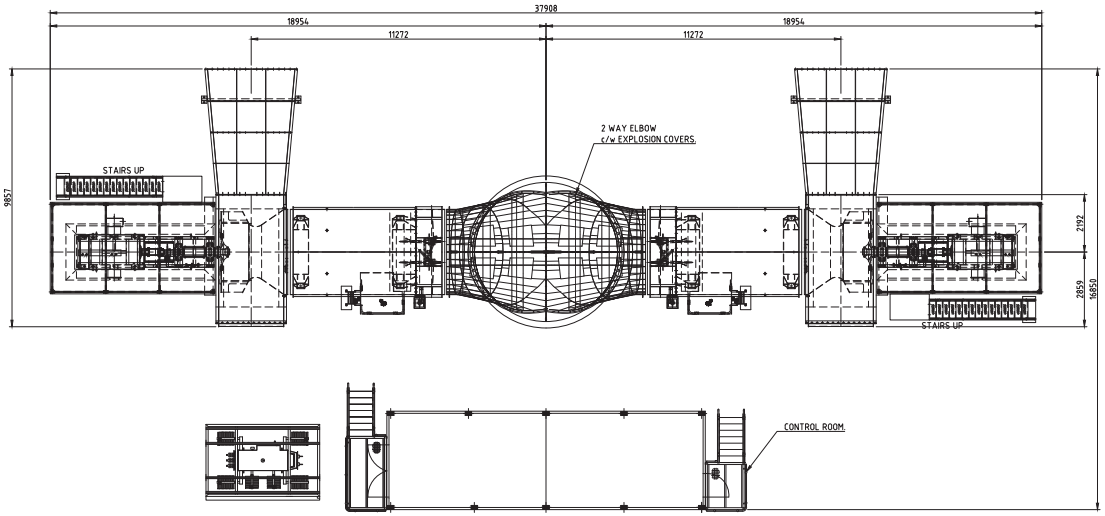
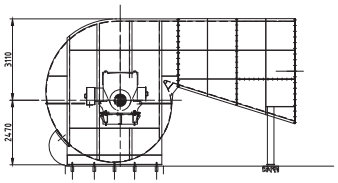
Indicative Fan Specifications

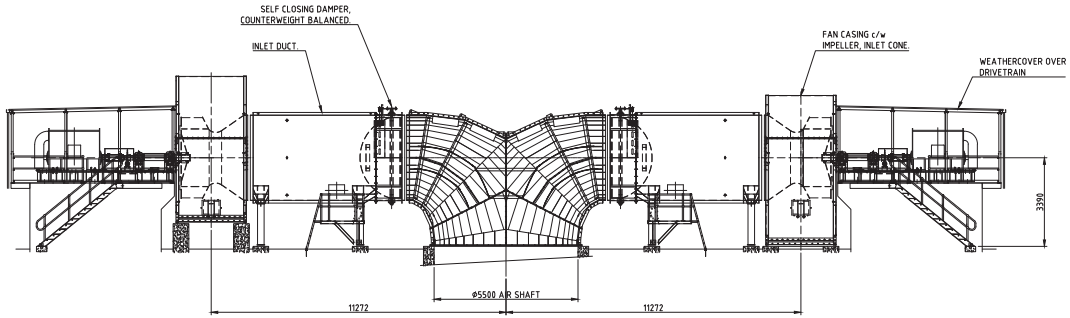
APPENDIX 1

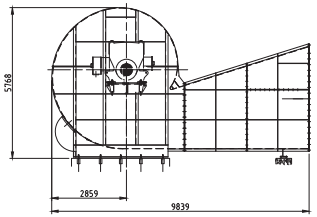
PRELIMINARY DRAWING
NOT TO BE USED FOR CONSTRUCTION PURPOSES





OVERCAST FAN - VIEW ON FAN 1.





UNDERCAST FAN - VIEW ON FAN 2.

PRELIMINARY DRAWING
NOT TO BE USED FOR CONSTRUCTION PURPOSES

REV No	ZONE	DATE	DETAILS	BY
1		14/6/11	GENERAL UPDATE, DRAWN TO SCALE	C.C.

PAINTING AND SURFACE TREATMENT
OTHER THAN SHOWN SEPARATELY PAINTING SURFACE TREATMENT IS :
REFER TO COATING CARD
"INTERNAL" MEANS ALL PARTS IN THE GAS STREAM

REFERENCE LIST TO BE USED IN CONJUNCTION WITH THIS DRAWING

DRAWING No	TITLE	DRAWING No	TITLE

MATERIALS AND WORKSHOP
MATERIALS SHALL BE NEW, TO SPECIFICATION AND IN GOOD CONDITION.
WORKMANSHIP SHALL BE FIRST CLASS EMPLOYING "STATE OF THE ART" EQUIPMENT AND PROCESSES.
ALL MATERIALS AND WORKMANSHIP SHALL CONFORM TO RELEVANT AUSTRALIAN STANDARDS EXCEPT WHERE SHOWN SEPERATELY.
3RD ANGLE PROJECTION UNLESS SHOWN OTHERWISE

TOLERANCES EXCEPT SHOWN SEPARATELY
MACHINED SURFACES: DECIMALS ± 0.1 MM; INTEGERS ± 0.5 MM; SURFACES 1.6 OR N7; FINISH SHAFTS OTHER 3.2 OR N8
FABRICATIONS: HOLE CENTERS UP TO 1000MM ± 2 MM; ABOVE 1000 MM ± 3 MM; OTHER DIMENSIONS UP TO 1000 MM ± 2 MM; ABOVE 1000 MM ± 3 MM
TOLERANCES SHALL BE NOM CUMULATIVE

APPROVED	CHECKED
DRAWN C.C.	SCALE 1:100
DATE 30/5/11	

TITLE
PRELIMINARY LAYOUT
DY 306 FANS
TWIN PA FANS

CUST. REF.
OUR REF.
SHEET 1 OF 1
FlaktWoods
FlaktWoods Fans (Aust.) Pty.Ltd.
A1
REV. 1
DWG. No. DY-306-12589

Environmental Risk Assessment

APPENDIX 2

Wells Environmental Services

ACOL

5.5m. Diameter Shaft and Fans Installation

Environmental Risk Assessment

1 PURPOSE & SCOPE

The purpose of the risk assessment is to identify the risks, and the controls required to be put in place, to enable the installation of a 5.5m diameter upcast ventilation shaft, fans and associated infrastructure. The scope was limited to environmental and community risks, applicable to the built and natural environment (onsite and offsite), and including public safety (but not ACOL OHS risk or operational asset damage).

2 BACKGROUND

ACOL proposes to construct a new 5.5 metre diameter upcast ventilation shaft and install associated extraction fans and ancillary surface infrastructure. This project enables the establishment of sufficient ventilation capacity for the ACOL to safely continue mining operations for a further 12 to 14 years.

The proposed site for the planned new main ventilation shaft and fans is located on ACOL owned property, on the surface above the start of longwall block one.

The total mine airflow quantity provided by the existing two main fans and backroad supplementary fan combination is estimated to be limited to a maximum of 190m^3/s. However, expert consultation has confirmed a requirement to upgrade the mine's ventilation system to provide between 290m^3/s and 365m^3/s total volumetric capacity, to safely meet future demands.

To meet these future requirements, a 5.5 metre diameter circular ventilation shaft will be drilled using raise-bore methodology. The proposed shaft is to be constructed from the surface to the Upper Liddell seam, a depth of approximately 90 metres, using mechanized drilling and lining methodology.

The 5.5m diameter ventilation shaft will be raise bored to the surface from existing mine workings inside the ULD seam, from a depth of approximately 90 metres. On completion, two new exhausting fans will be placed over the main ventilation shaft, each with an evasé (cone-shaped discharge plenum) fitted for noise reduction.

The boring machine is set up on the surface and a pilot hole drilled to the level of the Upper Liddell seam. A reamer head is then attached to the end of a drill string and, with the rotational power provided to the drill rods by the raise bore machine, the machine then draws the reamer up along the line of the pilot hole.

3 ASSESSMENT STEPS

The risk assessment was a team based methodology, making use of an existing ACOL / Wells Environmental Services template, which guided the following steps –

1. Identification of environmental 'aspect' categories (drawn from legislative requirements, existing permits and 'typical' mine-site operational Environmental Management areas;
2. Specification of possible 'impacts' (risks) applicable to each aspect (in the context of this project only);
3. Identification of the project stage(s) the impact applied to (typically 'operations', 'construction' or both);
4. Control measures intended to be applied;
5. Risk ranking in accordance with the ACOL risk matrix; and
6. Notation of actions to implement, improve or monitor risk controls, to ensure risks were (or would become after implementation) acceptable to ACOL.

4 KEY ASSUMPTIONS, LIMITATIONS & PARAMETERS

The following key points underpinned the risk assessment –

1. ACOL has existing systems for the management of environmental risks, and also has the capacity and resources to make changes to these systems if this need was identified in the risk assessment;
2. Contractors and other project participants have obligations to conduct their own risk assessment(s) prior to commencing project work.

5 PARTICIPANTS

The following personnel participated in the risk assessment –

Person	Company	Specialisation
Robert Holmes	ACOL	Contract Ventilation Officer
John Gruhn	ACOL	Mining Engineer
Phil Fletcher	ACOL	Mining Engineer
Michael Moore	ACOL	Approvals management
Cassandra Ferguson	ACOL	Environmental Management
James Grebert	ACOL	Ventilation Officer
Alan Wells	Wells Environmental Services	Project – assistance
Neil Pennington	Spectrum Acoustics	Acoustics
David Lowe	SKM	Traffic Management
John-Paul King	Pacific Environmental Associates	Ecology
Liz Wyatt	Insite Archaeology	Indigenous Archaeology
Gabi Parke	AECOM	Visual amenity

6 RISK MATRIX

Risk analysis (R) is undertaken by assessing the consequence severity level (C) of an impact against the predicted frequency or probability (P) of the event occurring. For example, an issue with a high probability and high consequence severity has a High Risk while a low probability and low consequence severity has low or negligible Risk.

Ashton Coal RISK MATRIX

Loss Type	Hazard Effect/ Consequence 1 Insignificant	2 Minor	3 Moderate	4 Major	5 Catastrophic
(P) Harm to People	Slight injury or health effects – first aid/ minor medical treatment level	Minor injury or health effects – restricted work or minor lost workday case	Serious bodily injury or health effects – major lost workday case/ permanent disability	Single fatality, permanent total disabilities.	Multiple fatalities
(E) Environmental Impact	**Environmental nuisance** – unreasonable interference with and environmental value or contamination or pollution with a cost less than $1,000	**Minor environmental harm** – not trivial or negligible, potential health risks for community or pollution or contamination with costs between $1,000 & $5,000	**Serious environmental harm** – high local impact or impacts to and area(s) of local conservation value, actual community health impacts or significance or pollution or contamination with a costs between $5k and $50k	**Major environmental harm** – high impact in district or actual impacts to an area of regional conservation significance, health statistics in community alter as a result of this incident or pollution or contamination with costs between $50k & $500k	**Extreme environmental harm** – irreversible harm to environmental values of extreme and widespread areas, impacts to conservation areas or national significance, community fatalities or pollution or contamination with costs greater than $500k
(A) Asset Damage & Other Consequential Losses	Slight damage <$0.1M or < 1 shift disruption to operation	Minor damage $0.1M to$1.0M, or 1 Shift – 1 day disruption to operation	Local damage $1.0M to$5.0M, 1day to 1week - disruption to operation	Major damage $5.0M to$30.0M, 1week – 1 month -Partial loss of operation	Extreme damage > $30.0M, > 1 month - Substantial or total loss of operation
(R) Impact on Reputation	Slight impact – public awareness may exist but no public concern	Limited impact – some local public concern	Considerable impact – regional public concern	National impact – national public concern	International impact – international public attention

Likelihood	Likelihood Examples (use only as a guide)	Risk Rating				
A (Almost certain)	Likely that the unwanted event could occur several times per year at this location	15 (M)	10 (H)	6 (H)	3 (Ex)	1 (Ex)
B (Likely)	Likely that the unwanted event could occur several times per year in the Australian mining industry; or could happen annually	19 (M)	14 (M)	9 (H)	4 (Ex)	2 (Ex)
C (Possible)	The unwanted event could well have occurred in the Australian mining industry at some time in the past 10 years	22 (L)	18 (M)	13 (H)	8 (H)	5 (Ex)
D (Unlikely)	The unwanted event has happened in the Australian mining industry at some time; or could happen in 50 years	24 (L)	21 (L)	17 (M)	12 (H)	7 (H)
F (Rare)	The unwanted event has never been known to occur in the Australian mining industry; or is highly unlikely that it could ever occur	25 (L)	23 (L)	20 (M)	16 (M)	11 (H)

Risk Rating	Risk Level	Guidelines for Risk Control Barriers
1 to 5	(E) – Extreme	Immediate intervention required from Senior Management, do not proceed with activity. *
6 to 13	(H) – High	Imperative to eliminate or reduce risk by introduction of controls, do not proceed with activity until reviewed by Senior Management *
14 to 20	(M) – Medium	Corrective action to be determined, do not proceed without authorisation from Shift Coordinator *
21 to 25	(L) – Low	Safe to continue activity once hazards minimised *

Catastrophic Risks

Issue	Hazard Type (Environment and Community)	Applies to... Construction and/or Operations	Controls / Measures during design and assessment	Risk Rating *C= Consequence* *P= Probability* *R= Risk Rating* *(See Table above)*		
				C	P	R
Aboriginal Heritage						
Impacts to known items of Aboriginal cultural heritage significance.	Environmental	Construction Only	Avoidance of sites identified in previous environmental assessment. Traffic management protocols – staying on tracks (and demarcation of tracks/sites (e.g. barrier tape). Archaeological inductions for all work crews (project specific) – emphasising 'no-go' zones. Implementation of AHIP #3436 Implementation of ACOL Aboriginal Cultural Heritage Management Plan - Permit to Disturb.	3 D		17(M)
Impacts to previously unknown Aboriginal artefacts or similar from earthworks and/or traffic movements.	Environmental	Construction Only	Surveillance during construction stage by Aboriginal representatives. Existing Management Plans for artefact discovery/preservation, heritage management. Permit to Disturb.	3 D		17(M)
Inability to upgrade tracks pending Aboriginal heritage processes / salvage (delay risk)	Environmental Cons	truction & Operations	Consultation process. Permit to Disturb. Studies if/as required.	2 C		18(M)
Acoustics						
Acoustic impacts from construction work.	Environmental	Construction Only	Distance from residential properties and existing background noise. Day time work only. Contingency – bunding if/as required.	2 D		21(L)

Issue	Hazard Type (Environment and Community)	Applies to… Construction and/or Operations	Controls / Measures during design and assessment	Risk Rating *C= Consequence P= Probability R= Risk Rating (See Table above)*		
				C	P	R
Acoustic impacts from vent fans during operation equipment.	Environmental	Operations Only	Low density of residential receptors. Use of acoustical screens where required. Noise monitoring. Design of fans to minimise noise (horizontal orientation etc.). Site cut in 3.5m.	2 D		21(L)
Air Quality						
Dust from construction work (civils & traffic).	Environmental	Construction Only	Use of water truck on a needs basis. No dust from drilling.	1 D		24(L)
Particulate emissions (dust & diesel).	Environmental	Operations Only	Distance from residential properties & low density. Low sulphur fuels.	2 D		21(L)
Diesel back-up generator for fans.	Environmental	Operations Only	Fit-for Purpose equipment. Entry-to-Site requirements. Maintenance regime.	2 D		21(L)
Community						
Community opposition to the Project (including due to lack of knowledge / awareness / understanding).	Community Cons	truction and Operations	Consultation with the local community through the Community Consultation Committee (CCC) & community newsletter.	2 D		21(L)
Active objection / protest / disruption (in absence of damage / vandalism).	Community Cons	truction & Operations	On private land. Located away from main roads. Community complaints arrangements. Not high profile location. Continued use of CCTV.	2 D		21(L)
Ecology						

Issue	Hazard Type (Environment and Community)	Applies to... Construction and/or Operations	Controls / Measures during design and assessment	Risk Rating *C= Consequence* *P= Probability* *R= Risk Rating* *(See Table above)*		
				C	P	R
Proposed areas of disturbance for vents and access roads etc. which may contain threatened flora & fauna.	Environmental Cons	truction & Operations	Previous Environmental Assessments on the area. No clearing of trees required. Areas are included in monitoring surveys for coming year. Impact assessment report being prepared for inclusion.	1 E		25(L)
Greenhouse Gas						
No net increase in emissions during operations. (Minor increase in construction).	Environmental	Operations Only	Potential for treatment of VAM gas.	1	D	24(L)
Ground Water						
Interaction with groundwater.	Environmental	Construction & Operations	Shaft location away from known aquifers. Ground Water Management Plan. Water licences to manage U/G water make. No use of chemicals in drilling / boring.	2 D		21(L)
Hydrocarbons						
Diesel (20k/l & 2k/l) & oils storage / use.	Environment	Construction & Operations	Daily inspection. Filling Procedure. Rapid-fill closed system. Spill kit onsite. FFP vessels, incl. self bunding pods. Environmental Standards & procedures.	1 D		24(L)
Socio-Economic						
Failure of Approval resulting in lower production and shorter life of mine and loss of jobs.	Community Cons	truction & Operations	Development Approval Process. Demonstrated safety benefit. Improved business security and associated life of mine economics. Risk management principles applied – due diligence & sound project management.	5 D		7(H)
Soils						

Issue	Hazard Type (Environment and Community)	Applies to… Construction and/or Operations	Controls / Measures during design and assessment	Risk Rating *C= Consequence* *P= Probability* *R= Risk Rating* *(See Table above)*		
				C	P	R
Erosion of sediment from disturbed areas.	Environmental	Construction & Operations	Minimum area disturbed. Site selection process & experienced personnel undertaking earthworks. Sediment control fencing where required Reuse of topsoil in site rehabilitation elsewhere. Utilisation of existing access roads.	2 D		21(L)
Soil / material removed for site levelling.	Environmental	Construction Only	Several options for reuse onsite.	1	D	24(L)
Surface Water						
Rainfall impact on construction (loss of time & sediment control).	Environmental	Construction Only	Erosion Sediment Control Management Plan (existing). Site Water Management Plan (catchment / drainage design).	2 D		21(L)
Management of water make from shaft / around site.	Environmental	Operations Only	Drainage design in line with site requirements / existing plans.	2	D	21(L)
Theft / trespass						
Entry with intent of theft or vandalism (injury to intruder – fire, falls from height, high pressure injection).	Community Cons	truction & Operations	Locked compound. Signage. Daily inspections. Private land (majority sites ACOL owned). Not readily visible.	2 D		21(L)
Traffic and Transport						
Impacts to traffic on New England Highway (accident involving public vehicle on publically accessible).	Community Cons	truction & Operations	Use of approved access point. Traffic management plan. D&A testing. Site Inductions.	4 D		12(H)
Cumulative traffic impacts owing to neighbouring projects (cumulative effect) – delay & disruption.	Environmental	Construction Only	Traffic management plan.	2	E	23(L)

Issue	Hazard Type (Environment and Community)	Applies to… Construction and/or Operations	Controls / Measures during design and assessment	Risk Rating *C= Consequence* *P= Probability* *R= Risk Rating* *(See Table above)*		
				C	P	R
Use (legally or otherwise) of access tracks by the public – accident.	Community Cons	truction and Operations	Signage (existing). Compound fencing. Right-of-Way protocols. Communication with landholders.	3 E		20(M)
Utilities (rail/road/power/ communications						
Contact with buried services (e.g. fibre optics). Telephone line known to exist in area.	Community	Construction Only	Permit to Dig systems. Service plans available.	1 E		25(L)
Power lines – clearances – easement gets in way.	Community	Construction Only	Flexibility of location. All infrastructure clear of easement. Service plans available.	2 D		21(L)
Visuals						
Impacts from fans and associated infrastructure on the visual landscape / amenity (Hwy, realigned Lamington Road).	Environment Cons	truction & Operations	Minimal visual profile. Locations away from residential areas. Tree screen proposed.	1 D		24(L)
Lighting impacts from lights at the fans during operation.	Environment	Operations Only	Minimal lighting.	2	D	21(L)
Waste						
Inadequate disposal options of cuttings while drilling pilot bore hole.	Environment	Construction Only	All cuttings into sedimentation dam / sump & removed from site. Procedures and Standards for drilling (existing). Raise bore likely option (most cuttings then U/G).	2 D		21(L)
END						

Noise Impact Assessment

APPENDIX 3

Wells Environmental Services

Project No: 11645

Noise Impact Assessment
Ashton Upcast Ventilation Shaft and Fans
Camberwell, NSW

Prepared for:

Wells Environmental Services
PO Box 205
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Review:

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December 2011

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EXECUTIVE SUMMARY

A Noise Impact Assessment (NIA) has been prepared for the proposed construction and operation of a ventilation shaft and fans with associated access track and mine service shafts (drop-holes) at the Ashton Coal Project (ACP) near Camberwell, NSW.

The assessment is based on or refers to the Office of Environment and Heritage (OEH, formerly DECCW) *NSW Industrial Noise Policy* (2000). A brief summary of essential data, results and recommendations arising from this assessment is presented below.

Operational Noise Criteria

Construction and operation of the project will be required to satisfy the existing noise criteria, when considered cumulatively with all other ACOL noise emissions.

Existing noise criteria are reproduced below.

Location	Day	Evening	Night	
	$L_{Aeq(15min)}$	$L_{Aeq(15min)}$	$L_{Aeq(15min)}$	$L_{A1(15min)}$
Any residence not owned by the Applicant or not sub ject to an agreement between the Applicant and the residence owner as to an alternative noise limit.	38 38		36	46

Summary of Findings

The assessment has found that noise emissions from the raise-bore drilling of the 5.5m diameter ventilation shaft and operation of the ventilation fans would be sufficiently below the noise criteria that they would not contribute to any exceedance of the noise criteria.

During the brief period of drilling the ventilation shaft pilot hole, during daytime only, moderate (up to 3 dB) exceedances of the operational noise criterion have been predicted under worst case meteorological conditions. The following recommendation has been made to achieve noise levels sufficiently below the noise criterion that this activity would not contribute to any criterion exceedance.

> **Recommendation 1.**
> Site sheds or shipping containers should be placed east of the drill with the long side aligned on a north-south direction to act as a noise barrier to receivers in Camberwell village. Noise monitoring should be conducted during this activity to confirm compliance with the noise criterion.

Sleep Disturbance

No sleep disturbance impacts have been predicted at any receiver. Night time maximum noise levels 15 dB or more below the criterion have been predicted.

1.0 INTRODUCTION

1.1 The Proposal

Ashton Coal Operation Limited (ACOL) seeks project approval to install and operate a new upcast ventilation shaft and fans to meet future ventilation demands for their underground mining operation. The project will also require construction of access tracks and two mine service drop-holes for ballast and concrete. A detailed description is contained in the main volume of the Environmental Assessment (EA). Accordingly, a noise impact assessment (NIA) is required for inclusion with the (EA). This NIA has been conducted in accordance with relevant NSW Office of Heritage and Environment (OEH) policies and guidelines.

The project will comprise:

- Construction of access tracks;
- Drilling of a pilot hole to a depth of approximately 90m;
- Drilling a 5.5m diameter ventilation shaft by raise-bore methodology;
- Drilling of two 300mm diameter drop-holes; and
- Installation and operation of two exhaust fans with evasé (cone-shaped discharge plenum) fitted for noise reduction.

1.2 Study Area

The Ashton Coal Project (ACP) is located 14 km northwest of Singleton in then Hunter Valley of NSW within the Hunter coalfields of the Sydney Basin. The proposed ventilation fan site is located approximately 800m southwest of the village of Camberwell, on the southern side of the New England Highway. The locations of the ACP and the ventilation fan site are illustrated in **Figure 1** (at the end of this report).

1.3 Surrounding Land Uses and Receivers

The village of Camberwell is located approximately 880m north east of the site. Given the localised position of the vent fan site, the nearest residences in Camberwell village are considered to have the greatest potential for noise impacts from the project. Representative non-mine related receivers considered in this assessment are listed in **Table 1** below and illustrated in **Figure 2**.

TABLE 1
Non-mine related receivers considered in this assessment.

Receiver	Owner / Description
35	De Jong, Meindert & Thelma Eileen
34	Oloffson, Torbjorn Anders and Diedre Ella
23	Lopes, Valda Kim
18	Turner, Sandra Phyllis
117	McInerney, John Charles and Judith

Figure 1. Ventilation Fan Site

Figure 2. Assessed Receiver Locations

2.0 THE EXISTING ENVIRONMENT

The existing meteorological and acoustic environments were studied and reported as part of the recent South East Open Cut (SEOC) EA. Meteorological data relevant to the current study are summarised below.

2.1 Meteorology

2.1.1 Wind Speed and Direction

Winds are an assessable feature of an area if the sum of wind vector components up to 3 m/s from a given direction occurs for more than 30%

of the time during the day, evening or night periods in any given season. Analysis of winds for the SEOC noise assessment did not separate the day, evening and night periods so any assessable wind is assumed to occur at all times of the day during the relevant season(s), as a worst case.

Wind roses were analysed as part of the SEOC project. Results of the analysis are summarised in **Table 2** with assessable winds (>30% occurrence of vector components 0.5-3 m/s) indicated in bold type. Wind directions selected for noise modelling are shaded grey.

TABLE 2
Summary of wind vector components from 0.5 m/s to 3 m/s.

Direction	SEASON			
	Summer	Autumn	Winter	Spring
N	5.91% 20.30	%	30.10%	17.20%
NNE	17.31% 22.70	%	10.60%	18.00%
NE	44.77%	31.30%	12.10%	33.50%
ENE	53.65%	43.40%	21.10%	41.40%
E	41.86%	43.00%	21.20%	38.00%
ESE	43.87%	43.30%	21.70%	38.30%
SE	47.85%	44.30%	23.60%	40.40%
SSE	57.30%	47.00%	26.80%	45.50%
S	48.55%	38.90%	28.70%	42.00%
SSW	19.00% 27.40	%	23.40%	25.30%
SW	7.40% 24.70	%	34.90%	21.60%
WSW	8.00% 26.80	%	38.40%	24.10%
W	6.97% 20.70	%	31.20%	21.00%
WNW	6.06% 21.90	%	25.10%	18.70%
NW	5.65% 21.80	%	24.90%	18.40%
NNW	5.67% 24.00	%	29.30%	19.00%
Calms	8.50% 14.50	%	7.80%	6.90%

Point source modelling was conducted and it was found that winds from the west are worst case with respect to receivers in Table 1.

2.1.2 Temperature Inversions

A temperature inversion study was conducted by Spectrum Acoustics on the ACP site during August/September 2006, with five Gemini data loggers placed at various locations on the site and in Camberwell village to cover a total altitude separation of 79m. The tenth percentile inversion strength was found to be 4.7^0C/100m. Since the construction (shaft drilling) stage of the project will occur only during daytime hours, this inversion strength was included in noise modelling for the operating ventilation fans only.

3.0 NOISE CRITERIA AND PREDICTED IMPACTS

3.1 Existing Noise Criteria

The proposed vent fan construction and operation will be required to satisfy the existing noise criteria, when considered cumulatively with all other ACOL noise emissions.

Existing noise criteria are reproduced below.

Location	Day	Evening	Night	
	$L_{Aeq(15min)}$	$L_{Aeq(15min)}$	$L_{Aeq(15min)}$	$L_{A1(15min)}$
Any residence not owned by the Applicant or not sub ject to an agreement between the Applicant and the residence owner as to an alternative noise limit.	38 38		36	46

3.2 Noise Impact Assessment Procedure

The assessment of noise emissions was conducted using RTA Technology's Environmental Noise Model (ENM v3.06). Major noise producing items were modelled as point sources and noise contours were generated for the surrounding area. Point calculations were performed for the receivers in Table 1.

3.2.1 Noise Sources

Sound power levels of operational noise sources used in the modelling are shown below in **Table 3**.

TABLE 3
Modelled noise source sound power levels.

Noise source	Sound power level, dB(A)		Source Height, m
	$L_{eq(15\ min)}$	L_{max}	
Pilot hole drill (370mm diam.)[1] 114		N/A	2
Raise-bore drill (5.5m diam.)[2] 97		N/A	2
Ventilation Fans (with evase)	95	97	2
Dam / access road construction[3] 108		N/A	3

[1] Same power adopted for 300mm drop-holes.
[2] Noise data supplied by ACOL.
[3] Combined small dozer, excavator, grader, tip-truck, water cart as measured at another site.

3.2.2 Modelled Scenarios

Noise modelling was conducted for the following adverse atmospheric conditions:

- *Adverse winds* – Air temperature 10^0C, 70% RH, 3m/s wind from West; and

- *Inversion* – Air temperature 5^{0}C, 85% RH, +4.7^{o}C/100m vertical temperature gradient (vent fans only).

Noise models were generated for the following scenarios using the Environmental Noise Model (ENM v3.06).

Scenario 1 – Pilot hole and drop-hole drilling and dam construction* (daytime only).

Scenario 2 – Raise-bore reaming of the shaft (daytime only).

Scenario 3 – Operation of vent fans (24-hour) and occasional vehicle movements associated with the drop-holes#.

* Given the proximity of sources to receivers and the dominance of the drill, the combined activity of pilot hole or drop-hole drilling and dam construction will be the worst case construction scenario.
# Activities associated with service drop-holes will occur during daytime only.

3.3 Predicted Noise Levels

Predicted noise levels using the ENM point calculation mode are presented below for the modelled operational and meteorological scenarios.

3.3.1 Pilot Hole / Drop-Hole Drilling

Predicted noise levels for Scenario 1 (drop-hole or pilot hole drilling) under worst case conditions (West wind) are summarised in **Table 4**. .

TABLE 4
Predicted Scenario 1 intrusive noise levels.

Receiver	Predicted $L_{Aeq(15min)}$	Criterion
35	40	38
34	40	38
23	39	38
18	40	38
117	37	38

3.3.2 Discussion of Scenario 1 Results

The above results show that noise levels from the drill used to form the drop-holes / pilot hole may exceed the site noise criterion by up to 2 dB in the absence of any noise control. It is noted that these smaller diameter holes would be drilled during daytime only and would be completed within a few days. Notwithstanding, reducing noise from the drill will be reasonably straightforward and should be implemented.

The construction site would contain at least one site shed or shipping container. This should be positioned immediately east of the drill, with its longer side aligned north-south. Re-modelled noise levels are summarised in **Table 5**.

TABLE 5
Predicted Scenario 1 intrusive noise levels with noise control.

Receiver	Predicted $L_{Aeq(15min)}$	Criterion
35	28	38
34	29	38
23	29	38
18	30	38
117	26	38

The results in Table 5 show noise levels 8 dB or more below the site noise criterion. If the total noise level from ACOL sources other than the drill was less than the criterion, then the additional 30 dB(A) from the drill would not be sufficient to result in a criterion exceedance. If general ACOL noise levels were equal to, or greater than, the criterion then the additional 30 dB(A) from the drill would not increase the noise level by more than 0.5 dB. This level of increase is widely accepted as not being discernible by the human ear and is within the measurement error of a Type 1 (laboratory quality) sound level meter.

The predicted worst case noise level from dam construction and the drill, with noise control in place, would therefore be sufficiently low that it would not lead to an exceedance of the site noise criterion, during its brief period of operation.

3.3.3 Raise-bore Drilling

Predicted noise levels for Scenario 2 (raise-bore drilling) under worst case conditions (West wind) are summarised in **Table 6**.

TABLE 6
Predicted Scenario 2 intrusive noise levels.

Receiver	Predicted $L_{Aeq(15min)}$	Criterion
35	30	38
34	28	38
23	28	38
18	31	38
117	26	38

As discussed in section 3.3.2 above, the predicted noise levels in Table 6 are sufficiently low that they would not contribute to an exceedance of the site noise criterion.

3.3.4 Operations

Predicted noise levels for Scenario 3 (vent fan operation, occasional vehicle movements on access track and in relation to the service drop-holes) under worst case conditions (West wind and inversion) are summarised in **Table 7**.

TABLE 7
Predicted Scenario 3 intrusive noise levels.

Receiver	Predicted $L_{Aeq(15min)}$		Criterion
	Inversion	WSW wind	
35	<20 24		36
34	<20 24		36
23	20 25		36
18	21 30		36
117	<20 23		36

As with the previous results for the raise-bore drilling, the predicted noise levels in Table 7 for the continued operations are sufficiently low that they would not contribute to an exceedance of the site noise criterion.

3.4 Sleep Disturbance

Assessment of potential sleep disturbance during night time hours usually begins by considering the OEH recommendation that further assessment is required if maximum noise levels[1] (L_{Amax}) exceed the background level (L_{A90}) by more than 15 dB at a bedroom window. If this level is exceeded then further consideration of potential disturbance to sleep includes the nature and level of ambient noise in the area, with some guidance also offered in Appendix B of the OEH *Environmental Criteria for Road Traffic Noise* (ECRTN, 1999).

In this project only the ventilation fans would operate during the night. Noise emissions from fans are characteristically uniform in their noise emissions with very little variation about the mean levels. Further, the predicted noise levels in Table 7 were for worst case meteorological conditions so maximum noise levels would not exceed these values by more than a few decibels.

The sleep disturbance criterion is 46 dB(A) and maximum noise levels from the vent fan would be 15 dB or more below this level.

4.0 SUMMARY

A noise impact assessment of the proposed construction and operation of a ventilation shaft and fans with associated access track and mine service shafts (drop-holes) at the Ashton Coal Project (ACP) near Camberwell, NSW, has been conducted. The assessment has found that noise levels would be well below the site noise criterion, provided that noise control in the form of a temporary barrier is utilised during the brief period of drilling the ventilation shaft pilot hole and the two 300mm drop-holes. With the adoption of this recommendation, we see no acoustic reason why the project could not proceed.

[1] The sleep disturbance criterion is technically the $L_{A1(1minute)}$ level. As this is the loudest 0.6s during a 15-minute period, the L_{Amax} level is usually adopted.

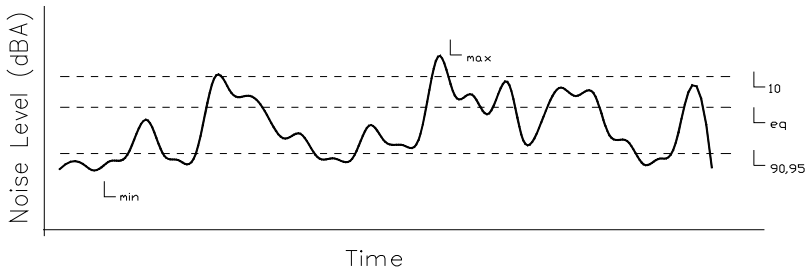
APPENDIX A

DESCRIPTION OF ACOUSTICAL TERMS

Table A1 contains a glossary of commonly used acoustic terms and is presented as an aid in understanding this report.

The descriptions in this section are not formal definitions of the terms. Formal definitions may be found in AS1633-1985 “Acoustics – Glossary of terms and related symbols”.

Table A1. Acoustical Terms

Term	Description
dB(A)	The quantitative measure of sound heard by the human ear, measured by the A-Scale Weighting Network of a sound level meter expressed in decibels (dB).
SPL	Sound Pressure Level. The incremental variation of sound pressure above and below atmospheric pressure and expressed in decibe ls. The human ear responds to pressure fluctuation s, resulting in soun d being heard.
STL	Sound Transmission Loss. The ability of a partiti on to attenuate sound, in dB.
Lw	Sound Power Level radiated by a noise source per unit time re 1pW.
Leq	Equivalent Continuous Noise Level - taking into account the fluctuations of noise over time. The time-v arying level is computed to give an equivalent dB(A) level that is e qual to the ene rgy content and time period.
L1	Average Peak Noise Level - the level exceeded for 1% of the monitoring period.
L10	Average Maximum Noise Level - the level exceeded for 10% of the monitoring period.
L90	Average Minimu m Noise Level - the level exce eded for 90 % of the monitoring period and recognised as the Background Noise L evel. In this instance, the L90 percentile level is representative of the noise level generated by the surrounds of the residential area.
	

AshtonCoal

APPENDIX 4

Air Quality and Greenhouse Gas Impact Assessment

Wells Environmental Services

REPORT

ASHTON COAL VENTILATION SHAFT AND FAN – AIR QUALITY ASSESSMENT

Ashton Coal Operations Ltd C/O Wells Environmental Services

Job No: 5527C

16 December 2011

PROJECT TITLE:	**ASHTON COAL VENTILATION SHAFT AND FAN – AIR QUALITY ASSESSMENT**
JOB NUMBER:	**5527C**
PREPARED FOR:	Alan Wells **ASHTON COAL OPERATIONS LTD C/O WELLS ENVIRONMENTAL SERVICES**
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ES1 EXECUTIVE SUMMARY

Ashton Coal Operations Limited seek approval for the installation of infrastructure to assist in the ventilation of their existing underground operations. The aspects of the mine ventilation system considered in this report include a 5.5 m diameter ventilation shaft (raise bored), associated fans and surface infrastructure and construction of an access track to the site.Additionally, mine service shafts (a ballast drop hole anda concrete drop hole) will be required.

A qualitative air quality impact assessment demonstrates that air quality impacts during both construction and operation would be minimal. There will be no expected increase in particulate matter emissions to the airshed as there is no increase in mining rate and therefore no expected increase in dust generation underground. The new ventilation shaft will increase efficiency of mine ventilation, and increase the overall flow rate, however the total particulate emissions are not expected to increase. Further, separation distances of 1 - 2 km would provide a sufficient buffer between the shaft and the closest residences to ensure any cumulative impact on air quality would be minimal.

Air quality impacts during the construction phase will be short lived and are expected to be easily controlled through commonly applied dust management measures. It is recommended that during construction, mitigation measures are applied to control short term nuisance dust impacts.

There would only be minor increases in GHG emissions from the proposed ventilation shaft as there is no proposed increase in mining rates and therefore no increase in coal seam gas generated.

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1 INTRODUCTION

Ashton Coal Operations Limited (ACOL) seek approval for the installation of infrastructure to assist in the ventilation of their existing underground operations. The ventilation system would deliver the necessary ventilation capacity for safety, allowing mining to proceed and facilitating access to future coal reserves in the remaining seams.

The aspects of the mine ventilation system considered in this report include a 5.5m diameter ventilation shaft (raise bored), associated fans and surface infrastructure and construction of an access track to the site. Additionally, mine service shafts (a ballast drop hole and a concrete drop hole) will be required. Further details on the project are provided in the main body of the Environmental Assessment (EA).

1.1 Scope and Objectives

PAEHolmes have been commissioned by Ashton Coal Operations Limited (ACOL), to assess the potential for air quality impacts associated with the proposed works.

The primary objective of the study is to identify all potential air quality and greenhouse gas emissions from the construction and operation of the project and provide a qualitative assessment of impact.

2 STATUTORY REQUIREMENTS

The most importantpiece of legislation for preventing and controlling air emissions in NSW is the *Protection of the Environment Operations Act 1997* (POEO Act). The POEO Act requires that no occupier of any premises causes air pollution through a failure to maintain or operate equipment or deal with materials in a proper and efficient manner.

The *POEO (Clean Air) Regulation 2010* is made under the POEO Act and provides standards of concentrations for scheduled activities which are not to be exceeded. The maximum pollution levelsallowed under the regulations, for general activitiesrelevant to this assessment, are provided in **Table 2.1**.

Table 2.1: Maximum Allowable Emission Levels

Air Impurity	Activity or Plant	Standard of Concentration
Solid Particles	Any process emitting solid particles	50 mg/m^3

2.1 Air Quality Criteria and Standards

Air quality assessment in NSW is guided by the NSW Office of Environment and Heritage (OEH)[a]"Approved methods for the modelling and assessment of air pollutants in NSW" (**NSW DEC, 2005**).

[a]The NSW EPA exists as a legal entity operated within the Office of Environment and Heritage (OEH) which came into existence in April 2011. The OEH was previously part of the Department of Environment, Climate Change and Water (DECCW). The DECCW was also recently known as the Department of Environment and Climate Change (DECC), and prior to that the Department of Environment and Conservation (DEC). The terms NSW EPA, OEH, DECCW, DECC and DEC are interchangeable in this report.

The Approved Methods specifies the impact assessment criteria for air pollutants which are outlined in **Section 2.1**.

During operation, the ventilation shaft will result in emissions of particulate matter (PM) and dilute concentrations of methane (CH_4) in the mine ventilation air (MVA).

During construction, fugitive dust emissions from surface activities can also be expected.Emissions of particulate matter are generally considered in three separate size fractions. These are described as total suspended particulate matter (TSP), particulate matter with equivalent aerodynamic diameters 10 μm or less (PM_{10}) and particles with equivalent aerodynamic diameters of 2.5 μm and less ($PM_{2.5}$). Goals for TSP were developed before more recent health studies suggested stronger relationships between health impacts and exposure to smaller size fractions of particulate matter, including PM_{10} and $PM_{2.5}$.

The impact assessment criteria refer to the total pollutant load in the environment and impacts from new sources of these pollutants must be added to existing background levels for compliance assessment. **Table 2.2**summarises the air quality goals that are relevant to this study.

Table 2.2: Air quality standards / goals for particulate matter concentrations

Pollutant	Standard	Averaging Period	Source
PM_{10}	50 μg/m^3	24-Hour	NSW DEC (2005)(assessment criteria)
	30 μg/m^3	Annual	NSW DEC (2005)(assessment criteria)
$PM_{2.5}$	25 μg/m^3	24-Hour	NEPM Advisory Reporting Standard[1]
	8 μg/m^3	Annual	NEPM Advisory Reporting Standard[1]

Note: [1] The National Environment Protection Measure (NEPM) for Ambient Air Quality sets "Advisory Reporting Standards" for $PM_{2.5}$for averaging periods of 1 day and 1 year. It is important to note that the advisory reporting standards were established to assess monitoring data representative of average population and are not used for compliance or impact assessment for specific projects.

3 EXISTING ENVIRONMENT

3.1 Location of Privately-owned Residences

The closest privately-owned residences in the vicinity of the proposed ventilation shaft site are located approximately 1 km east in Camberwell village and 2km south east on agricultural land holdings. These locations, along with the approximate location of the proposed ventilation site are shown in **Figure 3.1**.

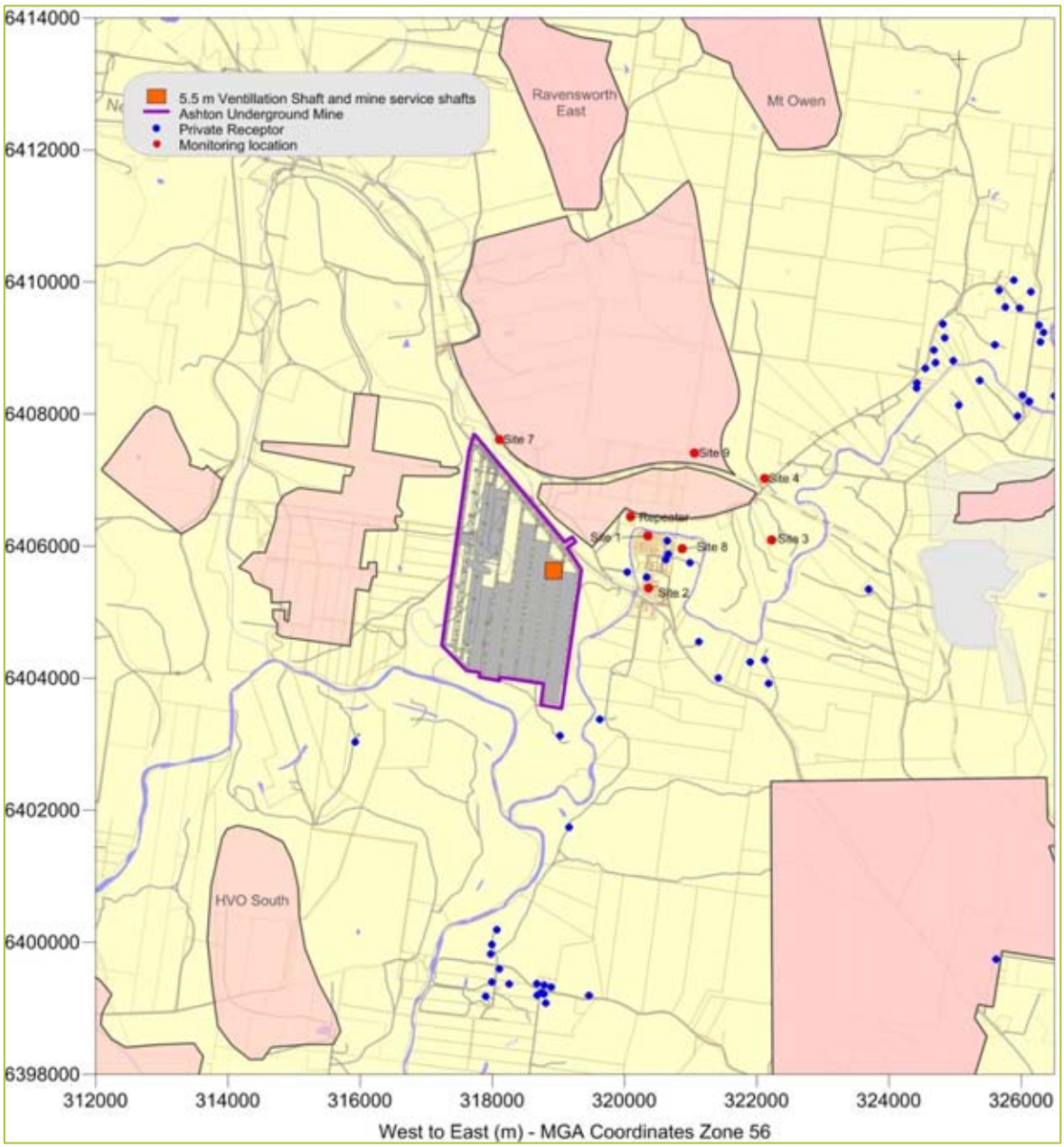

Figure 3.1: Locations of Closest Residences

3.2 Dispersion Meteorology

Annual and seasonal windroses for the Ashton repeater site from July 2007 to June 2008 were analysed and are shown in **Figure 3.2**. The dominant winds are from the west-northwest and the east-southeast for all seasons, with less wind from the west-northwest during summer and from the east-southeast during winter.Based on the prevailing winds, emissions from the vent shaft would be directed away from the closest residences for the majority of the time. On occasion, emissions from the vent shaft could be transported towards residences located to southeast.

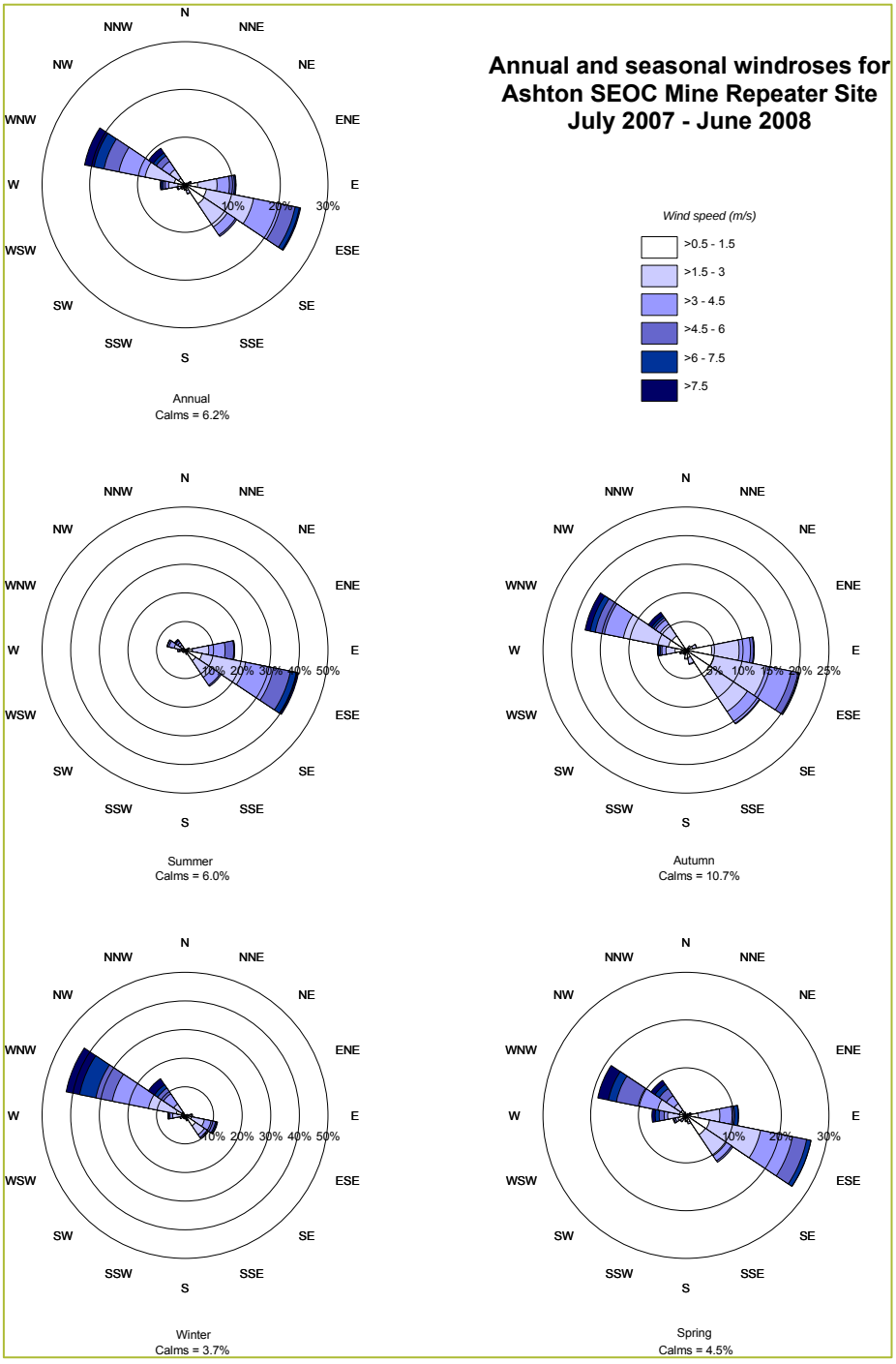

Figure 3.2: Wind Roses for ACOL repeater site– July 2007 to June 2008

3.3 Ambient Air Quality

Air quality standards and goals refer to pollutant levels that include the contribution from specific projects as well as existing sources. Therefore, to assess impacts against all the relevant air quality standards and goals (see **Section 2**) it is necessary to have information or estimates on existing background pollutant levels in the area.PM_{10}concentration is monitored at 8 locations in the vicinity of ACOL.

Table 3.1 presents the annual average PM_{10} concentrations measured at the Ashton TEOM's between 2008 and 2010. All sites from 2008 show annual averages below the OEH criterion of 30 µg/m^3.

Table 3.1: Annual average PM_{10} concentrations at each Ashton TEOM monitoring site (µg/m^3)

TEOM Site	2008	2009	2010
1	25.9	29.5	22.1
2	18.2	19.8	14.8
3	22.5	27.3	20.0
4	23.1	28.7	22.4
7	21.5	24.3	19.5
8	25.1	28.0	22.2

4 IMPACTS

4.1 Construction Phase Impacts

The primary emissions during construction will be dust and particulate matter. The majority of the particulate matter (PM) emissions generated from construction will be in the coarse size fractions, generally referred to as PM_{10}. Particulate matter (PM) emissions in the fine size fractions, generally referred to $<PM_{2.5}$ are typically associated with combustion sources.

Construction dust will be generated from:

- Trucks and light vehicles travelling on existing unpavedaccess roads;
- Construction of access tracks;
- Clearing and earthworks for vent shaft site construction;
- Earthworks for sedimentation dam construction; and
- Drilling of the ventilation shaft and mine service bore holes;

4.1.1 Ventilation Shaft

For the 5.5 m diameter upcast ventilation shaft, an area of approximately 60 m by 75 m is proposed to be leveled. The soil would be stockpiled for reuse at the site once the construction phase is complete.

The ventilation shaft will be raise bored to the surface from existing mine workings inside the ULD seam. The proposed raised bore technique limits disturbance on the surface by leaving cuttings underground and leaving a considerably smaller construction footprint than alternative methods of shaft construction. During shaft construction, power is planned to be supplied by a generator. Construction activities will generally be conducted between the hours of 7am to 10pm, Monday to Saturday, and 8am to 10pm on Sunday. The duration of the construction phase for the main ventilation fan, from preliminary site works to fan commissioning, is expected to be a maximum of 26 weeks, subject to site conditions.

4.1.2 Mine Service Boreholes

Minor additional infrastructure is proposed to be included in the modification. This infrastructure includes:

- a ballast drop hole; and
- a concrete drop hole.

At present, materials required for underground operations are delivered via the main entry road. Construction of the drop holes will provide significant operational advantage in alleviating congestion entering the underground. The proposed ballast drop hole will be a steel cased shaft, constructed in close proximity to the 5.5m diameter ventilation shaft.
Ballast will be gravity-fed to the underground workings, replenished by a small stockpile located directly above the opening of the hole at the surface.

A pad approximately 30m x 30m will be created and stabilised with a roadbase material. Associated vehicle movements will include a delivery truck up to twice per week and a bobcat to occasionally reform the stockpile over the shaft.

The concrete drop hole will be a steel cased shaft, constructed adjacent to the ballast drop hole. A pad approximately 30m x 30m will be created and stabilised

with roadbase material. Associated vehicle movements will include a concrete delivery truck on average once per fortnight, with up to a maximum of fifteen deliveries per day. Construction time for the drop holes is expected to take approximately 3 weeks.

Drilling of these vertical shafts will occur from the surface, using a conventional drilling rig. Above-ground relocatable sumps may be used to limit ground disturbance if required during drilling operations.

After construction has been completed, the disturbed area will be reduced to that required for operations, and the remaining area re-vegetated as soon as possible.

4.1.3 Summary of Construction Phase Impacts

Air quality impacts during the construction phase will be short lived, minor and are expected to be easily controlled through commonly applied dust management measures. Procedures for controlling dust impacts during construction are outlined in **Section** 5.

There would be some minor emissions as a result of construction vehicles and use of the on-site generator (exhaust emissions) which would include oxides of nitrogen (NO_x), carbon monoxide (CO), sulfur dioxide (SO_2) and organic compounds. However these emissions are typically minor for projects of this scaleand would not give rise to significant off-site concentrations.

The current delivery of ballast and concrete to the underground workings is via the mine's main transport roadway. Storage of ballast and delivery of ballast and concrete via the proposed methods will not only increase operational efficiency, but also reduce energy consumption and exhaust emissions as a consequence of a reduction in travel time and travel distance using heavy mine vehicles underground.

4.2 Operation Phase Impacts

Air quality impacts during operation can be characterised based on local air quality impact and greenhouse gas emissions.

4.2.1 Local Air Quality

The primary purpose of mine ventilation is to provide a safe working environment for mine employees and pollutant concentrations within the return air will be well below levels that would normally be associated with adverse health effects.

There will be no expected increase in particulate matter emissions to the airshed as there is no increase in mining rate and therefore no expected increase in dust generation underground. The new ventilation shaft will increase efficiency of mine ventilation, and increase the overall flow rate, however the total particulate emissions are not expected to increase.

Separation distances to nearest residences of 1-2 km will mean that the cumulative impacts from the addition of the new ventilation shaft emissions to existing air pollution levels are expected to be negligible.

Odorous hydrocarbons or sulfur based compounds are not expected in the MVA and even if small pockets are encountered, odour impacts would not be expected due to separation distances of 1- 2 km to residences.

4.2.2 Greenhouse Gas Emissions

Carbon Dioxide (CO_2) and low concentration of methane (CH_4) would be released from the new ventilation shaft as MVA. Although concentrations of methane released in MVA are typically low (~ 2%), due to the large volumes of air released (flowrates of up to 365m^3/s) the total GHG emissions from the ventilation shafts could be locally significant.

However, as there is no increase in mining rates there will be no significant increase in GHG emissions as a result of this project. The ventilation flow rate will be higher, however as the coal mining rate will not increase, it is not expected to increase the emissions of coal seam gas from underground workings.

The use of electricity to power the fans would also contribute to GHG emissions, however no significant change in emissions is expected as a result of this project.

There would be a small increase in diesel consumption during construction however this will constitute only a minor contribution of the total GHG emissions from the site.

5 MANAGEMENT AND MONITORING

Mitigation measures employed to control dust generation during construction would include, but not necessarily be limited to the following:

- Use of water carts to maintain moist soil during clearing and stripping of shaft site, on access tracks during dry and windy conditions and during access track construction (or upgrade);
- Minimising ground disturbance and the number and size of soil stockpiles to as low as practical; and
- All vehicles will be confined to a designated route with a speed limit enforced;

Due to the small scale and temporary nature of the construction phase, monitoring (in addition to that already conducted by ACOL) is not required for construction.

6 CONCLUSIONS

A qualitative air quality impact assessment demonstrates that air quality impacts during both construction and operation of the proposed changes to the mine ventilation system and addition of the mine service shafts would be minimal. Air quality impacts during the construction phase will be short lived and are expected to be easily controlled through commonly applied dust management measures.

There will be no expected increase in particulate matter emissions to the airshed as there is no increase in mining rate and therefore no expected increase in dust generation underground. The new ventilation shaft will increase efficiency of mine ventilation, and increase the overall flow rate, however the total particulate emissions are not expected to increase. Separation distances of 1 - 2 km would provide a sufficient buffer between the shaft and the closest residences to ensure any cumulative impact on air quality would be minimal.

Similarly there would only be minor increases in GHG emissions from the proposed ventilation shaft as there is no proposed increase in mining rates and therefore no increase in coal seam gas generated.

It is recommended that during construction mitigation measures are applied to control short term nuisance dust impacts.

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Archaeological Impact Assessment

APPENDIX 5

Wells Environmental Services

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Aboriginal Archaeological Report
Proposed Ventilation Shaft & Associated Infrastructure
Ashton Coal Operations Ltd
Camberwell, NSW

Report to
Wells Environmental Services
on behalf of
ACOL

February 2012

Singleton Council Local Government Area

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Date	14 February 2012	
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Document Status	**Final**	

NB Sections of this report, specifically Figure 1, Section 3 and Appendix A, contains culturally sensitive material relating to the location of recorded Aboriginal archaeological sites. This information is included in this report to satisfy the requirements for assessment. This information should not be released into the public domain. This information must be removed from this report prior to it being placed on public display.

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Executive Summary

Insite Heritage Pty Ltd were commissioned by Wells Environmental Services (WES) on behalf of Ashton Coal Operations Ltd (ACOL) to undertake an indigenous archaeological assessment for a proposed upcast ventilation shaft, fans, a concrete drop hole, a ballast drop hole and proposed access tracks (Option 1 and Option 2).

The assessment identified an additional twelve Aboriginal objects at eight additional loci (AFA109-116). Six of these newly identified loci (AFA109-113) are associated with previously recorded site 37-3-0537.

The report recommends that proposed access track Option 1 is preferable to Option 2 as the upgrading of the existing track has less potential to impact on unknown objects associated with 37-3-0537 than the construction of a new all weather access track.

The required upgrading of the proposed access track Option 1 will impact on identified objects (AFA109-11, 113-116 and EWA84).

Site 37-3-0537; the High Ridge Site, comprises 19 known artefacts. The site boundary is 200m x 300m encompassing six loci of low to moderate density of artefacts that has been interpreted as a microblade workshop area. The ventilation shaft is located within the site boundary but does not include known loci, however it is probable that loci could be present in the development area that are obscured by grass cover.

It is recommended that a perimeter barricade be placed around the known objects (AFA40, 62, 63, 66 112 and EWA84) located in proximity to the proposed works to avoid unintentional impacts during construction and operation.

It is also recommended that a salvage methodology be developed with the stakeholders to identify and retrieve any lenses of objects that are within the disturbance boundary.

ACOL has an approved AHIP over the area of Longwalls 1-4 (AHIP 1131017), which includes the proposed development area. The conditions of this AHIP will apply to the management of Aboriginal objects required to be disturbed in the carrying out of the development and the salvage methodology will need to be consistent with the conditions of this AHIP.

At the time of report compilation upgrading of existing farm tracks to support ongoing mining operations was being scheduled. These road upgrade works may require the salvage of some Aboriginal objects associated with site 37-3-0537 identified in this report. Any salvage works required to be undertaken will be done so in accordance with AHIP 1131017.

1. Introduction

1.1 Scope & Objectives

Ashton Coal Operations Ltd (ACOL) are lodging a modification to their existing Consent for the following:

- A 5.5m diameter ventilation shaft to the depth of the Upper Liddell seam (approximately 89m) within the underground workings.
- Installation of a ventilation fan and construction of associated infrastructure within a levelled base of approximately 60m x 75m and construction of an access track and sediment dam.

In addition the modification includes:

- A ballast drop hole, 300mm in diameter
- A concrete drop hole, 300mm in diameter; and
- Upgrading of existing access tracks, or establishment of new access tracks, as required.

The drop holes will allow delivery of materials required in the underground workings and relieve traffic congestion at the workings entry. The 300mm ballast drop hole will comprise a steel cased shaft, through which, ballast will be gravity fed, the supply of which will be from a small stockpile located directly above the opening of the hole on the surface. Each drop hole requires an adjacent pad, 20m x 20m in area. The layout of the proposal can be seen in Figure 1.

There are two proposed options for access to the development site. Option 1 utilises an existing track which runs to the north of the proposed location of the ventilation shaft and fans. This track will be required to be widened by approximately 1m and surface preparation works undertaken to allow for all weather access. Option 2 utilises an existing track to the south of the proposed ventilation shaft site. This option will require the extension of the track by approximately 350m.

Insite Heritage Pty Ltd have been commissioned by Wells Environmental Services (WES) on behalf of ACOL to undertake an Aboriginal archaeological assessment as part of the Environmental Assessment for the development. The aim of the archaeological assessment is to identify and assess if the proposed works will impact on any Aboriginal archaeological objects and to recommend the appropriate management / mitigation strategies.

The justification for the development is to provide essential ventilation to the underground workings and improve physical and energy efficiencies by delivering materials directly to the underground and reduce the use of heavy mine vehicles where ever possible.

Figure 1 The proposed modification layout.

1.2 Aboriginal Stakeholder Consultation

Consultation regarding the proposed development has occurred with ACOL's existing registered Aboriginal stakeholders (comprising 32 Aboriginal stakeholder groups). To inform stakeholders a review of the existing Aboriginal archaeology information within and around the proposed development area was carried out and an archaeological survey of the development area in conjunction with representative stakeholders:

Luke Hickey, Hunter Valley Cultural Consultants
Darrel Mathews, Upper Hunter Heritage Consultants
Noel Phillips, Yunaga
George Sampson, Cacatua Culture Consultants
Rob Tickle and Liz Wyatt, Archaeologists, Insite Heritage Pty Ltd.

On the 4th and 7th of November 2011, representatives from the 32 registered stakeholder groups were invited to visit the site and were given information regarding the development. An information package, outlining the development, was provided to participants on the day. The information package was also mailed to all stakeholders on the 2nd and 3rd of November, 2011.

In the field, participants were invited to provide confidential comments on the development and management strategy for Aboriginal objects in and around the development area.

Twelve participants provided positive feedback (details available upon request). No participants provided negative feedback.

In addition, stakeholders were invited to information sessions, held in small groups during the 7th to the 11th November, 2011.

Stakeholders were requested to provide written feedback on the proposal in response to the information package. No further feedback or comment on the proposed development to that provided during site field inspections has been provided.

An AHIP was applied for in January 2011 over Longwalls 1-4, encompassing the area of proposed works, and was granted in December 2011. Community consultation for this report was undertaken at a time when the AHIP approval was pending.

2. Statutory Obligations

2.1 The National Parks & Wildlife Act 1974 (NPW Act)

The NPW Act provides statutory protection for all material evidence of Aboriginal occupation of NSW. The objects of the act, as outlined in Section 2A include;

(*b) the conservation of objects, places or features (including biological diversity) of cultural value within the landscape, including, but not limited to:*
(i) places, objects and features of significance to Aboriginal people

An Aboriginal object means any deposit, object or material evidence (not being a handicraft made for sale) relating to the Aboriginal habitation of the area that comprises New South Wales, being habitation before or concurrent with (or both) the occupation of that area by persons of non-Aboriginal extraction, and includes Aboriginal remains.

It is an offence to harm an Aboriginal object or declared Aboriginal place without first obtaining an Aboriginal Heritage Impact Permit from the Director General of the Office of Environment and Heritage.

The NPW Act requires the obtaining of an Aboriginal Heritage Impact Permit (AHIP) issued under Division 2, Part 6 if a person wishes to excavate land to disturb or discover an Aboriginal object or disturb or move an Aboriginal object.

An AHIP is required if an activity will or is likely to harm an Aboriginal object or Aboriginal place.

3. Existing Environment

3.1 Regional Archaeological Context

In NSW a number of archaeological sites have been dated back to the Pleistocene. Koettig (1986) recorded a date of 20,200 BP from a hearth at Glennies Creek, approximately 10km north of the ACOL mine lease area. An Aboriginal site on the Liverpool Plains has been dated to at least 19,000 BP (Gorecki *et al,* 1984) and one of the world's oldest ritual cremation sites dated to 26,000 years ago is located at Lake Mungo in western NSW (Mulvaney et al, 1999) Other Pleistocene sites have been found in other environmental contexts such as Moffats Swamp, near Newcastle where Baker (1994) found material dating to 17,000 years ago within the Pleistocene sand dunes. Navin & Officer (2005) citing Haglund (1985) notes that Aboriginal occupation of the Darling Basin has been dated to 40,000 years ago.

Sites dating back to the Holocene (the last 10,000 years) are far more common in the open site context. Within this period the morphology of the stone artefacts has been used to give a general estimate of the antiquity of the manufacturing technique. Earlier reduction techniques have been known as the 'core and scraper tradition' that focused on the initial reduction of cores to produce large flake blanks for use as tools (Koettig 1990). The replacement of this technological approach with the manufacture of microliths (small artefacts) that were then hafted to produce a composite tool occurred about 5,000 years ago. Reasons for change in technological characteristics have been proposed by Hiscock (1994) who suggested that increased mobility may have become necessary during the Holocene, as people occupied areas of unfamiliar environmental resources, or as climatic fluctuations rendered the environment less predictable. The extension of stone resources to include small pebbles and small outcrops would have increased the amount of time between visits to the stone sources previously used (ibid).

3.2 Ethnographic Context

Tindale (1974) and Horton (1999) place Camberwell in the area of the Wonnarua peoples, bordering the Awabakal to the east and Worimi to the north. The environment of the Hunter Valley has been reviewed by Brayshaw (1984) based on the records of early explorers. The explorers reported areas of rich meadow, thinly timbered with deep loam soils. Food resources included possum, bear, wallaby, kangaroo rat, bandicoot, echidna and flying fox (Dawson in Brayshaw). Rivers were described with abundant fish with wild ducks, pigeons and brush turkeys also hunted. The early explorers also noted that women and children hunted and captured the smaller animals, and sought out the hiding places of various grubs and the nests of the native stingless bees (Green in Brayshaw).

Research in the Hunter Valley has attempted to address various questions related to Aboriginal culture, lifestyles and change over time. Subjects studied include tool manufacture and distribution of stone resources, trade, potential for Pleistocene sites, camp site distribution within the landscape, and landscape modelling.

Material culture of the local Aboriginal people included items made of wood, bark, plant fibres, stone, shell and bone including such items as spears, clubs, shields, dishes, canoes, nets, cloaks, cord and cutting implements.

European settlement of the Hunter Valley commenced in the early 1800's which in turn had a catastrophic impact on the local Wonnarua peoples and their traditional culture. Populations were greatly reduced due to the introduction of previously unknown diseases and traditional social structures disintegrated.

3.3 Local Indigenous Archaeological Context

A review of previous archaeological assessments was conducted in proximity to the proposed development in order to place the study area into an archaeological context.

3.3.1 Surveys within the Surrounding District

Koettig (1986) excavated a number of sites on the alluvial flats of Glennies Creek, approximately 10km north of the ACOL mine lease area, following a survey for the Glennies Creek to Singleton pipeline. Excavations revealed distinct A and B soil units and a geomorphologist who investigated this site suggested that the B unit could date from 10,000 to 30,000 years old. Of note, one site was radiocarbon dated to over 13,000 years BP and contained evidence of a hearth and associated artefacts. Excavation showed that these sites represented discrete activity units, knapping floors, ovens, hearths and heat treating areas; distance between these features was unpredictable, and their distribution along the creek lines did not have a pattern. All the dated sites were of the mid-Holocene period (Koettig 1992).

Stuart (1999) surveyed an area for a proposed waste rock dump to the east of Glennies Creek and to north of the Camberwell village. The survey concentrated on an area along Station Creek, a tributary of Glennies Creek. The survey located 3 artefact scatters and 16 isolated finds. No sites were assessed as being of high significance, one artefact scatter was regarded as being of medium significance and the remainder were of low significance.

HLA Envirosciences (2005) conducted subsurface investigations for the proposed extension of the Rail Unloader Facility at Newdell Junction, just north of Ravensworth for Macquarie Generation. The previous survey identified three sites (MG#1, 2 &3), all open artefact scatters, located on lower slope and in an open depression. The main artefact types recorded at the sites include flakes, broken flakes, retouched flakes and cores, with raw material types of silcrete, mudstone and fine grained siliceous (FGS). Subsurface testing at sites MG#1 and MG#2 and in designated areas of sensitivity across the site recovered a total of 197 whole and broken artefacts, with the majority (156) identified as flakes. 24 retouched flakes were also recorded of which 5 were backed artefacts. 5 cores were also identified. 88 of the artefacts were manufactured from silcrete, and 88 from FGS. Small numbers of chert, volcanic and quartz were also recorded. The majority of artefacts were recovered from areas of testing located on the lower slopes. Only three artefacts were recovered from test pits located on the alluvial flat, but it was considered that artefacts may have been removed from this area due to flooding or buried deeper than 80cm the limit of the excavations. Objects located at deeper levels would be consistent with the Koettig 1992 findings.

Umwelt (2002) conducted an archaeological assessment for enlargement of a mine water storage dam for the Nardell Coal Mine. The survey covered an area of approximately 1200 x 300m and was situated on a hill and gently sloping land to the north of the New England Highway and south of the Macquarie Generation coal conveyor, north of Ravensworth. The survey identified six sites (N1-N5 and the Dam Site) predominantly open artefacts scatters.

The Umwelt (2002) survey also revisited five sites identified by Stuart (1996) located in Nardell Colliery land, north of the Macquarie Generation coal conveyor (Nard 8,9,11,12&13). The dominant raw material types were mudstone and silcrete with some porcellanite and glass with main artefact types recorded as flakes, broken flakes, flaked pieces and cores. The largest site recorded by Stuart and re-recorded by Umwelt, Nard 12 (37-3-0523), comprises of 150 artefacts in a 50m x 30m area. Severe sheet erosion and previous disturbances were noted at the site.

In 2004 Umwelt surveyed land at Glendell for a proposed open cut mine project. This area is approximately three kilometres to the north of the study area and comprises similar landform units, within the Glennies and Bowman's Creek catchments. The survey recorded 29 artefact scatters, 7 isolated finds and a quarry site. The majority of sites were within 30m of watercourses (63%). Three sites contained more than 100 artefacts with mudstone being the most commonly utilised material followed by silcrete. Two sites were deemed to be of high significance and three to be of moderate to high significance.

3.3.2 Surveys within the ACOL Mine Lease Area

HLA Envirosciences (2001) carried out an archaeological assessment for White Mining Ltd at Camberwell for the Ashton Coal Project. Their study area included the land between Bowmans and Glennies Creeks. Vehicle and foot surveys were conducted over an 801ha area (HLA 2001:16). The survey identified twenty four archaeological sites. Twenty of the recorded sites were identified as artefacts scatters ranging from 2 to approximately 200 artefacts, with the majority containing 4-10 artefacts. Four isolated artefacts were also recorded. The majority of recorded artefact types were flakes pieces and flakes with some cores and tools, with silcrete and mudstone the dominant raw material with minor quartz and quartzite. The majority of sites were located along drainage channels, and adjacent creek flats and low ridge lines.

Witter (2002) resurveyed the area and completed a more detailed analysis. He revisited previously recorded sites and also identified an additional 18 sites, 31 isolated artefacts and 6 sets of grinding grooves. At three of the recorded sites (Waterhole, Oxbow and Glennies Creek sites) over 200 artefacts were identified. All three sites were located on high ground adjacent to a deep section of a permanent creek. There was also a close similarity in artefact type at the three sites. All three sites were noted as having a low component of micro-blade technology, and two sites also had associated grinding grooves.

Mitchell (2002) conducted a geomorphological study into Witter's survey area and this included a pit dug into a terrace within the Ashton Glennies Creek site. Of note, an artefact was exposed in the pit wall by rain wash. This artefact was 550mm below the ground surface within a buried soil profile (Mitchell 2002:22). Mitchell suggested this buried soil profile may be of an early Holocene or possibly a late Pleistocene age.

Sites dating to the Pleistocene are uncommon in the Hunter Valley and, as such, sites with any potential to provide dates of this age are deemed to be very significant.

In 2008 Telstra obtained a Section 87 permit to allow monitoring by Wonnaruah LALC of a telecommunications trench that traversed the Bowmans Creek flat. No artefacts were found during excavation of the creek flat (S. Worth WLALC pers. com).

In December 2008 Insite Heritage surveyed the area of ACOL's proposed South East Open Cut Project, to the east of Glennies Creek and the mine lease area. The Aboriginal archaeological assessment identified 85 archaeological sites (artefact scatters and isolated finds combined) within the study area. A number of identified sites were of low significance, comprising low density open artefact scatters or isolated finds, however sites located on the terrace and slopes above Glennies Creek are of high significance within a local and regional context (Besant et al 2009).

In 2008/9 Insite Heritage also provided an assessment for ACOL's Longwall 9 project proposal. The Aboriginal archaeological assessment identified seven (7) archaeological sites (artefact scatters and isolated finds) within the longwall footprint. The identified sites were of low significance, comprising of low density open artefact scatters or isolated finds. A terrace flanking Bowmans Creek was identified as containing potential sub-surface deposits or PAD, and has been assessed as being potentially significant (Besant et al 2009a).

3.4 Archaeological Sites within the Proposed Development Area

A search of the Aboriginal Heritage Information Management System (AHIMS) database for recorded Aboriginal archaeological sites maintained by the Office of Environment and Heritage (OEH) and a review of the ACOL database of archaeological sites has identified the following sites in or in proximity to the proposed development area, including along an existing farm access track proposed to access the development area.

The development area lies within the boundaries of previously identified site: AHIMS No. 37-3-0537 which was recorded by Witter (2002) and is described as several localities over a 300m x 200m area. The site is collectively referred to as the High Ridge Workshop Site and is located on a shoulder of the Ashton ridge (refer Appendix A for site card). Table 1 below lists the localities; referred to as exposures with artefacts (EWA) outlined on the site card.

Table 1 Details of EWAs associated with AHIMS Site 37-3-0537

EWA No.	Exposure Area	Details	Location in Proximity to Proposed Works
EWA76	100m x 3m	4 Artefacts	Outside area of proposed development. Objects salvaged as part of AHIP 1131017 works.
EWA79	10m x 10m	2 Artefacts	Outside area of proposed development. Object unable to be relocated.
EWA83	20m x 5m	1 Artefacts	Outside area of proposed development
EWA84	15m x 3m	10 Artefacts, including tuff micro blade workshop with associated area of deposit that has been cut by a farm track	In proximity to proposed development
EWA85	50m x 50m	1 Artefact	In proximity to proposed development. Objects unable to be relocated during AHIP 1131017 works.
EWA86	50m x 1m	1 Artefact	Object has been salvaged as per AHIP#2783 and returned. Object could not be relocated as part of AHIP 1131017 works.

Previously identified site 37-3-0557 (EWA91), an isolated artefact, is located adjacent to the proposed access track (Option 1) for the ventilation shaft. CR1, an isolated artefact, likely to be associated with 37-3-0557 is located within the alternate access track (Option 2).

Sites AFA40, AFA62, AFA63 and AFA66 were identified by registered Aboriginal parties for the ACOL project as part of pre disturbance and site survey work for a prior raise bore site. Impacts were avoided on these sites and the area barricaded off during construction. The sites are extant and are located within the survey area for the proposed ventilation shaft; their details are listed in Table 2 below.

Table 2 Details of ACOL identified sites in proximity to the development area.

AFA No.	Details	Location in Proximity to Proposed Works
AFA40	Isolated Artefact	In proximity to proposed development, survey to assess impacts
AFA62	2 broken silcrete flakes - conjoin	In proximity to proposed development, survey to assess impacts
AFA63	Small banded mudstone core	In proximity to proposed development, survey to assess impacts
AFA66	Isolated Artefact	In proximity to proposed development, survey to assess impacts

3.5 Landscape Context

3.5.1 Soils & Geology

The generalised geology of the Hunter Valley places the study area within the Late Permian Singleton Coal Measures and comprises coal, tuff, conglomerates, shales, fluvial and barrier sandstones (Drysdale *et al*, 2000:12). The main soil types are yellow Soloths on slopes with Earthy and Siliceous Sands on mid to lower slopes. Red Soloths, red Solodic Soils and Red Podzolic Soils also occur (Kovac & Lawrie 1991:254).

3.5.2 Landform & Topography

The development area is located on the mid to upper slope of the western spur crest of the Ashton ridge line which is located between Glennies and Bowmans Creeks. Slope gradients within the development area range between 3 -12.5% with elevations ranging from 70-90m.

3.5.3 Hydrology

The development area is located on the mid to upper slope of a spur crest located between Bowmans and Glennies Creeks. Glennies Creek lies approximately 1km to the east of the study area. Bowmans Creek is located approximately 1.5km to the west of the proposed ventilation shaft.

3.5.4 Land Use History

The development area is located in an area that has been extensively cleared and grazed since post European settlement. Existing farm access tracks form part of the proposed development area. The area overlays the existing Ashton underground mine.

3.6 Predictive Model of Archaeological Potential

Previous archaeological investigations have shown that archaeological sites are more prevalent in areas in close proximity to water sources with the number and density of archaeological sites increasing with the permanence of the water resource. Areas

surrounding creek confluences have also been shown to be of importance in the region and potentially contain larger and more complex archaeological sites. River terraces of sufficient age, may also have been favoured areas for Aboriginal encampments, however preservation of sites in this context is dependent upon the stability of the terrace. Open sites may be subject to re-deposition of artefacts and the exposure of subsurface archaeological material as a result of geomorphological processes. Smaller artefact scatters and knapping sites can be located on ridgelines particularly where these are located close to stone resources, or between larger occupation areas. Open sites containing a few artefacts or isolated finds can occur in all landscapes as a result from movement between areas, the procuring of resources and or other activities.

Ridgelines may also contain art, rock engravings and axe grinding grooves where suitable rock types and aspects occur. Rock overhangs have high potential to contain shelter sites in which stratified deposits may be found. Grinding grooves may also occur in creek lines where suitable rock outcrops (predominantly sedimentary) occur.

Areas of potential archaeological deposit (PAD) may occur either in shelter sites or in locations where slope wash may have preserved underlying older occupation surfaces.

Given previous land use practices it is predicted that the most likely site types to occur will be surface artefact scatters and isolated finds visible in eroded exposures.

3.7 Survey Objective

The purpose of the survey was to assess the potential impacts of the proposed works on existing known archaeological sites and to identify and assess any additional Aboriginal objects that may be impacted by the proposed development.

3.8 Survey Details

A foot survey was conducted over the existing access track (Option 1) and an approximate 250m x 250m area around the proposed location for the ventilation shaft and fans, and drop holes.

The survey was conducted on the 6th June 2011 and was conducted with the following personnel.
Luke Hickey, Hunter Valley Cultural Consultants
Darrel Mathews, Upper Hunter Heritage Consultants
Liz Wyatt, Archaeologist, Insite Heritage

As Aboriginal objects were identified on the existing access track (Option 1) an alternate access track (Option 2) was assessed. A foot survey of proposed alternate track was undertaken on the 7th July 2011 and was conducted by:

Noel Phillips, Yunaga
George Sampson, Cacatua Culture Consultants
Rob Tickle, Senior Archaeologist, Insite Heritage Pty Ltd

3.9 Survey Results

In general surface visibility was low, generally <10% within the 250m x 250m area surveyed for the ventilation shaft pad due to grass cover. Some eroded exposures and areas of previous disturbance provided opportunities for visibility. Within this, two artefacts were identified to the north east of the prior raise bore site in an eroded exposure and seven artefacts identified along the existing track way to the north east of the proposed ventilation shaft pad. The proposed access track (Option 1) provided good surface visibility with four artefacts identified in four separate locations along the track. No artefacts were identified within the area surveyed for Option 2, however visibility was noted to be low (0-20%). The details of the areas surveyed are presented in Table 3 and Figure 2 below. The details of the identified artefacts are shown in Table 4 and their locations in Figure 2.

Table 3 Survey Data

Survey Unit	Landform	Survey Area	Visibility %	Exposure % (Mean % of the survey area sufficient to reveal Aboriginal objects)	Effective Coverage Area (sq m)*	Notes
Ventilation Shaft & drop holes development footprint	Spur slope	Approx. 250 x 250m (6.25ha)	<10%	<10%	625	Predominantly grassed except for access track. Some areas of visibility in eroded exposures and previous surface disturbance
Access Road - Option 1	Spur slope - base of slope	Approx 900m x 3m (0.27ha)	60-90%	60-90%	1085.4	Good visibility along access track.
Access Road - Option 2	Spur slope	Approx 375m x10m (0.375ha)	0-20%	0-20%	3.75	Poor surface visibility due to grass cover.

***(= survey unit area x visibility% x exposure %)**

Table 4 Location of newly identified artefacts

Location	Easting	Northing	Landform	Site Type	Artefact Type	Raw Material	Dimensions (length width x thickness mm)	Platform dimensions (length x width mm)	Notes	Site Details
AFA109	319184	6405778	ridge	Isolated Find	Broken Flake	Silcrete	8x7x3	8x2		Silcrete broken flake in track way near bore hole Associated with previously recorded EWA84. Part of existing site 37-3-0537
AFA110	319189	6405770	ridge	Artefact Scatter (3)	Angular Fragment Broken Flake Broken Flake	Mudstone FGS* FGS	10x4x2 11x7x4 22x12x3		40% cortex 4 arices, 3 negative scars	In track way near bore hole, buried artefact also noted. Associated with previously recorded EWA84. Part of existing site 37-3-0537
AFA111	319194	6405761	ridge	Artefact Scatter (2)	Flaked Piece Broken Flake	Chert FGS	18x20x3 11x7x2			2 artefacts on edge and in centre of track 3m apart. Associated with previously recorded EWA84. Part of existing site 37-3-0537
AFA112	319304	6405654	ridge	Artefact Scatter (2)	Broken Flake Angular Fragment	FGS Mudstone	26x21x4 14x10x4		2 arices, 3 negative scars	In exposure 10x7m, NE side of borehole in erosion scour below fence line. Within site boundaries of previously recorded 37-3-0537
AFA113	318992	6405842	ridge	Isolated Find	Broken Flake	FGS	32x30x4	27x4	30% cortex	Located in existing track way Within site boundaries of 37-3-0537
AFA114	318956	6405858	ridge	Isolated Find	Broken Flake	Mudstone	15x21x4		50% cortex	Located in existing track way Within site boundaries of 37-3-0537
AFA115	318629	6405977	ridge	Isolated Find	Flake-	Mudstone	29x23x5	4x2	Usewear right margin	Situated on N edge of track way, W of the crib rooms. Likely an extension of existing site 37-3-0557.
AFA116	318565	6406015	slope	Isolated Find	Flake	Mudstone	53x35x6	16x9	50% cortex, cobble flake	In track way west of AFA115. Likely an extension of existing site 37-3-0557.

*FGS - Fine Grained Siliceous

Figure 2 The location of objects located in relation to the modification elements.

Plate 1 AFA 109 in track way facing west.

Plate 2 Artefact AFA112.

Plate 3 View south west at proposed location for fan shaft, note existing prior surface disturbance.

Plate 4 Exposure in existing farm access track (Option 1), facing east adjacent to location of AFA115.

3.10 Scientific Values & Significance Assessment

3.10.1 Significance Criteria

The basic processes of assessing significance for items of heritage are outlined by *The Australian ICOMOS Charter for the Conservation of Places of Cultural Significance: the Burra Charter* (amended 1999) and its associated *Guidelines*. Sites may be significant according to several criteria, including scientific or archaeological significance, significance to Aboriginal people, aesthetic value, the degree to which a site is representative of archaeological and/or cultural type, and value as an educational resource. In New South Wales the nature of significance relates to historic, aesthetic, social, scientific, cultural or educational criteria and sites are also assessed on the degree to which they exhibit rare or representative characteristics of their type, or whether they exhibit historic or cultural connections.

Scientific Significance

In order to determine scientific significance it is necessary to first place sites within a local and regional context. This process enables the assessment of any individual site in terms of merit against other sites of similar nature within similar contexts.

Public Significance

The sites are assessed in terms of their educational value, to enhance community knowledge and appreciation of cultural heritage.

Cultural Significance

Generally, all sites are of significance to the Aboriginal people. Cultural significance can only be determined by Aboriginal people. The registered Aboriginal parties for the development will be determining the cultural significance of the identified sites.

Representative Significance

Site significance is rated low, medium and high. The significance of individual sites is determined by factors such as representativeness, rarity, and the sites potential to add scientific data to what is known about past human occupation of the Australian continent. Conservation outcomes are determined by comparison of a site's qualities with known sites in the region that have been protected.

3.10.2 Scientific Significance Assessment

Artefact scatters and isolated finds are one of the most common site types identified in the Hunter Valley. The identified artefacts are considered to be of low scientific, public and representative significance. Newly recorded AFAs 109-114 are considered to be part of previously identified site 37-3-0537, however they are considered to be of low scientific significance as they do not add further information to what is already known about this site. AFAs 115 and 116 are considered to be of low scientific significance as they are located in disturbed contexts.

4. Impacts

The proposed ventilation shaft and associated works and parts of the proposed access track options (1 & 2) are located within the boundaries of previously recorded site 37-3-0537. The proposed location of the ventilation shaft was placed in an area to avoid impacts on known locations of objects within 37-3-0537 where possible.

Following the survey, additional items were located in the existing access track (Option 1). This access track will impact on AFA115 and AFA 116 located on the western end of the track and AFA109-11, 113 and 114 and EWA84 associated with 37-3-0537. The access track will require limited widening and upgrading and this may impact on additional objects not identified by the survey due to limitations in surface visibility. As noted earlier in the document ongoing maintenance of existing access tracks was underway at the time of writing this report for the purposes of ongoing mining operations in accordance with AHIP 1131017.

It is considered likely that the ventilation shaft pad and associated works, the sediment dam and drop holes may also impact on subsurface objects associated with 37-3-0537. No objects were located within the proposed location of the development however the ability to locate items was limited by surface visibility.

The proposed alternate access track (Option 2) will impact on existing site CR1 and any additional subsurface material which may be impacted by track widening and upgrading. Subsurface material associated with 37-3-0537 may also be impacted by the required 350 metre track extension. A summary of impact on known archaeological objects in the development area is provided in Table 5 below.

Table 5 Impact assessment

Site No	Type of impact	Degree of impact	Consequence of impact
37-3-0537	Direct	Partial	Partial loss of value
CR1 Object salvaged under AHIP1131017			
AFA40	None	None	N/A
AFA62	None	None	N/A
AFA63	None	None	N/A
AFA66	None	None	N/A
AFA109	Direct - If Option 1 utilised	Total	Total loss of value
AFA110	Direct - If Option 1 utilised	Total	Total loss of value
AFA111	Direct - If Option 1 utilised	Total	Total loss of value
AFA112	None	None	N/A
AFA113 Object salvaged under AHIP1131017			
AFA114 Object salvaged under AHIP1131017			
AFA115	Direct - If Option 1 utilised	Total	Total loss of value

AFA116	Direct - If Option 1 utilised	Total	Total loss of value

5. Management & Monitoring

5.1 Review of Existing Measures

Management of archaeological sites within the ACOL Longwalls 1-4 area is undertaken as per the ACOL Aboriginal Cultural Heritage Subsidence Management Plan Longwall Panels 1-4 (Insite 2007).

ACOL have internal protocols for new works which initially involves avoiding known locations of sites followed by site inspection and archaeological investigation to assess the impacts of the proposed development.

On 23 December 2011, AHIP number 1131017 was granted to ACOL over longwall areas 1 to 4. The AHIP includes conditions relating to the management of Aboriginal objects within the permit area. This proposed development is fully within the AHIP 1131017 area and is considered an approved works for the purpose of the AHIP.

5.2 Recommendations for Additional Measures

It is recommended that the proposed alternate access track (Option 2) not be utilised as it is considered that the construction of a new all weather access track has greater potential to impact on additional unknown objects associated with 37-3-0537. If ACOL were to pursue Option 2, further consultation would be required with the Aboriginal stakeholders.

The upgrading of the existing access track (Option 1) will impact on identified objects (AFA109-11, 115-116 and EWA84). This is considered a preferred option and has been discussed during consultation with the registered Aboriginal stakeholders.

It is anticipated that further loci of artefacts at similar densities to those recorded will be located within the proposed disturbance footprint. It is recommended that a salvage methodology be developed in accordance with the approved AHIP 1131017, and consultation undertaken with Aboriginal stakeholders during the development of this assessment report.

It is recommended that a perimeter barricade be placed around the known objects (AFA40, 62, 63, 66 and 112) located in proximity to the proposed works to avoid unintentional impacts during construction and operation.

6. Conclusions

The development area lies within the boundaries of previously identified site: AHIMS No. 37-3-0537, which was recorded by Witter (2002) and is described as several localities over a 300m x 200m area. The site is collectively referred to as the High Ridge Workshop Site and is located on a shoulder of the Ashton ridge. Details of the site can be seen in Appendix A – AHIMS Site Card.

The 60 x 75m concrete pad around the proposed ventilation shaft site, the drop holes and the vegetative screens have been placed in locations which avoid known Aboriginal objects. However there remains a probability that further loci may be impacted by the development.

It is recommended that Option 1 for the access track is given high preference as this option utilises established disturbed areas although further impact is likely when the track is upgraded. Mitigation against the impact will be developed with stakeholders and carried out in accordance with the conditions of AHIP 1131017.

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Appendix A – Site Card 37-3-0537

Aboriginal Sites Register of NSW

NPWS, PO Box 1967, Hurstville NSW 2220

Standard Site Recording Form

New Recording ☒ Additional information ☐

SITE IDENTIFICATION

Site name	Ashton High Ridge Workshop Site	NPWS Site Number	37-3-0537
Owner/manager	White Mining Limited		
Owner Address	PO Box 899, Singleton, NSW 2330		

LOCATION

Location	1.5 km west of Camberwell						
How to get to the site	Site is about 1 km on the south side of the New England Highway from the Bowmans Creek bridge on a track 50 m east of a fence gate						
1:250,000 map name	Singleton				NPWS map code	37	
AMG Zone	56	AMG Easting	319098		AMG Northing	6405565	
Method for grid reference	Hand-held GPS	Map scale (if method = map)	1:25,000	Map name	Camberwess		
NPWS District Name (see map)	Upper Hunter				NPWS Zone (see map)	Sydney Zone	
Portion no.	70				Parish	Vane	

SITE DESCRIPTION

Site type(s)	open camp site	Site type code (NPWS use only)	

Description of site and contents
CHECKLIST: eg. length, width, depth, height of site, shelter, deposit, structure, element eg. tree scar, grooves in rock.
DEPOSIT: colour, texture, estimated depth, stratigraphy, contents-shell, bone, stone, charcoal, density & distribution of these, stone types, artefact types.
ART: area of decorated surface, motifs, colours, wet/dry pigment, engraving technique, no. of figures, sizes, patination.
BURIALS: number & condition of bone, position, age, sex, associated artefacts.
TREES: number, alive, dead, likely age, scar shape, position, size, patterns, axe marks, regrowth.
QUARRIES: rock type, debris, recognisable artefacts, percentage quarried

Shoulder of ridge 300 x 200 m B, gravel lag, Track, bare patches 10%vis
19 artefacts

The high ridge workshop site is on a shoulder of Ashton Ridge, and features a microblade workshop of grey tuff. There are several exposures in the locality as are listed in Table 12.40. Although only a few flakes belonging to the grey tuff microblade workshop, they consisted of finely made blades and a perfect geometric. The microblade core present was of silcrete. This workshop occurred in a relatively high density background of conventional debitage.

The deposit associated with the grey tuff workshop is intact and although it has been cut through by a bladed farm track, is likely that excavation would recover more of it.

EWA	dimen.	landform	exposure	vis.	n artefacts
76	100 x 3	Ridge crest	A&B lag, track	50%	4
79	10 x 10	Ridge crest	A,B,gravel lag, track	20%	2
83	20 x 5 m	Spur crest	Gravel lag, gravel pit	20%	1
84	15 x 3 m	Spur shoulder	A&B lag, tack	80%	10
85	50 x 50 m	Spur crest	A&B lag, track, erosion	50%	1
88	50 x 1 m	Slope tributary	Talus, rill banks	20%	1

Version: June 1998 Data entered by: JA Date entered: 15/10/02

Aboriginal Sites Register of NSW

NPWS, PO Box 1967, Hurstville NSW 2220

Standard Site Recording Form

SITE ENVIRONMENT

Land form	ridge crest	Aspect	open	Slope	gentle, moderate
Mark position of the site					
Local rock type	sandstone/conglomerate	Land use/effect	grazing		
Distance from drinking water	1 km	Source	creek		
Resource zone (eg. estuarine, river, forest)	ridge slopes	Vegetation	grasses		
Edible plants	unknown	Faunal resources (include shellfish)	unknown		
Other exploitable resources (eg. ochre)	unknown				
Are there other sites in the locality	Yes	Are they in the Sites Register	No	Other site types include	open camp sites

SITE MANAGEMENT

Site condition	Disturbed	vehicle track cuts through site	
Management recommendations	Test salvage excavation for mine development		
Have artefacts been removed from site	No	When	
By whom		Deposited at	
Consent applied for	☒	Consent issued	☐
Date of issue		Consent number	

SITE INSPECTION AND RECORDING

Reason for investigation	Coal mining EIS archaeological impact study		
Were local Aborigines contacted or present for the recording	☐ Not contacted ☐ Contacted and present ☒ Contacted but not present	Names and addresses	Victor Perry UWTC Barry Anderson LWTC Bev and Larry Van Vliet WLALC
Is the site important to local Aborigines	yes		
Verbal/written reference sources	Dan Witter 2002. Ashton Coal Project EIS: Aboriginal Archaeology	ASR report number(s) (or title)	C-0 C-
Photographs taken		No. of Photos attached	
Site recorded by	Dan Witter, Sedgemere, RD3, Leeston, New Zealand	Date of recording	April 2002
Address/institution			

Version: June 1998 Data entered by: Date entered:

Appendix B – Stakeholder information packs

Example letter – with stakeholder details removed. Full copies available on request.

AshtonCoal

ASHTON COAL OPERATIONS PTY LIMITED
ABN 22 078 556 500

GLENNIES CREEK ROAD
CAMBERWELL NSW 2330

TEL: 02 6576 1111
FAX: 02 6576 1122

PO BOX 699
SINGLETON NSW 2330

ENVIRONMENTAL CONTACT LINE: TEL: 02 6576 1830
TOLL FREE NUMBER: 1800 657 639
WEB ADDRESS: WWW.ASHTONCOAL.COM.AU

3 November 2011

Stakeholder name and address

Dear

Consultation for Additional Minor Development for the Ashton Underground Coal Mine – Ventilation Shaft

Ashton Coal Operations Pty Limited (ACOL) has reviewed the ventilation requirements for its existing underground mine and has determined that additional ventilation infrastructure and changes to existing ventilation arrangements. This will require the development of a new main ventilation shaft above the underground mine. The need for this additional ventilation requirement coincides with the scheduled development of the second coal seam (the Upper Liddell Seam) approved to be mined in the Ashton underground mine. The location of the Ashton mine and proposed ventilation shaft are shown on the attached plans.

The main ventilation shaft and fan will disturb an area of less than 0.5 ha. Heavy vehicle access to the main vent shaft and fan site may require the construction of a new access track which would disturb up to a further 0.5 ha of land. While every effort has been made to locate the shaft and fan infrastructure in areas away from known Aboriginal sites as far as practical, the final positioning of the shafts and fans will ultimately be determined by the underground mine layout.

ACOL is now seeking input from interested Aboriginal community members to assist in identifying the potential impacts of constructing the ventilation infrastructure on Aboriginal cultural heritage. Open consultation sessions will be held on site at the Ashton mine during the week of Monday 7 – Friday 11 November.. These will be one on one or small group sessions upon request. Please note these sessions are unpaid consultation.

Further information on the required works, assessment process and testing methodology is included in the attached information package.

I encourage you and any other interested community members to provide ACOL with written response on the information provided in the attached information pack. The information you

provide will be used to assist ACOL in its management of Aboriginal cultural heritage at the Ashton coal mine.

It would be greatly appreciated if your written feedback on the new and changed ventilation infrastructure arrangements for the underground mine could be provided to ACOL by **5pm Friday 18 November.**

Regards

LISA RICHARDS
Environment & Community Relations Manager
Encl: Information pack

Construction and Operation of Ventilation shaft and fans within Mining Lease 1533 area

Introduction

The Ashton Coal Project (ACP) is located near Camberwell, 14 km northwest of Singleton in the Hunter Valley, New South Wales (see Figure 1 below). The ACP comprises an open cut and underground mine, coal handling and preparation facilities, run-of-mine (ROM) and product stockpiles, rail loading facilities and associated support facilities.

Development consent (DA 309-11-2001-i) for the ACP was granted by the Minister for Planning in October 2002. This approves a four seam descending longwall underground mine, which operates within Mining Lease (ML) 1533 and ML 1623. Ashton Coal Operations Pty Limited (ACOL) is the manager and operator of the ACP.

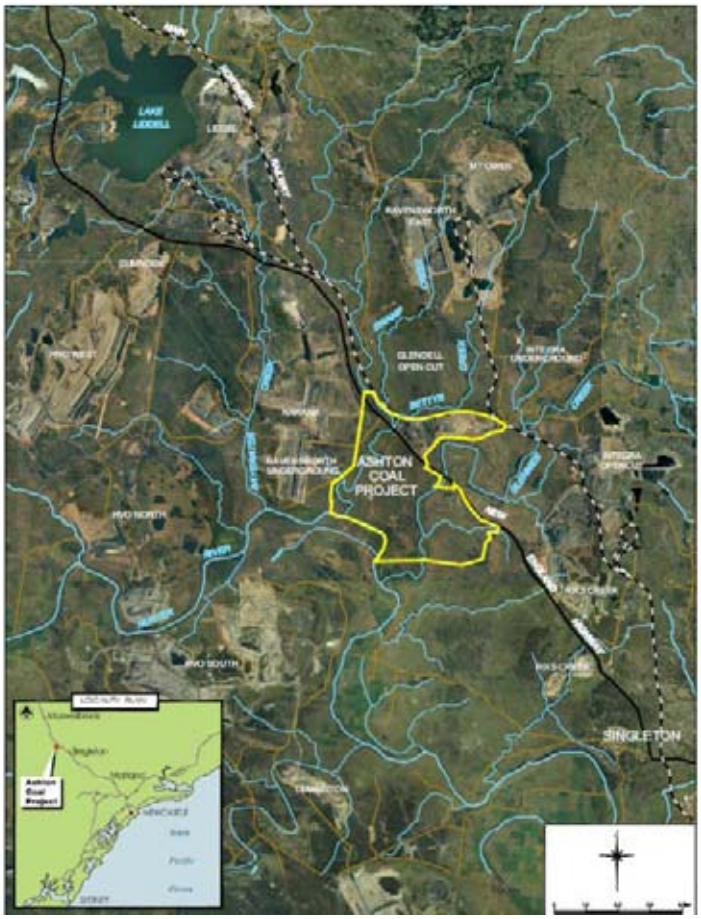

Figure 1: Locality of Ashton Coal Project

Proposed Additional and Changed Underground Mine Ventilation Infrastructure Requirements

Sydney Office: Suite 1106, Level 11, 68 York Street, Sydney, NSW, 2000 – Tel: (02) 8243 5300 Fax: (02) 8243 5399
Brisbane Office: Level 6, 316 Adelaide Street, Brisbane, QLD, 4000 – Tel: (07) 3248 7900 Fax: (07) 3211 7328

Background

ACOL has undertaken a review of the ventilation requirements for the Ashton underground mine as it continues the development of the mine to the next lowest coal seam (the Upper Liddell Seam) in the approved underground mine. This review has determined that a new main ventilation shaft and fan is required to supplement the existing underground mine ventilation system.

This identified development requires the establishment of:

- A 5.5 m diameter shaft located at the northern end of the Upper Liddell Seam Longwall Panel 1. This main ventilation shaft will be drilled to a depth fitted with two surface mounted extraction fans.

The locations of these ventilation shafts and fans are shown on Figure 2 below. Their locations have been selected to ensure that once developed they will provide effective long-term ventilation of the mine. As far as practically possible the shaft and fan sites have also been selected to minimise impacts on key sensitive surface features, including known Aboriginal objects.

Main Ventilation Shaft and Fans

The main ventilation shaft will involve:

- Drilling a 120 m deep 5.5 m diameter shaft.
- Lining the shaft with concrete.
- Constructing a 50 x 70 m concrete pad and fenced compound around the shaft.
- Installing two extraction fans on the concrete pad and connecting the fans to the shaft via ventilation tubing.
- Connecting power and installing switching gear to power the fans.
- Constructing appropriate sediment and erosion control measures.
- Either upgrading an existing farm track or constructing a new access track to enable heavy vehicle and all weather access to the ventilation shaft area.
- Ballast drop hole
- Other minor ancillary disturbance works that may be required to facilitate the operation of the main ventilation shaft and fan.

The key features influencing the location of the main ventilation shaft include:

- It is an effective location for ACOL to maintain long-term mine ventilation.
- There are no known archaeological objects within the areas to be disturbed.
- There will be limited visibility of the constructed shaft and fan structures from areas outside ACOL's land holding.
- There will be minimal additional noise from operation of the fans on ACOL's neighbours.

The layout of the main ventilation shaft, fans and associated infrastructure is shown in Figure 2 below.

Construction Method

The main ventilation shaft will be drilled using raise bore equipment. This requires a small diameter pilot hole to be drilled to the required depth. The shaft is then excavated upwards to the surface using a raise bore drilling rig located on the surface. The excavated material falls to the bottom of the shaft in the underground workings. This method minimises drilling impacts that would otherwise occur on the surface, reducing surface disturbance, noise and other drilling related activities.

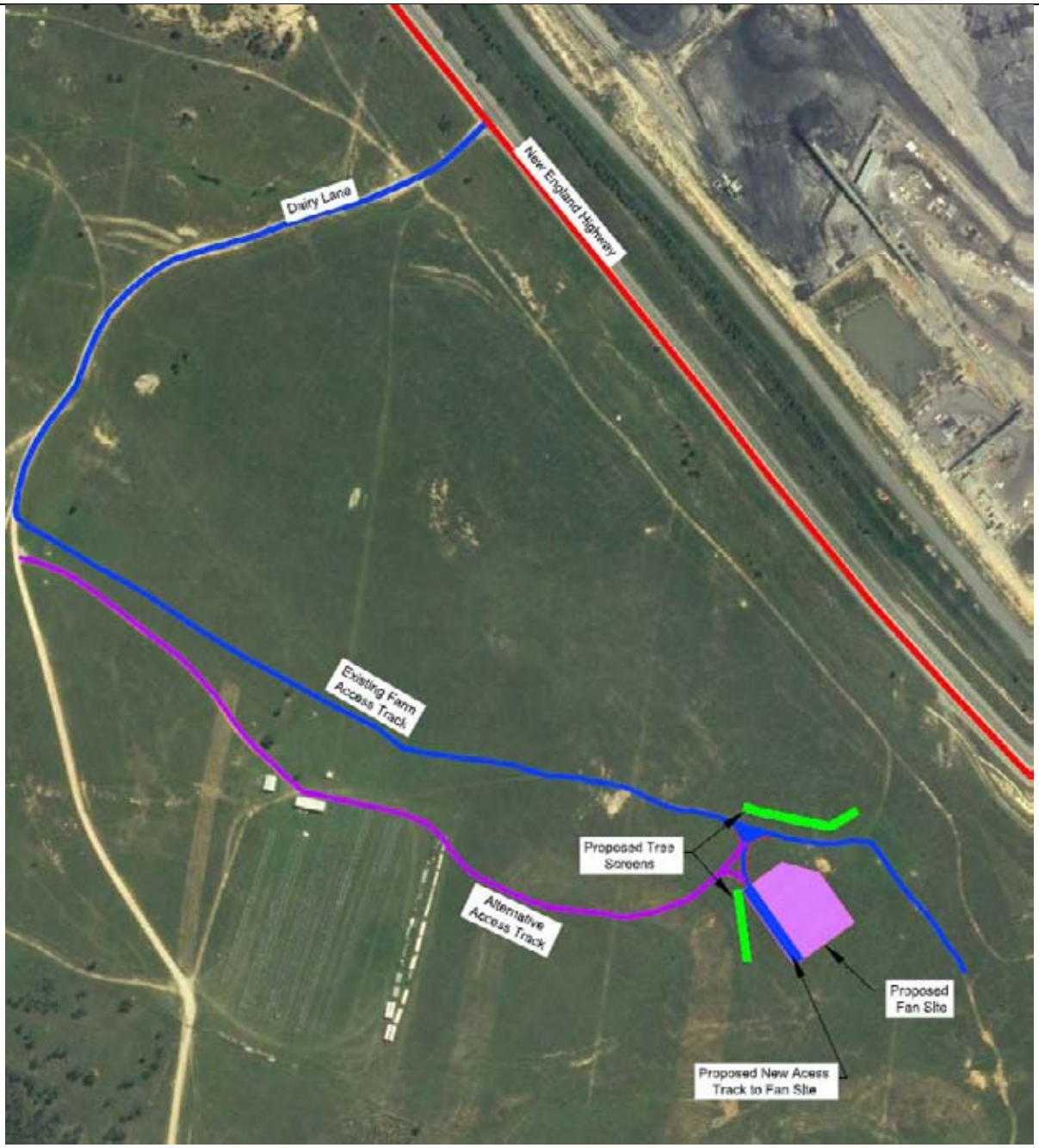

Figure 2: Proposed site location of the ventilation shaft and associated infrastructure

Archaeological Information

The project area was surveyed as part of the archaeological assessment conducted by Hardy (2001) and Witter (2002) for the original development application in 2001. A revision of these documents has been undertaken. In addition there has been a site inspection undertaken with Insite Heritage and representatives of the registered Ashton Aboriginal Stakeholder groups.

Main Ventilation Shaft and Fans

The selected site of the main ventilation shaft and fans lies within the boundaries of a previously identified site - AHIMS No. 37-3-0537, which was recorded by Witter (2002) and described as several localities over a 300 x 200 m area. The area is collectively referred to in the Witter report as the High Ridge Workshop and is located on a shoulder of the Ashton ridge. The site is located on a ridge with eroded shallow A horizon soil.

The location of the 50 x 70 m concrete pad around the proposed main ventilation shaft site has been selected to avoid known Aboriginal objects within the identified site. During the site inspection a further 11 objects were identified along the existing farm track.

It was noted that due to vegetation, surface visibility was low during the site inspection of the area for the ventilation shaft area. It is therefore recommended that salvage utilising subsurface archaeological testing of obscured artefacts be undertaken.

As there is potential for some known objects to be impacted due to visibility during site inspections and a potential for there to be previously unidentified objects exposed during construction works, appropriate Aboriginal Heritage Impact Permits (AHIP) will be in place prior to undertaking these works.

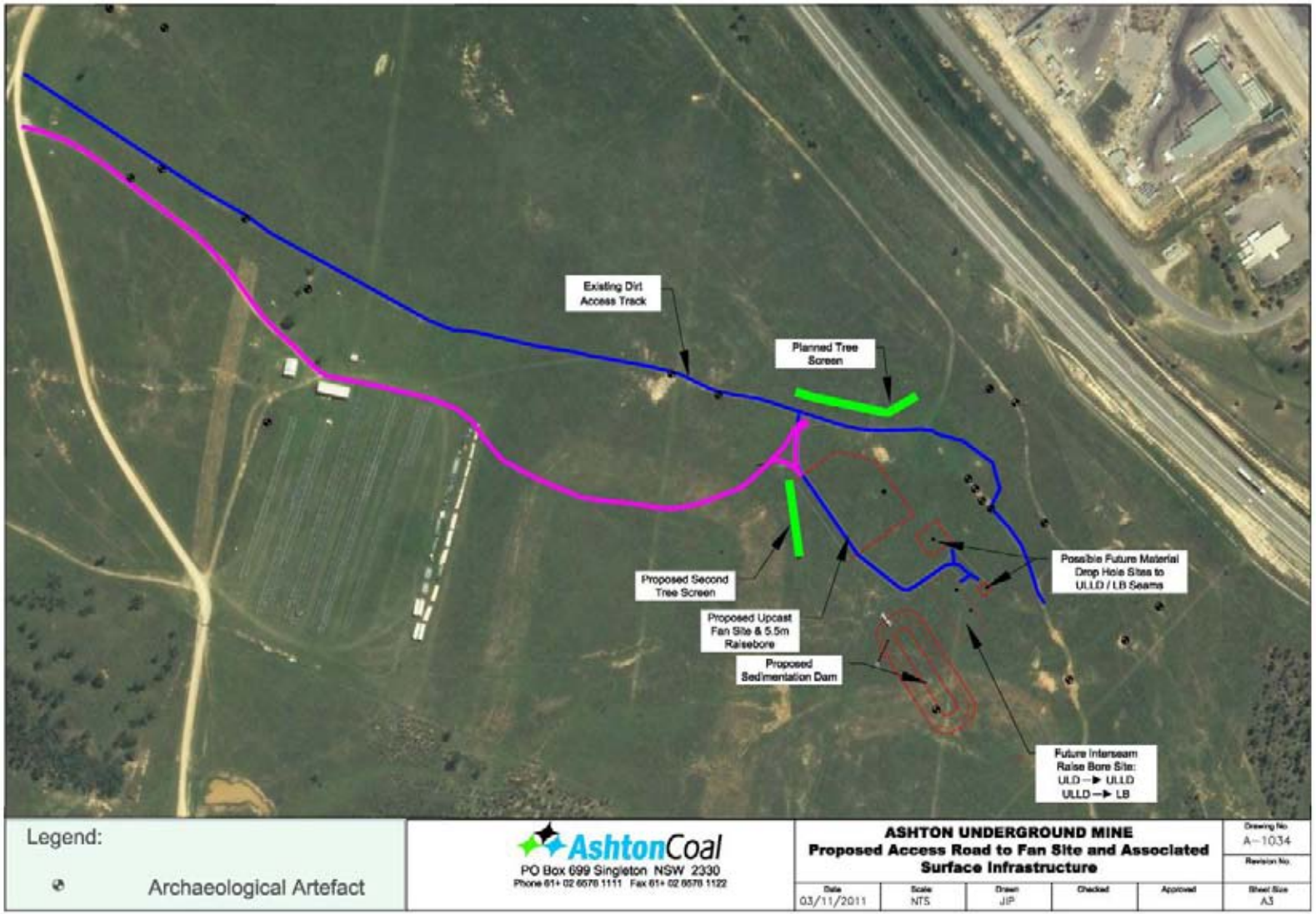

Figure 3: Location of known archaeological objects in proximity to the proposed ventilation shaft fan site.

Proposed Methodology for Subsurface Testing

The purpose of the proposed subsurface testing is to collect information about the nature and extent of Aboriginal objects that may potentially occur in subsurface heavily vegetated areas. The proposed methodology is in line with the 2010 Department of Climate Change & Water (DECCW now OEH) Code of Practice for archaeological investigation of Aboriginal objects in NSW. Test excavations will also contribute to the understanding of site characteristics, local and regional prehistory and will be used to inform conservation goals and harm mitigation measures to be applied during the proposed surface disturbance activities.

It is proposed that subsurface testing is undertaken in the following locations:
i) Proposed location of the pad area for the ventilation shafts and fans, and adjacent to identified objects in the area of access track widening.
ii) The proposed 20 x 20m area of impact for the back road fan shaft and any additional areas required for service trenches and drainage sumps.

Archaeological subsurface testing will be undertaken in accordance with OEH (2010) Code of Practice for Archaeological Assessment of Aboriginal Objects in NSW outlined below:
1 Test excavation units must be placed on a systematic grid appropriate to the scale of the area – either PAD or site – being investigated e.g. 10 m intervals, 20 m intervals, or other justifiable and regular spacing.

2 Any test excavation point must be separated by at least 5 m.

3 Test excavations units must be excavated using hand tools only.

4 Test excavations must be excavated in 50 cm x 50 cm units.

5 Test excavations units may be combined and excavated as necessary to understand the site characteristics, however:
i) the maximum continuous surface area of a combination of test excavation units at any single excavation point conducted in accordance with point 1(above) must be no greater than 3 m^2

ii) the maximum surface area of all test excavation units must be no greater than 0.5% of the area – either PAD or site – being investigated .

6 Where the 50 cm x 50 cm excavation unit is greater than 0.5% of the area then point 5 (ii) (above) does not apply.

7 The first excavation unit must be excavated and documented in 5 cm spits at each area – either PAD or site – being investigated. Based on the evidence of the first excavation unit, 10 cm spits or sediment profile/stratigraphic excavation
(whichever is smaller) may then be implemented.

8 All material excavated from the test excavation units must be sieved using a 5 mm aperture wire-mesh sieve.

9 Test excavation units must be excavated to at least the base of the identified Aboriginal object-bearing units, and must continue to confirm the soils below are culturally sterile.

11 Photographic and scale-drawn records of the stratigraphy/soil profile, features and informative Aboriginal objects must be made for each single excavation point.

12 Test excavations units must be backfilled as soon as practicable.

13 Following test excavation, an Aboriginal Site Impact Recording form must be completed and submitted to the AHIMS Registrar as soon as practicable, for each AHIMS site that has been the subject of test. The test excavation should be sufficiently comprehensive to allow characterisation of the Aboriginal objects present without having a significant impact on the archaeological value of the subject area.

Protocols for handling artefacts:
Should any artefacts be identified in the test probes, their locations will be recorded with a GPS and their features (artefact type, size raw material type) also recorded; the artefacts will then be returned to the base of the test probe and a survey stake labelled with pit identification placed at its location.
Protocols / Procedures for Conducting the Assessment
We would like to invite all registered parties to identify any protocols you wish to be adopted in the information gathering process and assessment methodology. We would also appreciate if you could identify any matters such as issues/areas of cultural significance that might affect, inform or refine the assessment methodology.
We would also like to invite submissions regarding the presence of any culturally significant objects and or places within the proposed development areas so that these may be avoided wherever possible.

Feedback

ACOL welcome feedback on the proposal. Written feedback can be sent to:
PO Box 699 Faxed to (02) 6576 1122 or emailed to:
cferguson@ashtoncoal.com.au
SINGLETON NSW 2330
Closing dates for submissions will be **5pm Friday 18 November**.

Further information

If you would like any further information please contact Lisa Richards or Cassandra Ferguson on (02) 6576 1111.

AshtonCoal

APPENDIX 6

Terrestrial Ecology Impact Assessment

Wells Environmental Services

PEA Consulting
Ecologists and Ecohydrologists specialising in the assessment, management and restoration of complex terrestrial and wetland ecosystems
35 Hannan St
Maitland, NSW 2320
Australia
E: info@peaconsulting.com.au
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Ashton Coal Operations
Underground Ventilation Shaft

Final Version

Prepared by John-Paul King

For

AshtonCoal

Document Control

Version Date	Version	Tasks undertaken and updated material	Completed by
08/11/2011	Final with modification of specifications	Modification of specifications	John-Paul King
27/07/2011	Final	Editing, map finalization	John-Paul King
28/06/2011	Final Draft	Wells Environmental Services review	John-Paul King
20/12/2011	Final	Ashton review comments inclusion	John-Paul King

Distribution

Version Date	Distribution	Distribution Form
08/11/2011	Wells Environmental Services Pty Ltd	PDF via email
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20/12/2011	Wells Environmental Services Pty Ltd	PDF via email

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Document Limitations

This report has been prepared with the utmost care using information supplied by the client and other entities, as well as the results of original investigations. PEA does not warrant that the information in this report is free from errors or omissions. While the document satisfies the requirements of the brief, a need for additional investigations and reporting may be identified after consultation with relevant authorities. Current knowledge of the ecology of most flora and fauna species is poor. As a consequence there is often insufficient data to objectively assess the potential ramifications of any given proposal for most species. Therefore, it is typical for ecological assessments to rely to some extent on professional opinion, judgments based on the personal knowledge of the ecological consultant, investigations undertaken specifically for the proposal and/or data derived from previous studies (i.e. literary resources). In scientific jargon, such subjective judgments are 'hypotheses': 'likely' explanations developed through a synthesis of available information and consultant experience in the discipline. These hypotheses are considered quite accurate within the profession as the experience of the consultant balances any insufficiency of data to the standards of the discipline; they nevertheless remain subjective opinions unless tested scientifically.

Where possible, PEA seeks to test hypotheses using scientifically sound methods. That is, PEA undertakes studies designed to replace subjective judgments with objective data. However, due to various constraints, this is not always feasible for all areas at issue and it is therefore necessary to rely on informed opinion at certain times during ecological assessment. In keeping with our position that authors of ecological assessments should be accountable for their opinions, the authors responsible for PEA reports are clearly stated on the title page.

Independence

Due to the inherent reliance of ecological assessments on professional opinion, assessments provided unavoidably reflect the experiences and attitudes of their authors. While personal bias is considered an intrinsic consequence of any interpretive procedure in ecological reporting, advice provided must be independent. Independent advice draws conclusions regardless of client identity. Further, it is common practice for a client to modify their proposal in response to information supplied by the ecological consultant so as to avoid excessive ecological impact. This typically results in an ecological assessment report that is the considered opinion of the authors, supports the proposal, and yet is in no way adversarial on behalf of the client. While others may disagree with opinions expressed in PEA reports, opinions provided are independent and represent the best advice of the authors at time of publication given available data.

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1.0 Introduction

This proposal has been prepared in support of an application by Ashton Coal Operations Limited (ACOL) to construct one (1) ventilation shaft, fan infrastructure, one (1) ballast drop hole, one (1) concrete drop hole, access tracks and a sediment dam at the Ashton Coal Project. The additional infrastructure will assist the ventilation of underground workings, enabling the safe continuation of underground mining, and reduce congestion at the underground entrance.

The project includes the construction of a 5.5 metre shaft and infrastructure pad of approximately 60 metre x 75 metre, and two small (nominally 300mm diameter) drop holes on 20 x 20 metre pads adjacent to the shaft infrastructure. Outside the pad, an access track, electrical supply infrastructure and a sedimentation dam will be constructed. The proposed development will result in a surface footprint of approximately 0.5 hectares plus a minor access track. The proposed location for the ventilation shaft sites were selected based on the following criteria:

1. Mature trees and remnant vegetation have been avoided;
2. Ecologically sensitive areas have been avoided;
3. Where possible the length of access tracks has been minimised; and,
4. The shaft has been located in the best location to achieve a safe work environment whilst adhering to criteria 1-3 above.

A detailed description of the proposal is provided in Section 4 of the *Ashton Upcast Ventilation Shaft and Associated Infrastructure Environmental Assessment*. The specific areas of issue for this report are presented below and diagrammatically in **Figure 1:**

1. **Local Area**- This includes all terrestrial lands from the New England Highway in the north to the Hunter River in the south and ranges from Glennies Creek in the east across Bowmans Creek and terminates on the Ravensworth mine site.
2. **Proposal Area**- This includes all terrestrial lands within the footprint of the proposed disturbance area of approximately 0.5 hectares, a buffer of 20 metres from the edges of the footprint, and access tracks, as shown in **Figure 1.**

1.1 Scope of Work

The general aim of this report is to undertake a terrestrial flora and fauna assessment of the impacts from the proposed shaft and supporting infrastructure on potential and significant ecological issues.

The specific aims are to:

1. Determine the potential impacts of the proposal on terrestrial ecological matters; and,
2. Provide recommendations to minimise impacts on terrestrial ecology.

1.2 Methodology

Various surveys of terrestrial ecology have been previously conducted across the Local Area, including in-depth ecological surveys for previous ACOL assessments and reporting. An inspection of the proposed development site in June 2011 confirmed the site as cleared pasture, and as such no additional surveys were undertaken for the preparation of this report. Details of flora and habitats in the proposal and local area are provided in Appendix A and B. See Ashton Coal Project modification of DA 309-11-201-i Environmental Assessment (Mod 7) 2011for a comprehensive assessment which includes current surveys as well as all previous surveys relevant to the project site.

2.0 Existing Environment

Given the comprehensive and up-to-date nature of surveys and assessments prepared for ACOL in the recent past, and based on a visual inspection of the site no further surveys and assessments are considered necessary.

2.1 Vegetation Communities

There is one (1) vegetation community of dry pasture. The vegetation in the Local Area predominantly comprises an induced vegetation community formed by clearing of the original native woodland and ongoing grazing to maintain grassland of native grasses, such as *Aristida r amosa, Austrostipa verticillata* and *Eriochloa pseudoacrotricha*, introduced grasses, such as *Paspalum dilatatum*, and native and introduced herbs. Appendix A shows the flora data recorded for the local area.

2.2 Significant Flora

No significant flora species were identified or exist at the site of the development. Given the comprehensive and up-to-date nature of surveys and assessments prepared for ACOL no further assessment of potential impacts on threatened species (populations, communities or their habitats) is required.

2.3 Significant Fauna

Four (4) significant fauna species were identified as being relevant to the development site, however, no impacts to these species will occur as a result of the proposed activity (see Appendix B).

2.4 Areas of Environmental Sensitivity

There are no areas of environmental sensitivity within the local or proposal areas.

3.0 Statutory Requirements

3.1 Environment Protection & Biodiversity Conservation Act 1999

The Commonwealth Environment Protection & Biodiversity Conservation Act, 1999 (EPBC Act) provides for the need for the approval of the Commonwealth Environment Minister for all actions that will or are likely to have a significant impact on a matter of national environmental significance (MNES). The underground area was included within EPBC Act Referral 2001/524 in 2001 and was assessed and deemed not to have an impact on any MNES.

The proposed modification to the original disturbance area detailed within EPBC Act Referral 2001/524 will not result in any impacts on MNES.

3.2 Threatened Species Conservation Act 1995

The TSC Act provides a framework for the listing and declaration of threatened species, populations, endangered ecological communities, key threatening processes and critical habitat. It also provides a framework for the preparation and implementation of recovery plans and threat abatement plans and for licensing. No listed or declared threatened species, populations, endangered ecological communities, or critical habitat will be significantly impacted by this proposal.

3.3 Environmental Planning and Assessment Act 1979

The EP&A Act provides a framework for the assessment of development and activities which are likely to impact on threatened species, populations or ecological communities as listed pursuant to the TSC Act. It also requires that all relevant threat abatement plans and recovery plans are considered.

3.4 State Environmental Planning Policies (SEPP)

3.4.1 SEPP 44 – Koala Habitat Protection

State Environmental Planning Policy No 44 – Koala Habitat Protection (SEPP 44) was introduced to protect potential and core koala habitat in NSW. Under SEPP 44, developers of land with koala habitat (as defined in the SEPP) have to consider the impact of their proposals on koalas, and in certain circumstances, prepare individual koala plans of management for their land. There is no core koala habitat in the Local Area and no koala recorded.

3.5 Relative key threatening processes

The key threatening process of "clearing of native vegetation" is the only relevant process. Improved dry pasture grass is not considered to be 'native' vegetation and as a result no further assessment is required.

4.0 Predicted Impacts

The removal of 0.5 hectares of dry pasture to establish the proposed development and disturbance for improvements to access tracks will not impact on the Local Area ecology pursuant to the provisions of the EP&A Act and EPBC Act. Provided continuing and appropriate mitigation measures are maintained (see below) this proposal will not result in any impacts additional to those which have already been assessed for the existing ACOL underground mine.

5.0 Management Actions for Terrestrial Ecology

The development is limited to the minor footprint and access tracks, which are all located within pasture communities. The current management actions already in place at Ashton adequately cover this type of activity, as such, no additional management actions are necessary. Guidelines for the management of construction and operation will include:

- Access to areas outside the defined roads and tracks should be restricted to authorised personnel only;
- Where access roads are not clearly defined, markers should be installed to guide access; and
- Existing environmental management plans and procedures for the area should be adhered to.

6.0 Conclusions

The proposed ventilation shaft and supporting infrastructure will have no impact on local or national ecological issues and, will not impact on any threatened species, populations, communities or their habitats known to the Local Area.

The ecological findings of this assessment are consistent with the results of assessments conducted for the Bowmans Creek Environmental Assessment (2009) and the Ashton Cola Project modification of DA 309-11-201-i Environmental Assessment (Mod 7) 2011, and there is no ecological reason for not supporting the proposal.

References

Ashton Coal Operations Limited (2011) Underground Mine Interim Gas Drainage and Open Cut Hebden Seam Recovery DA 309-11-2001 MOD 7

Figure 1 Proposal Area


N
W
E
S
unamed "Dairy Lane" Intersection
Ashton Coal
North East
Open Cut Mine
New England Highway
Ashton Coal
Underground Offices
Ashton Coal
Operations
Main Administration
Existing Access Track
Proposed Buried
Powerline
Vehicle Turning Area
5.5m Ventilation Shaft
Ballast Drop Hole
Alternative Access Track
Concrete Drop Hole
Sediment Dam
Glennies Creek Road
0
250 m

Appendix A- Flora of the Local Area

Table 1 Flora transect data

Classification/ Scientific name	Recent Synonyms	Common Name	Status
Transect data information: Transect data recorded from walking transects in Bowmans Creek locality.			
SUBKINGDOM TRACHEOBIONTA		**Vascular Plants**	
SUPERDIVISION PTERIDOPHYTANAE		**Seedless Vascular Plants**	
DIVISION POLYPODIOPHYTA		**Ferns**	
CLASS POLYPODIOPSIDA			
Order Pteridales			
ADIANTACEAE			
Cheilanthes sieberi		Slender Cloak-fern	
SUPERDIVISION SPERMATOPHYTANAE		**Seed Plants**	
DIVISION MAGNOLIOPHYTA		**Flowering Plants**	
CLASS ROSOPSIDA		**Eudicotyledons**	
SUBCLASS CARYOPHYLLIIDAE			
Order Caryophyllales			
AIZOACEAE			
Galenia pubescens		Galenia	i
AMARANTHACEAE			
Alternanthera denticulata		Lesser Joyweed	
Amaranthus viridus		Green Amaranth	i
Gomphrena celosioides		Gomphrena Weed	i
BASELLACEAE			
Anredera cordifolia		Madeira Vine	i
CACTACEAE			
Opuntia aurantiaca		Tiger Pear	i
Opuntia stricta var. *stricta*		Common Prickly Pear	i
CARYOPHYLLACEAE			
Spergularia marina		Saltspurry	
CHENOPODIACEAE			
Chenopodium ambrosioides		Mexican Tea	i
Einadia hastata		Shrubby Berry-saltbush	
Enchylaena tomentosa		Ruby Saltbush	
POLYGONACEAE			
Persicaria decipiens	*Polygonum decipiens*	Slender Knotweed	
Persicaria lapathifolia	*Polygonum lapathifolia*	Pale Knotweed	

Classification/ Scientific name	Recent Synonyms	Common Name	Status
Polygonum arenastrum		Common Wireweed	
Rumex brownii		Swamp Dock	
Rumex crispus		Curled Dock	i
PORTULACACEAE			
Portulaca olearacea		Pigweed	
SUBCLASS ROSIDAE			
Order Saxifragales			
CRASSULACEAE			
Bryophyllum X *houghtonii*		Mother-of-millions	i
HALORAGACEAE			
Myriophyllum verrucosum		Red Water-milfoil	
Order Myrtales			
MYRTACEAE			
Eucalyptus crebra		Narrow-leaf Ironbark	
ONAGRACEAE			
Epilobium billardierianum		Smooth Willow-herb	i
Ludwigia peploides subsp. *montevidensis*		Water Primrose	
Oenothera stricta subsp. *stricta*		Common Evening Primrose	i
Order Malpighales			
PHYTOLACCACEAE			
Phytolacca octandra		Inkweed	i
SALICACEAE			
Salix babylonica		Weeping Willow	i
Order Fabales			
FABACEAE			
FABOIDEAE			
Glycine tabacina agg.			
Order Fagales			
CASUARINACEAE			
Alloocasuarina luehmanii	*Casuarina luehmanii*	Bulloak	
Casuarina cunninghamiana		River Oak	
Order Brassicales			
BRASSICACEAE			
Hirschfeldia incana		Buchan Weed	i
Rorippa laciniata		Watercress	i
Order Malvales			
EUPHORBIACEAE			
Chamaesyce dallachyana		Caustic Weed	i
Ricinus communis		Castor Oil Plant	i

Classification/ Scientific name	Recent Synonyms	Common Name	Status
MALVACEAE			
Modiola caroliniana		Red-flowered Mallow	i
Sida corrugata		Corrugated Sida	i
Sida rhombifolia		Paddys Lucerene	i
Order Sapindales			
ANACARDIACEAE			
Schinus areira	*Schinus molle* var. *areira*	Pepper tree	i
SUBCLASS ASTERIDAE			
Order Gentianales			
APOCYNACEAE			
Araujia sericifera	*Araujia hortorum*	Moth Vine	i
Order Lamiales			
MYOPORACEAE			
Eremophila debilis	*Myoporum debile*	Amulla	
PLANTAGINACEAE			
Plantago lanceolata		Plantain	i
Plantago major		Large Plantain	i
VERBENACEAE			
Verbena bonariensis		Purple Top	i
BORAGINACEAE			
Heliotropium amplexicaule		Blue Heliotrope	
Order Solanales			
SOLANACEAE			
Cestrum parqui		Green Cestrum	i
Datura stramonium		Common Thornapple	i
Lycium ferocissimum		African Boxthorn	i
Solanum nigrum		Black Nightshade	i
Order Apiales			
APIACEAE			
Centella asiatica		Swamp Pennywort	
Foeniculum vulgare		Fennell	i
Order Asterales			
ASTERACEAE			
Aster subulatus	*Symphyotrichum subulatum*	Wild Aster	i
Bidens pilosa		Cobblers Peg	
Carthamus lanatus		Saffron Thistle	i
Centipida minima subsp. *minima Centipida minima* var. *minima*		Spreading Sneeze Weed	
Chrysocephalum apiculatum	*Helichrysum apiculatum*	Yellow Buttons	

Classification/ Scientific name	Recent Synonyms	Common Name	Status
Cirsium vulgare		Scotch Thistle	i
Conyza bonariensis		Fleabane	i
Dittrichia graveolens		Stinkwort	i
Schkuhria pinnata var. *abrotanoides*		Dwarf Marigold	
Senecio madagascariensis		Fireweed	i
Senecio quadridentatus		Cotton Fireweed	
Sonchus oleraceus		Common Sow-thistle	i
Tagetes minuta		Stinking Roger	i
Xanthium occidentale	*Xanthium strumarium* pp	Noogoora Burr	i
CAMPANULACEAE			
Wahlenbergia stricta		Tall Bluebell	
CLASS LILIOPSIDA		**Monocotyledons**	
SUBCLASS COMMELINIDAE			
Order Poales			
CYPERACEAE			
Cyperus eragrostis		Umbrella Sedge	i
Cyperus polystachyos		Bunchy Flat-sedge	
Fimbristylis dichotoma		Common Fringe-rush	
Isolepis cernua	*Scirpus cernuus*	Nodding Club-rush	
Schoenoplectus validus	*Scirpus validus*	River Club-rush	
JUNCACEAE			
Juncus acutus		Spiny Rush	i
Juncus usitatus		Common Rush	
POACEAE			
Aristida ramosa		Three-awned Spear Grass	
Austrostipa verticilliata	*Stipa verticilliata*	Slender Bamboo Spear Grass	
Avena barbata		Beared Oat	i
Chloris truncata		Windmill Grass	
Chloris virgata		Feathertop Rhodes Grass	
Cortadieria selloana		Pampas Grass	i
Cynodon dactylon		Common Couch	n
Digitaria brownii		Cotton Panic Grass	
Digitaria parviflora		Small-flower Finger Grass	
Digitaria sanguinalis		Crab Grass	i
Ehrharta erecta		Panic Veldtgrass	i
Eragrostis curvula		African Lovegrass	i
Lachnagrostis filiformis	*Agrostis avenacea*	Blown Grass	

Classification/ Scientific name	Recent Synonyms	Common Name	Status
Panicum effusum		Hairy Panic	
Paspalum dilatatum		Paspalum	i
Phragmites australis		Common Reed	
Setaria parviflora	*Setaria gracilis*	Slender Pigeon Grass	i
Sporobolus creber	*Sporobolus indicus* var. *creber*	Slender Rats Tail Grass	
Vulpia bromoides		Foxtail Grass	i
TYPHACEAE			
Typha orientalis		Broad-leaf Cumbungi	
Order Commelinales			
COMMELINACEAE			
Commelina cyanea		Scurvy Weed	

STATUS ABBREVIATIONS:

i = introduced (i.e. not indigenous to Australia)

n = native Australian species not considered to be indigenous to the site

SCIENTIFIC NAMES & AUTHORITIES:

Scientific names & families are those used in the *Flora of New South Wales* as maintained by the Royal Botanic Gardens (http://.plantnet.rbgsyd.gov.au).

The classification scheme used for orders and higher taxa is detailed at http://www.hunterwetlands.com.au)

For sake of simplicity, scientific names in this list do not include authorities. These can be found in the *Flora of New Sout h Wales.*

Appendix B- Analysis of Proposal Area Habitat

Table 2. Analysis of the Proposal Areas habitat potential for significant species recorded in the Local Area and the identification of impacts.

Scientific name	Local information	Habitat present?	Will this habitat be impacted?	7-part test?
Plants				
Lobbed Blue grass *(Bothriochloa biloba)*	Lobbed blue grass is a tall (1.0m) perennial that flowers in summer. It was recorded on the Ravenswroth site in 2009. This species is often found in woodland and derived grassland communities. It is believed that grazing may have a positive effect on the species, due to it being less palatable than its completion and reduces the competitive advantage of its main competitor.	No	No	No
Finger Panic Grass *(Digitaria porrecta)*	This species is found in native grassland, woodlands or open forest with a grassy understory, on richer soils in the North West Slopes and North West Plains botanical divisions of NSW. In NSW, the most frequently recorded associated tree species are *Eucalyptus albens* and *Acacia pendula*.	No	No	No
White-flowered Wax Plant *(Cynanchum elegans)*	Rainforest gullies and thick scrub in wet sheltered areas.	No	No	No
Olearia cordata	Dry forest species that is known from Wisemens Ferry to Wollombi	No	No	No
Ozothamnus tesselatus	A rare woodland species that has a very small known distribution in the Rylstone area.	No	No	No
Dillwynia tenuifolia	A rare woodland species known to sandstone, shale and laterite.	No	No	No
Acacia pendula *(Acacia pendula population in the Hunter catchment)*	Individuals recorded in the Local Area within 100 meters of the proposal area in the north western sector (gas wells 13,14,16,17,18). Extensive surveys located a mixture of Acacia pendula and a superficially similar species Acacia salicina.	No	No. Well removed from activity.	No
Singleton Mint Bush *(Prostanthera cineolifera)*	Little is known of about this species. One record known to the Wollimi region.	No	No	No
Charmhaven Apple *(Angophora inopina)*	Known to the Lake Macquarie, Central Coast and Bulahdelah areas. Only found in four vegetation types of which one: Eucalyptus haemastoma–Corymbia gummifera–Angophora inopina woodland/forest was recorded onsite. No individuals were recorded onsite.	No	No	No

Scientific name	Local information	Habitat present?	Will this habitat be impacted?	7-part test?
Netted Bottle Brush (*Callistemon linearifolius*)	A dry sclerophyll forest on the coast and adjacent ranges, nearest records north in the Lake Macquarie Cessnock boarder. No individuals were recorded onsite.	No	No	No
Darwinia biflora	Often found on the edges of weathered shale-capped ridges, where these intergrade with Hawkesbury Sandstone.	No. No such habitat onsite.	No	No
Darwinia peduncularis	Usually grows on or near rocky outcrops on sandy, well drained, low nutrient soil over sandstone. No such habitat onsite.	No. No such habitat onsite.	No	No
Eucalyptus camaldulensis (*population in the Hunter catchment Eucalyptus camaldulensis*)	Creek River and floodplain species of the interior river system of the East coast of Australia. Scattered remnants in the Local Area and recorded on the lower reaches of Bowmans Ck and Glennies Ck.	No	No. Well removed from activity and no downstream effects predicted.	No
Broken Back Ironbark (*Eucalyptus fracta*)	Found on Sandstone escarpments in the ranges.	No	No	No
Slaty Red Gum (*Eucalyptus glaucina*)	Grows in grassy woodland and dry eucalypt forest, in moderately fertile and well-watered soils.	No	No	No
Grove's Paperbark (*Melaleuca groveana*)	Grove's Paperbark grows in heath and shrubland, often in exposed sites, at high elevations, on rocky outcrops and cliffs.	No	No	No
Cymbidium canaliculatum (*Cymbidium canaliculatum population in the Hunter Catchment*)	Grows in the hollows of trees in dry sclerophyll forest or woodland.	No	No	No
Illawarra Greenhood (*Pterostylis gibbosa*)	All known populations grow in open forest or woodland.	No	No	No
Evans Grevillea (*Grevillea evansiana*)	Restricted to a small area east of Rylstone on the Central Tablelands. Grows in dry sclerophyll forest or woodland, occasionally in swampy heath, in sandy soils, usually over Hawkesbury sandstone.	No	No	No
Hairy Geebung (*Persoonia hirsute*)	The Hairy Geebung is found in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone.	No	No	No
Leionema lamprophyllum subsp. obovatum (*Leionema*	*Leionema lamprophyllum* subsp. obovatum occurs in dry eucalypt forest on exposed rocky terrain.	No	No	No

Scientific name	Local information	Habitat present?	Will this habitat be impacted?	7-part test?
lamprophyllum subsp. obovatum population in the Hunter Catchment)				
Frogs				
Green and Golden Bell Frog *(Litoria aurea)* E1	Recorded approximately 1 kilometre to the north west in 2009. Past records on the Ravensworth Hunter Valley project area show a range of records that are likely dispersing individuals from the core population in the Liddell main population. Bowmans Creek provides some habitat for individuals but not for breeding populations. No individuals recorded onsite.	No	No	No
Davies' Tree Frog *(Litoria daviesae)* V	Davies Tree Frog occurs in permanently flowing streams above 400 m elevation.	No	No	No
Littlejohn's Tree Frog *(Litoria littlejohni)* V	Plateaus and eastern slopes of the Great Dividing Range. Records are isolated and tend to be at high altitude.	No	No	No
Glandular Frog *(Litoria subglandulosa)* V	Glandular Frogs may be found along streams in rainforest, moist and dry eucalypt forest or in subalpine swamps.	No	No	No
Giant Burrowing Frog *(Heleioporus australiacus)* V	Breeding habitat of this species is generally soaks or pools within first or second order streams.	No	No	No
Stuttering Frog *(Mixophyes balbus)* E1	Found in rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range.	No	No	No
Sphagnum Frog *(Philoria sphagnicolus)* V	Rainforests, including Antarctic Beech forest, moist eucalypt forest and sphagnum moss beds, usually at higher elevations.	No	No	No
Red-crowned Toadlet *(Pseudophryne australis)*	Occurs in open forests, mostly on Hawkesbury and Narrabeen Sandstones. Inhabits periodically wet drainage lines below sandstone ridges that often have shale lenses or cappings.	No	No	No
Birds				
Speckled Warbler *(Pyrrholaemus saggitatus)* V	Recorded onsite and in the Local Area. Inhabits woodland and forest where it forages on the ground at the edges and within the interior of remnants. Can fly into open areas and use road verges. Requires large remnants for stable populations.	Known to the Local Area and ACOL lands, but requires forest or woodland for habitat.	No	No

Scientific name	Local information	Habitat present?	Will this habitat be impacted?	7-part test?
Spotted Harrier *(Circus assimilis)*	Occurs in grassy open woodland including acacia and Mallee remnants, inland riparian woodland, grassland and shrub lands. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands.	No	No.	No
Red Goshawk *(Erythrotriorchis radiates)* E4A	Red Goshawk appear to move from nesting sites in the ranges to coastal plains, where they are associated with permanent wetlands.	No	No	No
Black-breasted Buzzard *(Hamirostra melanosternon)*	Black-breasted Buzzard prefers timbered watercourses as breeding habitat. It also hunts over grasslands and sparsely timbered woodlands.	No	No	No
Little Eagle *(Hieraaetus morphnoides)* V	Recorded in Glennies Creek 2010. Occupies open eucalypt forest, woodland or open woodland. She oak or acacia woodlands and riparian woodlands of interior NSW are also used.	No	No	No
Blue-billed Duck *(Oxyura australis)* V	Wetlands, ponds and sewerage works.	No	No	No
Black Bittern *(Ixobrychus flavicollis)* V	Inhabits both terrestrial and estuarine wetlands, generally in areas of permanent water and dense vegetation. Where permanent water is present, the species may occur in flooded grassland, forest, woodland, rainforest and mangroves.	No	No	No
Gang-gang Cockatoo *(Callocephalon fimbriatum)* V	In summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered 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.	No	No	No
Glossy Black-Cockatoo *(Calyptorhynchus lathami)* V	Inhabits open forest and woodlands of the coast and the Great Dividing Range up to 1000 m in which stands of she-oak species, particularly Black She-oak (*Allocasuarina littoralis*), Forest She-oak (*A. torulosa*) or Drooping She-oak (*A. verticillata*) occur.	No	No	No
Black-necked Stork *(Ephippiorhynchus asiaticus)* E1	Black-necked Storks are mainly found on shallow, permanent, freshwater terrestrial wetlands, and surrounding marginal vegetation, including swamps, floodplains, watercourses and billabongs, freshwater meadows, wet heathland, farm dams and shallow floodwaters,	No	No	No

Scientific name	Local information	Habitat present?	Will this habitat be impacted?	7-part test?
	as well as extending into adjacent grasslands, paddocks and open savannah woodlands. They also forage within or around estuaries and along intertidal shorelines, such as saltmarshes, mudflats and sandflats, and mangrove vegetation.			
Brown Treecreeper *(Climacteris picumnus)* V	Found in eucalypt woodlands (including Box-Gum Woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range; mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species; also found in mallee and River Red Gum (*Eucalyptus camaldulensis*) Forest bordering wetlands with an open understorey of acacias, saltbush, lignum, cumbungi and grasses; usually not found in woodlands with a dense shrub layer; fallen timber is an important habitat component for foraging; also recorded, though less commonly, in similar woodland habitats on the coastal ranges and plains.	No	No	No
Brown Treecreeper (eastern subspecies) *(Climacteris picumnus victoriae) v*	Local record two kilometres to the north of the site. Could be a transient in the Local Area.	No	No	No
Diamond Firetail *(Stagonopleura guttata)* V	This species is often found in the Local Area in grassy eucalypt woodlands, including Box-Gum Woodlands. Also occurs in open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities. Often found in riparian areas (rivers and creeks), and sometimes in lightly wooded farmland. Feeds exclusively on the ground, on ripe and partly-ripe grass and herb seeds and green leaves, and on insects (especially in the breeding season). Recorded two kilometres north of the site.	Does forage on exotic and native grassland in Autumn in the local area.	No. This very minor removal of a common potential foraging habitat in the regional area does not constitute an impact.	No
Painted Honeyeater *(Grantiella picta)* v	Inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests.A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias.	No	No	No
Black-chinned Honeyeater (eastern subspecies) *(Melithreptus gularis gularis) v*	Occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts, especially Mugga Ironbark (*Eucalyptus sideroxylon*), White Box (*E. albens*), Inland Grey Box (*E. microcarpa*), Yellow Box (*E. melliodora*) and Forest Red Gum (*E.*	No	No	No

Scientific name	Local information	Habitat present?	Will this habitat be impacted?	7-part test?
	tereticornis).			
Regent Honeyeater *(Anthochaera Phrygia)* E1	The species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Regent Honeyeaters inhabit woodlands that support a significantly high abundance and species richness of bird species.	No	No	No
Varied Sittella *(Daphoenositta chrysoptera)* V	Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, Mallee and Acacia woodland. Recorded in the ranges to the south of the site.	No	No	No
Olive Whistler *(Pachycephala olivacea) v*	Mostly inhabit wet forests above about 500m. During the winter months they may move to lower altitudes.	No	No	No
Hooded Robin *(Melanodryas cucullata)v*	Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and Mallee, often in or near clearings or open areas.	No.	No	No
Hooded Robin (south-eastern form) *(Melanodryas cucullata cucullata) v*	Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and Mallee, often in or near clearings or open areas.	Known to the Ashton Lease area and can sometimes be recorded in pasture near to woodland edge or scattered trees.	No. This very minor removal of a common potential marginal foraging habitat in the regional area does not constitute an impact.	No
Scarlet Robin *(Petroica boodang)* v	The Scarlet Robin lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs.	No	No	No
Flame Robin *(Petroica phoenicea) v*	Breeds in upland tall moist eucalypt forests and woodlands, often on ridges and slopes. Prefers clearings or areas with open understoreys. The groundlayer of the breeding habitat is dominated by native grasses and the shrub layer may be either sparse or dense.	No	No	No
Grey-crowned Babbler (eastern subspecies) *(Pomatostomus temporalis temporalis)*	Recorded onsite and in the Proposal Area. Inhabits woodland and mallee and in the lower Hunter will be recorded on the edges of forests and gardens of rural lots and recreational gardens, such as golf courses. Forages on-ground and on the branches and trucks of trees.	No	No.	No
Little Lorikeet *(Glossopsitta pusilla)* V	Forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in Angophoras, Melaleucas and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater	No	No	No

Scientific name	Local information	Habitat present?	Will this habitat be impacted?	7-part test?
	productivity.			
Swift Parrot *(Lathamus discolour) e1*	On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations.	No	No	No
Turquoise Parrot *(Neophema pulchella) v*	Recorded in the southern woodland in 2010. Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. Usually seen in pairs or small, possibly family, groups and have also been reported in flocks of up to thirty individuals. Prefers to feed in the shade of a tree and spends most of the day on the ground searching for the seeds or grasses and herbaceous plants, or browsing on vegetable matter.	Can be recorded foraging on grass under the shade of paddock trees or in woodlands.	The isolation of these grasses and the high presence of similar marginal habitats in the local area results in this no being an impact on this species.	No
Barking Owl *(Ninox connivens)* V	Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. Is flexible in its habitat use and hunting can extend in to closed forest and more open areas. Sometimes able to successfully breed along timbered watercourses in heavily cleared habitats (e.g. western NSW) due to the higher density of prey on these fertile soils.	No	No	No
Powerful Owl (Ninox strenua) V	The Powerful Owl inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. The Powerful Owl requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well.	No	No	No
Red-backed Button-quail *(Turnix maculosa)* V	In NSW, said to occur in grasslands, heath and crops. Said to prefer sites close to water, especially when breeding. The species has been observed associated with the following grasses (in various vegetation formations): speargrass *Heteropogon*, Blady Grass *Imperata cylindrica*, *Triodia*, *Sorghum*, and Buffel Grass *Cenchrus ciliaris*. One record 10 kilometres north at Greenland.	Known to be recorded in pasture near to woodland edge or scattered trees.	No. This very minor removal of a common potential marginal foraging habitat in the regional area does not constitute an impact.	No
Masked Owl *(Tyto novaehollandiae) v*	Lives in dry eucalypt forests and woodlands from sea level to 1100 metres.	No	No	No
Sooty Owl *(Tyto tenebricosa) v*	Occurs in rainforest, including dry rainforest, subtropical and warm temperate rainforest, as well as moist eucalypt forests.	No	No	No
Mammals				

Scientific name	Local information	Habitat present?	Will this habitat be impacted?	7-part test?
Eastern Pygmy-possum *(Cercartetus nanus) v*	Found in a broad range of habitats from rainforest through sclerophyll (including Box-Ironbark) forest and woodland to heath, but in most areas woodlands and heath appear to be preferred, except in north-eastern NSW where they are most frequently encountered in rainforest.	No	No	No
Spotted-tailed Quoll *(Dasyurus maculatus) v*	Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline.	No	No	No
Brush-tailed Phascogale *(Phascogale tapoatafa) v*	Prefer dry sclerophyll open forest with sparse groundcover of herbs, grasses, shrubs or leaf litter.	No	No	No
Yellow-bellied Sheathtail-bat *(Saccolaimus flaviventris)* V	Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. When foraging for insects, flies high and fast over the forest canopy, but lower in more open country.	No	No	No
Parma Wallaby *(Macropus parma) v*	Preferred habitat is moist eucalypt forest with thick, shrubby understorey, often with nearby grassy areas, rainforest margins and occasionally drier eucalypt forest.	No	No	No
Brush-tailed Rock-wallaby *(Petrogale penicillata)* E1	Occupy rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges, often facing north.	No	No	No
Red-legged Pademelon *(Thylogale stigmatica)* V	Inhabits forest with a dense understorey and ground cover, including rainforest, moist eucalypt forest and vine scrub.	No	No	No
Eastern Freetail-bat *(Mormopterus norfolkensis) v*	Occur in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. Roost mainly in tree hollows but will also roost under bark or in man-made structures.	No	No	No
Hastings River Mouse *(Pseudomys oralis)* E1	A variety of dry open forest types with dense, low ground cover and a diverse mixture of ferns, grass, sedges and herbs.	No	No	No
Yellow-bellied Glider *(Petaurus australis) v*	Occur in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils.	No	No	No
Squirrel Glider *(Petaurus*	Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great	No	No	No

Scientific name	Local information	Habitat present?	Will this habitat be impacted?	7-part test?
norfolcensis) v	Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas. Prefers mixed species stands with a shrub or Acacia midstorey.			
Koala *(Phascolarctos cinereus)*	Inhabit eucalypt woodlands and forests.	No	No	No
Rufous Bettong *(Aepyprymnus rufescens) v*	Rufous Bettongs inhabit a variety of forests from tall, moist eucalypt forest to open woodland, with a tussock grass understorey. A dense cover of tall native grasses is the preferred shelter.	No	No	No
Long-nosed Potoroo *(Potorous tridactylus) v*	Inhabits coastal heaths and dry and wet sclerophyll forests. Dense understorey with occasional open areas is an essential part of habitat, and may consist of grass-trees, sedges, ferns or heath, or of low shrubs of tea-trees or melaleucas. A sandy loam soil is also a common feature.	No	No	No
Grey-headed Flying-fox *(Pteropus poliocephalus) v*	Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.	No	No	No
Large-eared Pied Bat *(Chalinolobus dwyeri) v*	Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (*Hirundo ariel*), frequenting low to mid-elevation dry open forest and woodland close to these features. Females have been recorded raising young in maternity roosts (c. 20-40 females) from November through to January in roof domes in sandstone caves. They remain loyal to the same cave over many years. Found in well-timbered areas containing gullies.	No	No	No
Eastern False Pipistrelle *(Falsistrellus tasmaniensis) v*	Prefers moist habitats, with trees taller than 20 metres.	No	No	No
Golden-tipped Bat *(Kerivoula papuensis) v*	Found in rainforest and adjacent wet and dry sclerophyll forest up to 1000m. Also recorded in tall open forest, *Casuarina-dominated riparian forest and coastal Melaleuca forests.*	No	No	No
Little Bentwing-bat *(Miniopterus australis) v*	Moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. Generally found in well-timbered areas.	No	No	No

Scientific name	Local information	Habitat present?	Will this habitat be impacted?	7-part test?
Eastern Bentwing-bat *(Miniopterus schreibersii oceanensis) v*	Hunt in forested areas, catching moths and other flying insects above the tree tops.	No	No	No
Southern Myotis *(Myotis macropus) v*	Recorded onsite and in the vicinity of the Proposal Area. Generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. Forage over streams and pools catching insects and small fish by raking their feet across the water surface.	No	No.	No
Greater Long-eared Bat *(Nyctophilus timoriensis) (South-eastern form)*	Inhabits a variety of vegetation types, including mallee, bulloke *Allocasuarina leuhmanni* and box eucalypt dominated communities, but it is distinctly more common in box/ironbark/cypress-pine vegetation that occurs in a north-south belt along the western slopes and plains of NSW.	No	No	No
Greater Broad-nosed Bat *(Scoteanax rueppellii)*	Utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest.	No	No	No
Eastern Cave Bat *(Vespadelus troughtoni)*	A cave-roosting species that is usually found in dry open forest and woodland, near cliffs or rocky overhangs; has been recorded roosting in disused mine workings, occasionally in colonies of up to 500 individuals.	No	No	No
Reptiles				
Broad-headed Snake *(Hoplocephalus bungaroides)*	Shelters in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring.	No	No	No
Rosenberg's Goanna *(Varanus rosenbergi)*	Found in heath, open forest and woodland.	No	No	No

AshtonCoal

APPENDIX 7

Traffic and Transport Impact Assessment

Wells Environmental Services

Ashton Coal Operations Limited Ventilation and Service Shafts Project

- Final
- 19 December 2011

Ashton Coal Operations Limited
Ventilation and Service Shafts Project

TRAFFIC IMPACT ASSESSMENT – STAGE 1

- Final
- 19 December 2011

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Executive Summary

This Traffic Impact Assessment report examines the impact of construction and operational traffic associated with the installation and operation of proposed ventilation and service shafts at Ashton Coal Mine.

The traffic generated by the construction of the Ventilation and Service Shafts Project amounts to approximately 25 additional two way vehicle movements per day. During the operational phase, up to 30 additional two way vehicle movements will be generated on an intermittent basis.

The vehicles will access the southern side of the New England Highway each day for up to about 30 weeks in order to construct the ventilation and service shafts. Vehicles will use the unnamed Dairy Lane intersection with the New England Highway.

Vehicles accessing the Ventilation and Service Shafts Project from the unnamed Dairy Lane will use the existing intersection, with the exception of southbound right turning vehicles. An alternative access route would be put in place for these southbound right turning vehicles, with construction traffic to continue straight on and turn left into Glennies Creek Road, u-turn, and then travel northbound on New England Highway to turn left into the unnamed Dairy Lane.

The construction work may take place concurrently with other Aston Coal Operations Limited (ACOL) construction projects, including the proposed South East Open Cut (SEOC) Project (including the construction of a conveyor belt across the New England Highway), the previously approved Bowmans Creek Diversion Project and the Gas Drainage Project. Should the Ventilation and Service Shafts Project occur concurrently with these other ACOL construction projects using unnamed Dairy Lane, then ventilation and service shaft construction traffic would utilise the temporary traffic arrangements proposed for SEOC and Bowmans Creek.

The additional 25 two way vehicle movements per day arising from the construction of the ventilation and service shafts and up to 30 vehicle movements during operation would be added to the existing New England Highway traffic volume. The impact of this small volume of additional traffic is negligible given the current Average Annual Daily Traffic (AADT) of the New England Highway of around 11,000 vehicles per day.

The intersection configuration of unnamed Dairy Lane and the New England Highway is considered to be sufficient to cater for vehicle movements proposed to be generated by the construction and operation of the ventilation and service shafts, based on an assessment against Austroads warrants for treatments for unsignalised intersections.

Due to the small number of construction and operational trips arising, and there being no changes required to traffic conditions on the New England Highway to facilitate access, no significant impacts or cumulative impacts from other concurrent ACOL construction works are anticipated.

Given the very small volume of traffic proposed to be generated by the Ventilation and Service Shafts Project, no special measures or traffic management strategies during construction of the project are considered to be required, other than the southbound right turn detour, 80kph road works speed limit and provision of advance trucks turning warning signage.

1. Introduction

1.1. Scope and Objectives

This Traffic Impact Assessment (TIA) examines the traffic impact associated with the construction and operation of the proposed ventilation and service shafts to serve ACOL underground operations on the south western side of the New England Highway. This project will also involve the construction of minor support infrastructure for each shaft.

The ventilation and service shafts work cover only a small element of the overall Ashton Coal Project (ACP). The ACP comprises a number of concurrent medium to large scale projects including the proposed South East Open Cut (including the construction of a Conveyer Crossing across the New England Highway), the approved Bowmans Creek Diversion, and Gas Drainage projects. Previous studies and reports have been prepared which cover the impact of the other projects, and this report concentrates on the additional traffic impact that the construction and operation of the ventilation and service shafts will have on the New England Highway and local traffic.

A detailed description of the ventilation and service shafts can be found in the Environmental Assessment Report.

1.2. Construction Approach

1.2.1. Ventilation Shaft

The ventilation shaft is a discrete excavation which will be constructed on land located on the south western side of the New England Highway. The excavation will be carried out to match the depth of the proposed underground mining works, and will involve the installation of a fan and other infrastructure in order to ventilate air in the existing approved mining operations.

The construction of the ventilation shaft requires the use of different vehicle types. The impact of traffic movements on the operation of the adjacent road network is assessed for both the construction and operation stages.

1.2.2. Service Shafts

Drilling of the vertical service shafts will occur from the surface using a conventional drilling rig. Above ground sumps that are able to be relocated may be used to limit ground disturbance during drilling operations if required for environmental reasons. Various support vehicles will be required for drilling operations, and the impact of these traffic movements will be assessed.

2. Statutory Requirements

All temporary or permanent traffic controls put into place for the construction or operation of the Ventilation and Service Shafts will be in accordance with Australian Standards 1742 - Manual of Uniform Traffic Control Devices.

The Roads and Traffic Authority (RTA) manual for Traffic Control at Worksites Revision 4 will be used to guide the installation of any temporary traffic controls required during the construction period.

3. Existing Environment

3.1. Adjoining Road Network

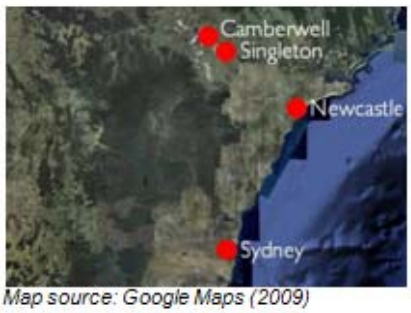
The construction of the ventilation and service shafts, comprising an additional and necessary component of the larger scale ACP, is located near the village of Camberwell, 16 kilometres north-west of Singleton on the New England Highway. The New England Highway is part of the National Highway network, and forms the main inland route between Sydney and Brisbane. The location of the mine is shown in **Figure 3-1** overleaf.

The ACP's current operations are accessed via Glennies Creek Road, which intersects with the New England Highway north-west of Camberwell. Current operations include administrative offices, a coal handling and processing plant, the north-east open cut (NEOC) and an underground mine.

In the vicinity of the ACP's operations, the highway varies in width from two to four lanes. South-east of the intersection with Glennies Creek Road the highway is generally one lane per direction; however a southbound overtaking lane commences approximately 1km south-east of the village of Camberwell. A four-lane section (two lanes per direction) begins north of the intersection with Glennies Creek Road and extends to the north-west. Details of the lane configuration of the New England Highway in the vicinity of the ACP are shown in **Figure 3-2**.

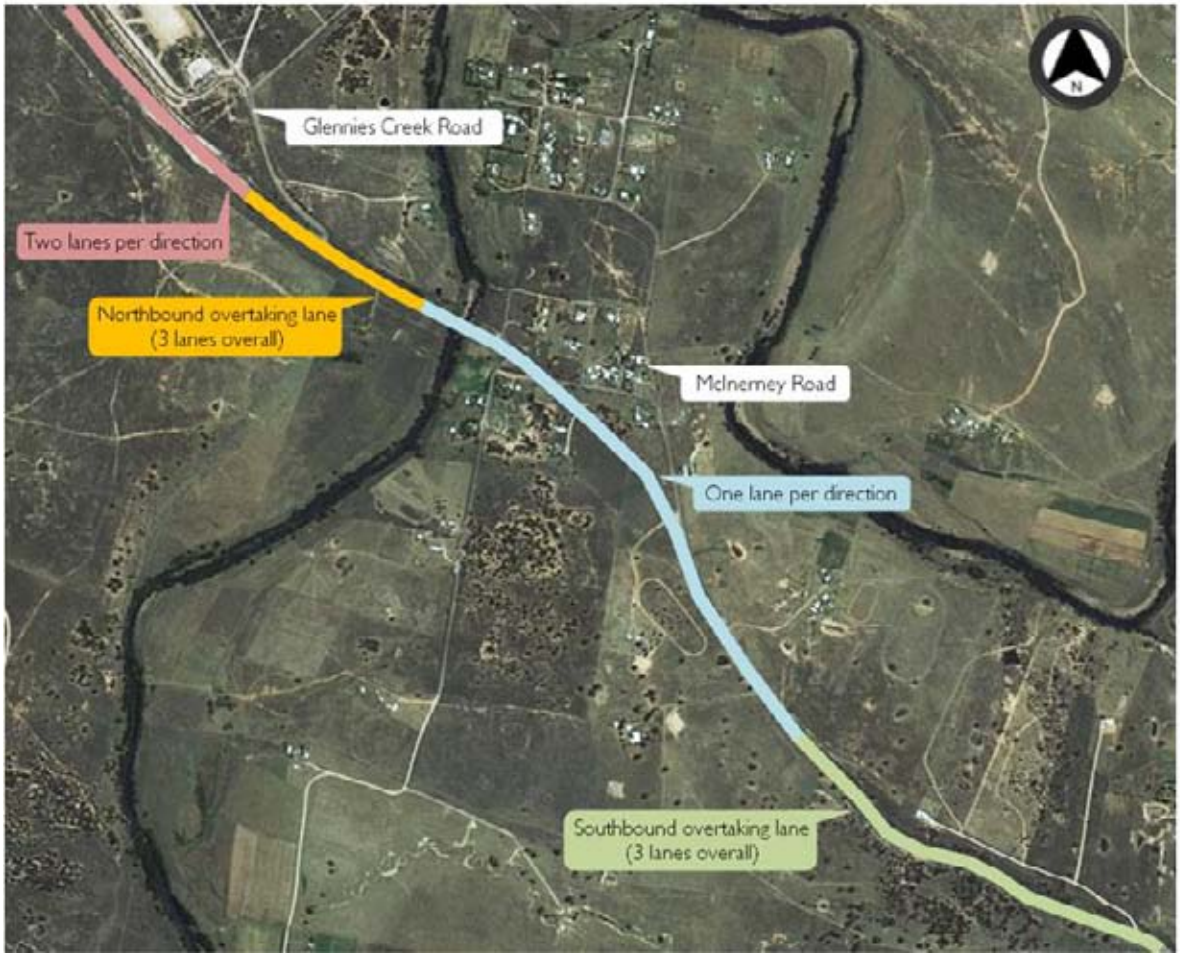
Glennies Creek Road is a local road providing access to the existing ACP, and to rural landholdings north of the New England Highway.

Figure 3-1 Site Location



Map source: Google Maps (2009)

- **Figure 3-2 Lane Configuration on New England Highway**

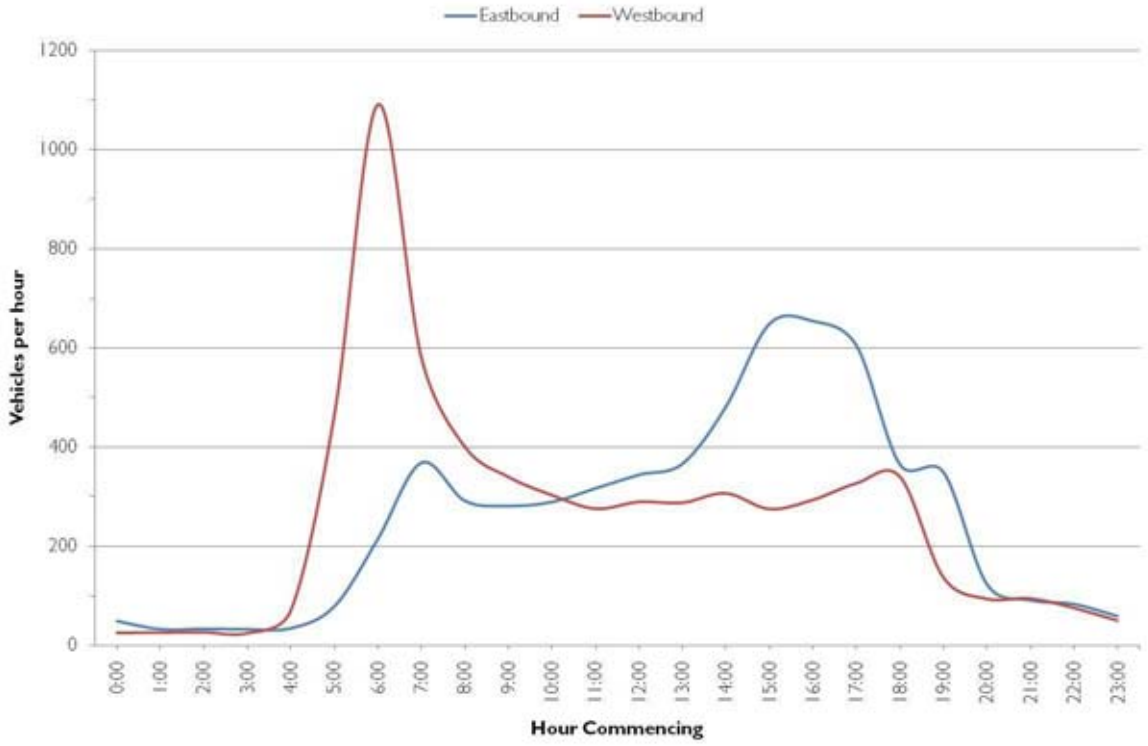


3.2. Existing Traffic Volumes

A 7-day classified count of traffic on the New England Highway east of Camberwell was undertaken from 23 to 29 October 2008. The average daily traffic volume during that week was 11,109 vehicles, including 17% heavy vehicles. The average weekday volume was slightly higher at 12,391 vehicles, including 18% heavy vehicles.

The average weekday hourly profile of traffic activity is shown in **Figure 3-3**.

- **Figure 3-3 New England Highway weekday average hourly profile**



The AM peak hour on a weekday is between 6:00 and 7:00AM, with an average weekday volume of 1,306 vehicles per hour, the majority of which are heading westbound. The PM peak is between 4:00 and 5:00PM, with an average of 947 vehicles per hour. The peak direction in the afternoon is eastbound. Peak hour volumes on the New England Highway are presented in **Table 3-1**.

- **Table 3-1 Peak hour volumes on the New England Highway**

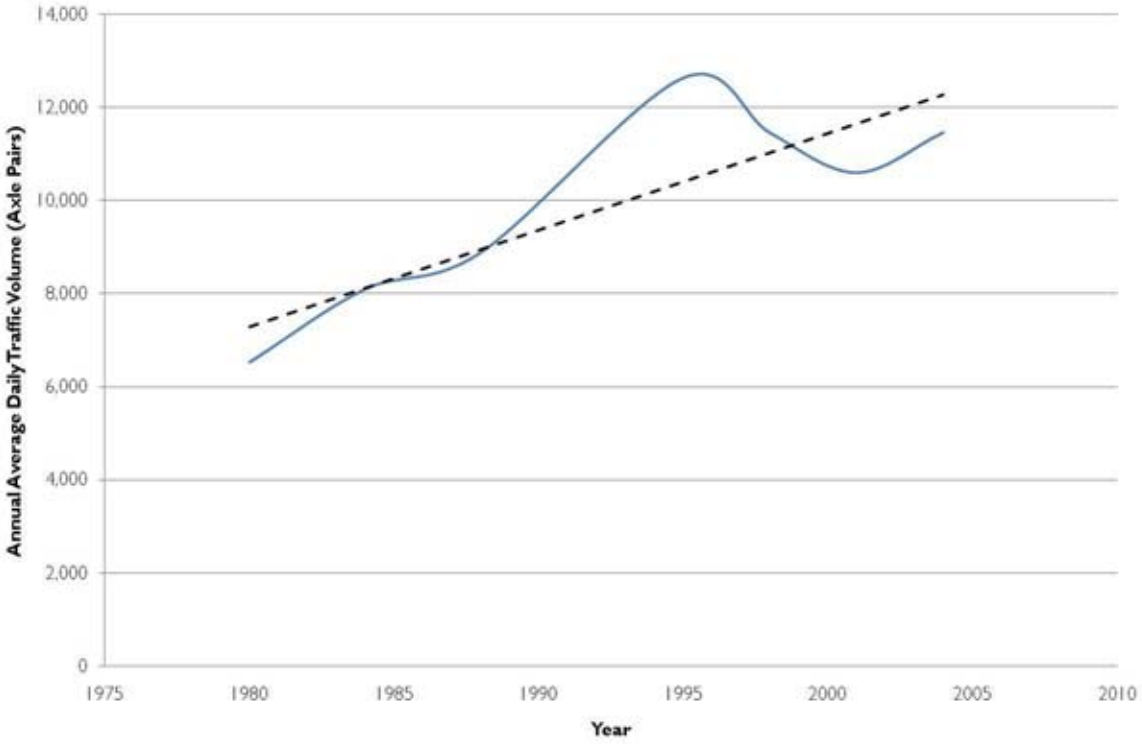
	October 2008	
	Eastbound	Westbound
AM	370	1,090
PM	650	340

The NSW Roads and Traffic Authority (RTA) also collect and publish traffic volume data for the New England Highway. The nearest RTA data point is located at Foy Brook Bridge (over Bowmans Creek) in Camberwell (station number 05.037). **Figure 3-4** shows growth in traffic[1] on

[1] Volume at this location is measured in axle pairs, rather than vehicles. A 2-axle car is one axle pair. A 3-axle truck is 1.5 axle pairs. The number of vehicles is less than the number of axle pairs.

the New England Highway at this RTA data point since 1980. Traffic has generally risen steadily, with a peak in the late 1990s and an overall linear trend growth rate of 1.7% per annum (base year 2004).

- **Figure 3-4 Growth in Annual Average Daily Traffic on the New England Highway at Foy Brook Bridge, Camberwell (Station number 05.037)**



3.3. Road safety

Data was obtained from the RTA about the recent road crash history of the New England Highway between Singleton and Muswellbrook. In the five years from September 2003 to August 2008, there were 88 crashes recorded, including four fatal crashes and 32 injury crashes. The most common types of crashes involved the vehicle leaving the carriageway, accounting for 52% of all crashes. The number of crashes was highest in the year September 2003 to August 2004, when 24 crashes were recorded. There were 13 crashes recorded in the year September 2007 to August 2008.

A crash rate, where the number of crashes is compared to the volume of passing traffic, has been calculated at approximately 10 crashes per 100 Million Vehicle Kilometres Travelled (MVKT). This is significantly below the NSW state average crash rate of approximately 75 crashes per 100MVKT.

Three collisions, including one injury collision, were recorded in the past five years within close proximity of Bowmans Creek and thus within close range of the proposed construction access points. These collisions involved two off-path type crashes and one collision where a temporary object on the roadway was hit.

4. Traffic Impacts

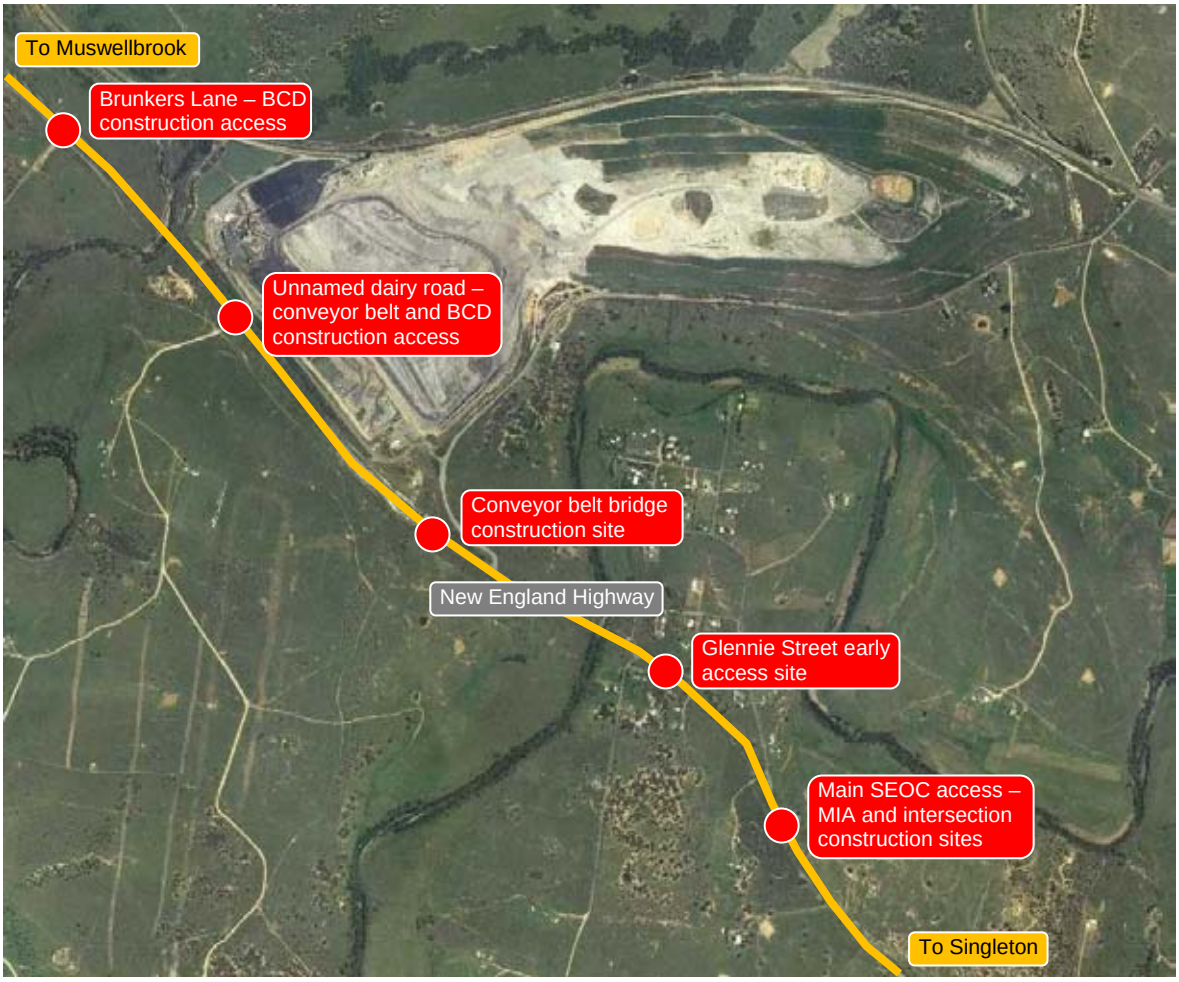
This TIA examines the effect the construction and operation of the ventilation and service shafts will have on traffic flow in the area, with a particular focus on the impact it will have on the New England Highway. The ventilation and service shafts will be located south west of the New England Highway between south of the unnamed Dairy Lane and north of Glennies Creek Road. The location of the underground mining and proposed shaft and fan site is shown in **Figure 4.1** below. The access tracks in **Figure 4.1** are shown indicatively, with more detail of the access track provided in **Figure 4.3**.

- **Figure 4.1 – Location of Proposed Ventilation and Service Shafts and Access Tracks**

Construction work may be carried out concurrently with a number of ACOL projects including the proposed South East Open Cut (SEOC) and the approved Bowmans Creek Diversion. In order to assess the overall impact of the additional traffic generated as a result of the project, the traffic induced from all projects proposed in the area has been taken into account. **Figure 4.2** below

shows the location of adjacent construction sites that have the potential to be active during ventilation and service shafts construction.

Figure 4.2: Location of adjacent potentially concurrent worksites



The following assessment examines the main construction access points on the New England Highway affected by the ventilation and service shafts project and the cumulative impacts that will arise from all potentially concurrent works proposed.

4.1. Unnamed Dairy Lane

The unnamed Dairy Lane is located adjacent to the existing NEOC, and provides access to a work site located on the southern side of New England Highway. The lane is owned and maintained by ACOL and general public access is not permitted. It is an unsealed access track serving an existing rural property and dairy farm, located to the south of the New England Highway. Dairy operations will continue during the period of construction and operation of the ventilation and service shafts,

with a milk tanker and other associated minor traffic continuing to use the intersection. No change to the existing farming or dairy traffic operation is proposed.

The unnamed Dairy Lane joins the New England Highway on a straight alignment, where there is a southbound overtaking lane. The topography slopes uphill to the east of the intersection.

4.1.1. Works Proposed

Access to the proposed site will be via the existing unnamed Dairy Lane and then via an existing farm access track, which will require upgrading (solid east-west oriented red line in **Figure 4.3**). Alternatively, access from the unnamed Dairy Lane to the worksite will be provided by extending an existing track from the hay sheds to the shaft worksite as shown by the dashed red line in **Figure 4.3**.

- **Figure 4.3: Proposed Access Track**

The unnamed Dairy Lane will provide the only work site access points for the ventilation and service shafts.

Vent Shaft

During the construction stage, the approximate average daily number of vehicles accessing the worksite will be as follows:

- 2 flat bed trucks (delivery of concrete/pre cast segments, steel etc);
- 1 water cart;
- 5 light vehicles associated with contractors/onsite staff; and
- 1 diesel fuel delivery truck will be required to deliver fuel to the site approximately every two days.

On some days there will be arrival or departure of other vehicles and vehicle types on a one off basis, such as delivery of cranes, hoists, pre-fabricated fan elements etc. However as these are one off type movements, the average number of vehicle movements presented above is considered to be an accurate reflection of the ongoing traffic generation attributable to construction.

The drilling rig will remain on site during construction, while the flat bed trucks and the water cart would travel to and from the site once per day. The light vehicles would make two round trips per day. The diesel delivery truck delivers fuel to the site every two days. As such, the maximum likely number of daily vehicle movements along the unnamed Dairy Lane and New England Hwy intersection arising from the ventilation shaft is 17.

During the operation stage the expected traffic generation from the ventilation shaft and fan site will be significantly lower. Only ad-hoc inspections of the ventilation fan would be required.

Service Shafts

During the construction stage, the approximate average daily number of vehicles accessing the worksite will be as follows:

- 2 flat bed trucks (drill rig operational support/pre cast segments, steel etc); and
- 2 light vehicles.

As such the maximum number of daily vehicle two way movements at the unnamed Dairy Lane and New England Highway intersection arising from the construction of the service shafts is 8.

During operation of the service shafts, the maximum number of daily vehicle movements will be a maximum of 30. This is detailed below:

- Ballast drop hole
  - A small sized delivery tip truck will deposit ballast at the location of the small stockpile, when required. A small earth mover (bobcat or similar) may also occasionally be required to reform the stockpile over the shaft.
  - At maximum usage rates, a ballast delivery is expected to be required once every 7 days.
- Concrete drop hole
  - Concrete will be required intermittently for underground operations as mining progresses, and at maximum rates concrete may be delivered up to 15 times per day, once every 2 weeks.
- Access track
  - Construction of the access track is expected to generate movements of a grader, excavator and roller at the start and end of the construction, as well as a water cart each day.

Traffic Generation Summary

The worst case scenario for traffic generation occurs if construction of both ventilation and service shafts occur concurrently. This is considered unlikely but possible, and hence forms the basis of this assessment on a worst case scenario. The construction of the access track occurs prior to construction of the ventilation or service shafts and results in significantly less traffic impact, and hence has not been assessed.

Table 4-1 summarises the worst case expected traffic movements during the construction of both shafts.

- **Table 4-1 Traffic Generation**

Period	Trucks (Movements per day[1])	Light Vehicles (Movements per day[1])
Construction	11	14
Operation	30	<1

[1] One trip = 2 vehicle movements (approaching and departing)

4.1.2. Access

Construction vehicles accessing the site will utilise the existing northbound running lane and/or 2.5m wide shoulder lane on the New England Highway to decelerate and undertake left turns into

the work site. The method of access for southbound vehicles will depend on the configuration of New England Highway and the unnamed Dairy Lane at the time.

There is a proposal arising from other ACOL construction works to construct a temporary right turn bay utilising the existing southbound overtaking lane, to provide for southbound right turns into the site. The temporary right turn treatment would be painted on the road or established by other temporary traffic control devices, and removed following completion of those construction works. During the time this temporary traffic layout is in place, vehicles accessing the ventilation and service shafts construction site would use the channelised right turn bay if approaching from the north.

Should construction of the ventilation and service shafts not occur concurrently with this temporary traffic layout, any southbound vehicles would continue past the unnamed Dairy Lane, turn left into Glennies Creek Road, perform a u-turn, turn right back into New England Highway and turn left into the unnamed Dairy Lane.

4.1.3. Traffic Impacts and Cumulative Impacts Arising

The unnamed Dairy Lane will provide the main work site access point for other ACOL construction works. The unnamed Dairy Lane is proposed to be the main access point to the works compound, and as such is anticipated to generate a combined total of up to 100 vehicle movements per day associated with the Bowmans Creek and Gas Drainage projects. It is noted that the timing of the projects has not been confirmed and it is currently unknown whether the projects will run concurrently.

The worst case scenario occurs where construction of the ventilation and service shafts and all other ACOL projects run concurrently. In this case, up to an aggregate of up to 125 vehicle movements could be generated per day on the New England Highway by staff, delivery of materials and plant. This worst case scenario is unlikely to be achieved in practice, due to the likelihood of utilisation of shared resources such as man power, supervision, deliveries etc or the timing of projects not occurring simultaneously.

Construction vehicles accessing the work site approaching from the northbound direction will be required to decelerate on the New England Highway on approach to the unnamed Dairy Lane, which may have a minor impact on the travel speed of following traffic.

Traffic delays will be generally isolated to vehicles turning onto the New England Highway from the unnamed Dairy Lane. Left turns from the unnamed Dairy Lane to the New England Highway may impact on traffic flow on the New England Highway northbound as vehicles accelerate up to the posted speed limit. Sight distances in both directions are good, enabling entering traffic to select appropriate gaps. The proposed temporary channelised right turn treatment, should this be

installed concurrently with construction of the ventilation and service shafts, will provide a protection area for vehicles turning right from the unnamed Dairy Lane onto the New England Highway to use as an acceleration lane.

If the channelised right turn configuration is not in place, vehicles wishing to turn right from the New England Highway onto the unnamed Dairy Lane will be required to continue travelling along the highway until they reach Glennies Creek Road, turn left onto Glennies Creek Road, perform a U-turn on this road, turn right onto the New England Highway and turn left onto the unnamed Dairy Lane. Further, all ACOL related traffic will be required to turn left onto the New England Highway, and then U-turn in Brunkers Lane to access the New England Highway southbound.

The additional 25 trips per day arising from the ventilation and service shafts construction works would be added to the existing New England Highway traffic volume. The impact of this volume of additional traffic is negligible given the current AADT of the New England Highway of around 11,000 vehicles per day.

Austroads' *Guide to Road Design – Part 4A: Unsignalised and Signalised Intersections* (Second Edition, 2010) details warrants for various intersection treatments. The warrants provide guidance on where a full-length deceleration lane must be used and where a basic turn treatment (Type BAL) is appropriate based on traffic volume. The existing intersection is a type BAL treatment, with two through lanes southbound and a well formed 2.5m sealed shoulder northbound.

Based on the proposed construction speed limit of 80kph on the New England Highway, where there are 1,090 vehicles travelling westbound on the New England Highway during the AM peak hour (6:00AM-7:00AM), a maximum of 5 turning vehicles are permitted for a Type BAL intersection.

For the remainder of the day there is an average of approximately 350 vehicles per hour travelling westbound on the New England Highway – therefore a maximum of 15 turning vehicles per hour would be permitted to turn into site for a Type BAL intersection before the warrant for an intersection upgrade would be met.

Assuming that the 25 daily vehicle movements (average 12.5 vehicles per day) generated by the construction of the ventilation and service shafts, and a maximum of 30 daily vehicle movements (15 vehicles) generated in the operational phase, will not be permitted to access the site during the morning peak hour of 6-7am, and given the short-term nature of the work and that it is highly unlikely that the vehicles will all arrive in the one hour, it is considered that the Type BAL intersection as currently exists at the unnamed Dairy Road/New England Highway is sufficient and does not warrant upgrade.

Due to the small volume of construction and operational trips arising, the short term nature of the construction activity, and there being no changes required to traffic conditions on the New England Highway, no significant cumulative impacts from other ACOL construction works are anticipated.

5. Management and Monitoring

5.1. Review of Existing Measures

Unnamed Dairy Lane

The unnamed Dairy Lane will provide the main work site access point for other ACOL works assessed in previous studies, including construction of the SEOC conveyor crossing and a secondary work site access for the approved Bowmans Creek Diversion Project. The following mitigation measures are currently proposed to mitigate the potential impacts associated with these other ACOL projects:

- Reduction of the speed limit on the New England Highway to 80kph;
- Advance signage alerting motorists to the presence of turning trucks;
- Installation of a temporary channelised right turn treatment in the existing southbound overtaking lane on the New England Highway (to be delineated with temporary line marking or cones / bollards) (this treatment is associated with other ACOL projects not the ventilation or service shaft project);
- Maintenance of the existing 'give way' control for vehicles turning out of the unnamed Dairy Lane onto the New England Highway; and
- Grass cutting in the vicinity of the intersection to enhance sight distance for vehicles turning out of the unnamed Dairy Lane onto the New England Highway.
- Traffic exiting the unnamed Dairy Lane wishing to travel south will be required to turn left and then U-turn in Brunkers Lane to access the New England Highway southbound.

Should the construction of the Ventilation and Service Shafts Project coincide with the construction of either Bowmans Creek Diversion Project or the SEOC Project, traffic arising from the construction would be able to utilise the temporary traffic controls put into place for these other projects.

If the Bowmans Creek Diversion Project or SEOC Project are not under construction at the same time as the construction of the ventilation and service shafts, the measures set out in **Section 5.2** of this report will be implemented.

5.2. Recommendations for Additional Measures

Vehicles travelling southbound and wishing to turn right from the New England Highway onto the unnamed Dairy Lane will be required to continue beyond the unnamed Dairy Lane, turn left onto Glennies Creek Road, perform a u-turn on this road, turn right onto the New England Highway and

turn left onto the unnamed Dairy Lane. This vehicle movement will be maintained unless the temporary intersection channelisation is constructed as part of the other ACOL works.

In order to promote maximum safety for workers and New England Highway traffic, it is proposed that trucks turning signage will be installed in both directions on the New England Highway, approximately 2-300m in advance of the unnamed Dairy Lane intersection during the construction stage. This signage will act to provide advance warning to drivers of the potential for slower moving vehicles to be turning into or out of the side street.

Given the small volume of traffic proposed to be generated by the construction of the ventilation and service shafts, no other special measures or traffic management strategies are proposed.

6. Conclusions

This Traffic Impact Assessment report examines the impact of construction and operational traffic associated with the installation and ongoing operation of ventilation and service shafts, to be installed in conjunction with the Ashton Coal Underground Mine.

The additional traffic generated by the construction amounts to 25 two way vehicle movements per day. Up to 30 traffic movements per day may be required on an intermittent basis post-construction.

The vehicles will access the southern side of New England Highway each day for up to about 30 weeks in order to construct the ventilation and service shafts. Vehicles will use the unnamed Dairy Lane intersection with the New England Highway.

Vehicles accessing the ventilation and service shafts from the unnamed Dairy Lane will use the existing intersection, with the exception of southbound right turns. Southbound right turns will be required to continue straight on and turn left into Glennies Creek Road, u-turn, and then travel northbound on New England Highway to turn left into the unnamed Dairy Lane.

The construction work may take place concurrently with other ACOL construction projects, including the SEOC Project, and diversion of Bowmans Creek. Should the construction of the ventilation and service shafts occur concurrently with these other ACOL construction projects using the unnamed Dairy Lane, then ventilation and service shaft construction traffic would utilise the temporary traffic arrangements in place for these other projects.

The additional 25 movements per day arising from the construction of the ventilation and service shafts and during the operational stage up to 30 movements per day would be added to the existing New England Highway traffic volume. The impact of this small volume of additional traffic is negligible given the current AADT of the New England Highway of around 11,000 vehicles per day. The intersection of unnamed Dairy Lane and the New England Highway is considered to be sufficient to cater for vehicle movements generated by the construction and operation of the ventilation and service shafts, based on an assessment of Austroads warrants for treatments for unsignalised intersections.

Due to the small number of construction and operational trips arising, and there being no changes required to traffic conditions on the New England Highway to facilitate access, no significant cumulative impacts from other concurrent ACOL construction works are anticipated.

Given the very small volume of traffic proposed to be generated by the Ventilation and Service Shafts Project, no special measures or traffic management strategies other than the southbound right turn detour and provision of advance trucks turning warning signage is proposed.

7. References

Ashton Coal Limited Bowmans Creek Diversion
Traffic Impact Assessment
Sinclair Knight Merz 2009.

Ashton Coal Limited South East Open Cut and Bowmans Creek Diversion
Traffic Management Plan
Sinclair Knight Merz 2010

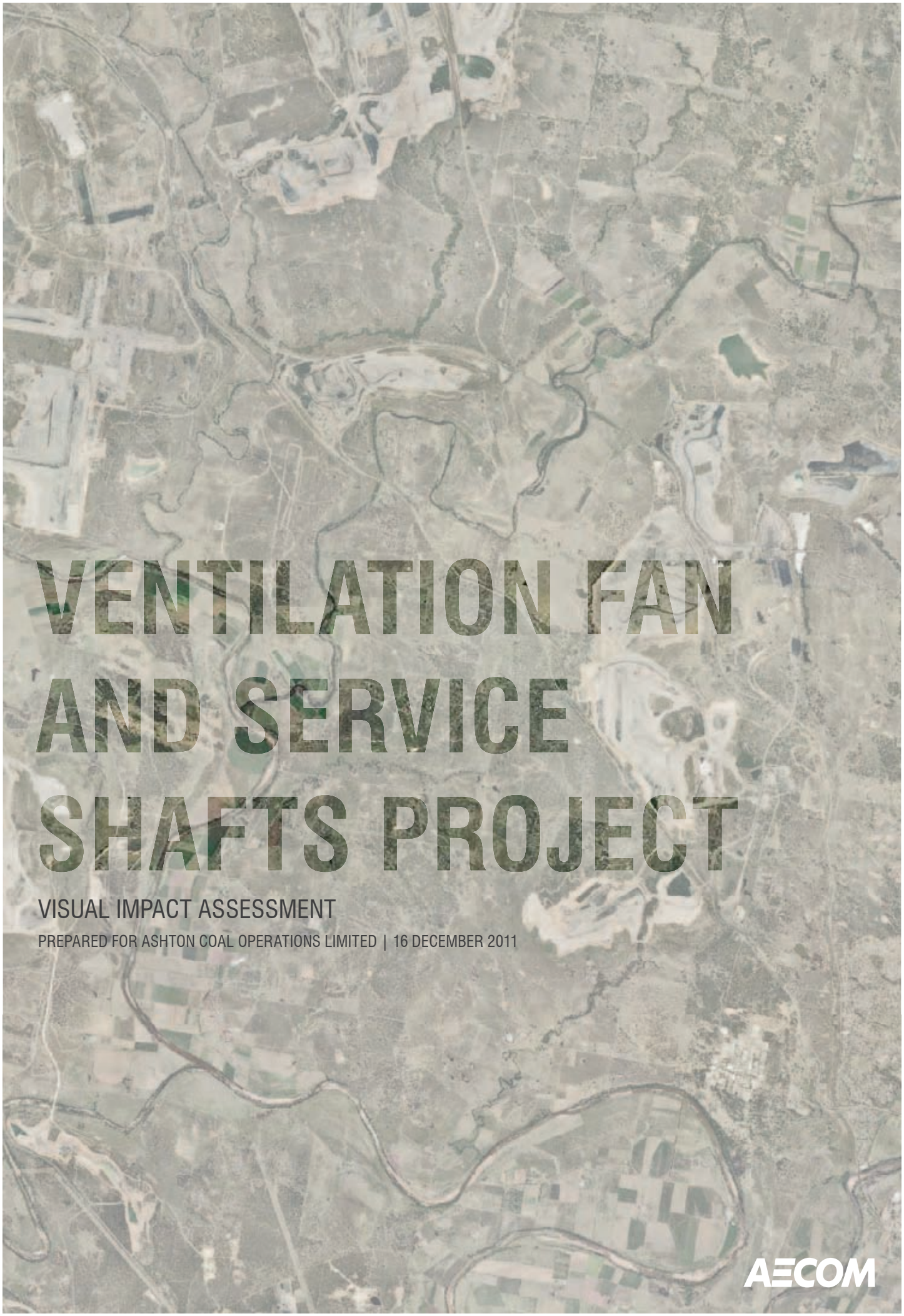
Ashton Coal Operations Limited Gas Drainage Project
Traffic Impact Assessment
Sinclair Knight Merz 2011

ACOL Mine Service Shafts
Description of works
Received by email from Philip Burns, 4 November 2011

Visual Impact Assessment

APPENDIX 8

Wells Environmental Services



VENTILATION FAN AND SERVICE SHAFTS PROJECT

VISUAL IMPACT ASSESSMENT

PREPARED FOR ASHTON COAL OPERATIONS LIMITED | 16 DECEMBER 2011

AECOM

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EXECUTIVE SUMMARY

AECOM Australia Pty Ltd has been commissioned by Ashton Coal Operations Limited (ACOL) to prepare a Visual Impact Assessment for the proposed Ventilation Fan and Service Shafts Project (the Project) at its site 14 km north of Singleton in the Hunter Valley. This report assesses the potential visual impact of the above-ground (visible) elements for the Project. The Project has been assessed for both the construction and operation phases.

The Project is sited west of the New England Highway, opposite the existing ACOL open cut coal mine (to be referred to as the Site, refer Figure 1). The seen elements associated with the Project are as follows (refer Figure 2):

— Two exhausting fans (refer Figure 3);

— An evase with a maximum height of 7m cone-shaped discharge plenum fitted for noise reduction (refer Figure 3);

— A road base surfaced pad 60 m by 75 m for all infrastructure to sit on (which would be cut into the hillside, with a 3.5 m high batter to the north of the slab); and

— Associated switch gear, (motor control room) which is 3.5 m in height and housed in a 5 m x 5 m compound.

The seen elements associated with the Ballast Drop Hole would comprise the following:

— A 20 m by 20 m flat pad, surfaced with road base;

— One (or occasionally two) small ballast stockpiles; and

— A 1.8 m high mesh fence around the edge of the 20 m by 20 m pad.

The seen elements associated with the Concrete Drop Hole would comprise the following:

— A 20 m by 20 m flat pad, surfaced with road base; and

— A 1.8 m high mesh fence around the edge of the 20 m by 20 m pad.

Vehicular movements to and from the Site are also addressed.

A sedimentation dam and catch drain would be required for the duration of the construction period (refer Figure 4). A permanent dam will be constructed for ongoing operation.

The construction phase of the ventilation shaft project will be up to 30 weeks, in which time other infrastructure would be required on site, including a:

— Raise Borer and protective marquee (refer Figure 5);

— Conventional drilling rig (refer Figure 6);

— Site office;

— Generator;

— Workshop container;

— Fuel tank; and

— Chemical toilet.

The landscape surrounding the Project reflects the major industries of mining, power generation and distribution, agriculture, and transport (road and rail) in the area. The landscape visually comprises large, undulating, open fields of agricultural grazing land with pockets of forest vegetation dotted throughout. A number of open cut mines are highly visible in the landscape surrounding the Site (refer Figure 8).

The Site comprises a gently undulating hillside sloping to the south-west, vegetated with pasture grass and occasional stands of trees (refer Figure 7). It is bounded on the north-east by the New England Highway, although the Highway is cut into the hillside behind the Site, effectively screening it from views to the proposed ventilation infrastructure (refer Figure 8).

Three representative observer locations were identified surrounding the Site (refer Figure 12), these being:

— Observer Location 1a: New England Highway - View from the north-west;

— Observer Location 1b: New England Highway - View from the south-east; and

— Observer Location 2: Brunkers Lane.

1 INTRODUCTION

Overall, the proposed ventilation shaft and fans would have a **very low visual impact**, due to the following;

— The Project is situated in a relatively remote location, within a predominantly visually agricultural (pastoral) landscape, within which mining and power infrastructure is visually prominent and prevalent;

— All views to the Site are from a substantial distance (minimum 700 m) and the proportion of the view within the context of the broader landscape is minor;

— The main visual impacts would be associated with lighting during construction, operation, and from vehicles moving to and from the Site at night time. This could readily be mitigated by strategic planting surrounding the Site, which would offer screening to the proposed infrastructure;

— The short construction time of the project (up to 30 weeks) significantly diminishes any visual impact the project would have, especially within the context of a mining landscape; and

— The materials finish of the infrastructure and the landscape treatment surrounding the infrastructure would have a substantial impact on how visually prominent this structure would be viewed within the landscape.

1.1 Scope

AECOM Australia Pty Ltd (AECOM) has been commissioned by Ashton Coal Operations Limited (ACOL) to prepare a Visual Impact Assessment (VIA) for the proposed Ventilation Fan and Service Shafts Project - Visual Impact Assessment (the Project) 14 kms north of Singleton in the Hunter Valley, New South Wales.

This report addresses the potential visual impact of the above-ground (visible) elements for the Project. The Project consists of the construction and operation of one ventilation shaft and two service shafts and associated infrastructure, as shown in Figure 1.

The Project has been assessed at both the construction and operation phases.

1.2 Project Overview

The ACOL mining operation comprises an open cut coal mine, an underground multi-seam longwall mining operation, a coal handling and preparation plant and a rail siding.

Detailed investigations have identified the need for an additional ventilation shaft and fan to allow for the safe operation of approved longwall mining areas, and two service drop holes and associated infrastructure to provide access and facilitate the delivery of necessary supplies underground.

To fulfil these requirements, an integrated mine ventilation system and service drop holes would be established (referred to as the Project in this report), consisting of the construction and operation of:

— A new main ventilation shaft (5.5m diameter);

— Two new centrifugal fans associated with this ventilation shaft;

— A ballast drop hole (300mm diameter);

— A concrete drop hole (300mm diameter);

— Associated infrastructure required to access and power the fans and service access drop holes.

For more detailed information on the project, refer to the Environmental Assessment (EA) prepared by Wells Environmental Services, 2011.

Figure 1: Proposed position of ventilation shaft and drop holes, and associated infrastructure pads (Source: Wells Environmental Services)

1.3 Project description

The Project is sited on a hillside west of the New England Highway, as shown in Figure 1.

The Upcast Ventilation Shaft and Fans

The upcast ventilation shaft and fans would comprise the following elements (refer Figure 2):

- A 5.5 m diameter ventilation shaft;
- Two exhausting fans (refer Figure 3);
- An evase with a maximum height of 7m (cone shaped discharge plenum fitted for noise reduction);
- A road base surfaced pad, 60 m by 75 m in size, for all infrastructure to sit on; and
- Associated switch gear, (motor control room) which is 3.5 m in height and housed within a 5 m by 5 m area.

The proposed slab that the ventilation infrastructure would sit on is to be cut into the hillside, with a 3.5 m high batter to the north of the slab.

During the 30 week construction phase, additional infrastructure would be required on site (refer Figure 4), including a;

- Raise Bore drilling rig (6 m tall);
- Marquee to protect Raise Borer (approximately 10 m tall, refer Figure 5);
- Site office;
- Generator;
- Workshop container;
- Fuel tank; and
- Chemical toilet.

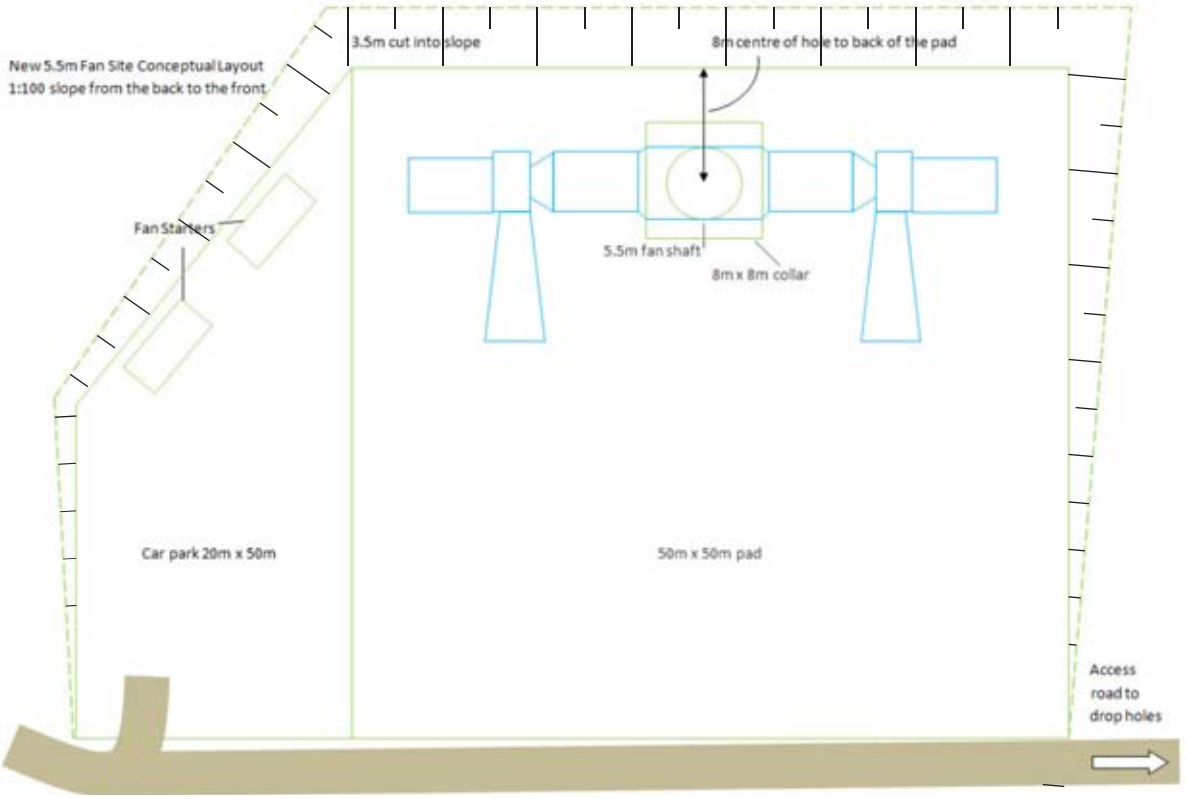
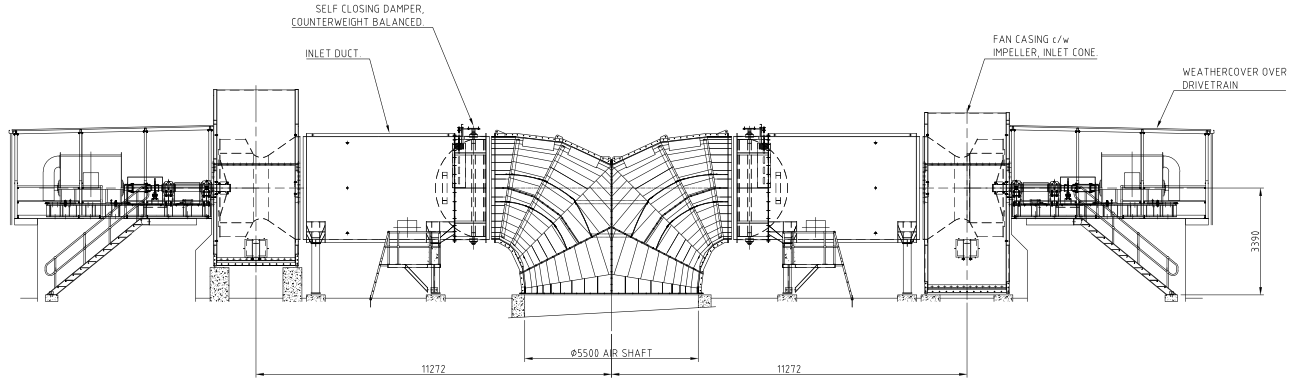


Figure 2: Conceptual plan of upcast ventilation shaft and fans during the operation phase (Source: ACOL) Not to scale



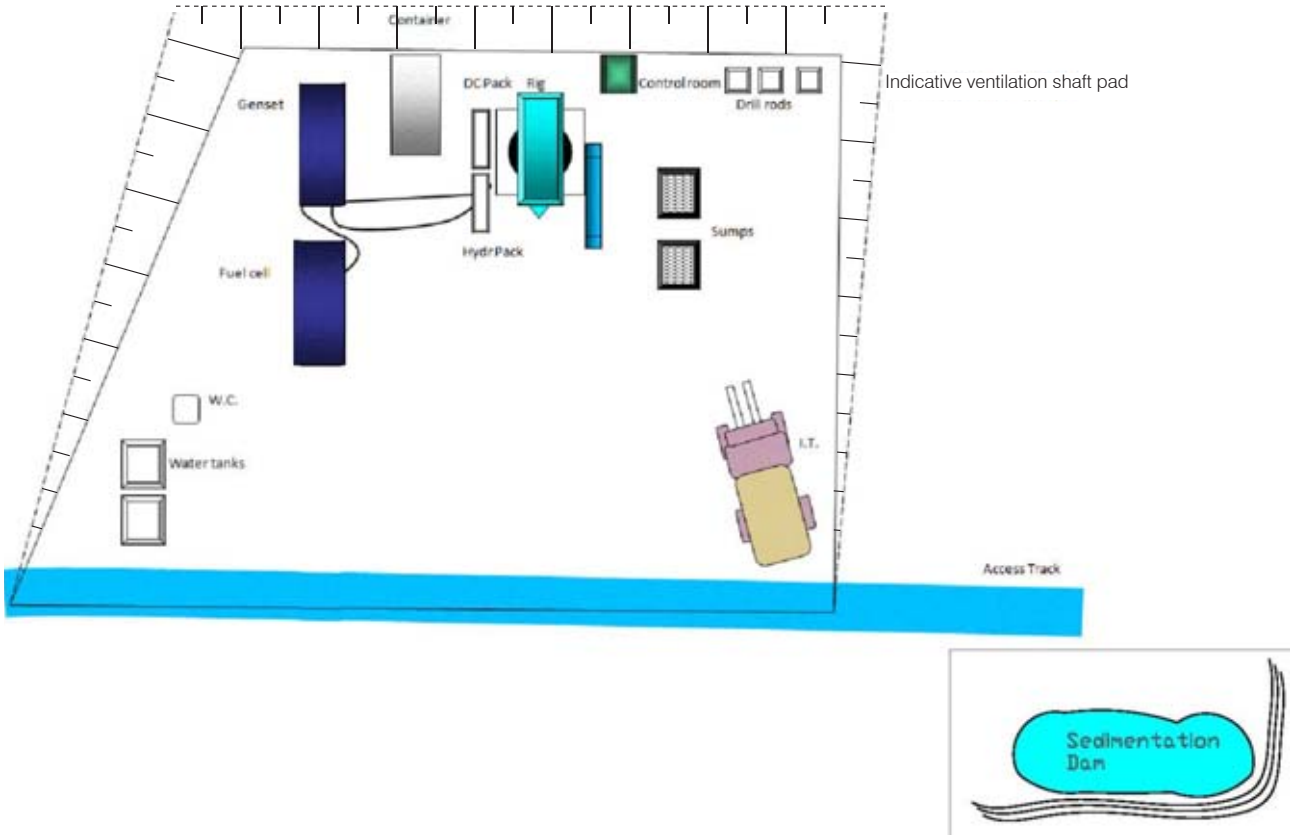


Figure 3 (top): Schematic diagram of ventilation fans and cover (Source: ACOL)
Figure 4 (bottom): Conceptual plan of the ventilation shaft and fans during the construction phase (Source: ACOL) Not to scale

A sedimentation dam and catch bank would also be required for the duration of the construction period (refer Figure 4). The site for this part of the project will be accessed by an existing track from the unnamed "Dairy Lane".

Additional traffic to and from the upcast ventilation shaft and fans site will be in the order of:

— 17 light and heavy vehicles per day during construction; and

— 1 vehicle movement per day during operation.

The ventilation fans would be in operation for the life of the underground mine.

The Ballast Drop Hole

The Ballast Drop Hole would be sited near to the main ventilation shaft and fans site as shown in Figure 1, and would comprise the following:

— A 20 m by 20 m flat pad, surfaced with road base;

— A 300 mm diameter drop hole, cased in steel;

— One (or occasionally two) small ballast stockpiles, no greater than 2 m in height;

— A 1.8 m high mesh fence around the edge of the 20 m by 20 m pad; and

— An access track from the existing track between the unnamed "Dairy Lane" and the upcast ventilation shaft and fans site.

During the one and a half week construction phase, the following additional infrastructure will be required:

— A conventional drilling rig; and

— A chemical toilet.

Additional traffic to and from the Ballast Drop Hole site will be in the order of:

— During construction:

- Drill rig crew (2 vehicles) per day,
- Delivery of materials as required,
- One water truck per week; and

— During operation:

- One ballast delivery (a small delivery truck) every week during maximum operation rates,
- Occasional visitation by a small earth mover (e.g. Bobcat or similar) to re-form the stockpile over the shaft; and
- Occasional visitation by ACOL staff for maintenance purposes.

Figure 5 : Photo showing an example of the marquee erected to protect the Raise Bore rig (Source: ACOL)

Figure 6: Photo showing an example of a conventional drilling rig (Source: ACOL)

The Concrete Drop Hole

The Concrete Drop Hole would be sited near to the main ventilation shaft and fans site as shown in Figure 1, and would comprise the following:

— A 20 m by 20 m flat pad, surfaced with road base;

— A 300 mm diameter drop hole, cased in steel;

— A lockable control device to prevent access when not in use;

— A 1.8 m high mesh fence around the edge of the 20 m by 20 m pad; and

— An access track from the existing track between the unnamed “Dairy Lane” and the upcast ventilation shaft and fans site.

During the one and a half week construction phase, the following additional infrastructure will be required:

— A conventional drilling rig;

— Above-ground relocatable sumps to limit ground disturbance during drilling; and

— A chemical toilet.

Additional traffic to and from the Concrete Drop Hole site will be in the order of:

— During construction:

  - Drill rig crew (2 vehicles) per day,
  - Delivery of materials as required,
  - One water truck per week; and

— During operation:

  - Concrete delivery by concrete truck, dependant on the requirements of the underground mine, and
  - Occasional visitation by ACOL staff for maintenance purposes.

1.4 Site Context

The ACOL mining operation is situated 14 km north-west of Singleton in the Hunter Valley, NSW (refer Figure 8).

The landscape surrounding the Project reflects the major local industries of mining, agriculture, and power generation in the area. The landscape visually comprises large, undulating, open fields of agricultural grazing land with pockets of forest vegetation dotted throughout. A number of open cut mines are highly visible in the landscape surrounding the Project (refer Figure 8), with the underground mining operations subtly visible on the ground surface due to white posts that mark longwall placement below.

The site of the proposed ventilation infrastructure comprises a gently undulating hillside sloping to the south-west, vegetated with pasture grass and occasional stands of trees (refer Figure 7). It is bounded on the north-east by the New England Highway, although the Highway is cut into the hillside behind the Project, effectively screening it from direct, close up views to the proposed infrastructure (refer Figure 9).

On the northern side of the New England Highway adjacent to the Project, lies the ACOL open cut mine (refer Figure 8), parts of which are visible from the hillside on which the infrastructure would be situated (refer Figure 7, right of frame).

Bowmans Creek lies in a gully to the west of the Project, and is seen in the landscape as a band of taller, dark vegetation against the pale, grassed hillside beyond (refer Figure 12).

To the east, Glennies Creek lies behind a ridge line and is not visible from the Project site.

Other industrial elements are visible in the landscape surrounding the Project, including a power station (Figure 10), power lines (Figure 11) and isolated mining infrastructure.

Although the site of the proposed Project itself is a very open, exposed location, there are very limited numbers of viewers that would get uninterrupted views to it. These are discussed in Section 2.2 - Observer Locations.

Figure 7: Panorama of the Site of the proposed project infrastructure (the Site).

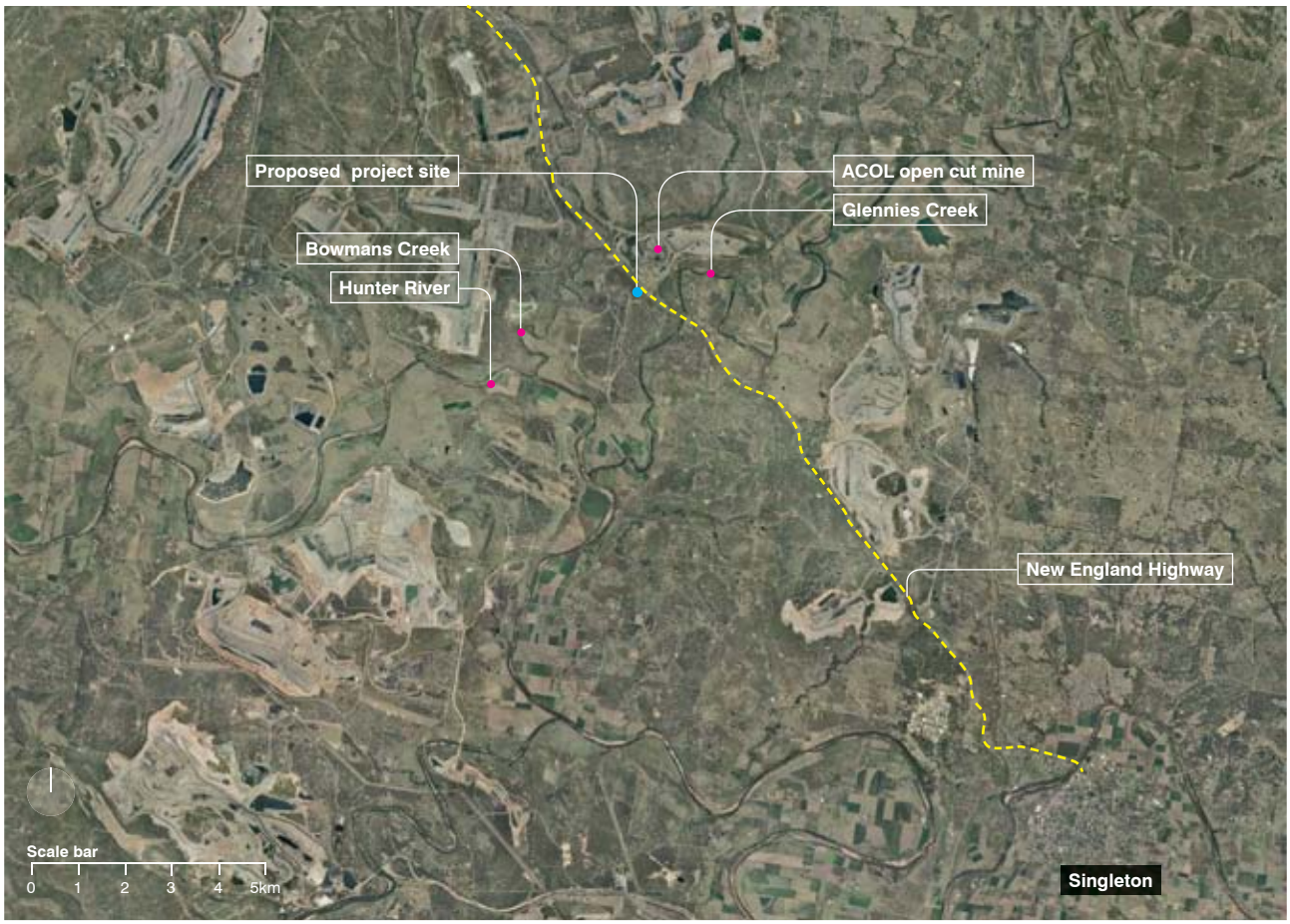


Figure 8: Aerial photo of the proposed Project Site showing proximity to surrounding open cut mines in the area (Source: Google Earth)

Panorama continues from page 12

Figure 9 (top): View to the Site from the corner of Glennies Creek Road and the New England Highway. Note how the Highway adjacent to the Site is cut into the hillside, screening the Project from view.
Figure 10 (bottom): View from the Site to power station on the western horizon

Figure 11: View to the Site from the New England Highway (north). Note power lines that traverse the landscape

2 METHODOLOGY

2.1 Methodology

The visual impact of the proposed development has been assessed using the following method;

1. Describe the site and project
   - Site context
   - Project elements
   - Project character
2. Describe the proposed development
3. Identify the main observer locations to the project - map and photograph
4. Define a range of criteria against which the relative importance of each observer location can be assessed, e.g.:
   - Heritage significance
   - Distance to view
   - Observer type (e.g. tourist, site-seeing, other recreational user, resident, local user)
   - Number of observers
   - Duration of observation
   - Visibility / visual prominence of the development (including skyline view / backdrop / screening / etc.)
   - Land use (public open space / private ownership / road)
   - Change from existing
   - Specific issues
5. Assess the visual impact for each key observer location
6. Provide conclusion

Observer Locations

Observer locations were chosen using a combination of aerial photograph interpretation and exploration of the surrounding area by car. Observer locations comprised of representative, publicly accessible places which encapsulated the potential for views to the proposed development site, from nearby dwellings or other important observer types, e.g. from public recreation areas.

Observer locations that were not included in this report were either deemed not significant due to very low observer numbers, or the proposed development site being substantially obscured from view by landform or by other factors (e.g. housing, trees), so no clear view to the development would be possible.

Photographs

For each observer location, a photograph (or number of photographs, stitched together to make a panorama) were taken using 25mm digital focal length. This equates to 50 degrees in 35mm film format, which approximates the view as seen unaided by the human eye. Each photo or panorama shows the approximate width of the Site relative to the observer location.

2.2 Observer Locations

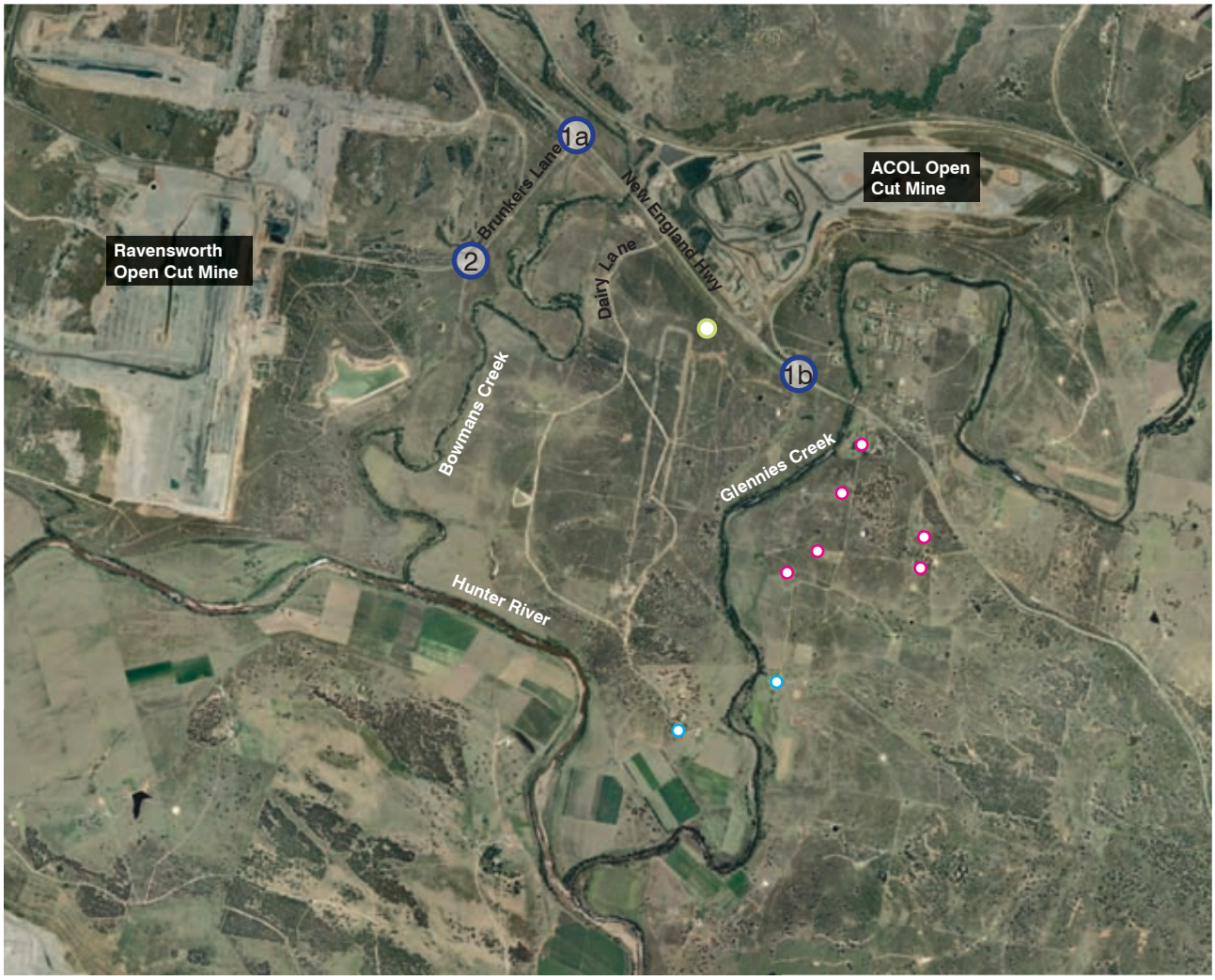
The Site is relatively isolated, with no immediate residential neighbours receiving close, uninterrupted views. The hillside where the proposed ventilation infrastructure would be located has a south-westerly aspect, facing away from the New England Highway. This aspect, coupled with the ridge line that runs along the eastern boundary of the Site, protects the Site from any views to the proposed infrastructure from observers on the northern side of the Highway.

South of the New England Highway there are a number of rural residences within a 4 km radius of the Site, as shown on Figure 12. A majority of these properties are owned by ACOL, with the exception of two residences which lie around 3km to the south of the Site. Properties on the eastern side of Glennies Creek would be screened from view by the vegetation adjacent to Glennies Creek and by surrounding landform (a ridge line running along the eastern boundary of the Site). The two non-ACOL owned properties south of the Site would be screened from view by landform, existing vegetation associated with the creekline, the vegetation of the VCA, and the greater viewing distance.

Properties south of the Hunter River are similarly protected by vegetation associated with the river, as well as the greater viewing distance.

Views to the Site would be available from users of the New England Highway, therefore these are included as Observer Locations 1a and 1b.

Brunkers Lane was chosen as Observer Location 2 as this road is being upgraded as part of the proposed Lemington Road realignment (Ravensworth Operations Project Environmental Assessment, 2010). Lemington Road connects the New England Highway with the Golden Highway, as well as providing access to a number of local mining operations.



Legend

- Site of proposed project infrastructure (the Project)
- Nearby Residences: owned by ACOL
- Nearby Residences: not owned by ACOL

1a Observer Location 1a: New England Highway, View from the North-west

1b Observer Location 1b: New England Highway, View from the South-east

2 Observer Location 2: Brunkers Lane

Figure 12: Map of observer locations (Source: Google Earth)

Scale bar
0 0.2 0.4 0.6 0.8 1km

3.0 VISUAL IMPACT ASSESSMENT

3.1 Observer Location 1a: New England Highway, View from the North-west

Distance to the Site: 1.5 kilometres

Existing Situation

This observer location approximates the view to the Site as seen by road users of the New England Highway, travelling in a south-eastern direction.

Travellers on the New England Highway pass through the landscape at an approximate speed of 80 to 100 kms per hour, obtaining extensive views to the greater landscape but fleeting views of detailed individual elements within it. The predominant view experienced would be one of the rolling, agricultural landscape dotted with stands of darker vegetation associated with remnant bushland or streams. Periodic exposure to mining sites and isolated infrastructure are visible as observers traverse the landscape.

The Site is seen as a very small component of grassed hillside in the background, substantially screened by a dark band of vegetation associated with Bowmans Creek (refer Figure 13). A number of existing tracks across the Site are not distinguishable from this distance and with the partial screening of the hillside by the Bowmans Creek vegetation.

The foreground of the view comprises the immediate road and road verge, and an open, agricultural grazing landscape up until the vegetated line of Bowmans Creek. To the left (east) of the New England Highway, elements of the ACOL open cut mine can be seen in the middle ground, including conveyors, stockpiles, cut hill faces and corrugated metal clad buildings, some of which are visually prominent in silhouette against the skyline.

Other elements indicating the industrial nature of much of the landscape can be seen, including power poles and signage.

The number of viewers at this location is expected to be high, as many people use the New England Highway every day. Users travelling along this road would be expected to be concentrating on the road ahead, with only the larger elements in the landscape commanding their attention as they quickly move through the landscape. Many of these observers could be anticipated to be locals or workers in the surrounding mines, who would be used to seeing mining infrastructure as they travel on their daily journeys.

Figure 13: Key plan (Source: Google Maps)

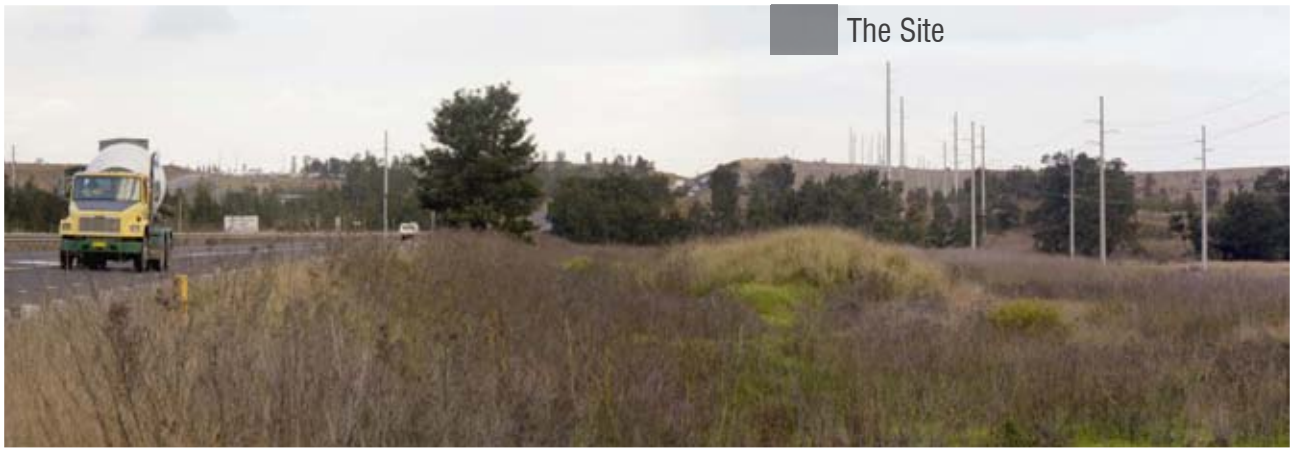

Panorama continues over page 19

Figure 14: Panorama showing the view to the Site looking from the north-west on the New England Highway. Note the vegetation associated with Bowmans Creek in the middle ground is partially screening the view to the Site.

Proposed Development - Construction

During the construction phase, the bulkier elements on site may be visible to passing motorists, these being:

- Site offices;
- A workshop container;
- Generator;
- Lighting structures;
- Any large vehicles temporarily stationed on-site, including delivery and earth moving equipment;
- Boring and shaft lining equipment, which would be approximately 7 m high, and
- A 10 m high white marquee to protect the boring equipment and associated workers.



Panorama continues from page 18

Figure 15 (top): Detail of Figure 14 showing the view to the Site from the New England Highway.

Of these, the tops of the taller elements (white marquee with ventilation shaft boring and lining equipment inside, drilling rig for drop holes, and lighting poles) may be visible on the horizon, seen in relief against the skyline.

Elements on the construction site that are clad in metal (e.g. the site offices, workshop container, fuel tank and boring equipment) may be more visible at certain times of the day if the surface of the equipment is reflective and the sun is at an angle where light is reflected off them.

It is anticipated that the sedimentation dam and catch drains would not be visible to passers by on the New England Highway due to their low profile, nor would smaller construction equipment be discernible (e.g. the fuel tank or chemical toilet) due to their small size and the viewing distance.

During daylight hours, it would be difficult for drivers on the New England Highway to discern moving vehicles traversing the hillside due to partial screening from vegetation, and the distance of viewing.

As hours of operation would be from 7 am to 10 pm, 6 days a week and 8 am to 10 pm on Sundays, some vehicle movements would occur at night, meaning headlights traversing the field would be a visible and new element seen in the landscape.

Night lighting on the proposed construction site would be visible to users of the New England Highway from this location, and would be a noticeable change from the existing situation, as the hillside currently has no lighting and would presently not be noticed at night by passers by.

Proposed Development - Operation

During operation, the largest element on the Site (the fan structure over the ventilation shaft) would be visible in side elevation from users of the New England Highway.

The fan structure is 7 m tall, but sits slightly depressed into the landscape due to the proposed slab being benched into the hillside. The fans would sit to the back of the slab near the 3.5 m high batter, therefore the fans would protrude approximately 4 m above the ground height of the immediately adjacent hillside (refer Figure 16 - Note that the site of the fan may be further down the hill than shown in Figure 16. This diagram is used as an example of benching only). As the slab is not situated on the crest of the hill, only the upper portions of the fans may be seen in relief against the skyline.

Although it would be seen from this observer location, the finish of the fan covering would determine how visible the fan is in the landscape. A reflective, metal or dark coloured covering to the fan would be more visible than a pale, non-reflective surface. Recommendations for finishes to minimise the visual prominence of this structure are provided in Section 5 - Conclusions and Recommendations.

It is anticipated that any other infrastructure (e.g. switch gear, parked small vehicles and fencing) would be too low to be seen on the horizon (i.e. seen against the skyline), but would be viewed against the backdrop of the grassed hillside (if they are not obstructed from view by the fans). These too may be seen more readily if they have reflective surfaces, especially when and the sun is at an angle which would allow reflected light to be seen by users of the New England Highway (i.e. late afternoon).

Night lighting would be minimal during operation, and would consist of lighting sufficient to meet safety requirements only. Although this lighting may be seen by drivers on the New England Highway, it is anticipated that the low, contained light source would not comprise a disruptive or unusual element for passers-by.

During daytime hours, the additional traffic to the three sites (i.e. to the ventilation shaft and fans site, and the two drop hole sites) of approximately 5 light vehicle movements per day and 4 heavy vehicle movements per week along the existing access track may be seen by passing motorists, but would be hard to discern through partial screening of the Bowmans Creek vegetation. Any night access may be easier to see, as the headlights will stand out against the darkened hillside.

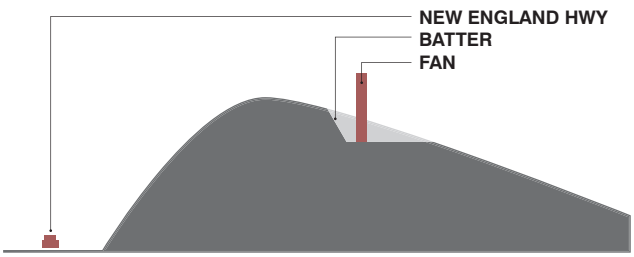


Figure 16: Diagram showing the fan site slab benched into hillside, reducing the amount of the proposed fan seen in relief against the sky from some observer locations. Note that the two drop hole pads will also be cut into the slope, reducing the height of the infrastructure seen by passers-by. Not to scale.

Visual Impact Assessment - Construction

There would be a **low visual impact** during the construction phase of the project, due to the following:

— Although the construction infrastructure (particularly the white marquee and conventional drilling rig) would be visible to users on the New England Highway (which has a high usage rate and therefore provide a high number of observers), the view would partially be screened at this location by the vegetation associated with Bowmans Creek, which lies in the gully between the observer location and the Site.

— The duration of viewing would be very short, as the driver travels south along the Highway past the proposed development. Furthermore, the viewing distance of 1.5 km significantly diminishes the prominence of the construction infrastructure in the landscape.

— The change in traffic on the access road would probably not be readily discernible from this observer location due to distance of viewing and partial screening by the vegetation between the Site and the observers. At night, some headlights may be visible on the hillside, but would not be an unusual element of the view to a driver, whose main concern would be the traffic on the road in front of them.

— The construction infrastructure and vehicular movement to and from the Site is diminished in importance by the larger, more prominent industrial elements within the landscape, such as the open cut mine to the left of the New England Highway as the driver passes the Site.

— Night lighting on the currently unlit hillside would provide a new visual element, but as above, within the context of the greater mining landscape this would be a minor one.

— The relatively short construction period of 29 weeks provides a 'worst case' scenario to passers by, in that the most vehicular traffic and seen elements would be partially visible during construction, but would drop back to a lesser visual prominence during operation.

Visual Impact Assessment - Operation

There would be a **very low visual impact** during the operation phase of the project, due to the following;:

— Users of the New England Highway travelling south would obtain only fleeting glimpses to the new infrastructure as they approach the Site. High numbers of observers would travel along the Highway, but within the context of the greater mining landscape, these relatively small pieces of infrastructure would appear as visually diminutive, especially considering the open cut mine to their left, and power lines to their right, as they approached the Site.

— The ventilation fans and drop holes infrastructure would be predominantly seen against a grassy hillside, so material choice for the covering structures would help the infrastructure visually recede into the landscape. Some of the fan covering may be viewed against the skyline, which would make it more visible to passers by, although again within the greater mining landscape, and the combination of viewing distance and proportion of the view taken up by the Site, this would be a small and easily overlooked element.

Targeted screen planting would substantially reduce the impact of the structure to passing motorists (refer Section 4 - Conclusions and Recommendations).

3.2 Observer Location 1b: New England Highway, View from the South-east

Distance to the Site: 700 metres

Existing Situation

This observer location approximates the view to the Site as seen by road users travelling north on the New England Highway (refer Figure 17). As with Observer Location 1a, travellers on the Highway pass through the landscape at around 80 to 100 kms per hour, obtaining extensive views to the greater landscape but fleeting views of detailed individual elements within it. The predominant view experienced would be one of the rolling, agricultural landscape dotted with stands of darker vegetation associated with remnant bushland or streams. Periodic exposure to mining sites, and power generation and distribution infrastructure are visible as observers traverse the landscape.

The Site is seen as a grassed hillside in the background, seen in relief against the skyline as the driver travels up an incline towards the Site (Figure 18). The proposed infrastructure sits on a grassy slope beyond the crest of this hillside.

Bands of planted trees can be seen in the middle ground, viewed as a line of dark trees following the horizon line to the left, but dipping down in front of the hillside approaching the Site, screening part of the hill from this location (refer Figure 18).

The view to the right (north-east) of the Highway comprises further views to the open, agricultural grazing landscape. The ACOL open cut mine and associated infrastructure lies over a slight ridge and therefore cannot be seen from this location.

As with Observer Location 1a, the number of viewers at this location is expected to be high, as many people use the New England Highway every day. Users travelling along this road would be expected to be concentrating on the road ahead, with only the larger elements in the landscape commanding their attention as they quickly move through the landscape. Many of these observers could be anticipated to be locals or workers in the surrounding mines, who would be used to seeing mining infrastructure as they travel on their daily journeys.

Figure 17: Key plan (Source: Google Earth)

Figure 18: Panorama showing the view to the Site from the New England Highway, as seen from the south-east.

Proposed Development - Construction

During the construction phase, only the top of the protective marquee over the Raise Borer and the conventional drilling rig are expected to be seen projecting above the hillside. Even so, it is anticipated that, at most, only the top of the marquee would be seen due to the position of the structure on the other side of the hill and the benching of the pads into the hillside, further reducing the level of the structure up to 3.5 metres into the ground.

Depending on the intensity of the night lighting during construction, there may be a glow visible at night (during working hours between sundown and 10pm) from beyond the hillside, but due to the angle of lighting this would be expected to be minimal.

No vehicular activity is anticipated to be seen from this observer location.

Proposed Development - Operation

During operation, only the top of the largest element on the Site (the fans and fan coverings of the ventilation shaft) would be visible in side elevation from this observer location. The fan coverings are 7 m tall, but sit slightly depressed into the landscape due to the proposed slab being benched into the hillside. The fans would sit to the back of the slab near the 3.5 m high batter. Therefore the fans would protrude approximately 4 m above the ground height of the surrounding hillside (refer Figure 16). Due to the position of the proposed infrastructure on the other side of the hill to this observer location, it is anticipated that the full 4 m of this structure would not be visible to observers, rather only the top 2 m (approximately) would be seen over the hillside on the horizon.

Night lighting would be minimal during operation, and would consist of lighting sufficient for safety only. It is anticipated that a low, contained light source would be only just discernible to drivers, and therefore would not be disruptive or seem unusual to passers by.

It is anticipated that no vehicular movement to and from the infrastructure sites will be visible from this observer location.

Panorama continues from page 22

Visual Impact Assessment - Construction

There would be a **low visual impact** during the construction phase of the project, due to the following:

— Although the top of some of the protective marquee and the drill rig would be visible to users on the New England Highway (which has a high usage rate and therefore provide a high number of observers), the view would mostly be screened by the hillside.

— The duration of viewing would be very short, as the driver travels north along the Highway past the proposed development. Although the viewing distance of 700 m is quite close, a majority of the proposed infrastructure would be hidden behind the hillside. As the driver gets closer to the Site, the hillside would screen all of the construction infrastructure.

— Night lighting on the currently unlit hillside may be noticeable, but would constitute a very minor impact due to the angle of lighting and short viewing time and short construction period where this would be visible.

Visual Impact Assessment - Operation

There would be a **very low visual impact** during the operation phase of the project, due to the following:

— Users of the New England Highway travelling north would obtain only fleeting glimpses of the very top of the fan covering as they approach the Site. Although high numbers of observers would travel along the Highway, the minimal detail that would be apparent to observers coupled with the short viewing time, would result in this piece of infrastructure appearing as either a very small element within the view, or not being readily noticeable.

3.3 Observer Location 2: Brunkers Lane

Distance to the Site: 1.5 kms

Existing Situation

This observer location approximates the view to the Site as seen by road users on Brunkers Lane. Brunkers Lane is being upgraded to the new Lemington Road alignment, which would connect the New England Highway with the Golden Highway, giving access to a number of mining operations. As such, it is anticipated that the road would be heavily used by commuters travelling to work at one of these facilities, or general public seeking to traverse between the two highways.

At present, Brunkers Lane comprises a minor access road to the Ravensworth mining operation, the gate of which is located under the observer location marker in Figure 19. With the realignment of Lemington Road, an increased amount of traffic would be expected, giving a moderate number of observers views to the proposed ventilation infrastructure.

The view from this location is to the open, rolling hills of the surrounding grazing landscape, punctuated by dark stands of trees associated with stands of remnant bushland and planted wind breaks / screening vegetation. The cut batter faces of the ACOL open cut mine are visible in the background above the Bowmans Creek vegetation (refer Figure 20).

Figure 19: Key plan (Source: Google Earth)

The Project itself is predominantly screened from view to road users by the vegetation associated with Bowmans Creek, with glimpse views to the hillside of the proposed infrastructure seen through tree canopies. The vegetation corridor associated with Bowmans Creek would significantly increase with a proposed realignment of the watercourse therefore decreasing the extent of the already highly limited views to the Site.

Observers travelling north towards the New England Highway (facing the Site) would be the only travellers expected to obtain views to the Site, as travellers moving south would have their backs to the development. Many of these observers are expected to be workers in a number of near by coal mining operations, who would be used to views of mining infrastructure.

Proposed Development - Construction

During the construction phase, only the bulkiest elements on site may be visible to passing motorists, these being:

- Site offices;
- A workshop container;
- Lighting structures;
- Boring and shaft lining equipment for the ventilation shaft (i.e. the Raise Borer), which would be approximately 6 m high;
- A protective marquee over the rasieboring equipment, which will be 10 m high; and
- The conventional drilling rig for the drop holes.

Elements on the construction site that are pale or clad in metal (e.g. the marquee, site offices, workshop container, and fuel tank) may be more visible at certain times of the day if the surface of the equipment is reflective and the sun is at an angle where light is reflected off them (i.e. late afternoon).

During daylight hours it would be difficult to discern vehicles driving to and from the Site on existing access tracks due to the size of the vehicles, the distance and angle of viewing, and the screening vegetation of Bowmans Creek.

At night time, night lighting on the proposed construction site may be visible to users of Brunkers Lane from this location, seen as through the trees associated with Bowmans Creek. Similarly, headlights of vehicles travelling to and from the Site on the existing access tracks may be seen through the vegetation.

The Project would only potentially be visible as very short glimpses as road users travelled between the point of the existing Ravensworth Mining Operations gate and the New England Highway (approximately 1 km).

Proposed Development - Operation

During operation, the largest element on the Site (the fan structure and covering) may be visible from users of Brunkers Lane, seen through screening vegetation. The visual prominence of these elements against the backdrop of the grassed hillside would depend on the surface finish of the structures, i.e. a pale (but not white), non-reflective surface would be harder to discern against the pale hillside than a dark or reflective one. Recommendations for finishes to minimise any visual impact of this structure are discussed in Section 5 - Conclusions and Recommendations.

It is anticipated that any other infrastructure (e.g. switch gear, fencing or small parked vehicles) would be difficult to discern at this viewing distance and through the Bowmans Creek riparian corridor.

Night lighting would be minimal during operation, and would consist of lighting sufficient for safety only. Although this lighting may be seen by drivers on Brunkers Lane, it is anticipated that the a low, contained light source would not be disruptive or unusual for passers by. Furthermore, any night access by vehicles may be seen.

Panorama continues over page 27

Figure 20: Panorama showing the view towards the Site from Brunkers Lane. Note the open cut coal mine visible in the background on the horizon to the middle of the frame.

Visual Impact Assessment - Construction

There would be a **low visual impact** during the construction phase of the project, due to the following;

— Although some of the construction infrastructure may be visible to road users from this location, the view to the proposed development would be unclear due to the distance and effective screening of the Project by the Bowmans Creek riparian corridor.

— The duration of viewing would be very short, as the driver travelled north along the road towards the New England Highway.

— Night lighting on the currently unlit hillside may be noticeable, again providing minimal impact to the viewer due to viewing distance and screening vegetation.

— Many of the road users could be expected to be workers at a number of other coal mines, therefore mining infrastructure would be a familiar sight. Furthermore, the size of the open cut coal mine visible on the horizon in the background would diminish the impact of the relatively small piece of proposed mining infrastructure glimpsed through the Bowmans Creek vegetation.

Visual Impact Assessment - Operation

There would be a **very low visual impact** during the operation, due to the following;

— There would be less infrastructure on the Site during operation than for the construction phase, and therefore less elements to view;

— There would be less lighting at night for the operations phase than for the construction phase; and

— Carefully considered material colour choices for operation phase would further reduce the visual prominence of the infrastructure.

The Site

Panorama continues from page 26

4 CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusions

Overall, the proposed ventilation shaft, fans and drop holes would have a **very low visual impact**, with the greatest difference to existing experienced by:

— Drivers travelling south on the New England Highway from approximately 1 km north-west of the Site, of which there would be high numbers but each receiving only short periods of exposure to the view.

The Project is situated within a predominantly agricultural (pastoral) landscape, amongst which mining infrastructure features substantially, with a number of open cut and underground mines in the locality. In context with this local mining history, the proposed development would not be out of place.

The main visual impacts would likely be associated with lighting during construction, operation, and from vehicles moving to and from the Site at night time, requiring the use of headlights, seen against the darkened existing grassy hillside.

The short construction time of the Project (up to 30 weeks) significantly diminishes any visual impact the project would have during this phase, especially within the context of a mining landscape. The white marquee used to protect the raise boring equipment would be the most visible element on site due to its size and colour (white).

The materials finish of the infrastructure would have a substantial impact on how visually prominent the structures would be within the landscape.

4.2 Recommendations

In order to minimise the visual prominence of the proposed ventilation infrastructure, the following steps are recommended:

— The provision of screening vegetation (with locally indigenous tree and shrub species, suited to the particular climatic conditions of proposed location) to the north-west and south of the proposed infrastructure, as shown in Figure 21;

— The selection of visually recessive coloured materials for the proposed fan covering, such as Colourbond ‘Sandbank’ or ‘Jasper’ shades, as shown in Figure 22.

Legend

- Proposed infrastructure locations
- Screening vegetation to reduce visual prominence of fan infrastructure as seen by passing motorists heading south and north on the New England Highway
- Screening vegetation to reduce the visible safety lighting as seen by residents of the nearby residence

Figure 21: Recommended screen planting and alternate position of the Site (Source: Google Earth) Not to scale

Sandbank®
CMYK: 15 15 40 0
RGB: 209 185 136
Hex: D1B988

Evening Haze®
CMYK: 15 11 23 0
RGB: 196 192 176
Hex: C4C0B0

Bushland®
CMYK: 0 0 15 50
RGB: 138 138 127
Hex: 8A8A7F

Jasper®
CMYK: 0 10 13 58
RGB: 128 110 92
Hex: 806E5C

Figure 22: Recommended Colorbond® colours for fan infrastructure (Source: www.colorbond.com)