

Appin - Mine Safety Gas Drainage Project

Environmental Management Strategy



Environmental Management Plan

Review History

Revision	Description of Changes	Date	Approved
P0	New Document	9 September 2009	
P1	Revised Document	22 September 2009	
R0	Final Document	24 September 2009	
R1	Revised Document	11 November 2011	
R2	Revised Document	16 November 2011	
R3	Revised Document	16 January 2012	

Persons involved in the development of this document include:

Name	Title	Company
Peter Chudleigh	Civil/Environmental Engineer	Cardno Forbes Rigby
Bruce Blunden	Environmental Approvals Manager	BHP Billiton Illawarra Coal
Hugh Selby	Senior Environmental Scientist	Cardno

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1 INTRODUCTION

1.1 Background

BHP Billiton Illawarra Coal (BHPBIC) currently undertakes longwall mining operations in the Bulli Seam within the Wollondilly Local Government Area (LGA). Coal is currently extracted from the Bulli Seam within West Cliff Area 5 and Appin Area 7. However, West Cliff Area 5 has limited remaining coal that can be extracted. Appin Area 7 Longwalls 701 to 703 and in part 704 have been mined (in accordance with the Subsidence Management Plan [SMP]).

BHPBIC has identified Appin Area 9 mining domain to replace West Cliff Area 5 once the resource there is fully extracted. BHPBIC is currently preparing an Extraction Plan for Appin Area 9. The Extraction Plan requires approval from the Director-General of Planning prior to the commencement of coal extraction. It is expected that mining in Area 9 may commence in 2015.

These areas have relatively high coal seam methane concentrations. In order to facilitate safe and efficient first workings development, gas drainage of the coal seam is required prior to mining activities. The effectiveness of in seam gas drainage is a function of the pre-mining lead time where the gas can be removed from the coal seam. As such, the Mine Safety Gas Drainage (MSGD) will commence as soon as possible. Similarly continued safe and efficient mining of Longwalls 704 and 705 requires the drainage of methane gas from the goaf during mining.

On the 2nd of October 2009, the Project Approval (MP 08_0256) for the Appin Gas Drainage Project was granted by the Minister for Planning under Section 75(J) of the *Environmental Planning and Assessment Act 1979*. This approval was modified in December 2010 to relocate a Medium Radius Drilling (MRD) borehole, a vertical borehole, and to provide an alternative access route that avoided traffic interactions with Douglas Park village and in particular Douglas Park Public School. It is expected that a further modification application will be submitted during November 2011 to address the additional gas drainage requirements outlined above.

This Environmental Management Plan (EMP) details the proposed environmental management activities that will be undertaken during construction and operation of the mine safety gas drainage works. It has been compiled in accordance with BHPBICs Statement of Commitments (SoC) within the approved project application. This document is a module of the Environmental Management Strategy (EMS).

1.2 Scope

The scope of this Environmental Management Plan is to identify mitigation measures to be implemented during the project works to minimise soil, erosion, noise, water, air, flora and fauna and cultural heritage impacts.

The project sites are located within the Wollondilly LGA, with the general project location shown on Figure 1. The proposed gas drainage surface facilities will be located across a number of properties on private landholdings. BHPBIC has consulted with and obtained written agreements from all landowners on which the proposed gas drainage activities will take place.

This EMP covers the following project sites:

- Lot 1 DP576136 (Longwall 705 vertical well, access and surface pipeline);
- Lot 2 DP576136 (Longwalls 704 and 705 vertical wells, MRD holes, access, surface pipeline and extraction plant);
- Lot 1 DP802151 (Longwalls 704 and 705 vertical wells, MRD holes, access and surface pipeline);
- Lot 1, 2 and 3 DP838568 (Longwall 703 vertical wells, access, surface pipeline and extraction plant);
- Lot 2 DP747563 (MSGD Site 1 – two steered horizontal wells, temporary infrastructure and access); and
- Lot 3 DP553170 (MSGD Site 2 – three vertical wells, temporary infrastructure and access).

The location of the sites are shown on **Figures 2 – 3**. Photographs of the sites are shown on **Figure 4**.

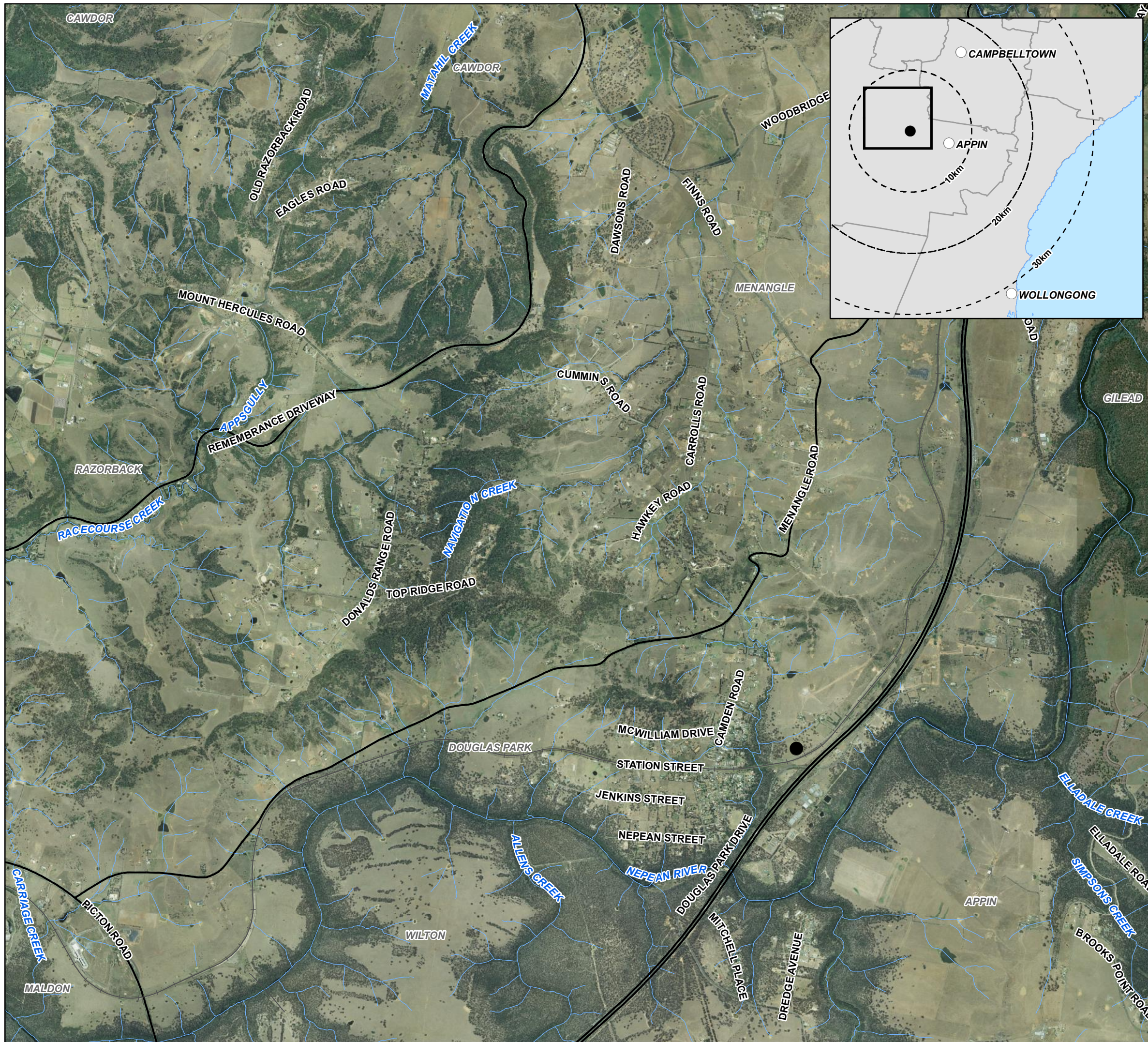
The project involves no native vegetation clearing, while no items of Aboriginal or non-Aboriginal heritage will be impacted. As such, no detailed Vegetation Management Protocol or Cultural Heritage Management Plan has been prepared.

All gas extracted from the steered horizontal wells and vertical wells at MSGD Site 1 and Site 2 will be flared onsite, while gas from Longwalls 704 and 705 will be piped into the existing surface reticulation system and extraction plant. No odour impacts should occur from flaring of methane as all hydrocarbons will be oxidised to carbon dioxide and water in the flaring process. No long term venting of gas will occur.

The drilling of steered horizontal wells at MSGD site #1 (on Lot 2 DP 747563) will be visible to motorists travelling on Menangle Road and from three nearby properties. The MSGD Site #1 compound will be enclosed by temporary chain mesh security fence and noise walls to minimise

visual impacts. Flaring will take place using a horizontal flare system, which will be fully enclosed within a container. This will ensure that no flame is visible at any time from any location.

Consultation has been undertaken with nearby residents in regard to all the proposed horizontally steered wells, vertical well and infrastructure sites. The Douglas Park community has also been informed of the drilling and operational program.



Location Plan

APPIN GAS DRAINAGE PROJECT

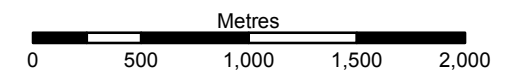
Legend

- Approved Appin No 6 Vent Shaft
- +— Railway (LPI)
- Major Roads (LPI)
- Watercourses (LPI)

FIGURE 1

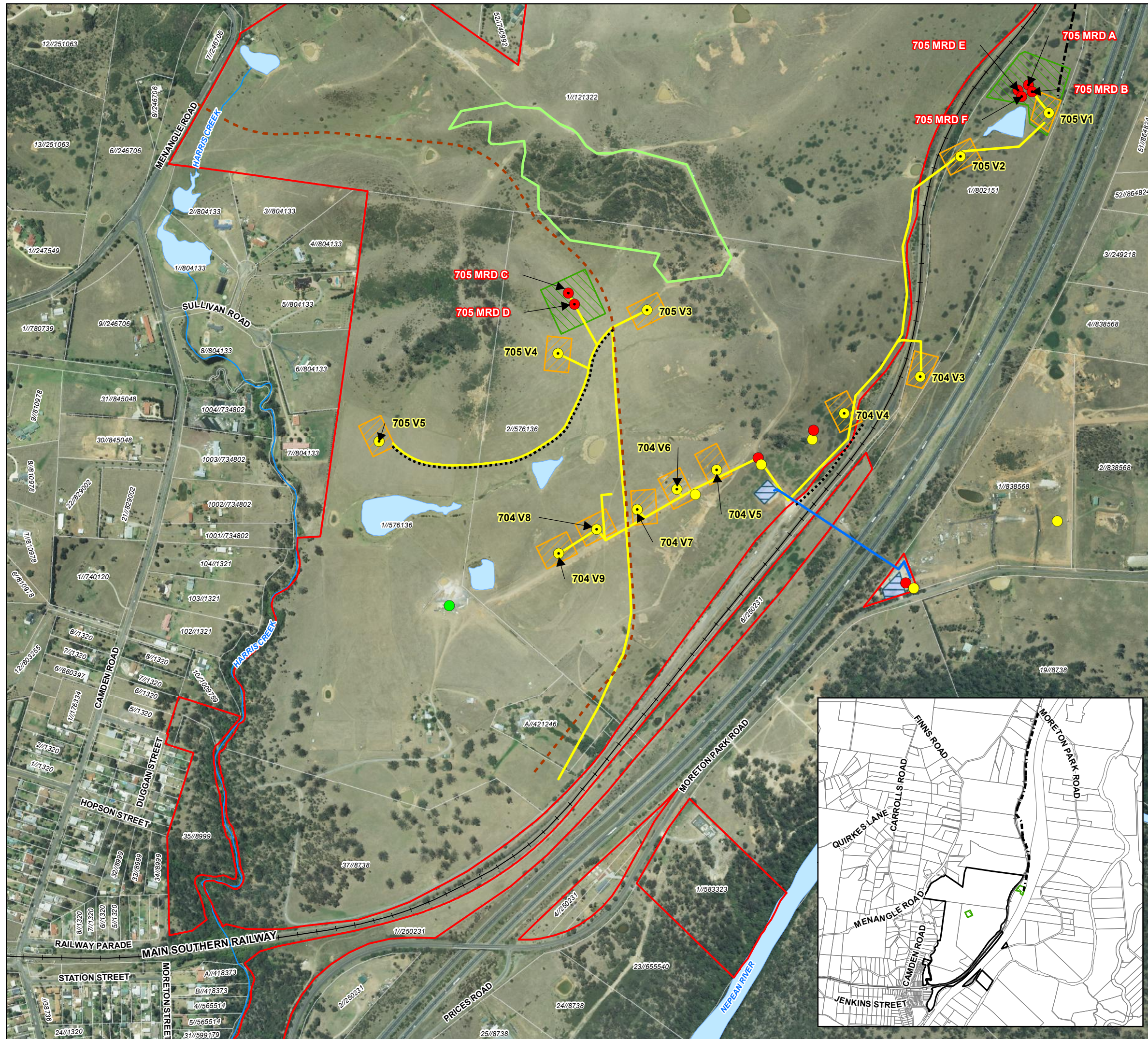


1:35,000 Scale at A3



Map Produced by Cardno NSW/ACT Pty Ltd (WOL)
Date: 2011-11-01
Coordinate System: GDA 1994 MGA Zone 56
Project: 212055-001
Map: G1004_LocationPlan.mxd 04

Aerial imagery supplied by BHPBIC (2007/2009)



LW704 and 705 Goaf Gas Drainage Works

APPIN MINE GAS DRAINAGE PROJECT

- BHPBIC Land
- Railway (LPI)
- Cadastre (LPI)
- Borehole Infrastructure**
 - MRD Borehole (Approved)
 - Vertical Borehole (Approved)
 - Downhole (Approved)
 - MRD Borehole (Proposed)
 - Vertical Borehole (Proposed)
- Drainage Pipelines
- Vegetation Offset Area (Niche and Cardno)
- Extraction Plant Locations
- 705 MRD Well Sites
- 704-705 Vertical Well Sites (BHPBIC)
- Access Roads and Tracks**
 - Access Track
 - Approved VS#6 Access Road (under construction)
- Water Features and Infrastructure**
 - Possible Water Supply
 - Major Watercourses (LPI)
 - Waterbodies (LPI)

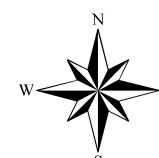
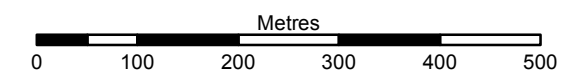


FIGURE 2

1:7,500 Scale at A3



Map Produced by Cardno NSW/ACT Pty Ltd (WOL)
Date: 2011-11-01
Coordinate System: GDA 1994 MGA Zone 56
Project: 212055-001
Map: G1005_SitePlanDrainageWorks.mxd 06
Aerial imagery supplied by BHPBIC (2009)



Mine Safety Gas Drainage Site Plan

APPIN MINE
GAS DRAINAGE PROJECT

Legend

- Proposed Well Locations
- Contingency Access (Indicative)
- Access Road (Indicative)
- +— Railway (LPI)
- Major Roads (LPI)
- Cadastre (LPI)
- Waterbodies (LPI)
- ▨ Drilling Pad

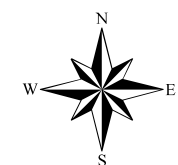
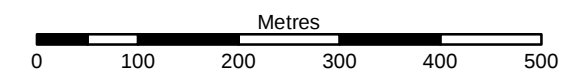


FIGURE 3

1:7,500 Scale at A3



Map Produced by Cardno NSW/ACT Pty Ltd (WOL)
Date: 2011-11-08
Coordinate System: GDA 1994 MGA Zone 56
Project: 212055-001
Map: G1002_STIS_Layout.mxd 09
Aerial imagery supplied by BHPBIC (2009)

		
LW 704 v4	LW 704 v5 - v9	LW 705 v3/v4/v5 and LW705 MRD C/D
		
LW 705 MRD A/B/E/F and LW705v1/2/3	MSGD Site #1	MSGD Site #2

Figure 4 Photo Log

2 OBJECTIVES

The objectives of this plan are to:

- Comply with all regulatory requirements set out in the Appin Gas Drainage Project Approval, Environment Protection Licence (EPL) No. 2504 (where applicable) and other legislation with regards to noise, water, air and erosion and sediment control management and monitoring;
- Ensure BHP Billiton environmental and other relevant Strategies and Policies are met and upheld;
- Identify activities that could cause noise impacts to nearby receivers;
- Identify activities that could cause air pollution;
- Identify activities that could cause impacts to surface water and groundwater;
- Identify activities that could cause soil erosion and generate sediment;
- Describe measures to minimise and monitor potential noise impacts;
- Describe measures to minimise air pollution impacts;
- Describe measures to minimise and monitor potential water impacts;
- Describe measures to minimise soil erosion and the potential for transport of sediment to downstream waters;
- Describe measures to provide site access to minimise impact to the community;
- Develop a program/inspection regime to ensure the noise, water and erosion and sediment controls for the project are performing in a satisfactory manner; and
- Detail the procedures associated with reporting the results of the monitoring.

3 RESPONSIBILITIES

It is the responsibility of all employees and contractors to undertake practices to manage and minimise potential environmental impacts according to this Environmental Management Plan.

The Approvals Advisor (Surface) is responsible for coordinating the implementation of this Management Plan and for the periodic review of the Plan.

The Approvals Advisor (Surface) will also be responsible for ensuring the commitments contained within this management plan are met. This will include:

- i. Overseeing the operation and maintenance of the site water management and sediment and erosion control system;
- ii. Overseeing the operation and maintenance of the noise monitoring and mitigation measures;
- iii. Overseeing the operation and maintenance of the gas flaring system to ensure no venting of gas occurs.
- iv. Being the first point of contact for landowners, neighbours and members of the community.
- v. Production and dissemination of reports and information.

The Approvals Advisor (Surface) reports to the Manager Approvals (Surface), who in turn reports to the Project Directors, who have overall responsibility for the delivery of the Projects within the geographical area falling under their responsibility.

The Manager Approvals (Surface) also has reporting functions to the Illawarra Coal Head of External Affairs.

4 LEGISLATIVE AND OTHER REQUIREMENTS

4.1 Legislative Requirements

Legislation applicable to noise, water, erosion and sediment control management includes but is not limited to:

- NSW Industrial Noise Policy and OEH Construction Noise Guidelines;
- *Protection of the Environment Operations Act 1997* (POEO Act);
- *Environmental Planning and Assessment Act 1979* (EP&A Act);
- *Soil Conservation Act 1938* (SC Act); and
- *Water Management Act 2000* (WM Act).

4.2 Environment Protection Licence Requirements

The POEO Act 1997 is the key piece of the NSW Government's legislation with respect to protection of the environment. The Office of Environment and Heritage (OEH) administers this Act. The POEO Act permits the granting of Environmental Protection Licences (EPL) to regulate industrial activity.

The mine safety gas drainage project does not require an EPL because the proposed works do not meet any of the definitions in Schedule 1 of the POEO Act. The closest scheduled activities are 'Extractive Activities' or 'Mining for Coal'. The gas drainage works are not captured by either because the extractive activities do not apply to methane gas and the drainage operations do not involve the mining, processing or handling of coal.

Appin Mine is regulated via an Environment Protection Licence No 2504. A copy of the abovementioned EPL can be accessed at the OEH website via the following link:

http://www.environment.nsw.gov.au/poeo/details.asp?licence_no=2504

4.3 Appin Gas Drainage Project Approval

Project Approval for the Appin Gas Drainage Project (08_0256) was granted by the Minister for Planning on the 2nd of October 2009 with a subsequent modification to the approval granted in December 2010. Copies of these approvals are available at www.planning.nsw.gov.au, including the conditions of the Project Approval.

This revision of the EMP has been prepared to include gas drainage activities associated with Area 7 Longwall 704 & 705, and MSGD activities at MSGD sites #1 and #2.

4.3.1 Noise

Illawarra Coal commits to construct and operate the project in accordance with the hours listed in **Table 1** below.

Table 1 Construction and operation hours of the project

Activity	Hours	Expected Duration
Construction - Site establishment of borehole and extraction plant sites, including drill assembly/setup, access and power. - Drilling of vertical boreholes and downhole - Construction of infrastructure including pump units, flares and additional surface pipeline reticulation system	Monday to Friday 7:00am to 6:00pm, Saturday 8:00am to 6:00pm and at no time on Sunday or Public Holidays	20 days / site 35 days / vertical well 60 days additional infrastructure
Construction - Under-boring the Hume Highway and Main Southern Rail Line	Monday – Sunday 7:00am to 6:00pm	14 days / bore
Construction - Drilling of MRD Borehole 1 and 2, LW705MRD A, B, C, D, E and F, - 2 horizontally steered MSGD wells	24 hours 7 days per week	90 days / well
Operation - surface water/gas pumps and flaring units at MSGD sites - Gas reticulation to existing extraction plant	24 hours 7 days per week	~ 24 months
Operation Water cartage to Appin West, West Cliff or an licensed facility	Monday to Friday 7:00am to 6:00pm, Saturday 8:00am to	~ 24 months

Activity	Hours	Expected Duration
	1:00pm and at no time on Sunday or Public Holidays	
Site Rehabilitation	Monday to Friday 7:00am to 6:00pm, Saturday 8:00am to 6:00pm and at no time on Sunday or Public Holidays	20 days / site

The construction noise criteria were determined from background noise measurements undertaken in Douglas Park in May 2010 in accordance with the NSW Industrial Noise Policy and are set out in **Table 2**.

Table 2 Construction Noise Impact Assessment Criteria

	NCA	Standard Construction Hours $L_{Aeq}(15mins)$	Outside $L_{Aeq}(15mins)$	Standard Construction Hours	Hours
			Day	Evening	Night
MSGD	Site 1	46	41	41	36
	Site 2	50	45	45	39
Goaf	4	50	45	45	40
	5	55	50	50	43
	6	50	45	45	41

Note – NCA refers to Noise Catchment Area.

Table 3 Sleep Disturbance Construction Noise Goals

	NCA	Night Background Noise Level	time Acceptable L_{A1} 1min Noise Level
		RBL	Night
MSGD	Site 1	31	46
	Site 2	34	49
Goaf	4	35	50
	5	38	53
	6	36	51

Note – RBL refers to Rating Background Level.

4.3.2 Soil and Water

Except as may be expressly provided by an OEH Environment Protection Licence, the proponent shall comply with section 120 of *the Protection of the Environment Operations Act 1997* (POEO Act 1997) during the carrying out of the project.

Illawarra Coal commits to:

- Minimising and controlling erosion and sedimentation from the project in a manner that is consistent with the requirements of Managing Urban Stormwater: Soils and Construction Manual (Landcom 2004 or its latest version).
- Minimising impacts on groundwater quality, including the potential for cross contamination by casing MSGD, MRD and vertical boreholes to a depth below regionally significant groundwater aquifers.
- Capturing all water brought to the surface via the gas drainage system and transporting this water to Appin West or West Cliff prior to its reuse or discharge via an EPA licensed discharge point. Alternatively water produced from the gas drainage system may be disposed of at a licensed facility.

4.4 BHP Billiton and Other Policies and Strategies

BHP Billiton operates in accordance with the Health, Safety, Environment and Community (HSEC) Management Standard (STA.009) which covers all operational aspects and activities of its business and the Environment Standard (STA.020) which prescribes the mandatory environmental performance requirements that support the aspiration of zero harm across BHP Billiton.

The HSEC Management System framework is consistent with internationally recognised standards. It aims to set benchmarks for the Company's diverse range of businesses to develop and implement their own HSEC Management Systems, to provide auditable criteria for these systems and to provide a basis from which to drive continuous improvement.

The Environmental Management Plan has been developed to be consistent with the principles of the HSEC Management Standard and Environment Standard.

Illawarra Coal maintains an environmental management system which is certified to the ISO14001 standard.

4.5 Reporting

The details of the construction and operation of the Appin Gas Drainage Project and the performance of its noise, water and erosion and sediment controls will be reported in the Appin Mine Annual Environmental Management Report.

Any incidents will be reported to the Department of Planning and Infrastructure. If material harm to the environment occurs, the incident will also be reported to the Office of Environment and Heritage.

5 PROJECT DESCRIPTION

This section primarily describes the proposed modification works which are the subject of the November 2011 s75W application.

The Appin Mine Safety Gas Drainage (MSGD) project consists of several vertical, steered Medium Radius Diameter (MRD) and vertical boreholes drilled from the ground surface to approximately 500m underground in order to safely remove naturally occurring gas present in the strata. A schematic of the MSGD concept is shown in Figure 6 & 7.

The boreholes will be cased and grouted to prevent the creation of any pathway between aquifers. The Area 7 goaf drainage boreholes will drain gas through connection to a surface pipeline reticulation system and goaf gas extraction plant. The extraction plant is located on the property described as Lot 2 DP576136. The goaf gas extraction plant will draw goaf gas up from each of the boreholes in series, thus reducing the concentration of methane underground and provide a safe working environment in the mine. Gas drained from the MSGD wells will be managed via onsite flaring units. At this stage in the development of the MSGD project it is not feasible to utilise the extracted gas for electricity generation due to the distance to the nearest gas reticulation infrastructure. However, in subsequent stages of mine development and operation associated with the area, Illawarra Coal is committed to exploring and implementing gas utilisation alternatives wherever practical and feasible.

The small volumes of groundwater (less than 3 ML/year) extracted by the MSGD wells will be stored in tanks onsite then transported by road for reuse in or disposal at an appropriately licensed facility. Based on current regulations and existing approvals, an 'aquifer interference approval' or 'water access licence' would not be required for these works. The Appin Gas Drainage Project does not impact on usable regionally significant aquifers located in the Hawkesbury Sandstone and any impacts at depth in the uncased section of the gas extraction wells are insignificant and a result of the effect of longwall extraction. Illawarra Coal applied for a licence under Part 5 of the *Water Act 1912* to intercept groundwater as a result of longwall mining operations at Appin Mine on 7 August 2008. As the project works are located within the *Water Sharing Plan for the greater Metropolitan Region Groundwater Sources*, existing Water Act 1912 licences are converted to water access licences and approvals under the Water Management Act 2000.

The site infrastructure will be connected to mains power in order to minimise noise and air emissions associated with the onsite generation of electricity or operate from gas fuelled silenced generators.

The civil works associated with the proposed, and previously approved project consist of the following:

-
- i. Establishment of MRD, MSGD and vertical borehole drilling compounds on Lot 1 DP576136, Lot 2 DP576136, Lot 1 DP 802151, Lot 2 DP 747563 and Lot 3 DP 553170;
 - ii. Drilling of:
 - a) Two previously approved and two new MRD and three previously approved and eight new vertical boreholes over Longwalls 704 and 705 on Lot 2 DP576136 to convey extracted goaf gas to the EDL Power Station at Appin;
 - b) one vertical borehole and one downhole on Lot 1 DP576136 to convey the extracted goaf gas to the EDL Power Station at Appin;
 - c) four MRD and three vertical boreholes over Longwalls 704 and 705 on Lot 1 DP 802151 to convey extracted goaf gas to the EDL Power Station at Appin;
 - d) two horizontally steered wells and flaring unit on Lot 2 DP 747563 to flare drained gas; and
 - e) three vertical wells and flaring unit on Lot 3 DP 553170 to flare drained gas.
 - iii. The site establishment and drilling of the MRD on Lot 7 DP250231 and four vertical boreholes over Longwall 703;
 - iv. Under boring the Hume Highway and Main Southern Rail Line between Lot 7 DP250231 and Lot 2 DP576136;
 - v. Underboring the Main Southern Rail Line between Lot 1 DP 802151 and Lot 1 DP121322 / Lot 2 DP 576136;
 - vi. Establishment of a goaf gas extraction plant compound on Lot 2 DP576136 and/or Lot 7 DP250231 (if required);
 - vii. Demolition of derelict farm sheds in proximity to the access route for MSGD Site #2 in accordance with AS 2601—2001, *The demolition of structures to address site safety*
 - viii. Establishment of access tracks as required;
 - ix. Establishment of the pipeline reticulation system to link the MRD and vertical boreholes to the extraction plant and downhole to convey the extracted goaf gas to the EDL Power Station at Appin; and
 - x. Minor trenching works to locate the pipeline reticulation system easement just below the ground surface.

Figure 5 Schematic of Goaf Gas formation during longwall mining and MRD borehole

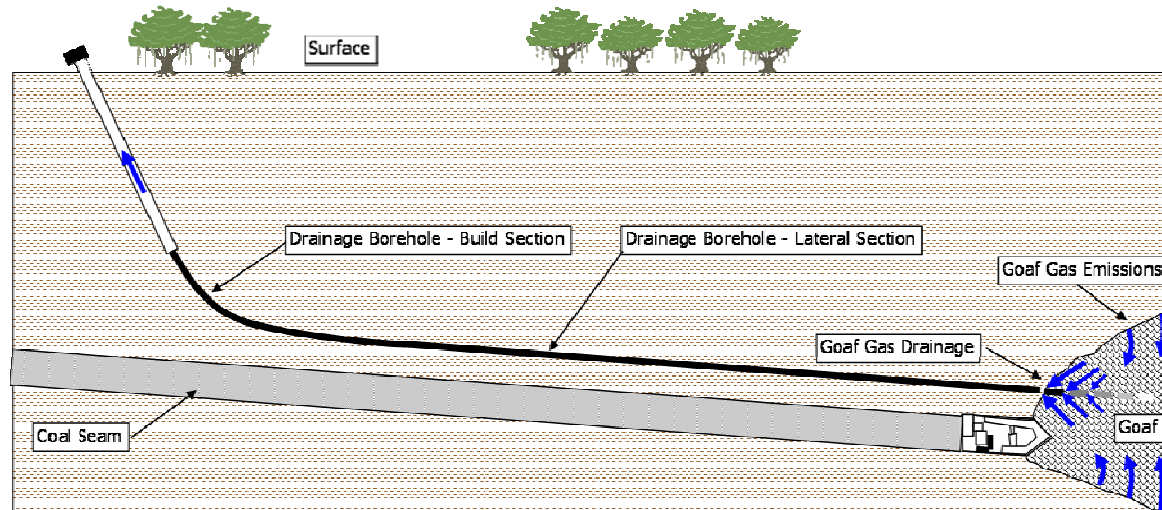


Figure 6 Schematic of MSGD Well #1

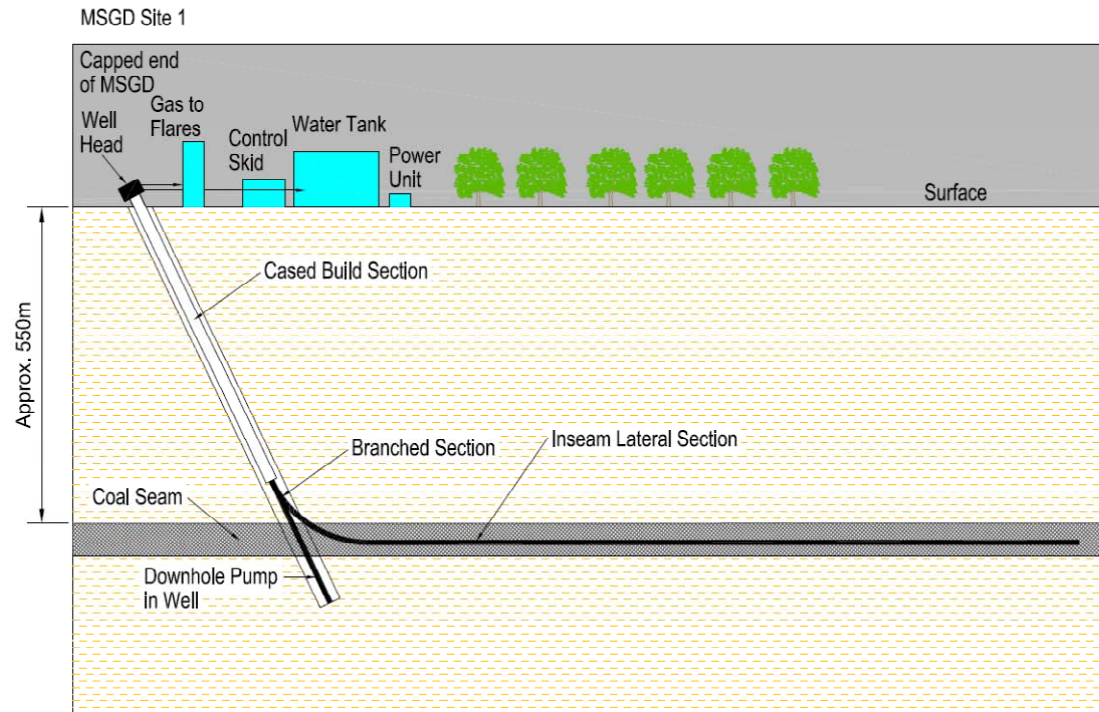
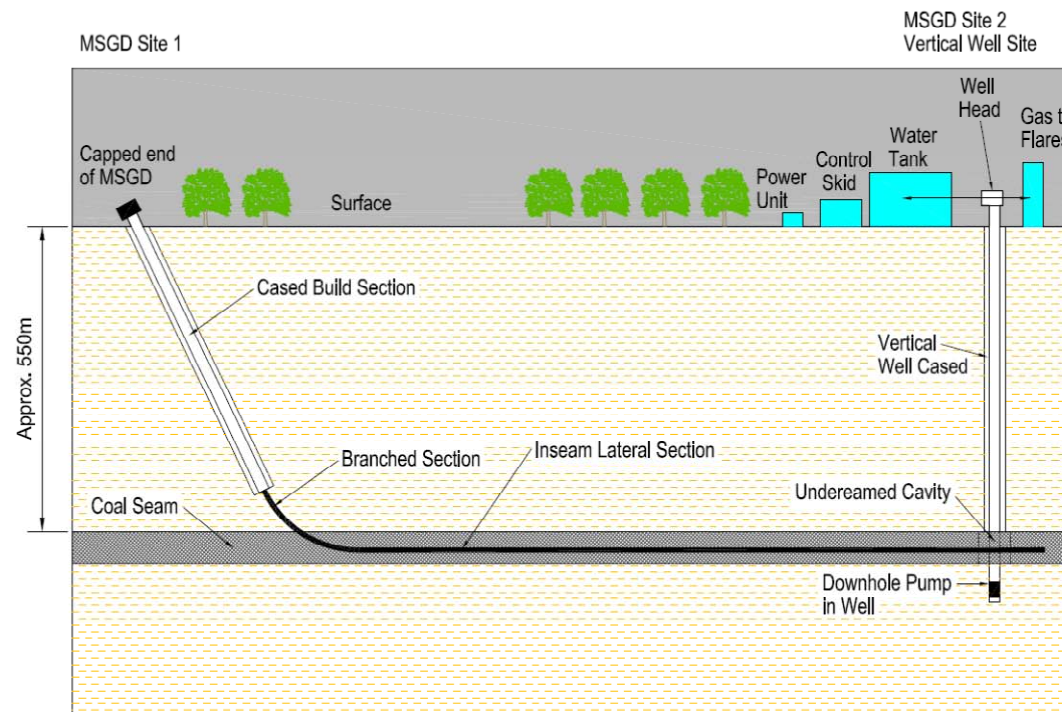


Figure 7 Schematic of MSGD Well #2

6 NOISE MANAGEMENT STRATEGIES

The Noise Management and Monitoring Program has been developed by Illawarra Coal with technical input from Cardno and Wilkinson Murray, in consultation with potentially affected landowners. A Noise Impact Assessment is provided in **Appendix C**.

6.1 Site Description

The Appin Gas Drainage Project covers several sites on privately owned properties within the Wollondilly LGA. The project sites that noise management strategies for this project pertain to are as follows:

- i. Contingency extraction plant and LW703 MRD and vertical borehole site on Lot 7 DP250231.
- ii. Preferred extraction plant and LW704 MRD and vertical borehole (either Option A or B) sites on Lot 2 DP576136 (refer **Figure 2**).
- iii. MRD Boreholes 705 MRD A,B,E and F and associated infrastructure located on Lot 1 DP 802151.
- iv. Two new vertical boreholes associated with LW705, located on Lot 1 DP 802151.
- v. Two MRD wells and flare system located at MSGD Site#1 (located on Lot 2 DP 747563).
- vi. 3 vertical wells located at MSGD Site#2 (located on Lot 3 DP 533170).

The location of preferred extraction plant, LW704 / 705 MRD and vertical boreholes (refer **Figure 2**) on Lots 1 and 2 DP 576136 can be described as undulating to hilly. The sites are generally cleared of native vegetation with some weeds including blackberry present. The project sites on these properties are bounded by the Main Southern Rail Line to the south and east and privately owned land to north and west.

The MSGD sites located on Lot 2 DP 747563 and Lot 3 DP553170 are slightly hilly and generally cleared of native vegetation. The sites are bounded by the Main Southern Rail Line to the south, Menangle Road to the north and privately owned agricultural land to the east and west.

6.2 Proposed Management Strategies

The greatest noise generating activities associated with the project are expected to be firstly the drilling of the MSGD and MRD boreholes, then secondly, the operation of the extraction plant, pumps and flares. The MSGD and MRD boreholes are steered boreholes in that they start out vertically but are steered to near horizontal below the surface. This drilling technique needs to be operated continuously 24 hrs per day, seven days per week. The gas extraction plant and flaring units will also be operated 24 hours a day, seven days per week for the duration of the gas extraction phase of the project. The MSGD and MRD wells are planned to be drilled over a period of ~13 weeks.

These activities therefore have the potential to cause noise impacts to nearby receivers and thus requires appropriate management actions to mitigate where possible and/or minimise this potential impact.

BHPBIC propose to install temporary noise barriers between 3.5m and 5m depending on the site (refer **Figure 8** and layouts in **Appendix A**) around the MRD and horizontally steered borehole drilling compounds for the duration of the drilling works. Similar temporary noise barriers will be installed for vertical well drilling, however given that operation of the vertical drilling will occur during the daytime only, noise impacts are not expected. Barriers for vertical well drilling will be located between the drilling operations and the closest receivers, with the equipment and barrier layout also arranged to minimise any opportunity for noise to flank around these mitigation measures. The success of these measures will be assessed on an ongoing basis during the drilling process and modified if required.



Figure 8 Typical Noise Mitigation Barriers

Further to this, BHPBIC propose the following additional noise management measures:

- i. Use of quietest available horizontally steered / MRD and vertical borehole drilling plant which shall be fitted with appropriate mufflers in good working order;
- ii. Orientation of the MRD drilling plant so that the quietest side faces the nearest receivers;
- iii. Ongoing consultation with potentially affected residential receivers to respond to issues of concern; and
- iv. Proactive management of potentially noisy operations at various stages of the MRD drilling process in consultation with potentially affected residential receivers.

The major noise sources associated with the gas extraction infrastructure is likely to be:

- Silenced gas generator and pumps. .
- Flares. The flares will be operated at seam gas pressure. Flares will operate at or below their rated capacity to minimise noise generation. Flares will be contained within an enclosure, and will ensure the Project Specific Noise Levels described in Table 2 can be met.

Further to this, BHPBIC propose the following additional noise management measures for the extraction plant:

- i. Use of quietest available generator and pumps which shall be fitted with appropriate mufflers in good working order;
- ii. Enclosure of any noisy equipment or use of noise mitigation walls where necessary;
- iii. Ongoing consultation with potentially affected residential receivers to respond to issues of concern.
- iv. Operation of flares to ensure that the flow of gas at or less than their rated capacity.

As stated above, consultation will occur with the most affected residents prior to the commencement of this project, as well as during the construction and operation phases. Methods of communication used by BHPB IC include letters, information leaflets, door knocks, information sessions and community consultative group. In addition BHPB IC operates a 24 hour community call line, which is available to log any queries or concerns. Feedback received through these means will be investigated and, where practicable to do so, actions put in place to minimising any potential impacts.

6.3 Maintenance/Monitoring of Noise Management Measures

The noise mitigation barriers will be inspected on a weekly basis to check that they are operating satisfactorily and to perform any maintenance work and repairs that may be required.

Attended noise monitoring will be undertaken at the commencement of horizontally steered hole and MRD drilling to determine compliance with Noise Limits specified in Table 2.

Any issues from ongoing consultation with affected residents will be assessed and responded to as soon as practical.

7 WATER MANAGEMENT STRATEGIES

7.1 Site Description

The project infrastructure is located on rural land consisting of undulating to hilly topography, which has been previously cleared to support agriculture. Grass is the dominant vegetation within the paddocks but there are also a variety of weeds and exotic plant species. All sites are on rural residential land that is currently used for grazing. All sites have previously been extensively cleared of native vegetation.

7.2 Proposed Management Strategies

For the drilling of each vertical borehole a single pond lined with an impermeable liner will be excavated within each drilling compound to act as a drilling sump. The approximate dimensions of the pond are 15 m length * 5 m width * 3 m depth and the approximate volume of water used throughout the drilling process is 10,000L per vertical borehole over the drilling period.

For the drilling of each horizontally steered borehole, two ponds of similar dimensions (as defined above) will be excavated within each drilling compound to act as a drilling sump and each lined with an impermeable liner. The approximate volume of water used throughout the horizontally steered drilling process is 20,000L per borehole over the drilling period. Alternatively, above ground water storage tanks will be used.

The operation of the extraction plant requires water cooling and a small water tank will be located within the extraction plant compound/s. Potable water supplied by a Sydney Water Authorised user will be brought onsite and used for this cooling process. Alternatively, water pumped from the Nepean River via a licensed pump will be used. Approximate cooling water volumes would be less than 2,000L and this will be pumped through a continuous recirculation system between the extraction plant and water tank.

For the under boring of the Hume Highway and Main Southern Rail Line, a single pond lined with an impermeable liner will be excavated within each drilling compound to act as a drilling sump. The approximate dimensions of the pond are 15m length x 5m width x 3m depth and the approximate volume of water used throughout the drilling process is 10,000L per underbore over a drilling period of approximately two weeks.

For the drilling of each MRD borehole, two ponds of similar dimensions as for the vertical boreholes will be excavated within each drilling compound to act as a drilling sump and each lined with an impermeable liner, or, alternatively, above ground water storage tanks will be

used. The approximate volume of water used throughout the MRD drilling process is therefore 20,000L per MRD borehole. Alternatively, above ground water storage tanks will be used.

Without mitigation, these works have the potential to impact both surface and groundwater at the abovementioned sites and thus require the implementation of management measures to mitigate or minimise these impacts. BHPBIC propose the following management strategies in relation to water management:

- i. Water used for drilling and extraction plant operations will be from a Sydney Water Authorised user and will be potable in quality, or will be pumped from the Nepean River in accordance with a Water Access Licence;
- ii. All excavated ponds will contain an appropriate impermeable liner to prevent water loss. The walls of ponds will be of an appropriate height to provide adequate freeboard to prevent inflow or overflow during rainfall. Alternatively, above ground temporary water storages will be used.
- iii. The vertical boreholes will be cased with steel and grouted in place from the ground surface of the well to the top of the Bulgo Sandstone section of the strata above the coal seam (refer **Figure 9**) to prevent any cross contamination of groundwater;
- iv. The MRD boreholes will be cased with welded or threaded steel and grouted in place from the ground surface of the borehole to the end of the radial or build section where the horizontal alignment and branching to the laterals of the borehole starts, an approximate depth of 450m underground (refer **Figure 9**) to prevent any cross contamination of groundwater;
- v. The horizontally steered boreholes will be cased with welded or threaded steel and grouted in place from the ground surface of the borehole to the end of the radial or build section where the branching to the laterals start, an approximate depth of 500m underground to prevent any cross contamination of groundwater; and
- vi. The water used in the borehole drilling will be removed and reused at Appin West of West Cliff Mine, or disposed of at a licensed facility.
- vii. Groundwater extracted by the MSGD wells will be collected in tanks and transported offsite on an as needs basis. At a maximum, daily collections for each tank may be required. Tanker movement to the site will be during daylight hours only. All water removed from the site will be reused at Appin West or West Cliff Mine, or disposed of at a licensed facility.

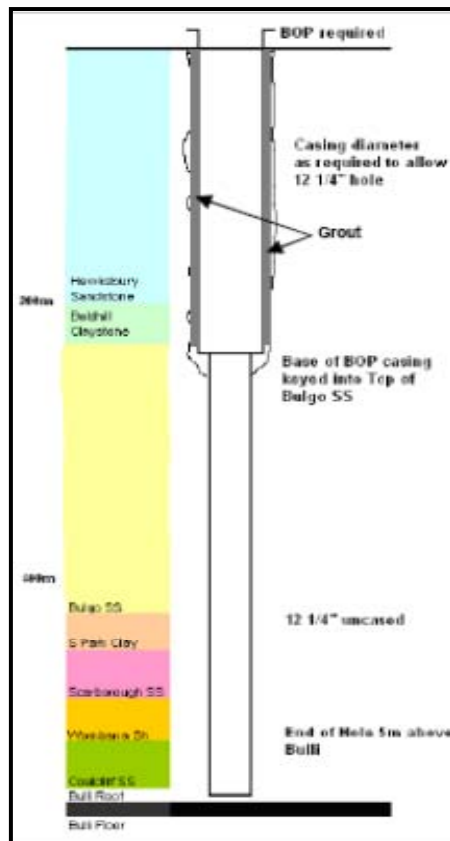


Figure 9 Example of Grout in Vertical Borehole

7.3 Maintenance/Monitoring of Water Management Structures

The drilling water sumps will be inspected on a weekly basis as well as after every significant storm and rainfall event (i.e. >10mm in a 24hour period) to ensure the integrity of the impermeable liner and that the sumps continue to operate satisfactorily. Any maintenance work and repairs required will be promptly undertaken. Regular maintenance will include:

- Repairs of areas which may become unstable following periods of high rainfall; and
- Checks on sump wall and liner integrity to ensure no leakage of water.

8 EROSION AND SEDIMENT MANAGEMENT STRATEGIES

All the sites are within the Nepean River catchment. All the sites are on cleared agricultural land.

8.1 Site Description

The civil works described in **Section 5** have the potential to generate sediment laden runoff and erosion, thus management measures are proposed to be implemented to minimize these impacts.

Soil and Water Management Plan drawings have been prepared for the project outlining specific soil and water management measures and these are attached to this document as **Appendix B**.

Erosion and sedimentation control measures will be implemented in accordance with the above mentioned Soil and Water Management Plans and the requirements of the "Blue Book" (Soils and Construction, Volume 1, 4th edition March 2004, Landcom). The following types of management strategies are proposed:

- i. Weekly inspection of site drainage and erosion/sediment controls and implementation of maintenance as needed;
- ii. Identification of drainage channels and effective management of surface water during construction and operational phases of work (refer **Appendix B**);
- iii. Disturbed areas will be spray grassed and stabilised to minimise erosion and scour;
- iv. Reducing the amount and velocity of any water flows over the construction site;
- v. Installing sediment filters or fences downslope of disturbed areas (refer **Appendix B**);
- vi. Installing clean water diversion drains (refer **Appendix B**);
- vii. Minimising the length and duration of exposed excavations during pipe line laying operations. Where trenches and soil stockpiles are exposed for more than one week then silt fences will be deployed immediately adjacent to the disturbed areas on the downslope side. Soil stockpiles will be placed on the uphill side of any excavated trench so that any sediment flows into the trench during runoff;
- viii. Maintain pasture adjacent to any disturbed areas and direct runoff to flow through pasture prior to any flow to waterways.



Figure 10 Erosion and Scour Control Structure



Figure 11 Sedimentation Control Structure

Drilling compounds will be leveled to accommodate safe drilling operations. Small cut/fill operations of generally less than 1,000 m³ may occur. Crushed sandstone or gravel will be used to create non-erodible surface working areas within the drill and infrastructure plant compounds. In general, access roads will be constructed using crushed sandstone or gravel, and some temporary sealing of access tracks may be undertaken. All sediment control structures will have sufficient capacity to trap sediment mobilized from cleared areas and sump overflows during 'normal' rainfall events. Any overflow from sediment control structures will be directed to grassed paddocks to minimize sediment export to any waterways. Any fuel or chemicals stored on site will be located within fully bunded storage areas.

Pasture will be re-established on disturbed areas such as buried pipelines and drilling compounds (where it is reasonable and practical to do so) after construction is complete to minimise potential for sediment runoff.

At the end of effective gas extraction, the extraction plant compounds, well heads and pipelines will be decommissioned, removed and rehabilitated. Compound areas will be reshaped back to the original ground contour unless otherwise requested by the landowner. The boreholes will be rehabilitated in accordance with Department of Industry and Investment requirements. The extraction plant and drilling compounds as well as the pipeline route will be rehabilitated back to pasture

8.2 Maintenance/Monitoring of Sediment and Erosion Control Structures

The erosion and sediment control structures (i.e. drainage lines and silt fencing) associated with the construction of the project will be inspected on a weekly basis, as well as after every significant storm and rainfall event (i.e. >10mm in a 24hour period) to check that they are operating satisfactorily and to perform any maintenance work and repairs that may be required. Regular maintenance will include:

- Sediment removal from sediment traps;
- Repairs of areas, which become unstable following periods of high flow; and
- Checks on bund integrity and diesel fuel/chemical storage to ensure compliance with the appropriate standards.

9 OTHER MANAGEMENT ISSUES

9.1 Native Vegetation

No native vegetation clearing is required for the construction of the drilling compound pads, infrastructure and temporary access roads, with the exception of some minor works for the entrance to the MSGD Site#1. A specialist ecological study undertaken by Niche concluded that the proposed works are not likely to have a significant impact on any threatened species, population or ecological community. As such, no Vegetation Management Protocol is necessary. Any vegetation that is removed will be retained on site and used, where possible, in disturbed area rehabilitation.

9.2 Cultural Heritage

No known items of Aboriginal or Non-Aboriginal Cultural Heritage are present on any of the sites. Historical agricultural practice at the sites has resulted in extensive disturbance. Biosis Research archaeologists inspected a portion of the sites on 7 September 2010, while Niche inspected the remainder of the sites on 31 August 2011 to confirm that no Aboriginal cultural heritage items are present. No Archaeological and Non-Aboriginal heritage constraints were identified. However, basic management recommendations described below will be implemented.

If, during the construction or operation of any aspect of the Project, Aboriginal objects are discovered, all work will cease immediately. A suitably qualified archaeologist will be employed to advise on the appropriate management measures that can be employed. It is BHPBIC's preference to avoid disturbance to Aboriginal cultural heritage items where it is possible to do so.

Any Aboriginal sites within 150 m of any disturbance will be temporally fenced to ensure that no interaction with the site occurs. All nearby Aboriginal cultural sites will be identified on site maps.

9.3 Air emissions

Minor air quality impacts may occur through dust generation during drilling. Gas extracted from the goaf wells from LW703-LW705 would be piped back to the existing surface pipeline reticulation system for electricity generation, while gas from the MSGD wells would be flared.

A fail safe system to shut of the well and flow of gas to the flares will be installed to avoid the venting of gas should the flare turn off. All gas will be oxidised in the flares thereby avoiding

odour impacts associated with venting gas. The product of the combusted methane is carbon dioxide and water. The gas flow and site infrastructure operations will be controlled via the pump control unit PLC which is in communication with the control room via 3G modem.

For this Project, utilisation of all gas is not possible given the considerable overland distance from the gas extraction point at MSGD Site#1 and MSGD Site#2 to any gas distribution system. However, BHPBIC will capture and utilize captured gas where it is practical and reasonable to do so.

Any dust generated during construction activities will be managed by the application of a water from a water cart.

9.4 Traffic

Traffic for MSGD Site#1 will enter the site from Menangle Road. Site lines on Menangle Road are sufficient for this activity to be undertaken without traffic control. Where it is possible to do so, traffic movements will be scheduled outside the morning and afternoon peak times. Approximately 250m of access track will be constructed from Menangle Road to the MSGD Site 1 drilling compound. In consultation with Wollondilly Shire Council a new driveway access from Menangle Road will be constructed.

Traffic for MSGD Site#2 will enter the site from Menangle Road. Site lines on Menangle Road are sufficient for this activity to be undertaken without traffic control. Where it is possible to do so, traffic movements will be scheduled outside the morning and afternoon peak times. Approximately 700m of access track will be constructed from Menangle Road to the MSGD Site 2 drilling compound. In consultation with Wollondilly Shire Council a new driveway access from Menangle Road will be constructed.

Traffic accessing the LW704 project sites will use access routes defined for the approved project. This includes access via the approved Vent Shaft 6 Access Road from Menangle Road, with proposed access to 704v4 being in part through the Main Southern Rail Line Corridor.

Traffic accessing the LW705 project sites will use access routes defined for the approved project including access via the approved Vent Shaft 6 Access Road from Menangle Road to LW705v3-v5 and MRD – C and D. Approximately 3km of the existing access track will be upgraded on property (Lot 1 DP802151) from Moreton Park Road to take heavy vehicles for construction at the MRD 705 MRD A,B,E and F, and 705 V1-2 project sites.

10 REFERENCES

Cardno (2009) *Environmental Assessment Appin Colliery Area 7 – Goaf Gas Drainage Project*. Prepared by Cardno Forbes Rigby for BHP Billiton Illawarra Coal Pty Ltd., June 2009.

Department of Planning (2009) *Project Approval – Appin Area 7 Longwalls 703 to 704 Goaf Gas Drainage Project*.

Landcom (2004) *Soils and Construction – Managing Urban Stormwater (Volume 1)*, 4th Edition.

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