WHITEHAVEN COAL MINING PTY LTD

(A.B.N. 65 086 426 253)

WATER MANAGEMENT PLAN

for the

WHITEHAVEN COAL MINE

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(A.B.N. 65 086 426

Water Management Plan

for the

Whitehaven Coal Mine

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GLOSSARY OF ACRONYMS

AEMR - Annual Environmental Management Report

CCC - Community Consultative Committee

DA - Development Application

DEC (EPA) - Department of Environment and Conservation (Environment Protection Authority)

DNR - Department of Natural Resources

DoP - Department of Planning

DPI (MR) - Department of Primary Industries (Mineral Resources)

EPL - Environment Protection Licence

ESCP - Erosion and Sediment Control Plan

GSC - Gunnedah Shire Council

GWMP - Groundwater Monitoring Program

NSC - Narrabri Shire Council

SGRP - Surface and Groundwater Response Plan

SWMonP - Surface Water Monitoring Program

WCM - Whitehaven Coal Mining Pty Ltd

WMP - Water Management Plan

1.0 INTRODUCTION

1.1 Scope

This Water Management Plan for the Whitehaven Coal Mine:

- has been prepared in accordance with Condition 24 (Schedule 3) of DA 8-1-2005, *viz*

  (a) *"Within 6 months of this consent, the Applicant shall prepare and implement a Water Management Plan for the mine, to the satisfaction of the Director-General. This plan must include:*

  (b) *the site water balance;*

  (c) *an Erosion and Sediment Control Plan;*

  (d) *a Groundwater Monitoring Plan;*

  (e) *a Surface and Groundwater Response Plan to address any potential adverse impacts associated with the development; and*

  (f) *provision for a review of collected data a monitoring requirements 5 years after the cessation of mining, or as otherwise agreed by the Director-General"*; and

- supersedes similar documents prepared in accordance with Condition 3.1(a) of DA 72-03-2000 and subsequently revised in accordance with Condition 3.2(f) of MOD 8-2-2003-1. The more recent of these two documents was approved by the Director-General, Department of Urban Affairs and Planning on 30 March 2004.

Water management activities at the Whitehaven Coal Mine have been consistent with the contents of these plans since the commencement of operations in 2000 and, more recently, with the concepts and commitments identified in the SoEE accompanying DA 8-1-2005, with the result that, with few exceptions, all required water management controls are already in place, each having been designed, constructed and, where required, maintained by Soil Services.

Throughout this document, the terms "clean", "dirty" and "contaminated" waters are defined as follows.

1. **"Clean" water** – surface runoff from catchments undisturbed or relatively undisturbed by mining or related activities and rehabilitated catchments. All surface water emanating from the final landform on lease relinquishment will be defined as "clean".

2. **"Dirty" water** – surface runoff from disturbed catchments such as the active mine area and overburden emplacement, ROM coal stockpiling and crushing areas, soil and subsoil stockpiles and rehabilitated areas (until stabilised), all of which could contain sediments.

3. **"Contaminated" water** – surface runoff which could potentially contain hydrocarbons.

1.2 Water Management Objectives

Throughout the life of the mine to-date, WCM has undertaken its mining activities in a manner designed to:

- ensure the protection of the quality of the surface and groundwater resources;
- ensure that groundwater availability to or utility by local landowners is not compromised and that contingencies are in place should adverse impacts occur;
- ensure appropriate water control systems are established prior to mining and additional systems are progressively implemented in advance of mining activities;
- minimise the generation of "dirty" and "contaminated" water and to maintain effective measures for their control and isolation; and
- ensure that any groundwater extraction, "clean" surface water use and surface water discharges comply with all relevant legislation and licences as verified by an appropriate level of ground and surface water monitoring. Relevant licences held by WCM include EPL 10094 and groundwater extraction licences 90BL249901 and 90BL252067.

1.3 Plan Components

The following sub-sections provide:

- a description of the water management system in place at the mine including the design and location of the various surface water management structures (Section 2);
- a site water balance based on operational experience (Section 3);

- an erosion and sediment control plan (Section 4);
- a groundwater monitoring programme (Section 5);
- a surface and groundwater response plan to address any potential impacts associated with the ongoing development of the mine (Section 6);
- post-mining monitoring and data review (Section 7); and
- reporting (Section 8).

For completeness, and to ensure all water monitoring requirements / commitments are presented in a single document, Section 5 also includes the surface water monitoring programme. This programme is consistent with the monitoring requirements identified in the Mine's Environmental Protection Licence (EPL 10094).

1.4 Plan Review

In view of the requirements of Condition 3[43] of DA 8-1-2005, it is proposed that the contents of this plan, in particular the monitoring programmes, be reviewed and revised as appropriate on the basis of increased knowledge and be incorporated into the Mine Closure Plan: ongoing water management, particularly with respect to the long-term prevention of erosion and sedimentation, the assessment of the impacts of groundwater movement from the final void on groundwater and surface water resources, and post-mining water levels and quality beyond the active life of the mine, are each considered to be integral components of the overall strategy for mine closure.

This approach also has the advantage of providing all relevant information and obligations in a single document.

2.0 THE EXISTING WATER MANAGEMENT SYSTEM

2.1 Description

The existing surface water management system is shown on **Figure 1** and comprises 14 sediment basins (prefix SB-) and eight storage dams (prefix SD-) with interlinking diversion and catch bank / drains which effectively:

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TN
MN

Bore Pump
Meteorological Station
Bore Pump Dam
Fuel Farm
Existing buildings & facilities (office/bathhouse/crib)
Maintenance Building
Existing Coal Stockpiling/Crushing/ Loading area
Nitropril Storage Area
Access Road
Relocated Coal Stockpiling/Crushing/ Loading area
To Hoad Lane
Whitehaven Fault

WHITEHAVEN
"WHITEHAVEN"
"WOMBOOLA"
"MERTON"
LOT 138 DP754926
LOT 2 DP1015797
LOT 1 DP1015797
LOT 2 DP1038308
ML1464
ML1471
MINE ACCESS ROAD
MAGAZINE
RBS

SD-1
SD-2
SD-3
SD-4
SD-5
SD-6
SD-7
SD-8
SB-1
SB-2
SB-3
SB-4
SB-5
SB-6
SB-7
SB-8
SB-9
SB-10
SB-10a
SB-12
SB-13
SB-14

REFERENCE
- ML 1471Boundary
- ML 1464 Boundary
- 260 Mining Contour (m, AHD)
- 260 Contour (m, AHD)
- Fence
- Topsoil/Subsoil Stockpile Area
- Existing Farm Water Storage
- Existing Sediment Basin (SB) / Storage Dam (SD)
- Bank / Drain / Flow Direction (Clean)
- Bank / Drain / Flow Direction (Dirty)
- Limit of Approved Open Cut Mining (DA 8-1-2005)
- Fault Line
- Watercourse
- Powerline

SCALE 1:12 500

200 0 200 400 600 m

Figure Compiled by R.W. Corkery & Co.

Figure 1
MINE SITE LAYOUT

- encircle all areas of existing and approved future disturbance;
- divert “clean” flows from upstream areas around areas of disturbance; and
- capture all potentially “dirty” flows.

The rehabilitated components of the final landform also incorporate contour banks and rock-lined waterways which collect surface runoff and direct flows to the natural landform, and hence to sediment basin storage dam system (**Plate 1**).

Plate 1: An aerial view of the Whitehaven Coal Mine showing contour banks and rock-lined waterways on the rehabilitated post-mining landform (Ref. E513-134.JPG)

Figure 2 presents the generalized design of each of the storage dams, sediment basins and diversion and catch banks / drains.

The combined storage of all sediment basins and storage dams approximates 98ML (45ML in sediment basins and 53ML in storage dams). Of the storage dams, all but SD-6 (4ML), SD-7 (3ML) and SD-8 (1.5ML) primarily collect flows emanating from the array of sediment basins and provide a final “polishing” storage prior to off-site discharges. Each of SD-1, SD-2, SD-3,

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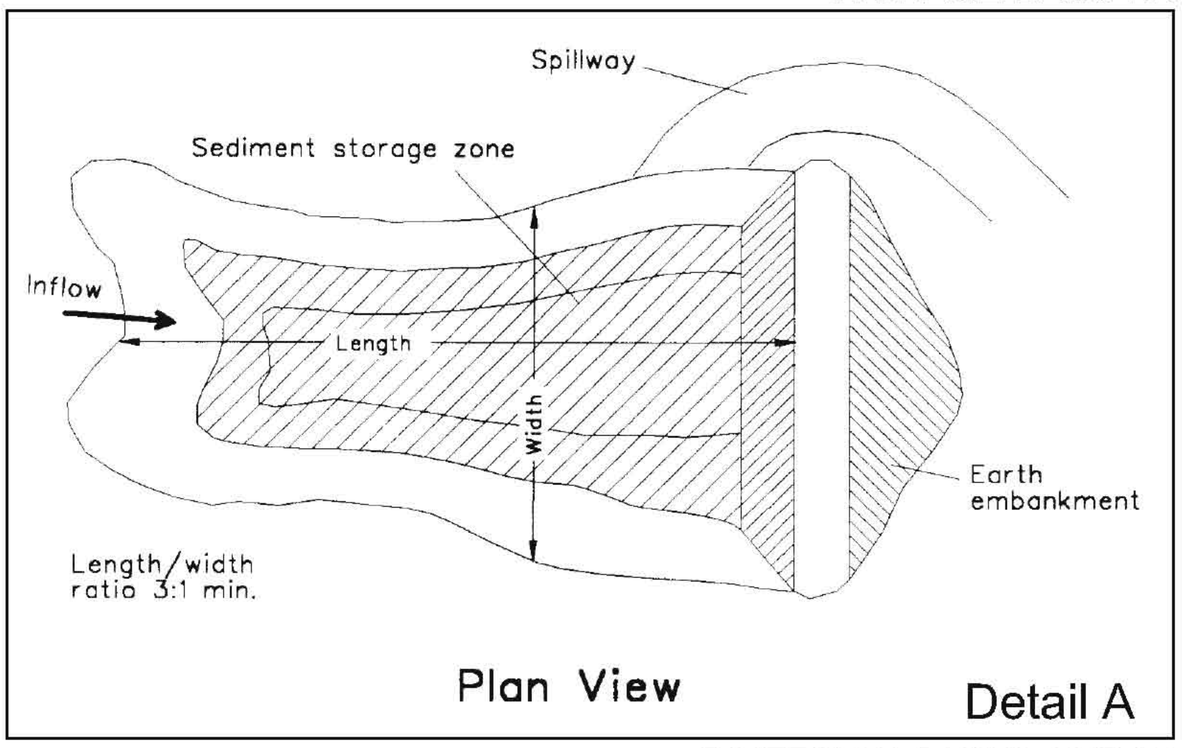
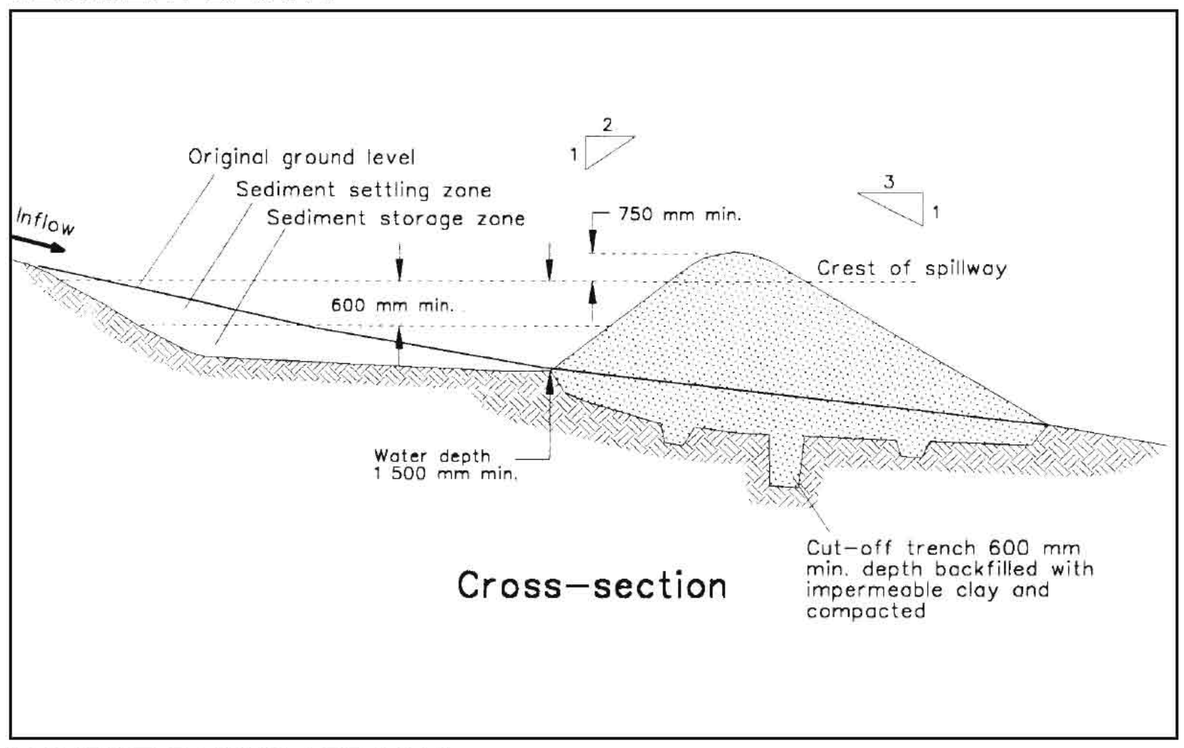
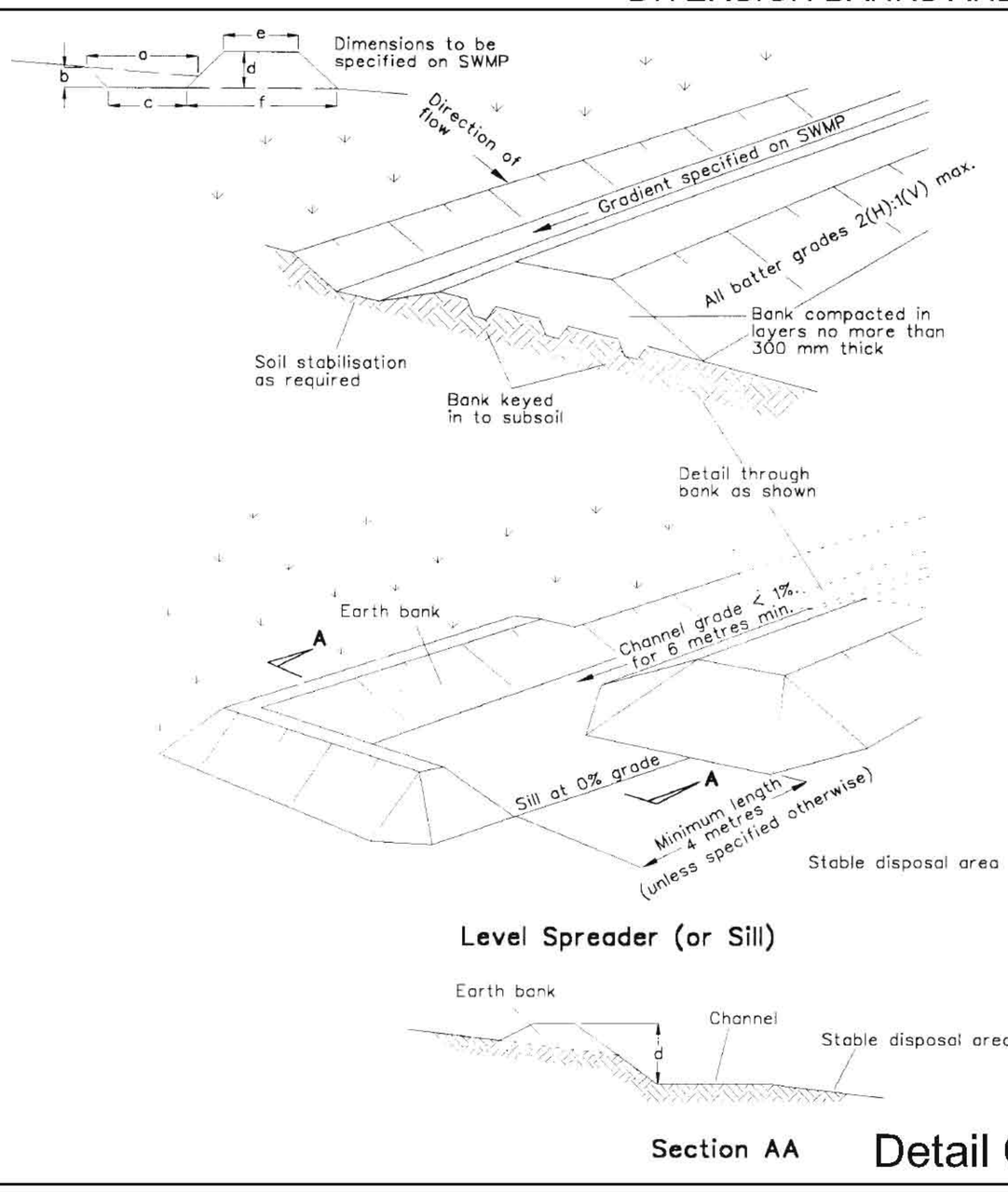
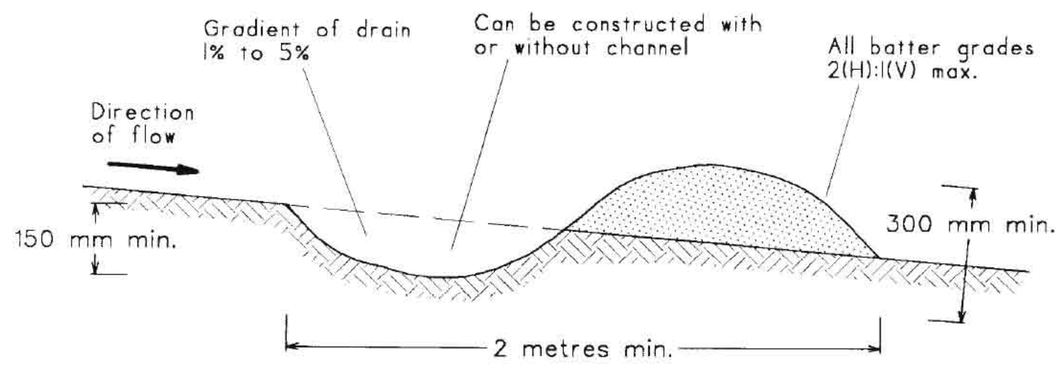
STORAGE DAMS AND SEDIMENT BASINS





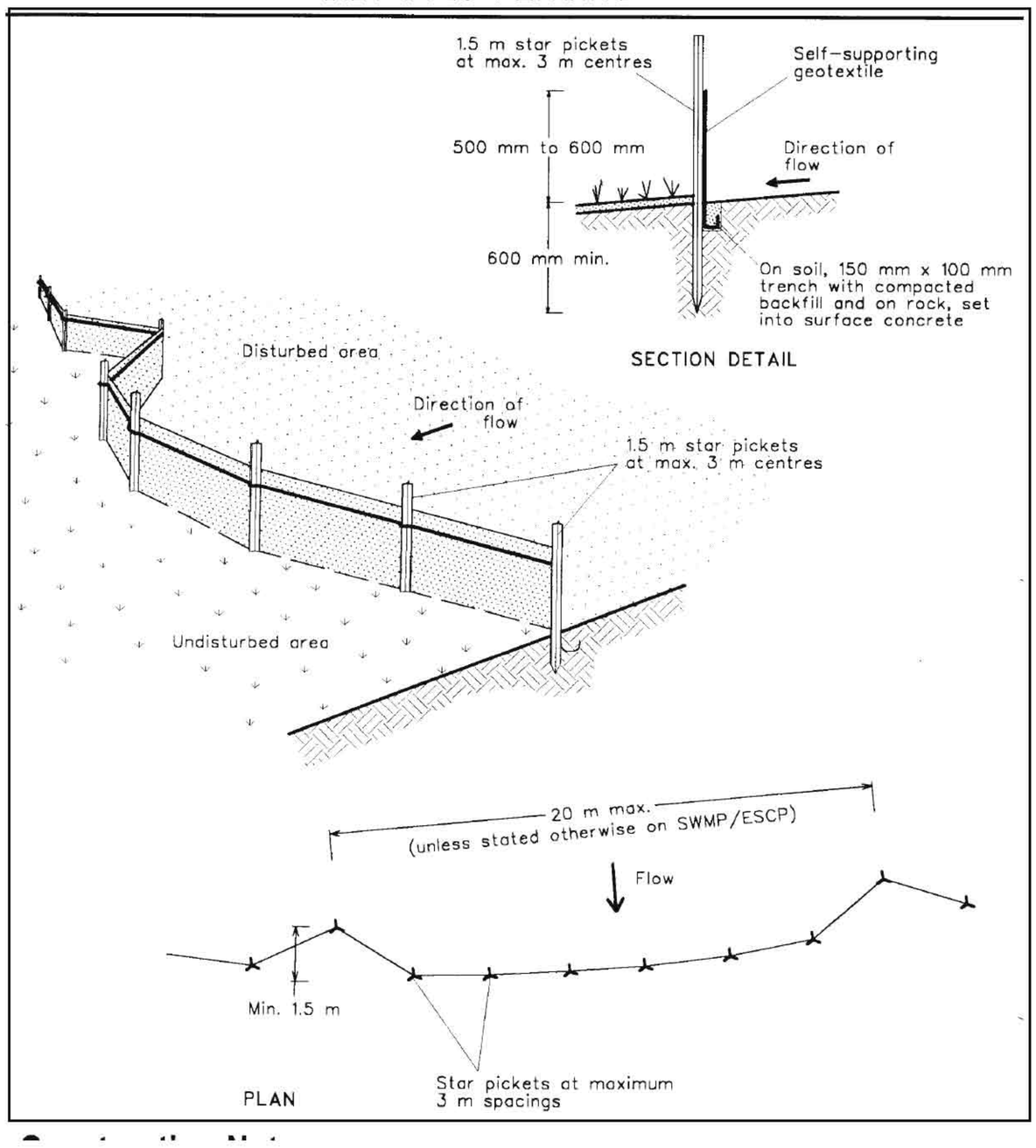
DIVERSION BANKS AND CATCHMENT BANKS / DRAINS





NOTE: Only to be used as temporary bank where maximum upslope length is 80 metres.

SILT-STOP FENCING



Where upslope length is >80m, design as per Detail C would be used

Figure 2

WATER MANAGEMENT STRUCTURES

Figure Compiled by R.W. Corkery & Co.

SD-4 and SD-5 are licenced discharge points under EPL 10094, and are subject to the discharge criteria identified in **Table 1.**

TABLE 1

Surface Water Discharging 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					6.5 – 9.0
Total suspended solids	mg/L	20	35		50

Contaminated water management is described in Section 2.2.7.

2.2 Water Management Structures – Design / Construction

2.2.1 Diversion and Catch Bank / Drains

Diversion and catch banks and/or drains are used to direct "clean" water away from areas of disturbance to natural drainage lines and/or to storages, or to catch potentially "dirty" water and direct it to sediment basins respectively.

All diversion and catch banks / drains shown on **Figure 1** have been designed and constructed by Soil Services personnel with:

- trapezoidal channels;
- bank batters between 1:3 and 1:6 (V:H);
- channel batters of 1:6 (V:H);
- channel gradients of 1:400 where the channel is bare;
- channel gradients of 1:200 (V:H) where the channel is to be kept well grassed;
- a level sill outlet to each channel (where the channel is discharging to the natural surface as opposed to a storage dam or sediment basin). A stable grass cover is maintained below the sill outlets; and
- a sill width a minimum 1.5 x the channel base width.

The dimensions of each of the banks / drains were determined at the time of design / construction based on the upslope catchment area.

2.2.2 Storage Dams

As noted in Section 2.1, storage dams may function as either containment structures for diverted “clean” water or as “polishing” storages for sediment basin outflows prior to discharge from the premises.

Each of the storage dams on the Whitehaven Mine site has been designed and constructed by Soil Services personnel with the following features.

- Dam excavation and bank batters no steeper than 1:3 (V:H).
- A crest width of a minimum 3m.
- A freeboard of a minimum 1m above top water level (Note: the majority have been constructed with a freeboard of 1.2m to 1.3m). No storage dam has been constructed with a wall height in excess of 3m, that is, the trigger height for increased freeboard.
- Inlet and outlet channel (spillway) batters of 1:6 (V:H).
- An outlet channel grade 1:400 where the channel is bare.
- An outlet channel grade 1:200 where the channel is to be kept well grassed.
- A level sill outlet to each outlet channel with a stable grass cover and a sill width a minimum 1.5 x the channel base width.

2.2.3 Sediment Basins

The principal function of the sediment basins is to detain “dirty” or potentially “dirty” water for a sufficient period to enable the suspended particulates to settle such that any outflows to the storage dams satisfy the EPL discharge criteria or, with further polishing in the storage dams, will satisfy the criteria.

With the exception of primary discharge outlets which were installed on SB-4 and SB-6 in addition to the spillways during the initial development of the mine, all sediment basins have been constructed in the same manner as the storage dams as described in Section 2.2.2.

2.2.4 Contour Banks

In order to minimize any erosion potential on the reshaped and revegetated final landform, contour banks have been and will continue to be constructed following completion of the reshaping activities. The contour banks constructed to date have comprised 0.6m to 1.2m high embankments generally grading at approximately 1:400 (V:H) to the natural landform or rock waterways (see **Plate 1**). Bank spacing is determined by the slopes of the landform but have historically ranged from 20m to 25m.

Bank construction is undertaken by Soil Services using materials specifically placed along the surveyed bank alignment for that purpose, in combination with pushing from upslope areas.

The contour banks will remain a permanent feature of the post-mining landform and are vegetated in conjunction with the adjacent landform.

2.2.5 Rock-lined Waterways

Four rock-lined waterways have been installed by Soil Services on the peripheral batter slopes of the post-mining landform in order to transfer water collected by the contour banks to the natural surface, and hence to water storages. Each waterway is approximately 10m wide and constructed using selected blastrock placed in an excavated cut. The invert of each waterway is approximately 10cm below the margin in order to spread any flow and minimise erosion potential.

Additional waterways will be installed by Soil Services on an as-needs basis.

2.2.6 Additional Structures

With the exception of contour banks and rock-lined waterways which are to be progressively installed on the post-mining landform, additional water management structure requirements over the life of the mine will be limited to the south-east corner of the Canyon area and the relocation / replacement of the existing diversion bank which directs "clean" surface runoff from the north-western slopes of Red Hill to SD-8. Relocation / replacement of this bank will only be required if mining progresses to the full extent of that approved and involves the extraction of the high stripping ratio coal in the south-east corner of the Canyon. As has been the case to date, the relocated diversion bank, if required, will be designed and constructed by Soil Services and conform to the design provided in Section 2.2.1 and shown on **Figure 2**.

Similarly, all future contour banks and rock-lined waterways will be designed and installed by Soil Services and conform to the design presented in Section 2.2.4 and 2.2.5, as refined by on-site experience. For the contour banks, the spacing will reflect the progressive reduction in the final landform slopes as the mine advances through the Canyon area and the final landform (other than in the final void area) approximates that prior to mining.

2.2.7 Contaminated Water Management

"Contaminated" water at the Whitehaven Coal Mine comprises surface runoff from the fuel farm, truck and equipment parking, washdown and workshop areas (**Figure 1**), all of which could potentially contain petroleum products (principally grease and oil). Caltex maintains two 50,000L diesel fuel tanks positioned within a bund with a capacity to hold 240,000L. The bunded area, which also contains stored oils, incorporates clay over plastic over a clay liner to minimise the potential of soil contamination in the event of a spill. Pipes and lockable valves are in place to enable removal of spills and rainwater from the area, with these materials placed in a tank for collection and off-site disposal. In the event of a tank rupture, fuel or oil would be pumped from the bunded area to drums or other containers for collection and off-site disposal.

Hydrocarbon-contaminated water originating from other areas, eg in the workshop area, is diverted to an oil separator, with the "clean" water used for dust suppression purposes. Spill kits are also maintained on the mine site.

Other "contaminated" water management measures in place include:

- the securing of all fuel and oil on site, eg at the various water pumps, within appropriately-sized and/or integrated bunds;
- immediate clean-up of spills of fuel and oil which may occur external to the bunded areas, with the form of clean-up depending on the source and location, magnitude and pollution potential, eg from use of spill kits to excavation and disposal of contaminated materials to bio-remediation;
- a three-phase contingency plan (see Section 6.4) for containment and remediation of major spills or events which could potentially lead to contamination of surface or groundwater. Implementation of the contingency plan has yet to be required.

No additional sources of "contaminated" water are projected for the remaining life of the mine.

3.0 SITE WATER BALANCE

3.1 Introduction

The Whitehaven Coal Mine has been operating since the commencement of the trial mine in early 2000 and, since that time has, with the exception of importing approximately 9ML in late 2002 / early 2003, been able to supply its production (dust suppression) water requirements from surface and groundwater which accumulated in the open cut, limited groundwater extraction from licenced production bores (Nos 90BL249901 and 90BL252067 with a combined allocation of 100MLpa), "dirty" water from sediment basins and clarified "dirty" water which could be discharged from Storage Dams SD-1 to SD-5. It is also noteworthy throughout 2002/03, 2003/04 and the majority of 2004/05, the Gunnedah area was in drought.

SD-6 to SD-8 inclusive, with a combined storage capacity of 8.5ML, have not been used to supply the mine's requirements.

Potable water has historically, and will continue to be brought to the mine at a rate of approximately 1.4 MLpa.

3.2 Operational Water Requirements

Annual operational water usage at the Whitehaven Coal Mine over the past four years is presented in **Table 2**.

TABLE 2

Operational Water Supplies

Source (ML)	**01-10-01 to 30.09.02**	**01-10-02 to 30.09.03**	**01-10-03 to 30.09.04**	**01-10-04 to 30.09.05**
Licenced Production Bore(s) *[1]	16.8	17.1	23	16.8
Groundwater / Surface Water Inflows to the Open Cut	3	6	30	35
Sedimentation Basins / Storage Dams *[2]	28.2	42.9	12	31
Import	0	9	0	0
Total	48	75	65	82.8

*[1] pumped to sediment basins to supplement dirty water surface runoff

*[2] additional to inflows to the open cut which are routinely pumped to sediment basins for subsequent collection and use for dust suppression

A review of **Table 2** shows that despite the drought, the mine remained essentially self sufficient with respect to water usage. Over this same period, discharges from the mine occurred on three occasions only.

3.3 Harvestable Right

Of the "clean" water that could be captured on the mine site each year, WCM has a right to collect and use only a portion of this, ie the maximum harvestable right. The harvestable right for the mining lease alone is 28.7, ie 410 ha x 0.07.

It should be noted, however, that WCM's landholding contiguous with ML1471, ie on its "Whitehaven" and "Womboola" properties exceeds 700ha, allowing for additional harvestable right of 23.1ML.

Of the 98ML storage capacity on the mine site, only SD-6, SD-7 and SD-8 and less than 50% of flows to SD-1, SD-2 and SD-4 (totalling less than 21.5ML) constitutes part of WCM's harvestable right.

4.0 EROSION AND SEDIMENT CONTROL PLAN

4.1 Introduction

Erosion and sediment control over the life of the Whitehaven Coal Mine to-date and on and from areas to be disturbed over the remaining life of the mine will primarily rely on the various water management structures identified in Sections 2.2.1 to 2.2.6, each of which has been (or will be) designed and constructed by Soil Services and be consistent with the requirements, standard drawings and construction notes within the Department of Housing's publication entitled "Managing Urban Stormwater : Soils and Construction Manual" (DoH, 2004).

Figure 2 presents the generalised design of each of the erosion and sediment control structures identified on **Figure 1** along with installation details for silt-stop fencing.

4.2 Sources of Erosion and Sedimentation

Erosion and sedimentation could potentially result directly or indirectly from:

(i) surface water runoff from areas disturbed in advance of, and during mining;

(ii) surface water runoff from topsoil, subsoil and overburden stockpiles and emplacements prior to rehabilitation;

(iii) surface water runoff from the ROM coal stockpile and crushing area;

(iv) surface water runoff from rehabilitated areas prior to full stabilisation;

(v) discharges of water at erosive velocities; and

(vi) runoff from roads at erosive velocities.

Elevated winds may also result in erosion from exposed surfaces.

4.3 Erosion and Sediment Control Structures

The structures presented on **Figure 1** and described in Section 2.2.1 to 2.2.3 will be the primary erosion and sediment control structures as these will be used to direct and control the velocity of surface water and prevent uncontrolled flows and discharges of water. As the final landform is created, additional erosion controls, in the form of contour banks and rock-lined waterways as described in Sections 2.2.4 and 2.2.5 will be progressively installed.

Figure 2 presents the design features of each of the referenced structures which have been based on the recommendation of DoH (2004).

Though only infrequently required to date, silt-stop fencing will be installed where necessary to assist in reducing the suspended sediment level in surface water flows. **Figure 2** also presents the design features to be adhered to when installing the silt-stop fencing.

4.4 Erosion and Sediment Control Management

WCM will remain vigilant in managing erosion and sedimentation on the mine site and, by only discharging water which satisfies the criteria identified in **Table 1**, will minimise the potential for migration of sediments to downstream waters. Although the structures presented on **Figure 1** have been designed to enable the movement of surface water on the mine site at non-erosive velocities and have been shown to be effective in this respect, the following additional procedures and management practices have been adopted and will be continued to further reduce the risk of erosion and sedimentation.

(i) Areas on the mine site without some form of vegetation cover will be minimised. A non-persistent cover crop will be sown on any exposed surfaces not required for operational purposes or inactive topsoil or subsoil stockpiles retained in excess of three months.

(ii) The erosion and sediment control structures will be inspected monthly, or after a rainfall event of >25mm/24hr, to assess their success in preventing erosion, identify signs of potential erosion and determine the retained capacity, especially within the sediment basins.

(iii) The erosion and sediment control structures will be cleaned of accumulated sediment material (or extended or replaced) as soon as 20% capacity is lost due to the accumulation of material such that the specified capacities are maintained.

(iv) As part of a surface water monitoring program, water flowing from the following discharge points (SD-1, SD-2, SD-3, SD-4 and SD-5) will be sampled for suspended sediment.

(v) Water captured in the open cut void will be allowed time to settle within the sumps before being pumped to one or more of the sediment basins identified in **Figure 1**.

(vi) All discharges from the rock-lined waterways will flow to sediment basins.

(vii) If, following heavy rain, erosion is identified on the rehabilitated landform or in operational areas, it will be remediated quickly using one or a combination of the following.

a. Filling the erosion channels.

b. Cross-ripping (along the contour) to assist infiltration.

c. Installation of additional controls, eg banks sown with a non-persistent cover crop.

Areas previously identified and treated to prevent further erosion will be monitored on a minimum monthly basis or following a rainfall event of >25mm/24hr.

5.0 SURFACE AND GROUNDWATER MONITORING

5.1 Surface Water

Surface water monitoring is currently undertaken at the locations, frequency and for the parameters and purpose identified in **Table 3**. Surface water monitoring locations are shown on **Figure 3** (pre-fix WW-). The monitoring sites, parameters and frequency are consistent with the requirements of EPL 10094.

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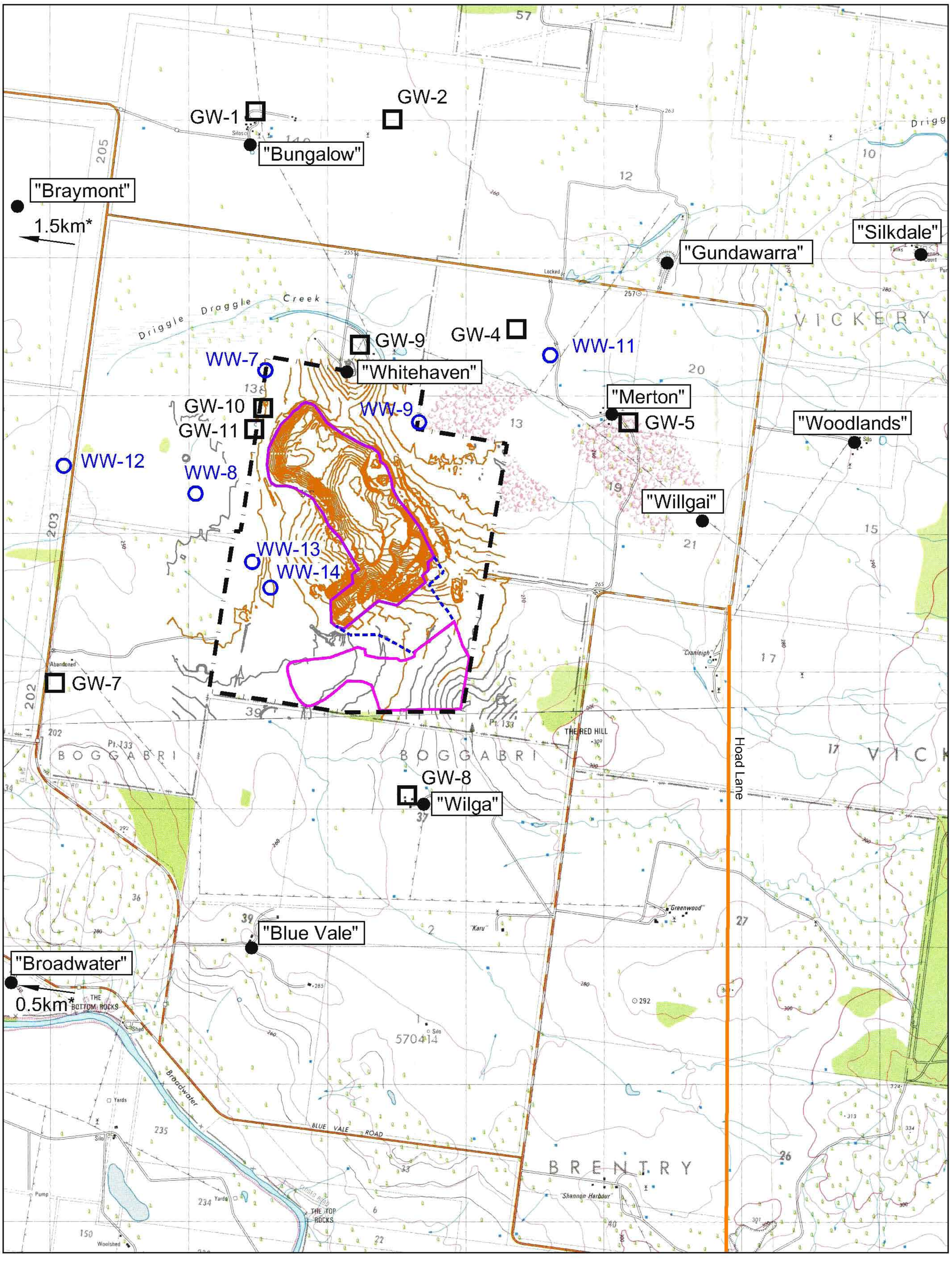
TN

MN



REFERENCE

Mining Lease Boundary - ML 1471

WW-1 Surface Water Monitoring Site

GW-4 Groundwater Monitoring Site

SCALE 1:50 000

0.5 0 0.5 1.0 1.5 2.0 2.5 km

Figure Compiled by R.W. Corkery & Co.

Figure 3

SURFACE AND GROUNDWATER MONITORING LOCATIONS

TABLE 3

Surface Water Monitoring

Site (see Figure 3)	Site Description	Frequency	Parameters	Purpose
WW-7	Discharge from SD-1	Each overflow event when discharging	pH, TSS, Grease and Oil, Conductivity, Volume	To verify compliance with EPL and parameters identified in **Table 1.**
WW-8	Discharge from SD-2	Each overflow event when discharging	pH, TSS, Grease and Oil, Conductivity, Volume	To verify compliance with EPL and parameters identified in **Table 1.**
WW-9	Discharge from SD-3	Each overflow event when discharging	pH, TSS, Grease and Oil, Conductivity	To verify compliance with EPL and parameters identified in **Table 1.**
WW-11	Driggle Draggle Creek, upstream of any mine-related discharges *	If discharge is occurring at WW-7, WW-8, WW-9, WW-13 or WW-14	pH, TSS, Grease and Oil, Conductivity	To determine quality of water in Driggle Draggle Creek upstream of all mining-related activities.
WW-12	Driggle Draggle Creek, downstream of any mine-related discharges *	If discharge is occurring at WW-7, WW-8, WW-9, WW-13 or WW-14	pH, TSS, Grease and Oil, Conductivity	To determine quality of water in Driggle Draggle Creek downstream of all mining-related activities. To compare with WW-11.
WW-13	Discharge from SD-4	Each overflow event when discharging	pH, TSS, Grease and Oil, Conductivity, Volume	To verify compliance with EPL and parameters identified in **Table 1**.
WW-14	Discharge from SD-5	Each overflow event when discharging	pH, TSS, Grease and Oil, Conductivity, Volume	To verify compliance with EPL and parameters identified in **Table 1**.
* Where streamflows occurring and discharges reach Driggle Draggle Creek				

Monitoring over the remaining operational life of the mine and until all areas are rehabilitated will, as a minimum, continue in accordance with **Table 3**.

5.2 Groundwater

Groundwater level and quality monitoring is currently undertaken at the locations, frequency and for the parameters identified in **Table 4**. Monitoring locations are shown on **Figure 3** (prefix GW-).

TABLE 4

Groundwater Monitoring

Site (see Plan 3)	Registered Bore No.	Property	Frequency				Hours Pumped / Extraction Rate Volume	Purpose
			SWL *[2]	E.C. *[3]	pH, Na, Ca, K, Mg, Fe, Mn, Al, As, CI, SO_4, Alkalinity, NO_3 and NO_2 (as N)	TDS, TPH, Cu, Ni, Pb, Se, Zn, Cd.		
GW-1 *[1]	GW031896	"Bungalow"	Quarterly	Six monthly		-	-	To determine existing status and any impacts
GW-2 *[1]	GW031897	"Bungalow"	Quarterly	Six monthly		-	-	To determine existing status and any impacts
GW-3 (a)	GW003087	"Gundawarra"	Nil	Nil	Nil	-	-	
GW-4 *[1]	GW000880	"Merton"	Quarterly	Six monthly		-	-	To determine existing status and any impacts
GW-5 *[1]	GW000891	"Merton"	Quarterly	Six monthly			-	To determine existing status and any impacts
GW-7 *[1]	GW001653	"Womboola"	Quarterly	Six monthly			-	To determine existing status and any impacts
GW-8 *[1]	GW005749	"Wilga"	Quarterly	Six monthly			-	To determine existing status and any impacts
GW-9	GW001613	"Whitehaven"	Quarterly	Six monthly			-	To determine existing status and any impacts
GW-10	GW001602	"Whitehaven"	-	Six monthly			-	To determine existing status and any impacts
GW-11 *[4]	90BL249901	"Whitehaven"	-	-	Annually		Annually	To determine existing status and any impacts
GW-12 *[4]	90BL252067	"Womboola"	Nil	Nil	Nil		Nil	
GW-13*[4]	Pending	"Womboola"	-	Six monthly	Annually	Annually	Annually	To determine existing status and any impacts
P1 *[6]	Pending	"Womboola"	Quarterly	Six monthly	Six monthly	Six monthly	-	To determine existing status, impacts; and recovery during and following mining
P2 *[6]	Pending	"Womboola"	Quarterly	Six monthly	Six monthly	Six monthly	-	
P3 *[6]	Pending	"Womboola"	Quarterly	Six monthly	Six monthly	Six monthly	-	

*[1] Non-Company Owned Bore
*[2] SWL – Standing Water Level
*[3] EC = Electrical Conductivity
*[4] Company Production Bore
*[5] Until Mined
*[6] Piezometer

Note: (a) SWL and EC monitoring at former site GW-3 ("Gundawarra") were terminated in May 2005 at the request of the landowner.
(b) Sites GW-6 and GW-12 were formerly located in an area which has now been mined.

Groundwater monitoring over the remaining life of the mine will continue in accordance with **Table 3** with additional monitoring as noted below. The parameters to be monitored and

frequency of monitoring presented in **Table 3** have been developed in consultation with the Department of Natural Resources.

- Groundwater / surface water accumulating within the open cut sump. This water will be monitored six monthly for pH, EC, Na, Ca, K, Mg, Fe, Mn, Al, As, Cl, SO_4, alkalinity, NO_3 and NO_2 (as N) Cd, Cu, Ni, Zn, Pb, Se in order to subsequently assess the impacts of groundwater movement from the final void to the adjacent groundwater and surface water resources

5.3 Water Balance Review

In order to refine the water balance presented in Section 3.0, and more accurately assess annual production and/or use from various sources, eg groundwater bores, the open cut, sediment dams, "clean" water storages (from Storage Dams SD-6, SD-7 and SD-8) WCM and Roche have initiated a programme of data collection / reconciliation including:

- recording pumping hours – from the open cut sump, sediment basins or storage dams. Pumping hours will be multiplied by the known output for the individual pumps to provide a yield;
- pumping destinations, eg whether water is pumped from the open cut directly to the water truck, to a sediment basin or to the land surface;
- dust suppression usage – by truck load;
- rehabilitation usage by truck load.

Records will be collated monthly.

6.0 SURFACE AND GROUNDWATER RESPONSE PLAN

6.1 Introduction

With the exception of bores GW-6 and GW-12 which showed a decrease in groundwater level as the mine excavation approached within 200m and have subsequently been removed during mining, groundwater monitoring results have shown levels and chemistry to have remained essentially unchanged at locations as close as 200m from points of groundwater extraction or mining, or to have exhibited only minor fluctuations over time. Similarly, the limited surface water monitoring undertaken has shown that discharges have, with one exception, complied

with the DEC (EPA) discharge criteria and that on that occasion, the quality of the discharge was higher than that in the receiving water.

Notwithstanding, WCM recognises that any poor management practice has the potential to adversely impact on surface and groundwater in the short and/or longer term.

Sections 6.2 and 6.3 present the response plan with respect to surface water and groundwater while the response in the event of a major liquid hydrocarbon / contaminant spill which could potentially adversely affect both surface and/or groundwater, is presented in Section 6.4.

6.2 Surface Water

In the event that monitoring (see Section 5.1) shows that the quality of water discharged from Storage Dams (SD-1 to SD-5) (**Figure 3**) are exceeding the discharge criteria (**Table 1**) and reaching Driggle Draggle Creek, WCM will contact the Armidale office of DEC (EPA) advising of the event and salient proceeding weather conditions and, subject to their advice, may undertake one or a combination of the following.

(i) Direct non-compliant discharges to other storages or the open cut to provide additional residence time.

(ii) Add flocculants.

(iii) Increase the storage / detention capacity through the enlargement of existing structures or construction of new structures. Either of these treatments would be quickly achievable with the equipment permanently positioned on-site.

It should be noted that the surface water monitoring programme (Section 5.1) identifies the monitoring of Driggle Draggle Creek water upstream and downstream of any discharge as a means of assessing the impact on the creek, that is, if the discharge is reaching or flows are occurring within the creek.

A report will be provided to the DEC detailing any non-compliant discharge and the rectification / amelioration measures adopted.

6.3 Groundwater

Table 5 presents the trigger levels for changes in groundwater level and chemistry which will be used to assess the potential for significant impact to groundwater level and quality. The triggers will be assessed against the natural conditions which have been determined through the baseline and routine monitoring programmes undertaken before and since the commencement of mining.

TABLE 5

Trigger Levels and Benchmarks

Parameter	Measure	Benchmark	Trigger Level
Standing Water Level	Saturated Thickness	Natural Conditions	15% Reduction
Chemistry	EC	Natural Conditions	15% Increase
	pH	Natural Conditions	15% Increase or Decrease

In the event that routine monitoring indicates that a trigger has been reached or is being approached on any privately-owned bore, WCM will commission a hydrogeologist to review the data, with the outcomes of that review, including any recommendations, being subject to discussion and agreement with the DNR hydrogeologists.

A trigger of pH or EC would initially lead to an increase in the analytes monitored and/or frequency of sampling to confirm the magnitude and extent of the change in water chemistry and verify the change is a consequence of mining.

Should the saturated thickness trigger level be achieved in any bore, WCM will notify the affected landowner(s) and, if WCM's and DNR's hydrogeologists are of the opinion that the reduction is a consequence of mining, initiate negotiations with the affected landowners with the intent of formulating an agreement which provides for one or a combination of:

- re-establishment of saturated thickness in the affected bore(s) through bore deepening;
- establishment of additional bores to provide a yield at least equivalent to the affected bore prior to mining;

- provision of access to alternative sources of water; and
- monetary compensation to reflect increased water extraction costs (if any), for example as a consequence of lowering pumps or installation of additional or alternative pumping equipment.

An independent authority may also be used where a dispute arises as to the cause of the change, given that groundwater supply and quality can be affected by non-mining related factors such as bore siltation, aquifer depletion by large scale agricultural users, bacterial infection, fertilizer contamination etc.

6.4 Major Hydrocarbon / Contaminant Spill

In the event a major liquid hydrocarbon/contaminant spill was to occur, WCM will implement the following 3-phase remediation plan.

Phase 1

Recover as much as possible at the source by pumping the contaminant from the surface and excavating contaminated materials and stockpiling them on site under cover and on an impermeable surface (eg a high density polyethylene sheet). This material will later be bio-remediated on site and/or transported to an approved waste depot.

Phase 2 – Source Control

Begin hydraulic control of the source to prevent spreading of contamination. This will involve digging one or more holes close to the centre of the spill area, and pumping from these holes to create a cone of depression with a hydraulic gradient towards the holes. This will prevent movement of contamination away from the area of the spill.

Phase 3 – Recovery

If necessary, install boreholes to remove and treat contaminated groundwater. Any surface water or groundwater recovered will be treated on site prior to release (or use for processing or dust suppression) under an EPA licence.

No solid potential contaminants will be used on the site in sufficient quantity as to require development of a specific contingency plan. However, any spillages of such materials, eg explosives, will immediately be cleaned up and disposed of in an appropriate manner approved by DEC.

Notwithstanding the measures identified above, WCM recognises that the potential remains for changes in groundwater quality to occur which may or may not be a consequence of potential contaminants used on the mine site. Should such a situation be demonstrated by monitoring, appropriate measures to mitigate impacts on groundwater quality will be developed in consultation with DNR's hydrogeologists, with the nature of the "appropriate solution(s)", eg pumping and treatment, isolation or remediation, being dependent on the nature of the issue.

7.0 POST-MINING DATA AND MONITORING REVIEW

WCM will undertake routine surface and groundwater monitoring throughout the remaining life of the mine as identified in Section 5 and, for groundwater and downstream surface water resources, for a period of five years after the cessation of mining (or as otherwise directed by the Director-General), with the details of the monitoring programme to be presented in the Mine Closure Plan.

After five years (or as otherwise directed), the results of the post-mining monitoring, particularly the water quality and level within the final void, the levels and chemistry in surrounding bores and the chemistry of downstream waters, will be assessed to ascertain the need for a continuance of the programme, its expansion, reduction or termination.

8.0 REPORTING

In accordance with Conditions 5(5) and 5(10) of DA 8-1-2005, WCM will

1. present surface and groundwater monitoring results and a site water balance review in each AEMR along with:
    - an analysis of the results against the relevant criteria with DA 8-1-2005, monitoring results for the previous years and the predictions in the EIS and SoEEs prepared for the development;

- an identification of trends over the life of the development;
- the identification and discussion of any non-compliances during the reporting period;
- a description of actions implemented to ensure compliance; and
- a description of any refinements to the site water management plan or system;

2. provide the results to the CCC; and
3. make the results of the monitoring available for public examination at the Gunnedah and Narrabri Council offices.