THE WALLERAWANG COLLIERIES LIMITED

ENVIRONMENTAL MONITORING SUMMARY October – December 2011

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1. INTRODUCTION

In accordance with Schedule 5, Condition 9 of Project Approval 09_0178 this report provides a summary of environmental monitoring results for Baal Bone Colliery, for the period 1 October 2011 – 31 December 2011. Baal Bone's licensed discharge and monitoring locations are identified in **Drawing 1** and **Drawing 2**. Noise monitoring locations are identified in **Drawing 3.** Results included in this summary include – air quality, surface water quality and dewatering bore flow rates.

2. AIR QUALITY

In accordance with Schedule 3, Condition 12 of Project Approval 09_0178 Baal Bone Colliery has developed an Air Quality Monitoring Program (AQMP). The Department of Planning approved the AQMP in correspondence dated 6 July 2011.

Monthly dust fall-out monitoring is carried out in accordance with Australian Standard AS3580.10.1, EPL requirements and Baal Bone's AQMP. Baal Bone has engaged ALS Group Environmental Division Mudgee, a NATA Accredited laboratory, to undertake monthly sampling, monitoring and analysis.

Baal Bone maintains a network of five dust deposition gauges to monitor dust levels around site and in the vicinity of the nearest neighbour, these are:

- Sample location DM1 (EPL monitoring point No. 7);
- Sample location DM2 (EPL monitoring point No. 13);
- Sample location DM3 (EPL monitoring point No. 14); and
- Sample location DM4 (EPL monitoring point No. 15).
- Sample location DM5 – installed 8 September 2011 (EPL monitoring point No. 16).

Particulate matter less than 10 µm in size (PM10) and high volume air sampler total suspended particulate (TSP) monitors were installed 23 October 2011 and 29 October 2011 respectively in accordance with a revised Air Quality Management Plan which was approved by the Department of Planning and Infrastructure in accordance with Project Approval 09_0178. The location of the TSP and PM10 monitors are situated at the same location as DM2.

Locations of all air quality monitoring gauges are shown in **Drawing 1.**

2.1 Air Quality Impact Assessment Criteria

Schedule 3, Condition 10 of Project Approval 09_0178 includes air quality impact assessment criteria for the project which are summarised in **Table 2.1** below. The pollutants to be monitored include deposited dust, TSP and PM10.

Table 2.1: Baal Bone Air Quality Impact Assessment Criteria

Pollutant	Averaging period	Criterion	
Deposited dust	Annual	Maximum increase	Maximum total
		2 g/m^2/month	4 g/m^2/month
TSP	Annual	90 µg/m^3	
PM^{10}	24 hour	50 µg/m^3	
	Annual	30 µg/m^3	

2.2 Depositional Rust Monitoring Results

Levels of deposited dust at Baal Bone's five gauges were below the 4g/m^2/month criterion during the reporting period (refer to **Table 2.2**). Further, the maximum increase criterion of 2g/m^2/month was not exceeded. **Figures 2.1 to 2.5** provide monthly results for each depositional dust gauge for 2012.

Table 2.2: Deposited dust monitoring results for the reporting period (g/m^2/month)

Month	DM1	DM2	DM3	DM4	DM5
October	0.3	0.5	0.3	0.3	0.5
November	0.4	0.4	0.3	0.2	0.4
December	0.1	0.4	1.9	0.1	0.1

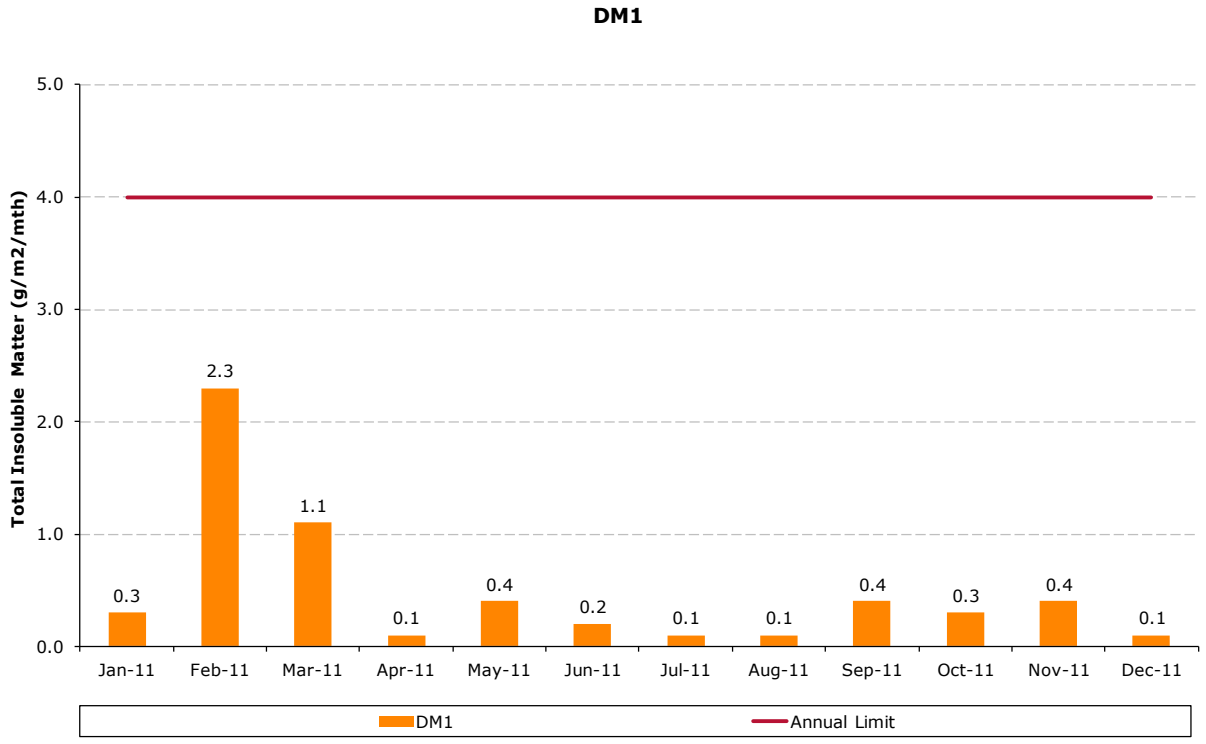


Figure 2.1: Dust monitoring gauge DM1 (EPL monitoring point No. 7)

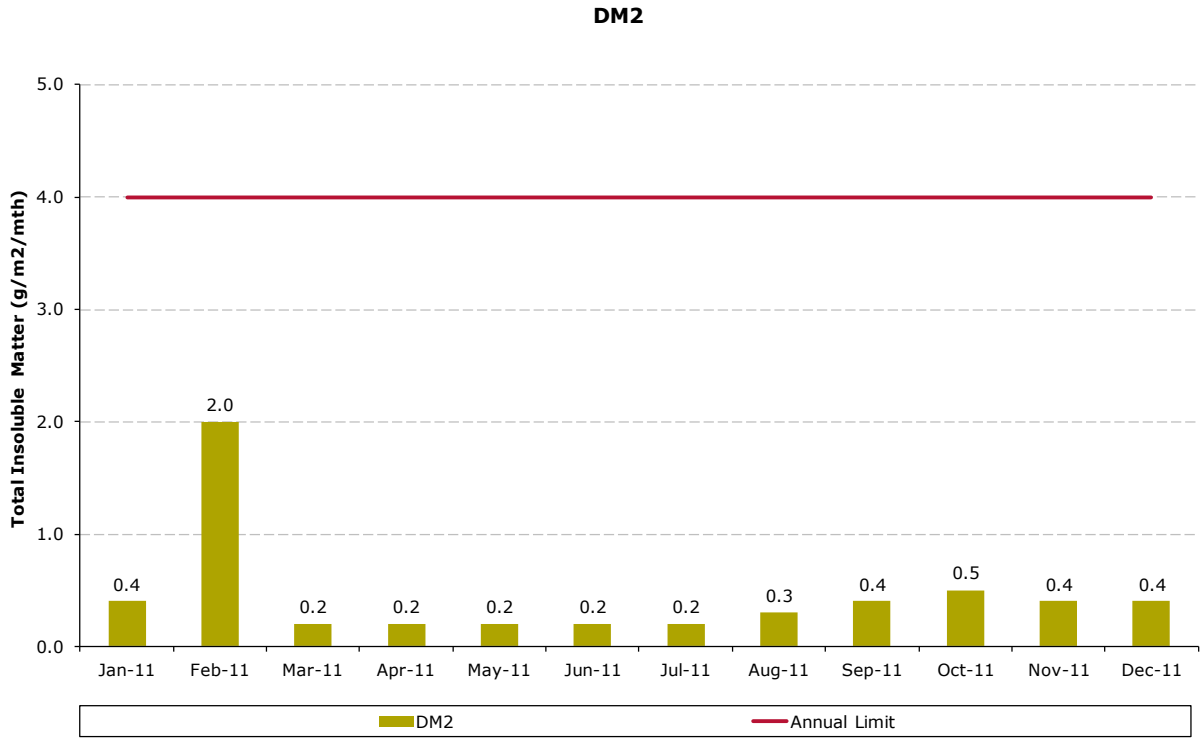


Figure 2.2: Dust monitoring gauge DM2 (EPL monitoring point No. 13)

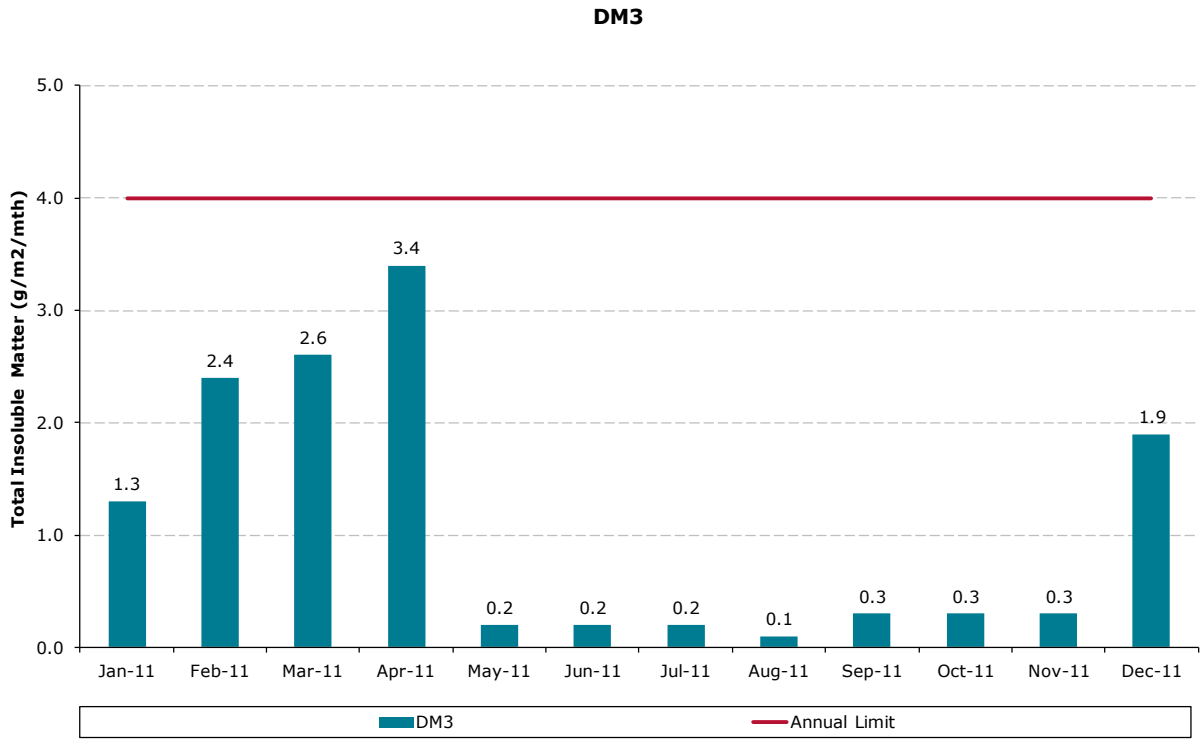


Figure 2.3: Dust monitoring gauge DM3 (EPL monitoring point No. 14)

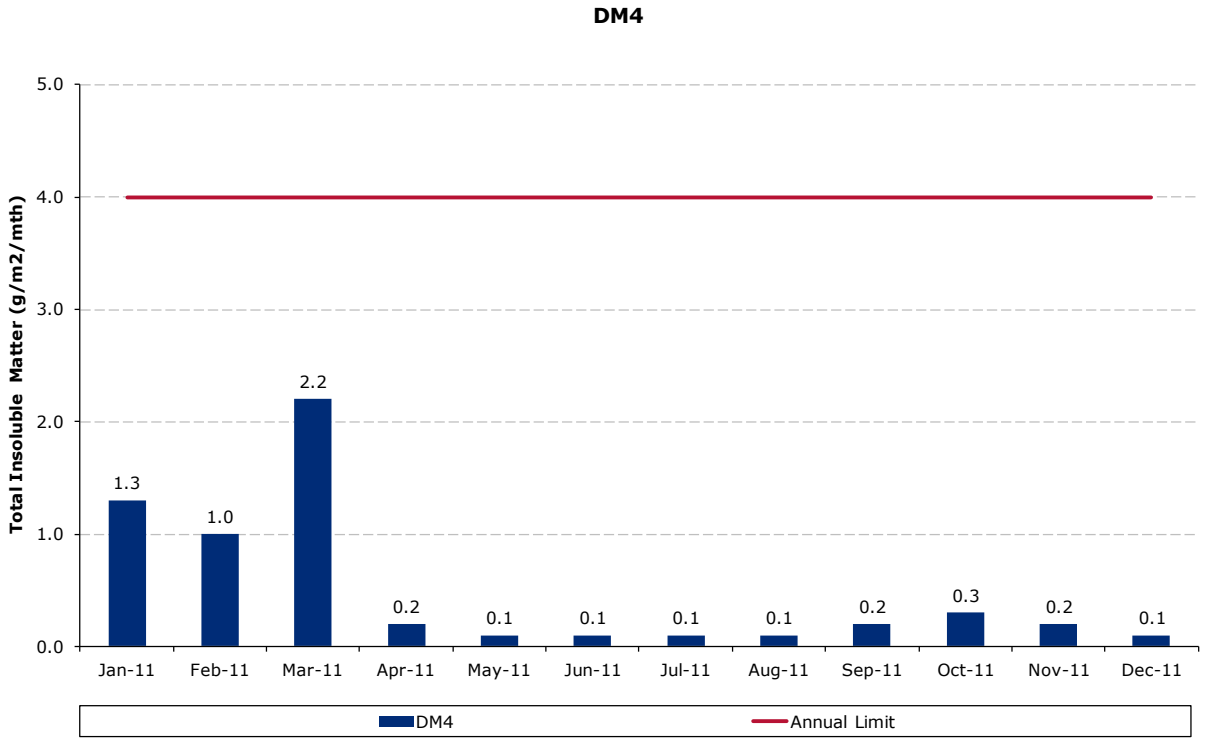


Figure 2.4: Dust monitoring gauge DM4 (EPL monitoring point No. 15)

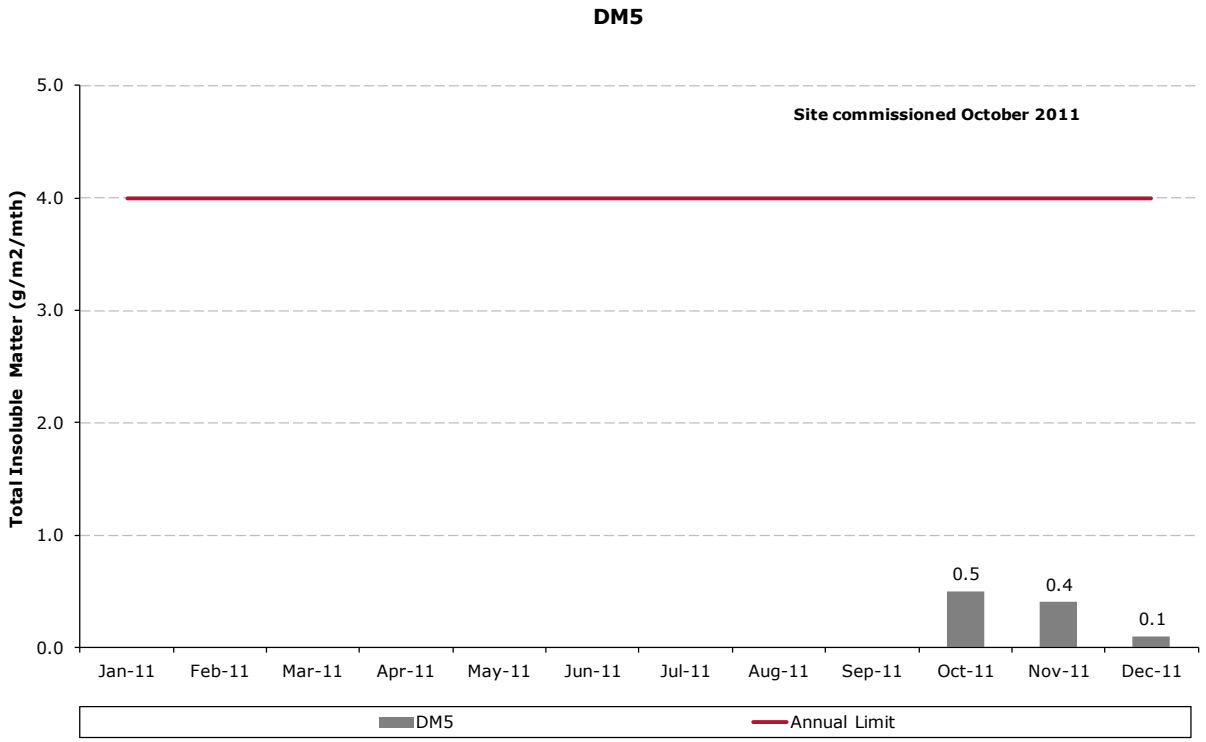


Figure 2.5: Dust monitoring gauge DM5 (EPL monitoring point No. 16)

2.3 Total Suspended Particulate Results

A high volume air sampler (HVAS) monitors total suspended particulates (TSP) at one location: DM2. HVAS run on a six-day cycle in accordance with EPA/OEH requirements.

Figure 2.6 shows the TSP results for the reporting period.

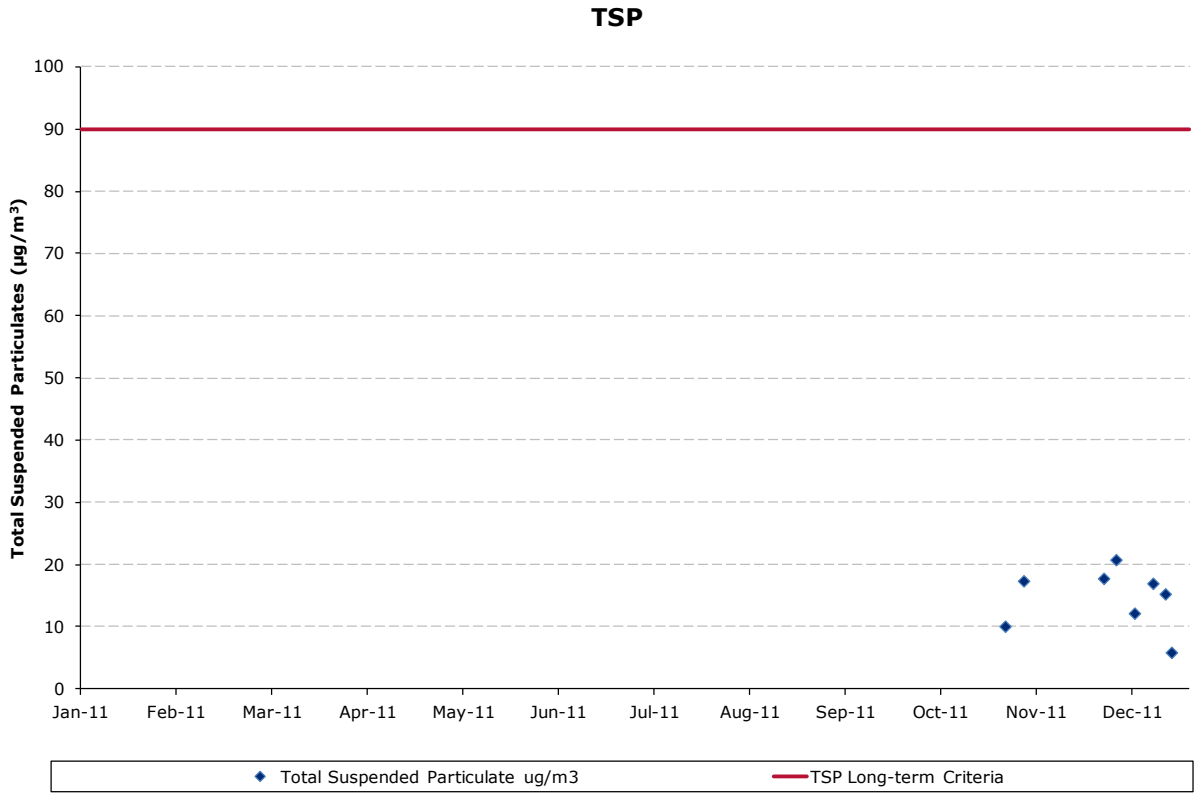


Figure 2.6: TSP Results

As the HVAS for monitoring TSP was installed in October 2011, the annual rolling average is not available for the current reporting period.

As illustrated at **Figure 2.6** the TSP levels during the reporting period were well below the long-term criteria, with the average TSP level for the October – December 2011 period being 14.6 µg/m^3.

2.4 PM^{10} Results

A Tapered Element Oscillating Microbalance Analyser (TEOM) measures particulate matter up to 10 microns in diameter (PM^{10}) at one location: DM2.

Figure 2.7 shows PM^{10} 24 hour average results for the reporting period.

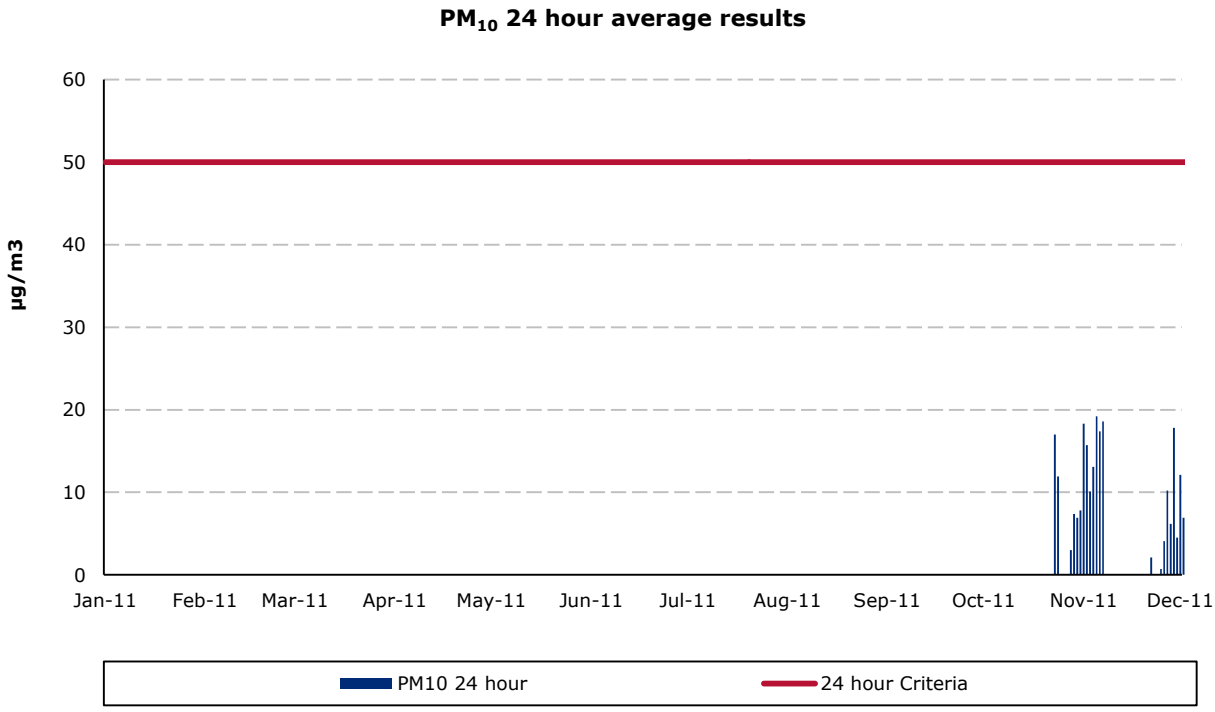


Figure 2.7: PM^{10} 24 hour average results for the reporting period

As illustrated in **Figure 2.7** the PM10 levels during the reporting period were below the short-term assessment criteria (50 µg/m^3).

As the TEOM was installed in October 2011, the annual rolling average will not available until October 2012.

3. SURFACE WATER

Baal Bone has engaged ALS Group Environmental Division Mudgee, a NATA Accredited laboratory, to undertake monthly sampling, monitoring and analysis of a range of surface and subsurface waters.

Baal Bone maintains a network of five licensed discharge and monitoring points in accordance with EPL 765 (viz. LD2, LD3, LD6, LDP1 and WMP1)(**Drawing 1 and Drawing 2**).

A copy of EPL 765 can be accessed here: http://www.environment.nsw.gov.au/prpoeoapp/ViewPOEOLicence.aspx?DOCID=31065&SYSUID=1&LICID=765.

3.1 Water Quality Concentration Limits

Condition L2 of EPL 765 outlines water concentration limits for oil and grease, pH, total suspended solids and total iron. These limits are presented below in **Table 3.1.**

Table 3.1: EPL concentration limits

	LD2	LD3	LD6	LDP1	WMP1
Oil and grease (mg/L)	-	10	10	10	-
pH	-	6.5-8.5	6.5-8.5	6.5-8.5	-
Total Suspended Solids (mg/L)	-	50	50	50	-
Total Iron (mg/L)	-	-	1.0	1.0	-

3.2 Water Quality Results

Monitoring results for Baal Bone's five licensed discharge and monitoring points as required by EPL 765 are presented below in **Table 3.2**.

Table 3.2: Water quality results for the reporting period

EPL Point [1]	Month	EC uS/cm	Oil & Grease mg/L	SO_4^{2-} mg/L	Fe mg/L	TSS mg/L	pH	BOD mg/L	Faecal Coliforms cos/100mls	N mg/L	P mg/L
LD2	Oct	-	8.0	-	-	15	7.6	14.0	1	13.3	5.33
	Nov[3]	-	-	-	-	-	-	-	-	-	-
	Dec[3]	-	-	-	-	-	-	-	-	-	-
LD3	Oct[2]	-	-	-	-	-	-	-	-	-	-
	Nov[2]	-	-	-	-	-	-	-	-	-	-
	Dec	1650	<2	374	5.1	6	6.9	-	-	-	-
LD6	Oct	1530	<2	454	1.2	2	7.6	-	-	-	-
	Nov	1690	<2	475	0.39	<2	7	-	-	-	-
	Dec	1470	<2	320	0.14	3	6.9	-	-	-	-
LDP 1	Oct	-	-	-	-	-	-	-	-	-	-
	Nov	1280	<2	445	0.64	4	7.8	-	-	<0.1	<0.01
	Dec	1150	<2	374	0.28	3	7.6	-	-	0.3	<0.01

1. No samples taken at WMP1 during the reporting period as the sample point was dry.
2. No samples taken as there was no discharge/flow at the sample point.
3. No sample taken as the sample point was dry.

Legend

EC = Electrical conductivity
Fe = Iron
BOD = Biological oxygen demand
P = Phosphorus
SO_4^{2-} = Sulfate
TSS = Total suspended solids
N = Nitrogen

Figures 3.1 to 3.4 provide monthly water quality results compared to EPL concentration limits.

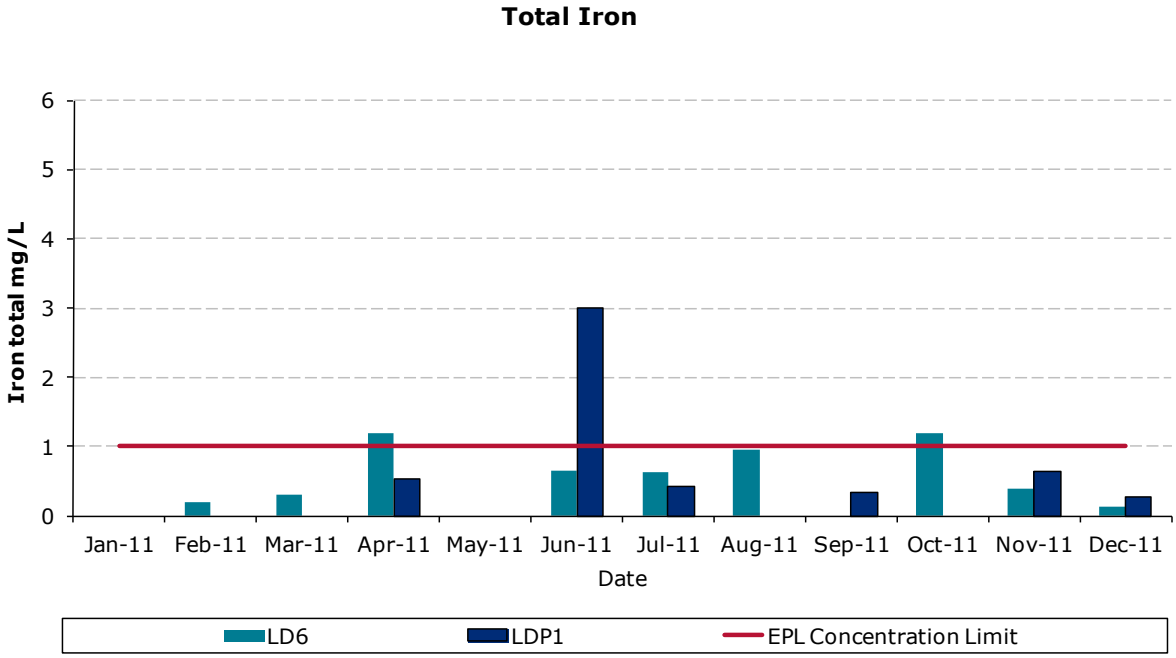


Figure 3.1: Total Iron levels

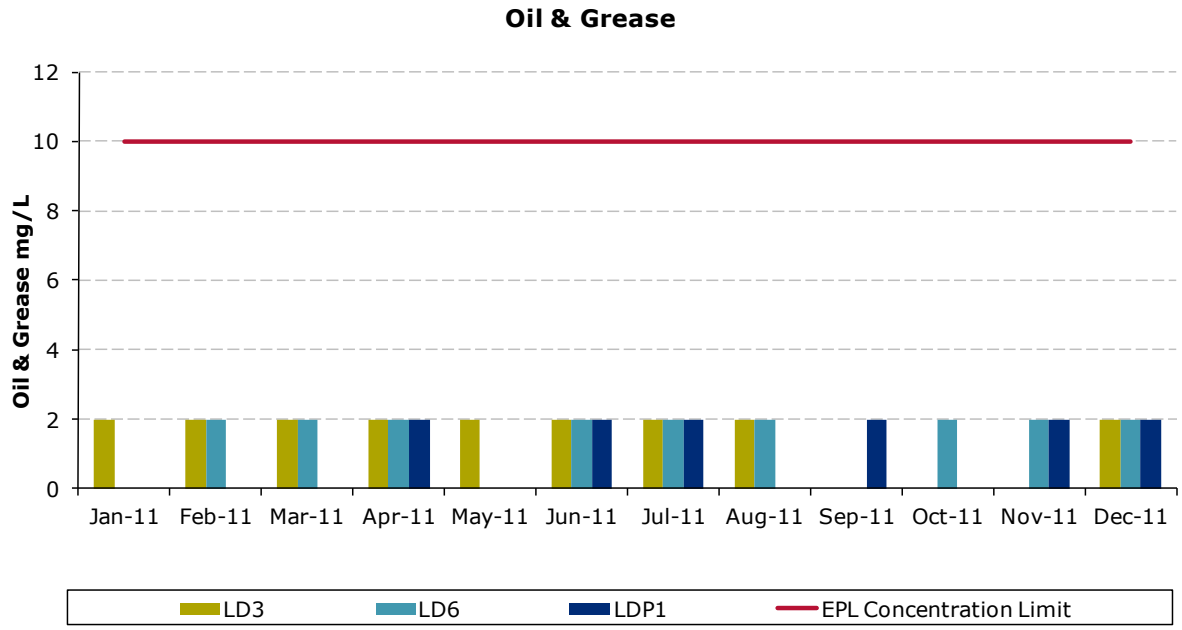


Figure 3.2: Oil and grease levels

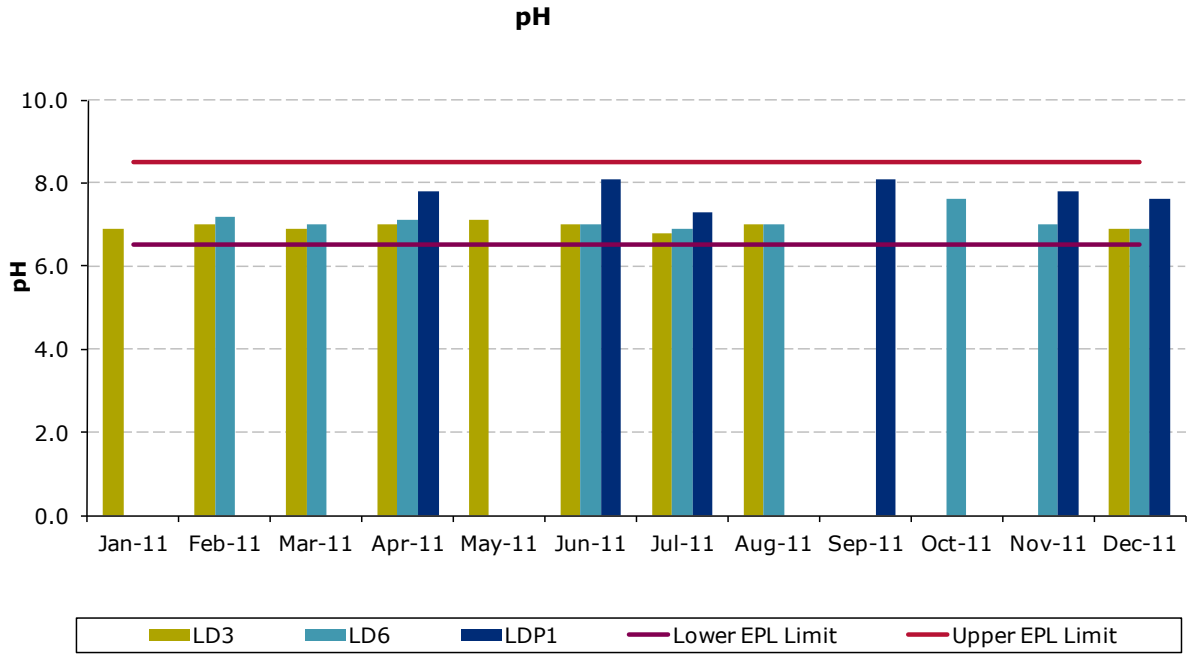


Figure 3.3: pH levels

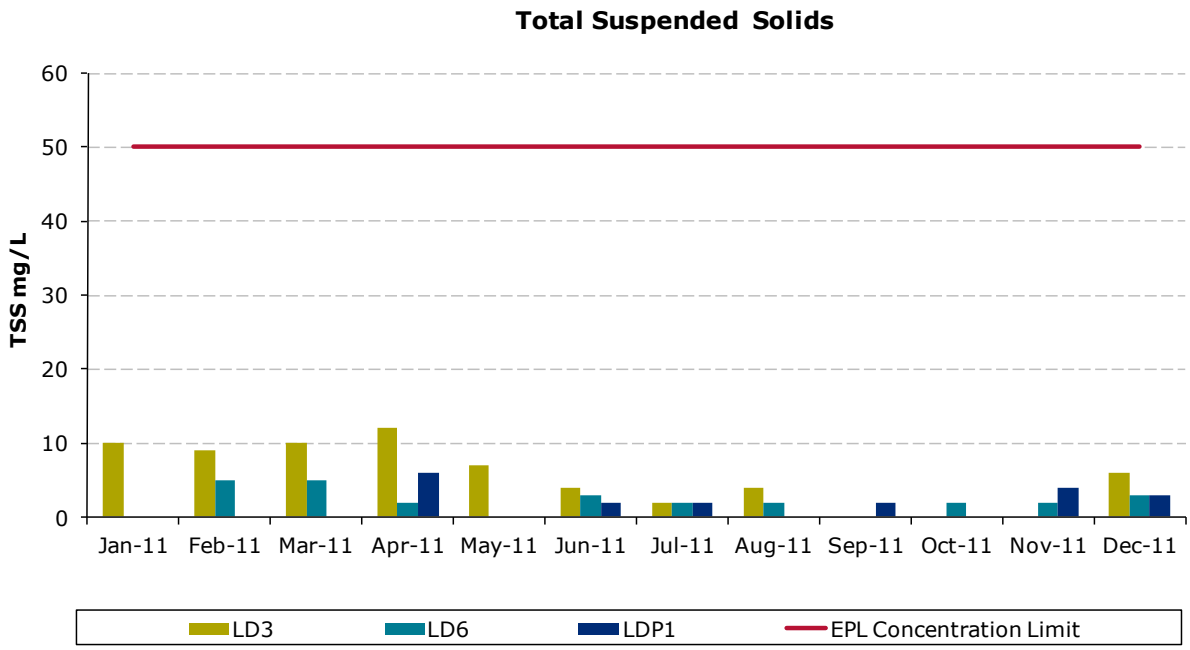


Figure 3.4: Total suspended solids levels

All samples for the October to December 2011 reporting period were within EPL concentration limits except for iron levels at LD6 in October. For the entire 2011 reporting period there were three exceedances of iron levels: April and October 2011 at LD6, and June 2011 at LDP1.

A summary of monitoring results for EPL discharge and monitoring points (those with specified concentration limits) during the October – December 2011 period can be found below:

- All samples for oil and grease at returned levels of 2 mg/L or less, well below the EPL concentration limit of 10 mg/L.
- All samples returned pH results that were within the upper and lower EPL limits (8.5 and 6.5 respectively).
- All TSS results were at or below 6 mg/L, well below the concentration limit of 50 mg/L.

Initial investigations into iron levels at LDP1 and LD6 were unable to determine a cause for the non-compliance. As such a follow-up investigation will be conducted during 2012, including weekly surface water testing at LDP1 for a period of eight weeks to determine if any trends are discernible with increased monitoring frequency. Appropriate actions arising from the investigation will be implemented. Furthermore a new system for tracking monitoring results is scheduled to be deployed on-site during 2012, with the aim of improving the identification of trends.

4. GROUNDWATER

Condition L3.1 of EPL 765 specifies a discharge volume limit of 12 ML per day at LD6.

During the October to December 2011 period, discharges from LD6 did not exceed the daily limit, with an average daily discharge at LD6 of 3.0 ML per day.

5. NOISE

Baal Bone Colliery has developed a Noise Management Plan (NMP) in accordance with Schedule 3, Condition 6 of Project Approval 09_0178. The NMP was approved by the Department of Planning in correspondence dated 11 November 2012.

As per the NMP Baal Bone Colliery operates a real time noise monitor at location R2. In addition to real time noise monitoring (which is supplementary to regulatory measurements), attended monitoring is undertaken on a quarterly basis at receptors R1 and R2/R3 (**refer to Drawing 3**).

5.1 Noise Impact Assessment Criteria

Schedule 3, Condition 4 of Project Approval 09_0178 includes long term noise impact assessment criteria. Table 5.1 outlines the assessment criteria.

Table 5.1: Long term noise impact assessment criteria

Location	All periods dB(a) $L_{Aeq(15\ min)}$	Night dB(a) $L_{A1(1\ min)}$
R1	46	47
R2	41	48
R3	41	48
All other privately-owned land	35	45

5.2 Noise Audit Results

During the reporting period an environmental compliance noise audit was conducted by Atkins Acoustics & Associates on Tuesday 4 October 2011 between 3.00pm and 12.00 midnight.

Table 5.2 summarises the results from the audit.

Table 5.2: Attended noise measurement results

Location (Start time)	Measured Predicted Colliery Noise L_{Aeq}	Limit	Unit	Comments
Daytime Audit (3.30pm to 6.00pm, Tuesday 4 October 2011)				
R1 (1537 hrs)	<32	48	dBA	Drift ventilation fan; Insects; Frogs, Road traffic
R1 (1554 hrs)	<55	48	dBA	Dozer (track noise 46-52); Dozer (pushing 46-48); Dozer (reversing alarm 36-37); Insects, Road traffic
R2/R3 (1620 hrs)	<35	43	dBA	Dozer (track noise 45-48); Dozer (pushing 35-36); Dozer (reversing alarm 35-36); Insects, Road traffic; Children playing; Dozer behind coal stockpile <30
R2/R3 (1643 hrs)	<35	43	dBA	Dozer (track noise 44-48); Dozer (pushing 38-40); Dozer (reversing alarm 36-37); Insects, Road traffic; Three (3) vehicle drive bys

Location (Start time)	Measured Predicted Colliery Noise L_{Aeq}	Limit	Unit	Comments
Evening Audit (8.00pm to 10.00pm, Tuesday 4 October 2011)				
R1 (2045 hrs)	<47	48	dBA	Dozer (track noise 48-49); Dozer (pushing 46-47); Dozer (reversing alarm 47-48); Insects 43-44
R1 (2104 hrs)	<46	48	dBA	Dozer (track noise 50-52); Dozer (pushing 46-47); Dozer (reversing alarm 46-47); Insects 45
R2/R3 (2130 hrs)	<42	43	dBA	Dozer (track noise 48-49); Dozer (pushing 47-48); Dozer (reversing alarm 42-43); Insects 40-41.
R2/R3 (2149 hrs)	<41	43	dBA	Dozer (track noise 47-48); Dozer (pushing 45-46); Dozer (reversing alarm 36-37); Insects, One dozer stopped after 14 minutes

Location (Start time)	Measured Predicted Colliery Noise		Limit		Unit	Comments
	L_{Aeq}	L_{Amax}	L_{Aeq}	L_{Amax}		
Night Audit (10.00pm to midnight, Tuesday 4 October 2011)						
R1 (2250 hrs)	<37	<40	48	47	dBA	Drift ventilation fan; CPP; No dozer noise; Insects
R1 (2308 hrs)	<43	<40	48	47	dBA	Dozer started after 12 minutes; Dozer (pushing 45-46); Dozer (reversing alarm 44-45).
R2/R3 (2205 hrs)	<44	<40	43	48	dBA	Dozer (track noise 48-49); Dozer (pushing 40-41); Dozer (reversing alarm 39-40); One dozer.
R2/R3 (2221 hrs)	<38	<40	43	48	dBA	Drift ventilation fan; CPP; No dozer noise; Insects; Resident outdoors.

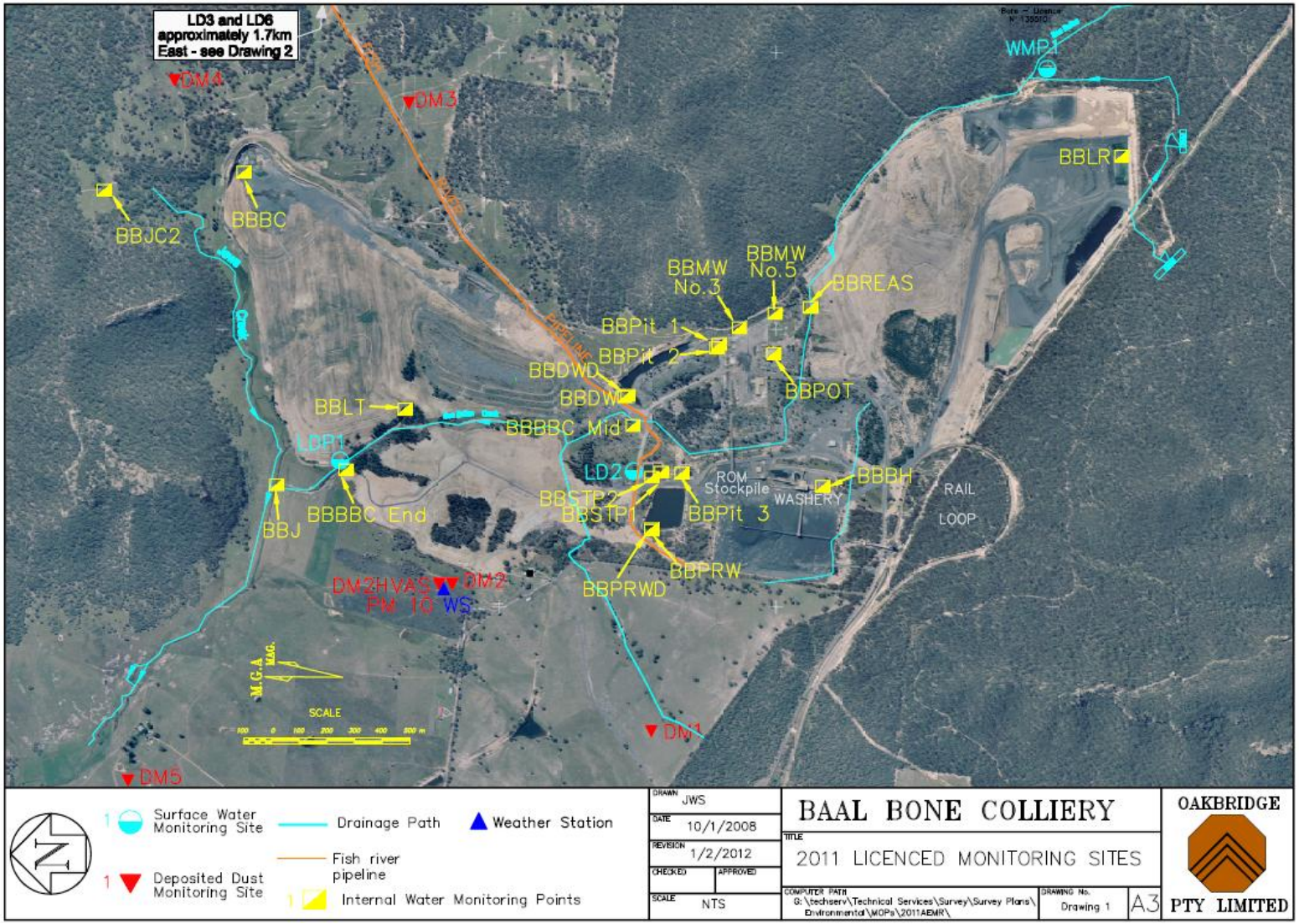
The audit report concluded that:

> "The LAeq, 15 min noise levels from *BBC* during the day and evening assessment periods satisfied the licence short-term noise limits. During the evening hours it was found that with the *BBC* dozers operating on the ROM stockpiles the LAeq, 15 min noise levels exceeded the long term licence limits by 1dBA at R1 and R2/3.
>
> With the dozers working the ROM stockpiles during the nighttime hours, the LAeq, 15 min noise levels from *BBC* exceeded the short-term licence limit at R2/3 by 1dBA and the long-term limit by 3dBA. Without the dozers operating on the stockpiles, noise from *BBC* satisfied both the short-term and long-term licence noise limits. Considering the evening noise measurements at R1 it is expected with the dozer operating, noise from the *BBC* would exceed the long-term licence noise limit."

The full noise audit report can be accessed from the Baal Bone publications page at: http://www.xstratacoal.com/EN/Operations/Pages/BaalBonePublicationsArchive.aspx.

To address noise exceedances associated with the use of the dozers on the ROM stockpiles, a rubber tyre dozer was trialled as an alternative to the tracked dozer. Orientation of plant equipment and coal stockpiles to shield noise generated by the dozer from sensitive receivers was also trialled. Orientation of the stockpiles was found to be more effective in reducing noise emissions than the use of a rubber tyre dozer. This measure was subsequently implemented, and attended noise monitoring carried out in February and May 2012 have found that Baal Bone Colliery is within noise limits.

Drawing 1


LD3 and LD6 approximately 1.7km East - see Drawing 2
DM4
DM3
WMP1
BBLR
BBJC2
BBBC
BBMW No.3
BBMW No.5
BBREAS
BBPit 1
BBPit 2
BBDWD
BBDW
BBPOT
BBLT
BBBBC Mid
LDP1
LD2
ROM Stockpile
WASHERY
BBBH
RAIL LOOP
BBSTP2
BBSTP1
BBPit 3
BBBBC End
BBJ
BBPRW
BBPRWD
DM2HVAS PM 10
DM2
WS
DM1
DM5
SCALE
Surface Water Monitoring Site
Deposited Dust Monitoring Site
Drainage Path
Fish river pipeline
Internal Water Monitoring Points
Weather Station
DRAWN JWS
DATE 10/1/2008
REVISION 1/2/2012
CHECKED
APPROVED
SCALE NTS
BAAL BONE COLLIERY
TITLE
2011 LICENCED MONITORING SITES
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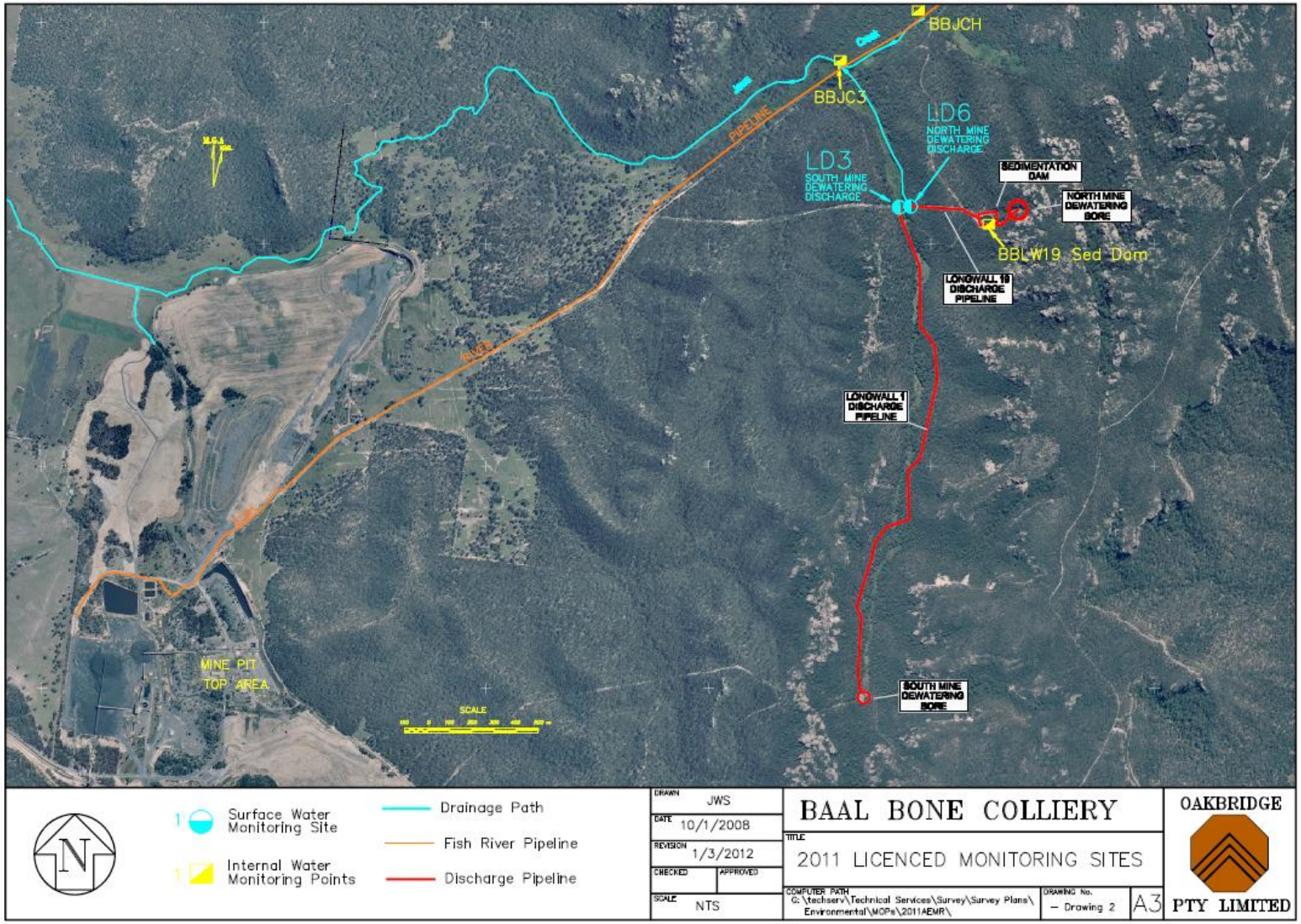
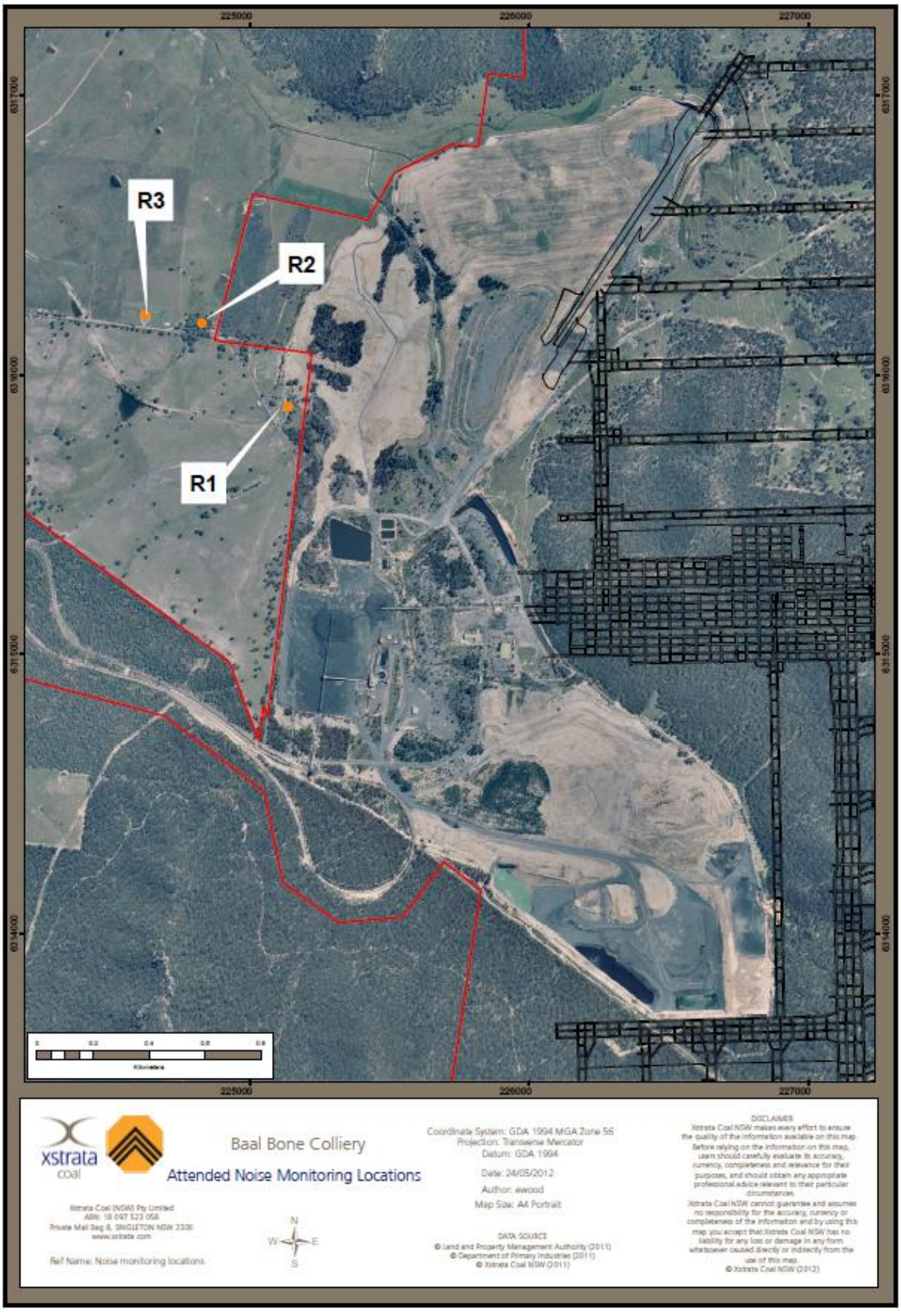
DRAWING No. Drawing 1
A3
OAKBRIDGE
PTY LIMITED

Drawing 2


BBJCH
BBJC3
LD6
NORTH MINE DEWATERING DISCHARGE
LD3
SOUTH MINE DEWATERING DISCHARGE
SEDIMENTATION DAM
NORTH MINE DEWATERING BORE
BBLW19 Sed Dam
LONGWALL 19 DISCHARGE PIPELINE
LONGWALL 1 DISCHARGE PIPELINE
SOUTH MINE DEWATERING BORE
MINE PIT TOP AREA
SCALE
Surface Water Monitoring Site
Internal Water Monitoring Points
Drainage Path
Fish River Pipeline
Discharge Pipeline
DRAWN JWS
DATE 10/1/2008
REVISION 1/3/2012
CHECKED
APPROVED
SCALE NTS
BAAL BONE COLLIERY
TITLE
2011 LICENCED MONITORING SITES
COMPUTER PATH G:\techserv\Technical Services\Survey\Survey Plans\Environmental\MOPs\2011AEMR\
DRAWING No. – Drawing 2
A3
OAKBRIDGE PTY LIMITED

Drawing 3


225000
226000
227000
6317000
6316000
6315000
6314000
R3
R2
R1
0
0.2
0.4
0.8
0.8
Kilometers
xstrata coal
Baal Bone Colliery
Attended Noise Monitoring Locations
Xstrata Coal (NSW) Pty Limited
ABN: 18 097 523 058
Private Mail Bag 8, SINGLETON NSW 2330
www.xstrata.com
Ref Name: Noise monitoring locations
N
W
E
S
Coordinate System: GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
Date: 24/05/2012
Author: ewood
Map Size: A4 Portrait
DATA SOURCE
© Land and Property Management Authority (2011)
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