas

LPG consumption is estimated as 39,246 kg per annum, which is not expected to change due to the modified Project operations. It has been assumed that 1 kg LPG is equal to 1.76 L and contains 25.7 GJ/kL, as per NGA Factors (2011).

Scope 1 emissions from use of LPG as defined by NGERS were estimated for the 2010-11 financial year using Method 1, Division 2.4.2 section 2.41 of the NGERS Measurement Determination 2008.

Emissions of GHG due to LPG use are not expected to change due to the Project upgrade.

10.2.2 Scope 2: Indirect Emissions through the Consumption of Purchased Electricity

Scope 2 GHG emissions as defined by NGERS were estimated for the 2010-11 financial year using Method 1, Chapter 7, section 7.2 of the NGERS Measurement Determination 2008.

State emission factors are used because electricity flows between states are significantly constrained by the capacity of the inter-state interconnectors and in some cases there are no interconnections.

Electricity consumption at the Springvale Colliery has been calculated as (approximately) 64.8 Megawatt-hours (MWh) in the current year of mining (July 2010 to June 2011) with a total of 3.7 MWh attributable to current electric ventilation fan operations and 10.6 MWh attributable to dewatering bore operation.

It is expected that this will increase due to Project upgrade (addition of dewatering Bore 8) to a total of approximately 91 MWh with the addition of dewatering bores <u>and</u> an upgraded ventilation fan.

The emission factor for Scope 2 (0.89 tonnes of CO_2-equivalents per kilowatt hour [t CO_2-e/kWh]) represents the consumption of purchased electricity in NSW.

10.2.3 Scope 3: Other Indirect Emissions

As discussed previously, Scope 3 emissions of GHG attributable to the Project are reported for completeness. Springvale Coal has a restricted capacity to reduce their GHG emissions under Scope 3. Reductions in the emissions of GHG resulting from the extraction and transport of fossil fuels for use in electricity production or onsite diesel combustion are beyond the control of Springvale Coal. Also beyond the control of Springvale Coal are the operations of coal consumers.

Combustion of Product Coal

Indirect emissions of GHG from the combustion of product coal are expected “downstream” due to the combustion of coal produced by the Project. Up to 3.4 Mtpa of ROM coal may be produced by Springvale Colliery.

This calculation assumes that 100% of ROM coal produced by the Project is combusted to produce electricity.

The GHG emissions from combustion of product coal by other (non-Springvale Colliery) entities have been based on a coal energy content of 27 GJ/t for thermal (black coal) (Table 1 of the NGA Factors).

It is noted that no Scope 3 emission factor exists for black coal used for electricity generation purposes within the most recent (July 2011) version of the NGA Factors. In this instance, the Scope 3 emission factor for “Black coal” published in Table 1 of the July 2011 version of the NGA Factors has been used within this assessment.

Extraction, Production and Transport of Fuel Burned for the Generation of Electricity and Electricity Consumed in the Transmission and Distribution System

The NGA Factors provides Scope 3 emission factors for the consumption of purchased electricity by each state. State emission factors are used because electricity flows between states are significantly constrained by the capacity of the inter-state interconnectors and in some cases there are no interconnections.

The NSW Scope 3 emission factor (0.17 kg CO_2-e/kWh) covers both the emissions from the extraction, production and transport of fuels used in the production of the purchased electricity (i.e. fugitive emissions and stationary and mobile fuel combustion emissions) and also the emissions associated with the electricity lost in transmission and distribution on route to the customer. In this report, Scope 2 and 3 emissions for the consumption of purchased electricity have been reported separately so that the share of the transport and distribution loss can be correctly attributed under Scope 3 emissions - Generation of Electricity Consumed in a transmission and distribution system.

Extraction, Production and Transport of Diesel Consumed at the Project

Scope 3 GHG emissions attributable to diesel used at the Project relate to its extraction, production and transport.

The annual emissions of CO_2 and other GHG from this source have been estimated using Table 38 of the NGA Factors, an emission rate of 5.3 kg CO_2-e/GJ and an assumed energy content of Diesel of 38.6 GJ/kL.

Sources not Included

The following Scope 3 GHG emission sources were not included within the assessment:

- Waste Disposal;
- Employee business travel; and
- Outsourced activities.

10.3 Greenhouse Gas Calculation Results

Calculated Scope 1, Scope 2 and Scope 3 emissions of greenhouse gas resulting from the emissions sources outlined above for the existing (July 2010 to June 2011) and modified Project are presented in **Table 47**. As previously discussed, GHG emissions are presented for the following scenarios:

1. Baseline GHG emissions for Current Operations (does not include Bore 8 Project); and

2. Baseline GHG emissions for Proposed Operations (includes Bore 8 Project).

A summary of the GHG emissions attributable to Current Operations and that due to Bore 8 Project is presented in **Table 46.** A summary of activity data and associated GHG emissions for Current Operations (Bore 8 Project not included) and the Proposed Operations (includes Bore 8) is presented in **Table 47**.

It can be seen from **Table 46** that the operation of Bore 8 will result in an increase of:

- 46 tonnes of CO_2-e per annum Direct (Scope 1) emissions;
- 9,983 tonnes of CO_2-e per annum Indirect (Scope 2) emissions; and,
- 1,910 tonnes of CO_2-e per annum Indirect (Scope 3) emissions.

The installation and operation of the dewatering Bore 8 is therefore anticipated to result in a total of 11,939 t CO_2-e per annum (Scope 1, 2 and 3). When compared to the current site operations, this represents an increase of 1.3%.

A comparison of the annual GHG emissions from the Project against published net total GHG emissions for NSW and Australia during 2009 has also been conducted. Net emissions of 160.6 Mt CO_2-e and 564.5 Mt CO_2-e were reported for 2009 for NSW and Australia respectively by the DCCEE (2011). Total Scope 1 GHG emissions from the Proposed Operations (Current operations plus Bore 8) would represent approximately 0.02% of total NSW 2009 emissions and approximately 0.004 % of total Australian 2009 emissions. Scope 2 and Scope 3 emissions are not compared to National and State totals as an element of double counting exists (e.g. Power Station operators report emissions associated with electricity generation).

Table 46 Summary of GHG Emissions Attributable to the Project and Current Operations

Emission Source	**Emissions (t CO_2-e / annum**						**Total (t CO_2-e)**	
	Scope 1		**Scope 2**		**Scope 3**		**Scope 1 + Scope 2 + Scope 3**	
	Project (Bore 8)	**Current Operations**	**Project (Bore 8)**	**Current Operations**	**Project (Bore 8)**	**Current Operations**	**Project (Bore 8)**	**Current Operations**
Fugitive Emissions	-	20,076	-	-	-	-	-	20,076
Diesel	46	4,274	-	-	3.5	327	49.5	4,601
LPG	-	129	-	-	-	-	-	129
Oils and Greases	-	220	-	-	-	-	-	220
Electricity	-	-	9,983	71,594	1,907	13,675	11,890	85,269
Coal Combustion	-	-	-	-	-	808,242	-	808,242
Total	**46**	**24,699**	**9,983**	**71,594**	**1,910**	**822,244**	**11,939**	**918,537**

Table 47 Summary of Activity Data and GHG Emissions Attributable to the Project (Current Operations and Proposed Upgrade)

Emissions Scope	Emissions Source	Activity Data		Activity Rate	Emission Factor	Units	Source	Total Emissions (t CO_2-e / annum)	
		Baseline	Proposed Upgrade					Baseline (Current Operations)	Proposed Operations
Scope 1	Fugitive Emissions[1]	3,440,790	3,440,790	tpa ROM	-	-	NGERS method 4	20,076	20,076
	Diesel Combustion	1,593	1,610	kL/annum	69.5	kg CO2-e /GJ	NGERS method 1 / Table 3 NGA Factors	4,273	4,319
	LPG consumption	47,510	47,510	kg/annum	59.9	kg CO2-e/GJ	NGERS method 1 / Table 3 NGA Factors	129	129
	Use of oils / grease	204	204	kL/annum	1.08	t CO2 /kL	NGERS method 1	220	220
Sub-Total Scope 1								**24,698**	**24,744**
Scope 2	Electricity Consumption	80.4	91.7	MWh/annum	0.89	kg CO2-e /kWh	NGERS method 1 / Table 5 NGA Factors	71,594	81,577
Sub-Total Scope 2								**71,594**	**81,577**
Scope 3	Diesel Combustion	1,593	1,610	kL/annum	5.32	kg CO2-e /GJ	Appendix 4 Table 39 NGA Factors	327	331
	Electricity Consumption	80.44	91.12	MWh/annum	0.17	kg CO2-e /kWh	Appendix 4 Table 39 NGA Factors	13,675	15,491
	Coal Combustion	3,440,790	3,440,790	tpa ROM	8.73	kg CO2-e /GJ	Table 1 NGA Factors (July 2011)	808,242	808,242
Sub-Total Scope 3								**822,244**	**824,154**
TOTAL								**918,537**	**930,945**

Note 1: Fugitive emissions are related to the ventilation data viz, Flow, Pressure, Temperature and gas % and it is considered that these parameters and therefore the fugitive emissions will not change materially with the proposed upgrade. Emissions are as reported for Springvale Colliery during the 10/11 year using NGERS Method 4

Note 2: For transport energy purposes

Note 3: Black Coal used in electricity generation assumed to have an energy content of 27 GJ/t as per Table 1 of the NGA Factors

11 CONCLUSIONS

SLR Consulting was commissioned by Springvale Coal Pty Ltd (Springvale Coal) to undertake an Air Quality Impact Assessment (AQIA) and Greenhouse Gas (GHG) Assessment for the proposed Springvale Bore 8 Project.

The current operations at the Springvale Colliery include receival of coal from the underground mine and transferring the processed coal to Springvale Coal Services Washery, or Mt Piper or Wallerawang Power stations via an overland conveyor system. Washed coal from Coal Services is transferred via overland conveyor system (OL2) to Lidsdale Siding for export overseas. The coal is currently being screened and crushed using the rotary breaker and the crushing plant located onsite and handled using bulldozers.

In addition, Springvale have proposed to construct the Bore 8 dewatering facility required to facilitate the progress of mine workings and needs to be established ahead of the workings to ensure manageable water levels.

Dispersion modelling was conducted for the identified sources for two scenarios representing construction works for Bore 8 and the operations at the Springvale Colliery.

In order to assess the background air quality of the region a number of industrial facilities with the potential to have a cumulative impact on the local airshed were identified. A dispersion modelling exercise was performed to determine suitable background levels of pollutants in order to assess the cumulative impacts.

It is concluded that particulate emissions from the construction of Bore 8 and Springvale Colliery operations are unlikely to contribute to any exceedances of the respective NSW OEH criteria for the pollutants assessed. In particular, the predicted air quality impacts of construction and operation of Bore 8 over and above existing approved operations at Springvale are negligible.

A Greenhouse Gas (GHG) Assessment was conducted in addition to a quantification of current emissions resulting from Project operation. The GHG emissions were calculated using the National Greenhouse Accounts (NGA) Factors (DCCEE, 2011). Scope 1 emissions associated with proposed operations at Bore 8 are anticipated to increase by approximately 46 tonnes CO_2-e per annum compared to current operations. Scope 1 GHG emissions for the proposed Project were calculated and compared against published net total GHG emissions for NSW and Australia during 2009. The total GHG emissions from the operation of Bore 8 plus current operations would represent less than 0.02% of total NSW and 0.004% of Australian 2009 emissions. Given the Bore 8 Project on its own results in an increase in 46 tonnes CO_2-e per annum then the total GHG emissions from the Project would represent less than 0.00003% of total NSW and 0.0000008% of Australian 2009 emissions.

12 REFERENCES

- AEMR 2011, Springvale Annual Environmental Management Report.
- Centennial Coal Company 2012a Greenhouse Gas Assessment, Centennial Guidance Notes, March 2012
- Centennial Coal Company 2010 Climate Change Response Policy, February 2010
- DSEWPC 2012, The National Pollutant Inventory Emission Estimation Technique Manual for Mining v3.1, published by Department of Sustainability, Environment, Water, Population and Communities, January 2012.
- DECC 2008, "National Environment Protection (Ambient Air Quality) Measure New South Wales Annual Compliance Report 2007", Department of Environment and Climate Change, 2008.
- Katestone 2010, NSW Coal Mining Benchmarking Study: International Best Practice Measures to Prevent and/or Minimise Emissions of Particulate Matter from Coal Mining, Katestone Environmental Pty Ltd, December 2010.
- NSW DECC (2008), NSW Annual Compliance Report 2008, National Environment Protection (Ambient Air Quality) Measure (NEPM).
- NSW DECC (2009), NSW Annual Compliance Report 2009, National Environment Protection (Ambient Air Quality) Measure (NEPM).
- NSW DEC, 2005, "Approved Methods for the Modelling and Assessment of Air Pollutants in NSW", NSW Department of Environment, Climate Change and Water 26 August 2005.
- Scire et al 2011, *Generic Guidance and Optimum Model Settings for the CALPUFF Modeling System for Inclusion into the 'Approved Methods for the Modeling and Assessments of Air Pollutants in NSW, Australia'*, Atmospheric Studies Group, TRC Environmental Corporation, March 2011.
- SLR 2011a, Springvale Vent Shaft – Air Quality and Greenhouse Gas Assessment, Project Number 630.10123.00300-R1
- SLR 2011b, "Air Quality Impact Assessment and Greenhouse Gas Assessment, Angus Place Colliery 75W Modification", SLR Consulting Australia Pty Ltd.
- SLR 2011c, "Air Quality Impact Assessment and Greenhouse Gas Assessment, Pine Dale Coal Mine Extension Project", SLR Consulting Australia Pty Ltd, 2011.
- SLR 2012a, *Air Quality Impact Assessment and Greenhouse Gas Assessment*, Angus Place Colliery Ventilation Facility Project, Report number 670.10168-R1, 5 July 2012.
- SLR 2012b, *Air Quality Impact Assessment and Greenhouse Gas Assessment*, Lidsdale Siding Loading Facility, Report number 630.10123-R4R2, 18 June 2012.
- SLR 2012c, Springvale Colliery Bore 8 Dewatering Facility Noise and Vibration Impact Assessment, Report number 630.10123.00320R1, 19 July 2012.
- SKM 2007, Western Rail Coal Unloader Environmental Assessment, AIR QUALITY ASSESSMENT, SKM, April 2007.
- SKM 2009, "Mt Piper Power Station Extension Environmental Assessment" September 2009.
- United States Environmental Protection Authority (2001) AP42 Compilation of Air Pollutant Emission Factors, Fifth Edition
- United States Environmental Protection Authority (2006) Compilation of Air Pollutant Emission Factors AP-42 - Chapter 13.2.5 Industrial Wind Erosion

- USEPA AP42 11.19.2 – Crushed Stone Processing and Pulverised Mineral Processing, Mineral Products Industry, Chapter 11.19.2, August 2004.

Scenario 1 – Construction Scenario

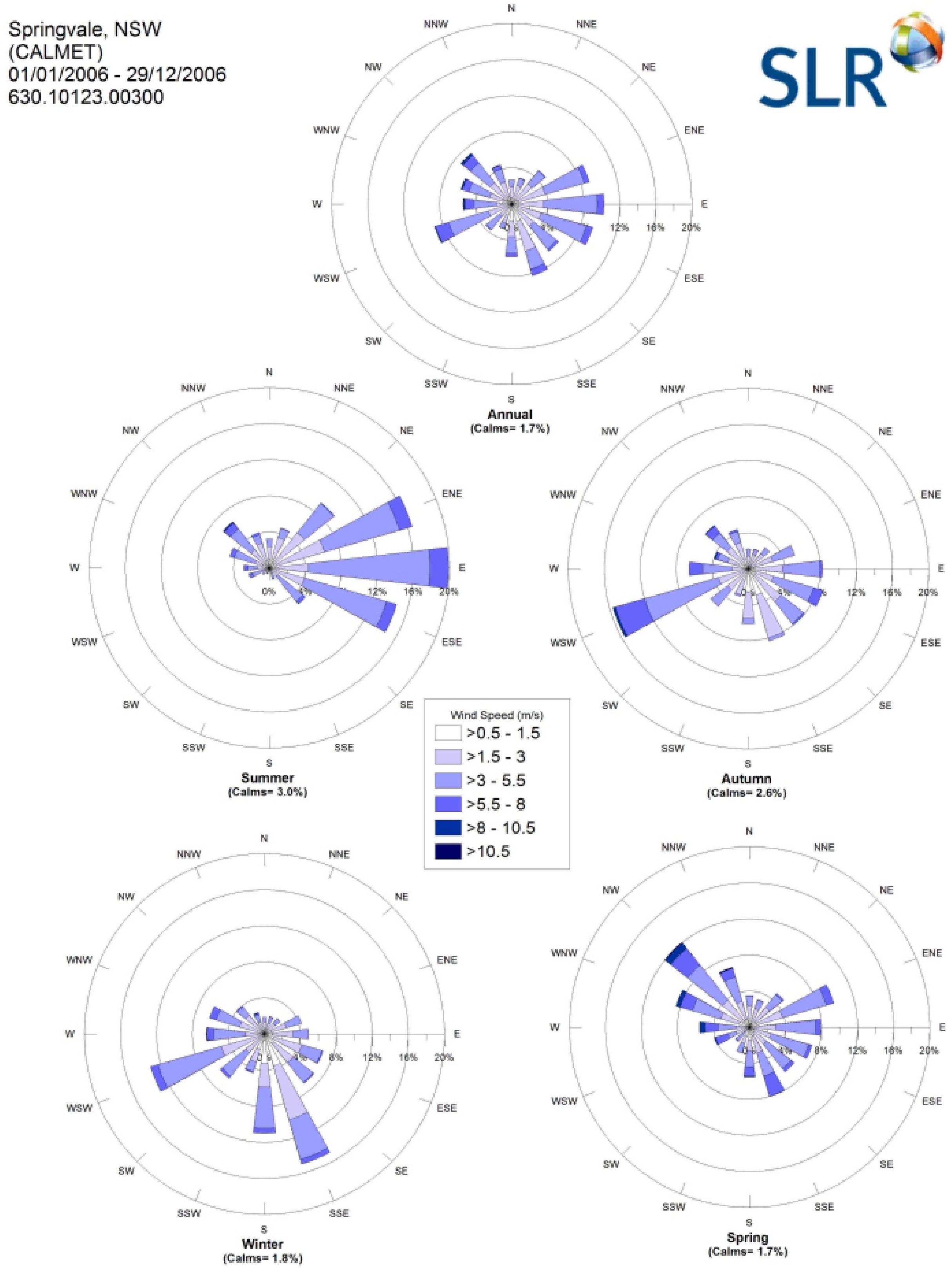
Emission Source	**Activity**	**Emission Factor**			**Units**	**Operational Hours per Day**	**Operational Days per year**	**Activity Rate**	**Units**	**Controls**	**Controlled Emission Rate (kg per year)**		
		TSP	**PM_{10}**	**$PM_{2.5}$**							**TSP**	**PM_{10}**	**$PM_{2.5}$**
Bulldozer	Bulldozer on ROM coal	12.2	3.7	0.37	kg/h/vehicle	8	365	2,920	hr/yr	No Control	35,532	10,815	1,081
Conveyor transfer points	Coal transfer	1.5×10^{-4}	6.9×10^{-5}	6.9×10^{-6}	kg/t/transfer point	24	365	3,400,000 4 transfer points	t/yr	Wind Shielding (30%)	1,398	661	66
Primary Crusher	Crush coal	0.01	0.004	0.0004	kg/t	24	365	3,400,000	t/yr	Enclosed (70%)	10,200	4,080	408
Secondary Crusher	Crush coal	0.0125	0.0043	0.000645	kg/t	24	365	3,400,000	t/yr	Enclosed (70%)	12,750	4,386	658
Unpaved haul roads	Trucks carrying coal	1.856	0.431	0.0431	kg/VKT	24	365	15,768	VKT/yr	No Control	29,272	6,791	679
ROM Stockpile	Wind Erosion	1,300	650	98	kg/ha/yr	24	365	1.08	ha	Water Sprays (50%)	1,404	702	105
Support storage area	Wind Erosion	1,300	650	98	kg/ha/yr	24	365	0.2	ha	No Control	261	130	20
Conveyor storage area	Wind Erosion	1,300	650	98	kg/ha/yr	24	365	0.2	ha	No Control	261	130	20
Mining supplies storage area	Wind Erosion	1,300	650	98	kg/ha/yr	24	365	0.2	ha	No Control	261	130	20
Bore 8 Drill pad	Wind Erosion	3,504	1,752	263	kg/ha/yr	24	365	0.99	ha	No Control	3,496	1,748	262
Ventilation Fan No3	Ventilation fan	0.001	0.0005	0.0005	mg/m^3	24	365	130	m^3/s	N/A	4.1	2.1	2.1
Bulldozer	Bulldozer on Bore 8 access road	1.603	0.252	0.025	kg/h/vehicle	10	30	300	hr/yr	No Control	481	76	8

Emission Source	**Activity**	**Emission Factor**			**Units**	**Operational Hours per Day**	**Operational Days per year**	**Activity Rate**	**Units**	**Controls**	**Controlled Emission Rate (kg per year)**		
		TSP	**PM_{10}**	**$PM_{2.5}$**							**TSP**	**PM_{10}**	**$PM_{2.5}$**
Grader	Grader on Bore 8 access road	0.05	0.03	0.003	kg/VKT	10	30	900	VKT/yr	No Control	48	28	3
Bulldozer	Bulldozer on Bore 8 drill pad	1.603	0.252	0.025	kg/h/vehicle	10	30	300	hr/yr	No Control	481	76	8
Excavator	Excavator on Bore 8 drill pad	0.03	0.01	0.001	kg/t	10	30	9,360	t/yr	No Control	234	112	11
Drill Rig Bore 8	Drilling	0.03	0.01	0.001	kg/t	24	90	9,360	t/yr	No Control	234	112	11
Unpaved haul roads	Bore 8 access road	1.856	0.431	0.0431	kg/VKT	8	120	6,720	VKT/yr	No Control	12,397	2,876	288
TOTAL											**108,714**	**32,855**	**3,650**

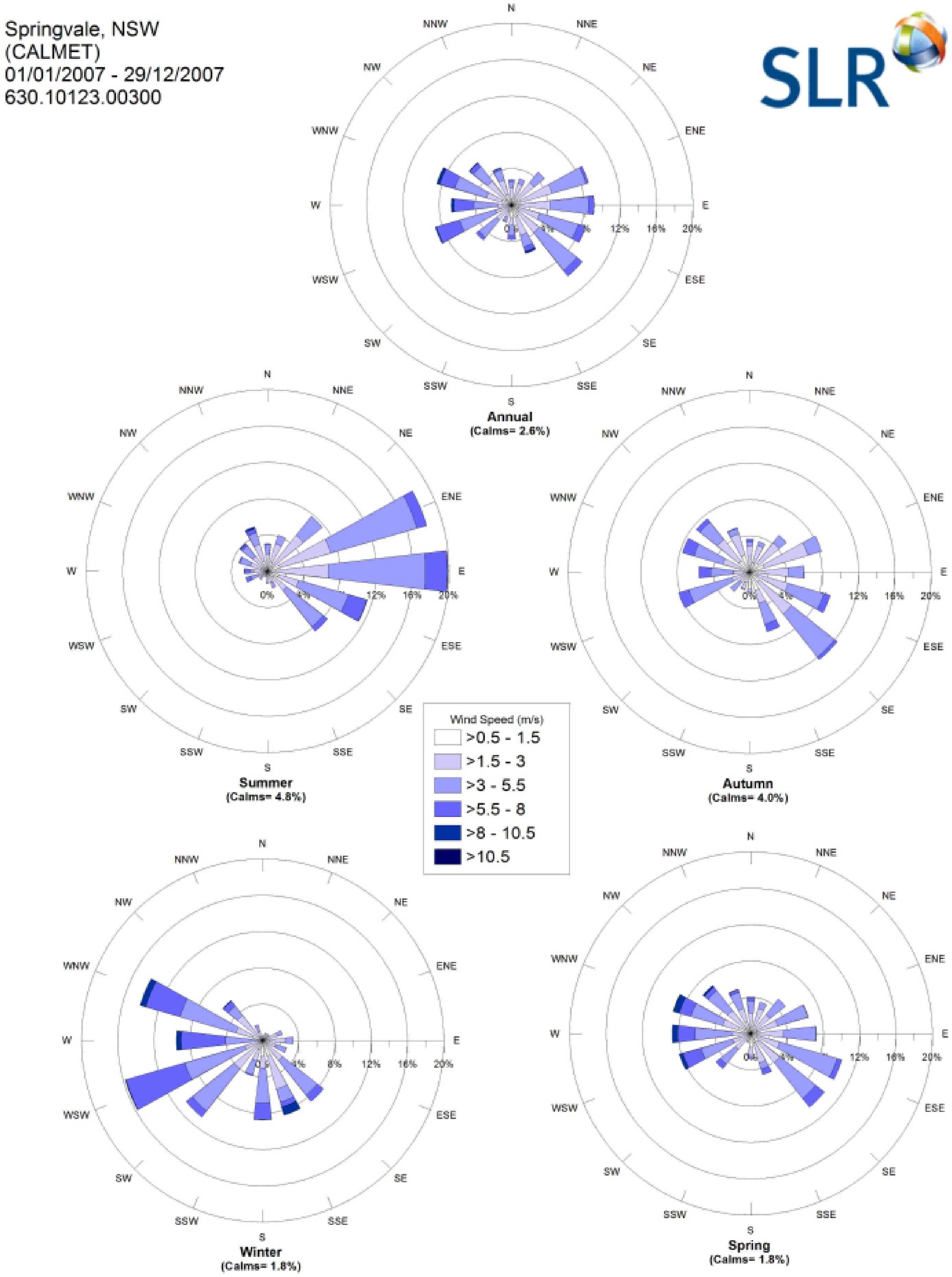
Scenario 2 – Operation Scenario

Emission Source	**Activity**	**Emission Factor**			**Units**	**Operational Hours per Day**	**Operational Days per year**	**Activity Rate**	**Units**	**Controls**	**Controlled Emission Rate (kg per year)**		
		TSP	**PM_{10}**	**$PM_{2.5}$**							**TSP**	**PM_{10}**	**$PM_{2.5}$**
Bulldozer	Bulldozer on ROM coal	12.2	3.7	0.37	kg/h/vehicle	8	365	2,920	hr/yr	No Control	35,532	10,815	1,081
Conveyor transfer points	Coal transfer	1.5×10^{-4}	6.9×10^{-5}	6.9×10^{-6}	kg/t/transfer point	24	365	3,400,000 4 transfer points	t/yr	Wind Shielding (30%)	1,398	661	66
Primary Crusher	Crush coal	0.01	0.004	0.0004	kg/t	24	365	3,400,000	t/yr	Enclosed (70%)	10,200	4,080	408
Secondary Crusher	Crush coal	0.0125	0.0043	0.000645	kg/t	24	365	3,400,000	t/yr	Enclosed (70%)	12,750	4,386	658
Unpaved haul roads	Trucks carrying coal	1.856	0.431	0.0431	kg/VKT	24	365	15,768	VKT/yr	No Control	29,272	6,791	679
ROM Stockpile	Wind Erosion	1,300	650	98	kg/ha/yr	24	365	1.08	ha	Water Sprays (50%)	1,404	702	105
Support storage area	Wind Erosion	1,300	650	98	kg/ha/yr	24	365	0.2	ha	No Control	261	130	20
Conveyor storage area	Wind Erosion	1,300	650	98	kg/ha/yr	24	365	0.2	ha	No Control	261	130	20
Mining supplies storage area	Wind Erosion	1,300	650	98	kg/ha/yr	24	365	0.2	ha	No Control	261	130	20
Ventilation Fan No3	Ventilation fan	0.001	0.0005	0.0005	mg/m^3	24	365	130	m^3/s	N/A	4.1	2.1	2.1
TOTAL											**91,343**	**27,827**	**3,059**

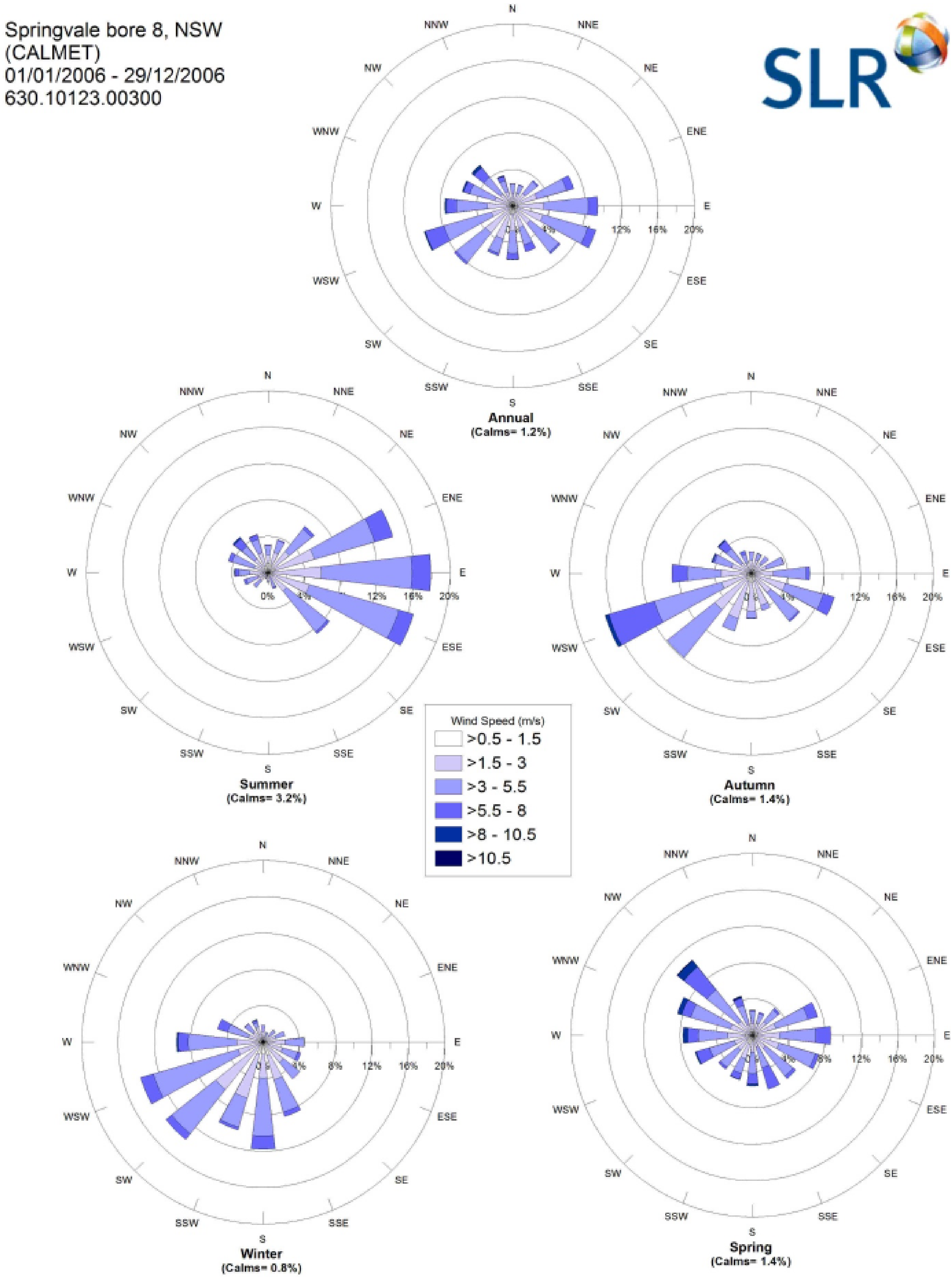
Annual Wind Roses for Springvale Colliery Site (CALMET predictions, 2006)



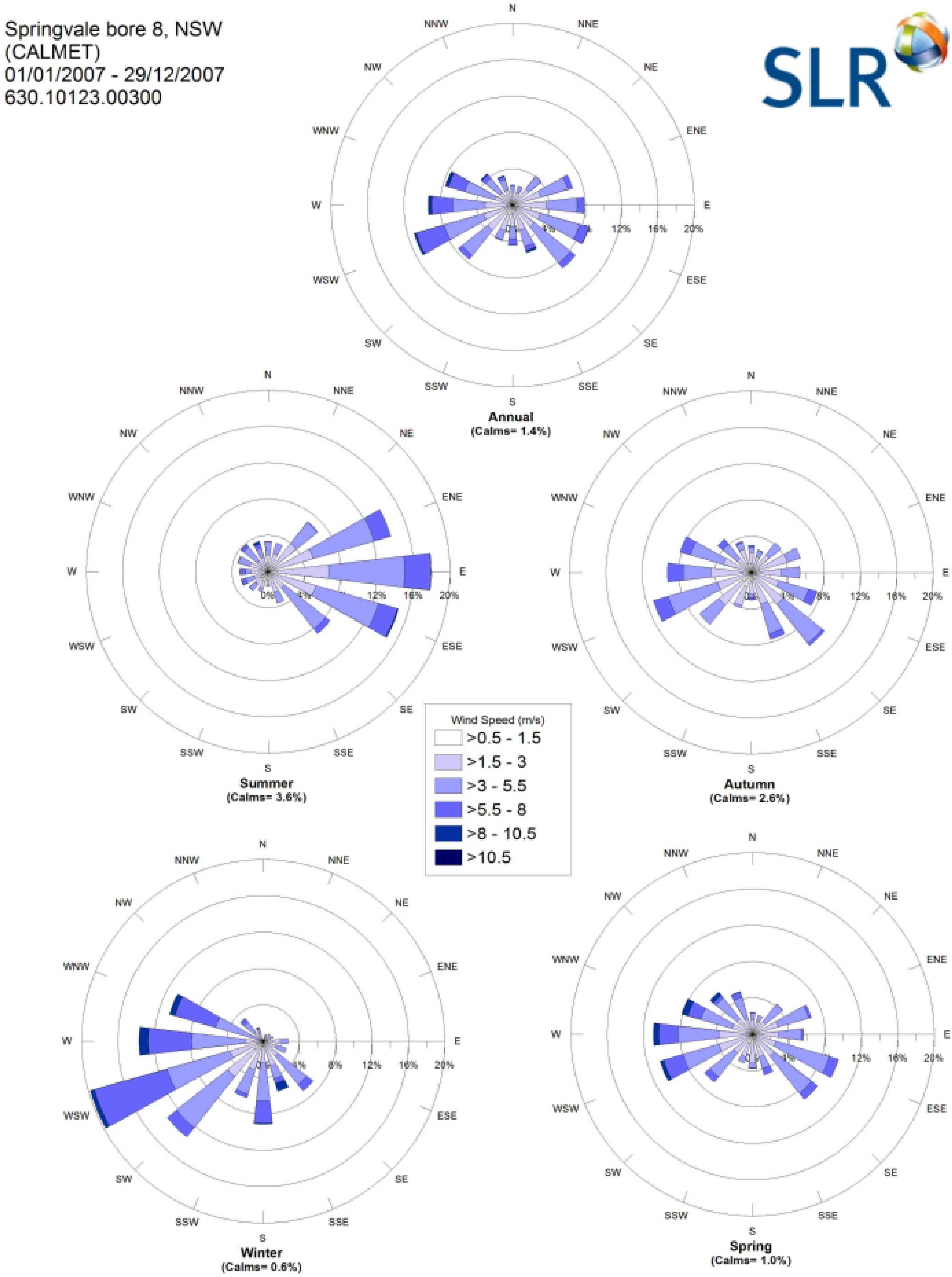
Annual Wind Roses for Springvale Colliery Site (CALMET predictions, 2007)



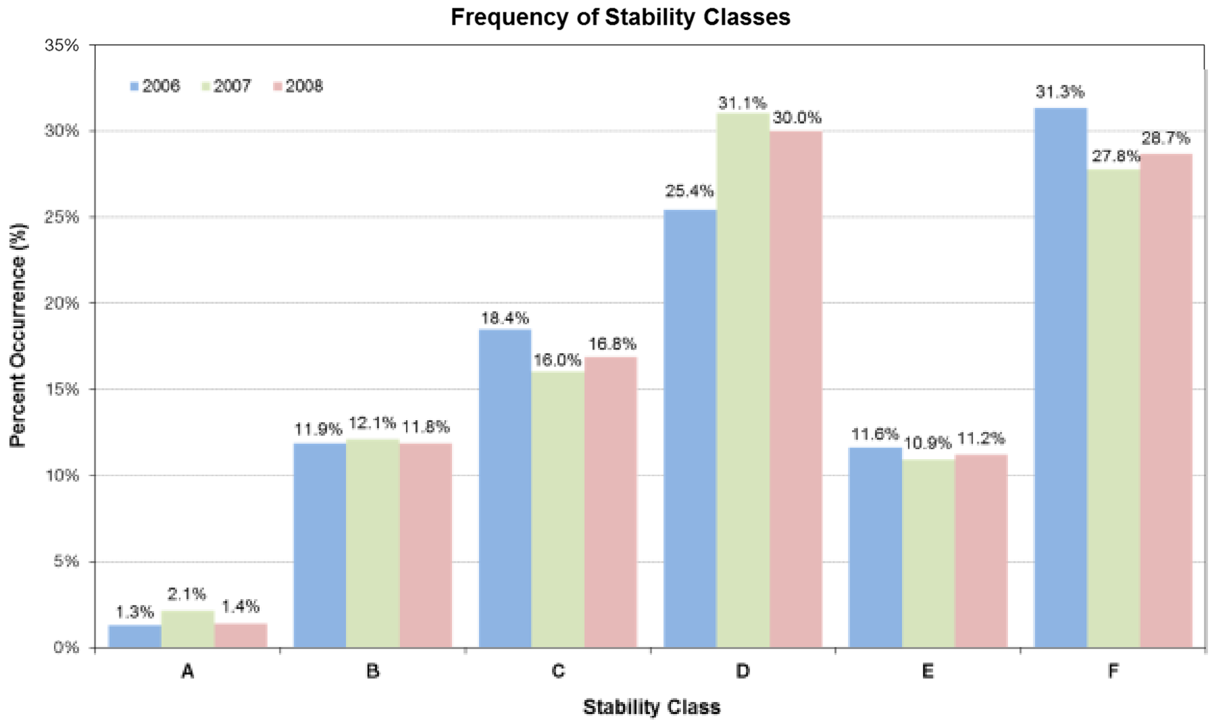
Annual Wind Roses for Springvale Bore 8 Site (CALMET predictions, 2006)



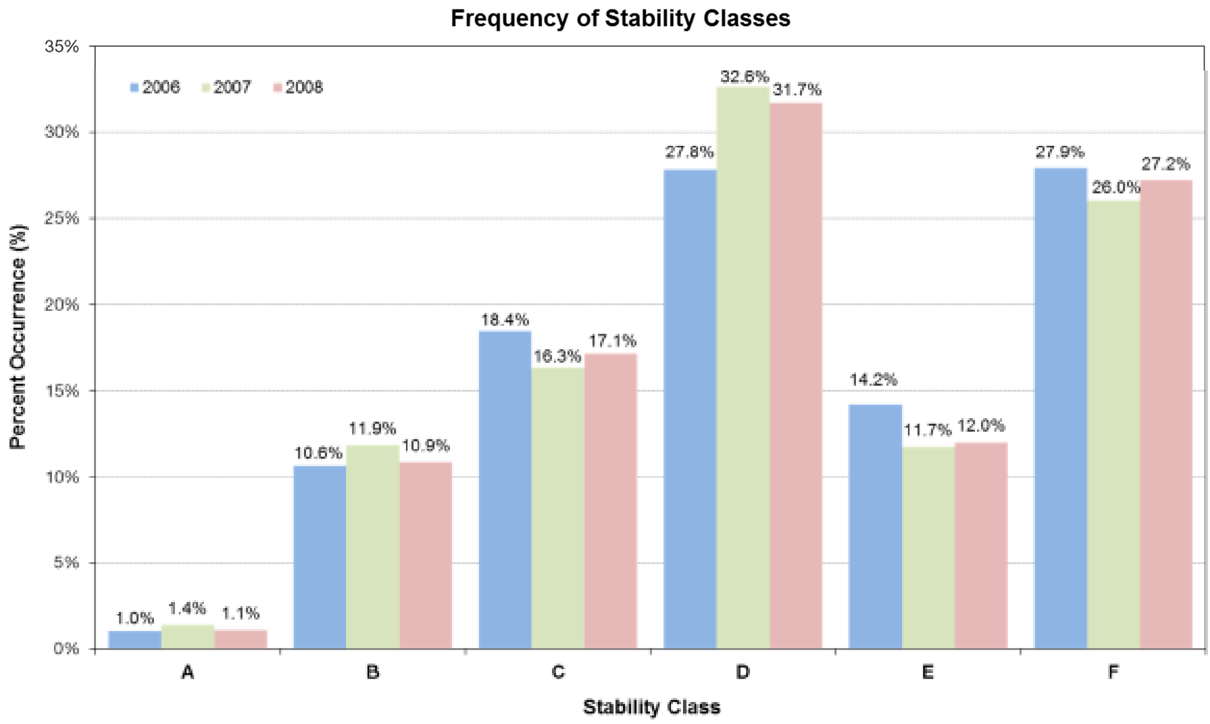
Annual Wind Roses for Springvale Bore 8 Site (CALMET predictions, 2007)



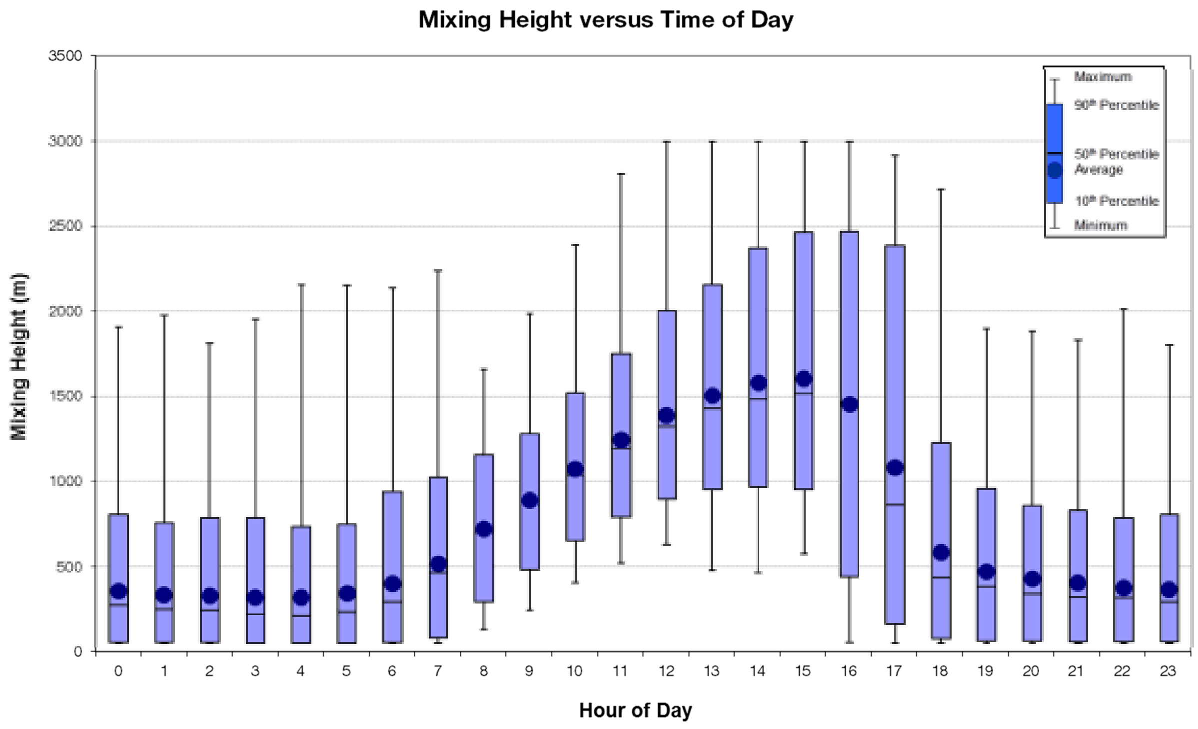
Stability Class Frequencies for Springvale Colliery Site (CALMET predictions, 2006-2008)



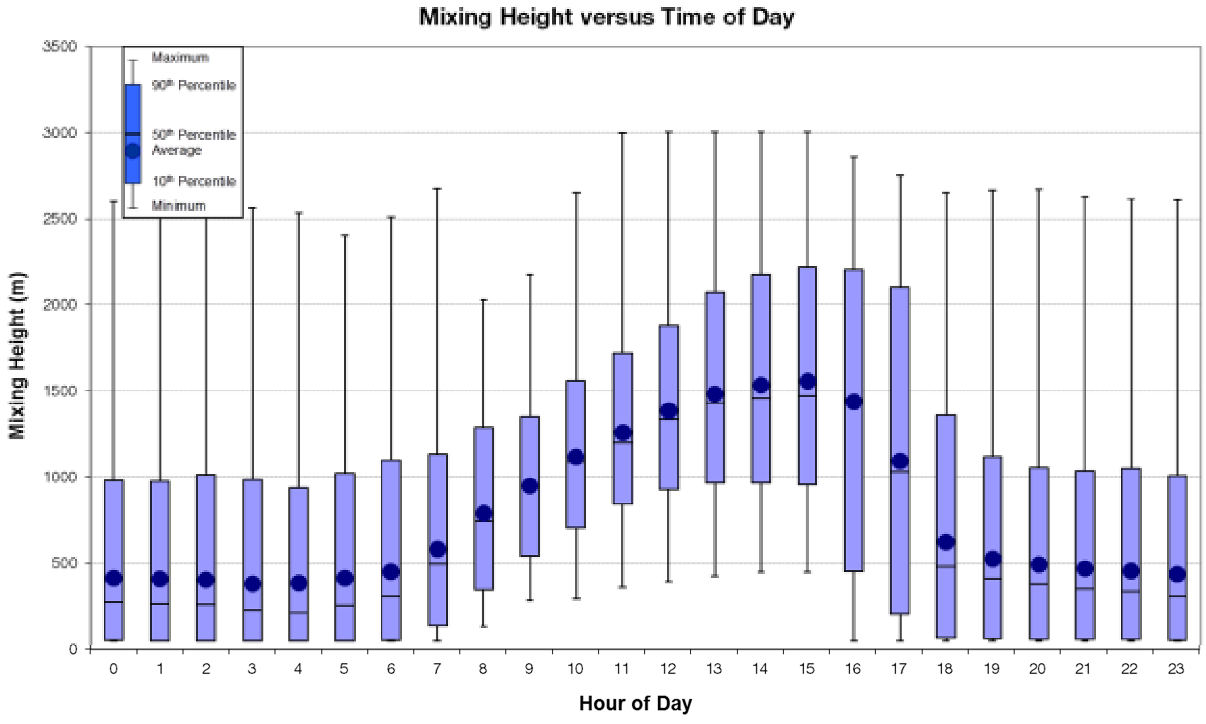
Stability Class Frequencies for Springvale Bore 8 Site (CALMET predictions, 2006-2008)



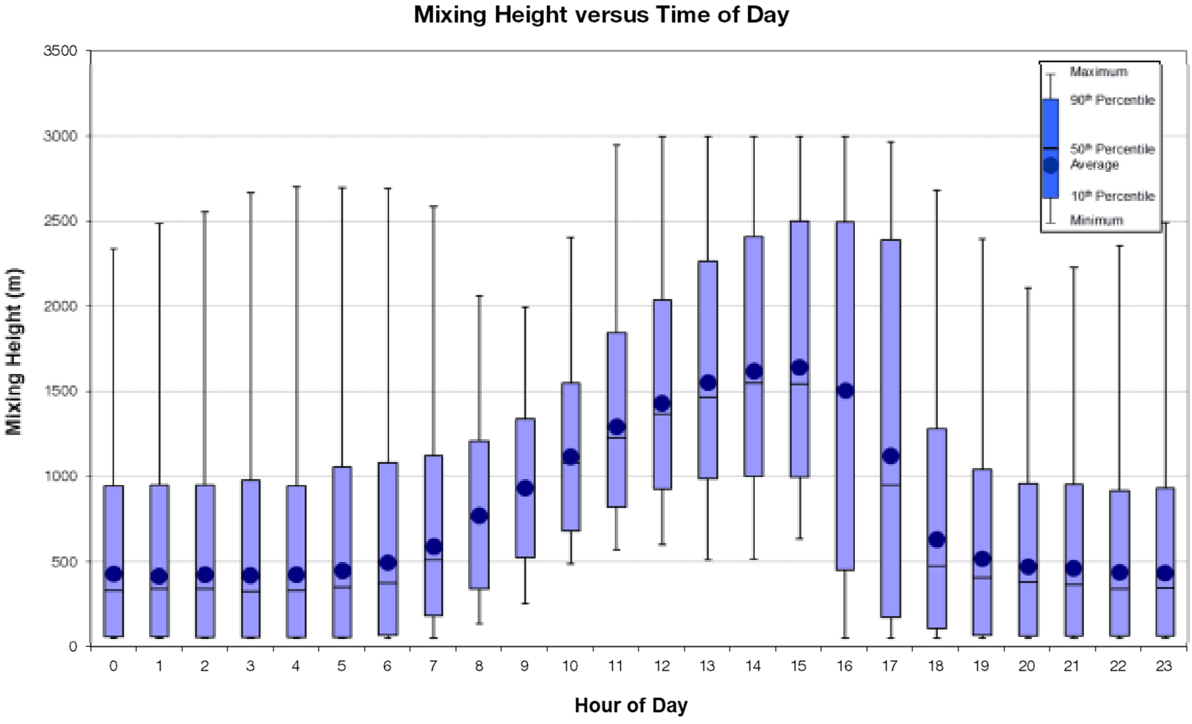
Mixing Heights at Springvale Colliery Site (CALMET predictions, 2006)



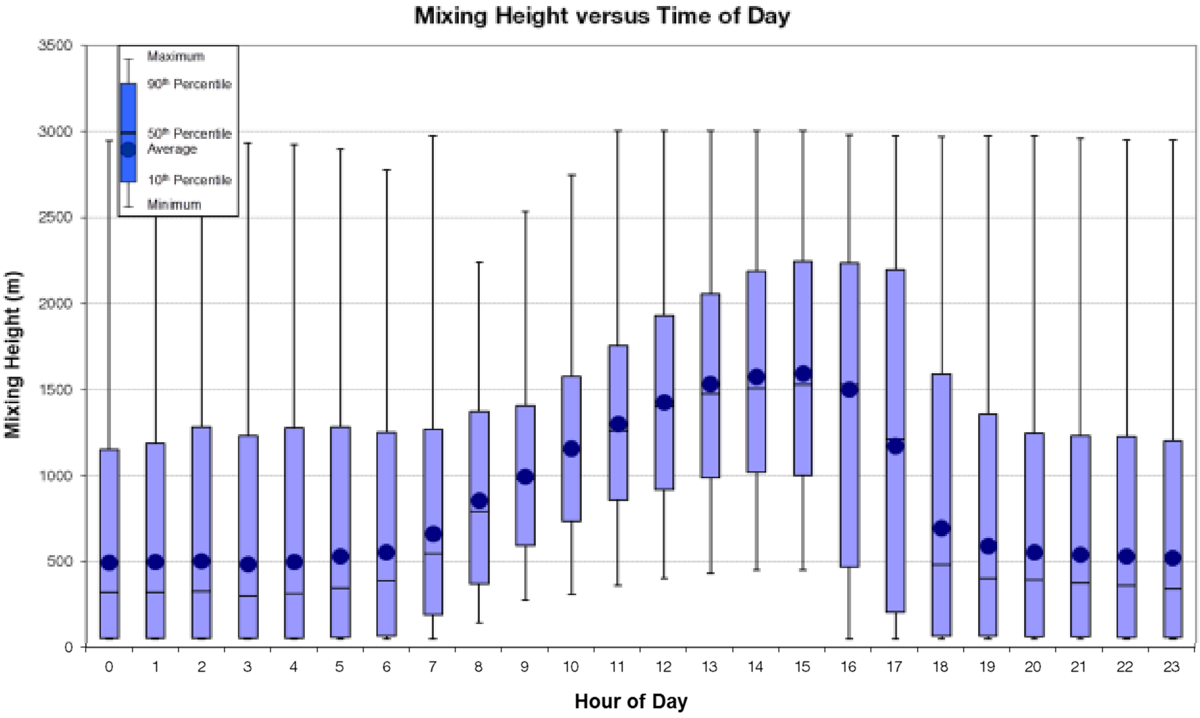
Mixing Heights at Springvale Colliery Site (CALMET predictions, 2007)



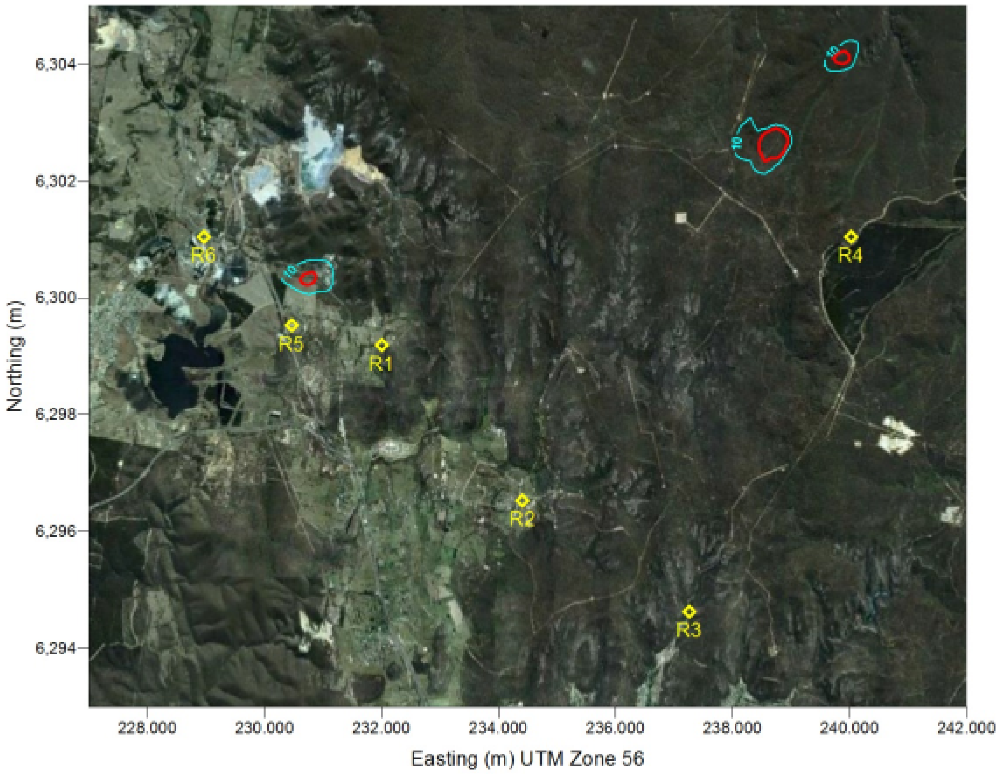
Mixing Heights at Springvale Bore 8 Site (CALMET predictions, 2006)



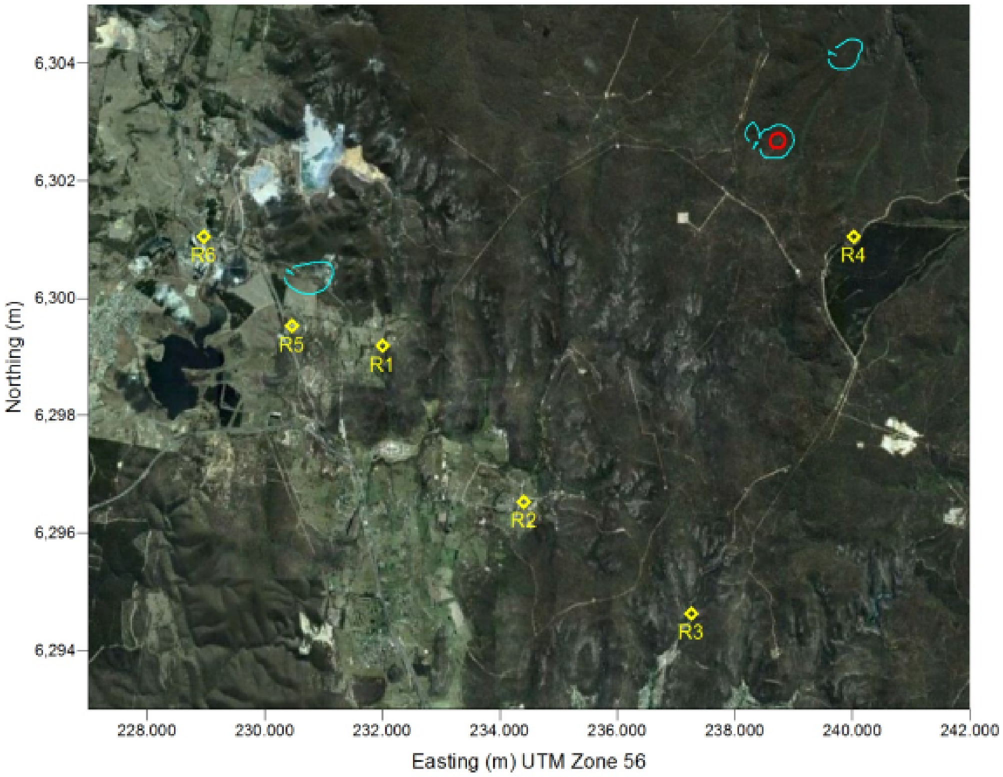
Mixing Heights at Springvale Bore 8 Site (CALMET predictions, 2007)



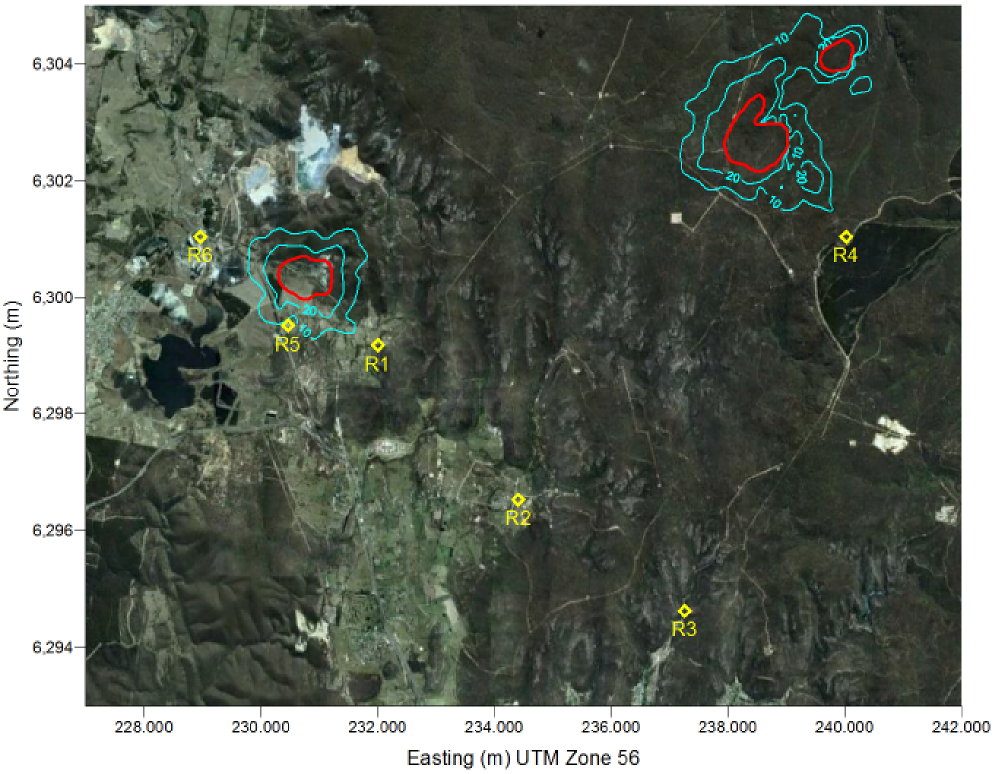
Construction Scenario – $PM_{2.5}$ 24-hour Average (µg/m^3)



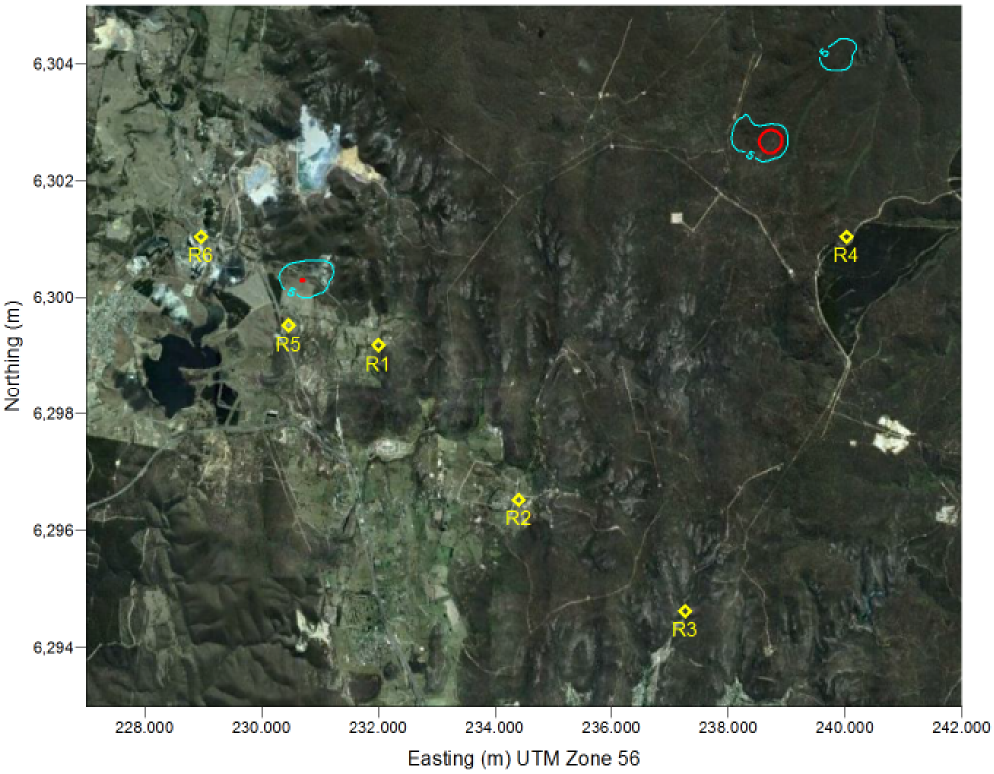
Construction Scenario – $PM_{2.5}$ Annual Average (µg/m^3)



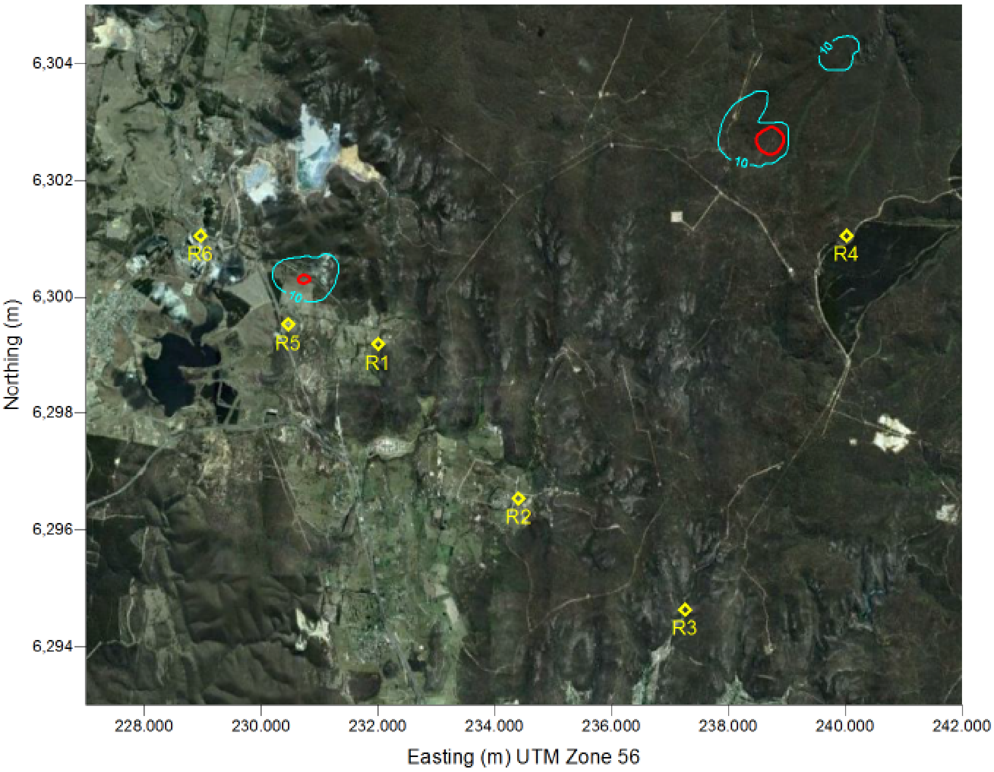
Construction Scenario – PM_{10} 24-hour Average ($\mu g/m^3$)



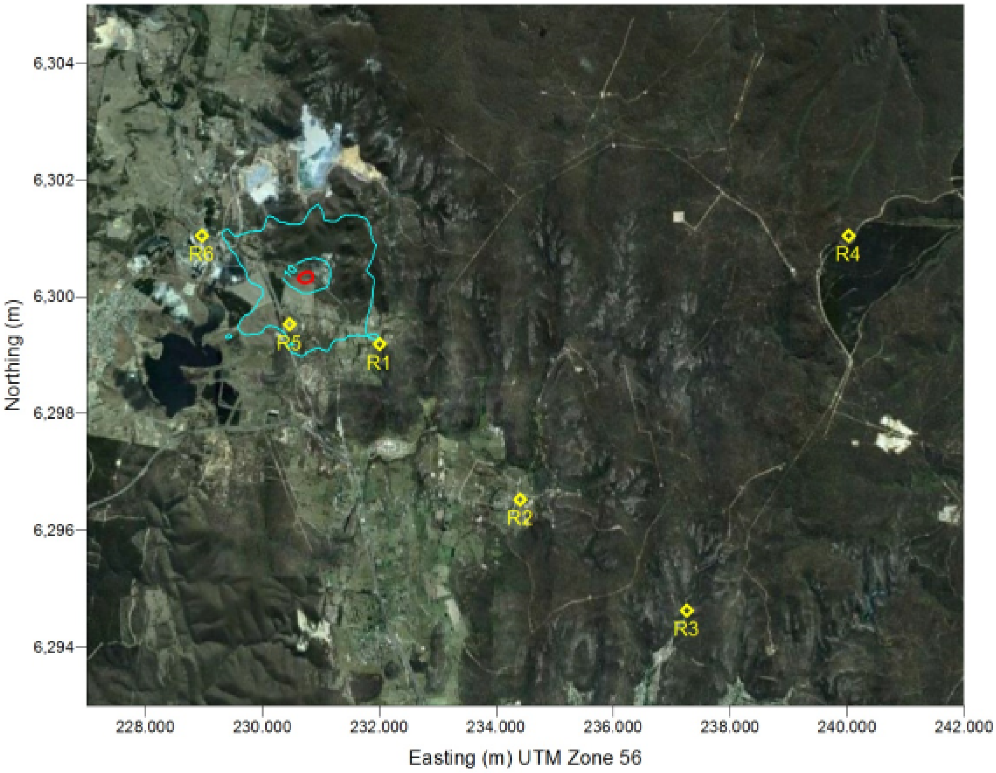
Construction Scenario – PM_{10} Annual Average ($\mu g/m^3$)



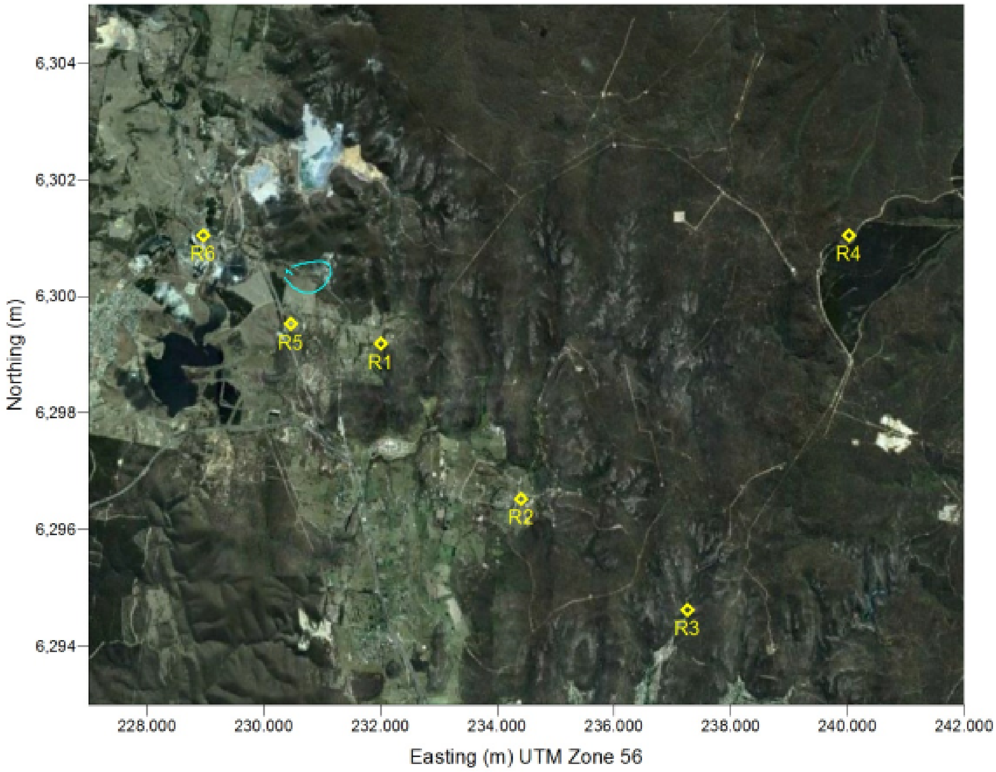
Construction Scenario – TSP Annual Average (µg/m^3)



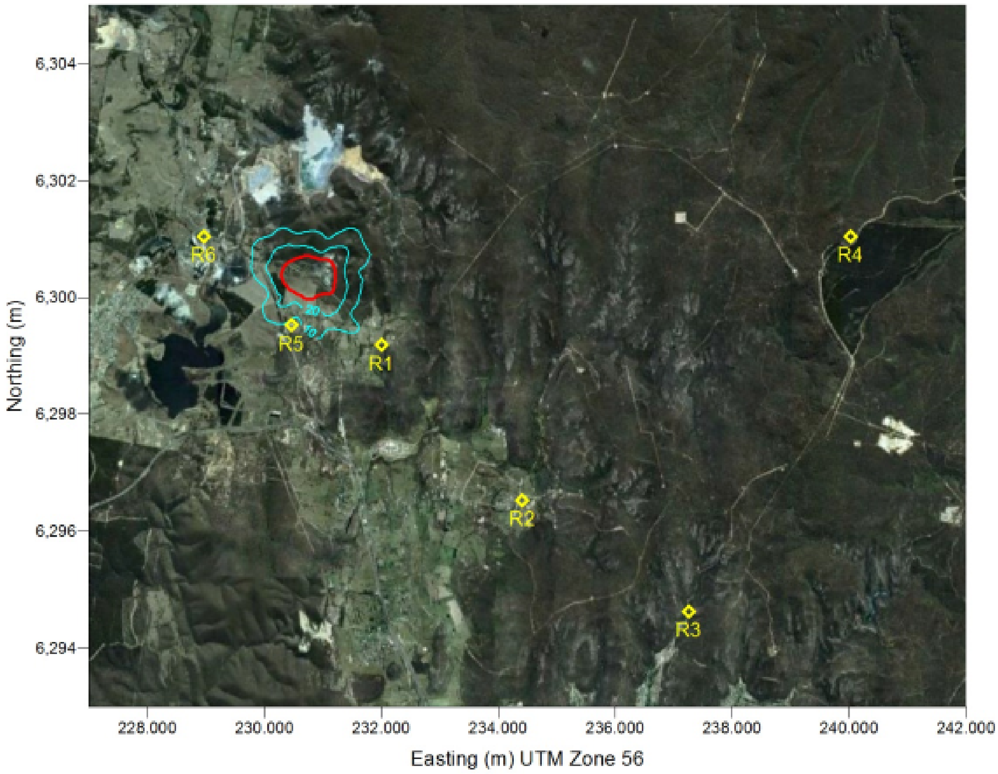
Operation Scenario – $PM_{2.5}$ 24-hour Average ($\mu g/m^3$)



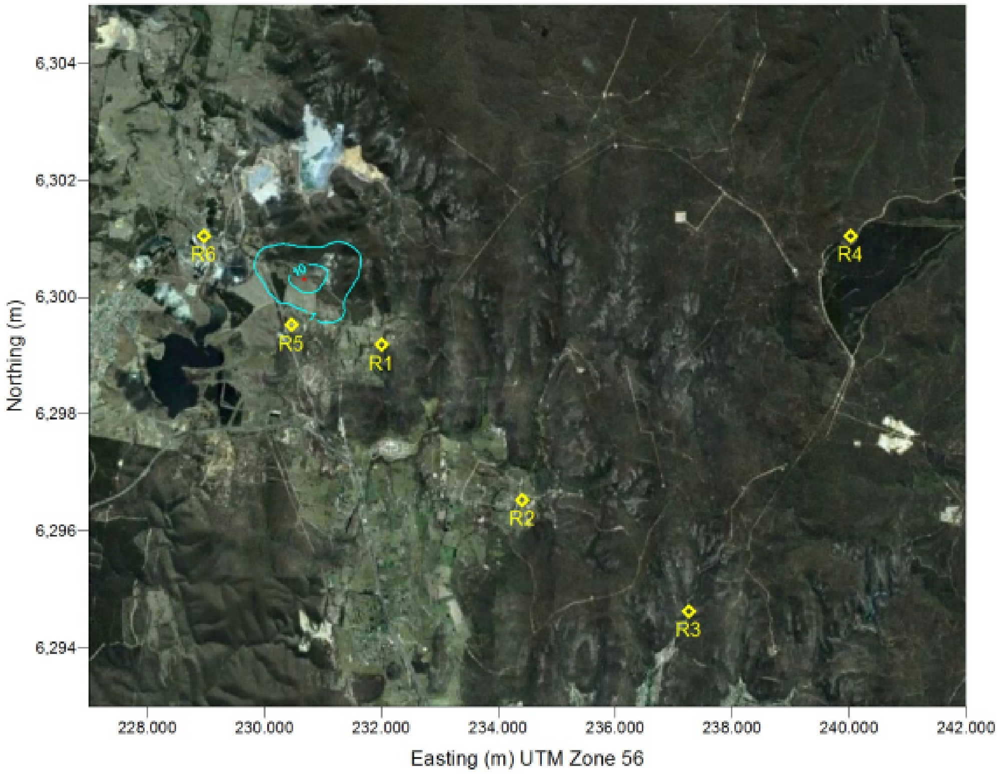
Operation Scenario – $PM_{2.5}$ Annual Average ($\mu g/m^3$)



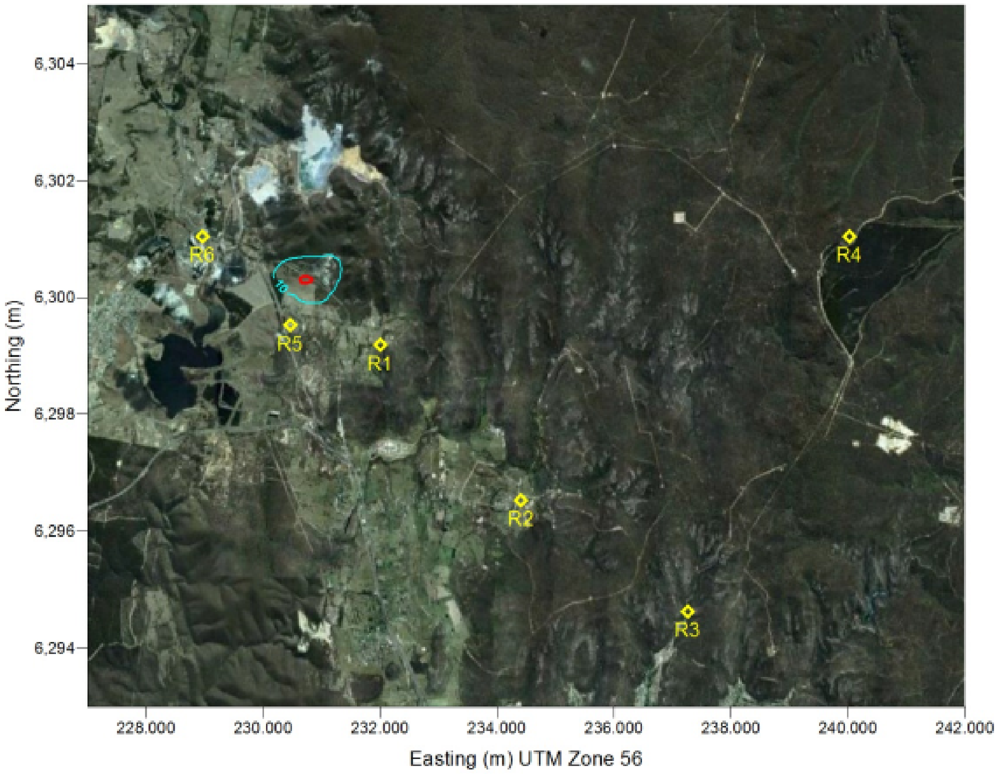
Operation Scenario – PM_{10} 24-hour Average (µg/m^3)



Operation Scenario – PM_{10} Annual Average (µg/m^3)



Operation Scenario – TSP Annual Average (µg/m^3)



Surface Water Assessment

(GSSE, 2012)

Springvale Coal Pty Limited

Surface Water Assessment

Dewatering Bore 8

Springvale Colliery

September 2012

CCC15-005

GSS ENVIRONMENTAL
Environmental, Land and Project
Management Consultants

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

1.0 INTRODUCTION

1.1 Project Overview

Springvale Colliery (Springvale) is an underground coal mine located within the NSW Western Coalfield, approximately 15 kilometres (km) north-west of Lithgow as shown on **Figure 1.** GSS Environmental (GSSE) is preparing an Environmental Assessment (EA) on behalf of Springvale to support an application to construct and operate an additional surface mine dewatering facility (Bore 8) within the Newnes State Forest on the Newnes Plateau, NSW (the Project). This Surface Water Assessment (SWA) has been prepared by GSSE to support the EA.

Mine water is currently pumped from the mine workings at Bore 6 (refer to **Figure 2**) and sent via pipelines to Wallerawang Power Station, under the Springvale - Delta Water Transfer Scheme (DWTS). As mining advances eastward through longwalls (LWs) 416 to 419, Bore 8 will be required to continue mine dewatering, and Bore 6 will become obsolete and decommissioned. Water pumped from Bore 8 will continue to be transferred via pipeline to Wallerawang Power Station under the existing DWTS arrangements.

Ecological studies conducted for the EA (RPS, 2012) have identified occurrences of Newnes Plateau Hanging Swamp (NPHS) and Newnes Plateau Shrub Swamp (NPSS) communities within the region, with the nearest occurrences approximately 200 m and 100 m from the Study Area respectively. NPHS is commensurate with 'Temperate Highland Peat Swamps on Sandstone' (THPSS), a Threatened Ecological Community (TEC) listed under the federal *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (RPS 2012) (refer to **Section 3.3**).

GSSE have prepared this SWA to provide a robust assessment of potential surface water impacts to the receiving environment, and recommend best practice management measures to minimise any potential impacts.

1.2 Director General's Requirements and Scope of Assessment

No Director-General's Requirements (DGRs) were issued by the NSW Department of Planning and Infrastructure (DP&I) for the Project, who instead advised that the EA be prepared in line with the assessment considerations outlined in an email to the DP&I from Centennial Coal. With regards to a SWA, these assessment considerations included a commitment to undertake the following:

- A SWA including a Site Water Balance which will assess discharge/transfer requirements; and
- A SWA including clean / dirty water management and erosion and sediment controls.

Upon further consideration of the Project, a review of the site water balance was deemed not necessary since there will be no changes to the relevant aspects of water management or water use at Springvale as a result of the modification. The water extracted from Bore 8, which will replace the existing Bore 6, will continue to be managed as per existing arrangements and sent to the Wallerawang Power Station via the DWTS. No changes are proposed to existing surface water management or surface infrastructure facilities at the Springvale pit top.

An assessment of potential hydrogeological impacts relating to the construction and operation of Bore 8 was conducted by Aurecon (2012), including an assessment of mine dewatering rates and potential associated impacts. The scope of this SWA therefore does not address hydrogeological considerations or the water make from the bore.

Accordingly, the focus of this SWA assessment is on the management of clean and dirty water, including the recommendation of erosion and sediment controls, relating to the construction, operation and eventual decommissioning of Bore 8.

1.3 Purpose and Objectives

This SWA has been prepared to:

- Identify potential surface water impacts and propose surface water management strategies during construction, operation and rehabilitation phases of the Project;
- Specifically assess the potential for short or long term impacts on the receiving environment including the THPSS communities such that the risk of potential impacts is minimised; and
- Address legislative requirements and guidelines relevant to the SWA.

The key objectives of surface water management for construction and operation of the proposed Bore 8 are:

- Maintain existing flow regimes reporting to the Carne Creek sub-catchment
- Separate clean and dirty water flows;
- Minimise soil erosion in all areas disturbed by the Project;
- Retain sediment at the source; and
- Treat all sediment laden water prior to discharge into the environment.

Strategies to realise surface water management objectives are described in **Section 6.1**.

1.4 Project Description

The proposed Bore 8 dewatering facility requires the construction of a bore infrastructure platform, access track and an adjacent services corridor, located within the Newnes State Forest (**Figure 1**). Bore 8 infrastructure will consist of four dewatering boreholes, submersible pumps, and associated surface infrastructure including electrical control sheds and amenity facilities.

It is expected that Bore 8 will take approximately six months to construct and commission. Construction of Bore 8 is expected to commence in late 2012, with completion by mid-2013. During operation, Bore 8 will be managed in accordance with the existing Springvale Coal Underground Dewatering Management System and Environment Protection Licence (EPL) 3607.

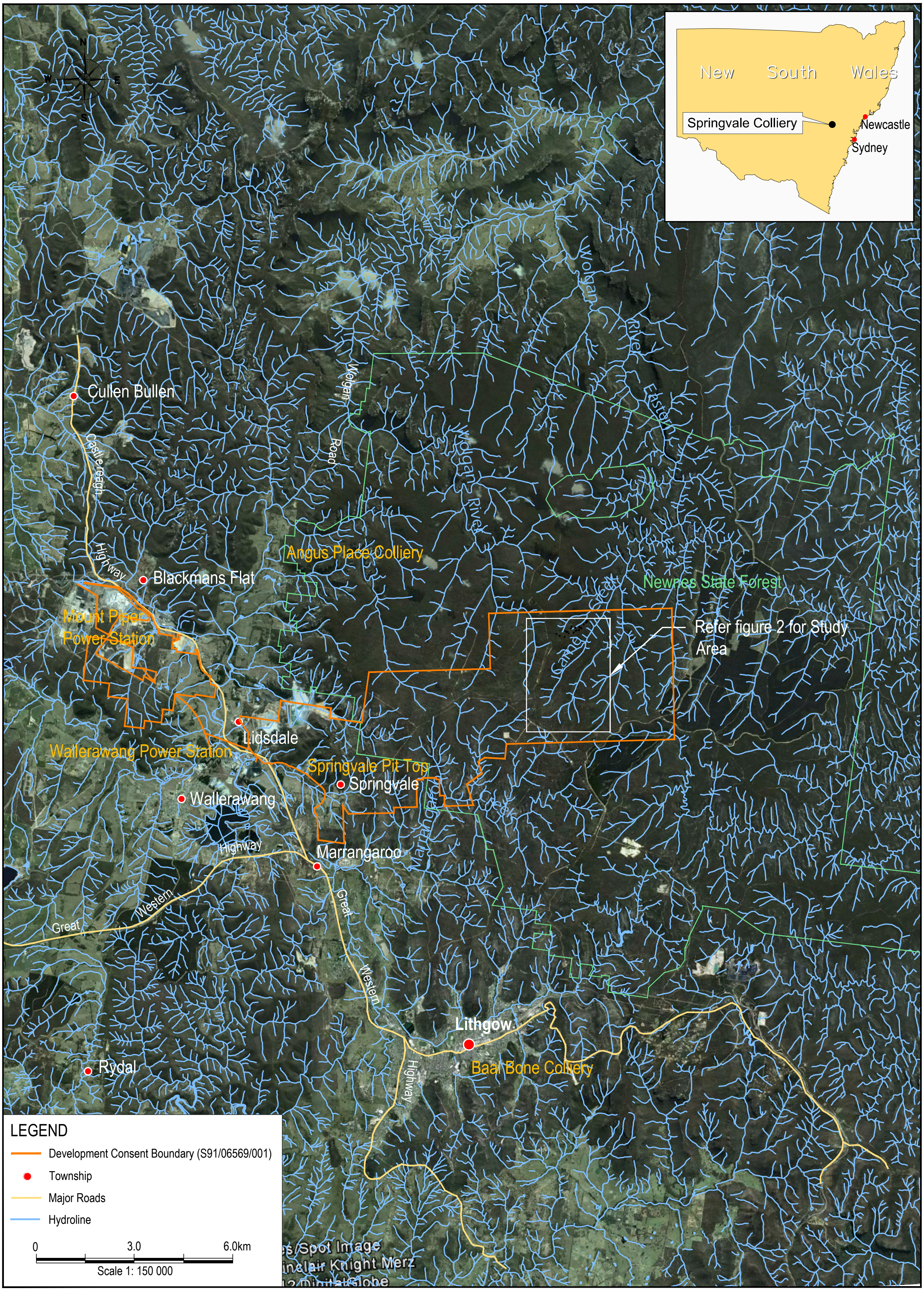
1.4.1 Access Track and Service Corridor

The construction of the proposed access track will follow the alignment of an existing fire trail (refer to **Sections 4.1**) to minimise disturbance. The existing access track will be upgraded to provide a 5 metre (m) wide track for support vehicles to access the bore during construction and operation including; semi-trailers to transport dewatering infrastructure, fuel tankers to supply fuel to the diesel generators, light vehicles and maintenance vehicles.

A 5 m wide service infrastructure corridor will be constructed adjacent to the access track for an underground 11 kV electricity supply line and a 500 millimetre (mm) diameter water transfer pipeline. The power and water infrastructure will be buried in the service corridor to protect the infrastructure from accidental damage or acts of vandalism, and therefore minimise the potential for a water pipe failure resulting in offsite water discharge.

All final cut or fill batters along the track alignment will be progressively rehabilitated as works are completed (refer to **Section 6.1.5**). Similarly, the service corridor will be progressively rehabilitated following installation of the electrical and water services, leaving a 5 m wide track surface during the operation phase.

During decommissioning of Bore 8 electrical cabling is likely to be removed via inspection pits installed along the cable route. However to avoid re-disturbing the rehabilitated service corridor the cable conduit and water pipeline is likely to remain in situ as redundant infrastructure. It is proposed to retain the access track as a permanent fire trail.



To be printed A4

Springvale Colliery
Locality Plan

FIGURE 1

GSS ENVIRONMENTAL
Environmental, Land and Project
Management Consultants

V:\CCC15-005\Figures\Final\SWA\Fg1_CCC15-005_Location Plan SWA_120910.dwg

1.4.2 Bore Platforms

The construction of the dewatering facility at Bore 8 will require an anticipated 0.77 ha construction footprint to be cleared of vegetation and graded to form a level hardstand platform for construction of the boreholes. The disturbance footprint is the minimum area required to construct a level platform with sufficient space to facilitate the proposed borehole drilling program, store drilling related equipment and machinery, install operational plant and equipment for the dewatering facility, and installation of a dirty water management system including a drilling sump.

In addition, some disturbance will occur outside of the 0.77 ha drill platform as a result of the installation of erosion and sediment controls, such as clean and dirty water diversions, sediment basin and sediment fences. Disturbance will therefore occur within an area totalling 1.44 ha.

Upon completion of construction and commissioning of Bore 8 the site will be partially rehabilitated to the minimum area required for the operational phase, anticipated to be a 0.32 ha area.

Following decommissioning of Bore 8 the platform and sump will be rehabilitated to the satisfaction of Forests NSW. All surface infrastructure will be removed, and the boreholes grouted and sealed to prevent long term changes to ground water hydrology.

1.4.3 Study Area

The Study Area for this assessment is shown in **Figure 2**. The Study Area consists of the proposed:

- Bore 8 drilling platform;
- Access track from Sunnyside Ridge Road to the proposed location of Bore 8; and
- Service corridor for the installation of water pipeline and electricity supply infrastructure, located adjacent to the proposed access track.

The Study Area encompasses the full disturbance footprint associated with construction of Bore 8, equating to an area of 1.44 ha, and a corridor approximately 50 m wide for the access track and services (refer **Figure 2**).

1.5 Methodology

The key steps undertaken in the preparation of this SWA are as follows:

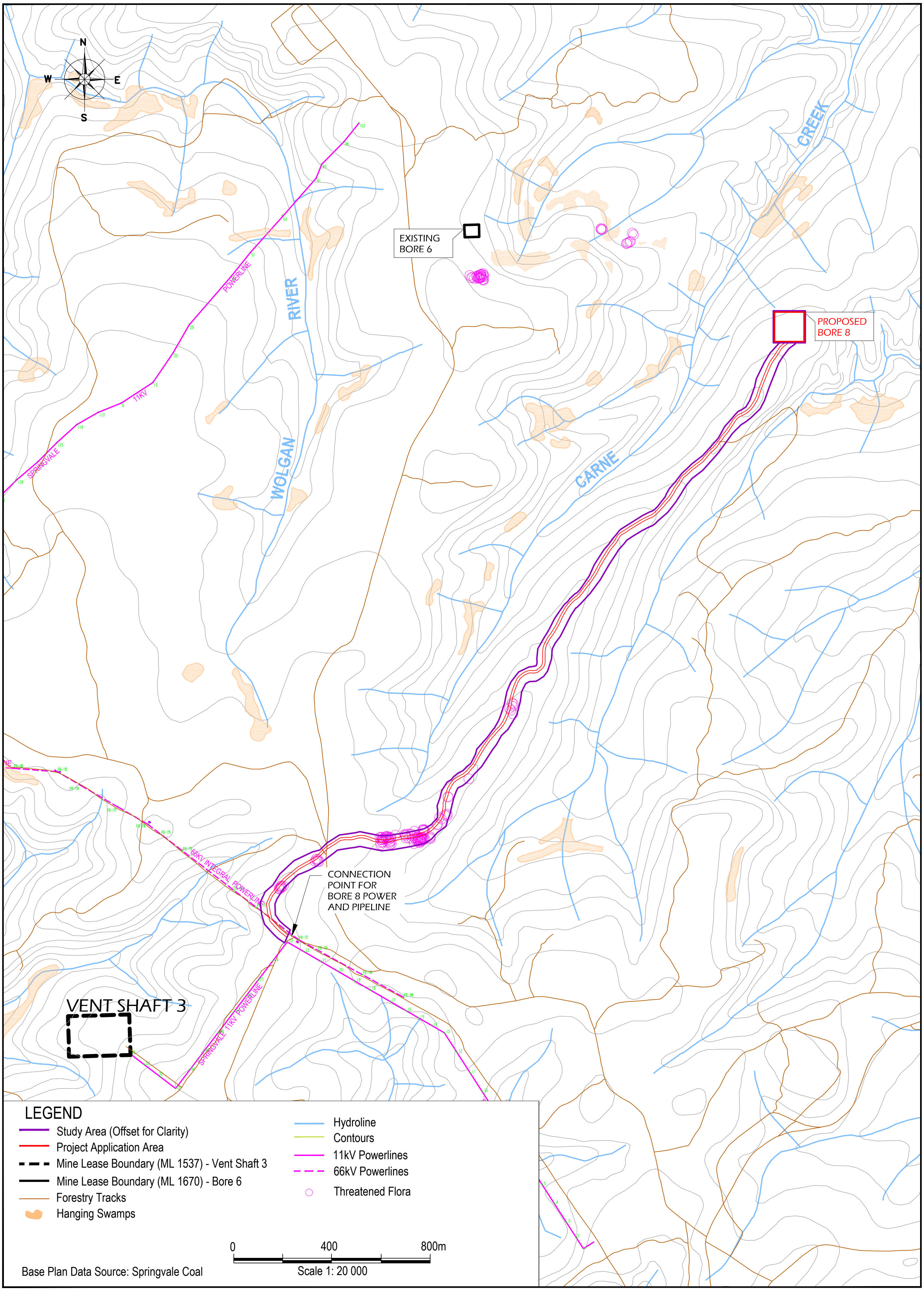
1. Collection and review all relevant background information including physical and climatic characteristics of the Study Area, relevant legislation and guidelines (**Section 1.6**);
2. Identification of potential surface water impacts relating to the construction and operational phases of the Project, with a focus on protection of sensitive receiving environments within the Carne Creek sub-catchment (**Section 5.0**);
3. Develop key surface water management objectives and strategies incorporating industry best practice erosion and sediment control (ESC) management principles (**Section 6.1**); and
4. Develop proposed water management controls (**Section 6.0**) including a conceptual Erosion and Sediment Control Plan (ESCP) (**Section 6.4**).

1.6 Literature Review

The following documents that specifically relate to the Project have been reviewed during preparation of this assessment:

- Springvale Coal Project – Environmental Impact Statement (Sinclair Knight 1992);
- Springvale Colliery – Mining Operations Plan (Centennial Springvale Pty Ltd 2009);
- Springvale Coal Surface Water Management System (Centennial Springvale Pty Ltd 2010);

- Springvale Coal Underground Dewatering Management System (Centennial Springvale Pty Ltd 2010);
- Springvale Coal Standard Work Procedure: Erosion and Sediment Control;
- Springvale Coal Standard Work Procedure: Water Management;
- Environment Protection Licence (EPL) 3607 (Environmental Protection Authority of New South Wales 2011);
- Soil Survey and Land Capability Section of the Environmental Assessment for the Springvale Colliery (GSSE 2012); and
- A range of legislative, planning and policy documents (see **Section 2**).



V:\CCC15-005\Figures\Final\SWA\Fg2_CCC15-005_Erosion Sed Control_120910.dwg

To be printed A4

GSS ENVIRONMENTAL
Environmental, Land and Project
Management Consultants

Springvale Colliery
Study Area and Local Hydrology

FIGURE 2

2.0 RELEVANT LEGISLATION, POLICY AND GUIDELINES

GSSE has considered the following legislative requirements, government policies and guidelines in the preparation of this SWA:

- *Protection of the Environment Operations Act 1997* (POEO Act);
- *Water Act 1912*;
- *Water Management Act 2000*;
- *State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011;*
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (the “ANZECC Guidelines”), October 2000;
- Department of Environment and Conservation, Approved Methods for the Sampling and Analysis of Water Pollutants in NSW, March 2004;
- Managing Urban Stormwater: Soils and Construction (the Blue Book) Volume 1 2004;
- Managing Urban Stormwater: Soils and Construction Volume 2A Installation of services (the Blue Book: Vol 2A installation of services), Department of Environment and Climate Change, (DECC) 2008;
- Managing Urban Stormwater: Soils and Construction Volume 2C unsealed roads (the Blue Book: Vol 2C unsealed roads), DECC, 2008; and
- Hawkesbury Nepean Catchment Management Authority Catchment Action Plan, 2008.

Guidelines of particular relevance to the Project are discussed below.

2.1 Managing Urban Stormwater: Soils and Construction, Vol. 1, 4th ed.

In NSW, the most relevant and comprehensive guidelines for the design of stormwater controls are contained within the Landcom document, ‘Managing Urban Stormwater: Soils and Construction’, Vol. 1, 4th ed. (Landcom 2004) commonly known as the ‘Blue Book’. The Blue Book is utilised as guidance for broader industries and contains prescriptive guidelines for what should be included in an Erosion and Sediment Control Plan (ESCP) and a Soil and Water Management Plan (SWMP). The relevant principles of surface water management described in the Blue Book have been adopted in the development of proposed surface water management strategies and the conceptual ESCP included in this SWA (**Section 6.1.3).**

2.2 Managing Urban Stormwater: Soils and Construction, Vol. 2A Installation of services and Vol 2C Unsealed roads

In June 2008, DECC released Volume 2A installation of services and Volume 2C unsealed roads (DECC 2008) as part of a series in the second volume of the Blue Book guidelines. These guides provide specific management practices for erosion and sediment control relevant to construction of unsealed roads and installation of services. Proposed surface water management strategies for works associated with installation of Bore 8 and associated access track have been developed in accordance with this guideline.

3.0 EXISTING SURFACE WATER ENVIRONMENT

3.1 Rainfall and Climate

The Study Area lies within the Newnes State Forest, below the Newnes Plateau. The area is classified as a temperate climatic zone (Bureau of Meteorology 2012) being characterised by mild to warm summers and cold winters. Weather in the region is influenced by the regular passing of low pressure systems which bring milder temperatures and winds from the south. The climate in the Study Area is also influenced by altitude and local topography, with substantial mountain ranges (Blue Mountains) to the east and north.

Rainfall is relatively even throughout the year (refer to **Table 1**), however there is a noticeable increase in the summer months and a marginally lower rainfall in late winter and early spring. On average, January is the wettest month of the year and September is the driest.

The average number of mean rain days is reasonably consistent throughout the year, indicating that increased summer rain is due to higher intensity storm events rather than more frequent rain events. Rainfall data for the site has been obtained from the Australian Government Bureau of Meteorology (BoM) monitoring station at Newnes State Forest (No.063062), situated approximately 8.0 km to the east - south east of the Study Area (**Table 1**). This data is considered representative of rainfall at the Study Area due to the close proximity and similar orographic influences at the Newnes State Forest BoM station.

Table 1 – Summary of Newnes State Forest rainfall records

Lithgow (Newnes State Forest) rainfall records (1938 – 1999): Site number 063062													
Season	**Summer**			**Autumn**			**Winter**			**Spring**			
Month	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Year**
Mean rainfall (mm)	90.4	121.0	114.1	102.9	79.9	81.3	83.0	68.3	83.5	67.9	91.5	89.0	1073.1
Mean rain days >1mm	8.7	10.6	8.2	9.2	9.2	9.0	9.0	8.2	7.4	7.2	7.9	7.8	107.5

3.2 Landform

The topography within the immediate vicinity of the Study Area consists of rugged mountain ranges and plateaus characterised by sheer and benched cliffs, and steep sided gorges. Isolated mountains and mesas also occur. The rugged topography is dissected by numerous streams and gullies often bordered by discontinuous belts of flat undulating land (**Figure 1**).

Elevations within the region vary between a maximum of about 1 250 m above sea level (ASL) to 280 m ASL. The total relief within the region is approximately 970 m. Gradients are also highly variable ranging from in excess of 100% along escarpments to about 5% on the undulating plains.

The proposed alignment of the access track to Bore 8 follows an existing fire trail that gently undulates along a ridgeline that dips to the north, descending approximately 90 m to the proposed Bore 8 platform.

3.3 Vegetation

The environment surrounding the proposed Bore 8 and associated access track is generally well vegetated woodland and open forest. Six native vegetation communities have been identified within the Study Area (RPS Australia 2012). As outlined in **Section 1.1** ecological surveys conducted for the Project (RPS 2012) have identified occurrences of the federally listed THPSS community in the region.

No THPSS communities occur within the Study Area. Furthermore, the nearest occurrence of THPSS that has the potential to receive runoff from the Project is located approximately 180 m from the access track and 300 m to the north of the Bore 8 drill platform.

Native vegetation communities identified within the Study Area are:

- Exposed Blue Mountains Sydney Peppermint – Silvertop Ash Shrubby Woodland;
- Sandstone Plateau and Ridge Scribbly Gum – Silvertop Ash Shrubby Woodland;
- Newnes Plateau Narrow Leaved Peppermint – Silvertop Ash Layered Open Forest; and
- Newnes Plateau Narrow Leaved Peppermint – Mountain Gum – Brown Stringybark Layered Forest.

The Ecological Assessment (RPS 2012) undertaken for the Project identified the threatened flora species *Persoonia hindi*, (*P. hindi*) which is listed as endangered under the TSC Act within the Study Area. Several occurrences of *P. hindi* occur adjacent to the existing and proposed Bore 8 access track.

Recommendations for surface water management in the Ecological Assessment (RPS 2012) are:

- Adopting a focus on sediment and erosion control during access track construction;
- All disturbed areas outside of the required functional road and borehole areas should be rehabilitated with endemic native vegetation; and
- Adequate sediment controls be employed adjacent to all areas of soil disturbance.

3.4 Surrounding Land Uses

The Study Area is located in Newnes State Forest on the Newnes Plateau and is generally vegetated with woodland and open forest communities as described above. The area immediately surrounding the Study Area supports a locally significant forestry industry. Selective harvesting of high value species including Blue Mountains Ash occurs throughout plateau areas in the Newnes State Forest.

The Newnes State Forest also hosts recreational activities due to natural features such as pagoda rock formations and proximity to the town of Lithgow.

3.5 Geology and Soils

Geology descriptions below have been adapted from *Springvale Coal Project Environmental Impact Statement* (Sinclair Knight 1992).

3.5.1 Geology

The Study Area lies within the Western Coalfields of NSW on the western most edge of the coal bearing strata of the Permo-Triassic Sydney Basin. The area is characterised by sandstones of the Narrabeen Group and thin outliers of the Hawkesbury Group.

The claystones of the Narrabeen Group are important in landform creation; rocks derived from this group include conglomerate, quartz sandstones, red, green and grey shales. These often outcrop over much of the region. The Grose Sub-Group (including Banks Wall Sandstone) comprises the major cliff lines. In this area, the Hawkesbury Sandstone directly overlies the Banks Wall Sandstone, while further eastwards the Burralow Formation gradually interposes between these sandstone units (Herbert and Helby 1980).

The Hawkesbury Sandstone is the hardest Permo-Triassic rock and provides the greatest resistance to weathering due mainly to its quartz-siderite cement. The Hawkesbury Sandstone has a very low vertical permeability and water moves mainly in a horizontal direction, which often results in the formation of small perched swamps. The combination of resistant sandstone overlying erodible sequences has given rise to broad valleys bordered by cliffs and numerous pagodas.

3.5.2 Soils

Soil landscape units in the Study Area have been identified with reference to the *Landscapes of the Wallerawang 1:100,000 Sheet* (King 1992) and are described in detail in the Soil and Land Capability Assessment section of the EA (GSSE 2012). Three soil landscape units underpin the Study Area; Newnes Plateau (np) landscape unit occurs on the undulating crests higher in the catchment and Wollangambe (wo) unit occurs on the slopes. A small part of the Study Area (partially underlying the Bore 8 drilling platform) is underpinned by the Medlow Bath (mb) unit (King 1992).

Soils on crests and moderate to steeper slopes higher in the catchment (np, wb) are typically rapidly draining, shallow siliceous sands and Earthy Sands, derived from siliceous sandstone parent material. Poorly drained Yellow Podzolic and Gleyed Podzolic soils have developed over shale lenses (King 1992), coinciding with occurrences of THPSS communities.

Topsoils (ranging from sands to sandy loams) tend have low water holding capacity due to the characteristic sandy and incoherent fabric (King 1992). Subsoils (ranging from sandy clay loams to sandy clays) tend to become earthier with depth. Fertility of all topsoils and subsoils is generally very low due to strong acidity and low water holding capacity. Further testing of soils is recommended to determine suitable amelioration prior to reuse in rehabilitation works.

Generally erodibility is low in non-concentrated flows (K values range from 0.013 – 0.017) (King 1992). However when subjected to concentrated flows, erodibility ranges from moderately-high to high, although dispersivity is generally low.

Due to high erosivity when disturbed, robust erosion and sediment controls will be required for works upslope of nearby occurrences of THPSS to ensure sediment is retained.

3.6 Surface Hydrology

3.6.1 Regional Hydrology

The Study Area straddles the divide between the upper catchment of the Wolgan River and the catchment of the Coxs River (refer to **Figure 1**). The Wolgan River flows in a north north-westerly direction and is a tributary of the Capertee River, which ultimately joins the Colo River, the Hawkesbury River and Broken Bay.

The Coxs River flows in a southerly direction and is a sub-catchment of the greater Warragamba Dam Catchment. The Warragamba Dam Catchment lies within the catchment for Sydney's water supply.

The Springvale lease area is characterised by a dendritic drainage network (which comprises tributaries of the following river and creek systems:

- Coxs River;
- Wolgan River (eastern and western branches);
- Marrangaroo Creek; and
- Kangaroo Creek.

The main watercourses and associated gullies within the development consent S91/06569/001 Boundary are:

- Sawyers Swamp on the western boundary;
- Springvale Creek in the south-west corner;
- Tributaries of Marrangaroo Creek in the south;
- Carne Creek in the north east corner; and
- Wolgan River headwaters in the north western corner.

3.6.2 Local Hydrology

The Project is located in the headwaters of the Carne Creek catchment, a sub-catchment of the Wolgan River catchment. No watercourse is intersected by the proposed alignment of Bore 8 access track or borehole platform.

GSSE observations undertaken during a site inspection indicate that there is little evidence of significant overland flow in the Study Area generally. The area is characterised by high infiltration rates associated with the sandy soils and vegetation cover (King 1992) as described above.

Due to local relief and topography in the Study Area, and the proposed alignment of the Bore 8 access track being located along the ridgeline of a spur, the probability of flooding is considered to be insignificant during construction and operation of Bore 8. As such flooding is not considered further in this assessment.

3.7 Existing Surface Water Management

Approved surface water management facilities are located at the Springvale pit top; these surface water management systems are used for controlling runoff water quality and consist of separate clean and dirty water flow paths. The dirty water flow path is directed through the treatment train prior to discharge through to licensed discharge points. No change to this infrastructure is proposed as a result of this project, including no change to current discharges into the Coxs River and no change to the EPL in relation to surface water management.

3.7.1 Existing Track Surface Water Management

As outlined in **Section 1.4.1** above the proposed access track and service corridor follows the alignment of the existing fire trail.

The existing fire trail utilises standard *Blue Book: Volume 2C unsealed roads* controls for unsealed roads on ridgelines. Cross banks and mitre drains, spaced according to track gradient, shed runoff into the shoulder vegetation. These controls appear to be effective, with no evidence of significant scouring on the track surface or sedimentation in the adjacent vegetation observed during the recent site inspection conducted by GSSE.

4.0 POTENTIAL SURFACE WATER IMPACTS

4.1 Introduction

This section details the potential surface water impacts associated with the construction and operation of Bore 8. Aspects of the Project and the management measures proposed to mitigate and minimise these impacts are introduced in this section with further detail provided in **Section 5** below.

4.2 Construction Phase

Activities with the potential to impact on surface waters during construction of the Project are:

- Initial site establishment;
- Vegetation clearing;
- Topsoil stripping and stockpiling;
- Earthworks to construct the Bore 8 access track and borehole platform;
- Construction of water management structures (e.g. mitres and diversion drains); and
- Vehicle and equipment movements during construction.

Potential impacts of these activities are anticipated to be:

- Elevated sediment loads and turbidity in surface water flows; and
- Chemical and / or hydrocarbon contamination of soils and receiving waters.

Specific measures to manage and mitigate potential impacts to surface water in the construction phase of the Project will be developed in a Construction Environmental Management Plan (CEMP).

4.3 Operational Phase

Activities with the potential to impact on surface waters during operation of the Project are:

- Operation of Borehole 8 pumping infrastructure;
- Water pipeline operation and maintenance; and
- Vehicle and equipment movements during operation.

Potential impacts of these activities are anticipated to be:

- Elevated sediment loads and turbidity in surface water flows; and
- Chemical and / or hydrocarbon contamination of soils and receiving waters.

4.4 Decommissioning and Rehabilitation Phase

Potential impacts to surface water described above are also anticipated to apply to the decommissioning and rehabilitation phases of the Project. Management and mitigation measures described in **Section 5** will be maintained throughout the decommissioning and rehabilitation process and not discontinued in any disturbance area until rehabilitation performance criteria have been achieved.

5.0 PROPOSED WATER MANAGEMENT CONTROLS

5.1 General Surface Water Management Strategies

The aim of surface water management for the Project is to minimise impacts to surface water quality and hydrology and ensure there are no adverse impacts on sensitive receiving environments. Objectives of the SWA are listed in **Section 1.3**.

The key water management strategies recommended to deliver the objectives of this SWA are described below.

5.1.1 Management Practices

Robust management practices will be essential to ensure that construction and operation of the Bore facility is conducted in accordance with the recommendations of this SWA, and minimise the potential for adverse surface water impacts to the receiving environment. Key management measures to be adopted are discussed in the section below.

5.1.1.1 Preparation of Progressive ESCP Drawings for Construction Activities

Conceptual ESCPs for construction and operations phases of the Bore 8 platform and access track are provided in **Section 5.4.** Controls nominated are conceptual only and not to be issued for construction since the nature and location of ESC devices is dependent upon the final detailed design.

It is recommended that the principal contractor prepare Progressive ESCPs prior to each major construction activity (for example clearing and earthworks). It is recommended to separate the site into discrete construction areas to enable detailed documentation of ESC measures to be implemented for each major construction activity.

The Progressive ESCP Drawings should be based on the management and mitigation measures outlined in this SWA and further developed in the detailed design phase of the Project.

The drawings and supporting documentation should contain detailed ESC information for each construction stage/area, and may include (but not be limited to):

- A map produced to scale of the construction site including initial and final contours, natural drainage features, general indications of direction(s) of fall, other natural and man-made features, north arrow, and scale bar;
- Nature and extent of earthworks, including cut and fill;
- The construction boundary and location of ‘No Go Zones’ and site constraints including locations of recorded threatened species occurrences;
- Construction diagrams for ESC features (including specific details of material requirements e.g. rock size, type of sediment filter, topsoil stockpile locations, stockpile drainage requirements);
- Catchment areas and design calculations of all temporary sediment basins (if required);
- Information on ground cover, soil type and compaction requirements;
- Rehabilitation requirements (e.g. seeding and fertiliser rates);
- An activity schedule (order of works for implementation of ESC features throughout construction and a monitoring and maintenance schedule); and
- End of day and shut down procedures.

Construction activities should not proceed until all controls nominated in the Progressive ESCP have been implemented for that phase of construction. Progressive ESCPs should be reviewed regularly and amended where necessary to meet the objectives of this SWA.

5.1.1.2 Wet Weather and End of Day Procedures

It is recommended that the principal contractor ensures that construction activities undertaken are appropriate for the forecast weather conditions. Topsoil stripping should not be scheduled to occur immediately prior to rainfall events to protect the topsoil structure (**Section 5.1.6**) and avoid introducing unnecessary erosion and sedimentation risks.

Progressive ESCPs should stipulate end of day and extended site shut down procedures to minimise the risks of stormwater runoff impacts when the site is unattended. It is recommended that end of day procedures include, but are not limited to:

- Covering disturbed areas (with black plastic or geotextile fabric) within flow paths to convey clean water across the disturbed area; and
- Installing temporary sand bag check dams and cross banks (sand bag bunds or berms) to direct stormwater runoff from disturbed areas and restrict flow velocities.

The principal contractor should ensure that emergency ESC stand-by work crews are nominated to be available to conduct site inspections and carry out necessary ESC maintenance during significant rain events that coincide with site shut down periods.

5.1.1.3 Inspections and Maintenance

It is recommended that the principal contractor develop and implement an ESC inspection and maintenance schedule for the construction and operation phases of the Project. Inspection and maintenance requirements are discussed in **Section 5.4**.

5.1.2 Minimising Disturbance

The disturbance footprint should be minimised, and disturbance staged to minimise exposure of soils to erosion and sedimentation. Minimising disturbance for the access track is primarily achieved through design; the proposed alignment selected for Bore 8 access track follows an existing fire trail along the ridge top thus minimising disturbance by:

- Utilising the previously disturbed alignment;
- Minimising cut and fill volumes due to absence of cross fall; and
- Eliminating disturbance for clean water diversion due to the absence of upslope catchment.

In addition, general management measures recommended to minimise disturbance include:

- Planning all operations to ensure that clearing occurs in areas immediately prior to active construction;
- Limiting disturbance to the minimum area required to enable construction, including sufficient areas for ESC and topsoil stockpiling;
- Prior to vegetation clearing, demarcate the limits of clearing on a plan and in the field;
- Implementing all proposed ESC measures in advance of, or in conjunction with, vegetation clearing and soil stripping operations; and
- Prior to works commencing the limits of disturbance (i.e. clearing boundary) would be demarcated in the field and on a plan. Similarly locations of sensitive areas including occurrences of *P. hindii* will be demarcated on construction plans and in the field. Disturbances of *P. hindii* shall be avoided where possible.

5.1.3 Clean Water Diversion

Clean water diversions should be constructed wherever possible upstream of the disturbance area (but within the Study Area boundary) to redirect clean water flows around the Project Application Area into natural ephemeral drainage lines. Effective clean water diversion minimises impact to surface water quality and the volume of runoff to be detained and treated (if required) within the Study Area.

Clean water diversions will not be installed in such a fashion as to divert flows away from downstream occurrences of THPSS.

5.1.4 Dirty Water Treatment

Dirty stormwater runoff generated within the Project Application Area should be captured and diverted using appropriate ESC devices. ESC devices (such as cross banks, spoon drains, downslope catch drains and check dams, refer to **Section 5.2.2**) are employed to:

- Inhibit flow velocities of site water to sub erosive levels;
- Divert runoff to detention areas to allow sediment to settle out of suspension; and
- Filter suspended sediment and control the discharge of site water into the receiving environment.

It is recommended to adopt a 'treatment train' approach to ESC during construction to minimise erosion and retain sediment at the source in disturbed areas. A treatment train approach to ESC employs multiple temporary sediment control devices along flow paths, in order to:

- Inhibit flow velocities to sub-erosive levels; and
- Detain water regularly to allow sediment to fall from suspension.

Implementing a staged approach to ESC in disturbed catchments reduces the sediment load that reaches final engineered controls such as sediment detention basins, thus reducing the potential for pollution incidents.

5.1.5 Progressive Rehabilitation

In order to minimise the areas of disturbance during construction, rehabilitation should take place immediately following completion of construction activities in specific work areas. Rehabilitation performance criteria for construction phase should be developed in the Project CEMP. Temporary ESC devices should remain in place until the disturbed area has been stabilised and the rehabilitation criteria met.

Maintenance and monitoring programs should be developed in the CEMP and implemented for the Project to ensure that water management objectives are met through the life of the Project.

5.1.6 Topsoil Management

Any topsoil to be stripped for reuse in rehabilitation should be stripped when in a moist but not wet condition to minimise damaging the topsoil structure. Topsoil stockpiles should be limited to a maximum of 2 m in height with batter slopes no steeper than 2:1 to maintain topsoil structure and seedbank viability. Stockpiles intended to be retained for periods longer than six months should be stabilised with a sterile cover crop or covered with geotextile fabric to minimise erosion.

Topsoil stockpiles should not be located in proximity to sensitive receiving environments or THPSS or within lines of concentrated flow, and should have temporary sediment control measures (i.e. sediment fences and/or sand bags) placed around the downslope perimeter of stockpiles.

5.1.7 Temporary Erosion and Sediment Controls

Temporary ESC devices should be installed during the construction phase of the Project (e.g. sediment fencing, sand bags and rock check dams) to minimise the discharge of sediment-laden water from newly disturbed areas. Temporary ESC devices are to be installed prior to clearing where possible, and must be maintained until the disturbed catchment is stabilised. All temporary ESC devices should be installed in accordance with the Blue Book Standard Drawings (Landcom 2004).

The location and types of specific temporary ESC devices are likely to vary as construction progresses in a given work area. Therefore, specific Progressive ESCPs should be developed by the principal contractor for construction activities (such as clearing and bulk earthworks) prior to works commencing (refer to **Section 6.1.1.1** above). Temporary ESC devices likely to be employed during construction, and their purpose, are described below.

5.1.7.1 Temporary Sediment Basins

Due to the proposed area of disturbance required for the Bore 8 platform, it is anticipated that a temporary sediment basin will be required to capture sediment from the disturbed catchment in accordance with the criteria described in the Blue Book (Landcom, 2004) (refer to **Section 5.3.1**). Literature descriptions of soil types in the Study Area (King 1992), supported by GSE field observations, indicates that the soils in the Study Area are dominated by coarse sandy soils. However, localised fine textured subsoil may be exposed during excavations at the bore platform location. Therefore, 'Type F' temporary basins are recommended to capture fine silt particles. Prior to construction, however, it is recommended to analyse soils proposed to be disturbed to determine the percentage of dispersible material and confirm the appropriate sediment basin design criteria as prescribed in the Blue Book.

Preliminary sediment basin sizing for the Bore 8 platform is provided in **Appendix A**. A conservative approach has been adopted to size the Bore 8 platform sediment basin to reflect the sensitivity of the receiving environment. The recommended volume of the sediment basin in accordance with Blue Book sizing requirements is 330 m^3.

Temporary sediment basins should be managed in accordance with Blue Book guidelines; where possible water should be reused onsite (e.g. dust control) in preference to dewatering into the environment. Prior to dewatering any basins into the environment, water should be tested to ensure it complies with Blue Book discharge criteria and treated if necessary. Flocculants may be required to promote settlement of fine dispersive sediment from the water column. Dewatering and sediment removal should be conducted as required to ensure a sufficient settling volume is retained to capture a 95th percentile 5 day storm event (61.0 mm) (**Appendix A**).

5.1.7.2 Sediment Fences

During construction, disturbance areas will require temporary ESC devices that may include sediment filter fences. Sediment fences detain runoff on site, allowing water to pond and sediment settle from suspension. Uses of sediment fences include:

- Installation at the lower perimeter of disturbed catchments to intercept and detain dirty water sheet flow; and
- Installation upstream of disturbed areas to divert clean water flows around disturbed areas.

Sediment fences should be constructed in accordance Blue Book specifications. Generally, sediment fences should be installed on the contour or slightly convex to the contour. Each end of the fence should be turned up slope, creating a stilling pond to capture sediment. Where possible, a sediment fence system should consist of a series of overlapping fences, each no longer than 40 m.

5.1.7.3 Check Dams

Sandbag (or rock) check dams are often temporarily installed within newly constructed drains and channels to limit scouring prior to works to stabilise the drain. Check dams should be installed within the channel profile to ensure that water overtops the check dam within the channel.

As described in **Section 3.5.2** the erodibility of soils in the Study Area is high when subjected to concentrated flows, therefore where temporary diversion drains are necessary, check dams should be appropriately spaced (typically a 25 metre intervals) to restrict flows to sub erosive velocities. During low flows check dams allow ponding and settlement of fines, thus assisting to keep sediment close to the source, and are a cost effective primary treatment in a 'treatment 'train' approach to managing ESC.

5.1.7.4 Temporary Cross Banks

Runoff from disturbed areas during works is to be controlled by installation of temporary contour or diversion drains when rain events are forecast. These drains generally take the form of bunds (e.g. sandbag bunds) installed along the contour and angled to shed run off from the disturbed area. Temporary cross banks should be spaced appropriately to prevent flows reaching erosive velocities as per Blue Book (Landcom 2004, and DECC 2008) guidelines.

5.1.7.5 Sheared Timber Windrow Sediment Traps

Sheared timber cleared for construction is an effective final filtering media in a sediment 'treatment train'. Sheared timber windrows should be installed on the downslope perimeter of the disturbance boundary as an additional measure to support primary sediment traps such as check dams and sediment fences. The timber windrow should not include tree root balls and should be installed using plant (e.g. excavator) capable of reaching from the construction footprint to avoid additional disturbance.

The timber windrow should be of sufficient size (approximately 1.5 m high, 2 m deep) to effectively filter remaining sediment in discharged water. Sheared timber windrows are effective during very high flows to dissipate energy and deter discharge forming erosive concentrated flows. Timber windrows should be pulled back on to rehabilitated disturbed areas after topsoil has been spread to provide stability and enhance rehabilitation.

5.2 Access Track and Services Corridors

5.2.1 Construction

General controls recommended to be adopted for Bore 8 access track and services corridor are described below. It is recommended that specific locations of controls be confirmed once the detailed design is complete, and should be documented on Progressive ESCPs (refer to **Section 5.1.1.1**).

Access tracks should be constructed in accordance with appropriate standards such as those described in *The Blue Book: Vol. 2C unsealed roads* (DEC, 2008). Earthworks for the trenching the proposed water pipeline and electricity infrastructure should be conducted in accordance with *The Blue Book: Vol. 2A installation of services* (DEC, 2008).

During construction, the track and services corridor should be graded with a crown to shed water in accordance with *The Blue Book: Vol. 2C unsealed roads* (DEC, 2008) recommendations for unsealed roads constructed on a ridge top (**Figures 4** and **5**).

5.2.1.1 General Temporary Erosion and Sediment Controls: Access Tracks

Temporary ESC strategies described in **Section 5.1.7** should be employed to limit erosion and minimise the discharge of sediment laden water from areas disturbed during construction. The recommended minimum general controls and order of installation, to be implemented during construction are described below:

- Clear timber in the construction footprint and stockpile timber windrows either side of the track / service corridor alignment. Due to the area of disturbance and well vegetated buffer between works and sensitive areas (including THPSS) sheared timber windrows are considered sufficient downslope sediment control, however sediment fence or sandbag bunds may be considered on steeper sections to detain dirty water and trap sediment;

- Strip topsoil. Due to location on the ridge top high in the catchment topsoil resources are expected to be minimal. Where present, push topsoil to form a berm adjacent to the services corridor to be used in rehabilitation after services are installed; and
- Install suitably spaced temporary cross banks (e.g. sandbag bunds) on track sections with longitudinal slopes prior to rainfall.

5.2.1.2 General Temporary Erosion and Sediment Controls: Trenching

As discussed in **Section 1.4.1**, installation of the water pipeline and electrical services are proposed to be buried in the service corridor located at the access track shoulder. During trenching, appropriate controls should be adopted to protect the trenches from erosion, in accordance with *The Blue Book: Volume 2A installation of services* (DECC 2008).

Trenches should only be opened if it is likely the trench can be closed within three days, and no rain is forecast for the anticipated period it is open.

Where trenches run across the grade (parallel with the contour) soil excavated from the trench should be bunded on the upslope side to divert run off away from the open trench. Where trenches run down slope an upstream trench stop should be installed (e.g. sandbag bulkhead), to divert flows around the trench. Appropriate controls will be installed downstream (e.g. sediment fence) to capture any sediment laden discharge.

Temporary sandbag check dams should be placed in long open trench sections running down grade prior to forecast rain events to minimise the trench floor scouring. Similarly, after back filling the trench regular sandbag check dams should be installed across the trench on down grade sections until design compaction and revegetation is established. It is recommended to pull sheared timber windrows back on to the services corridor to assist rehabilitation.

5.2.2 Operation

5.2.2.1 Access Track Cross Fall

The access tracks should be constructed to ensure surface drainage is optimised and stabilised, thereby reducing erosion and sedimentation. It is recommended to grade the final track alignment with outfall to shed water away from the rehabilitated services corridor (**Figure 7**)**.**

5.2.2.2 Cross Banks

Where runoff cannot be controlled simply with outfall drainage, banks should be constructed across the tracks to intercept runoff and direct it across the track surface as illustrated in **Figure 3** below. Cross banks are typically used in situations where longitudinal grades have potential to produce sheet flow with erosive velocity. Appropriately spaced cross banks maintain sub-erosive flow velocities and should be located to direct water into longitudinal drainage structures such as table drains and mitre drains (**Figure 7**). Cross banks should be constructed to be trafficable by vehicles and achieve long-term and low maintenance track drainage.

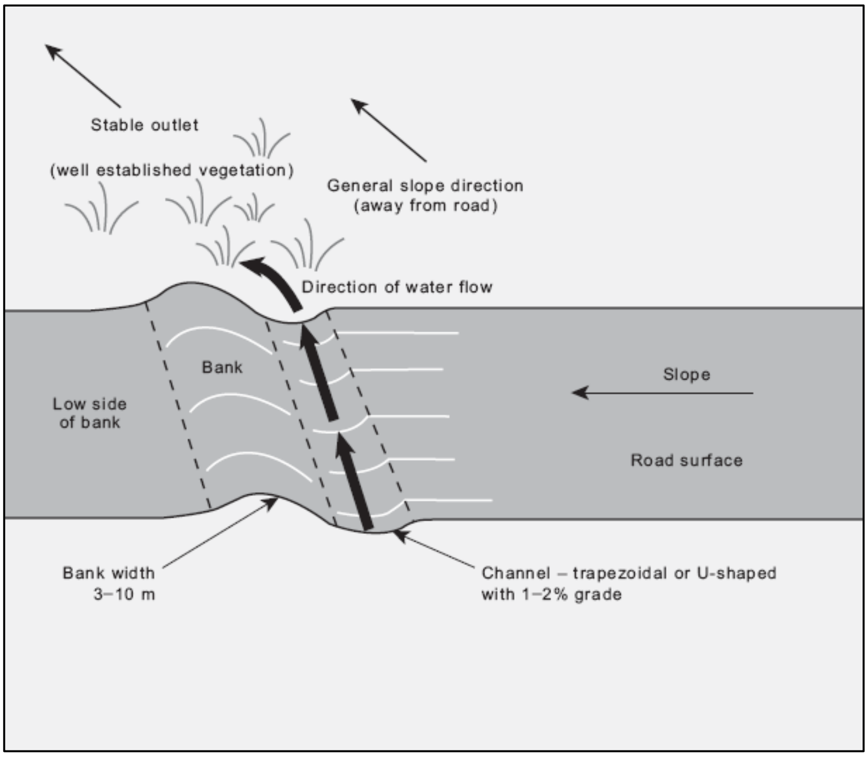


Figure 3 – Cross banks divert water

5.2.2.3 Mitre Drains

Mitre drains convey runoff from table drains to a discharge area away from the road alignment, but still within the road easement. Mitre drains should be spaced to limit runoff to a non-erosive velocity in table drains by reducing the length of run and potential flow velocities, and discharging runoff onto stable areas. Used in combination with road crowning, mitre drains provide adequate drainage for unsealed roads with low slope (less than 14%).

The frequency of mitre drains is subject to the soil type, slope gradient and slope lengths. Generally a spacing of 50 m is recommended with soils with a low erodibility and gentle slopes.

Mitre drains should have sediment trap and energy dissipater constructed at its outlet, such as a sump and downslope sediment fence (**Figure 7**) that is easily accessible for maintenance without creating additional disturbance. Mitre drains outlets should be preferentially located (e.g. discharging into relatively level, well vegetated areas) and constructed to encourage discharge to disperse rather than produce erosive concentrated flows.

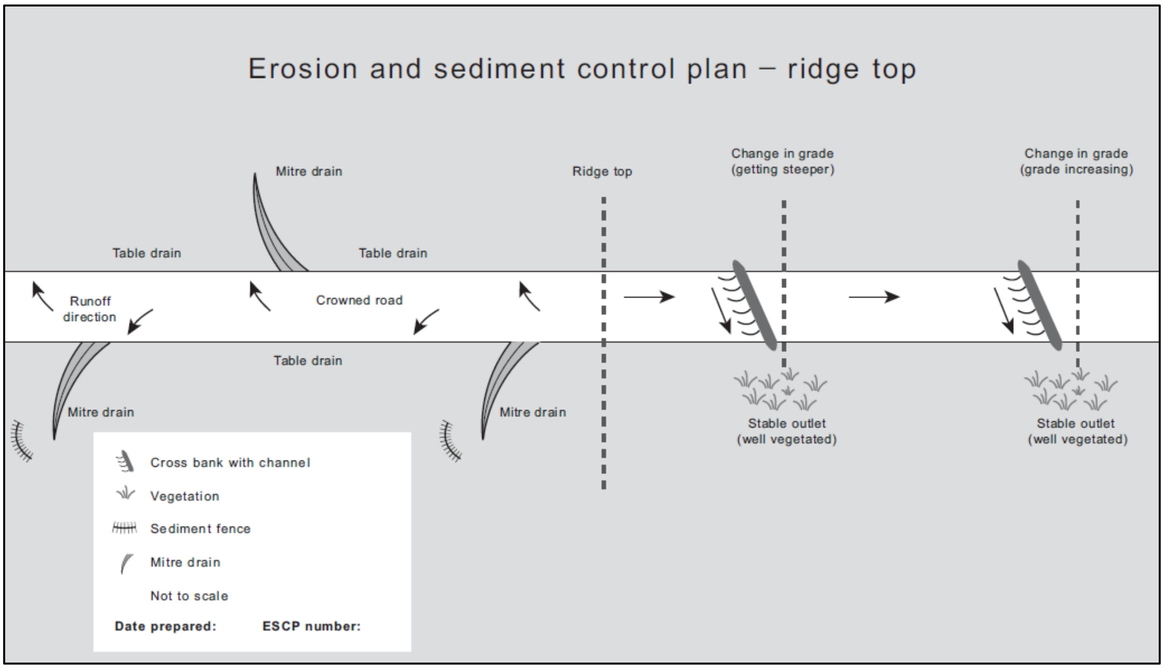


Figure 4 – Typical ESC structures for tracks on ridge lines

5.3 Bore 8 Platform

5.3.1 Construction

The Bore 8 platform should be constructed to minimise potential for release of stormwater runoff and contaminated fluids generated in the drilling process such as drilling return fluids or unexpected releases of mine water from the bores.

5.3.1.1 Platform construction

As described in **Section 1.4.2**, an approximate 0.77 ha disturbance area is proposed to permit construction and commissioning of the bore dewatering facilities. This disturbance area is anticipated to require an appropriately sized temporary sediment basin to capture and treat runoff from the disturbance area during construction of the platform (refer to **Appendix A**).

The sediment basin should be located at the downslope boundary of the construction footprint, and all dirty water runoff from the disturbed area should be directed into the basin. Temporary sediment basins should be managed in accordance with the Blue Book requirements (refer to **Section 6.1.7.1**).

During the clearing and bulk earthworks phases ESC recommended to be implemented is described below:

- Clear timber in the construction footprint and stockpile timber windrows on the downslope construction boundary to form a sheared timber windrow sediment trap;
- Push topsoil to form clean water diversion bunds at the top of cut batters to divert clean water around the construction area;
- Install sediment fences on the contour downslope of the construction footprint. Sediment fences are to be immediately upslope of the sheared timber windrow;
- Excavate a temporary sediment basin, to be designed to meet the Blue Book capacity requirements. The basin will have a formalised inlet and rock lined outlet;
- Strip remaining topsoil and stockpile for reuse during platform rehabilitation; and
- Cut dirty water diversion channels to direct runoff to the sediment basin.

5.3.1.2 Drilling

Prior to the drilling phase an appropriately sized drilling sump is proposed to be constructed to capture all drilling fluids and mine water released during bore hole drilling. Cross banks and/or spoon drains should be installed on the platform to divert drilling fluid and mine water into the sump and stormwater runoff from the platform hardstand into the temporary sediment basin. Separation of stormwater and mine water is recommended to minimise the potential for the drilling sump overtopping in rain events and minimise the volume of contaminated water requiring disposal.

All contaminated drilling fluids and mine water captured will be pumped into water carts and transported to the Springvale pit top for treatment and discharge in accordance with the EPL 3607.

5.3.2 Operation

As described in **Section 1.4.2** the drilling platform will be partially rehabilitated to an (approx.) 0.32 ha hardstand to accommodate the boreholes and pumping infrastructure during the operation phase. The hardstand will be sheeted with gravel containing no fines to create an all-weather surface. It is recommended to construct the hardstand with a 1 – 2% cross fall to shed runoff from the platform; crossfall design should be developed during the detailed design phase of the Project, and will depend upon the volumes of fill material as per **Section 5.2.1.1** above.

Temporary controls installed for the platform construction should not be removed until all rehabilitation areas are stable (minimum 60% vegetation cover).

5.4 Bore 8 Conceptual ESCP

As discussed in **Section 1.1** and **Section 3.3**, robust ESC management is recommended during construction and operation phases to mitigate potential surface water impacts to receiving environment.

Conceptual ESCP drawings for construction phase (**Figure 5 and 6**) and operational phase (**Figure 7 and 8**) have been developed in accordance with *The Blue Book: Vol 2C unsealed roads* (2008 DECC) to provide a conceptual framework for ESC implementation on Bore 8 platform and access track.

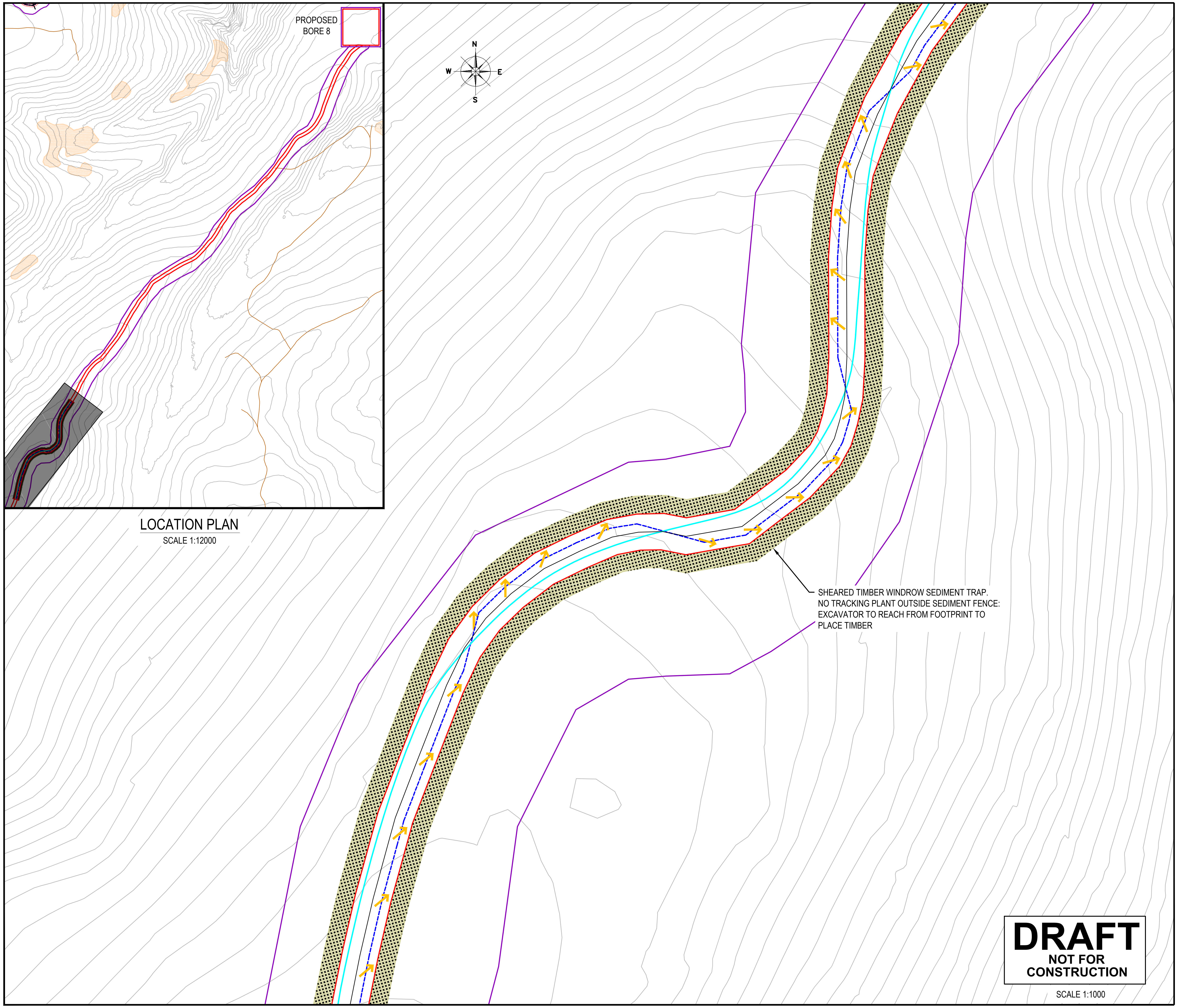
As described in **Section 5.1.5**, this conceptual ESCP is intended as a framework for the development of Progressive ESCPs to be developed by the Principal Contractor for each key stage of construction.

The conceptual ECP recommends management measures to ensure that:

- Vegetated buffers are located downstream of cross banks and mitre drains discharge locations;
- Changes to existing surface water flow regimes are minimised; and
- The likelihood of short or long term impacts to surface water quality is minimised.

The conceptual ESCP describes the minimum ESC measures that should be adopted during construction and operation of the access track; additional controls may be developed during the detailed design phase of the Project.

.



SHEARED TIMBER WINDROW SEDIMENT TRAP.
NO TRACKING PLANT OUTSIDE SEDIMENT FENCE:
EXCAVATOR TO REACH FROM FOOTPRINT TO
PLACE TIMBER

DRAFT
NOT FOR
CONSTRUCTION

SCALE 1:1000

LEGEND

> > > -	DIRTY WATER DIVERSION DRAIN
> > > -	CLEAN WATER DIVERSION DRAIN
→	CLEAN WATER GENERAL FLOW PATH
→	DIRTY WATER GENERAL FLOW PATH
→	GENERAL DIRECTION OF FLOW

TEMPORARY ESC MEASURES

▨	SHEARED TIMBER WINDROW
—	INDICATIVE LOCATION OF SERVICES
- - -	ROAD
—	1m CONTOURS
—	STUDY AREA (OFFSET FOR CLARITY)
—	PROJECT APPLICATION AREA
—	TRACK CENTRELINE

0 20 40m
Scale 1: 1 000

0 200 400m
Scale 1: 12 000

FIGURE 5

CONCEPTUAL ESCP
BORE 8 ACCESS TRACK
CONSTRUCTION PHASE

Project:
Springvale Erosion Sediment Control

Client:
Springvale Colliery

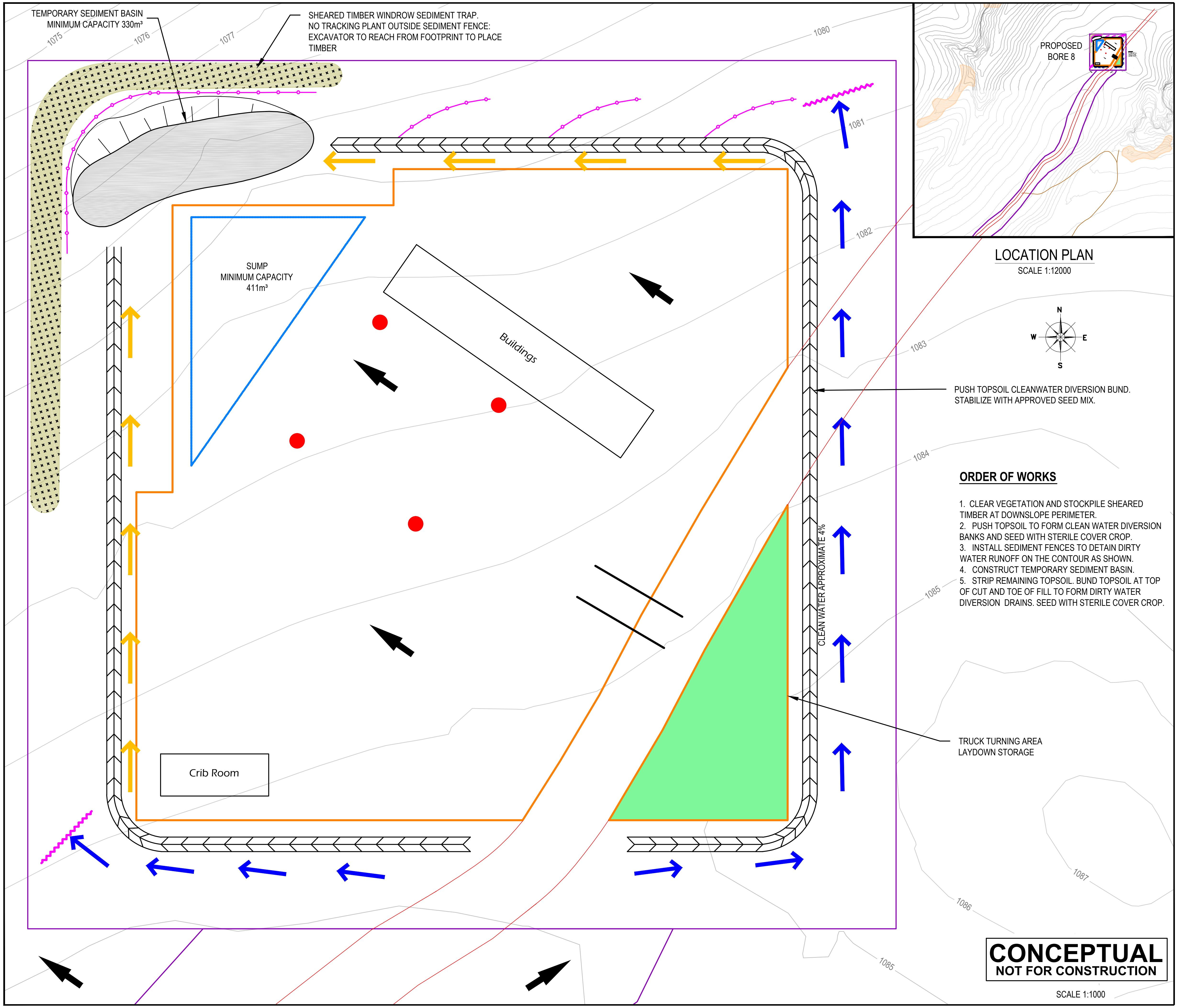
File:
Fg5_CCC15-005_Erosion Sed
Control_120910

Projection:
N/A

Version:	Date:	Author:	Checked:	Approved:
1	13/07/12	MS	CC	CC
2	10/09/12	KC	CC	CC

GSS ENVIRONMENTAL
Environmental, Land and Project
Management Consultants

To be printed A3
V:\CCC15-005\Figures\Final\SWA\Fg5_CCC15-005_Erosion Sed Control_120910.dwg



ORDER OF WORKS

1. CLEAR VEGETATION AND STOCKPILE SHEARED TIMBER AT DOWNSLOPE PERIMETER.
2. PUSH TOPSOIL TO FORM CLEAN WATER DIVERSION BANKS AND SEED WITH STERILE COVER CROP.
3. INSTALL SEDIMENT FENCES TO DETAIN DIRTY WATER RUNOFF ON THE CONTOUR AS SHOWN.
4. CONSTRUCT TEMPORARY SEDIMENT BASIN.
5. STRIP REMAINING TOPSOIL. BUND TOPSOIL AT TOP OF CUT AND TOE OF FILL TO FORM DIRTY WATER DIVERSION DRAINS. SEED WITH STERILE COVER CROP.

CONCEPTUAL
NOT FOR CONSTRUCTION

SCALE 1:1000

LEGEND

—	STUDY AREA
—	1m CONTOURS
➡	GENERAL DIRECTION OF FLOW
⪢	TOPSOIL DIVERSION BUND
→	CLEAN WATER FLOW
→	DIRTY WATER FLOW
▨	SHEARED TIMBER WINDROW
〰	LEVEL SPREADER
—•—	SEDIMENT FENCE

0 10 20m
Scale 1: 500

0 200 400m
Scale 1: 12 000

FIGURE 6

CONCEPTUAL ESCP
BORE 8 PLATFORM
CONSTRUCTION PHASE

Project:
Springvale Surface Water Assessment

Client:
Springvale Colliery

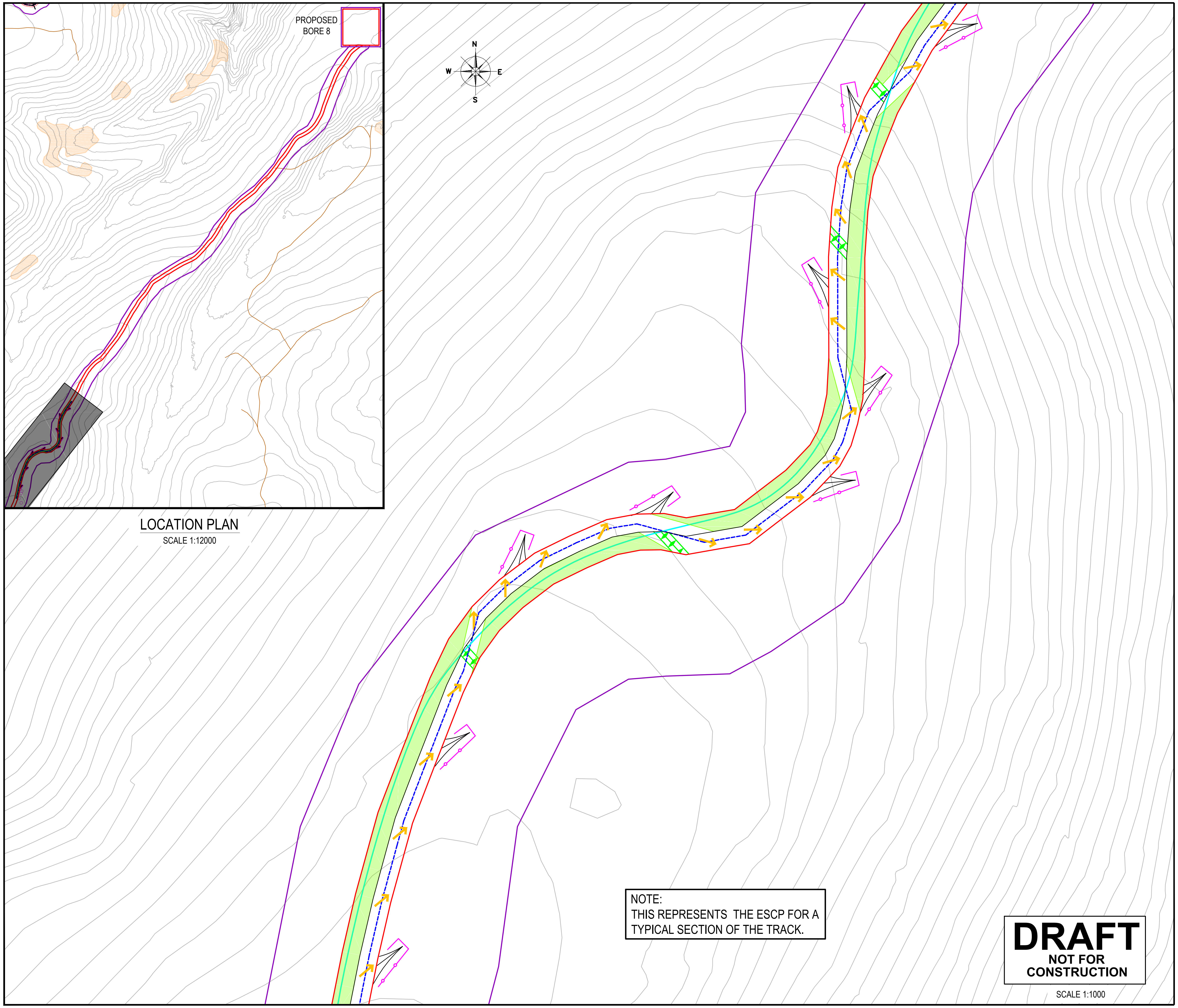
File:
Fg6_CCC15-005_Erosion Sed Control_120910

Projection:
N/A

Version:	Date:	Author:	Checked:	Approved:
1	13/07/12	MS	CC	CC
2	25/07/12	MS	CC	CC
3	08/08/12	MS	CC	CC
4	14/08/12	MS	CC	CC
5	10/09/12	KC	CC	CC

GSS ENVIRONMENTAL
Environmental, Land and Project
Management Consultants

To be printed A3
V:\CCC15-005\Figures\Final\SWA\Fg6_CCC15-005_Erosion Sed Control_120910.dwg



LOCATION PLAN
SCALE 1:12000

NOTE:
THIS REPRESENTS THE ESCP FOR A TYPICAL SECTION OF THE TRACK.

DRAFT
NOT FOR CONSTRUCTION

SCALE 1:1000

LEGEND

> > > -	DIRTY WATER DIVERSION DRAIN
> > > -	CLEAN WATER DIVERSION DRAIN
→	CLEAN WATER GENERAL FLOW PATH
→	DIRTY WATER GENERAL FLOW PATH
→	GENERAL DIRECTION OF FLOW
╪╪╪	CROSSBANK

TEMPORARY ESC MEASURES

-o-o-	SEDIMENT FENCE
▨	SHEARED TIMBER WINDROW
++++++	NO GO ZONE (BARRIER FENCE)
—	INDICATIVE LOCATION OF SERVICES
- - - -	ROAD
🟩	REHABILITATED SERVICES CORRIDOR
—	1m CONTOURS
—	STUDY AREA (OFFSET FOR CLARITY)
—	PROJECT APPLICATION AREA
—	TRACK CENTRELINE

0 20 40m
Scale 1: 1 000

0 200 400m
Scale 1: 12 000

FIGURE 7

CONCEPTUAL ESCP
BORE 8 ACCESS TRACK
OPERATIONAL PHASE

Project:
Springvale Erosion Sediment Control

Client:
Springvale Colliery

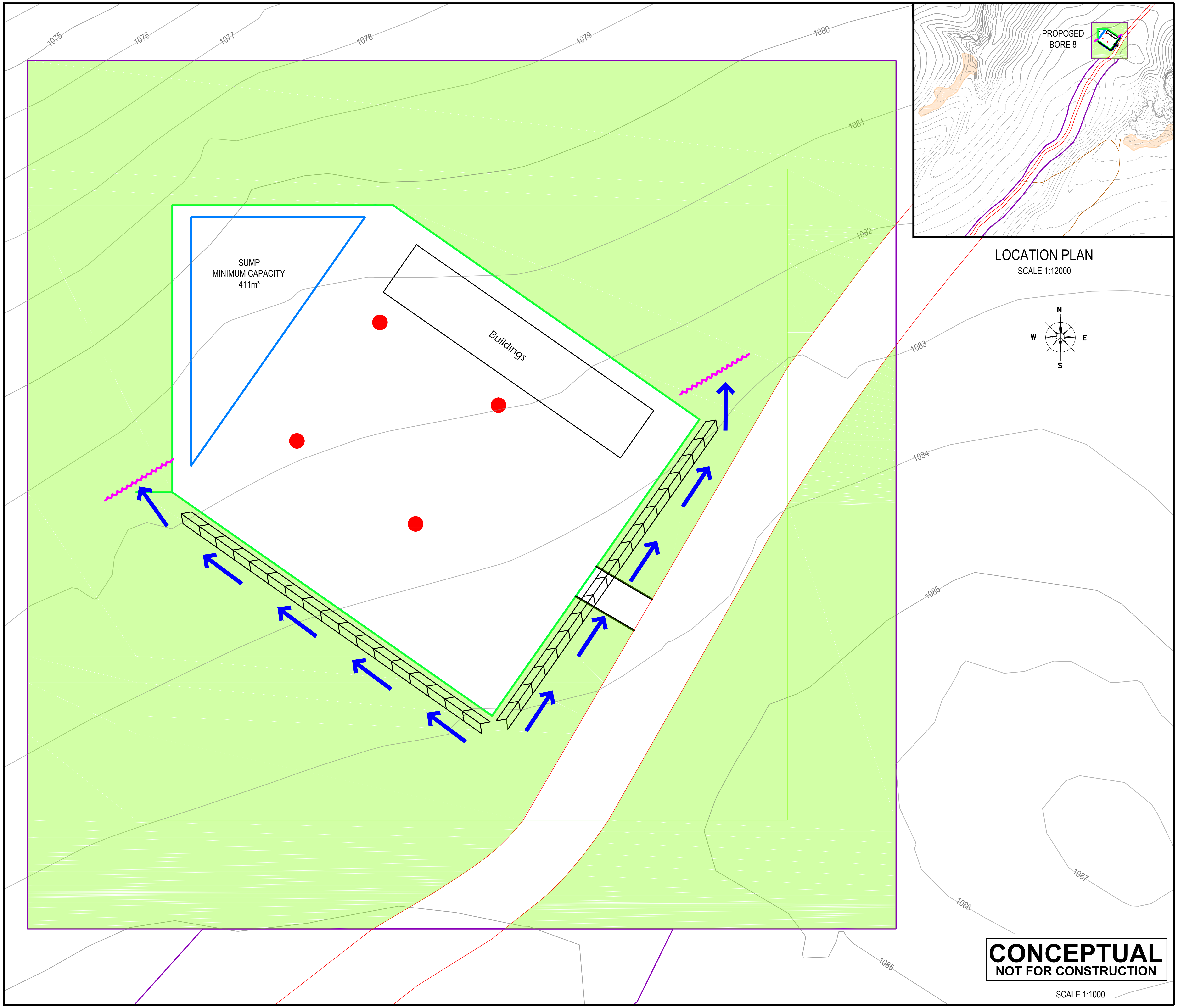
File:
Fg7_CCC15-005_Erosion Sed Control_120910

Projection:
N/A

Version:	Date:	Author:	Checked:	Approved:
1	13/07/12	MS	CC	CC
2	10/09/12	KC	CC	CC

GSS ENVIRONMENTAL
Environmental, Land and Project Management Consultants

To be printed A3
V:\CCC15-005\Figures\Final\SWA\Fg7_CCC15-005_Erosion Sed Control_120910.dwg



LEGEND

- STUDY AREA
- 1m CONTOURS
- ➡ GENERAL DIRECTION OF FLOW
- ⋙ TOPSOIL DIVERSION BUND
- → CLEAN WATER FLOW
- → DIRTY WATER FLOW
- 🟩 PARTIALLY REHABILITATED CONSTRUCTION FOOTPRINT
- 〰 LEVEL SPREADER

0 10 20m
Scale 1: 500

0 200 400m
Scale 1: 12 000

FIGURE 8

CONCEPTUAL ESCP
BORE 8 PLATFORM
OPERATION PHASE

Project:
Springvale Erosion Sediment Control

Client:
Springvale Colliery

File:
Fg8_CCC15-005_Erosion Sed Control_120910

Projection:
N/A

Version:	Date:	Author:	Checked:	Approved:
1	13/07/12	MS	CC	CC
2	08/08/12	MS	CC	CC
3	14/08/12	MS	CC	CC
4	10/09/12	KC	CC	CC

GSS ENVIRONMENTAL
Environmental, Land and Project
Management Consultants

To be printed A3
V:\CCC15-005\Figures\Final\SWA\Fg8_CCC15-005_Erosion Sed Control_120910.dwg

5.5 Inspections and Maintenance

Regular general inspections of the site should be undertaken to ensure that all the environmental controls are functioning effectively. These inspections should be undertaken according to an inspection schedule to be developed by Springvale and the Principal contractor, and after significant rainfall events. Any evidence of significant erosion or maintenance issues should be noted and remedial works undertaken as required.

Where significant erosion is observed, additional erosion controls should be considered (e.g. establishment of vegetation cover, armouring channel surfaces and scour protection at and discharge locations) and ESCPs amended. Specific inspection and maintenance requirements are described below.

5.5.1 Construction Sediment basins

Visual inspections of the sediment basins following runoff generating rainfall events should be undertaken to determine water quality prior to all discharges (refer to **Section 5.1.7.1**) and to determine if any maintenance is required.

When the design capacity of a sediment basin has been reduced by more than 20% through build-up of sediment, then the basin should be de-silted. Any removed sediment should be placed in an area such that it will not easily washed directly back into the basin.

5.5.2 Drainage Channels and Clean Water Diversions

Any signs of erosion along the length of the drains should be noted and remedial works undertaken as required. Where significant erosion is observed, additional ESC measures should be employed e.g. establishment of vegetation cover, use of temporary ESC measures until the vegetation is established, scour protection (rock-armouring or erosion blanket) of the channel surface.

5.5.3 Temporary ESC Structures

Regular visual checks will be made of any temporary ESC measures such as sediment filter fences, sandbag check dams and bunds, etc. to ensure they are functioning adequately and repaired where required.

5.5.4 Rehabilitated Areas

Regular visual inspections of the water management structures should be undertaken monthly. This highlights any maintenance that needs to be undertaken to ensure water is safely conveyed from the areas and that a stable landform is being created. The inspections should also include assessing vegetation cover to ensure that erosion potential is minimised. Where required, bald or patchy areas should be either re-ripped and seeded, or have a maintenance application of fertiliser to encourage growth.

5.6 Additional Water Management Considerations

5.6.1 Sewerage

Portable ablutions facilities are proposed to be located within construction amenity areas during construction and at Borehole 8 during the operations phase. Wastes from portable ablutions facilities should be disposed of offsite at a suitable facility by suitably licenced contractors.

5.6.2 Potable Water Supply

Potable water requirements of the proposed Project are expected to be minimal and would be managed in accordance with Springvale's existing water use policies and procedures. Potable and ablutions water would be supplied to the site via water tanker and stored in tanks for use.

6.0 CONCLUSION

Soil erosion and sedimentation resulting from disturbance during construction, as well as changes to surface water hydrology, present the most significant risks to surface water quality and the general receiving environment from the Project. The key objective of this SWA is to therefore assess the potential impacts of the Project on the downstream receiving environment and recommend management measures to minimise potential impacts. Accordingly, a number of surface water management measures are recommended.

No THPSS communities occur within the Study Area for the Project. Furthermore, the nearest occurrence of THPSS that has the potential to receive runoff from the Project is located approximately 100 m from the Study Area, and as such surface water related impacts as a result of the Project are not anticipated upon these communities. To ensure the risk of impact is further minimised however, robust erosion and sediment control measures are recommended.

Recommendations in this SWA include a conceptual ESCP (**Figures 5** to **8**) that provides a framework for managing surface water in the construction and operation phases of the Project. Key principles of the conceptual ESCP are to minimise erosion and retain sediment at the source, and to minimise short and long term changes to surface water hydrology.

Provided all surface water management and mitigation measures described in this SWA are implemented and maintained, the Project is anticipated to have an insignificant impact on surface water quality in the Study Area and the downstream receiving environment.

7.0 REFERENCES

Bureau of Meteorology. (2012). Monthly Climate Statistics – Newnes State Forest.

DECC. (2008). Managing Urban Stormwater: Soils and Construction, Vol. 2A installation of services.

DECC. (2008). Managing Urban Stormwater: Soils and Construction, Vol. 2C unsealed roads.

Environmental Protection Authority of New South Wales. (2011). Environment Protection License 3607.

Fairfull, S. and Witheridge, G. (2003) Why do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings. NSW Fisheries, Cronulla.

GSS Environmental. (2012). Soil Survey and Land Capability Study of the Proposed Bore 7 & 8 installation and increased ROM production.

Hawkesbury Nepean Catchment Management Authority. (2008). Hawkesbury-Nepean Catchment Action Plan 2007-2016.

King, D.P. 1992. Soil Landscapes of the Walerawang 1:100 000 Sheet Map. Department of Conservation and Land Management NSW.

Landcom. (2004). Managing Urban Stormwater: Soils and Construction - Volume 1, 4th Edition, (the Blue Book Volume 1).

RWC and GSSE. (2011). Water Management Plan for the Springvale Colliery.

RPS, (2012). Flora and Fauna Assessment, Proposed Surface Mine Dewatering Facilities Bores 7 and 8 Springvale Mine

Sinclair Knight. 1992. Springvale Coal Project Environmental Impact Statement.