



## NARRABRI NORTH MINE

Document Owner:	Env. Manager
Revision Period:	2 years
Issue:	1
Last Revision Date:	3/06/2010
Date Printed:	3/06/2010

# WHC\_PLN\_NAR\_SITE WATER MANAGEMENT PLAN

# SITE WATER MANAGEMENT PLAN

Approval	Name	Position	Signed	Date
Document Originator:	Jill Scealy	Environmental Officer		
Document Owner:	Danny Young	Group Environmental Manager		
Authorised by:	Shane Pegg	Technical Services Manager - Narrabri		



## NARRABRI NORTH MINE

Document Owner:	Env. Manager
Revision Period:	2 years
Issue:	1
Last Revision Date:	3/06/2010
Date Printed:	3/06/2010

# WHC\_PLN\_NAR\_SITE WATER MANAGEMENT PLAN

*This page has been intentionally left blank*



# NARRABRI NORTH MINE

Document Owner:	Env. Manager
Revision Period:	2 years
Issue:	1
Last Revision Date:	3/06/2010
Date Printed:	3/06/2010

## WHC\_PLN\_NAR\_SITE WATER MANAGEMENT PLAN

### Contents

1	INTRODUCTION .....	7
1.1	Background .....	7
1.2	Management Plan Requirements .....	7
1.3	Water Management Objectives .....	8
2	MINESITE WATER MANAGEMENT STRATEGY .....	8
2.1	Pit Top Area Surface Water Management Strategy .....	10
2.1.1	General.....	10
2.1.2	Contaminated Water Management Strategy .....	10
2.1.3	Dirty Water Management Strategy .....	11
2.1.4	Saline Groundwater Management Strategy .....	11
2.1.5	Saline Groundwater Contingency Plan.....	11
3	SURFACE WATER MANAGEMENT CONTROLS .....	12
3.1	Pit Top Surface Water Management Infrastructure .....	12
3.2	Rail Loop Water Storages .....	12
3.2.1	Configuration .....	12
3.2.2	Operating Procedures Prior to the Water Conditioning Plant Coming Online .....	12
3.2.3	Operating Procedures with the Water Conditioning Plant Online.....	13
3.3	Contaminated Catchment.....	14
3.3.1	Contaminated Catchment Sediment Basins.....	14
3.3.2	Surface Facilities Area.....	14
3.4	Storage Dams.....	15
4	EROSION AND SEDIMENT CONTROL .....	16
4.1	Overview.....	16
4.2	Sources of Erosion and Sedimentation .....	17
4.3	Mitigation of Erosion and Sedimentation .....	18
4.4	Diversion Drains .....	19
5	SITE WATER BALANCE .....	19
5.1	Onsite Water Demand .....	19
5.2	Sources and Security of Water Supply .....	20
5.2.1	General.....	20
5.2.2	Available Water Allocations .....	20
5.2.3	Pumped Out Mine Water .....	21
5.2.4	Mine Site Runoff/Direct Rainfall.....	21
5.2.5	Underground Recycle.....	22
5.3	Off Site Transfers .....	22
5.4	Reporting Procedures.....	22



# NARRABRI NORTH MINE

Document Owner:	Env. Manager
Revision Period:	2 years
Issue:	1
Last Revision Date:	3/06/2010
Date Printed:	3/06/2010

## WHC\_PLN\_NAR\_SITE WATER MANAGEMENT PLAN

6	SURFACE WATER MONITORING PLAN.....	23
6.1	General.....	23
6.2	Monitoring Locations .....	23
6.3	Water Quality Monitoring Schedule .....	24
6.4	Surface Water Impact Assessment Criteria.....	26
6.5	Reporting Procedures.....	28
7	GROUNDWATER MONITORING PROGRAM.....	28
7.1	General.....	28
7.2	Monitoring Locations .....	28
7.3	Baseline Data .....	35
7.3.1	Groundwater Levels .....	35
7.3.2	Groundwater Quality.....	35
7.4	Monitoring Schedule.....	36
7.5	Groundwater Impact Assessment Criteria.....	38
7.5.1	Mine Inflow Rates .....	38
7.5.2	Impacts to Licenced Users .....	39
7.5.3	Mine Inflow Water Quality.....	39
7.6	Reporting Procedures.....	39
7.7	Further Development of the Groundwater Model .....	40
8	SURFACE AND GROUNDWATER RESPONSE PLAN.....	40
8.1	Surface Water.....	40
8.2	Groundwater.....	41
8.2.1	Contingency Measures.....	41
8.2.2	Trigger Action Response Plan (TARP).....	41
8.2.3	Response Action .....	42
8.3	Management Plan Review.....	42
8.4	Unforeseen Impacts Protocol .....	46
9	REFERENCES .....	47



## NARRABRI NORTH MINE

Document Owner:	Env. Manager
Revision Period:	2 years
Issue:	1
Last Revision Date:	3/06/2010
Date Printed:	3/06/2010

# WHC\_PLN\_NAR\_SITE WATER MANAGEMENT PLAN

## Tables

Table 3.1	Evaporation Pond Specifications.....	13
Table 3.2	Sediment Basin Specifications .....	14
Table 3.3	Storage Dam Specifications .....	16
Table 5.1	Annual Mine Site Water Requirements .....	19
Table 5.2	Narrabri Coal Mine Water Allocation Licences.....	20
Table 5.3	Predicted Groundwater Inflows .....	21
Table 6.1	Water Quality Monitoring Schedule.....	26
Table 6.2	Surface Water Assessment Criteria .....	27
Table 7.1	Groundwater Monitoring Network.....	30
Table 7.2	Summary of Groundwater Salinity Data .....	36
Table 7.3	Groundwater Monitoring Schedule.....	38
Table 8.1	Trigger Action Response Plan (TARP).....	44
Table 8.2	Unforeseen Impact Procedure.....	46

## Figures

Figure 2.1	Pit Top Area Water Management Infrastructure.....	9
Figure 4.1	Narrabri Coal Mine Pit Top Area, June 2009.....	18
Figure 6.1	Surface Water and Meteorological Monitoring Locations .....	25
Figure 7.1	Groundwater Monitoring Network.....	33
Figure 7.2	Groundwater Monitoring Network (Pit Top Area) .....	34



## NARRABRI NORTH MINE

Document Owner:	Env. Manager
Revision Period:	2 years
Issue:	1
Last Revision Date:	3/06/2010
Date Printed:	3/06/2010

# WHC\_PLN\_NAR\_SITE WATER MANAGEMENT PLAN

*This page has been intentionally left blank*



## NARRABRI NORTH MINE

Document Owner:	Env. Manager
Revision Period:	2 years
Issue:	1
Last Revision Date:	3/06/2010
Date Printed:	3/06/2010

# WHC\_PLN\_NAR\_SITE WATER MANAGEMENT PLAN

## 1 INTRODUCTION

### 1.1 Background

The Narrabri Coal Mine Site is located about 30km southeast of Narrabri and approximately 10km northwest of Baan Baa in north-western New South Wales. Narrabri Coal Pty Ltd (the Company) was granted development consent (PA 05\_0102) in 2007 in accordance with the supporting document Narrabri Coal Project Environmental Assessment (2007). Narrabri Coal has approval to mine up to 2.5 million tonnes of ROM coal per year from the site using continuous miners.

### 1.2 Management Plan Requirements

Condition 3(7) of PA 05\_0102 required the preparation and implementation of a Water Management Plan prior to the commencement of activities. A Construction Phase Water Management Plan (CPWMP) was prepared by Coffey Geotechnics (2008) as the suitably qualified experts approved by the Director-General. The CPWMP, approved by the Director-General on the 20<sup>th</sup> February 2008, outlines and explains the strategies for managing water on site during the construction phase, which covers the period up to the time immediately prior to commencement of underground mining.

A revision of the Plan has been undertaken for the operational phase of the mine and incorporates the following requirements from PA 05\_0102:

- Site Water Balance;
- Erosion and Sediment Control Plan;
- Surface Water Monitoring Plan;
- Groundwater Monitoring Program; and
- Surface and Groundwater Response Plan, setting out the procedures for:
  - Investigating, and if necessary mitigating, any exceedances of the surface or groundwater assessment criteria (see below); and
  - Responding to any unforeseen impacts of the project.

The revised Water Management Plan (WMP), as prepared by WRM Water and Environment Pty Ltd (with assistance from Aquaterra for the groundwater components), has been approved by the Director-General. Any future refinements to water management or monitoring requirements will result in subsequent revisions of the WMP which will be submitted to the Director-General for endorsement.

The WMP is based on the approved Stage 1 operations, which includes the Statement of Commitments (referred to as 'SoC' throughout this Plan) and the recently approved Section 75W Modification Environmental Assessment. The modification incorporates a number of activities associated with the Stage 2



## NARRABRI NORTH MINE

Document Owner: Env. Manager

Revision Period: 2 years

Issue: 1

Last Revision Date: 3/06/2010

Date Printed: 3/06/2010

# WHC\_PLN\_NAR\_SITE WATER MANAGEMENT PLAN

Environmental Assessment for longwall mining (approval pending), including the extension of SB1 and addition of SB2, as discussed throughout this WMP.

Any further changes to the WMP will be incorporated in a further revision.

### 1.3 Water Management Objectives

The objectives of the Surface Water Management Plan are as follows:

- To ensure sufficient quantities of water can be obtained to meet the requirements for dust suppression across the site;
- To ensure segregation of “contaminated” and “dirty” water from “clean” water with “contaminated” water directed to sediment basins and “dirty” water directed to storage dams (“clean” water, comprising clarified water from storage dams and run-on water collected in accordance with the Company’s harvestable right may be directed to and/or collected in Pond D);
- To maximise the use of “contaminated” and “dirty” water for dust suppression purposes;
- To minimise the volume of water discharged from the mine site, and ensure in the event of discharge that there has been sufficient settlement time such that suspended sediment levels meet concentration limits specified in the Environment Protection Licence (EPL) as issued by DECCW;
- To minimise erosion and sedimentation from all construction/operational activities;
- To eliminate or minimise the risk of off-site discharge of saline water;
- To monitor the effectiveness of surface water controls and ensure all relevant surface water quality criteria are met;
- To minimise cumulative impacts on water sources and dependent ecosystems; and
- To minimise impacts on the availability of surface water to surrounding residents and landholders.

## 2 MINESITE WATER MANAGEMENT STRATEGY

For the purposes of surface water management, the surface water generated at the Narrabri Coal Mine is divided into four types based on water quality, as detailed below:

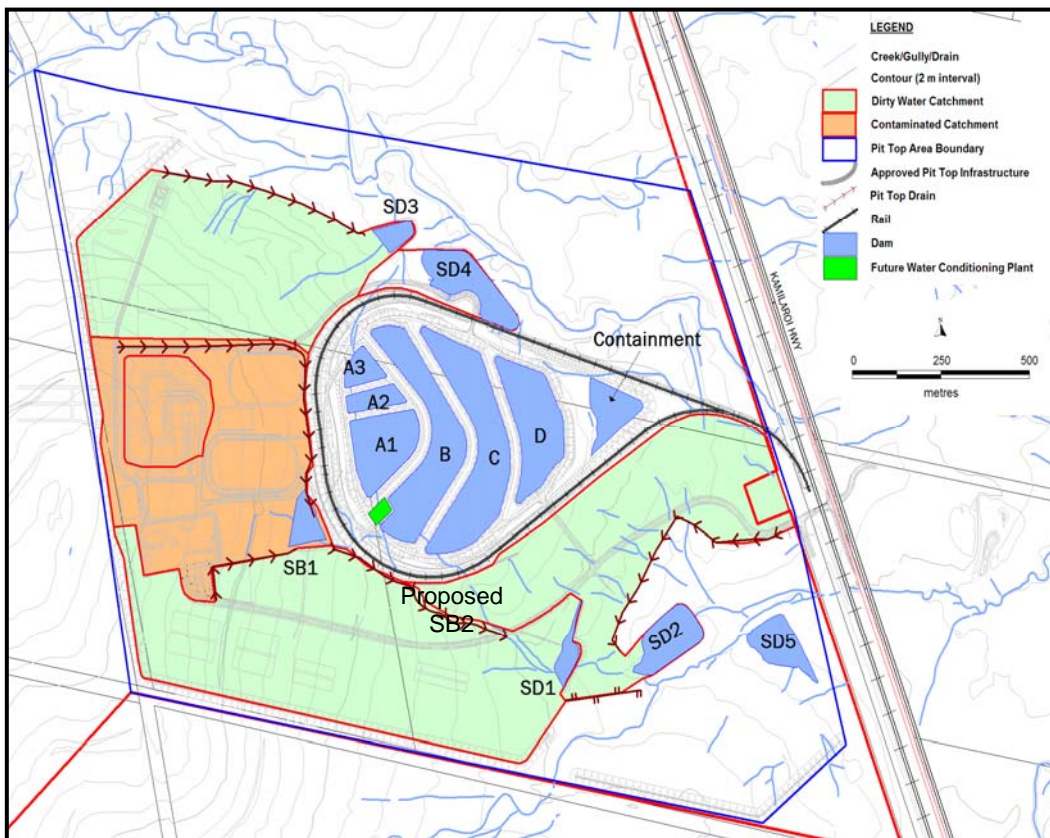
- **‘Clean’** – surface runoff from the Mine Site areas where water quality is unaffected by mining operations. Clean water includes runoff from undisturbed areas and any fully rehabilitated areas;
- **‘Dirty’** – surface runoff water from the Mine Site areas that are disturbed by mining operations. This runoff may contain silt and sediment, but does not

**WHC\_PLN\_NAR\_SITE WATER MANAGEMENT PLAN**

contain contaminated material. However, this runoff must be of sufficient quality prior to discharge into natural water courses, if required;

- **‘Contaminated’** – surface water from areas affected by mining operations and potentially containing chemicals of various types used in the mining operations. There are restrictions on the use and release of this water. Contaminated water areas include sumps, stockpile areas, service ponds and fuel storage areas. Rainfall and resulting runoff from these areas are also potentially contaminated and therefore must be managed to avoid discharge of potentially contaminated water into the natural water courses; and
- **‘Saline’** – water pumped from the underground workings containing concentrations of total dissolved solids (TDS) above that considered fresh water by ANZECC & ARMCANZ (2000) criteria.

The locations of the potentially dirty and contaminated catchments on the Pit Top Area are shown in **Figure 2.1**.



**Figure 2.1 Pit Top Area Water Management Infrastructure**

**WHC\_PLN\_NAR\_SITE WATER MANAGEMENT PLAN****2.1 Pit Top Area Surface Water Management Strategy****2.1.1 General**

The main principles of the Pit Top Area Surface Water Management Strategy are to separate the “clean”, “dirty”, “contaminated” and “saline” water generated on the Mine Site and to provide targeted strategies to minimise the impact of each water quality type. A description of the strategies for each water type is given below.

**2.1.2 Contaminated Water Management Strategy**

The main area of disturbance on the Pit Top Area that may generate contaminated runoff is the stockpiling, crushing and sizing area and the surface facilities area (See **Figure 2.1**), which is confined to a 32.5 ha site containing the:

- Conveyor and transport drift portals;
- ROM and product stockpiles;
- Coal processing plant;
- Rail load-out bin;
- Sub-station; and
- Surface facilities area.

Runoff from potentially contaminated catchments would be collected in sediment basin SB1. As part of the recently approved Section 75W modification to Stage 1 operations, SB1 will be increased in capacity (to 20ML) and a new sediment basin (SB2) will be constructed immediately downstream of SB1 to provide sufficient storage capacity (30ML) to prevent discharge of potentially contaminated water from site. Water collected in SB1 and SB2 will be pumped to the evaporation ponds for use on site or evaporated.

The modelling for surface water management conducted for the Stage 2 EA (approval pending), and therefore the approved Section 75W modification to Stage 1 (including expansion of SB1 and addition of SB2) predicts that no discharges will occur from SB1 and SB2 (except for the overflow of SB1 into SB2). Routine inspections of the sediment basins, as well as appropriate maintenance of pumps, will assist with ensuring adequate capacity is maintained in SB1 and SB2

Despite this, Narrabri Coal has designed the water management system so that, in the unlikely case of a severe runoff event that has not been modelled, any waters that cannot be contained in SB2 will be directed via storage dams SD1, SD2 and SD5 prior to discharge from site. It is expected that overflow water from SB2 will have a negligible impact on site discharge waters following dilution with clean water runoff contained within SD1, SD2 and SD5.

Any discharges that occur from SB2 will be sampled for water quality analysis and an estimate of the volume of water discharged will be recorded.



## NARRABRI NORTH MINE

Document Owner:	Env. Manager
Revision Period:	2 years
Issue:	1
Last Revision Date:	3/06/2010
Date Printed:	3/06/2010

# WHC\_PLN\_NAR\_SITE WATER MANAGEMENT PLAN

### 2.1.3 Dirty Water Management Strategy

**Figure 2.1** shows the locations of the catchments containing potentially dirty water runoff on the Pit Top Area. Much of the disturbed areas have now been revegetated and minimum disturbance of these areas are expected during the operational phase of the Narrabri Coal Mine. However, elevated sediment loads may occur until the revegetation becomes fully established. Details of the dirty water management strategy are given in **Section 4**.

### 2.1.4 Saline Groundwater Management Strategy

A series of evaporation ponds have been constructed within the rail loop as a depository for pumped out mine water from the underground operations and potentially contaminated runoff from the stockpiling and crushing/sizing area. During the early years of operations, when the groundwater inflows are expected to be low, the pumped out mine water would be used on site for dust suppression or will be evaporated.

As the volume of pumped out mine water increases, a reverse osmosis water conditioning plant will be commissioned to remove excess salts from the pumped out mine water so it can be used for dust suppression in the underground operations or potentially for off-site use. The trigger for construction of the plant is specified in the Stage 1 EA and SoC 6.14 as 880m<sup>3</sup>/day of pumped out mine water. The concentrated brine by-product of the water conditioning plant would be evaporated in storage dams on site without releasing it to the environment. Salt accumulation predictions and management will be based on the Stage 1 EA and SoC 6.6 and 6.7.

### 2.1.5 Saline Groundwater Contingency Plan

Narrabri Coal will monitor the volume of pumped out mine water over time and assess on a regular basis when, or if, the pumped out mine water would exceed the capacity of the evaporation dams. Options to manage the excess water should this occur are currently being investigated by Narrabri Coal. These options include:

- Increasing the area of the evaporation basins;
- Treating the water to a quality sufficient to release it to the Namoi River (it is understood that salinity offsets would be required so that there is no net increase in salt loads in the Namoi River); and
- Transferring the treated water to a third party for agricultural use.

The most appropriate option will be determined when better estimates of the volume of pumped out mine water are known. Any offsite use will be subject to a detailed site specific investigation to assess the long term sustainability of reusing the water at that particular site.

**WHC\_PLN\_NAR\_SITE WATER MANAGEMENT PLAN****3 SURFACE WATER MANAGEMENT CONTROLS****3.1 Pit Top Surface Water Management Infrastructure**

**Figure 2.1** shows the locations of the existing water management infrastructure on the Pit Top Area. The water management structures are referred to in Design Report, Evaporation and Storage Dams, Narrabri Coal Pit Top Infrastructure (URS, 2007). The general features of the surface water management infrastructure for the Pit Top Area are as follows:

- A series of water storages (Dam A1, A2, A3, B, C and D) within the rail loop to collect, store and dispose of pumped out mine water and dirty runoff from the Pit Top Area;
- A sediment basin (SB1) to collect dirty and contaminated runoff from the stockpiling and coal processing area;
- An additional sediment basin (SB2) immediately downstream of SB1 to collect any overflow from SB1;
- A sump in the box cut to collect runoff draining into the box cut and to temporarily store groundwater pumped from underground;
- A series of storage dams (SD1, SD2, SD3, SD4 and SD5) to collect and treat runoff from the periphery of the Pit Top Area that has been disturbed during the construction phase;
- A containment bund to collect runoff from within the rail loop; and
- A series of drains to collect runoff from the Pit Top Area and divert it to the various Pit Top Area water storages.

**3.2 Rail Loop Water Storages****3.2.1 Configuration**

**Figure 2.1** shows the locations of the existing rail loop water storages. These were constructed within the rail loop as a depository for pumped out mine water from the underground operations and potentially dirty runoff from the Pit Top Area. The storage volumes and surface areas of the evaporation ponds at full supply level are given in **Table 3.1**.

**3.2.2 Operating Procedures Prior to the Water Conditioning Plant Coming Online**

The operating procedures for the rail loop water storages prior to the water conditioning plant coming on line are summarised below.

- Pond A1, A2 and A3 would receive all saline groundwater pumped from the underground workings and all potentially contaminated runoff from SB1 and



## NARRABRI NORTH MINE

Document Owner:	Env. Manager
Revision Period:	2 years
Issue:	1
Last Revision Date:	3/06/2010
Date Printed:	3/06/2010

### WHC\_PLN\_NAR\_SITE WATER MANAGEMENT PLAN

SB2. These ponds are lined with HDPE with a maximum permeability of  $1 \times 10^{-14}$  m/sec;

- Sufficient freeboard will be maintained within the evaporation ponds to cater for a 1 in 100 year ARI event (SoC 6.9);
- Pumping of groundwater to the evaporation pond system will cease when the approved freeboard is reached (SoC 6.10); and
- Water in these ponds would be used for on-site dust suppression or would evaporate.

**Table 3.1 Evaporation Pond Specifications**

Pond	Surface Area @ Spillway (ha)	Storage Volume (ML)	Spill Location
A1	3.17	129.8	B2
A2	0.98	30.6	B2
A3	0.93	30.8	A2
B	5.85	209.1	C
C	6.63	218.3	D
D	4.15	128.4	Containment
Containment	4.01	46.0	Nil
<b>TOTAL</b>	<b>25.72</b>	<b>793.0</b>	-

#### 3.2.3 Operating Procedures with the Water Conditioning Plant Online

The operating procedures for the rail loop water storages when the water conditioning plant is on line are summarised below.

- Pond A1 would receive all pumped out mine water from the underground workings and would be the primary feed to the water conditioning plant when it comes on line;
- Pond B will be divided into a smaller pond B1 and larger pond B2. B1 would be the primary storage structure for treated water from the water conditioning plant when completed. Water in Pond B1 would be used underground for motor cooling and dust suppression. Saline water may also be mixed with water in Pond A1 or from Pond D for use in surface coal handling and site dust suppression;
- The HDPE lined Ponds A2 and A3 would be drained to receive the concentrated brine product from the water conditioning plant;
- The clay lined Pond C and Pond D are to be the primary storage ponds for clean or potentially dirty water harvested from the storage dams on the Pit Top Area. The maximum permeability of the clay liner is  $1 \times 10^{-9}$  m/day.



## NARRABRI NORTH MINE

Document Owner: Env. Manager

Revision Period: 2 years

Issue: 1

Last Revision Date: 3/06/2010

Date Printed: 3/06/2010

### WHC\_PLN\_NAR\_SITE WATER MANAGEMENT PLAN

These ponds would also store the excess low salinity, treated water (raffinate) from the water conditioning plant prior to use;

- To prevent any of the storage dams from overflowing, each dam would maintain a 0.5m freeboard from the spillway, which is equivalent to contain the 100 year 72 hour storm event (0.26m) and any wave run up (SoC 6.9);
- Pumping of groundwater to the evaporation pond system will cease when the approved freeboard is reached (SoC 6.10); and
- The spillway for each storage would be sufficient to convey the 10,000 year ARI critical duration storm event without overtopping the dam wall.

### 3.3 Contaminated Catchment

#### 3.3.1 Contaminated Catchment Sediment Basins

**Figure 2.1** shows the location of the contaminated catchment sediment basins SB1 and SB2. SB1 is located to the south of the product coal stockpile areas adjacent to the rail loop and collects and stores potentially dirty/contaminated runoff from the entire Pit Top Infrastructure Area. SB2 is located immediately downstream of SB1. **Table 3.2** provides summary details of the available storage volume of SB1 and SB2. Any water collected within SB1 will be pumped directly to Pond A1 within the rail loop via a dedicated 1ML/d pump. Water from SB2 will be pumped to Pond A1 on an as needs basis.

SB1 will be cleaned of accumulated sediment material (or extended or replaced) when the storage capacity of the structure is reduced by 20%.

**Table 3.2 Sediment Basin Specifications**

Storage Name	Catchment Area (ha)	Storage Volume (ML)
SB1	26.3	10.9 (to be extended 20)
SB2	0	30

#### 3.3.2 Surface Facilities Area

The surface facilities area may produce runoff that contains hydrocarbons. These areas include the:

- Wash-down area;
- Workshop;



## NARRABRI NORTH MINE

Document Owner: Env. Manager

Revision Period: 2 years

Issue: 1

Last Revision Date: 3/06/2010

Date Printed: 3/06/2010

### WHC\_PLN\_NAR\_SITE WATER MANAGEMENT PLAN

- Fuel, oil and grease storages; and
- Refuelling bays.

These areas would be managed as follows (as per SoC 6.5 – 6.8):

- Runoff from these areas would drain to an oil separator to reduce hydrocarbons to acceptable levels before draining to SB1. The oily fraction would enter a containment system for removal as necessary;
- Storage tank areas would have an impermeable surface and bunding capable of containing 110% of the largest tank's capacity in accordance with EPA (2007) guidelines;
- All oil, grease, fuel and hydrocarbon products would be securely stored; and
- Refuelling, oiling and greasing would take place in designated areas only.

The following actions would be taken if a major hydrocarbon spill on an unsealed area occurs:

- The contaminated soil at the site of the spill would be collected and transported to an approved waste depot or remediated safely on the mine site;
- Pits would be constructed around the spill with sufficient hydraulic gradient to capture seepage water and contaminated material, enabling the pits to be pumped out; and
- The local groundwater would be monitored for signs of further contamination.

#### 3.4 Storage Dams

**Figure 2.1** shows the locations of five storage dams on the Pit Top Area; SD1, SD2, SD3, SD4 and SD5. The water collected in these dams provides the final treatment of runoff (ie. settling of sediment) from the Pit Top Area. The collected water will also be used to supplement supplies during the early years of the operational phase of the project. **Table 3.3** gives the summary details of the configurations of the storage dams. These dams have been designed to contain the 5 day 95percentile storm event (DECC, 2008) of 52mm assuming a runoff coefficient of 0.74, which exceeds the minimum requirements in the Environment Protection Licence (EPL). The following points are of note:

- SD1 overflows to SD2, which overflows to SD5. Excess storage is provided in SD2 to contain the minimum storage requirements for SD1;
- SD3 overflows to SD4. Excess storage is provided in SD4 to contain the minimum storage requirements for SD3;
- SD5 partially collects runoff from Kurrajong Creek tributary 2 and was constructed (from an old farm dam) to supplement mine site supplies during the construction phase of the project. As the catchment is outside the



## NARRABRI NORTH MINE

Document Owner: Env. Manager

Revision Period: 2 years

Issue: 1

Last Revision Date: 3/06/2010

Date Printed: 3/06/2010

### WHC\_PLN\_NAR\_SITE WATER MANAGEMENT PLAN

controlled discharge area, upstream flows are out of the control of Narrabri Coal. For this reason, the catchment area and minimum storage volume have not been specified;

- The actual storage volume for storage dams with on-site catchments (SD1 – SD4) of 100.8 ML exceeds the minimum storage sediment requirement by 60.1 ML (minimum storage = 40.7 ML);
- The spillways of all dams have been designed with sufficient capacity to pass the 100 Year ARI critical duration design flood without overtopping the dam wall. Water collected in the storage dams would be pumped to Dam D to be used for mine site use when required;
- Any releases from these dams would achieve the water quality compliance criteria given in **Section 5.3**; and
- The primary release points for water from the Pit Top Area would be from SD2 and SD4.

**Table 3.3 Storage Dam Specifications**

Storage Name	Catchment Area (ha)	Minimum Storage Volume (ML)	Actual Storage Volume (ML)
SD1	43.2	16.6	5.9
SD2	29.6	11.4	55.2
SD3	28.6	11.0	4.7
SD4	4.5	1.7	35
SD5 <sup>1</sup>			11.2

1 – SD5 catchment outside of controlled drainage area

The storage dams will be cleaned of accumulated sediment material (or extended or replaced) when the storage capacity of the structure is reduced by 20%.

## 4 **EROSION AND SEDIMENT CONTROL**

### 4.1 **Overview**

An erosion and sediment control plan was developed for the construction phase of the Narrabri Coal Mine by Coffey Geotechnics (2008). The report outlined the hydrological characteristics of the Pit Top Area and how stormwater runoff was to be managed during the construction phase of the Project. Strategic plans for the management of water together with design details of the works necessary for



## NARRABRI NORTH MINE

Document Owner:	Env. Manager
Revision Period:	2 years
Issue:	1
Last Revision Date:	3/06/2010
Date Printed:	3/06/2010

### WHC\_PLN\_NAR\_SITE WATER MANAGEMENT PLAN

implementation of these plans were provided. The erosion and sediment control plan was consistent with the requirements of Landcom's Managing Urban Stormwater: Soils and Construction Manual (Landcom, 2004). All erosion and sediment control structures have been constructed in accordance with the recommendations identified in the relevant standard drawings and construction notes of Landcom (2004).

This plan was submitted to the Director General and has been approved. It is not proposed to alter the existing erosion and sediment control plan for the operational phase of the mine. A summary of the plan is given below.

#### 4.2 Sources of Erosion and Sedimentation

**Figure 4.1** contains an aerial photograph of the Pit Top Area showing the extent of the rehabilitated areas and disturbed areas taken in June 2009. The majority of the construction activities on the mine site have been completed and a significant amount of rehabilitation work has already been completed. Notwithstanding, erosion and sedimentation could potentially result directly or indirectly from:

- Surface runoff and/or erosion from limited vegetation clearing, topsoil stripping and stockpiles;
- Surface runoff from unsealed roads and newly constructed embankments and drains; and
- Erosion of stormwater drainage channels.

Elevated winds may also result in erosion of finer material during clearing and soil stripping activities, and from exposed surfaces and stockpiles.

**WHC\_PLN\_NAR\_SITE WATER MANAGEMENT PLAN**



**Figure 4.1 Narrabri Coal Mine Pit Top Area, June 2009**

**4.3 Mitigation of Erosion and Sedimentation**

Erosion and sediment control within the Pit Top Area has been designed to ensure effective management of surface water and sediment suspended in runoff. Erosion and sediment mobilisation will be minimised by adopting the following practices:

- Installing erosion and sediment controls prior to disturbance of any land;
- Limiting the extent of the disturbance to the practical minimum;
- Reducing the flow rate of water across the ground particularly on exposed surfaces and in areas where water concentrates;
- Establishment of non-persistent cover crops on exposed surfaces not required for operational purposes or stockpiles retained for periods greater than 3 months;
- Revegetation of embankments and bunds;
- Progressively rehabilitating disturbed land and constructing drainage controls to improve stability of rehabilitated land;
- Ripping of rehabilitation areas to promote infiltration.



## NARRABRI NORTH MINE

Document Owner:	Env. Manager
Revision Period:	2 years
Issue:	1
Last Revision Date:	3/06/2010
Date Printed:	3/06/2010

### WHC\_PLN\_NAR\_SITE WATER MANAGEMENT PLAN

- Protecting natural drainage lines and watercourses by the construction of erosion control devices such as diversion banks, channels and sediment basins;
- Restricting access to rehabilitated areas; and
- Installing sediment basins to settle out sediment prior to off-site release.

#### 4.4 Diversion Drains

A series of dirty water diversion drains have been constructed to divert runoff from the Pit Top Area to the sediment basins and storage dams as shown in **Figure 2.1** (SoC 6.3). The diversion drains have been designed to convey the 10 year ARI design discharge (as a minimum).

The amenity bund constructed around the perimeter of the Pit Top Area is 3 m high and effectively prevents all clean runoff from the surrounding catchment draining to the Pit Top Area. A gap exists in the southern boundary of the amenity bund to enable inflows from Kurrajong Creek. Water entering the site at this point flows in an easterly direction away from the Pit Top Area.

## 5 SITE WATER BALANCE

### 5.1 Onsite Water Demand

**Table 5.1** shows the estimated annual mine site water requirements for the Stage 1 Narrabri Coal Mine. Mine site requirements are based on the production of 1.8million tonnes of product coal per year using two continuous miners.

**Table 5.1 Annual Mine Site Water Requirements**

	Demand (ML/year)
Surface Dust Suppression	27
Surface Coal Processing	36
Underground Dust Suppression	142
Potable Use	20
<b>Total</b>	<b>402</b>



## NARRABRI NORTH MINE

Document Owner:	Env. Manager
Revision Period:	2 years
Issue:	1
Last Revision Date:	3/06/2010
Date Printed:	3/06/2010

### WHC\_PLN\_NAR\_SITE WATER MANAGEMENT PLAN

## 5.2 Sources and Security of Water Supply

### 5.2.1 General

Water can be supplied to the Narrabri Coal Mine from a number of sources including:

- Pumped out mine water;
- Namoi River;
- Groundwater;
- Mine site runoff/direct rainfall; and
- Underground recycle.

The water management system is designed such that on-site water requirements are supplied from pumped out mine water and mine site runoff. Off site supplies will be used to supplement on site supplies during shortfall periods. Potable water will be sourced from Council supplies.

### 5.2.2 Available Water Allocations

**Table 5.2** shows the water allocation licences held by Narrabri Coal Mine. An aquifer interference licence was obtained to dewater the underground workings and the remaining allocations are off-site licences from either the Great Artesian Basin or the Namoi River.

**Table 5.2 Narrabri Coal Mine Water Allocation Licences**

Licence	Type	Nominal Allocation (ML/yr)
90BL254679	Aquifer Interference	818
AL811346	Currently Irrigation (intend to change to aquifer interference once GAB zone is affected)	248
WAL7411	Namoi River	600
WAL2728	Namoi River	10
WAL2671	Namoi River	48
WAL14515	Groundwater (Zone 5)	150
WAL12833	Groundwater (Zone 5)	67

The off-site allocations would be used to mix with the on-site supplies to a sufficient quality for underground use.



## NARRABRI NORTH MINE

Document Owner: Env. Manager

Revision Period: 2 years

Issue: 1

Last Revision Date: 3/06/2010

Date Printed: 3/06/2010

### WHC\_PLN\_NAR\_SITE WATER MANAGEMENT PLAN

#### 5.2.3 Pumped Out Mine Water

**Table 5.3** shows the predicted annual groundwater inflows dewatered from the underground workings over the 29 year mine life as predicted by GHD (2007). These inflows are based on the most likely (Base Case) conditions assuming the hydraulic conductivity of the Hoskisson Coal Seam of 0.01m/d. Pumped out mine water inflow rates will be monitored once mining commences to refine these estimates.

The groundwater investigations undertaken by GHD (2007) found that some of the geological formations intersected by the Stage 1 underground operations contain significant quantities of poor quality water. Therefore the use of the pumped out mine water is limited to surface dust suppression and coal processing and possibly for mixing with clean water for use underground.

**Table 5.3 Predicted Groundwater Inflows**

Year	Groundwater Inflow (ML/year)	Year	Groundwater Inflow (ML/yr)
1	54.5	16	323.3
2	64.8	17	374.1
3	98.6	18	444.9
4	99.5	19	484.9
5	148.2	20	472.5
6	186.8	21	461.5
7	181.9	22	470.6
8	177.0	23	594.4
9	175.2	24	762.6
10	200.5	25	801.8
11	260.7	26	769.7
12	301.1	27	748.5
13	306.1	28	738.0
14	302.6	29	732.4
15	299.5		

#### 5.2.4 Mine Site Runoff/Direct Rainfall

Water balance modelling of the mine site water management system given in **Section 2** (WRM, 2006), predicted that the storage dams and sediment basins could harvest 68ML per year on average from the Pit Top Area. During low rainfall years, the ability to harvest water could fall as low as 8ML per year. Although on-site water harvesting is not a reliable source of water, priority will be given to



## NARRABRI NORTH MINE

Document Owner:	Env. Manager
Revision Period:	2 years
Issue:	1
Last Revision Date:	3/06/2010
Date Printed:	3/06/2010

# WHC\_PLN\_NAR\_SITE WATER MANAGEMENT PLAN

utilising mine site runoff for dust suppression and underground use rather than off site supplies.

### 5.2.5 Underground Recycle

Clean water is required at the continuous miners and along the conveyor belt for dust suppression and motor cooling. It is estimated that between 40 to 50% of this water used underground, given in **Table 5.1**, would be collected by the mine dewatering system and transferred back to the Pit Top Area for reuse.

### 5.3 Off Site Transfers

Water balance modelling indicates that the on-site water requirements, given in **Table 5.1**, would exceed the water that could be collected on-site and dewatered from the underground during the first 10 years of mining. During these years the excess demand would be met from the off-site supplies and therefore off-site transfers of water are not proposed at this stage.

Narrabri Coal will monitor the volume of pumped out mine water over time and assess on a regular basis whether sufficient storage is available in the existing evaporation basins and when, or if, off site releases would be required. Options to manage the excess water should this occur are currently being investigated by Narrabri Coal. These options include:

- Increasing the area of the evaporation basins;
- Treating the water to a quality sufficient to release it to the Namoi River (It is understood that salinity offsets would be required so that there is no net increase in salt loads in the Namoi River); and
- Transferring the treated water to a third party for agricultural use.

The most appropriate option will be determined when better estimates of the volume of pumped out mine water are known. Any offsite use will be subject to a detailed site specific investigation to assess the long term sustainability of reusing the water at that particular site.

### 5.4 Reporting Procedures

Monitoring of water volumes on site will be undertaken by collecting data on pumping rates and storage levels. Permanent pumps will be located in the following locations:

- The underground operations;
- The box cut sump;
- SB1; and
- The evaporation ponds for dust suppression requirements.



## NARRABRI NORTH MINE

Document Owner:	Env. Manager
Revision Period:	2 years
Issue:	1
Last Revision Date:	3/06/2010
Date Printed:	3/06/2010

### WHC\_PLN\_NAR\_SITE WATER MANAGEMENT PLAN

Mobile pumps will be used to dewater the various storage dams on the Pit Top Area.

Pumping times and flow rates will be recorded using flow meters located on pipes entering and exiting underground operations. Flow meter records will be kept at the site office and stored for later use on an active database of monitoring results.

Storage levels (and volumes) at each mine site water management dam will be monitored by installing gauge boards. For the rail loop water storages, the gauge boards will be coloured with a red zone that indicates when the stored volume is less than the 100 year 72 hour storage volume (plus wave run-up).

Storage levels in the rail loop water storages will be monitored on a weekly basis and following a storm event and recorded on the monitoring database (SoC 6.12). Storage levels in the remaining water dams will be monitored on a monthly basis and following a storm event and recorded on the monitoring database. Following review of dam capacities, all efforts will be made to restore capacity as soon as possible in preparation for the next rain event/sequence.

The total stored volume on the mine site of pumped out mine water, concentrated brine and raffinate (treated) water together with the available storage volume and an estimate of the volume of pumped out mine water over the following year is to be reported in the Annual Environment Management Report to be submitted to the various Government agencies including Industry and Investment NSW (I&I NSW), Department of Planning (DoP) and Department of Environment, Climate Change and Water (DECCW).

## 6 SURFACE WATER MONITORING PLAN

### 6.1 General

Narrabri Coal Operations has a comprehensive monitoring program in place across the mine site that incorporates:

- The collection of rainfall and meteorological data; and
- The collection of water quality and water level data in the water management dams and creeks.

### 6.2 Monitoring Locations

**Figure 6.1** shows the water quality sampling locations on the various creeks that cross the mine site. The locations of the various Pit Top Area water storages to be monitored are shown in **Figure 2.1**. The water quality monitoring program has been designed to provide upstream, source and downstream monitoring on the local creeks to assess whether the water quality compliance criteria have been met.



## NARRABRI NORTH MINE

Document Owner:	Env. Manager
Revision Period:	2 years
Issue:	1
Last Revision Date:	3/06/2010
Date Printed:	3/06/2010

### WHC\_PLN\_NAR\_SITE WATER MANAGEMENT PLAN

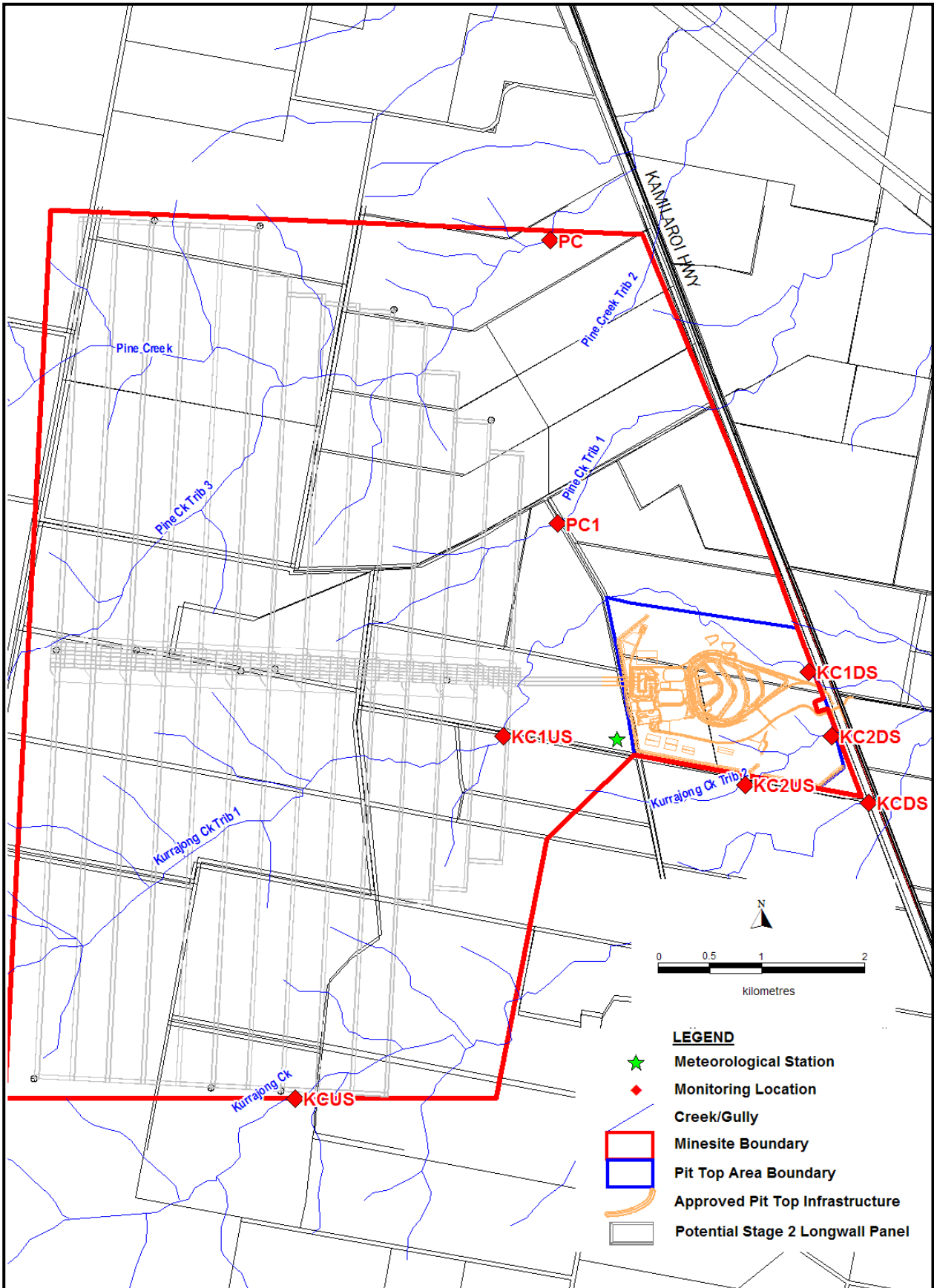
#### 6.3 Water Quality Monitoring Schedule

**Table 6.1** defines the parameters to be sampled and the recommended sampling frequency for each sampling location. The proposed water quality monitoring program provides for the assessment of background data for flow events in the various creeks as well as quarterly grab samples from the mine water storages on-site to determine whether mine site runoff meets the adopted water quality compliance criteria. The samples should be collected in a manner consistent with the Approved Method for Sampling and Analysis of Water Pollutants in NSW (DEC, 2004).

- The event-based sampling should enable quantification of any pollutant loads from the Mine Site and their corresponding impact on the local creek water quality.
- On-site quarterly sampling from the water storages allows for any potential problem areas with respect to pollutant generation on-site to be identified in advance ensuring appropriate remedial action can be taken.

The frequency of monitoring and range of parameters analysed during flow and routine monitoring should be reviewed after the first two years of operations.

**WHC\_PLN\_NAR\_SITE WATER MANAGEMENT PLAN**



**Figure 6.1 Surface Water and Meteorological Monitoring Locations**



# NARRABRI NORTH MINE

Document Owner:	Env. Manager
Revision Period:	2 years
Issue:	1
Last Revision Date:	3/06/2010
Date Printed:	3/06/2010

## WHC\_PLN\_NAR\_SITE WATER MANAGEMENT PLAN

**Table 6.1 Water Quality Monitoring Schedule**

Location	Parameters	Frequency
Site (Meteorological Monitoring)	Rainfall Wind speed and direction Temperature Relative Humidity Solar Radiation	Recording every 15 minutes
Rail Loop Water Storages	Water level/storage volume EC pH Turbidity TDS TSS Metals Anions and cations Oil and grease Total Organic Carbon (TOC) Sodium Adsorption Ratio	Weekly (water level)  Quarterly (water quality)
Sediment Basins and Storage Dams	Water level EC Oil and grease pH TSS Total Organic Carbon	Monthly (water level)  Quarterly (water quality – all dams)  Once per discharge from SB2, SD2, SD4 and SD5
PC, PC1, KC1US, KC1DS, KC2US, KC2DS, KCUS, KCDS	Water level EC Oil and grease pH TSS Total Organic Carbon	Once per discharge

### 6.4 Surface Water Impact Assessment Criteria

Impact assessment criteria for surface water are only relevant to water actually discharged from the mine site. The surface water compliance criteria are as prescribed by DECCW and specified as concentration limits within Environment Protection Licence (EPL) 12789. Condition L3 of EPL 12789 specifies the following concentration limits for licenced points 11 (SD4), 12 (SD5) and 13 (SD2) (**Table 6.2**):



## NARRABRI NORTH MINE

Document Owner: Env. Manager

Revision Period: 2 years

Issue: 1

Last Revision Date: 3/06/2010

Date Printed: 3/06/2010

### WHC\_PLN\_NAR\_SITE WATER MANAGEMENT PLAN

**Table 6.2 Surface Water Assessment Criteria**

Pollutant	Units of Measure	50 percentile concentration limit	90 percentile concentration limit	3DGM concentration limit	100 percentile concentration limit
Oil and Grease	mg/L	-	-	-	10
pH	pH	-	-	-	6.5-8.5
Total Suspended Solids	mg/L	-	-	-	50

Furthermore, Condition L3.4 states:

*The Total Suspended Solids concentration limits specified for Points 11, 12 and 13 may be exceeded for water discharged provided that:*

*(a) the discharge occurs solely as a result of rainfall measured at the premises that exceeds 38.4 millimetres over any consecutive 5 day period immediately prior to the discharge occurring; and*

*(b) all practical measures have been implemented to dewater all sediment dams within 5 days of rainfall such that they have sufficient capacity to store run off from a 38.4 millimetre, 5 day rainfall event.*

*Note: 38.4 mm equates to the 5 day 90%ile rainfall depth for Gunnedah sourced from Table 6.3a Managing Urban Stormwater: Soils and Construction Volume 1: 4th edition, March 2004.*

All monitoring events will be analysed against this criteria, and any surface water discharge events reported to the DECCW as required. Narrabri Coal notes Condition L1.1 and Condition L3.3 of the EPL, as follows:

#### **Condition L1.1**

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

#### **Condition L3.3**

*To avoid any doubt, this condition does not authorise the pollution of waters by any pollutant other than those specified in the tables. (see Table 6.2 above).*



## NARRABRI NORTH MINE

Document Owner:	Env. Manager
Revision Period:	2 years
Issue:	1
Last Revision Date:	3/06/2010
Date Printed:	3/06/2010

# WHC\_PLN\_NAR\_SITE WATER MANAGEMENT PLAN

## 6.5 Reporting Procedures

The Environmental Officer for the mine site will retain an active database of monitoring results which will be updated on a regular basis. Any discharge event off-site will result in the triggering of a sampling event, with results of the sampling to be provided to DECCW. All sampling results will be made available in the Annual Environmental Management Report (AEMR) for the site, as well as on the Company website. In the event of any exceedance in concentration criteria, Narrabri Coal will advise DECCW and other relevant agencies within 24 hours of detecting the exceedance in accordance with consent Condition 3 of Schedule 4. Narrabri Coal will also provide a written report within 6 days of the event to the relevant agencies which will:

- Describe the date, time and nature of the exceedance/incident;
- Identify the cause (or likely cause) of the exceedance/incident;
- Describe what action has been taken to date; and
- Describe the proposed measures to address the exceedance/incident.

The ongoing monitoring program and collation of relevant data will provide the basis for continuing improvement in surface water management across the site.

## 7 GROUNDWATER MONITORING PROGRAM

### 7.1 General

Narrabri Coal Operations has a groundwater monitoring program in place across the mine site that incorporates the collection of water quality and water level data from groundwater monitoring and local production bores.

### 7.2 Monitoring Locations

The Narrabri groundwater monitoring network includes a combination of 27 standpipe piezometers, 7 vibrating wire (VW) piezometer bores and 11 registered bores (subject to owner approval) which have been strategically located to target alluvium/colluvium, overburden and coal measures allowing the monitoring of both water level and water quality.

Seven coal exploration holes located close to the entry drift of the mine have been installed with vibrating wire pressure transducers before being grouted up. Five bores have a single vibrating wire pressure transducers installed, and two boreholes have multi-level vibrating wire pressure transducers installed.

An additional 7 shallow monitoring bores have been installed to monitor performance of the containment ponds/dams in the pit top area.



## NARRABRI NORTH MINE

Document Owner:	Env. Manager
Revision Period:	2 years
Issue:	1
Last Revision Date:	3/06/2010
Date Printed:	3/06/2010

### WHC\_PLN\_NAR\_SITE WATER MANAGEMENT PLAN

Narrabri Coal is currently in discussions with the NSW Office of Water (NOW) regarding expansion of the groundwater monitoring network to incorporate additional privately licenced water bores and/or the installation of new monitoring piezometers. NOW requires the bores/piezometers to be located to the east of the mine (to monitor possible impacts on the Namoi Alluvium) and to the west of the mine (to monitor possible impacts on the Great Artesian Basin). Use of existing bores and/or installation of piezometers will be subject to property access and licencing requirements associated with non-project related properties. Any additional monitoring locations will be incorporated in the Environmental Monitoring Program, to be submitted to DoP for Director-General approval, and any subsequent amendments to the WMP.

**Table 7.1** lists all groundwater monitoring bores and **Figure 7.1** shows the groundwater monitoring locations across the mine lease and surrounds. The locations of the containment monitoring bores within the Pit Top Area water storages to be monitored are shown in **Figure 7.2**.



# NARRABRI NORTH MINE

Document Owner:	Env. Manager
Revision Period:	2 years
Issue:	1
Last Revision Date:	3/06/2010
Date Printed:	3/06/2010

## WHC\_PLN\_NAR\_SITE WATER MANAGEMENT PLAN

**Table 7.1 Groundwater Monitoring Network**

New Bore ID	Former Bore ID	NOW Licence Number	NOW GW Reference	MGA Coordinates		Bore Depth (m)	Bore Diameter (m)	Screen Interval (m bgl)	Water Level (September 2008)		Formation
				Easting	Northing				(m bgl)	(m AHD)	
<b>Standpipe Piezometers</b>											
P1	NG1	90BL254481	GW968435	776116	6614694	50	100 - 125	44 – 50	42.82	272.51	Garrawilla Volcanics
P2	NG2	90BL254482	GW968436	777282	6616355	50	100 - 125	44 - 50	29.88	246.28	Napperby Formation
P3	NG3	90BL254483	GW968437	780433	6620115	45	100 - 125	34 – 40	9.77	226.43	Pamboola Formation
P4	NG4	90BL254484	GW968438	777490	6625553	30	100 - 125	24 – 30	17.99	230.80	Napperby Formation
P5	NG5	90BL254485	GW968439	778180	6628195	30	100 - 125	24 – 30	26.56	209.41	Pamboola Formation
P6	NG6	90BL254486	GW968440	772726	6626021	90	100 - 125	78 – 90	89.11	237.15	Pilliga Sandstone
P7	NG7	90BL254487	GW968441	768998	6624338	90	100 - 125	78 – 90	62.87	221.69	Pilliga Sandstone
P8	NC110S	90BL254663	GW968631	772697	6618421	65	100 - 125	57 – 63	50.53	271.56	Purlawaugh Formation
P9	GWB5S	90BL254958	GW968632	775127	6620209	30	150	24 – 30	19.66	267.80	Purlawaugh Formation
P10	NC30D	90BL254658	GW968633	774063	6616444	130	100 - 125	118 – 130	20.03	249.17	Napperby Formation (no sill)
P11	NC30S	90BL254959	GW968634	774066	6616447	50	150	44 – 50	22.91	280.10	Napperby Formation (no sill)
P12	NC98D	90BL254659	GW968635	776513	6619964	90	100 - 125	84 – 90	36.49	239.77	Napperby Formation (above sill)
P13	NC98S	90BL254690	GW968636	776526	6619972	30	150	24 – 30	9.43	268.13	Garrawilla Volcanics/ Napperby Formation
P14	NC100D	90BL254661	GW968637	775221	6622816	78	100 - 125	72 – 78		205.41	Napperby Formation (above sill)
P15	NC100S	90BL254961	GW968638	775221	6622818	30	150	24 – 30	Dry	N/A	Garrawilla Volcanics
P16	NC119D	90BL254660	-	772233	6623740	146	100 - 125	137 – 146	50.52	247.29	Garrawilla Volcanics
P17	NC119S	90BL254962	GW968639	772222	6623712	56	150	47 – 56	57.30		Purlawaugh Formation
P18	NC122	90BL254662	-	776826	6621802	146	100 - 125	143 – 146	13.16	258.20	Hoskissons Seam



# NARRABRI NORTH MINE

Document Owner:	Env. Manager
Revision Period:	2 years
Issue:	1
Last Revision Date:	3/06/2010
Date Printed:	3/06/2010

## WHC\_PLN\_NAR\_SITE WATER MANAGEMENT PLAN

New Bore ID	Former Bore ID	NOW Licence Number	NOW GW Reference	MGA Coordinates		Bore Depth (m)	Bore Diameter (m)	Screen Interval (m bgl)	Water Level (September 2008)		Formation
				Easting	Northing				(m bgl)	(m AHD)	
P19	NC123R	90BL254963	GW968640	776827	6621543	187	100 - 125	184 – 187	16.16	255.90	Pamboola Formation
P20	NC127	90BL254964	GW968643	776482	6621837	162	100 - 125	159 - 162	13.48	259.15	Arkarula Formation
<b>Vibrating Wire Piezometers (March 2009)</b>											
P21	-	90BL254965	-	776851	6620363	200	100 - 125	160	22.5	253.82	Hoskissons Seam
P22	-	90BL254966	-	776745	6620406	180	100 - 125	165	23.84	250.28	Hoskissons Seam
P23	NC175	90BL254967	-	776226	6620693	199	100 - 125	45	24.26	262.74	Garrawilla Volcanics
								120	46.32	240.68	Basalt Sill
								170	36.42	250.58	Digby Formation
								185	39.24	247.76	Hoskissons Seam
P24	NC179	90BL254701	-	776675	6621043	181	100 - 125	36	14.77	259.23	Base of weathering
								112	48.43	225.57	(?Napperby Formation)
								148	26.86	247.14	Digby Formation
								166	26.64	247.36	Hoskissons Seam
								180	31.96	242.04	Arkarula Formation
P25	-	90BL255167	-	776703	6620326	200	100 - 125	165	28.60	246.19	Hoskissons Seam
P26	-	90BL255168	-	776537	6620528	200	100 - 125	176	28.64	246.77	Hoskissons Seam
P27	-	90BL255169	-	776531	6620485	180	100 - 125	176	28.29	247.07	Hoskissons Seam
<b>Surface Water Containment Ponds</b>											
P28	-	90BL255170	-	778343	6620162	25	150	19 – 25			Garrawilla Volcanics
P29	-	90BL255171	-	778541	6619978	25	150	19 – 25			Garrawilla Volcanics
P30	-	90BL255172	-	778808	6620071	15	150	9 – 15			Garrawilla Volcanics



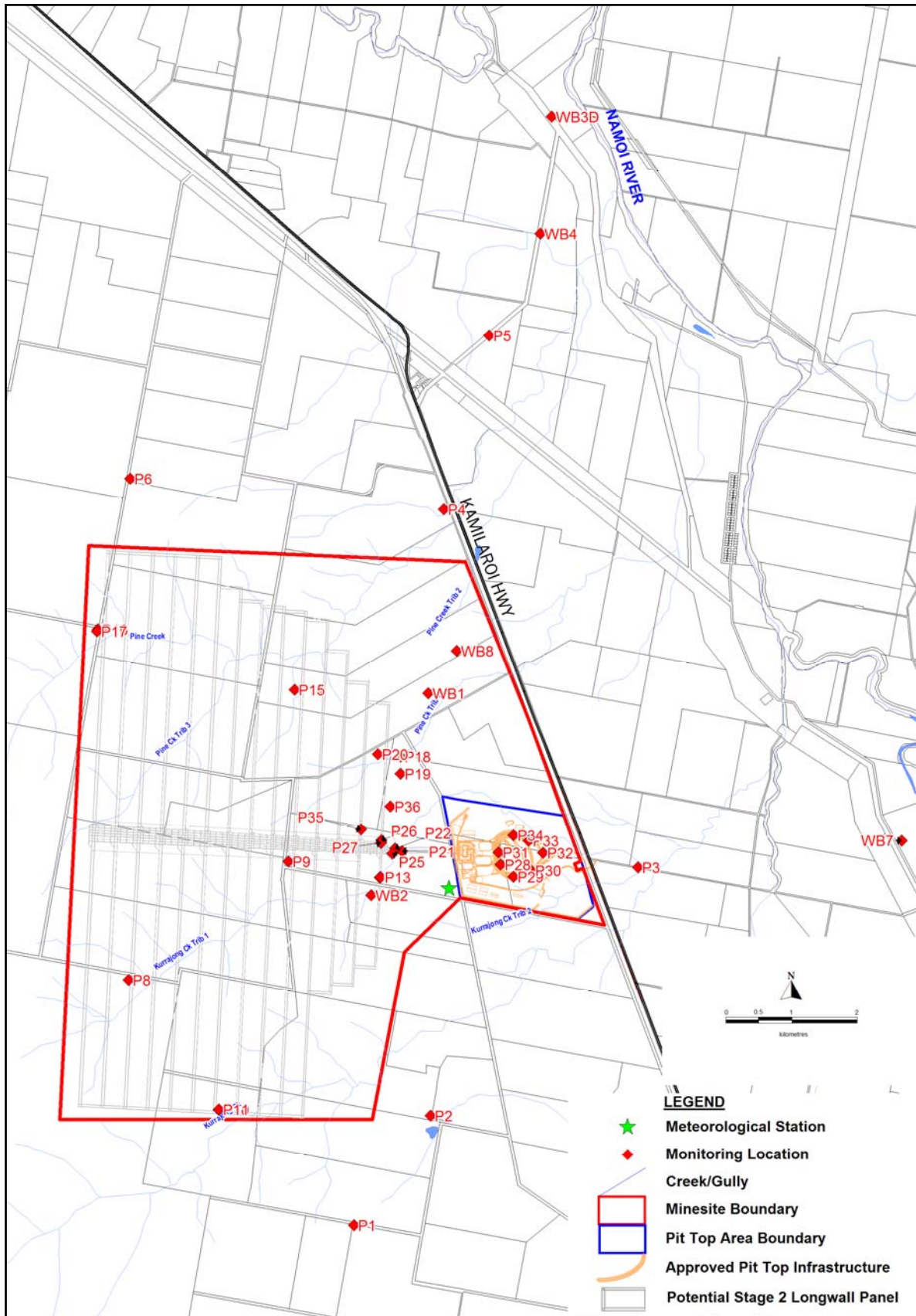
# NARRABRI NORTH MINE

Document Owner:	Env. Manager
Revision Period:	2 years
Issue:	1
Last Revision Date:	3/06/2010
Date Printed:	3/06/2010

## WHC\_PLN\_NAR\_SITE WATER MANAGEMENT PLAN

New Bore ID	Former Bore ID	NOW Licence Number	NOW GW Reference	MGA Coordinates		Bore Depth (m)	Bore Diameter (m)	Screen Interval (m bgl)	Water Level (September 2008)		Formation
				Easting	Northing				(m bgl)	(m AHD)	
P31	-	90BL255173	-	778318	6620343	15	150	9 – 15			Garrawilla Volcanics
P32	-	90BL255216	-	778993	6620335	15	125	9 – 14			Garrawilla Volcanics
P33	-	90BL255217	-	778772	6620523	15	125	9 – 14			Garrawilla Volcanics
P34	-	90BL255218	-	778542	6620604	15	125	9 – 14			Garrawilla Volcanics
<b>NSW Office of Water (NOW) Registered Bores</b>											
WB1	-	90BL028774	GW038662	777251	6622763	N/A	N/A	?	9	N/A	Alluvium
WB2	-	90BL246067	GW966836	776382	6619701	N/A	N/A	22 – 26	9	N/A	Garrawilla Volcanics
WB3a	-	-	GW030229	779133	6631524	N/A	N/A	8.2 – 8.5	8.6	N/A	Alluvium
WB3b	-	-	GW030229	779133	6631524	N/A	N/A	35.1 – 36.3	8.5	N/A	Alluvium
WB4	-	-	GW030230	778957	6629746	N/A	N/A	11.3 – 15.9	8.9	N/A	Alluvium
WB5a	-	-	GW036004	785892	6618196	N/A	N/A	11 – 14.5	11.1	N/A	Alluvium
WB5b	-	-	GW036004	785892	6618196	N/A	N/A	26.5 – 28	11.2	N/A	Alluvium
WB6a	-	-	GW036005	786976	6615621	N/A	N/A	11.5 – 13	14.8	N/A	Alluvium
WB6b	-	-	GW036005	786796	6615621	N/A	N/A	76.7 – 78	12.2	N/A	Alluvium
WB7	-	90BL100346	GW038200	784440	6620521	N/A	N/A			N/A	Alluvium
WB8	-	90BL100778	GW043315	777682	6623409	N/A	N/A	27.4 – 29.8		N/A	Alluvium

**WHC\_PLN\_NAR\_SITE WATER MANAGEMENT PLAN**



**Figure 7.1 Groundwater Monitoring Network**



# NARRABRI NORTH MINE

Document Owner:	Env. Manager
Revision Period:	2 years
Issue:	1
Last Revision Date:	3/06/2010
Date Printed:	3/06/2010

## WHC\_PLN\_NAR\_SITE WATER MANAGEMENT PLAN

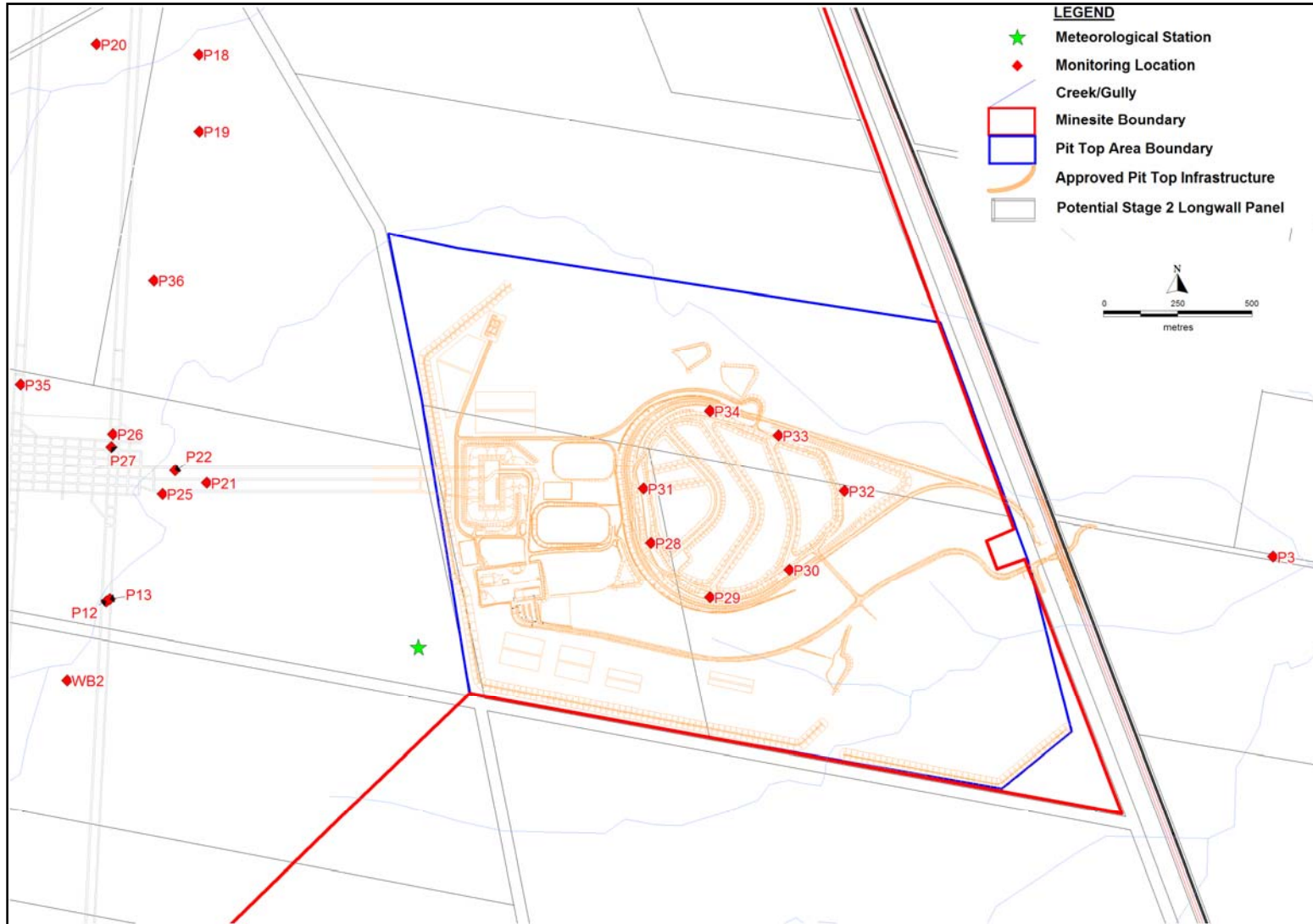


Figure 7.2 Groundwater Monitoring Network (Pit Top Area)



## NARRABRI NORTH MINE

Document Owner:	Env. Manager
Revision Period:	2 years
Issue:	1
Last Revision Date:	3/06/2010
Date Printed:	3/06/2010

# WHC\_PLN\_NAR\_SITE WATER MANAGEMENT PLAN

### 7.3 Baseline Data

Pre mining baseline groundwater level and quality information has been collected routinely since 2007.

#### 7.3.1 Groundwater Levels

Groundwater levels are monitored in all 27 standpipe bores, 7 vibrating wire piezometer bores and 11 registered bores. The VW piezometer bores are monitored for groundwater level/pressure only.

Three groundwater flow systems occur within the Mine Site area. A shallow aquifer system occurs within alluvium associated with the Namoi River, and locally in the alluvium/colluvium and weathered rock (regolith) above fresh rock. Two separate groundwater flow systems occur predominantly in open fractures in the underlying fresh rock.

Within the Project Site, groundwater levels in the shallow alluvium/colluvium/regolith aquifer are generally about 10-20m or more below ground level. Groundwater in this aquifer is localised and discontinuous and is influenced primarily by topography and local surface drainage.

The groundwater flow direction in the shallow groundwater system is therefore similar to the surface topography, ie east to northeast towards the Namoi River valley. Recharge to the shallow aquifer system is believed to occur by infiltration of rainfall through the surficial alluvium and regolith, with discharge occurring locally to the surface drainages.

Within the deeper hard rock aquifers, groundwater levels are generally in the range 25-55m below surface. The shallower of the two hard rock groundwater systems occurs within the Jurassic sediments, which subcrop beneath the Project area. The westerly dip on the strata exposes progressively younger units from east to west across the site. A deeper groundwater flow system occurs within the Permian-Triassic sediments which also dip in a westerly direction.

#### 7.3.2 Groundwater Quality

Groundwater quality monitoring has been conducted by NCOPL, with samples from all available standpipes in the monitoring network submitted for laboratory analysis of pH, electrical conductivity (EC), Total dissolved solids (TDS) major anions, major cations and selected heavy metals (As, Cd, Cr, Cu, Ni, Pb, Zn, Hg, V, Mn). The main water quality characteristics (ph, TDS) in the mine area are summarised in **Table 7.2**.

The laboratory analysis results to date indicate pH to be in the neutral to slightly alkaline range of 6.7 to 8.2. Salinity ranges from fresh (<500 mg/L TDS) within the Purlawaugh formations located to the west of the Mine Site (P7 and P8), to slightly brackish (1040 mg/L TDS) in the Garrawilla Volcanics, to strongly saline (up to 16



# NARRABRI NORTH MINE

Document Owner:	Env. Manager
Revision Period:	2 years
Issue:	1
Last Revision Date:	3/06/2010
Date Printed:	3/06/2010

## WHC\_PLN\_NAR\_SITE WATER MANAGEMENT PLAN

800 mg/L TDS) within the Napperby Formation. Salinity within the Hoskissons coal seam ranges from as low as 1350 mg/L measured in P18 to 9030 mg/L TDS measured in recent in seam drilling.

Low relative sulfate concentrations suggest that there is little concern for acid producing potential from groundwater inflows and therefore measurement of EC is deemed adequate for assessing water quality of groundwater discharged to surface holding ponds. Monthly analytical testing for anions, cations and metals from groundwater inflow discharge points will provide adequate monitoring of inflow groundwater quality conditions.

**Table 7.2 Summary of Groundwater Salinity Data**

Formation	TDS mg/L		pH	
	Minimum	Maximum	Minimum	Maximum
Pilliga Sandstone	101	101	7.95	7.95
Purlawaugh Formation	295	14820	6.25	8
Garrawilla Volcanics	109	9400	6.27	8.1
Napperby Formation (above Sill)	226	1735	6.65	7.9
Napperby Formation (below Sill)	3160	16800	7.4	8.7
Digby Formation*	N/A	N/A	N/A	N/A
Hoskissons Coal Seam**	1350	9070	6.5	8.5
Arkarula Formation	7740	9630	6.7	7.1

\* No sampling has occurred from the Digby Formation and salinity is assumed to be similar to the overlying Napperby Formation

\*\* Initial sampling from the Hoskissons coal seam was limited to a single monitoring bore (P18) which indicated that salinity within the seam was less than 2000 mg/L. Recent data from in seam gas drainage program suggests salinity concentrations are as high as 9630 mg/L.

### 7.4 Monitoring Schedule

**Table 7.3** defines the parameters to be sampled and the recommended sampling frequency for each sampling location. The proposed groundwater quality monitoring program provides additional baseline data information initially and ongoing operational data.

Key components of the groundwater monitoring program will include:

- Quarterly measurement of water levels in the existing network of piezometers to be monitored through the life of the project;
- Loggers to be installed on 2 key vibrating wire monitoring bores near mine entry area with daily water levels recorded;



## NARRABRI NORTH MINE

Document Owner:	Env. Manager
Revision Period:	2 years
Issue:	1
Last Revision Date:	3/06/2010
Date Printed:	3/06/2010

### WHC\_PLN\_NAR\_SITE WATER MANAGEMENT PLAN

- Quarterly measurement of water levels in existing registered groundwater bores within 5 km of the Mine Lease as indicated in **Table 7.1**;
- Quarterly sampling of all standpipe piezometers, for laboratory analysis of electrical conductivity (EC) and pH;
- Annual collection of water samples from all standpipe piezometers for laboratory analysis of a broader suite of parameters including:
  - Physical properties (EC, TDS and pH)
  - Major cations and anions (Ca, Mg, Na, K, Cl, SO<sub>4</sub>, HCO<sub>3</sub> and CO<sub>3</sub>)
  - Nutrients
  - Dissolved metals.
- Daily measurement of the volume of mine water pumped in to and out of the underground mine;
- Monthly measurement on site of the EC and pH of the mine water pumped in to and out of the underground mine; and
- Quarterly collection of water samples from mine water pumped out of the underground mine for laboratory analysis of a broader suite of parameters including:
  - Physical properties (EC, TDS and pH)
  - Major cations and anions (Ca, Mg, Na, K, Cl, SO<sub>4</sub>, HCO<sub>3</sub> and CO<sub>3</sub>)
  - Dissolved metals.

The frequency of monitoring and range of parameters analysed during flow and routine monitoring should be reviewed after the first two years of operations.



# NARRABRI NORTH MINE

Document Owner:	Env. Manager
Revision Period:	2 years
Issue:	1
Last Revision Date:	3/06/2010
Date Printed:	3/06/2010

## WHC\_PLN\_NAR\_SITE WATER MANAGEMENT PLAN

**Table 7.3 Groundwater Monitoring Schedule**

Location	Parameters	Frequency
All Standpipes  P1,P2, P3, P4, P5, P6,P7,P8, P9, P10, P11,P12, P13, P14, P15, P16,P17,P18, P19, P20, P28, P29, P30, P31, P32, P33, P34, WB1, WB2, WB3a, WB3b, WB4, WB5a, WB5b, WB6a, WB6b, WB7 and WB8	Water level EC pH TDS Metals Anions and Cations	Quarterly (water level, pH and EC)  Annually (full water quality)
Vibrating Wire Piezometers  P21,P22, P25 ,P26 and P27	Water Level	Daily (Data Logger)
Multi Level Vibrating Wire Piezometers  P35 and P36	Water Level	Daily (Data Logger)
Mine water pumped into and out of the mine.	EC pH TDS Metals Anion and Cations Discharge Rate	Daily (flow rate)  Monthly (EC pH,)  Quarterly (Full water quality)

### 7.5 Groundwater Impact Assessment Criteria

Impact assessment criteria are recommended for:

- Mine inflow rate;
- Mine inflow water quality;
- Near surface groundwater levels, in particular groundwater levels within the Garrawilla Volcanics;
- Impacts on surficial groundwater levels and/or creek base flows; and
- Impacts on existing licensed users.

#### 7.5.1 Mine Inflow Rates

The predicted mine inflow rates have been shown in **Table 5.3**. The rates gradually increase to reach a maximum of 801.8 ML per annum at Year 25 and then decline and stabilise around 700 ML per annum until end of mine life.



## NARRABRI NORTH MINE

Document Owner:	Env. Manager
Revision Period:	2 years
Issue:	1
Last Revision Date:	3/06/2010
Date Printed:	3/06/2010

### WHC\_PLN\_NAR\_SITE WATER MANAGEMENT PLAN

An observed inflow rate 100% in excess of the predicted mean monthly inflow rate at any stage during the mine life sustained for 3 consecutive months would require a response plan as detailed in **Section 8** of this report.

#### 7.5.2 Impacts to Licenced Users

Due to the generally high groundwater salinities and low bore yields, there is very limited existing groundwater abstraction in the immediate mining area other than for coal mine dewatering.

Occasional small stock water supplies are drawn from near surface groundwater. Impact on surrounding registered groundwater users is treated as significant if it exceeds 15% of available drawdown. The greatest impact from the Stage 1 development is predicted to be in the Gunnedah Basin formations with groundwater drawdowns in the Hoskissons Coal Seam of greater than 100 m restricted to within 1 km to 2 km of the underground workings after 50 years.

Drawdown has been predicted to rapidly decrease to less than 10 m around 6 km to 7 km to the west, north and south of the underground workings. The drawdown extent to the east is significantly less and is limited by the subcrop of the coal seam. Registered groundwater users outside the Project Site are not predicted to have their available drawdown reduced by greater than 15%. An observed drawdown in licensed bores which exceeds predicted drawdown would require a response action as detailed in **Table 8.1**.

#### 7.5.3 Mine Inflow Water Quality

Groundwater within the coal measures is highly variable, with measured TDS ranging from 1350 mg/L to 9070 mg/L. The salinity and pH of mine water will be monitored throughout the mine life. Significant changes in the trends of quality over a sustained period would require a response action as detailed in **Table 8.1**.

### 7.6 Reporting Procedures

An active database of monitoring results, to be retained by the Environmental Officer, will be updated on a regular basis. Sampling results will be made available in the Annual Environmental Management Report (AEMR), as well as on the Company website. The AEMR will present an overview of the performance of the groundwater monitoring network during the preceding 12 months and identify the proposed extraction, processing and rehabilitation activities and environmental management planned for the following 12 months.

The ongoing monitoring program and collation of relevant data will provide the basis for continuing improvement in groundwater management across the site.



## NARRABRI NORTH MINE

Document Owner: Env. Manager

Revision Period: 2 years

Issue: 1

Last Revision Date: 3/06/2010

Date Printed: 3/06/2010

# WHC\_PLN\_NAR\_SITE WATER MANAGEMENT PLAN

## 7.7 Further Development of the Groundwater Model

Groundwater modelling was undertaken to assess the potential impacts of mining activities for Stage 1. Since initial approval was granted, several modifications have been made to the model structure and parameters to improve the representation of the groundwater and geological environment. The most significant change was an extension of the model domain to the north-east to include the Namoi Valley and the alluvial sediments associated with the Namoi River, so that potential impacts on the Namoi Valley alluvial aquifer could be assessed, as well as potential baseflow impacts on the Namoi River.

In accordance with approval conditions and Statement of Commitments, it is proposed to further develop the current groundwater model, within 12 months of commencement of mining and to include additional groundwater data as the mine develops. It is proposed to calibrate this model with ongoing monitoring data from the site. Other circumstances which may trigger further development or refinement of the groundwater model include:

- A significant change to the mine plan;
- Acquisition of new hydrogeological information, such as groundwater levels and aquifer properties (i.e. hydraulic conductivity) which are different to calibrated values used in the model; and
- Groundwater drawdown and inflows which significantly exceed model predictions for that stage of mining.

## 8 SURFACE AND GROUNDWATER RESPONSE PLAN

### 8.1 Surface Water

If an exceedance of the monitoring criteria for wet weather discharges (listed in **Section 6**) is identified then Narrabri Coal will follow the procedure listed below:

- Exceedance in monitoring criteria identified;
- Record the timing, location, environmental conditions and any contributing factors to the exceedance;
- Advice issued to relevant agencies within 7 days;
- Sampling point and areas upstream inspected to ascertain cause of exceedance;
- Operational practices reviewed to determine if any current operational practice contributed to the exceedance;
- Implementation of ameliorative measures on site to minimise the potential for future exceedance, which may include clean out, redesign or alteration to structures and/or operational practice;



## NARRABRI NORTH MINE

Document Owner:	Env. Manager
Revision Period:	2 years
Issue:	1
Last Revision Date:	3/06/2010
Date Printed:	3/06/2010

# WHC\_PLN\_NAR\_SITE WATER MANAGEMENT PLAN

- Written advice to relevant agencies identifying actions undertaken to reduce future risk of exceedance within 6 days;
- Where specific cause of exceedance cannot be identified, external advice may be sought; and
- Ongoing future monitoring to ensure ameliorative measures have been successful with concentration criteria being met.

All other surface water monitoring will be discussed in the AEMR with reference to relevant guidelines, such as the ANZECC guidelines.

## 8.2 Groundwater

In the event that adverse impacts or water quality degradation on groundwater resources beyond predictions in the EA are determined, and these impacts are considered associated with the operations of Narrabri Coal, NCOPL will commission an assessment of the causes, will develop a staged response program satisfactory to DECCW and DoP to mitigate the adverse impacts, and will attempt to establish and implement measures to limit further adverse impact.

### 8.2.1 Contingency Measures

The identification process and response protocol to adverse outcomes are provided in the trigger action response plan (TARP). The responses proposed incorporate a staged assessment and development of management measures deemed appropriate for each individual event should it occur.

Specific trigger levels have been designed to alert NCOPL to observed parameter responses which are outside of normal variation and predicted responses, or where observed parameter values do not follow anticipated trends.

The triggers for instigation of response actions would occur when observed changes to monitored parameters exceed specified levels. Such changes in observed parameters or conditions would include:

- Sudden inrush of groundwater into the mine in exceedance of predicted inflows;
- Significant change in observed water quality or groundwater levels between sampling rounds; and
- Changes in trends over an extended period for groundwater levels and quality.

### 8.2.2 Trigger Action Response Plan (TARP)

The Trigger Action Response Plan (TARP) has been developed to focus upon appropriate trigger and response actions for mitigation of impacts to the natural environment as a result of mining.



## NARRABRI NORTH MINE

Document Owner:	Env. Manager
Revision Period:	2 years
Issue:	1
Last Revision Date:	3/06/2010
Date Printed:	3/06/2010

### WHC\_PLN\_NAR\_SITE WATER MANAGEMENT PLAN

Monitoring serves to advise of changes to groundwater levels or quality that occur or to raise alert that an abnormal condition relating to mining has developed.

Each monitoring program has established trigger levels of particular impacts at which a response is needed, and to help define an appropriate response (**Table 8.1**). Management of impacts within predictions follows standard assessment review and response protocols.

The TARP has been designed to allow reference to risks of impact from mining to environmental aspects identified within the mining area and surrounds. Aspects assessed to be at risk are summarised in **Section 7.5** of this report. These include both predicted and unpredicted impacts, and include:

- Groundwater level;
- Groundwater quality;
- Hydraulic connection to alluvium associated with the Namoi River; and
- Groundwater users (Private Bores).

#### 8.2.3 Response Action

In the event of any exceedance detailed in **Section 7.5**, the following response action may be initiated:

- NCOPL assessment to determine the reason for the exceedance.
- Refer the matter to an independent hydrogeologist for review if NCOPL investigation is unable to identify reason for exceedance.
- If assessed as being caused by the mining operation, and it is further assessed to be likely to cause an adverse impact on an existing beneficial or environmental use of surface water or groundwater, then an appropriate preventative and/or remedial strategy would be recommended, which may comprise:
  - Additional monitoring;
  - Modification to mine plans;
  - Provision of alternative water supply or other agreed compensation; or
  - (If appropriate) no change to operations.

The above response program would be carried out in consultation with DECCW, DoP and other relevant government agencies such as NSW Office of Water (NOW) and I & I NSW.

### 8.3 Management Plan Review

As specified in SoC 6.13, within 12 months of commencement of mining operations Narrabri Coal will commission a suitably qualified consultant to undertake a



## NARRABRI NORTH MINE

Document Owner:	Env. Manager
Revision Period:	2 years
Issue:	1
Last Revision Date:	3/06/2010
Date Printed:	3/06/2010

### WHC\_PLN\_NAR\_SITE WATER MANAGEMENT PLAN

transient calibration of the groundwater model presented in the EA in consultation with DECCW, and to the satisfaction of the Director-General. Following the completion of the transient calibration of the groundwater model and the first annual review of the water balance, the water management plan will be updated detailing the lead times to implement proposed management strategies (eg. commissioning of the reverse osmosis water conditioning plant).



# NARRABRI NORTH MINE

Document Owner:	Env. Manager
Revision Period:	2 years
Issue:	1
Last Revision Date:	3/06/2010
Date Printed:	3/06/2010

## WHC\_PLN\_NAR\_SITE WATER MANAGEMENT PLAN

**Table 8.1 Trigger Action Response Plan (TARP)**

Aspect	Parameter	Frequency	Purpose	Trigger	Action	Responsibility	Timing	Purpose
<b>Groundwater Monitoring</b>	Groundwater level in piezometers	Quarterly Daily (loggers)	To provide baseline water level data and to identify water level impacts	Alluvium/Colluvium Piezometers: An additional drawdown of 5m relative to the predicted drawdown in the near surface groundwater levels	Repeat water level monitoring to confirm. Refer the matter to an independent hydrogeologist for review	NCOPL Environmental Officer	See Note 1 below	Inform agencies of baseline assessment and monitoring. Identify, investigate and report on impacts to groundwater levels.
	Groundwater quality in piezometers	Quarterly: pH, EC Annually: TDS, Cations, Anions, Nutrients & Dissolved metals	To provide baseline water quality data and to identify water quality impacts	An observed change in trends over a sustained period.	Include monitoring results in AEMR	NCOPL Environmental Officer	Annually	Inform agencies of baseline assessment and monitoring. Identify, investigate and report on impacts to groundwater quality.
<b>Hydraulic connection with near surface groundwaters and baseflow impacts</b>	Groundwater level in piezometers	Quarterly	To provide baseline water level data and to identify water level impacts	Alluvium/Colluvium Piezometers: An additional drawdown of 2m below seasonal minimums relative to the predicted drawdown in the near surface groundwater levels within WB4 and WB7.	Repeat water level monitoring to confirm. Refer the matter to an independent hydrogeologist for review	NCOPL Environmental Officer	See Note 1 below	Ensure baseflows to Namoi River Alluvium are consistent with model predictions.
	Groundwater quality in piezometers	Quarterly: pH, EC Annually: TDS, Cations, Anions, Nutrients & Dissolved metals	To provide baseline water quality data and to identify water quality impacts	An observed change in trends over a sustained period.	Include monitoring results in AEMR	NCOPL Environmental Officer	Annually	Inform agencies of baseline assessment and monitoring. Identify, investigate and report on impacts to groundwater quality



## NARRABRI NORTH MINE

Document Owner:	Env. Manager
Revision Period:	2 years
Issue:	1
Last Revision Date:	3/06/2010
Date Printed:	3/06/2010

### WHC\_PLN\_NAR\_SITE WATER MANAGEMENT PLAN

Aspect	Parameter	Frequency	Purpose	Trigger	Action	Responsibility	Timing	Purpose
<b>Mine inflows</b>	Flow rate	Daily (when pumping)	Identify unexpected high mine inflows and determine whether this will impact on near-surface groundwater	An observed inflow rate 100% in excess of the predicted inflow rate at any stage during the mine life sustained for 3 consecutive months	Refer the matter to an independent hydrogeologist for review	NCOPL Environmental Officer	Inform relevant agencies within 7 days. Investigation initiated within 1 week	Identify, investigate and report on drawdown impacts to existing users
	Water quality	Monthly: pH, EC, TDS Quarterly: Cations, Anions, Nutrients & Dissolved metals	To provide baseline water quality data and assist with water management	Significant changes in water quality trends sustained over a consecutive 6 month period	Refer the matter to an independent hydrogeologist for review, if required	NCOPL Environmental Officer	Annually	Identify, investigate and report on water quality impacts and determine whether a new source of inflows has occurred
<b>Licensed users</b>	Water level	Quarterly	Monitoring potential water level impacts to existing registered bores	Drawdown of 15% of existing drawdown	Refer the matter to an independent hydrogeologist for review	NCOPL Environmental Officer	See Note 1	Ensure water supply is maintained

\* Note 1 – If quarterly groundwater monitoring identifies that the Standing Water Level (SWL) trigger has been exceeded, the SWL in the affected piezometer will be measured within one month of the initial measurement. If the SWL no longer exceeds the trigger level, the SWL measurements will continue as per the quarterly monitoring program. If the SWL still exceeds the trigger level, and NCOPL is unable to ascertain the cause of the exceedance (ie. windmill in operation) the matter will be referred to relevant agencies and an independent hydrogeologist for review.



## NARRABRI NORTH MINE

Document Owner: Env. Manager

Revision Period: 2 years

Issue: 1

Last Revision Date: 3/06/2010

Date Printed: 3/06/2010

### WHC\_PLN\_NAR\_SITE WATER MANAGEMENT PLAN

#### 8.4 Unforeseen Impacts Protocol

**Table 8.2** outlines the procedure to be followed (in general accordance with the criteria exceedance protocols detailed in **Section 6** and **Section 7**) in the event that any unforeseen surface or groundwater impacts are detected.

**Table 8.2 Unforeseen Impact Procedure**

Stage	Procedure
1	Review the unforeseen impact including consideration of: <ul style="list-style-type: none"><li>• Any relevant monitoring data; and</li><li>• Current mine activities and land management practices in the relevant catchment</li></ul>
2	Commission an investigation by an appropriate specialist into the unforeseen impact, if considered appropriate by the Environmental Specialist.
3	Develop appropriate ameliorative measures based on the results of the above investigations, in consultation with the relevant authorities.
4	Implement additional monitoring where relevant to measure the effectiveness of the improvement measures.



## NARRABRI NORTH MINE

Document Owner:	Env. Manager
Revision Period:	2 years
Issue:	1
Last Revision Date:	3/06/2010
Date Printed:	3/06/2010

# WHC\_PLN\_NAR\_SITE WATER MANAGEMENT PLAN

## 9 REFERENCES

- ANZECC and ARMCANZ (2000) *'Australian and New Zealand Guidelines for Fresh and Marine Water Quality'*, Australian and New Zealand Environment Control Council and Agricultural and Resource Management Council of Australia and New Zealand, Australia.
- Coffey (2008) *'Narrabri Coal Project Water Management Plan'*, Report prepared by Coffey Geotechnics Pty Ltd for Narrabri Coal Pty Ltd
- EPA (2007) *'EPA Guidelines. Bunding and Spill Management'* EPA 080/07 Updated June 2007
- GHD (2007) *'Groundwater Assessment of the Narrabri Coal Project'*, Report prepared by GHD Pty Ltd for Narrabri Coal Pty Ltd (Part 2 of the *Specialist Consultant Studies Compendium*).
- URS (2007) *'Report for Evaporation and Storage Dams, Narrabri Coal Pit Top Infrastructure'*, Report prepared by URS Pty Ltd for Narrabri Coal Pty Ltd.
- WRM (2007) *'Surface Water Assessment of the Narrabri Coal Project'*, prepared by WRM Water & Environment Pty Ltd for Narrabri Coal Pty Ltd (Part 1 of the *Specialist Consultant Studies Compendium*).
- WRM (2008) *'Narrabri Coal Project Surface Water Management Plan'* prepared by WRM Water & Environment Pty Ltd for Narrabri Coal Pty Ltd



## NARRABRI NORTH MINE

Document Owner:	Env. Manager
Revision Period:	2 years
Issue:	1
Last Revision Date:	3/06/2010
Date Printed:	3/06/2010

### WHC\_PLN\_NAR\_SITE WATER MANAGEMENT PLAN

Revision	Revision Description	Who Consulted	Date
0	Initial document	Tech Services Dept.	Feb/Mar 2010
1	Final draft following DoP, DECCW & NOW review	Tech Services Dept.	June 2010