



WE CARE. WE DELIVER.

# Bloomfield Colliery

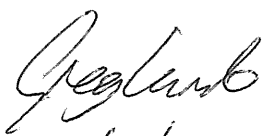
Annual Review Report

2019

# Bloomfield Collieries Pty Ltd

## Annual Review Report 2019

**Table 1: Title Block**

Name of Mine	Bloomfield Colliery		
Project Approval	PA 07_0087		
Name of PA Holder	Bloomfield Collieries Pty Limited		
Titles/Mining Leases	ML1738, CCL761, ANA1001		
Name of leaseholder	Bloomfield Collieries Pty Limited		
Name of Mine Operator	Bloomfield Collieries Pty Limited		
MOP Commencement Date	July 2018	MOP Completion Date	December 2020
Annual Review Commencement Date	1/1/2019	Annual Review End Date	31/12/2019
Water Licence	20AL217062 WAL 41506		
Name of Licence holder	Bloomfield Collieries Pty Limited		
<p>I, Greg Lamb, certify that this audit report is a true and accurate record of the compliance status of Bloomfield Colliery for the period 1/1/19 – 31/12/19 and that I am authorised to make this statement on behalf of Bloomfield Collieries Pty Ltd.</p> <p><i>Note.</i></p> <p>a) The Annual Review is an 'environmental audit' for the purposes of section 122B(2) of the Environmental Planning and Assessment Act 1979. Section 122E provides that a person must not include false or misleading information (or provide information for inclusion in) an audit report produced to the Minister in connection with an environmental audit if the person knows that the information is false or misleading in a material respect. The maximum penalty is, in the case of a corporation, \$1 million and for an individual, \$250,000.</p> <p>b) The Crimes Act 1900 contains other offences relating to false and misleading information: section 192G (Intention to defraud by false or misleading statement—maximum penalty 5 years imprisonment); sections 307A, 307B and 307C (False or misleading applications/information/documents—maximum penalty 2 years imprisonment or \$22,000, or both).</p>			
Name of Authorised Reporting Officer	Greg Lamb		
Title of Authorised Reporting Officer	Environmental Advisor		
Signature of Authorised Reporting Officer			
Date	30/3/20		

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## 1 STATEMENT OF COMPLIANCE

**Table 2: Statement of Compliance**

Were all conditions of the relevant approvals complied with?	
PA 07_0087	No
ML 1738	Yes

**Table 3: Non-compliances**

Relevant Approval	Condition No.	Condition Description	Compliance Status	Comment	Where addressed in Annual Review
PA 07_0087	Sched 3 - 15	Dust emission criteria	Non-compliant (Low)		Section 6.2.3
PA 07_0087	Sched 3 - 29A	Appropriate security for Biodiversity Offset Area	Non-compliant (Administrative)		Section 6.4.3

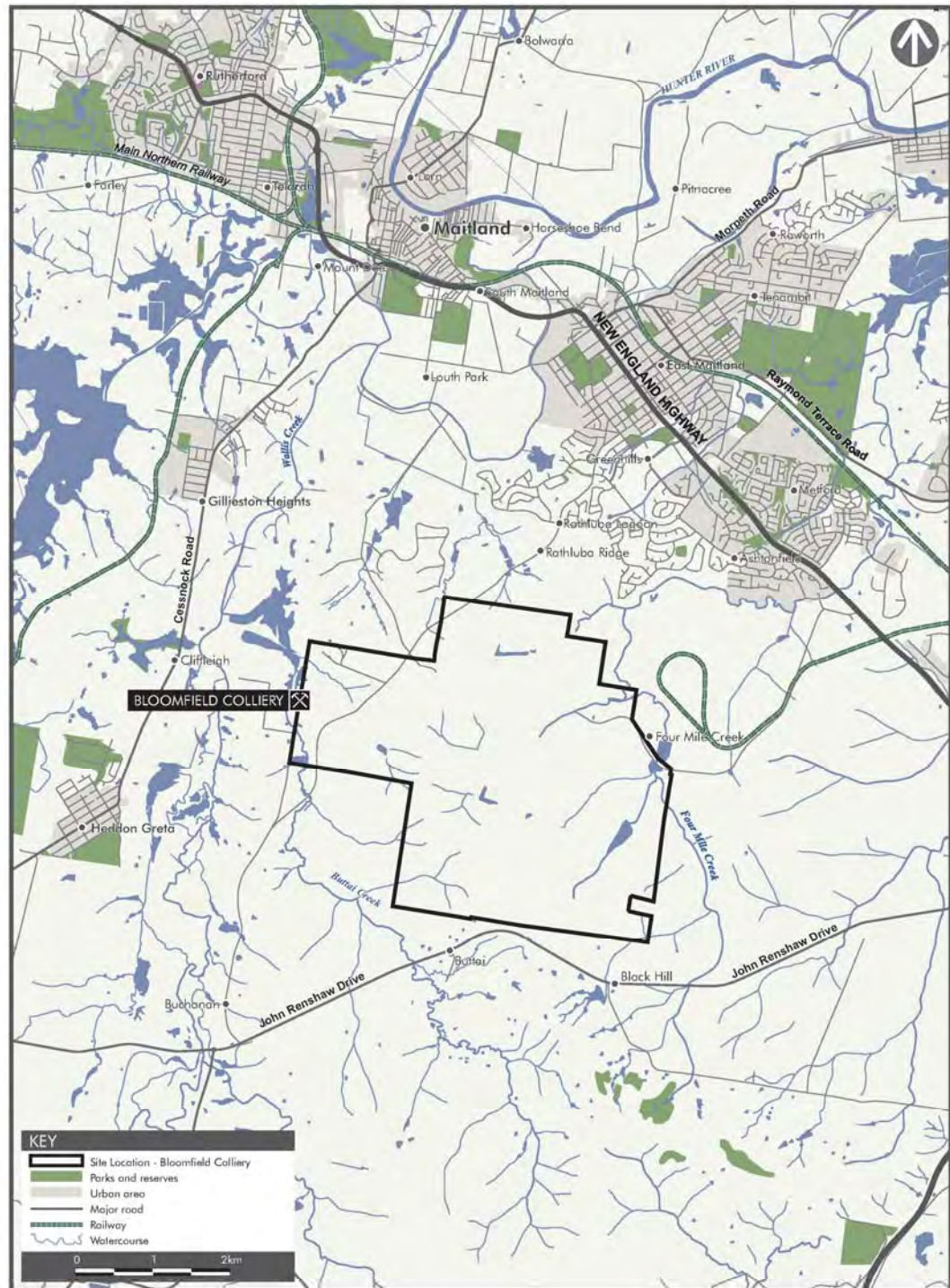
For further details regarding the non-compliances identified above refer to Section 11.

## 2 INTRODUCTION

Bloomfield Collieries (Bloomfield) is one of two open cut coal mines which are part of the Bloomfield Group of Companies (TBG). Bloomfield Colliery is located at Ashtonfield, NSW, and produces approximately 0.6 million tonnes of product coal by open cut methods per year. Coal has been mined on the property for over 100 years. Underground mining by the current owner commenced in 1937 and the last coal extracted from underground operations was in May 1992. The open cut commenced operations in 1966. Bloomfield produces mainly thermal coal with some semi soft coking coal, principally for the Asian export market. The parent company also owns Rix's Creek Mine which is located north of Singleton. Rix's Creek currently produces approximately 2 million tonnes of product coal per year.

This report covers 1 January 2019 till 31 December 2019.

This report is prepared to meet the requirements for the Annual Review, as outlined by the NSW Department of Planning & Environment (DPIE) in the *Annual Review Guideline, October 2015*.



SITE LOCATION - BLOOMFIELD COLLIERY



**Figure 1: Location of Bloomfield Colliery**

## **2.1 Consents, Leases and Licences**

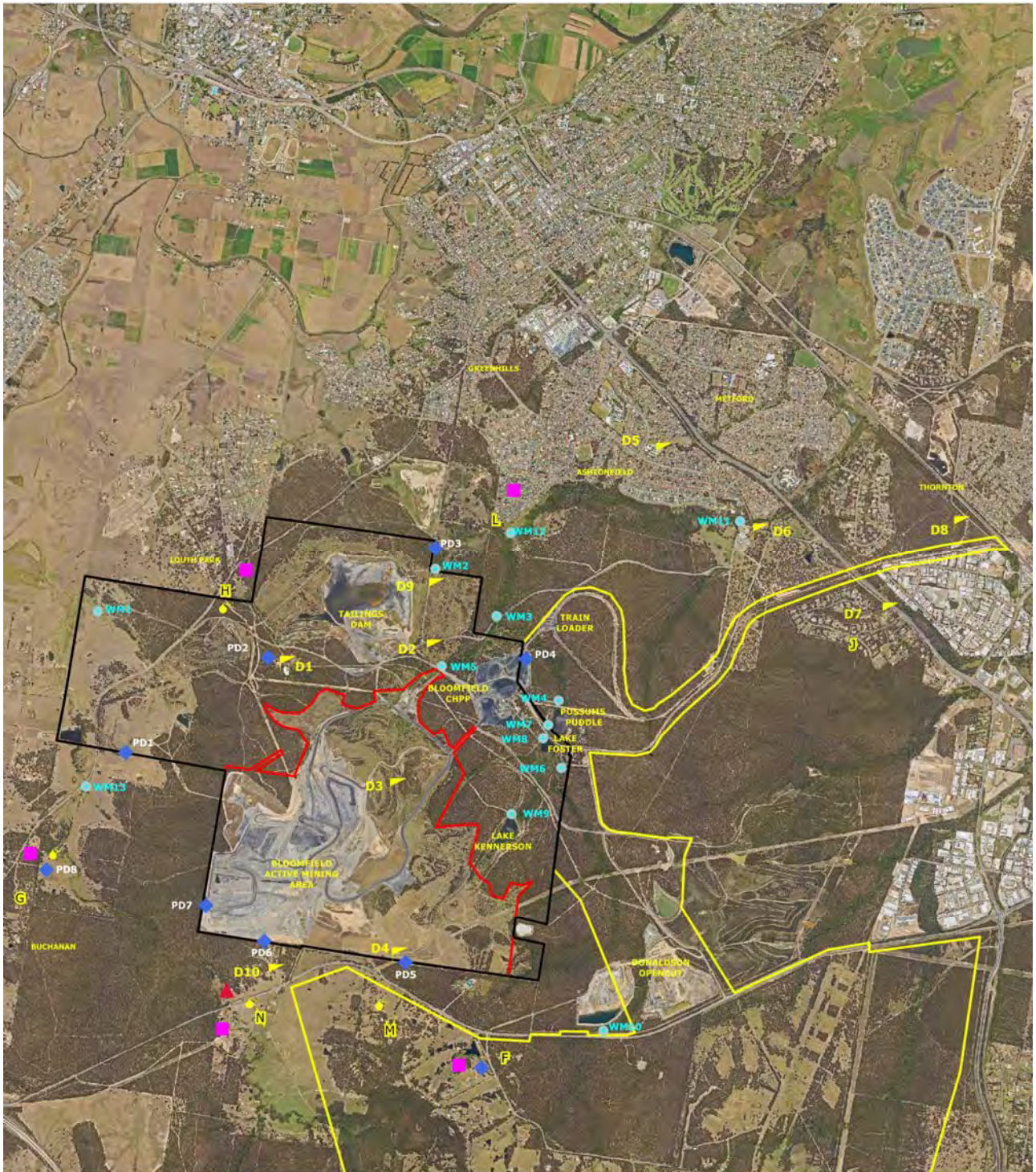
The lease area for ML1738 and the PA 07\_0087 boundary are shown on Plan 1.


Project Approval (05\_0136) for the Abel Underground Mine allows for the operation of the Bloomfield Coal Handling and Preparation Plant (CHPP), Rail Loading Facility (RLF) and other related facilities required for the handling and processing of coal.

Project Approval (07\_0087) was granted by the Minister for Planning under Part 3A of the *Environment Planning & Assessment Act 1979* (EP&A Act) to allow for the completion of open cut mining operations and rehabilitation. The approval was issued 3 September 2009 and is subject to a number of conditions. A variation to modify the Project Approval under s75W of the EP&A Act was granted on 16 May 2011 (07\_0087\_Mod 1). An additional variation to modify the Project Approval under s75W of the EP&A Act was granted on 29 March 2012 (07\_0087\_Mod 2). A further variation to modify the Project Approval under s75W of the EP&A Act was granted on 20 February 2013 (07\_0087\_Mod 3). During 2018 a variation to modify the Project Approval under s75W of the EP&A Act was granted on 16 August 2018 (07\_0087\_Mod 4).

A Mining Operations Plan (MOP) has been prepared under DRE's ESG3: MOP Guidelines September 2013. The MOP covers the period 2018 – 2020.





 <b>Bloomfield Colliery</b> Annual Review 2019		
<b>Plan 1 Environmental Monitoring Sites</b>		
Scale: 1:33,333	Date: January 2020 Photo: January 2020	Drawing: A3

## 2.2 Mine Contacts

The Bloomfield Colliery Mine Manager, Mr Brad Donoghue, is the primary mining contact and is responsible for regulatory compliance. The Environmental Advisor is Mr Greg Lamb who coordinates environmental management and rehabilitation operations at Bloomfield Colliery.

Mr Brad Donoghue	Mine Manager	Tel: 02 4930 2641 Mob: 0418 923 058 bdonoghue@bloomcoll.com.au
Mr Greg Lamb	Environmental Advisor	Tel: 02 4930 2689 Mob: 0457 819 211 glamb@bloomcoll.com.au
Environmental / Community Hotline		24hr: 02 4930 2680

## 3 APPROVALS

Bloomfield Colliery operates under the following approvals, leases and licenses as presented in Table 4.

**Table 4: Approvals, Leases and Licences**

Approval/Lease/License	Issue Date	Expiry Date
Project Approval 07_0087	3 September 2009	31 December 2021
Project Approval 07_0087_ Mod 1	16 May 2011	31 December 2021
Project Approval 07_0087_ Mod 2	29 March 2012	31 December 2021
Project Approval 07_0087_ Mod 3	20 February 2013	31 December 2021
Project Approval 07_0087_ Mod 4	16 August 2018	31 December 2030
Mining Lease 1738	29 June 2016	29 June 2037
Ancillary Mining Activity AMA1001	3 August 2018	29 June 2037
Consolidated Coal Lease (CCL) 761	20 October 1991	8 October 2029
Project Approval 05_0136 (Abel Mine)	7 June 2007	31 December 2030
Environmental Protection License 396	31 December 2007	-
Notification of Dangerous Goods NDG028550	29 July 2018	-
Licence No. 20AL217062 WAL 41506	7 June 2016	6 June 2039

## **4 MINING OPERATIONS DURING THE REPORTING PERIOD**

### **4.1 Exploration**

There were no exploration activities at Bloomfield during the reporting period.

### **4.2 Land Preparation**

No new areas were prepared for mining during the reporting period.

### **4.3 Construction**

No construction was undertaken on the site during the reporting period.

### **4.4 Mining**

During the reporting period, Bloomfield operated 15 shifts a week for 48 weeks employing 93 personnel. Production was 853,000 tonnes of raw coal, 519,000 tonnes of saleable coal and 6.4 million cubic metres of overburden moved primarily using a Hitachi 5500 excavator and Caterpillar rear dump trucks.

Mining operations continued in S Cut and Creek Cut throughout the year, generally in accordance with the mining methods described in the 2018-2020 MOP. During the next reporting period, Mining in S Cut will continue towards the west and Creek Cut will continue towards the south and west.

### **4.5 Mineral Processing**

The Coal Handling and Preparation Plant (CHPP) has a throughput of up to 8.5 Mtpa, as approved under the Abel Consent. The throughput capacity is rated at 1000 tonnes per hour. ROM coal and clean coal volumes are presented in Table 5.

**Table 5: Production and Waste Summary**

<b>Material</b>	<b>Approved limit</b>	<b>Previous reporting period</b>	<b>This reporting period</b>	<b>Next reporting period (forecast)</b>
Overburden	N/A	5,699,000	6,383,000	6,400,000
ROM Coal	1,300,000	1,083,000	853,000	1,300,000
Coarse reject	N/A	308,000	217,000	390,000
Tailings	N/A	166,000	117,000	210,000
Saleable product	N/A	609,000	519,000	700,000



## **4.6 Waste Management**

### Process Waste

Process Waste from the CHPP consists of breaker reject, coarse rejects and fine rejects (tailings). Breaker reject consists of large diameter (>150mm) rocks and coal rejects, and is hauled by truck to operational open cut pits and placed under advancing overburden dumps. Coarse rejects which are separated out during processing, and are currently disposed of under advancing overburden dumps. Fine tailings are currently pumped as 20% solids slurry to the tailings dam, a disused open cut pit in north of the mine site. Reject fines settle out of the slurry, gradually backfilling the pit, whilst the decant water is returned to the CHPP for re-use in processing. Process waste volumes are provided in Table 5.

### Waste Oil

Waste oil from scheduled maintenance of mining equipment and the workshop oil separator is collected in a storage tank and periodically evacuated for reprocessing and re-use by a licensed waste oil contractor. In 2019 a total of 71,500 litres of waste oil was collected for recycling.

### Waste Oil Filters

During the reporting period a recycling bin was installed for disposal of used oil filters. Used oil filters are placed in a 1.5m<sup>3</sup> bin and collected by licensed waste contractor for disposal. In 2019 a total of 9 tonnes of used filters was collected for disposal.

### Waste Metal

Bloomfield has a well implemented scrap metal recycling program, and has a high rate of on-site re-use of suitable steel. If no longer suitable for re-use, scrap metal is collected in designated skips and sold for recycling. In 2019 a total of 48 tonnes of scrap metal was collected for recycling.

### General Waste

General waste is placed in 1.5m<sup>3</sup> and 3m<sup>3</sup> bins and collected by licensed waste contractor for disposal. In 2019 a total of 116 tonnes of general waste was collected for disposal.

### Waste Paper

During the reporting period recycling bins were installed for disposal of paper and cardboard. Waste paper and cardboard waste is placed in 1.5m<sup>3</sup> and 3.0m<sup>3</sup> bins and collected by licensed waste contractor for disposal. In 2019 a total of 8 tonnes of waste paper and cardboard was collected for recycling.

#### **4.7 Product Stockpiles**

The ROM stockpile pad has a capacity of 150,000 tonnes and the clean coal stockpiles have a capacity of approximately 500,000 tonnes.

#### **4.8 Hazardous Materials Management**

Bloomfield held dangerous goods notification and a licence to store and handle explosives in accordance with WorkCover legislation for substances stored on site. The notification covers depots for explosives, distillate, gas cylinder stores, sodium hydroxide and MIBC reagent.

Explosives are stored in an explosive magazine located on site. The magazine complies with the relevant standards for storage of explosives. Bulk materials are also stored on site in a hopper for loading into a mobile mixing unit. This area is enclosed within concrete bunding and any spillage from this area is directed into a collection tank for periodic removal by a licensed contractor.

A bunded fuel farm, designed in accordance with Australian Standard 1940 (AS1940), is used for bulk distillate storage at the open cut workshop. Spill protected racks are used for small volumes of oil and lubricant storage. Distillate, MIBC and sodium hydroxide used for coal processing in the CHPP are stored in tanks contained in bunded enclosures.

ChemAlert is an online Safety Data Sheet (SDS) database service and is used to provide up to date SDS information. If new chemicals are introduced to site they must comply with system requirements and be approved by the Mine Manager.

No hazardous materials-related environmental incidents were reported during the reporting period.

#### **4.9 Other Infrastructure Management**

Silt traps along the edges of haul roads and hard stand areas are cleaned at regular intervals. They have been designed to capture surface run off during rain events and allow sediment to settle. All silt traps, dams, drains, bunds, lines, valves and other infrastructure used to manage runoff are inspected on a quarterly basis as part of the site Environmental Management System (EMS). Issues identified during the inspections are reported and appropriate actions taken to address these matters.

#### **4.10 Bushfire**

Weather conditions permitting, hazard reduction burns are conducted periodically by the RFS. Selection of burn location is based on risk levels, as determined by fuel load assessment and location of assets/asset protection zones. Hazard reduction clearing/slashing was also undertaken by Bloomfield along fire trails, asset protection zones and the mine boundary.

An asset protection zone adjacent to residential areas near Ashtonfield and Buchanan was slashed and maintenance work carried out on a number of tracks to enable access for hazard reduction activities by the RFS.

In consultation with the RFS four areas have been identified for hazard reduction burns within the ML1738 and land surrounding the mine. However due to adverse weather conditions no hazard reduction burns were undertaken in 2019. Hazard reduction burning and clearing will continue in consultation with the RFS. Hazard reduction burns are planned by the RFS for winter 2020. This does not include any rehabilitation areas.

**5 ACTIONS REQUIRED FROM PREVIOUS ANNUAL REVIEW**

Listed in Table 6 below are the actions required from the review of the 2018 Annual Review. Also listed are the relevant sections of the report that describe the measures taken in response to these actions.

**Table 6: Action Required from 2018 Annual Review**

<b>Action Required</b>	<b>Requested by</b>	<b>Status</b>	<b>Report Section</b>
Future annual reviews to include the total expenditure for community sponsorship to confirm compliance with Schedule 2 Condition 14 of the Approval	DPIE	Complete	Section 9.2.3

## 6 ENVIRONMENTAL PERFORMANCE

### 6.1 Meteorological Monitoring

Bloomfield Colliery has installed a continuously operating meteorological station in accordance with Project Approval requirements for the operation of the mine. The weather station has real-time capabilities for all personnel to access via computer or phone. The station records the following environmental parameters:

- wind speed;
- wind direction;
- temperature;
- relative humidity;
- rainfall;
- solar radiation and
- evaporation.

A comparison of monthly recorded rainfall for the 2019 reporting period and annual average data is shown in Figure 2. The total rainfall for the twelve month period was 600 mm. This was 299 mm below the annual average of 899 mm.

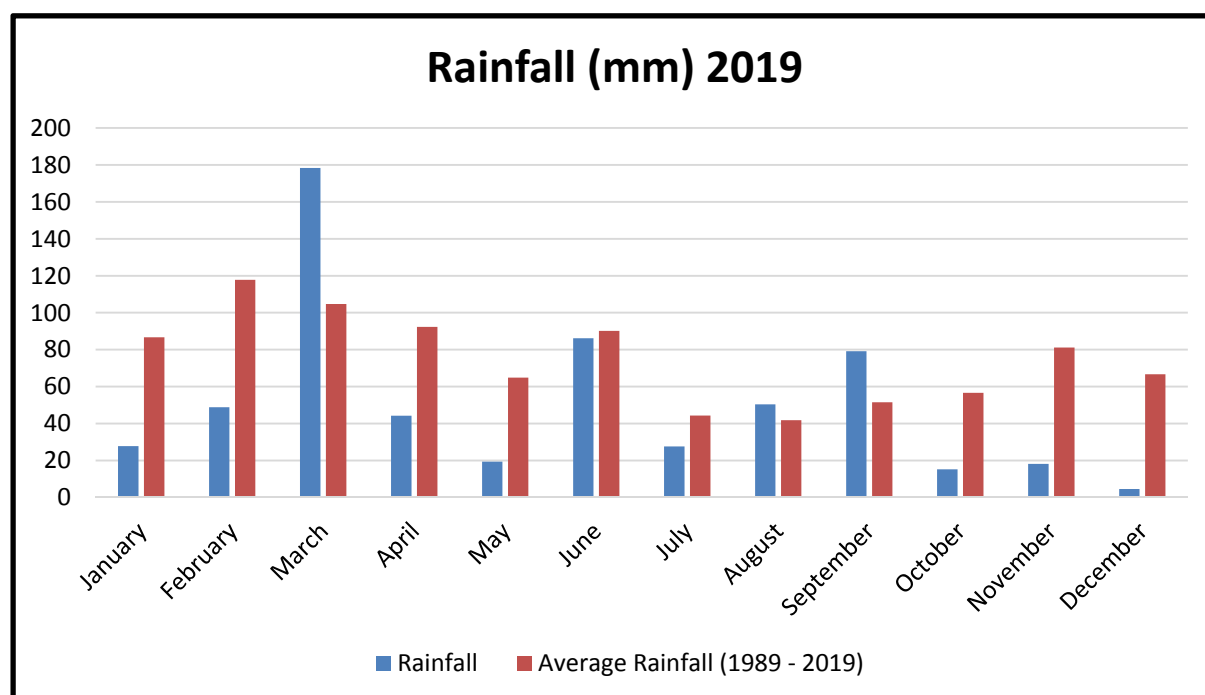


Figure 2: Rainfall 2019



A summary of the rainfall data for the past 31 years is presented in Table 7.

**Table 7: Monthly Rainfall Records**

Period	Average Monthly Rainfall (mm)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total
1989	177	62	168	133	95	208	52	6	15	33	48	43	1038
1990	42	448	80	190	80	58	71	135	73	57	6	39	1278
1991	83	14	4	12	90	104	39	9	6	30	37	167	593
1992	64	235	91	86	23	72	12	22	20	25	87	175	91
1993	125	53	65	16	29	81	109	64	36	31	72	33	713
1994	30	102	89	76	53	36	4	11	0	36	64	13	514
1995	162	48	171	0	129	51	1	0	78	37	184	80	942
1996	70	71	28	7	106	74	50	59	48	24	59	30	625
1997	105	101	63	0	85	78	65	28	50	34	25	56	688
1998	89	81	3	45	203	90	84	155	73	63	108	121	1114
1999	66	74	64	129	8	122	156	47	64	173	36	58	997
2000	95	34	281	149	44	12	51	36	31	58	93	28	912
2001	44	163	174	113	156	7	44	21	21	30	124	46	941
2002	54	235	172	48	55	28	31	26	25	10	43	129	856
2003	1	93	53	72	133	13	42	42	0	112	102	39	701
2004	76	163	72	45	18	10	27	44	64	154	59	38	769
2005	64	135	153	27	112	67	10	1	40	81	72	14	775
2006	38	66	39	23	11	62	50	58	194	21	53	24	635
2007	24	101	103	87	66	377	20	75	28	32	144	94	1150
2008	139	173	46	240	4	131	33	32	195	65	70	59	1184
2009	6	340	107	129	83	66	33	2	31	60	40	48	943
2010	78	35	75	28	75	118	62	43	27	66	151	70	826
2011	32	41	73	125	100	162	127	54	109	100	179	81	1182
2012	65	205	137	122	7	179	57	20	19	6	58	40	915
2013	180	184	121	101	59	99	18	11	22	43	288	22	1147
2014	16	83	138	106	30	47	22	102	38	68	23	169	844
2015	208	53	46	513	111	43	18	34	81	53	86	132	1378
2016	467	32	48	47	12	89	55	77	69	46	33	67	1041
2017	60	72	216	97	14	126	2	6	12	78	65	48	795
2018	3	108	189	56	5	101	3	28	50	116	89	102	850
2019	28	49	178	44	19	86	28	50	79	15	18	5	600
Average	87	118	105	92	65	90	44	42	51	57	81	67	899

The results of wind speed and direction monitoring shows a pattern typical in the Hunter Valley. During summer the winds predominate from the south east and winter the west-northwest. Autumn and spring are transitional seasons with winds distributed between both northwest and south-easterly directions. Figure 3 shows the annual windrose generated for the site on an annual basis.

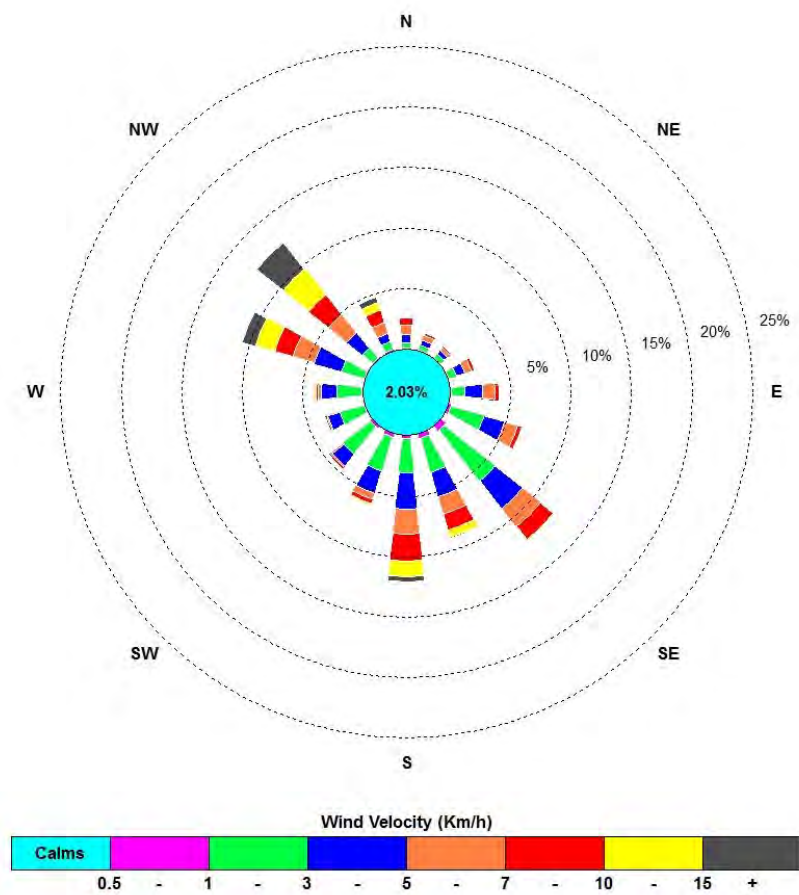


Figure 3: Windrose for Bloomfield Colliery 2019

## 6.2 Air Quality

### 6.2.1 Environmental Management

An Air Quality Monitoring Program has been prepared and approved by DPIE in accordance with Project Approval 07\_0087.

Dust can be generated by the operation of mobile plant on unsealed surfaces, loading and handling of coal and overburden in dry and windy conditions, or by blasting. Operational procedures are in place to minimise dust impacts on the surrounding environment and community. Vehicular generated dust is controlled through the use of water carts on all internal roads and high traffic areas. The company provides a fleet of three water trucks to allow for greater coverage and flexibility in dry and/or windy conditions.

Sprinkler systems operate on coal stockpile areas and the surrounds of the washing plant. Conveyor systems at the washing plant and rail loader are enclosed on at least two sides. Operational practices such as not dumping to exposed locations, minimizing the drop height into trucks during loading are also employed.

The use of a predictive meteorological modelling software program is utilised to assist in planning mine operations. The software incorporates regional weather station data to predict daily weather events that may exacerbate dust impacts from operations.

A dust monitoring program is in place with 10 dust deposition gauges and High Volume Air Samplers (HVOL) located on and around the mine lease area. The locations are listed in Table 8 and are shown in Plan 1. Samples are collected by independent environmental consultants and analysed by a NATA registered laboratory.

During 2018 the modified Project Approval (07\_0087\_Mod 4) included a new condition to monitor for PM<sub>2.5</sub> dust emissions. PM<sub>2.5</sub> monitoring commenced in November 2018.

**Table 8: Dust Monitoring Sites**

Site	Location
On Lease	
D1	Adjacent to Buttai Reservoir
D2	Adjacent to Main Haul Road
D3	Communications Tower
D4	Adjacent John Renshaw Drive
D9	Shamrock Lane
Off Lease	
D5	Bali Close Ashtonfield
D6	Off Four Mile Creek Road
D7	Off New England Highway, Avalon Estate
D8	Adjacent of Main North Rail line at Rail Loop
D10	Private property adjacent to John Renshaw Drive
HVOLs	Private property adjacent to John Renshaw Drive

## 6.2.2 Environmental Performance

Dust Deposition

Table 9 summarises the monthly deposition rates for insoluble solids during the reporting period and includes long-term averages for the site and the EPA guideline of 4 g/m<sup>2</sup>/month.

**Table 9: Annual Average Dust Deposition**

Insoluble Solids (g/m <sup>2</sup> /month)										
Site	D1	D2	D3	D4#	D5	D6	D7	D8	D9	D10
Jan-19	1.7	0.9	1.0	1.4	1.2	4.9c	2.9	2.3	2.3	1.8
Feb-19	1.5	1.2	1.5	1.4	1.2	2.4	4.0	2.0	1.7	1.7
Mar-19	1.9	1.1	1.8	1.4	2.1	2.4	2.5	2.4	1.7	2.8
Apr-19	1.8	0.9	1.8	1.3	1.8	2.4	2.5	1.7	1.2	1.6
May-19	0.6	0.8	0.9	0.8	1.2	1.7	1.2	1.1	0.8	1.6
Jun-19	0.9	1.2	1.4	1.5	0.6	0.7	1.5	1.8	1.5	1.3
Jul-19	0.3	0.4	0.8	0.7	0.9	0.9	0.7	1.0	0.5	0.5
Aug-19	0.9	1.5	1.7	1.2	0.6	1.7	1.2	1.1	1.1	1.1
Sep-19	1.4	1.4	2.0	2.3	1.8	1.5	1.6	1.7	1.1	1.0
Oct-19	1.1	1.7	2.1	2.1	2.4	1.5	1.8	1.1	0.9	1.2
Nov-19	1.8	2.3	2.0	1.6	1.4	2.9	2.9	2.3	2.5	1.7
Dec-19	2.8	3.3	4.0	4.9	1.5	3.6	4.8	3.4	8.9c	3.4
<b>Annual Averages</b>										
1997-1998	1.2	1.8	1.8	1.5	1.1	1.9	1.6	1.5	1.8	1.7
1998-1999	1.5	2.1	1.8	1.6	1.3	2.4	1.6	1.1	1.8	0.9
1999-2000	1.8	2.6	1.8	1.1	1.5	1.9	2.0	1.3		
2000-2001	1.2	1.6	1.3	1.4	1.2	3.1	1.8	1.1		
2001-2002	1.1	1.8	1.4	6.6	1.3	2.0	2.4	1.3	1.4	1.7
2002-2003	1.7	2.0	1.2	4.3	1.9	2.3	1.9	1.8	1.4	2.2
2003-2004	2.4	1.6	0.8	6.5	1.2	1.5	1.4	1.3	1.0	1.0
2004-2005	1.6	1.5	1.1	3.2	1.1	2.2	1.4	1.4	0.9	1.1
2005-2006	3.4	1.9	1.2	3.1	1.0	1.4	1.5	1.4	1.2	1.9
2006-2007	2.8	2.2	1.5	3.9	3.0	1.7	1.8	1.7	1.2	1.8
2007-2008	2.7	1.9	1.6	5.2	2.1	2.0	1.9	2.2	1.2	2.3
2008-2009	1.8	1.9	3.3	6.0	1.3	1.7	2.0	1.9	1.5	2.9
2009-2010	1.8	2.4	3.2	3.1	1.4	1.6	2.3	1.8	1.5	2.8
2010-2011	1.1	1.6	1.8	1.6	0.9	2.4	1.4	1.4	1.1	2.1
2011-2012	1.6	1.5	1.3	3.4	1.5	3.8	1.2	3.2	1.0	1.9
2012	1.5	1.7	1.9	3.1	1.4	3.4	1.8	1.6	1.1	2.2
2013	1.7	1.6	2.5	1.3	1.5	2.5	1.7	1.7	1.3	1.5
2014	1.2	1.4	1.6	1.5	1.5	2.5	1.4	1.7	1.1	1.5
2015	1.3	1.3	1.5	1.4	1.3	1.3	1.1	1.3	0.9	1.5
2016	0.7	1.3	1.1	1.3	1.3	1.5	1.1	1.4	0.8	2.2
2017	0.6	1.4	1.0	1.3	1.4	1.2	1.4	1.9	0.9	1.6
2018	0.9	1.2	1.0	1.3	1.7	1.6	1.5	1.3	0.9	1.6
2019	1.4	1.4	1.8	1.7	1.4	2.0	2.3	1.8	1.4	1.6
Overall*	1.6	1.7	1.6	2.7	1.4	2.1	1.7	1.6	1.1	1.9
<b>EPA Licence Limit</b>	<b>4</b>									

Notes: \* - Overall annual average since 1997.

C - Denotes result contaminated with insects, vegetation or bird droppings and considered non standard.

# - Site D4 was located adjacent to operational areas and was repositioned in December 2012 to the southern mining lease boundary, adjacent to John Renshaw Drive.

All dust deposition gauges recorded annual averages below the 4g/m<sup>2</sup>/month limit for 2019. The long term average annual dust deposition rates are all below the required impact assessment criteria.

Results are graphically provided in Appendix A. Figure A1 in Appendix A shows yearly results since Project Approval (PA 08\_0087). The results show a slight upward trend in 2019 due to a very dry year (Figure 2), dust storms in early 2019 and bushfires in late 2019. Sites D2 and D3 are located adjacent to operational areas well within lease boundaries. Results from these sites indicate the level of dust generated by mining operations and are unlikely to impact off site.

### PM2.5, PM10 and TSP

Table 10 summarises the PM2.5, PM10 and TSP monitoring results during the reporting period and detailed results are provided in Table A1 in Appendix A.

**Table 10: PM2.5, PM10 and TSP Results Summary 2019**

	<b>PM2.5 24hr (ug/m<sup>3</sup>)</b>	<b>PM10 24hr (ug/m<sup>3</sup>)</b>	<b>TSP (ug/m<sup>3</sup>)</b>
Maximum 24hr Average result 2019	99	119	262
<b><i>Project Approval Impact Assessment Criteria 24hr Average</i></b>	<b>25</b>	<b>50</b>	<b>-</b>
Annual Average 2019*	8	18	39
<b><i>Project Approval Impact Assessment Criteria Annual Average</i></b>	<b>8</b>	<b>25</b>	<b>90</b>

\* Note: Some samples not included in average calculations due to dust storms and bushfires across the region during 2019.

Due to the close proximity of John Renshaw Drive to the HVOLs (Plan 1) some impacts from vehicular emissions will affect the monitoring results.

The annual average TSP result recorded was below the 90 ug/m<sup>3</sup> limit for 2019.

The annual average PM10 result recorded was below the 25 ug/m<sup>3</sup> limit for 2019. The maximum PM10 24-hour average result recorded was 119 ug/m<sup>3</sup> which exceeds the 50 ug/m<sup>3</sup> limit for 2019. Table A1 in Appendix A details further exceedances for 2019. These exceedances were the result of dust storms and bushfires during 2019.

The annual average PM2.5 result recorded was 8 ug/m<sup>3</sup> equal to the 8 ug/m<sup>3</sup> limit for 2019. The maximum PM2.5 24-hour average result recorded was 99 ug/m<sup>3</sup> which exceeds the 25 ug/m<sup>3</sup> limit for 2019. Table A1 in Appendix A details further exceedances for 2019. These exceedances were the result of dust storms and bushfires during 2019.

Figures A2, A3 and A4 in Appendix A shows yearly results of TSP, PM10 and PM2.5 dust levels. The results show seasonal trends as well as rolling averages. In general higher results occur in the summer months and lower results occur in the winter months.

### Dust Predictions

Dust modelling predictions conducted as part of the Environmental Assessment (PA 07\_0087 Mod 4) are shown in Table 11. Monitoring during the reporting period indicates that dust results are close to predicted levels. As shown in Plan 1, the nearest modelled resident to the monitoring locations is Resident N. The dust monitoring locations are actually situated closer to the mine site than Resident N (refer Plan 1) and as a result the dust results are slightly higher.

**Table 11: Dust Prediction**

<b>Resident ID: N</b>	<b>EA Predictions</b>	<b>2019 Actual</b>
Dust Deposition D10 (g/m <sup>2</sup> /month)	1.5	1.6
PM2.5 (ug/m <sup>3</sup> ) (Annual Average)	6	8
PM10 (ug/m <sup>3</sup> ) (Annual Average)	16	18
TSP (ug/m <sup>3</sup> ) (Annual Average)	33	39

### 6.2.3 Reportable Incidents

During November and December 2019 exceedances of the 24 Hour PM2.5 and PM10 criterion were recorded on 22, 26, 28 November and 4, 10 and 16 December 2019. Elevated PM2.5 and PM10 results were also recorded at the EPA Beresfield and EPA Wallsend air quality monitoring stations on the days where exceedances were measured. The elevated results measured over the regional area are likely as a result of elevated particulate levels caused by bushfires during November and December. In addition, on these dates elevated particulate levels were also recorded by the Upper Hunter Monitoring Network. The exceedances were reported to the DPIE. Refer to Section 11 for further details.

### 6.2.4 Further Improvements

The air quality monitoring program will be continued in accordance with Air Quality Monitoring Plan requirements. The PM2.5 results and location of the HVOL (refer Plan 1) will be reviewed throughout 2020 to assess impacts on the results from vehicle traffic along John Renshaw Drive.

### 6.3 Biodiversity

#### 6.3.1 Environmental Management

The Environmental Assessment included an assessment of the potential impacts associated with the clearance of vegetation. Any clearing of vegetation within the project area must be undertaken in accordance with the requirements of the Project Approval.

#### 6.3.2 Environmental Performance

No vegetation was cleared within the Project Area during the reporting period.

A Biodiversity Offset Management Plan At the time of this report has been prepared and approved by DPIE in accordance with Project Approval requirements for the operation of the mine. A Biodiversity Offset Area has been established to compensate for future land clearance at the mine. The land was purchased by Bloomfield in December 2011 and consists of 40 Ha of remnant vegetation at Congewai adjacent to the Watagan State Forest. The western boundary abuts a part of Watagan State Forest on the eastern side of the Corrabare Range. Figure 4 shows the location of the Biodiversity Offset Area.

Consultation is underway with the NSW Biodiversity Conservation Trust regarding entering into a conservation agreement over the Biodiversity Offset land under Part 4, Division 12 of the *National Parks and Wildlife Act 1974*. During 2019 contact was made with the NSW Biodiversity Conservation Trust to determine whether it has finalised its policy regarding security of offset site. No response has been received at the time of this report.

In accordance with the Biodiversity Offset Management Plan a monitoring program is being implemented to assess weeds infestations and feral animals. During 2019 a visual inspection for weeds was undertaken and no weeds were present at the time of the inspection.

Three motion cameras were installed for a 20 day period to determine the presence of feral animals. Foxes, a wild dog and a hare were recorded. The details were compared against the CSIRO guidelines. The abundance score for the foxes was Low (8.33%) and the wild dog and hare was scarce (1.67%). A 1080 wild dog baiting program was conducted in March in conjunction with Local Land Services.

#### 6.3.3 Reportable Incidents

In February 2019 Bloomfield received a Show Cause letter from DPIE for potentially failing to comply with Schedule 3, Condition 29A of the Approval. Bloomfield provided a written response to the letter and DPIE issues Bloomfield with a Warning Letter. During 2019 Bloomfield has been in contact with the NSW Biodiversity Conservation Trust regarding entering into a conservation agreement over the Biodiversity Offset land under Part 4, Division 12 of the *National Parks and Wildlife Act 1974*. To date no further response has been received.

No other reportable incidents relating to flora and fauna management occurred during the reporting period.

#### 6.3.4 Further Improvements

Further details on progress of the implementation measures of the Biodiversity Offset Area will be provided in the next Annual Review. Further consultation is underway with the NSW Biodiversity Conservation Trust regarding entering into a conservation agreement.





Figure 4: Biodiversity Offset Area

## 6.4 Blasting

### 6.4.1 Environmental Management

A Blast Monitoring Plan (BMP) has been prepared and approved by DPIE in accordance with Project Approval requirements for the operation of the mine. Blasting activities are licensed under EPL 396. Both the EPL and Project Approval stipulates monitoring requirements, restricts blasting hours, as well as limiting airblast overpressure and ground vibration impacts at the nearest residences.

Blasting techniques have been developed in conjunction with ORICA, utilising the “nonel” initiation system and implemented to achieve maximum fragmentation and maintain levels of ground vibration and overpressure levels within the approved criteria for the site.

Each blast is monitored at four nearby residences for ground vibration and overpressure. Monitors are located at residences to the south, south-east, west and north-west of current open cut operations. The location of the blast monitors is shown on Plan 1.

The use of a predictive meteorological modeling software program is utilised to assist in planning blast operations. The software incorporates regional weather station data to predict daily weather events that may exacerbate overpressure impacts from blasting operations.

### 6.4.2 Environmental Performance

All blast results for the reporting period are included in Appendix B and are summarised in Table 12.

During the reporting period a total of 57 blasts were initiated on the site. No blasts exceeded 115 dB or 120 dB blast overpressure limits. No blasts exceeded the 5mm/sec or 10mm/sec ground vibration limits.

**Table 12: Blast Monitoring Summary**

Blasting Criteria Limits	Allowable Exceedance <sup>1</sup>	Results 2019
<b>Airblast Overpressure Level dB (Lin Peak)</b>		
>115	5 %	0 %
>120	0 %	0 %
<b>Ground Vibration Peak Particle Velocity (mm/s)</b>		
>5	5 %	0 %
>10	0 %	0 %

Note: 1. Percentage of the total number of blasts over a period of 12 months

Under the Project Approval blasting must be carried between 9 am and 5 pm, Monday to Saturday, with no blasting on Sundays and Public Holidays. A maximum of 2 blasts a day and

5 blasts a week (averaged over 12 months) are allowed. Appendix B provides the dates and times of all blasts for the reporting year which demonstrates that this Project Approval condition has been met.

Blast modelling predictions conducted as part of the Environmental Assessment (PA 07\_0087 Modification 4) are shown in Table 13. The approach of the assessment was to determine the limiting factors to the blast design with the aim of achieving the relevant criteria at all locations. Calculations were conducted using the respective 5% site law equations in order to determine the Maximum Instantaneous Charge (MIC).

For each site law, using statistical analysis of the measured data and assuming a log-normal distribution of data, a 95% confidence line and 50% confidence levels were determined. The ground vibration and airblast criteria cater for the inherent variation in emission levels from a given blast design by allowing a five percent exceedance of a general criterion up to a (never to be exceeded) maximum. Correspondingly, the "5% exceedance" (95% confidence) levels have been used in the blast emission site laws.

The levels of airblast and ground vibration have been predicted using the developed site laws for Bloomfield Colliery. The maximum instantaneous charge (MIC) may exceed (or be less than) the values in Table 13, depending on the location of the area being mined and its relation to the nearest affected receiver.

**Table 13: 5% MIC and Blast Predictions**

Year	Approximate Distance to Nearest Receiver (m)	MIC Based on Ground Vibration or Airblast (kg)	Blast Emission Prediction Based on MIC	
			Predictive PVS Ground Vibration (mm/s)	Predicted Airblast Level (dB Linear)
2018	1500	280	1.7	115
2021	1200	145	1.4	115
2025	1500	280	1.7	115

Monitoring results summarised in Table 14 for the reporting period indicates that the maximum and mean results are below predicted levels at the nearest receivers.

**Table 14: Blast Results Summary**

Location	N – Elliotts		M - MacNaughtons		H - Mt Vincent Rd		G - Richards	
	Airblast dBL	Vibration mm/s	Airblast dBL	Vibration mm/s	Airblast dBL	Vibration mm/s	Airblast dBL	Vibration mm/s
Max	110.0	1.5	107.0	1.3	104.5	0.9	114.4	1.0
Mean	100.7	0.5	99.4	0.4	94.1	0.2	98.9	0.3

#### 6.4.3 Reportable Incidents

No reportable incidents relating to blasting occurred during the reporting period.

#### 6.4.4 Further Improvements

Monitoring of blasts will continue in accordance with EPL and Project Approval requirements.

### 6.5 Operational Noise

#### 6.5.1 Environmental Management

A Noise Monitoring Plan (NMP) has been prepared in accordance with the conditions of the Project Approval. The noise monitoring plan has been endorsed by DPIE. Quarterly noise monitoring has been undertaken in accordance with the monitoring plan.

The use of a predictive meteorological modelling software program is utilised to assist in planning mine operations. The software incorporates weather models and regional weather station data to predict daily weather events that may exacerbate noise impacts from operations.

During 2016 the existing predictive meteorological modelling software program was upgraded to a predictive noise emissions management tool for the mine. In addition to meteorological data it also incorporates terrain data, mining equipment locations and aerial photographs.

#### 6.5.2 Environmental Performance

Attended and unattended quarterly noise monitoring was undertaken during the reporting period which assessed noise impacts from Bloomfield Colliery against relevant criteria detailed within PA 07\_0087 at five monitoring locations (see Plan 1). Monitoring results are summarised in Tables 15 and 16.

All noise monitoring indicated that compliance with consent criteria was met at all locations during day, evening and the night-time periods. Night time sleep disturbance criteria ( $LA1_{(1min)}$ ) were in compliance during all monitoring events.

**Table 15: Summary of Attended Noise Monitoring Results**

Location	Estimated Bloomfield LAeq(15minute) Contribution			Consent Conditions LAeq(15 minute)			Compliance		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
March Quarter Results									
F – Black Hill Road, Black Hill <sup>1</sup>	Inaudible at all times			35	35	35	Yes	Yes	Yes
G – Buchanan Road, Buchanan	Inaudible	31	35	39	42	37	Yes	Yes	Yes
L – Kilshanny Ave, Ashtonfield	Inaudible at all times			35	35	35	Yes	Yes	Yes
M – John Renshaw Drive, Buttai	Inaudible at all times			39	39	37	Yes	Yes	Yes
N – Lings Road, Buttai	Inaudible at all times			42	42	35	Yes	Yes	Yes
June Quarter Results									
F – Black Hill Road, Black Hill <sup>1</sup>	Inaudible at all times			35	35	35	Yes	Yes	Yes
G – Buchanan Road, Buchanan	Inaudible	Inaudible	30	39	42	37	Yes	Yes	Yes
L – Kilshanny Ave, Ashtonfield	Inaudible	Inaudible	<30	35	35	35	Yes	Yes	Yes
M – John Renshaw Drive, Buttai	Inaudible	Inaudible	34	39	39	37	Yes	Yes	Yes
N – Lings Road, Buttai	Inaudible	Inaudible	<30	42	42	35	Yes	Yes	Yes
September Quarter Results									
F – Black Hill Road, Black Hill <sup>1</sup>	Inaudible at all times			35	35	35	Yes	Yes	Yes
G – Buchanan Road, Buchanan	Inaudible	33	35	39	42	37	Yes	Yes	Yes
L – Kilshanny Ave, Ashtonfield	Inaudible at all times			35	35	35	Yes	Yes	Yes
M – John Renshaw Drive, Buttai	Inaudible	Inaudible	<25	39	39	37	Yes	Yes	Yes
N – Lings Road, Buttai	Inaudible	Inaudible	25	42	42	35	Yes	Yes	Yes
December Quarter Results									
F – Black Hill Road, Black Hill <sup>1</sup>	Inaudible at all times			35	35	35	Yes	Yes	Yes
G – Buchanan Road, Buchanan	Inaudible	Inaudible	28	39	42	37	Yes	Yes	Yes
L – Kilshanny Ave, Ashtonfield	Inaudible at all times			35	35	35	Yes	Yes	Yes
M – John Renshaw Drive, Buttai	Inaudible at all times			39	39	37	Yes	Yes	Yes
N – Lings Road, Buttai	Inaudible	Inaudible	25	42	42	35	Yes	Yes	Yes

1 – Mine owned property

**Table 16: Summary of Sleep Disturbance Results**

Location	Estimated Bloomfield LA1(1 minute) Contribution	Consent Conditions LA1(1 minute)	Compliance
<b>March Quarter Results</b>			
F – Black Hill Road, Black Hill <sup>1</sup>	Inaudible	45	Yes
G – Buchanan Road, Buchanan	39	45	Yes
L – Kilshanny Ave, Ashtonfield	Inaudible	45	Yes
M – John Renshaw Drive, Buttai	Inaudible	46	Yes
N – Lings Road, Buttai	Inaudible	46	Yes
<b>June Quarter Results</b>			
F – Black Hill Road, Black Hill <sup>1</sup>	Inaudible	45	Yes
G – Buchanan Road, Buchanan	39	45	Yes
L – Kilshanny Ave, Ashtonfield	<30	45	Yes
M – John Renshaw Drive, Buttai	44	46	Yes
N – Lings Road, Buttai	<30	46	Yes
<b>September Quarter Results</b>			
F – Black Hill Road, Black Hill <sup>1</sup>	Inaudible	45	Yes
G – Buchanan Road, Buchanan	43	45	Yes
L – Kilshanny Ave, Ashtonfield	Inaudible	45	Yes
M – John Renshaw Drive, Buttai	<25	46	Yes
N – Lings Road, Buttai	32	46	Yes
<b>December Quarter Results</b>			
F – Black Hill Road, Black Hill <sup>1</sup>	Inaudible	45	Yes
G – Buchanan Road, Buchanan	32	45	Yes
L – Kilshanny Ave, Ashtonfield	Inaudible	45	Yes
M – John Renshaw Drive, Buttai	Inaudible	46	Yes
N – Lings Road, Buttai	Inaudible	46	Yes

<sup>1</sup> – Mine owned property

### 6.5.3 Reportable Incidents

No reportable incidents relating to operational noise occurred during the reporting period.

#### 6.5.4 Further Improvements

The noise monitoring program will be continued in accordance with Noise Monitoring Plan requirements.

### 6.6 Aboriginal Heritage

#### 6.6.1 Environmental Management

An Aboriginal Cultural Heritage Management Plan (ACHMP) was prepared in consultation with Mindaribba LALC. The plan was endorsed by OEH and approved by DPIE.

#### 6.6.2 Environmental Performance

A number of Aboriginal sites identified during the Project Approval process were previously salvaged in 2010 in accordance with the ACHMP. Representatives from Mindaribba LALC participated and monitored the process ahead of preparation for mining activities. In all, 80 artefacts were salvaged and are being stored at Bloomfield Colliery.

In 2014 an additional 3 Ha was stripped of topsoil in preparation for mining activities. In accordance with the approved ACHMP Bloomfield engaged an archaeologist and the Mindaribba LALC to monitor the ground disturbance works and salvage identified artefacts. A further 6 artefacts were salvaged and are being stored at Bloomfield Colliery.

In 2016 an additional 3 Ha was cleared of vegetation and stripped of topsoil in preparation for mining activities. In accordance with the approved ACHMP Bloomfield engaged an archaeologist and the Mindaribba LALC to monitor the ground disturbance works and salvage identified artefacts. An additional artefact was salvaged and is being stored at Bloomfield Colliery.

#### 6.6.3 Reportable Incidents

No reportable incidents relating to Aboriginal heritage occurred during the reporting period.

#### 6.6.4 Further Improvements

Any Aboriginal heritage evidence that is identified will be managed in accordance with the ACHMP and reported in the 2020 Annual Review. The Aboriginal Cultural Heritage Management Plan (ACHMP) is under review in consultation with Mindaribba LALC and is expected to be finalised in the 2020 reporting period.

## **6.7 Non-Aboriginal Heritage**

### **6.7.1 Environmental Management**

During 2019 a Historic Heritage Conservation Management Plan for the Buttai No. 1 & 2 Reservoirs and Buttai Cemetery and submitted to DPIE for approval. The plan was prepared in consultation with OEH, Hunter Water and Cessnock Council.

### **6.7.2 Environmental Performance**

Blasting undertaken as part of the mining process at Bloomfield Colliery is the key activity with the potential to adversely impact the Buttai Reservoirs No 1 and No 2 and Buttai Cemetery. Specifically, it is the ground vibration from blasting activities that has the potential to cause superficial and structural damage to these sites.

A blast monitor at the Buttai Reservoirs No 1 and No 2 has been established and used as the ground vibration monitoring location for comparison against trigger values. Two levels of trigger values for blast monitoring have been determined to be appropriate, as follows:

- Level 1 trigger set at >5mm/ sec ppv; and
- Level 2 trigger set at >10mm/ sec ppv.

Monitoring commenced in September 2019 and the maximum ground vibration recorded at Buttai Reservoir was 1 mm/s (average 0.4 mm/s). The blast results demonstrate that neither trigger level has been reached.

Monitoring of the Buttai Cemetery will consist of an annual visual inspection which will commence in 2020.

### **6.7.3 Reportable Incidents**

No reportable incidents relating to Non-Aboriginal heritage occurred during the reporting period.

### **6.7.4 Further Improvements**

Monitoring of the Buttai No. 1 & 2 Reservoirs and Buttai Cemetery will continue in accordance with the Historic Heritage Conservation Management Plan.



## 7 WATER MANAGEMENT

The water management system has been designed with three primary goals and objectives:

- separation of clean water and mine water;
- safe storage and priority use of mine water on-site;
- management of water that is discharged so as to preserve the environmental values of Four Mile Creek and comply with the conditions of EPL 396.

In meeting these objectives, the following components of the system have been constructed or implemented.

### Mine Water

Bloomfield has two major mine water storage facilities referred to as Lake Kennerson and Lake Foster (see Plan 1). Water pumped from the open cuts (S Cut and Creek Cut) reports via open drains to Lake Kennerson. Run off from disturbed areas (i.e. high wall, haul roads, overburden dumps awaiting rehabilitation) which has the potential to carry suspended solids, is also directed to Lake Kennerson. Lake Kennerson dissipates velocity and allows the settlement of suspended solids.

Lake Kennerson has a valve controlled pipe which, when opened, feeds to Lake Foster. Lake Foster also receives decant water from the tailings storage facility (U Cut) and water from the stockpile dam, which collects the runoff from the CHPP and coal stockpile pads. Mine water is pumped, primarily from Lake Foster, to the CHPP for use in coal processing and for dust suppression spraying on the coal stockpile pads.

Mine water is discharged, via lockable valve pipes, into an open drain that flows to Four Mile Creek. Discharges are undertaken in accordance with conditions of the Environmental Protection Licence (EPL 396). Water samples are collected during discharge for independent water quality analysis. A monitoring station located downstream in Four Mile Creek continuously measures electrical conductivity (EC) and water level. Monthly background sampling is conducted in Lake Kennerson, Lake Foster and various upstream and downstream watercourses (see Section 7.2 for details).

During the reporting period, fine coal rejects (tailings) was transferred for disposal to an approved prescribed tailings dam located within a disused open cut pit (U Cut). Water from the historic underground workings is used in dust suppression and coal processing. Water storage volumes are presented in Table 17.

**Table 17: Stored Water**

	Volumes held (ML)		
	Start of Reporting Period	End of Reporting Period	Storage Capacity
<b>Clean Water</b>	90	90	90
<b>Dirty Water</b>			
Lake Kennerson	100	140	190
Lake Foster	30	40	45
Tailings Dam	200	0	600
S Cut (operational pit)	0	0	-
Creek Cut (operational pit)	130	0	-
<b>Controlled Discharge Water (EPL 396)</b>		730	
<b>Contaminated Water</b>	NIL	NIL	NIL

A water balance was calculated for 2019 providing information on inputs and outputs for the site in accordance with the Water Accounting Framework. The results are shown in Table 18.

#### Clean Water

Run off from undisturbed and rehabilitated areas is directed away from operational areas and mine water storages via diversion banks and channels. These banks and channels direct this run off into clean water dams or natural watercourses. The major clean water storage dam is Possums Puddle. No clean water is accessed for operational purposes and these dams overflow into natural drainage systems. Further isolation of smaller rehabilitated catchment areas from the mine water system will continue as rehabilitation work progresses.

The major natural creek running through the site is Four Mile Creek. Most of the operational mining areas at Bloomfield are located within the catchment of Four Mile Creek. A series of drains and levees direct Four Mile Creek around Lake Foster (mine water storage) and into Possums Puddle (clean water storage). From Possums Puddle clean water overflows back into Four Mile Creek.

#### Waste Water

Wastewater generated on site, consisting of domestic waste from bathhouses, administration offices and associated amenity areas, passes through a Cessnock City Council approved anaerobic waste water treatment system.

#### Compensatory Water

In accordance with the Water Management Plan (WMP) if it is found that downstream water users have been adversely impacted the landholder will be consulted regarding the provision of an alternative water supply or some other appropriate agreement negotiated between the parties. To date it has not been necessary to provide of any 'compensatory water' to other users.

Table 18: Input – Output Statement Data

Reporting Period Details	Date	Storage (ML)
Start	01-January-2019	460
Finish	31-December-2019	180

## INPUTS-OUTPUTS

Input-Output	Source/Destination	Inputs/Outputs	Total (ML)
Input	Surface Water	Precipitation and Runoff	541
		Rivers and Streams	
		External Surface Water Storages	
	Groundwater	Aquifer Interception	227
		Bore Fields	
		Entrainment	68
	Sea Water	Estuary	
		Sea/Ocean	
	Third Party Water	Contract/Municipal	
		Waste Water	293
TOTAL INPUTS			1129
Output	Surface Water	Discharge	730
		Environmental Flows	
	Groundwater	Seepage	
		Reinjection	
	Sea Water	Discharge to Estuary	
		Discharge to Sea/Ocean	
	Supply to Third Party		
	Other	Evaporation	382
		Entrainment	62
		Dust Suppression	300
TOTAL OUTPUTS			1474

Water taken during the water year 1 July 2018 to 30 June 2019 is provided in Table 19.

Table 19: Water Take

Water Licence	Source	Entitlement (ML)	Total (ML)
WAL41506	Sydney Basin – North Coast Groundwater	500	341

## 7.1 Surface Water

### 7.1.1 Environmental Management

A Water Management Plan (WMP) has been prepared and approved by DPIE in accordance with Project Approval requirements for the operation of the mine. The Plans prescribe the process water source and supply requirements, site-water balance, storage, impact management and monitoring of surface water in the vicinity of the mining operations.

Bloomfield has several sources of surface water (mine water) that require management to avoid pollution, or a non-compliance with the site EPL.

In addition to the physical, or infrastructure, components of the mine water management system, the two major management controls for surface water pollution are *water quality monitoring* and *licensed mine water discharge*.

#### Water Quality Monitoring

The water monitoring program at Bloomfield consists of discharge sampling, (EPL Licenced discharge point), and background monitoring. The background monitoring sites are centred on Four Mile Creek and its tributaries and Wallis Creek tributaries to the west of the mining lease. Plan 1 shows the location of the monitoring sites and Table 20 lists the monitoring sites.

**Table 20: Background Water Sample Locations**

Creek	ID	Location
Four Mile Creek	WM10	John Renshaw Drive
	WM6	Upstream from Lake Foster
	WM7	Possums Puddle
	WM4	Possums Puddle Overflow
	WM3	Elwells Creek & Four Mile Creek junction
	WM12	Shamrocks Creek & Four Mile Creek junction
	WM11	New England Highway
Four Mile Creek tributary	WM2	Shamrock Creek
	WM5	Elwells Creek
Wallis Creek tributary	WM1	Adjacent old Rathluba Colliery
	WM13	Buttai Creek
On-site water storage	WM8	Lake Foster
	WM9	Lake Kennerson

Table 21 outlines the background surface water analysis program undertaken at Bloomfield Colliery.

**Table 21 Background Water Analysis**

Analyte	Monthly	Quarterly	6 Monthly
pH	✓	✓	✓
Electrical Conductivity	✓	✓	✓
Dissolved Oxygen	✓	✓	✓
Turbidity	✓	✓	✓
Total Suspended Solids		✓	✓
Total Dissolved Solids		✓	✓
Filterable Iron		✓	✓
Chloride			✓
Sulphate			✓
Alkalinity			✓
Calcium			✓
Magnesium			✓
Sodium			✓
Potassium			✓

These results are reviewed and, if required, remedial action or further investigation initiated to identify the cause of anomalies.

#### Licensed Mine Water Discharge (EPL 396)

Mine water is discharged in accordance with conditions P1, L2 and L3 of EPL 396. These conditions allow discharge of 40ML of mine water per day, within water quality limits, dependent on rainfall. Representative samples are collected at the discharge point and at the Four Mile Creek monitoring station during each day of discharge. Samples are tested on site to ensure discharge water is within the allowed water quality limits, before being dispatched to an independent NATA accredited laboratory for analysis. Discharge samples are tested for:

- pH;
- EC;
- Total Suspended Solids (TSS);
- Total Dissolved Solids (TDS); and
- Filterable Iron (for discharge point samples).

A permanent monitoring station is located on Four Mile Creek, approximately 500m upstream of the New England Highway. It records EC and water level (via pressure sensor and V-notch weir) every 15 minutes and logs the results every hour.

### Other Management

All infrastructure (i.e. drains, dams, spillways, discharge pipes and valves) used for the separation of clean water and mine water, or the discharge of mine water, are inspected as part of the site EMS, with a documented quarterly check sheet being completed.

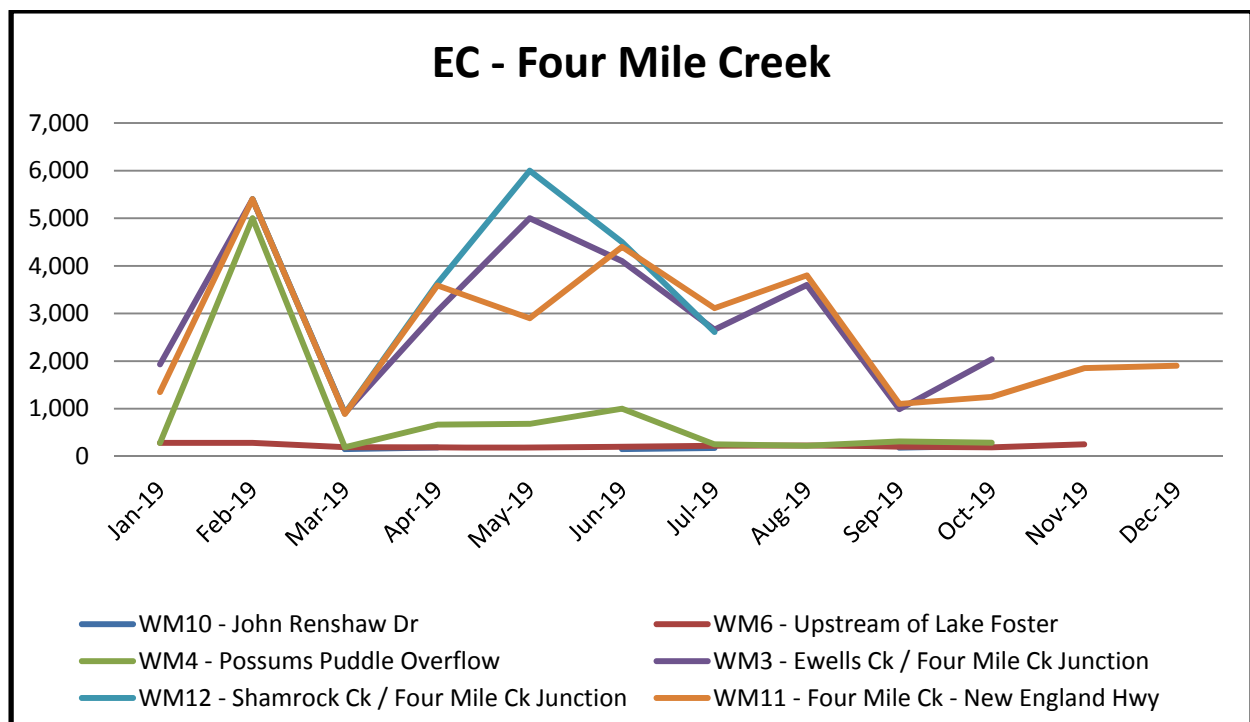
## 7.1.2 Environmental Performance

### Background Monitoring Results

The background surface water monitoring results for the reporting period are shown in Figures 5 to 9 below. Figures 5 to 9 provide a graphical presentation of EC and pH which are the main surface water parameters, with the full data set provided in Appendix C.

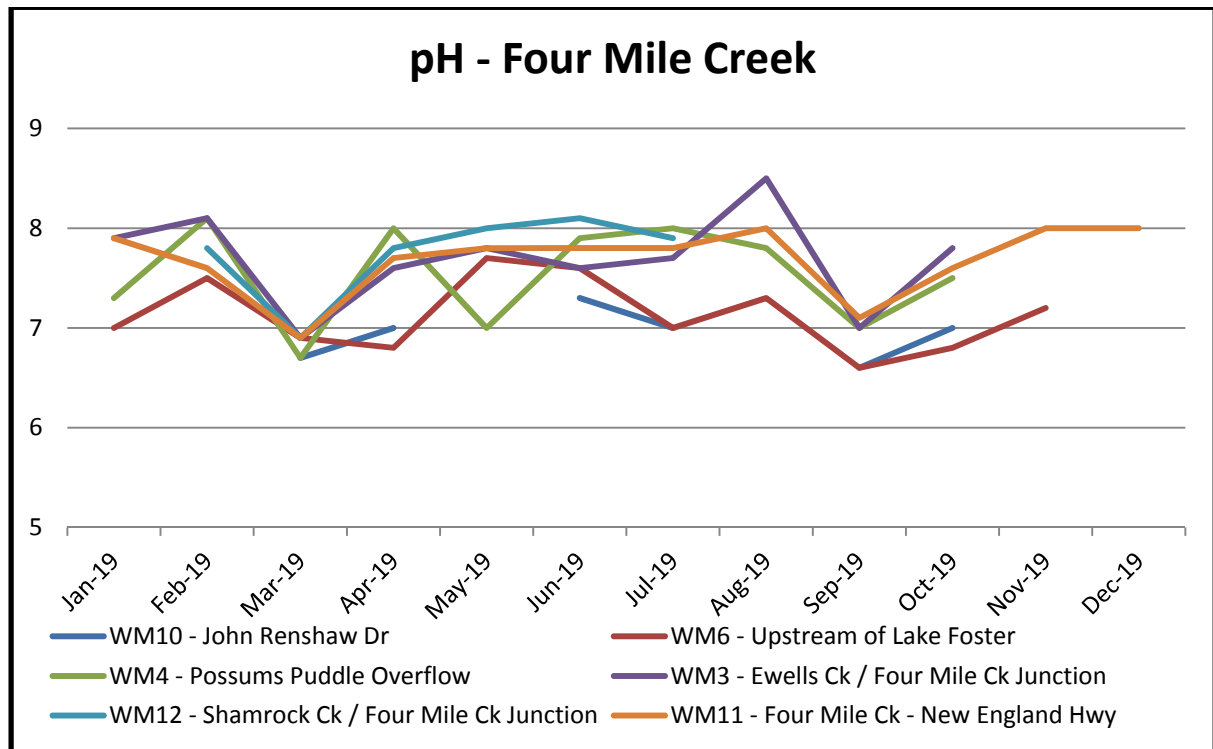
Figure 5 and 6 shows EC and pH results for the Four Mile Creek sites. Figure 5 shows salinity levels are slightly elevated in the lower end the catchment. Four Mile Creek is ephemeral and the EC level varies due to rainfall and mine discharge. The higher salinity results along Four Mile Creek (Elwells Creek and Shamrock Creek junctions and New England Hwy) reflect concentration of solutes in ponds during low flow periods and from licensed discharges in addition to offsite sources such as historic underground workings. Gaps in the data are due to very low rainfall and dry conditions in Four Mile Creek.

As outlined later, there were 12 licensed discharges throughout the reporting period. The monthly background sample collected in February, April and June coincided with a licensed discharge event. EC levels vary due to rainfall, creek flow volumes and mine discharge therefore monthly and yearly trends cannot be assessed.



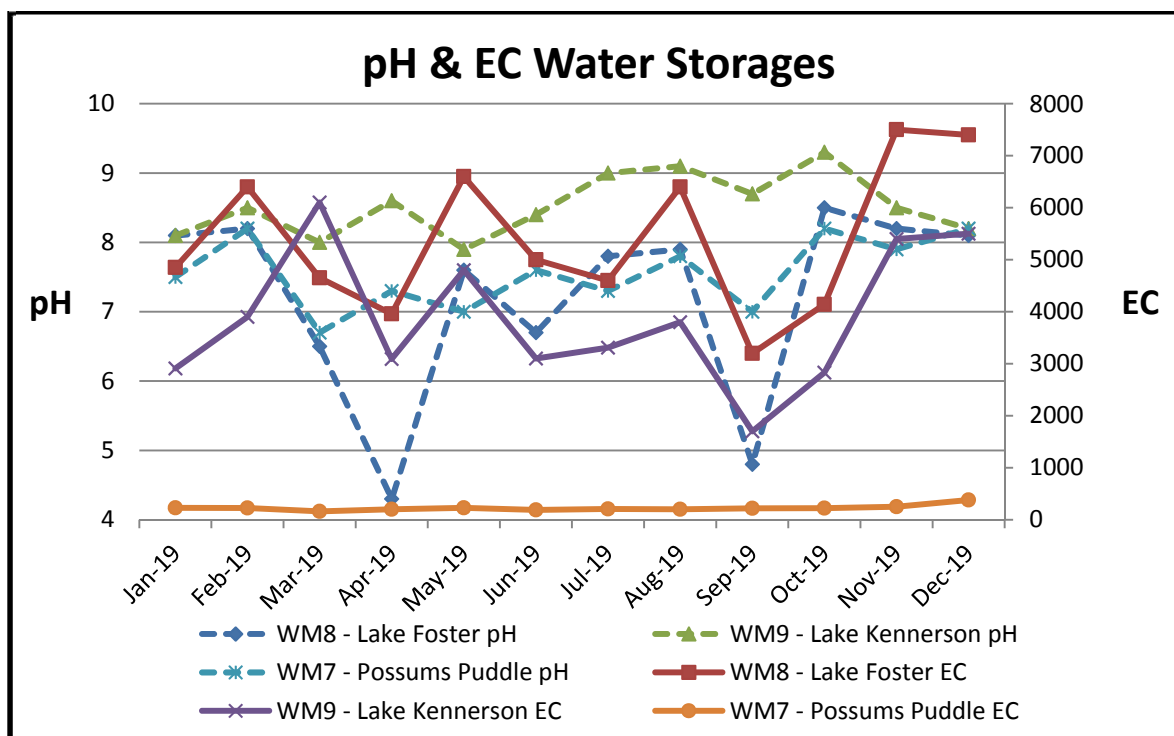
**Figure 5: Four Mile Creek Catchment Electrical Conductivity**

Figure 6 shows the pH levels in Four Mile Creek are generally consistent with ANZECC water quality guidelines (pH 6.5-8.5). pH levels vary due to rainfall and mine discharge therefore monthly and yearly trends cannot be assessed.



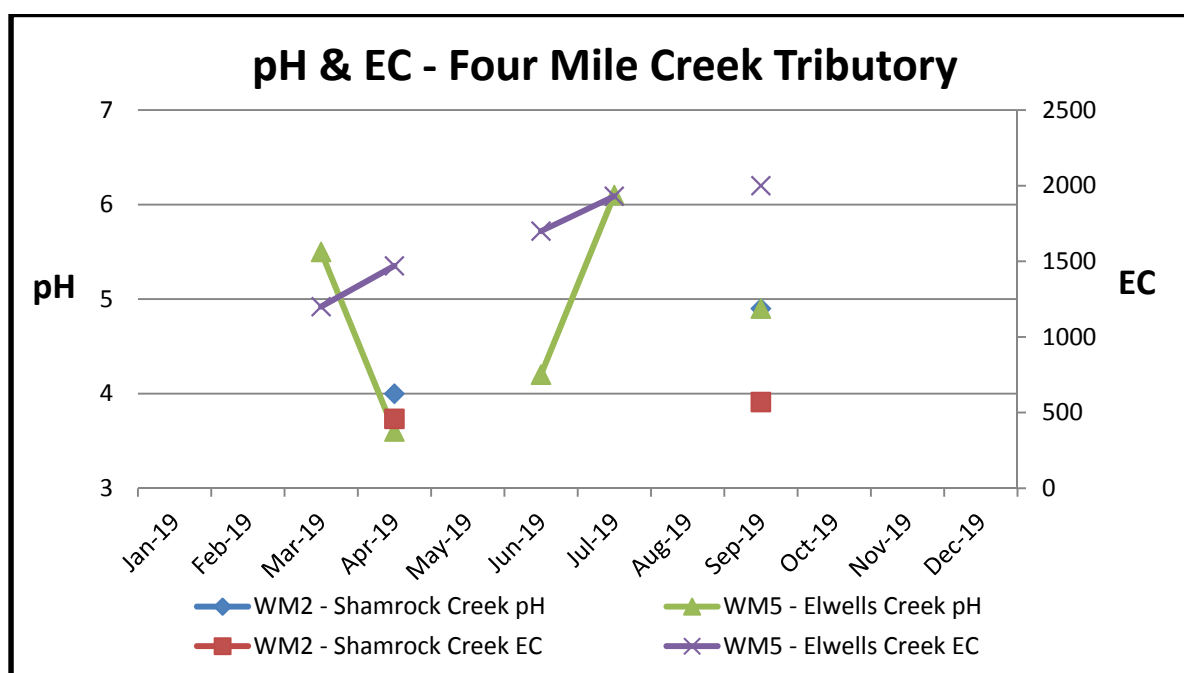
**Figure 6: pH of Four Mile Creek**

Figure 7 shows EC and pH results for water storage dams. Water quality within the mine water storage dams (Lake Kennerson and Lake Foster) varies throughout the year depending on rainfall capture in the open cut pits, CHPP water usage and frequency of licensed discharge events, which are also rainfall dependent. The freshwater dam (Possums Puddle) remains fairly constant throughout the year as it is separate from mining influences.



**Figure 7: pH and EC in Site Water Storages**

Figure 8 shows the pH and salinity levels in two Four Mile Creek tributaries. These tributaries are ephemeral streams and are often dry or not flowing (evaporating) resulting in gaps in the graphed data. The low pH levels are attributed to stagnate evaporating pools during dryer periods.

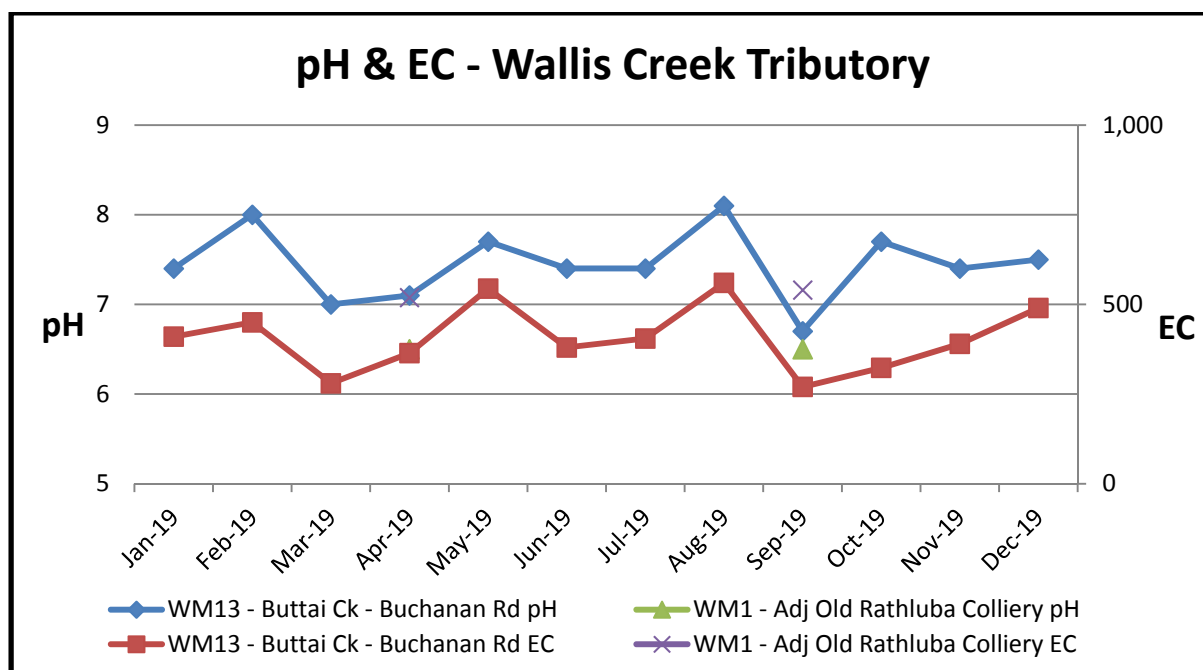


**Figure 8: pH and EC in Four Mile Creek Tributary**



Figure 9 shows the pH and salinity levels in Wallis Creek tributaries are generally consistent with ANZECC water quality guidelines (pH 6.5-8.5 & EC 125-2200).

Previous results indicate that the surface flow adjacent to Rathluba has historically been of low pH, regardless of mining impacts. Prior to 2006 pH results were less than 4 however pH levels have been steadily increasing since then. This drainage line carries surface flow from non-mining land and rehabilitated mining land, indicating that other off-site effects may be influencing the water quality in the area. The drainage line is ephemeral and is usually dry or evaporating resulting in gaps in the graphed data.



**Figure 9: pH & EC in Wallis Creek Tributary**

The WMP proposed water quality trigger values for Buttai Creek (WM13) and Elwells Creek (WM5). Table 22 summarises the results, with the full data set provided in Appendix C. EC results were within either WMP or ANZECC 2000 trigger. The low pH levels at WM5 are attributed to stagnate evaporating pools throughout a dryer than normal year.

**Table 22: Trigger Values**

Sampling Site	pH	EC	TSS
WM5 – Elwells Creek	3.6 to 6.1	1200 to 2000	5 to 48
<b>WMP Trigger Level</b>	5.2 - 8.0	430 - 4000	4 - 85
WM13 – Buttai Creek	6.7 to 8.1	270 to 560	6 to 15
<b>WMP Trigger Level</b>	6.4 – 7.8	380 - 1100	5 - 45
<b>ANZECC 2000 Trigger Level</b>	6.5 - 8.5	125 - 2200	50*

\* Standard Industry Criterion

Elwells Creek is an ephemeral tributary of Four Mile Creek. Sample site WM5 recorded a result of pH 3.6 in April. These ephemeral streams are often dry or not flowing (evaporating)

resulting in gaps in the data. Over the past few years this has been especially so with very low flows in the Four Mile Creek catchment due to lower than average rainfall.

The next downstream sampling site is WM3 located in Four Mile Creek below the junction with Elwells Creek (Plan 1). In April WM3 recorded a result of pH 7.6 (Figure 6). Throughout the reporting year WM3 pH results ranged from 6.9 to 8.5. This indicates that there is no detrimental impacts downstream of Elwells Creek.

Due to the ephemeral nature of Elwells Creek the creek is often dry. In August WM5 recorded a result of pH 6.1. The sampling occurred three weeks after a rainfall event and the stream had been flowing. This demonstrates that when Elwells Creek is flowing more neutral pH results are obtained.

#### Discharge Monitoring Results

There were 12 licensed discharge events conducted during the reporting period, with a total discharge volume of 730 ML. Table 23 shows the average, maximum and minimum water quality results at the discharge point, compared to EPA discharge water quality thresholds. Detailed daily discharge results are provided in Table C1 in Appendix C.

**Table 23: Discharge Sampling Analytical Results**

DATE	pH	TOTAL SUSPENDED SOLIDS (mg/L)	TOTAL DISSOLVED SOLIDS (mg/L)	CONDUCTIVITY (uS/cm)	IRON (mg/L)	DISCHARGE VOLUME (ML/day)
<b>EPA Limits</b>	<b>6.5-8.5</b>	<b>30</b>	<b>-</b>	<b>6,000</b>	<b>1</b>	<b>40</b>
Average	8.0	7	4,779	4,362	<0.04	29
Maximum	8.3	26	6,240	5,100	0.04	40
Minimum	7.3	2	3,650	3,460	<0.01	5

#### 7.1.3 Environmental Incidents

There were no reportable surface water incidents during the 2019 reporting period.

#### 7.1.4 Further Improvements

The surface water monitoring program will be continued in accordance with WMP requirements.

## 7.2 Ground Water

### 7.2.1 Environmental Management

A Water Management Plan (WMP) has been prepared and approved by DPIE in accordance with Project Approval requirements for the operation of the mine. The WMP prescribes the process water source and supply requirements, site-water balance, storage, impact management and monitoring of groundwater in the vicinity of the mining operations.

Plan 1 shows the location of the groundwater monitoring sites and Table 24 outlines the groundwater monitoring program undertaken at Bloomfield Colliery.

**Table 24: Groundwater Monitoring Program**

Analyte	Quarterly	6 Monthly	Annual
Water Levels	✓	✓	✓
pH		✓	✓
Electrical Conductivity		✓	✓
Total Dissolved Solids		✓	✓
Filterable Iron			✓
Chloride			✓
Sulphate			✓
Alkalinity			✓
Calcium			✓
Magnesium			✓
Sodium			✓
Potassium			✓

### 7.2.2 Environmental Performance

A graphical presentation of the groundwater levels for PD1 to PD8 are provided in Appendix D. Groundwater levels show the accumulated effects of long-term mining. Due to the long period of time mining has occurred on the site (170 years), there is no evidence to suggest what pre-mining groundwater levels might have been.

Predicted groundwater heads have been modelled to show groundwater levels and drawdown at the completion of mining in 2025. Drawdown as a result of mining activities are expected to reach a maximum in 2025.

Groundwater in the vicinity of the Mine Lease is saline and of negligible value for beneficial users. The Groundwater Impact Assessment concludes that no adverse impacts on groundwater supply, quality or any groundwater dependent ecosystems are expected as a result of the Project. Recorded EC and pH levels are relatively stable showing no real trend (Figures 10 & 11).

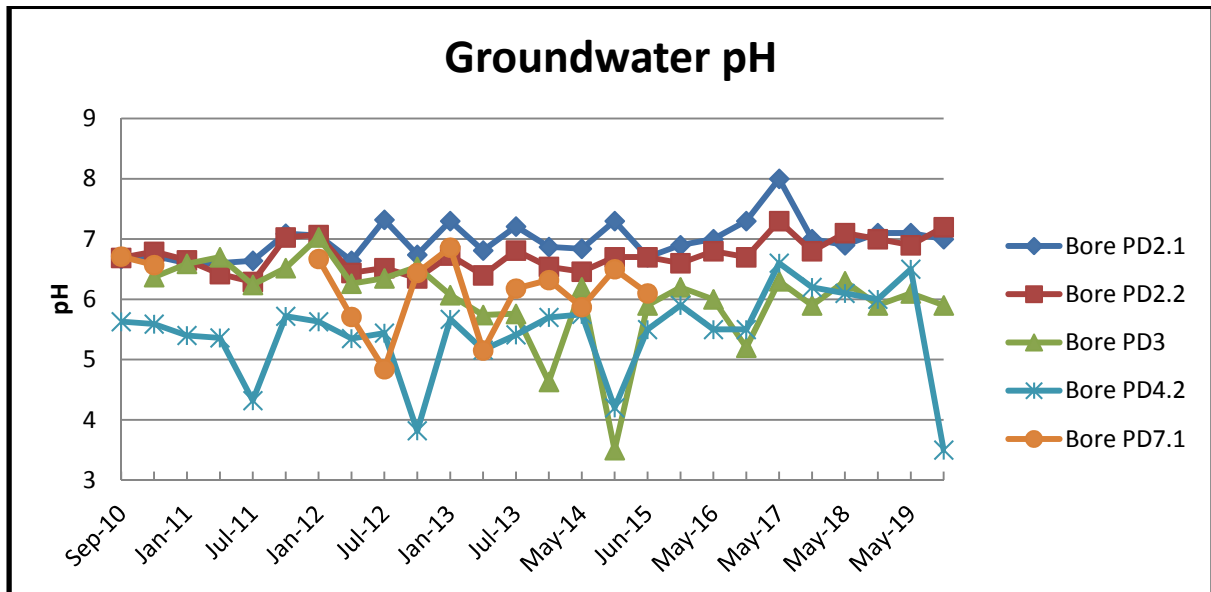


Figure 10: Groundwater pH

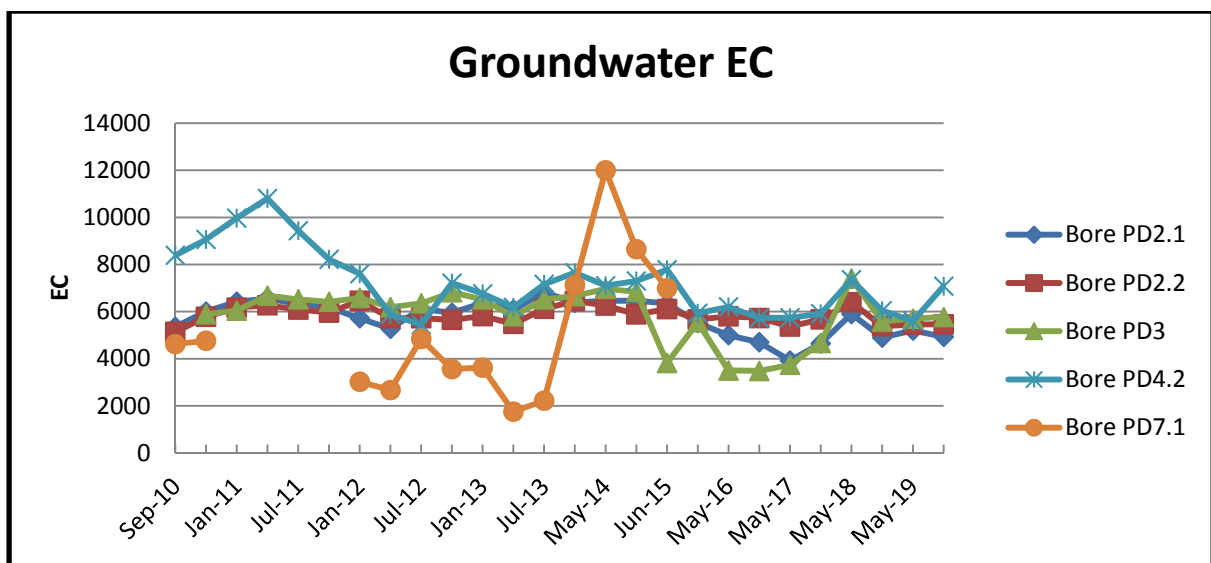


Figure 11: Groundwater EC

Predicted groundwater extractions via mine inflows are expected to peak in the water year 2020/21 at 482 ML. For the water year 2018/19 inflows were estimated to be 442 ML. Table 19 shows the actual water take for the water year 2018/19 was 341 ML.

### 7.2.3 Environmental Incidents

No reportable incidents relating to groundwater occurred during the reporting period.

#### 7.2.4 Further Improvements

The groundwater monitoring program will be continued in accordance with WMP requirements. As more groundwater data is collected any long-term trends may be identified.

## **8 REHABILITATION**

### **8.1 Buildings**

There have been no buildings or structures decommissioned over the site during the reporting period.

### **8.2 Rehabilitation of Disturbed Land**

A range of final land uses have previously been considered by Bloomfield and the landowner. Selection of an appropriate post-mining land use and development of a suitable post mining landform is detailed in the 2008 EA, 2017 EA (Mod 4) and in the current MOP. After consideration the land use options and the requirements under the Lease Agreement with the landowners, Bloomfield has determined that rehabilitated land suitable for a variety of future land uses, whilst enabling the retention of habitat areas, is the most appropriate choice.

As the site and surrounding area has been identified as having potential for industrial-type uses in the future, the mine site area will be rehabilitated in such a way that does not conflict with this future land use. Such rehabilitation will mean providing a flat to undulating topography suitable for mixed use industrial, seeded with grasses to stabilise, together with areas of trees for habitat, until such time as detailed determinations are made regarding any future industrial use of the site. Should no such future development eventuate, the site would remain as a stable, rural landscape. The objectives of the rehabilitation program being:

- To establish post-mining surfaces and vegetation cover which ensure a safe and stable landform of land capability class equal to that which existed prior to mining disturbance.
- Return the land to a condition suitable for a range of post-mining landuses, which take into account the proximity of the site to the urban areas of Maitland and possible future development demands.
- Create landforms that can accommodate overburden and waste products produced during coal mining and processing, and merge with adjoining undisturbed landforms.
- Reinstall a surface drainage network on the rehabilitated landforms that is hydrologically stable and incorporates adequate erosion and sediment control structures so as to effectively protect adjoining areas from potential water-borne impacts.
- Undertake a maintenance program to ensure the continued sustainability of previously rehabilitated areas.

Landscape re-contouring, topsoil handling and revegetation techniques are well established at Bloomfield. Rehabilitation is carried out throughout the year, with the aim of timing vegetation seeding operations in spring and autumn. The majority of the lease area is relatively undisturbed remnant native bushland and no other activities are carried out on the area other than the mining operation. To date 488 Ha has been rehabilitated.

As reported in the previous Annual Review, the major rehabilitation program undertaken over the past decade has now resulted in only relatively small areas becoming available for rehabilitation each year. Combined with this was an expansion of dumping area over areas previously categorised as rehabilitated.

During 2019 there was no rehabilitation undertaken as per the rehabilitation schedule in the MOP 2018-2020. Final shaping of about 5ha occurred on the southern end of S Cut however was not topsoiled. Throughout 2019 overburden emplacement operations were carried out within the mine void. This involved backfilling the lower areas of the void and against existing highwalls towards the final landform. The highwalls on the southern and western lease boundary will eventually be backfilled to ground level. Shaping and rehabilitation of existing overburden emplacement areas will not be able to continue until backfilling areas within the void has reached the final landform.

Plan 2 provides an overview of the site showing areas previously rehabilitated, shaped and unshaped areas (active dumps), and active mining areas.

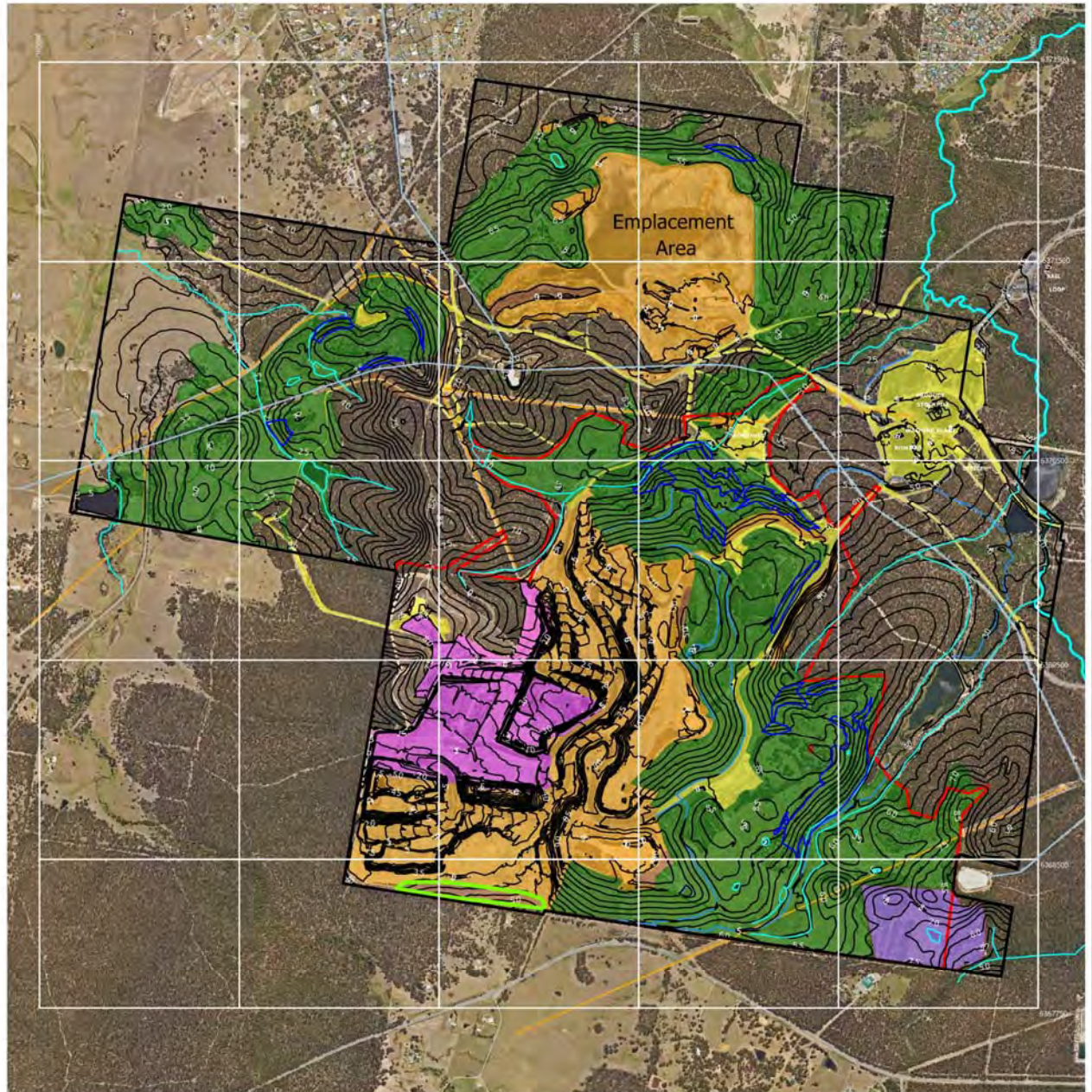
Table 25 provides a summary of the disturbed and rehabilitated areas at Bloomfield Colliery.

**Table 25: Rehabilitation Summary**

		Area Affected/Rehabilitated (hectares)		
		To date	Last report	Next Report (estimated)
<b>A: MINE LEASE AREA</b>				
<b>A1</b>	<b>Mine Lease(s) Area</b>	1,453		
<b>B: DISTURBED AREAS</b>				
<b>B1</b>	<b>Infrastructure area</b> (other disturbed areas to be rehabilitated at closure including facilities, roads)	72	72	72
<b>B2:</b>	<b>Active Mining Area</b> (excluding items B3 – B5 below)	61	68	57
<b>B3</b>	<b>Waste emplacements,</b> (active/unshaped/in or out-of-pit)	174	169	178
<b>B4</b>	<b>Tailings emplacements,</b> (active/unshaped/uncapped)	79	79	79
<b>B5</b>	<b>Shaped waste emplacement</b> (awaits final vegetation)	10	8	5
<b>ALL DISTURBED AREAS</b>		396	396	391
<b>C REHABILITATION PROGRESS</b>				
<b>C1</b>	<b>Total Rehabilitated area</b> (except for maintenance)	488	488	493
<b>D: REHABILITATION ON SLOPES</b>				
<b>D1</b>	<b>10 to 18 degrees</b>	28	28	28
<b>D2</b>	<b>Greater than 18 degrees</b>	-	-	-
<b>E: SURFACE OF REHABILITATED LAND</b>				
<b>E1</b>	<b>Pasture and grasses</b>	483	483	488
<b>E2</b>	<b>Native forest/ecosystems</b>	-	-	-
<b>E3</b>	<b>Plantations and crops</b>	5	5	5
<b>E4</b>	<b>Other</b> (include nonvegetative outcomes)	-	-	-

The 488 Ha total rehabilitated area includes 21 Ha of rehabilitated and relinquished lands.





## LEGEND

0 1 km  
Contour Interval 5m



Contour (m AHD)	Slopes 10 to 18 Degrees	Unshaped Areas
Clean Water	Power Lines	Shaped Areas
Dirty Water	Relinquished	Active Areas
Approval Area	Previous Rehabilitation	Infrastructure
Colliery Holding	2020 Rehabilitation	



## Bloomfield Colliery

Annual Review 2019

### Plan 2

### Rehabilitation Plan 2019

Scale: 1:20000

Date: January 2020  
Photo: January 2020

Drawing: A3



Table 26 provides a summary of the maintenance activities during the period and activities proposed for the next reporting period.

**Table 26 Maintenance Activities on Rehabilitated Land**

NATURE OF TREATMENT	Area Treated (ha)		Comment/control strategies/ treatment detail
	Report period	Next period	
<b>Additional erosion control works</b> (drains re-contouring, rock protection)	-	-	Repair and rehabilitation of drain and gully erosion.
<b>Re-covering</b> (detail – further topsoil, subsoil sealing etc)	-	10	Areas treated with fertiliser and re-seeded during the next reporting period. Actual areas small and difficult to calculate.
<b>Soil treatment</b> (detail – fertiliser, lime, gypsum etc)	-	-	See "Re-covering" above.
<b>Treatment/Management</b> (detail – grazing, cropping, slashing etc)	60	-	The northern and western area of K Cut rehabilitation area fenced and cattle grazing introduced to maintain pasture.
	-	5	Slashing of established rehabilitation to encourage nutrient recycling and, where needed, fertiliser application.
<b>Re-seeding/Replanting</b> (detail – species density, season etc)	-	-	See "Re-covering" above.
<b>Adversely Affected by Weeds</b> (detail - type and treatment)	ML1738	ML1738	Continual localised areas of weed treatment across all disturbed and undisturbed areas (see Section 3.7), but no specific areas of intensive treatment.
<b>Feral animal control</b> (detail – additional fencing, trapping, baiting etc)	1500	1500	Feral dog baiting undertaken during the reporting period in consultation with other large land holders in the area and Local Land Services.

### 8.2.1 Rehabilitation Monitoring

Rehabilitation monitoring at Bloomfield is undertaken in accordance with the Rehabilitation Management Plan, which was developed to satisfy the requirements of the Project Approval for the operation.

The monitoring program is based on the Landscape Function Analysis (LFA) tool developed by the CSIRO. LFA is the core of the monitoring procedures and uses visually assessed indicators of soil surface processes that gauge how effectively a hillslope is operating as a biophysical system. It is mainly based on processes involved in surface hydrology: rainfall, infiltration, runoff, erosion, plant growth and nutrient cycling. In addition to LFA monitoring, the monitoring program also assesses the performance of rehabilitated lands in terms of ground cover protection, erosion, vegetation community composition and structure, soil properties and pasture productivity.

Rehabilitation monitoring at Bloomfield is carried on a biennial basis (i.e. every 2 years) and did not commence until 2008, at the time where much of the existing rehabilitated areas were already established. Monitoring events were subsequently conducted in 2011, 2013, 2015,

2017 and 2019. The monitoring program currently includes a total of 29 monitoring sites, comprised of 27 sites within the rehabilitated areas plus two analogue sites. Plan 3 shows the monitoring transect sites in the rehabilitation areas, the analogue sites and the history of the rehabilitation areas.

Key findings of the 2019 rehabilitation monitoring program include the following:

- Landscape function yielded excellent results in terms of stability, but poorer results for infiltration and nutrient cycling capacities. Reference sites experienced a similar decline in index scores since the last monitoring, indicating these issues are not limited to rehabilitated areas and are likely impacted by drought conditions.
- At the time of survey, the Hunter Valley was subject to prolonged drought conditions (lack of rainfall and higher than average temperatures). Subsequently groundcover was generally low across all sites.
- Species diversity has decreased slightly since the 2017 monitoring event, likely as a result of dieback and drought conditions, however it remains on an upward trajectory since the monitoring commenced.
- The majority of sites with mid and upper storeys appeared to be in good health and exhibited signs of natural regeneration, despite prolonged drought conditions.
- Some minor areas of weed infestation were identified.
- Almost all sites displayed excellent soil characteristics in terms of topsoil cover, soil acidity, salinity, dispersion and sodicity.
- Land and soil capability were generally quite good across rehabilitated areas. Rehabilitated sites performed similar to, or better than reference sites.

### **8.3 Other Infrastructure**

No infrastructure was decommissioned during the reporting period.

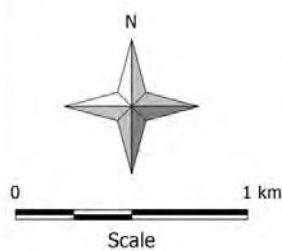
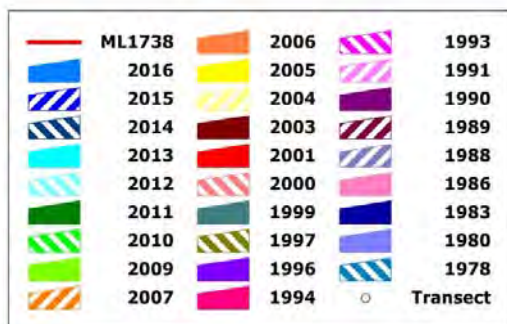
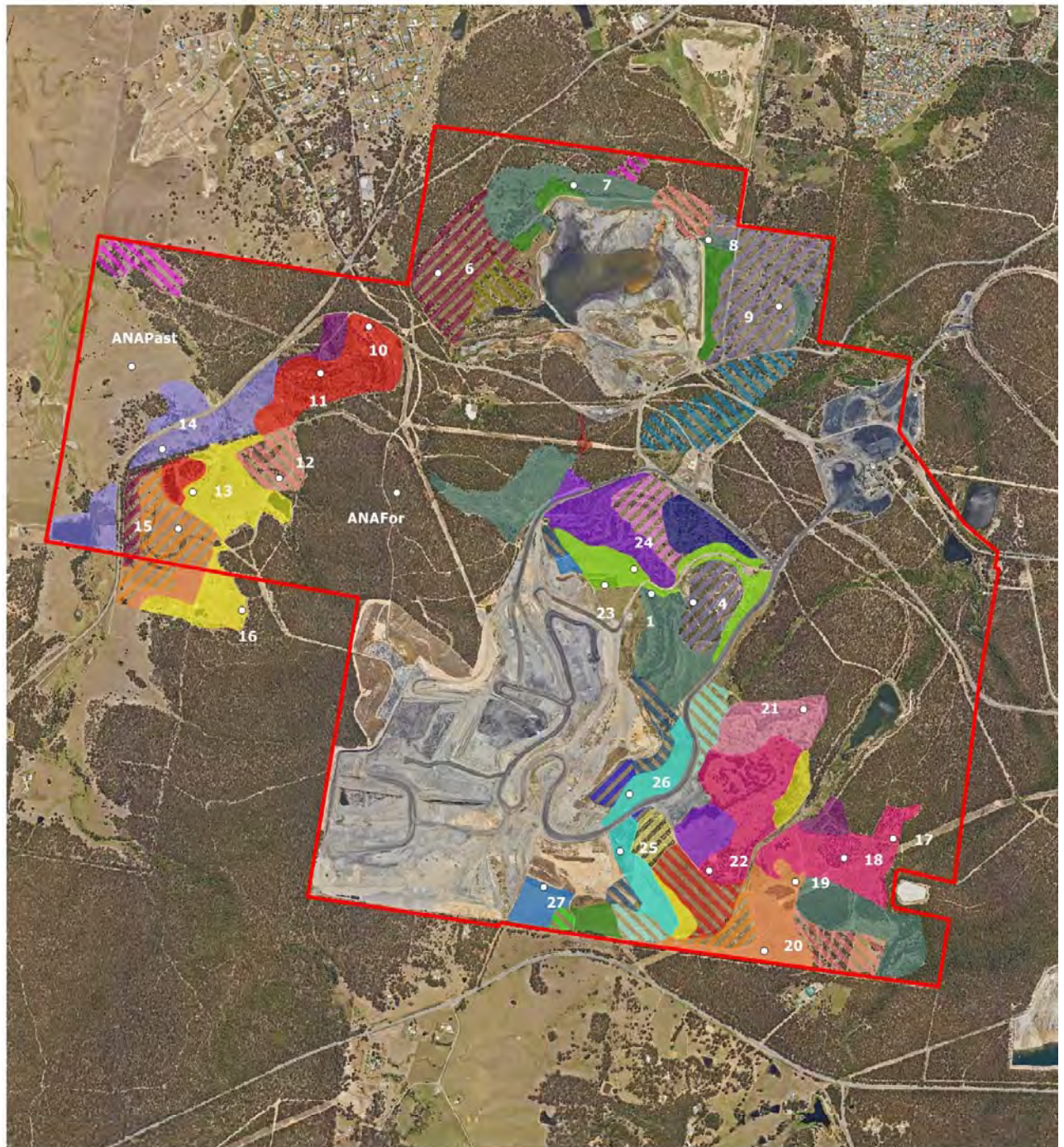
### **8.4 Rehabilitation Trials and Research**

Pastures have been established on rehabilitated land. The aim is to support a productive and sustainable grazing land use. During 2019 an additional 60 Ha of rehabilitation areas was fenced and cattle grazing introduced to maintain pasture.

During 2019 a monitoring program has commenced to assess progress in achieving a long term sustainable agricultural land use of the rehabilitated land. These areas of rehabilitated mined lands have been grazed with beef cattle. While 2019 was very dry conditions, grazing has been able to be maintained on rehabilitated areas. Further details on the results of the monitoring program will be reported in the 2020 Annual Review.

### **8.5 Overview of Potential Rehabilitation Issues**

The key issues associated with site rehabilitation have been assessed using the maximum reasonable consequence ratings, likelihood ratings, risk matrix and classifications presented in the approved MOP. Table 27 outlines the key issues and proposed mitigation measures that would be implemented.



<b>Bloomfield Colliery</b>
Annual Review 2019
Plan 3 Rehabilitation Monitoring Transects



**Table 27: Overview of Rehabilitation Issues**

Issue	Proposed Mitigation Measure
Geotechnical failure of emplacement area such as slumping.	Review emplacement design, including survey if required. Undertake reshaping of emplacement area minimising slopes >10°.
Wind and water erosion leading to degradation of growth medium and rehabilitation quality.	Ensure appropriate erosion and sedimentation controls and drainage lines will be employed during rehabilitation activities. Maintenance earth and revegetation works will be undertaken in the areas where erosion has been noted. Annual monitoring detailed above will be designed to determine the type, source, degree, and location of potential erosion sites and source of sediment.
Inadequate or insufficient topsoil to create/enhance the desired ecological communities.	Review soil management procedures and amend as appropriate. Implement maintenance revegetation program including seeding, tubestock planting of native overstorey species, fertiliser. Implement soil testing and amend growing media by the addition of soil ameliorants as required eg; lime, gypsum, mulch, biosolids. Assess soil for weed contamination and treat affected soil.
Impact of weeds and /or vertebrate pest animal leading to widespread failure of revegetation ecosystems.	Careful use of weed free topsoil and/or topsoil management. Encourage rapid establishment of ground cover species designed to outcompete weed species. Assessment and management of weed incursions on topsoil stockpiles prior to resspreading. Weed control undertaken in accordance with the requirements of the <i>Noxious Weeds Act 1993</i> . Control of pest animal species in accordance with industry guidelines.
Poor vegetation establishment success.	Review species mix and, if required, adjust to achieve the targeted ecosystem. Pasture species selection will be reviewed in context of pasture productivity. Conduct remedial treatment such as soil amelioration, reseeding etc.
Pasture areas not suitable for grazing productively.	Pasture species selection will be reviewed in context of pasture productivity. Conduct remedial treatment such as soil amelioration, reseeding etc.
Spontaneous combustion destabilising land surface and impeding vegetation establishment	Apply capping, or dig out affected area where possible and seal, remedial earthworks with inert material and revegetate. Spontaneous Combustion Management Plan
Major storm event resulting in flooding, geotechnical instability, major erosion and/or widespread damage to rehabilitated areas.	Design final landforms, drainage structures and revegetation to cope with major storm events. Implement maintenance program on rehabilitation and sediment structures.

Severe and/or prolonged drought leading to widespread failure of revegetation.	Re-seeding with a selection of drought-tolerant species for revegetation. Selection of species aligned to desired vegetation community. Time seeding/plantings to take advantage of ideal weather conditions. Assess against reference site to determine if impact rehabilitation specific.
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## 8.6 Weeds & Pests

A Weed Management Plan has been developed to provide a plan for weed management at Bloomfield Colliery. The purpose of the Weed Management Plan is to conduct regular surveys to identify weed species requiring control, identify and map weed infestation locations, and implement a weed control priority action plan to control weeds. Bloomfield undertakes regular inspections and has a treatment program to control weeds across the site. A contract weed-sprayer is employed in addition to mechanical support from a slasher when required.

Periodic feral animal control programs are undertaken in conjunction with neighbouring mines and landowners. Activities include feral dog baiting programs. These programs are conducted annually in consultation with Local Land Services.

Approximately \$80,000 was spent across the site on weed control during the reporting period. This consisted of a combination of spraying and slashing. Weed control works included rehabilitation areas and remnant vegetation within the Project Area as well as land outside the project area under the control of Bloomfield. No Class 1 or Class 2 declared weeds were identified onsite. Table 28 lists the weed species identified and treated on site.

**Table 28: Weed Priority Level**

Common Name	Scientific Name	Priority Level
African Daisy	<i>Senecio pterophorus</i>	Medium
Blackberry	<i>Rubus fruticosus</i>	Medium
Castor Oil	<i>Ricinus communis</i>	Low
Crofton Weed	<i>Ageratina adenophora</i>	Low
Farmers Friend	<i>Bidens pilosa</i>	Low
Giant Parramatta Grass	<i>Sporobolus fertilis</i>	Low
Lantana	<i>Lantana camara</i>	High
Mother of Millions	<i>Bryophyllum delagoense</i>	Low
Pampas Grass	<i>Cortaderia selloana</i>	High
Morning Glory	<i>Ipomoea indica</i>	Low
Tobacco Bush	<i>Solanum mauritianum</i>	Low

During the reporting period a wild dog and fox baiting program was undertaken in conjunction with local landholders and the Hunter Local Land Services. This was conducted in October 2019. The baiting program proved to be successful with 30 baits taken.

### **8.7 Further Development of the Final Rehabilitation Plan**

Under the current mine plan coal extraction is expected to continue until 2025 depending on rates of mining. Under Project Approval 07\_0087 mining operations can continue to 2030. The Bloomfield washery, rail loader and tailings facility will continue to operate after the mining operations are scheduled to be completed. The continued use of the washery, rail loader and tailings facility is approved under Project Approval 05\_0136 for the Abel Underground Mine. These items associated with the operation of the washery are approved to process coal from Bloomfield, Abel or the Tasman extended mines. When mining is completed at Bloomfield Colliery, the washery may continue processing coal from the Abel and or Tasman Extended mines. Abel Project Approval 05\_0136 permits operations until 2030.

The final void remaining at the end of mining will be used as the tailings facility for the washery operations. An estimated 20 million m<sup>3</sup> of storage capacity will be required for the final void as a tailings facility. This will be used for the disposal of approximately 18 M m<sup>3</sup> of waste rejects and a further 2 M m<sup>3</sup> of overburden capping. The tailings material will be capped with 2 metres of overburden material, soil spread and the area rehabilitated. Overburden material and topsoil will be stockpiled adjacent to the final void towards the end of Bloomfield mining operations to be utilised for final closure when washery operations are completed in 2030.

The current MOP expires at the end of 2020. A new MOP will be prepared and submitted to the NSW Resources Regulator towards the end of 2020 to cover the next MOP period.

## 9 COMMUNITY RELATIONS

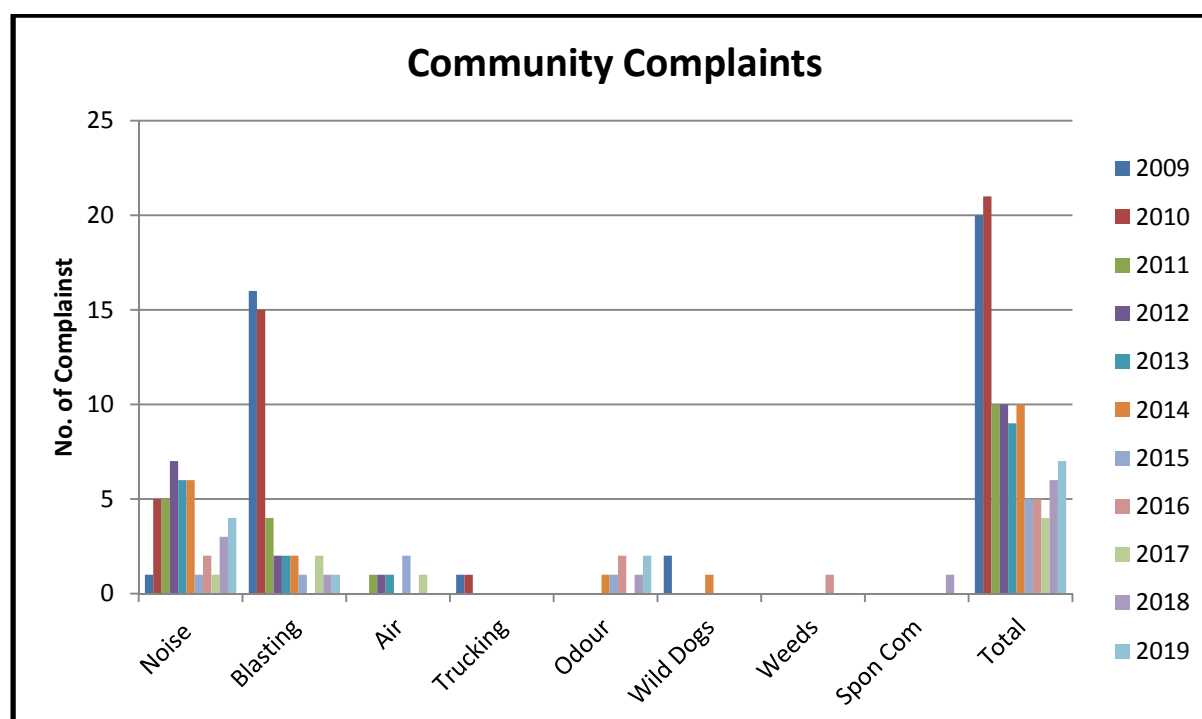
### 9.1 Environmental Complaints

Seven community complaints were received during the reporting period and a summary is provided below in Table 29. The complaints register for the reporting period is presented in Appendix E.

**Table 29: Community Complaints Summary**

Date	Issue	Type	Location
08-Apr-19	Noise	Resident	Black Hill
11-Apr-19	Noise	Resident	Ashtonfield
11-Apr-19	Noise	Resident	Ashtonfield
07-Aug-19	Odour	Resident	Black Hill
17-Oct-19	Odour	Resident	Black Hill
17-Oct-19	Blast	Resident	Buchanan
28-Oct-19	Noise	Resident	Buttai

Figure 12 displays a comparison of complaints with previous reporting periods, which demonstrates a decline in the number of complaints received.



**Figure 12: Community Complaints**

## **9.2 Community Liaison**

### **9.2.1 Community Consultative Committee**

In accordance with the Project Approval, a Community Consultative Committee (CCC) has been established. The CCC meets three times a year. The minutes of the CCC meetings can be viewed on the Bloomfield website ([www.bloomcoll.com.au](http://www.bloomcoll.com.au)).

Additional information about the operation has been included on the company website ([www.bloomcoll.com.au](http://www.bloomcoll.com.au)) and information about blasting schedules advertised quarterly in local newspapers.

### **9.2.2 Adopt-a-Road Program**

Bloomfield is a participant in Cessnock City Council's Adopt-a-Road program. Bloomfield has entered into an agreement with the Council to undertake litter collection campaigns along Buchanan Road, between John Renshaw Drive and Louth Park Road, Buchanan, including Valley View Lane. Bloomfield has contracted the Kurri Kurri Community Center Inc to conduct quarterly litter collection programs.

### **9.2.3 Community Sponsorship**

The Bloomfield Group has a commitment to support local community projects and activities. As part of this commitment, during 2019 financial sponsorship and donations were provided for the following local community groups, schools, charities and community events:

- Australian Men's Shed Association - Maitland Men's Shed
- Australian Men's Shed Association - Walka Men's Shed
- Bears of Hope - Pregnancy and Infant Loss support
- Black Hill Uniting Church
- Brewarrina Central School
- Camp Quality
- Cancer Council Australia
- Cancer Council NSW
- Combined Schools ANZAC Commemorative Event - Singleton
- Darlington Rural Fire Brigade Fire & Emergency Public Fund
- East Maitland Public School
- Go Fund Me - Tara Atkins - Singleton Family Devastated by Fire
- Hunter Medical Research Institute
- Hunter Medical Research Institute
- Hunter River Agricultural & Horticultural Association
- Hunter Valley Gemology Club
- Hunter Valley Junior Cricket
- John Hunter Children's Hospital
- Legacy Club Services - Singleton Branch
- Maitland Basketball
- Maitland District Hockey Club



- Maitland Football Club
- Maitland Grossman High
- Maitland Hospital
- Maitland Junior Soccer Club
- Maitland Polocrosse
- Maitland Rugby Blacks Netball Club
- Maitland Triathlon Club
- Maitland Tutorial Centre
- Mentor Support Network
- Metford Public School
- Mindaribba Warriors Rugby League
- Morpeth Men's Shed
- Movember
- Multiple Sclerosis Limited
- Muswellbrook Polocrosse
- National Trust
- Northern Agricultural Association - Singleton Show
- NSW Mining (conference support)
- Rotary Australia Overseas Aid Fund DGR
- Salvation Army - Red Shield Appeal
- Sculpture on the Farm - Dungog
- Singleton Business Chamber
- Singleton Council Mayoral Fund
- Singleton Hospital
- Singleton Neighbourhood Centre
- Singleton Netball Association
- St Philips Christian College Newcastle
- Steamfest
- Tarro Fire Brigade 454
- Tea Gardens Hawks Nest Surf Life Saving Club
- The Samaritans
- University of Newcastle
- Upper Hunter Where the is a Will
- Youth off the Streets

In addition to the above, in accordance with Schedule 2 Condition 14 of the Approval a minimum contribution of \$32,000 annually is provided to a locally operating community charity. Youth Off the Streets received this contribution in 2019.

## **10 INDEPENDENT AUDIT**

In accordance with the Bloomfield Project Approval (PA 07\_0087) every three years Bloomfield is required to undertake an Independent Environmental Audit of the project. The last Independent Environmental Audit was conducted in 2018 and further detail was provided in the 2018 Annual Review.

Table 30 outlines the recommendations arising from the 2018 Independent Environmental Audit and an update on progress made in implementing the action plan developed as an outcome of the audit.

The next Independent Environmental Audit of Project Approval 07\_0087 will be conducted in 2021.

**Table 30: Audit Recommendations**

<b>Auditors Conclusions and Recommendation</b>		<b>Bloomfield Response</b>	<b>Update</b>
Sched 2 Cond 5 Evidence of Consultation	The revision of management plans going forward will need to consider the outcomes of the required consultation in further detail to ensure compliance with this condition. Further for future revisions of management plans it should be confirmed with DPIE upfront whether additional consultation is required with listed agencies (in addition to consultation that has occurred for the original versions of the management plans).	When future revisions of management plans are required Bloomfield will confirm with DPIE upfront whether additional consultation is required with listed agencies.	As and when required.
Sched 3 Cond 19 Water Management Plan	It is recommended that during the next revision of the Water Management Plan that Bloomfield consults with DoI.	The Water Management Plan is currently being reviewed / updated by AECOM, as approved by DPIE. Consultation with relevant agencies will be undertaken before submission of the final revised Plan to DPIE for approval.	Completed. Submitted to DPIE for approval August 2019.
Sched 3 Cond 26 Landscape Management Plan	During the next revision of the Landscape Management Plan (and subsequent plans required within it) consultation with DoI and Council should be undertaken.	When the Landscape Management Plan is required to be revised in the future consultation with DoI and Council will be undertaken.	As and when required.
Sched 5 Cond 6	Bloomfield should continue to ensure that all staff are aware of the requirements to report incidents to DPIE and other relevant regulatory agencies under the project approval, mining authorities and EPL.	The employee induction presentation will be reviewed and updated to better highlight the requirement to report incidents to external agencies.	Completed.
Spontaneous Combustion Management	Revise documented dumping procedures in the "Spontaneous Combustion Principal Mining Hazard Management Plan" to reflect actual practice of providing a minimum of 10 metres of suitable inert overburden over higher spontaneous combustion risk carbonaceous material.	The Spontaneous Combustion Principal Mining Hazard Management Plan will be revised and updated to reflect actual practice of providing a minimum of 10 metres of suitable inert overburden over higher spontaneous combustion risk carbonaceous material.	Completed.
	Upgrade existing or purchase gas monitors with both SO <sub>2</sub> and H <sub>2</sub> S capability with resolution to 0.1 ppm to allow monitoring of very low levels of gases and better assess any deterioration.	A new gas monitor will be purchased specifically for use in spontaneous combustion testing.	Completed.
	Purchase heat gun/s to determine strata temperature (this is best done in the early morning).	Bloomfield owns heat guns that can be utilised to determine strata temperature.	Completed.

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Auditors Conclusions and Recommendation		Bloomfield Response	Update
	Develop a procedure for measurement of gas and temperature data to be incorporated into the existing TARP to better identify and manage potential odour issues.	A procedure will be developed for measurement of gas and temperature data that will be incorporated into the existing TARP.	In progress. Testing with monitors to determine levels needed for practicality. TARP to be updated as test data acquired.
	Provide personnel with relevant information on SO <sub>2</sub> and H <sub>2</sub> S gases, odour impacts and relevant concentration levels, particularly for public annoyance affection.	Information and training provided for relevant personnel.	In progress. Training outcomes determined around updated TARP above.
Water Licence	The groundwater management plan, which is part of the Water Management Plan should be updated to meet the specific requirements of Condition 6 of the water licence. The revised groundwater management plan should be provided to DPI Water for review and approval as required by Condition 5 of the water licence.	The Water Management Plan is currently being reviewed / updated by AECOM, as approved by DPIE. Consultation with relevant agencies will be undertaken before submission of the final revised Plan to DPIE for approval.	Completed. Submitted to DPIE for approval August 2019.
	It is recommended that Bloomfield conduct a thorough review of the specific conditions attached to 20BL172035 and any other water licences that might be required and granted in future and develop a compliance database to ensure that all requirements are adequately addressed as required.	Bloomfield will develop a compliance database to ensure that all requirements are adequately addressed.	In progress. Purchasing INX software for all environmental compliance and monitoring requirements.

## **11 INCIDENTS AND NON-COMPLIANCE**

As mentioned in Section 1 there were non-compliances with PA07\_0087 during the reporting period.

During November and December 2019 exceedances of the 24 Hour PM2.5 and PM10 criterion were recorded on 22, 26, 28 November and 4, 10 and 16 December 2019. Elevated PM2.5 and PM10 results were also recorded at the EPA Beresfield and EPA Wallsend air quality monitoring stations on the days where exceedances were measured. The elevated results measured over the regional area are likely as a result of elevated particulate levels caused by bushfires during November and December. In addition, on these dates elevated particulate levels were also recorded by the Upper Hunter Monitoring Network. The exceedances were reported to the DPIE on 9 December and 30 Jan 2020.

In February 2019 Bloomfield received a Show Cause letter from DPIE for potentially failing to comply with Schedule 3, Condition 29A of the Approval. Bloomfield provided a written response to the letter on 28 February 2019. Following investigation DPIE issued Bloomfield with a Warning Letter regarding the issue, however no further action was taken. During 2019 Bloomfield has again been in contact with the NSW Biodiversity Conservation Trust regarding entering into a conservation agreement over the Biodiversity Offset land under Part 4, Division 12 of the *National Parks and Wildlife Act 1974*. To date no response has been received.

## **12 ACTIVITIES PROPOSED IN THE NEXT AEMR PERIOD**

The activities for the ensuing year will generally be in accordance with the rehabilitation and landscape management strategy outlined in the Environmental Assessment and the MOP schedule. Environmental activities proposed for the next Annual Review period have been previously reported within relevant sections of this document.

**APPENDIX A**

**DUST MONITORING RESULTS**

**Table A1: PM2.5, PM10 and TSP Results 2019**

<b>Date</b>	<b>TSP Concentration (ug/m<sup>3</sup>)</b>	<b>PM<sub>10</sub> Concentration (ug/m<sup>3</sup>)</b>	<b>PM<sub>2.5</sub> Concentration (ug/m<sup>3</sup>)</b>
2/01/2019	75	34	24
8/01/2019	48	22	11
14/01/2019	46	21	10
20/01/2019	40	18	5
26/01/2019	64	29	20
1/02/2019	42	19	14
7/02/2019	35	16	6
13/02/2019	180*	82*	63*
19/02/2019	97	44	25
25/02/2019	35	16	5
3/03/2019	46	21	13
9/03/2019	51	23	14
15/03/2019	49	22	14
21/03/2019	40	18	10
27/03/2019	53	24	8
2/04/2019	22	10	3
8/04/2019	62	28	12
14/04/2019	33	15	8
20/04/2019	22	10	3
26/04/2019	55	25	13
2/05/2019	48	22	6
8/05/2019	42	19	8
14/05/2019	22	10	4
20/05/2019	46	21	7
26/05/2019	64	29	10
1/06/2019	26	12	6
7/06/2019	20	9	3
13/06/2019	24	11	7
19/06/2019	11	5	2
25/06/2019	2	1	1
1/07/2019	22	10	3
7/07/2019	9	4	2
13/07/2019	15	7	5
19/07/2019	22	10	4
25/07/2019	24	11	5
31/07/2019	13	6	3
6/08/2019	35	16	10
12/08/2019	15	7	3
18/08/2019	24	11	6
24/08/2019	55	25	15
30/08/2019	11	5	2
5/09/2019	33	15	6
11/09/2019	24	11	3
17/09/2019	18	8	3
23/09/2019	13	6	4
29/09/2019	37	17	4
5/10/2019	24	11	2
11/10/2019	15	7	1

Date	TSP Concentration (ug/m <sup>3</sup> )	PM <sub>10</sub> Concentration (ug/m <sup>3</sup> )	PM <sub>2.5</sub> Concentration (ug/m <sup>3</sup> )
17/10/2019	55	25	13
23/10/2019	48	22	-
29/10/2019	128*	58*	-
4/11/2019	22	10	6
6/11/2019	-	-	7
10/11/2019	86	39	14
16/11/2019	84	38	14
22/11/2019	187*	85*	50*
26/11/2019	-	-	65*
28/11/2019	139*	63*	36*
4/12/2019	262*	119*	99*
10/12/2019	231*	105*	79*
16/12/2019	110*	50*	27*
22/12/2019	97	44	15
28/12/2019	59	27	18
Maximum 24 hr Average	262	119	99
<b>EPA Limit 24hr Average</b>	<b>-</b>	<b>50</b>	<b>25</b>
Annual Average	39	18	8
<b>EPA Limit Annual Average</b>	<b>90</b>	<b>25</b>	<b>8</b>

\* Note: Sample not included in annual average calculations due to dust storms and bushfires across the region.



Figure A1

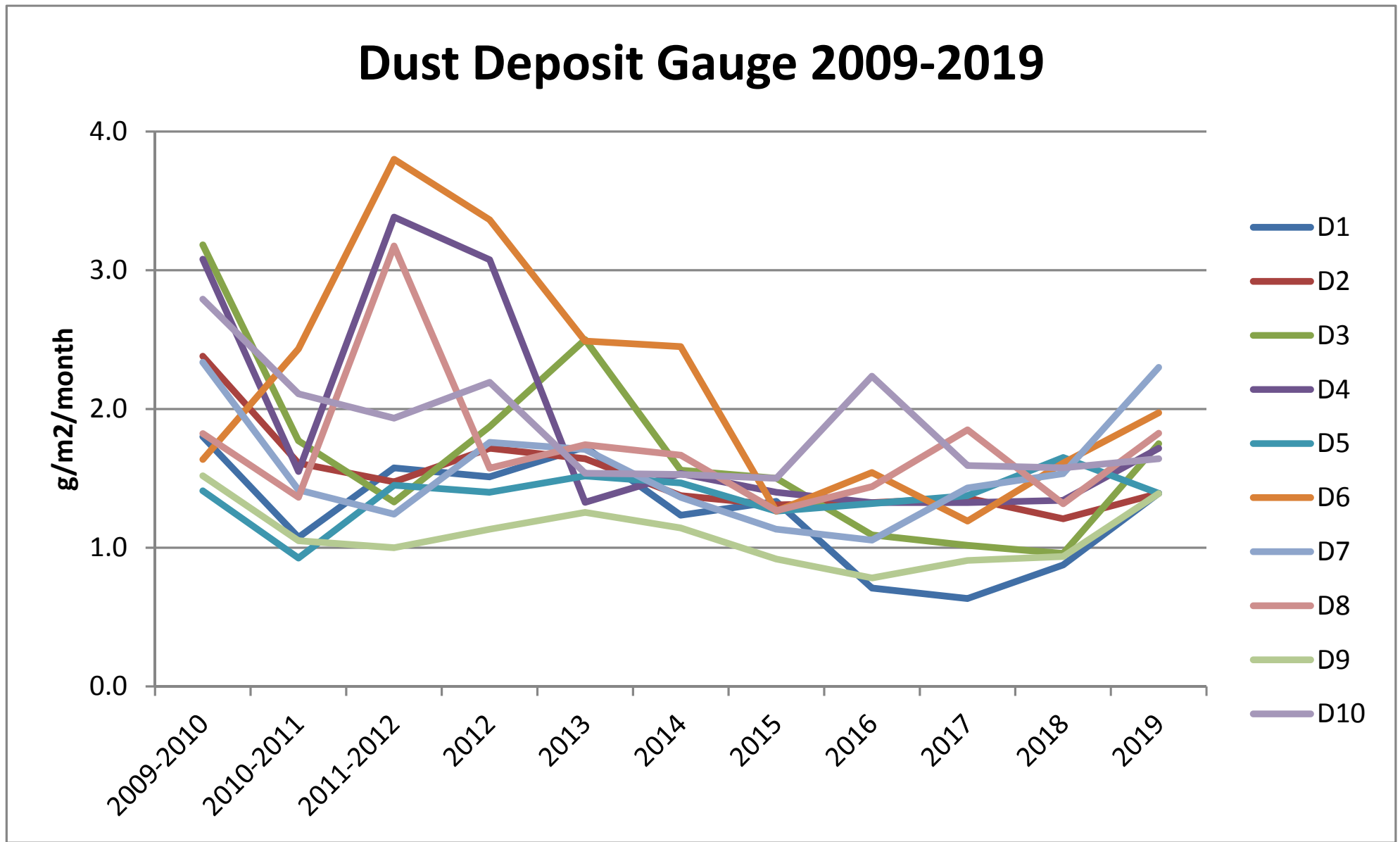


Figure A2

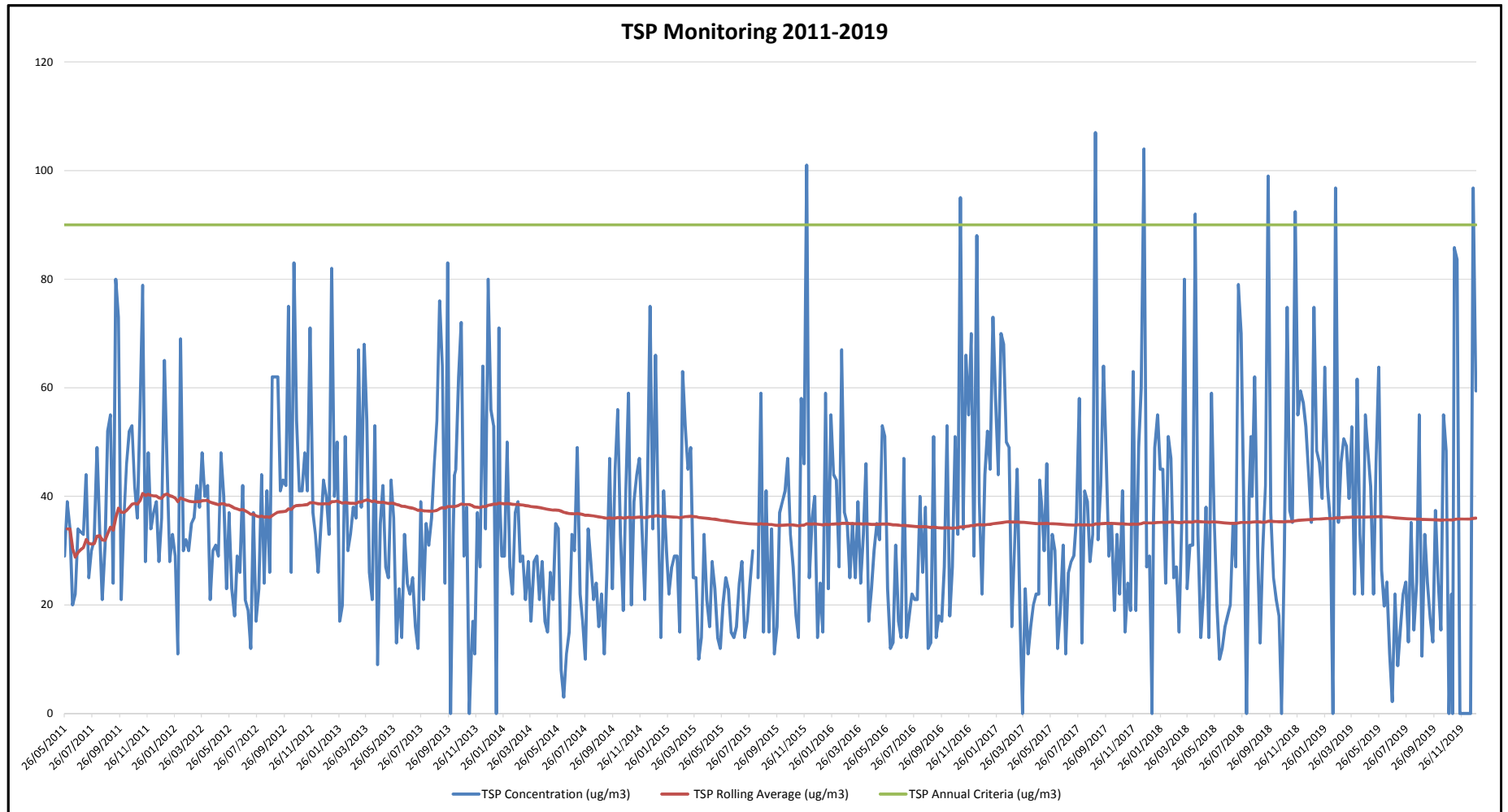


Figure A3

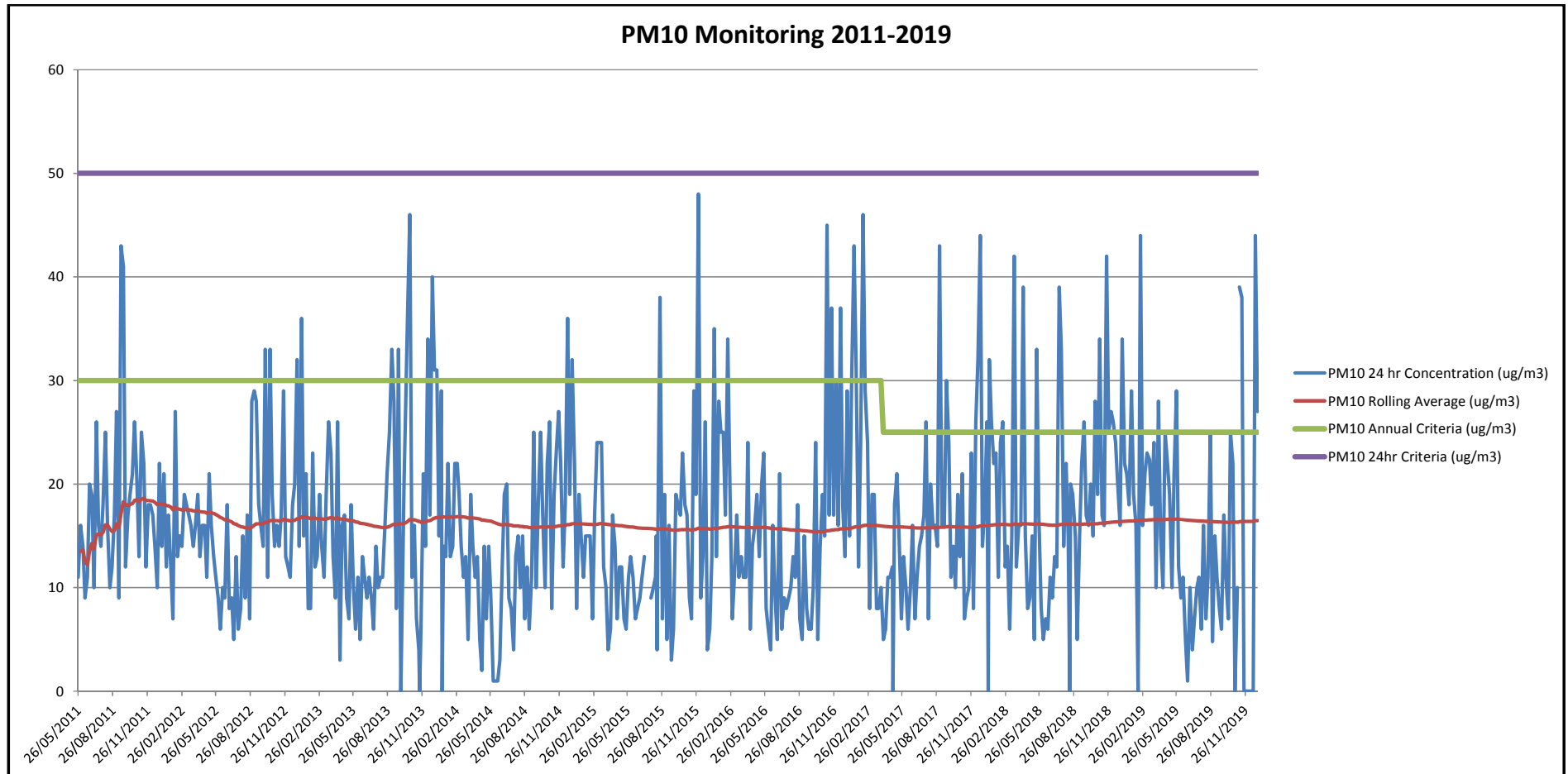
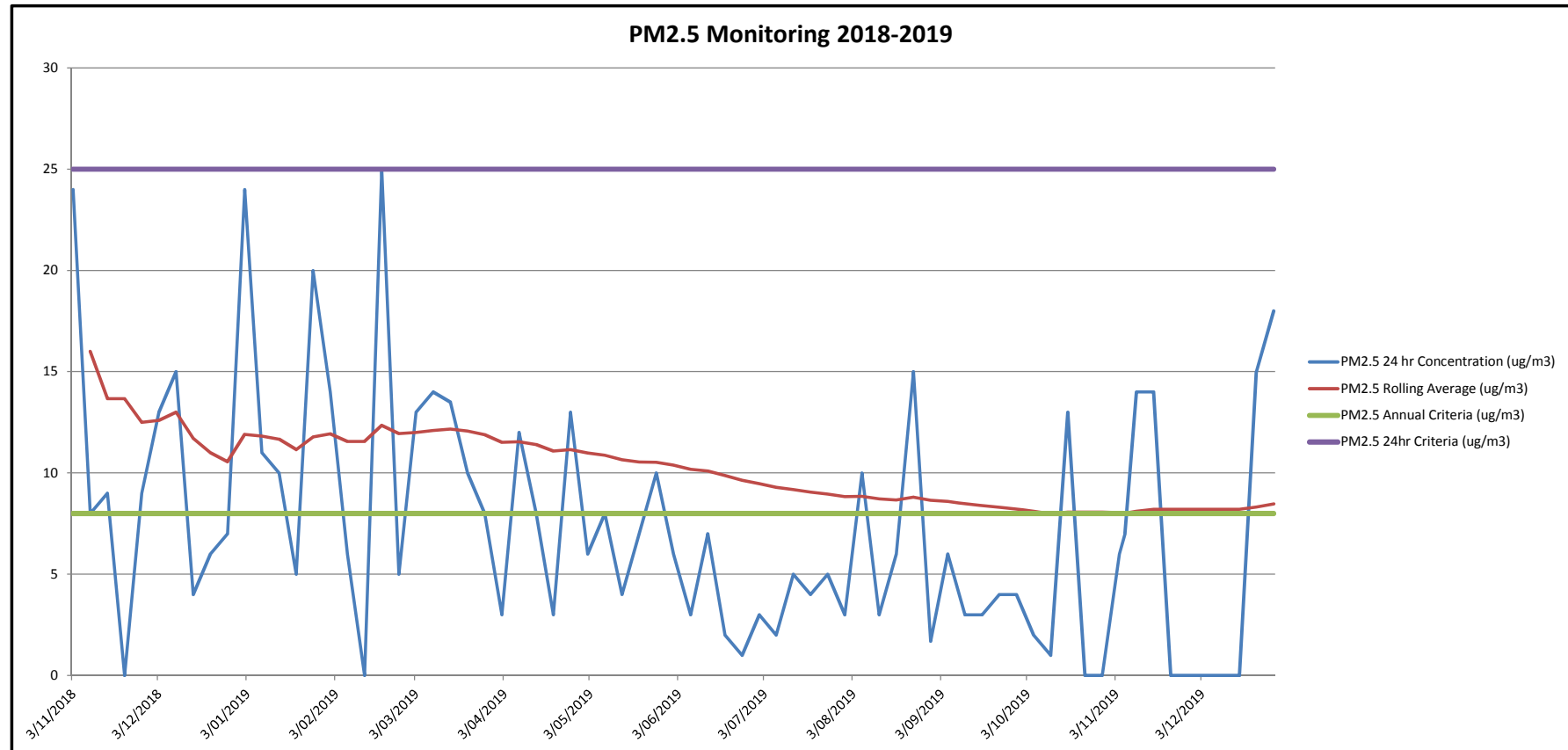


Figure A4



## **APPENDIX B**

### **BLAST MONITORING RESULTS**

**BLAST RESULTS 2019**

**EPL No.** 396  
**Licencee:** Bloomfield Collieries Pty Ltd  
**Premises:** Bloomfield Colliery  
 Four Mile Creek Rd  
 Astonfield NSW 2323

**Monitoring Frequency:** Every blast  
**Airblast Overpressure Limit:** 120 dB(Lin Peak)  
**Ground Vibration Limit:** 10 mm/s



Shot No.                      Date & Time		Blast Monitor Location											
		EPA ID No. 5 - Elliot's			EPA ID No. 4 - McNaughton's			EPA ID No. 3 - Mt Vincent Rd			EPA ID No. 6 - Richards		
		Vibration (mm/s)	Airblast (dB)	Distance (m)	Vibration (mm/s)	Airblast (dB)	Distance (m)	Vibration (mm/s)	Airblast (dB)	Distance (m)	Vibration (mm/s)	Airblast (dB)	Distance (m)
6811	9/01/2019 1:52pm	0.48	102	1344	0.57	95.7	1817	0.23	97.3	2721	0.24	104.6	2187
6812	16/01/2019 2:02pm	0.56	103	1674	0.74	98.5	2010	0.27	92.8	2420	0.38	101.8	2331
6813	16/01/2019 2:02pm	0.56	103	1306	0.74	98.5	1725	0.27	92.8	2778	0.38	101.8	2276
6814	22/01/2019 2:02pm	0.91	110	1340	1.12	106.5	1718	0.42	99	2758	0.46	99.9	2324
6815	1/02/2019 2:03pm	0.5	103.4	1567	0.58	102.8	1906	0.29	102.2	2532	0.33	101.9	2335
6816	1/02/2019 2:03pm	0.5	103.4	1308	0.58	102.8	1616	0.29	102.2	2828	0.33	101.9	2426
6817	4/02/2019 2:02pm	0.23	97.6	1308	0.26	96.7	1616	0.09	84.9	2828	0.2	91	2426
6818	5/02/2019 2:00pm	0.02	99.6	1723	0.02	99.6	2038	0.01	94	2379	0.01	91	2362
6819	18/02/2019 1:56pm	0.01	76	1403	0.01	76	1604	0.01	76	2792	0.01	76	2548
6820	25/02/2019 1:59pm	0.01	88.4	1414	0.01	87	1631	0.01	84	2768	0.01	82.9	2526
6821	11/04/2019 1:55pm	0.56	101.1	1711	0.51	97.7	1817	0.16	101.8	2542	0.26	103.6	2671
6822	16/04/2019 10:05pm	0.83	100.8	1460	0.73	100.9	1753	0.29	104.5	2671	0.24	103	2417
6823	18/04/2019 1:58pm	0.61	103	1733	0.48	100.6	1946	0.21	99.2	2432	0.22	101.1	2519
6824	2/05/2019 1:53pm	0.45	100.6	1610	0.49	102.2	1871	0.17	97.4	2529	0.28	101.3	2449
6825	6/05/2019 1:58pm	0.7	105.3	1732	0.41	98.5	1892	0.18	100.6	2473	0.26	97.2	2597
6826	9/05/2019 10:08am	0.53	102.7	1652	0.47	105.3	1842	0.15	97	2534	0.14	96.7	2550
6827	13/05/2019 1:59pm	0.44	103.2	1620	0.3	98.3	1783	0.15	96.9	2588	0.14	97.7	2588
6828	14/05/2019 1:53pm	0.13	101	1757	0.1	100.7	2079	0.08	95.4	2339	0.1	97.6	2350
6829	30/05/2019 1:55pm	0.36	97.1	1461	0.24	99.8	1751	0.11	89.7	2671	0.11	92.6	2421
6830	31/05/2019 1:57pm	0.28	99.5	1499	0.33	102.2	1772	0.1	94.4	2641	0.1	94.9	2441
6831	14/06/2019 1:55pm	0.5	101.4	1598	0.53	103.1	1789	0.17	96.5	2590	0.18	96.5	2548
6832	1/07/2019 1:52pm	0.02	93.2	1725	0.02	93.2	2108	0.01	80.4	2348	0.01	89.4	2252
6833	9/07/2019 1:56pm	0.07	89.8	1453	0.08	92	1794	0.03	86	2653	0.02	86.5	2351
6834	16/07/2019 2:03pm	0.17	98.9	1468	0.18	103.6	1746	0.06	89.1	2670	0.06	90.6	2437
6835	18/07/2019 1:57pm	0.18	97.7	1551	0.15	97.9	1809	0.06	91.1	2593	0.06	88.5	2461
6836	24/07/2019 2:01pm	0.13	98.3	1600	0.16	97.4	1800	0.05	95.7	2581	0.08	92.8	2537
6837	25/07/2019 2:04pm	0.49	98.6	1711	0.36	98.6	1797	0.15	92.4	2560	0.24	98.8	2700
6838	1/08/2019 1:57pm	0.08	105	1522	0.07	100.3	1999	0.04	91.5	2535	0.04	103.7	2129
6839	1/08/2019 1:57pm	0.08	105	1581	0.07	100.3	2041	0.04	91.5	2477	0.04	103.7	2143
6840	14/08/2019 2:00pm	0.42	105.1	1726	0.35	98.6	1815	0.12	93.2	2542	0.14	101.1	2697
6841	20/08/2019 1:57pm	0.25	109.3	1722	0.18	107	1934	0.08	97.9	2444	0.03	89.4	2521
6842	28/08/2019 2:03pm	0.7	96.9	1472	0.57	101	1759	0.19	102.5	2661	0.23	102.2	2424
6843	29/08/2019 11:41am	0.61	94.3	1537	0.43	96.5	1782	0.19	96.6	2617	0.26	98.1	2477

**BLAST RESULTS 2019**

**EPL No.** 396  
**Licencee:** Bloomfield Collieries Pty Ltd  
**Premises:** Bloomfield Colliery  
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**Monitoring Frequency:** Every blast  
**Airblast Overpressure Limit:** 120 dB(Lin Peak)  
**Ground Vibration Limit:** 10 mm/s



Shot No.		Blast Monitor Location											
		EPA ID No. 5 - Elliot's			EPA ID No. 4 - McNaughton's			EPA ID No. 3 - Mt Vincent Rd			EPA ID No. 6 - Richards		
		Vibration (mm/s)	Airblast (dB)	Distance (m)	Vibration (mm/s)	Airblast (dB)	Distance (m)	Vibration (mm/s)	Airblast (dB)	Distance (m)	Vibration (mm/s)	Airblast (dB)	Distance (m)
6844	4/09/2019 2:00pm	0.6	98.4	1655	0.46	101.2	1814	0.18	97.7	2555	0.19	97	2594
6845	9/09/2019 12:21pm	1.02	93.7	1710	0.88	95.8	1839	0.42	102	2523	0.38	93.5	2640
6846	11/09/2019 1:51pm	0.67	99.1	1680	0.7	100.5	1855	0.3	96.7	2516	0.38	92.9	2573
6847	20/09/2019 2:01pm	0.27	85.9	1682	0.14	104.4	2109	0.11	85	2380	0.11	110.5	2181
6848	20/09/2019 2:01pm	0.27	85.9	1558	0.14	104.4	2139	0.11	85	2500	0.11	110.5	1944
6849	25/09/2019 1:56pm	0.08	107.8	1508	0.03	105.2	2042	0.03	94.4	2545	0.07	114.4	2040
6850	27/09/2019 10:23am	0.5	106.4	1582	0.36	105.7	1976	0.25	86.7	2494	0.34	91.2	2250
6851	3/10/2019 1:56pm	0.35	105.3	1584	0.23	99	2009	0.3	92.3	2482	0.28	102.7	2200
6852	11/10/2019 11:13am	0.41	107.3	1507	0.19	99	2011	0.18	87.7	2547	0.23	105.5	2089
6853	11/10/2019 11:13am	0.41	107.3	1727	0.19	99	2034	0.18	87.7	2379	0.23	105.5	2374
6854	16/10/2019 2:03pm	0.09	106.5	1684	0.02	94.7	2136	0.02	99.5	2373	0.04	108	2139
6855	18/10/2019 2:00pm	0.04	102	1635	0.03	104	2159	0.02	85	2418	0.02	97.1	2025
6856	22/10/2019 2:01pm	0.29	101.5	1392	0.18	97	1936	0.12	88.9	2661	0.16	106.8	2062
6857	1/11/2019 1:57pm	1.53	100.9	1464	1.09	98	1797	0.93	95.7	2645	0.96	101.3	2361
6858	1/11/2019 1:57pm	1.53	100.9	1464	1.09	98	1797	0.93	95.7	2645	0.96	101.3	2361
6859	11/11/2019 2:24pm	1.52	101.1	1717	1.29	99	1897	0.64	88.1	2473	0.78	95.1	2567
6860	14/11/2019 1:57pm	1.1	100.3	1615	0.91	98.6	1844	0.42	91.2	2545	0.84	95.6	2495
6861	11/11/2019 2:01pm	0.68	103.4	1635	0.89	96	1746	0.43	93.5	2616	0.55	98.1	2659
6862	20/11/2019 1:56pm	0.77	101	1531	0.65	96.2	1766	0.43	99	2630	0.51	94.5	2492
6863	27/11/2019 2:04pm	0.35	105.9	1645	0.2	100	2074	0.26	100	2418	0.34	104.8	2184
6864	6/12/2019 9:14am	0.4	109.2	1613	0.47	106.4	2150	0.25	101.5	2440	0.33	105.4	2007
6865	9/12/2019 2:04pm	0.34	107.5	1352	0.4	103	1920	0.19	96.3	2701	0.22	110.1	2040
6866	13/12/2019 1:59pm	0.54	107.7	1278	0.38	104	1666	0.21	103.8	2821	0.28	112	2328
6867	20/12/2019 2:05pm	0.87	101.7	1485	1.05	97.9	1748	0.38	102.7	2662	0.53	102.3	2457

## **APPENDIX C**

### **WATER MONITORING RESULTS**



Site  
WM1[illegible]

Date	pH	Specific Conductance (µS/cm)	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Iron (mg/l)	Turbidity (NTU)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Comments
29-Jan-15	6.4	730	9	530	0.09	14.5								
23-Feb-15														Dry
30-Mar-15														Dry
28-Apr-15	6.4	116	79	86	0.62	190	17	12	17	2.7	2.8	14	6	Floodwater
28-May-15	6	1500				4								Floodwater
24-Jun-15	5.9	1900				4								
29-Jul-15														Dry
27-Aug-15														Dry
28-Sep-15	6.7	2300				4								
22-Oct-15														Dry
30-Nov-15														Dry
21-Dec-15														Dry
29-Jan-16	5.6	1450	2	1050	0.01	2								
26-Feb-16														Dry
31-Mar-16														Dry
28-Apr-16														Dry
26-May-16														Dry
29-Jun-16														Dry
19-Jul-16														Dry
23-Aug-16	6.2	1700				13								Not flowing
28-Sep-16	6.3	1800				8								Not flowing
20-Oct-16														Dry
24-Nov-16														Dry
21-Dec-16														Dry
31-Jan-17														Dry
27-Feb-17														Dry
31-Mar-17	6.3	900				6								Not flowing
26-Apr-17														Dry
30-May-17														Dry
28-Jun-17	5	1380				4								Not flowing
26-Jul-17														Dry
30-Aug-17														Dry
28-Sep-17														Dry
24-Oct-17														Dry
28-Nov-17														Dry
13-Dec-17														Dry
29-Jan-18														Dry
22-Feb-18														Dry
29-Mar-18	6.1	1200				7								
26-Apr-18														Dry
21-May-18														Dry
26-Jun-18														Dry
25-Jul-18														Dry
29-Aug-18														Dry
28-Sep-18														Dry
24-Oct-18														Dry
29-Nov-18														Dry
18-Dec-18	6.1	560				18								
31-Jan-19														Dry
28-Feb-19														Dry
28-Mar-19														Dry
10-Apr-19	6.5	519	53	360	0.25	87	30	150	39	20	15	50	11	
27-May-19														Dry
28-Jun-19														Dry
30-Jul-19														Dry
29-Aug-19														Dry
24-Sep-19	6.5	540				46								
29-Oct-19														Dry
27-Nov-19														Dry
23-Dec-19														Dry

Site  
WM2[illegible]

Date	pH	Specific Conductance (µS/cm)	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Iron (mg/l)	Turbidity (NTU)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Comments
29-Jan-15	5.6	180	42	234	1.4	126								
23-Feb-15	7.3	210				16.5								
30-Mar-15														Dry
28-Apr-15	5	1,040	47	790	0.04	74	5	485	37	45	66	76	13	
28-May-15														Dry
24-Jun-15														Dry
29-Jul-15														Dry
27-Aug-15														Dry
28-Sep-15														Dry
22-Oct-15														Dry
30-Nov-15	7	280				43.8								
29-Jan-16	5.6	180	42	234	1.4	126								
29-Jan-16	6.2	276	47	238	1.1	69								
26-Feb-16	6.7	260				23								
31-Mar-16	7.3	640				161								
28-Apr-16														Dry
26-May-16														Dry
29-Jun-16	6	440				24								
19-Jul-16	5.5	450	4	341	0.17	7								
22-Aug-16	6.7	350				31								
28-Sep-16	7.5	390				11								
20-Oct-16	5	480	10	347	0.09	15	5	180	17	19	21	35	9	
24-Nov-16														Dry
21-Dec-16														Dry
30-Jan-17														Dry
27-Feb-17														Dry
30-Mar-17	5	370				86								Not flowing
26-Apr-17	6.2	270	21	256	3.2	94	16	94	18	12	13	17	9	Not flowing
30-May-17	5.6	460				44								Not flowing
28-Jun-17	5.6	395				27								Not flowing
27-Jul-17														Dry
30-Aug-17														Dry
28-Sep-17														Dry
24-Oct-17	6.4	5,560	10	5,620	0.05	22	150	3100	410	330	330	920	36	
28-Nov-17														Dry
13-Dec-17														Dry
29-Jan-18														Dry
22-Feb-18														Dry
29-Mar-18	5.1	470				26								
26-Apr-18	5	2,630	54	2,290	0.14	30	30	1100	140	110	130	380	24	
21-May-18														Dry
25-Jun-18	4.5	750				7								
25-Jul-18														Dry
29-Aug-18														Dry
29-Sep-18														Dry
24-Oct-18	4.5	830	15	604	0.48	17	30	330	26	38	35	64	14	
29-Nov-18														Dry
18-Dec-18	4.1	700				14								
31-Jan-19														Dry
28-Feb-19														Dry
28-Mar-19														Dry
10-Apr-19	4	458	13	309	0.89	19	30	160	12	20	17	13	11	
27-May-19														Dry
28-Jun-19														Dry
30-Jul-19														Dry
29-Aug-19														Dry
24-Sep-19	4.9	570				9								
29-Oct-19														Dry
27-Nov-19														Dry
23-Dec-19														Dry

Site  
WM3

Elwells Creek / Four Mile Creek Junction

Date	pH	Specific Conductance (µS/cm)	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Iron (mg/l)	Turbidity (NTU)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Comments
24-Sep-09	8.80	360	14	220	0.74	34								
13-Oct-09	8.10	310	370	210	0.61	46	52		38	15	10	39	3	
03-Nov-09	8.30	640	10	500	0.70	27								
13-Dec-09	7.60	410	8	140	0.23	18								
13-Jan-10	6.80	280	10	200	0.61	17	92		39	14	10	34	3	
09-Feb-10	7.30	220	14	130	0.28	14								
04-Mar-10	8.90	280	9	200	0.35	86								
08-Apr-10	8.70	323	7	220	0.20	23	54		42	18	9	33	3	
14-May-10	7.50	193	7	131	0.10	10								
10-Jun-10	6.80	462	41	370	0.14	65								
07-Jul-10	7.30	581	14	354	0.21	33	75		57	19	16	67	4	
25-Aug-10	6.10	419	10	266	0.29	28								
20-Sep-10	7.42	1,950	10	1,390	0.11		89	710	143	95	81	256	9	
19-Oct-10	7.38	336	7	166	0.15									
19-Nov-10	7.94	2,840	31	1,740	0.05									
21-Dec-10	7.44	1,150	9	674	0.30									
14-Jan-11	7.74	2,140	9	1,430	0.09		181	642	217	59	70	353	8	
22-Feb-11	7.93	4,590	10	3,730	0.05									
24-Mar-11	7.96	4,940	12	3,630	0.06									
27-Apr-11	7.01	326	16	234	0.46		60	52	39	14	9	41	3	
26-May-11	8.24	5,460	24	3,800	0.05									
27-Jun-11	7.44	2,950	21	2,230	0.05									
25-Jul-11	7.78	2,420	67	1,440	0.20		148	504	311	56	57	358	7	
26-Aug-11	7.24	780	20	514	0.32									
21-Sep-11	8.02	1497	15	934	0.12									
26-Oct-11	7.71	627	190	436	0.39		43	140	74	19	18	80	5	
22-Nov-11	7.43	1871	29	1330	0.13									
15-Dec-11	7.76	3180	32	2190	0.05									
25-Jan-12	8.17	4810	14	3770	0.07		327	1760	513	109	201	813	18	
17-Feb-12	6.9	442	45	372	0.72									
30-Mar-12	8	3150	17	2190	0.05									
27-Apr-12	7.17	426	24	314	0.95		45	84	48	14	13	49	6	
24-May-12	7.58	351	23	224	1.25									
27-Jun-12	8.21	4810	24	3740	0.63									
27-Jul-12	7.45	1912	35	1370	0.39		82	689	192	85	81	269	8	
30-Aug-12	7.68	711	30	508	0.42									
25-Sep-12	7.94	2140	15	1330	0.1									
25-Oct-12	7.78	786	17	458	0.36		86	147	91	22	23	104	5	
29-Nov-12	8.06	4790	14	3180	0.05									
20-Dec-12	8.14	3620	12	2420	0.05									
24-Jan-13	8.03	2290	6	1510	0.06		204	690	253	62	79	400	9	
25-Feb-13	7.96	2450	54	1560	0.09									
22-Mar-13	7.58	1640	8	1110	0.27									
22-Apr-13	8.29	4150	54	2940	0.09		286	1370	427	109	149	734	15	
17-May-13	7.64	935	54	498	0.59									
21-Jun-13	7.64	860	10	580	0.35									
24-Jul-13	7.48	650	49	416	0.44		52	150	57	19	19	78	4	
28-Aug-13	7.58	596	15	345	0.34									
17-Sep-13	7.52	1180	38	758	0.17									
22-Oct-13	7.79	1250	8	703	0.17		137	246	135	23	31	192	5	
14-Nov-13	7.94	4210	14	2820	0.05									
11-Dec-13	7.29	718	15	447	0.24									
24-Jan-14	8.47	3840	26		0.07									
20-Feb-14	8.1	2810	58		0.05									
25-Mar-14	7.98	1270	17		0.07									
30-Apr-14	7.78	2600	20	1860	0.05		189	965	240	100	109	452	12	
28-May-14	6.94	357	15		0.46									
26-Jun-14	7.85	667	6		0.31									
28-Jul-14	8.36	4960	19	3890	0.05									
31-Aug-14	7.84	1090	23		0.23									
22-Sep-14	7.4	750				62								
27-Oct-14	7.2	1100	17	702	0.26	20.6	108	323	116	25	32	163	5	
21-Nov-14	8	1000				19.3								
22-Dec-14	8	2700				15.9								

Date	pH	Specific Conductance (µS/cm)	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Iron (mg/l)	Turbidity (NTU)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Comments
29-Jan-15	8.4	3000	26	2120	0.05	29.2								
20-Feb-15	8.2	4000				8.7								
30-Mar-15	7.7	960				18.1								
28-Apr-15	7.1	984	33	636	0.25	48	41	330	82	34	38	115	6	
28-May-15	7	890				62								
24-Jun-15	7.4	690				57								
29-Jul-15	7.5	554	8	382	0.41	29.9								
27-Aug-15	8.3	4840				31								
28-Sep-15	7.7	1980				16								
22-Oct-15	6.5	960	25	633	0.09	38.4	78	280	78	39	36	110	5	
30-Nov-15	7.7	2040				20.6								
21-Dec-15	7.7	5400				14								
29-Jan-16	7.4	1290	28	942	0.37	73								
26-Feb-16	7.1	1300				45								
31-Mar-16	8.1	5000				14								
28-Apr-16	7.5	1400	8	992	0.01	14	195	440	97	39	46	210	6	
26-May-16	7.5	670				51								
29-Jun-16	6.7	2400				18								
19-Jul-16	7.1	1100	7	812	0.27	20								
22-Aug-16	7.2	960				27								
28-Sep-16	8.1	4320				11								
20-Oct-16	8.3	3100	7	2460	0.02	14	240	1100	200	92	140	640	11	
28-Nov-16	8.1	3900				22								
21-Dec-16	8	5300				6								
30-Jan-17	8.2	4490	4	3860	0.01	5								
27-Feb-17	7.5	5320				7								
30-Mar-17	7.2	2100				12								
26-Apr-17	7.5	738	10	567	0.45	19	79	210	85	28	29	110	5	
30-May-17	7.4	1420				17								
28-Jun-17	7.1	923				30								
27-Jul-17	7.1	481	8	312	0.61	23								
30-Aug-17	7	1400				8								Not flowing
28-Sep-17	8.2	3790				6								Not flowing
24-Oct-17	8.2	5510	7	5210	0.01	9	410	2300	390	200	290	1200	22	
28-Nov-17	7.4	3100				3								Not flowing
13-Dec-17	7.9	3100				4								Not flowing
29-Jan-18														Dry
22-Feb-18	7.5	1030				108								Stagnant pool
29-Mar-18	7.5	1300				32								
26-Apr-18	7.4	3300	14	2770	0.01	14	220	1200	210	150	150	550	12	
21-May-18	7.4	2600				12								
25-Jun-18	7.6	2250				11								
25-Jul-18	7.1	713	6	512	0.14	17								
29-Aug-18	7.9	4500				7								
28-Sep-18	7.5	2700				7								
24-Oct-18	7.5	2280	3	1660	0.02	10	160	760	180	76	82	400	7.8	
29-Nov-18	8	4150				10								Discharging
29-Jan-18														Dry
31-Jan-19	7.9	1930	7	1170	0.03	10								No flow
28-Feb-19	8.1	5400				8								No flow
28-Mar-19	6.9	910				11								
10-Apr-19	7.6	3050	4	2810	0.01	6	220	1400	240	130	140	560	13	
27-May-19	7.8	5000				6								No flow
28-Jun-19	7.6	4100				7								
30-Jul-19	7.7	2660	4	2460	0.01	27								
29-Aug-19	8.5	3600				6								No flow
24-Sep-19	7	990				8								
29-Oct-19	7.8	2040	3	1620	0.01	4	160	770	200	89	97	300	9.3	
27-Nov-19														Dry
23-Dec-19														Dry

Site  
WM4

Four Mile Creek @ Possums Puddle Discharge

Date	pH	Specific Conductance (µS/cm)	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Iron (mg/l)	Turbidity (NTU)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Comments
24-Sep-09	8.70	160	6	120	0.72	5								
13-Oct-09	7.10	170	4	140	0.61	10	33		28	11	4	20	3	
03-Nov-09	8.80	150	6	130	0.44	22								
13-Dec-09	7.10	160	2	90	0.13	22								
13-Jan-10	7.10	150	6	120	0.17	8	46		24	12	4	14	2	
09-Feb-10	6.30	70	2	110	0.22	5								
04-Mar-10	9.30	190	4	120	0.18	12								
08-Apr-10	8.90	171	1	130	0.59	4	43		25	13	4	14	2	
14-May-10	7.40	157	2	117	0.05	2								
10-Jun-10	6.80	1,250	58	858	0.12	83								
07-Jul-10	7.30	190	13	148	0.24	31	34		27	11	4	13	2	
25-Aug-10	6.49	192	5	136	0.36	28								
20-Sep-10	7.74	180	2	128	0.46		31	15	22	13	4	13	2	
19-Oct-10	7.62	180	4	103	0.12									
19-Nov-10	7.69	332	12	226	0.63									
21-Dec-10	7.50	194	<5	164	0.70									
14-Jan-11	8.12	192	<5	123	0.37		39	14	30	10	4	18	3	
22-Feb-11	8.36	812	<5	656	0.12									
24-Mar-11	8.13	601	7	432	0.18									
27-Apr-11	7.43	185	12	116	0.50		41	12	21	13	4	16	2	
26-May-11	8.37	5,460	24	3,640	0.05									
27-Jun-11	8.04	3,250	20	2,480	0.05									
25-Jul-11	8.18	2,790	57	1,760	0.12		179	610	366	66	70	462	8	
26-Aug-11	7.36	319	14	257	0.41									
21-Sep-11	8.48	243	10	186	0.6									
26-Oct-11	8.71	4670	232	3480	0.5		328	1640	478	132	173	824	17	
22-Nov-11	7.94	760	126	534	0.37									
15-Dec-11	7.57	3340	22	2300	0.05									
25-Jan-12	8.65	2430	110	1770	0.36		126	733	250	52	87	373	10	
17-Feb-12	7.44	241	23	240	1.15									
30-Mar-12	7.8	521	5	374	0.69									
27-Apr-12	7.82	216	11	322	0.91		29	24	32	7	6	26	4	
24-May-12	7.73	206	6	163	1.02									
27-Jun-12	8.35	4710	29	3540	0.05									
27-Jul-12	7.09	342	15	289	47.7		42	52	50	14	10	41	4	
30-Aug-12	8.07	404	15	302	0.55									
25-Sep-12	7.68	255	10	160	0.58									
25-Oct-12	7.68	308	8	155	0.47		34	19	39	11	5	24	3	
29-Nov-12	8.23	550	5	364	0.33									
20-Dec-12	8.07	495	7	290	0.28									
24-Jan-13	8.25	290	6	229	0.14		51	38	32	16	7	30	3	
25-Feb-13	7.79	843	37	554	0.42									
22-Mar-13	7.54	764	8	474	0.63									
22-Apr-13	8.34	4430	16	3110	0.05		310	1510	463	119	159	810	16	
17-May-13	7.55	194	5	150	0.9									
21-Jun-13	7.6	261	5	174	0.62									
24-Jul-13	7.54	232	5	165	0.6		28	25	25	9	5	26	3	
28-Aug-13	7.69	179	5	136	0.37									
17-Sep-13	8.35	5750	25	4400	0.05									
22-Oct-13	8.05	180	5	136	0.41		37	12	22	10	3	16	2	
14-Nov-13	8.17	890	7	511	0.23									
11-Dec-13	7.67	202	5	160	0.56									
24-Jan-14	8.36	253	5		0.44									
20-Feb-14	7.56	413	18		0.23									
25-Mar-14	7.73	189	5		0.14									
30-Apr-14	7.74	493	9	321	0.39		53	120	45	17	16	74	4	
28-May-14	8.13	133	7		0.55									
26-Jun-14	7.91	187	5		0.47									
28-Jul-14	8.4	5220	8	3540	0.05									
31-Aug-14	8.17	297	6		0.32									
22-Sep-14	6.5	140				12.9								
27-Oct-14	7.9	230	3	112	0.24	5	30	10	30	10	3	15	2	
21-Nov-14	7	180				5								
22-Dec-14	8.3	140				3.7								

Date	pH	Specific Conductance (µS/cm)	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Iron (mg/l)	Turbidity (NTU)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Comments
29-Jan-15	8.5	3220	28	2270	0.03	32								
20-Feb-15	8.2	480				5.7								
30-Mar-15	7.9	130				4.5								
28-Apr-15	7.1	1030	46	702	0.23	57	26	400	65	42	48	105	6.4	
28-May-15														No access
24-Jun-15	7.8	390				44								
29-Jul-15	7.6	308	5	222	0.61	29.1								
27-Aug-15	7.9	590				19								
28-Sep-15	7.6	300				19.7								
22-Oct-15	6.8	260	2	168	0.29	9.3	42	43	30	17	7.6	26	2.2	
30-Nov-15	8.4	210				2.5								
21-Dec-15	7	220				4								
29-Jan-16	7.2	680	10	491	0.48	35.2								
26-Feb-16	7	210				10								
31-Mar-16	8.2	4950				12								
28-Apr-16	7.3	320	5	232	0.53		49	64	33	11	10	40	4	
26-May-16	7.9	240				15								
29-Jun-16	7.4	390				13								
19-Jul-16	7.3	230	4	178	0.41	10								
22-Aug-16	7.6	200				11								
28-Sep-16	7.8	760				6								
20-Nov-16	8	200	1	147	0.21	3	40	28	22	12	6	24	3	
24-Nov-16	8.1	190				4								
21-Dec-16	7	220				4								
30-Jan-17	8.4	322	2	146	0.08	5								
27-Feb-17	8.3	5380				3								Discharging
30-Mar-17	7.3	350				6								
26-Apr-17	7.8	330	5	221	0.73	11	46	71	50	12	10	45	5	
30-May-17														No access
28-Jun-17	7.4	500				21								
27-Jul-17	7.3	228	4	159	0.7	17								
30-Aug-17	7.3	250				22								
28-Sep-17	8.3	240				15								
24-Oct-17	8.3	5100	4	4770	0.01	7	340	2200	360	190	260	1000	20	Discharging
28-Nov-17	6.9	270				9								
13-Dec-17	7.8	310				11								Not flowing
29-Jan-18														Dry
22-Feb-18	7.5	1400				99								Stagnant pool
29-Mar-18	7.3	360				28								
26-Apr-18	7.9	560	12	439	0.31	18	52	140	53	16	16	95	4	
21-May-18	7.8	220				15								
25-Jun-18	7.8	540				14								
25-Jul-18	7.7	214	3	157	0.29	15								
29-Aug-18	7.8	4500				7								
28-Sep-18	7.6	220				8								
24-Oct-18	8.3	350	5	221	0.28	7	31	71	37	11	8.8	48	3.4	
29-Nov-18	8	4500				12								Discharging
18-Dec-18	7	300				25								
31-Jan-19	7.3	280	5	146	0.11	9								No flow
28-Feb-19	8.1	5000				3								No flow
28-Mar-19	6.7	190				11								
10-Apr-19	8	663	3	431	0.12	4	65	170	54	24	20	86	4	
27-May-19	7	680				7								No flow
28-Jun-19	7.9	1000				7								
30-Jul-19	8	250	2	155	0.28	7								
29-Aug-19	7.8	220				7								
24-Sep-19	7	310				5								
29-Oct-19	7.5	284	2	164	0.04	1	49	29	37	11	7.1	34	3.4	
27-Nov-19														Dry
23-Dec-19														Dry



**Site  
WM5**

### Elwells Creek @ Haul Road

[illegible]

Date	pH	Specific Conductance (µS/cm)	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Iron (mg/l)	Turbidity (NTU)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Comments
29-Jan-15	6.90	1,300	19	1,020	0.05	35.7								
20-Feb-15	6.80	1,700				5								
30-Mar-15														Dry
28-Apr-15	5.20	2,240	13	1,890	0.03	8	5	1190	77	160	135	185	10	
28-May-15	6.60	1,730				6								
24-Jun-15	7.20	1,400				4								
29-Jul-15	7.10	768	5	550	0.05	8.2								
27-Aug-15	6.60	1,500				5								
28-Sep-15	7.70	1,920				4.5								
22-Oct-15	6.30	2,600	10	2,380	0.04	10.7	10	1400	110	205	160	220	12	
30-Nov-15														Dry
21-Dec-15														Dry
29-Jan-16	6.40	1,760	9	1,280	0.04	12.7								
26-Feb-16														Dry
31-Mar-16	7.00	2,300				12.5								
28-Apr-16														Dry
26-May-16														Dry
29-Jun-16	6.60	1,730				4								
19-Jul-16	6.30	1,900	8	1,540	0.09	12								
22-Aug-16	6.20	2,010				31								Not flowing
28-Sep-16	7.20	1,560				6								Not flowing
20-Nov-16														Dry
24-Nov-16														Dry
21-Dec-16	6.60	2,300				15								Not flowing
30-Jan-17														Dry
27-Feb-17	4.20	3,050				3								Not flowing
30-Mar-17	5.20	2,000				17								Not flowing
26-Apr-17	4.40	1,820	20	1,900	0.22	33	5	1100	89	120	130	200	9	Not flowing
30-May-17														Dry
28-Jun-17	4.50	1,110				2								
27-Jul-17	5.50	1,190	36	978	0.13	11								Not flowing
30-Aug-17														Dry
28-Sep-17														Dry
24-Oct-17	3.70	2,130	4	1,880	5.4	6	5	1200	71	130	130	180	7	Not flowing
28-Nov-17														Not flowing
13-Dec-17														Dry
29-Jan-18														Dry
22-Feb-18														Dry
29-Mar-18	5.00	2,300				4								
26-Apr-18	3.20	2,630	2	2,320	8.7	7	30	1500	62	140	170	160	6	
21-May-18														No flow
25-Jun-18	5.00	1,350				5								
25-Jul-18														Dry
29-Aug-18	7.40	450				11								
28-Sep-18														No flow
24-Oct-18	4.00	1,980	19	1,680	2.6	40	30	970	84	100	110	200	8	
29-Nov-18	4.00	1,350				62								
18-Dec-18	4.60	1,400				5								
31-Jan-19														Dry
28-Feb-19														No flow
28-Mar-19	5.50	1,200				9								
10-Apr-19	3.60	1,470	5	1,220	1.3	7	30	740	51	87	81	100	5	
27-May-19														No flow
28-Jun-19	4.20	1,700				20								
30-Jul-19	6.10	1,930	48	2,010	0.01	10								
29-Aug-19														Dry
24-Sep-19	4.90	2,000				14								
29-Oct-19														Dry
27-Nov-19														Dry
23-Dec-19														Dry

**Site**  
**WM6**      **Four Mile Creek U/S Possums Puddle**

Date	pH	Specific Conductance (µS/cm)	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Iron (mg/l)	Turbidity (NTU)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Comments
24-Sep-09	9.10	120	10	80	0.86	42								
13-Oct-09	8.30	110	10	85	0.54	23	38		13	12	2	8	1	
03-Nov-09	8.80	120	12	120	0.40	31								
13-Dec-09	7.90	120	5	50	0.19	13								
13-Jan-10	6.70	110	5	88	0.62	110	47		12	13	2	8	1	
09-Feb-10	7.60	150	38	130	0.77	52								
04-Mar-10	8.90	140	90	350	0.24	24								
08-Apr-10	9.00	122	29	200	0.50	10	35		13	14	2	6	1	
14-May-10	8.20	124	6	87	0.17	18								
10-Jun-10	6.70	250	73	268	0.67	122								
07-Jul-10	7.40	130	10	75	0.19	6	35		11	13	2	6	1	
25-Aug-10	6.87	156	13	103	0.22	20								
20-Sep-10	7.35	141	9	101	0.23		32	9	12	15	2	8	1	
19-Oct-10	7.14	127	5	69	0.19									
19-Nov-10	6.80	274	65	417	1.59									
21-Dec-10	7.13	164	24	156	0.94									
14-Jan-11	6.91	135	7	85	0.71		40	2	19	13	2	8	2	
22-Feb-11	7.16	129	<5	83	0.57									
24-Mar-11	7.34	119	5	94	0.18									
27-Apr-11	7.07	125	78	175	0.42		30	8	15	12	2	10	2	
26-May-11	7.17	125	40	144	0.05									
27-Jun-11	7.38	272	22	214	0.31									
25-Jul-11	6.84	305	30	238	0.79		21	20	60	6	6	40	5	
26-Aug-11	7.11	245	70	256	0.46									
21-Sep-11	7.15	158	18	115	0.18									
26-Oct-11	8.04	185	30	139	0.38		33	12	25	12	4	19	2	
22-Nov-11	7.53	167	51	157	0.38									
15-Dec-11	6.78	225	95	246	1.13									
25-Jan-12	8.21	171	9	105	1.06		45	3	24	13	4	13	2	
17-Feb-12	6.68	189	38	242	1.31									
30-Mar-12	7.3	284	21	230	0.94									
27-Apr-12	7.03	248	37	268	1.16		39	15	41	8	6	30	4	
24-May-12	7.32	176	28	107	0.52									
27-Jun-12	8.18	324	22	190	0.72									
27-Jul-12	7.15	292	44	270	1.14		38	17	57	9	7	34	4	
30-Aug-12	6.5	147	9	121	0.15									
25-Sep-12	7.27	166	14	97	0.23									
25-Oct-12	7.53	144	164	89	0.24		39	7	14	14	3	11	2	
29-Nov-12	7.44	141	12	121	0.69									
20-Dec-12	8.19	499	8	278	0.14									
24-Jan-13	7.4	160	54	109	0.59		50	3	14	18	3	10	2	
25-Feb-13	8.24	2780	31	1760	0.05									
22-Mar-13	7.23	297	8	200	1.25									
22-Apr-13	7.41	166	136	198	0.25		28	17	22	9	4	17	2	
17-May-13	7.29	173	69	115	0.24									
21-Jun-13	7.28	161	9	114	0.18									
24-Jul-13	7.24	159	16	114	0.33		27	7	13	10	3	14	2	
28-Aug-13	7.29	130	5	89	0.1									
17-Sep-13	7.36	138	7	82	0.21									
22-Oct-13	7.3	138	5	111	0.15		43	5	10	11	2	8	1	
14-Nov-13	7.12	271	5	165	0.16									
11-Dec-13	6.97	206	11	145	0.59									
24-Jan-14	7.81	237	5		1.11									
20-Feb-14	8.13	196	38		0.55									
25-Mar-14	7.39	145	5		0.25									
30-Apr-14	7.75	141	14	154	0.77		18	13	28	6	3	24	3	
28-May-14	8.22	112	6		0.15									
26-Jun-14	7.57	136	16		0.1									
28-Jul-14	7.47	109	7	79	0.13									
31-Aug-14	7.87	233	30		0.64									
22-Sep-14	6.9	150				34.7								
27-Oct-14	7.9	150	6	84	0.32	11.5	32	10	23	10	2	9	1	
21-Nov-14	6.3	120				10.8								
22-Dec-14	7.5	130				14.9								

Date	pH	Specific Conductance (µS/cm)	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Iron (mg/l)	Turbidity (NTU)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Comments
29-Jan-15	6.6	150	56	20	0.88	121								
20-Feb-15	7.2	120				12.8								
30-Mar-15	7.6	100				15.4								
28-Apr-15	6.7	337	30	254	0.97	80	22	29	64	10	8.5	37	4.8	
28-May-15	7.9	200				58								
24-Jun-15	8.2	190				63								
27-Jul-15	7.3	171	14	114	0.2	33.2								
27-Aug-15	8	110				36								
28-Sep-15	7.7	140				27								
22-Oct-15	7.1	140	5	108	0.49	7.4	48	10	16	19	3.1	9	1.1	
30-Nov-15	7.3	150				9								
21-Dec-15	6.5	120				8								
29-Jan-16	6.8	220	12	176	1	37.3								
26-Feb-16	7	190				11.8								
31-Mar-16	7.1	140				9								
28-Apr-16	7.1	120	6	98	0.41	13	39	8	14	12	4	9	2	
26-May-16	7.6	120				18								
29-Jun-16	7.5	130				44								
19-Jul-16	7.4	120	13	107	0.14	37								
22-Aug-16	7.9	140				21								
28-Sep-16	8	120				18								
20-Nov-16	7.7	130	6	104	0.26	6	43	8	16	15	3	10	1	
24-Nov-16	7.5	120				11								
21-Dec-16	6.7	150				5								
30-Jan-17	7.2	174	2	104	0.02	3								
27-Feb-17	7.4	130				4								
31-Mar-17	7.6	300				62								
26-Apr-17	7.1	195	5	168	0.77	9	39	15	38	12	5	20	3	
30-May-17	7.3	250				8								
28-Jun-17	6.8	285				15								
27-Jul-17	6.8	124	4	35	0.13	9								
30-Aug-17	7.1	150				11								
28-Sep-17	7.7	225				7								
24-Oct-17	6.7	241	2	133	0.04	3	32	49	18	21	5	14	1	
28-Nov-17	7.1	180				5								
13-Dec-17	7.6	210				5								
29-Jan-18	7	214	4	126	0.49	7								
22-Feb-18	7.5	200				4								No flow
29-Mar-18	7.2	320				19								
26-Apr-18	7.6	260	5	178	0.72	6	41	32	39	14	5.5	27	3.1	
21-May-18	8.2	230				7								
25-Jun-18	7.7	200				60								
25-Jul-18	6.8	124	3	74	0.04	6								
29-Aug-18	7.9	150				5								
28-Sep-18	7.4	190				6								
24-Oct-18	7.3	190	12	122	0.37	17	30	23	22	7.9	3.8	17	1.5	
29-Nov-18	7.3	140				89								
18-Dec-18	7	150				64								
31-Jan-19	7	280	9	175	0.38	13								
28-Feb-19	7.5	280				9								
28-Mar-19	6.9	190				12								
10-May-19	6.8	186	7	151	0.39	21	36	17	23	11	3.7	15	2.3	
27-May-19	7.7	180				6								
28-Jun-19	7.6	200				24								
30-Jul-19	7	224	3	119	0.02	10								
29-Aug-19	7.3	220				4								
24-Sep-19	6.6	200				60								
29-Oct-19	6.8	186	2	119	0.3	8	42	9	31	9.5	4	20	2.1	
27-Nov-19	7.2	250				7								
23-Dec-19														Dry

**Site  
WM7**                      **Possums Puddle**

Date	pH	Specific Conductance (µS/cm)	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Iron (mg/l)	Turbidity (NTU)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Comments
24-Sep-09	8.50	170	7	110	0.81	82								
13-Oct-09	7.10	170	6	130	0.57	41	36		27	10	4	19	3	
03-Nov-09	8.70	160	4	140	0.38	108								
13-Dec-09	7.00	160	3	40	0.45	67								
13-Jan-10	6.80	150	2	110	0.16	11	44		24	12	4	14	2	
09-Feb-10	6.50	160	10	120	0.11	7								
04-Mar-10	8.80	170	9	97	0.81	12								
08-Apr-10	8.60	187	1	130	0.25	6	43		25	14	4	13	1	
14-May-10	7.30	158	2	119	<0.05	4								
10-Jun-10	6.80	167	46	161	0.16	75								
07-Jul-10	7.30	186	8	128	0.33	30	34		25	11	4	13	2	
25-Aug-10	6.93	188	6	145	0.37	32								
20-Sep-10	7.41	174	2	132	0.42		34	14	21	13	4	12	2	
19-Oct-10	7.40	174	6	107	0.12									
19-Nov-10	6.95	211	14	197	0.68									
21-Dec-10	7.08	194	12	159	0.77									
14-Jan-11	7.53	193	6	131	0.29		39	14	30	11	4	18	3	
22-Feb-11	7.69	175	<5	119	0.18									
24-Mar-11	7.29	164	<5	128	0.24									
27-Apr-11	7.03	178	5	133	0.49		41	8	22	13	4	15	2	
26-May-11	7.08	173	15	176	0.27									
27-Jun-11	6.94	235	50	270	0.48									
25-Jul-11	6.70	231	35	228	0.74		13	16	42	4	4	28	4	
26-Aug-11	7.01	247	16	230	0.38									
21-Sep-11	6.54	229	10	147	0.56									
26-Oct-11	8.45	202	5	142	0.35		34	10	24	11	4	18	2	
22-Nov-11	7.61	187	14	151	0.59									
15-Dec-11														No access
25-Jan-12	8.71	217	8	172	0.54		27	12	28	6	5	26	3	
17-Feb-12	6.9	194	38	218	0.94									
30-Mar-12	7.29	215	6	187	0.84									
27-Apr-12	7.41	219	26	152	0.89		28	11	29	6	4	23	4	
24-May-12	7.44	211	6	154	1.12									
27-Jun-12														No access
27-Jul-12	7.51	215	14	202	0.8		27	17	40	8	5	23	4	
30-Aug-12	7.02	202	9	191	0.66									
25-Sep-12	7.43	230	5	133	0.57									
25-Oct-12	7.8	204	5	143	0.44		32	14	35	11	4	21	3	
29-Nov-12	8.04	213	5	130	0.35									
20-Dec-12	7.84	213	5	133	0.21									
24-Jan-13	7.81	213	5	137	0.19		41	13	24	14	5	20	3	
25-Feb-13														No access
22-Mar-13	7.08	209	5	161	0.74									
22-Apr-13														No access
17-May-13	7.25	196	5	155	0.9									
21-Jun-13	8.06	4960	5	3580	0.05									
24-Jul-13	7.27	197	6	147	0.61		28	13	24	8	4	21	3	
28-Aug-13	7.44	179	5	137	0.44									
17-Sep-13	7.38	162	6	83	0.23									
22-Oct-13	7.64	182	5	127	0.43		38	12	22	9	3	16	3	
14-Nov-13	7.6	184	5	118	0.28									
11-Dec-13	7.37	204	5	156	0.5									
24-Jan-14	8.17	279	5		0.39									
20-Feb-14	7.6	202	8		0.25									
25-Mar-14	7.59	188	5		0.13									
30-Apr-14	7.65	163	5	106	0.48		34	13	25	7	4	24	4	
28-May-14	7.79	127	5		0.66									
26-Jun-14	7.6	176	5		0.42									
28-Jul-14	7.49	128	5	92	0.36									
31-Aug-14	7.91	210	2		0.33									
22-Sep-14	6.8	150				11.3								
27-Oct-14	7.7	190	3	107	0.23	12.4	30	10	30	10	3	15	2	
21-Nov-14	7.2	170				7.8								
22-Dec-14	8	150				3.4								

Date	pH	Specific Conductance (µS/cm)	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Iron (mg/l)	Turbidity (NTU)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Comments
29-Jan-15	7.4	140	16	122	0.29	35								
20-Feb-15	7.5	140				3.8								
30-Mar-15	7.6	130				5.1								
28-Apr-15	6.5	410	48	302	0.75	93	16	105	45	12	13	48	4.9	
28-May-15	7.7	350				58								
24-Jun-15	7.8	320				45								
27-Jul-15	7.4	290	7	202	0.5	31								
27-Aug-15	8.2	230				19								
28-Sep-15	7.6	230				9								
22-Oct-15	7.8	210	2	157	0.36	4.5	44	32	27	17	5.9	22	2	
30-Nov-15	8.6	220				2.5								
21-Dec-15	6.6	200				4								
29-Jan-16	6.8	210	23	173	0.86	45.2								
26-Feb-16	7.5	220				9.4								
31-Mar-16	7	210				7								
28-Apr-16	7	250	5	206	0.46	9	41	47	28	11	7	32	3	
26-May-16	8	260				10								
29-Jun-16	7.4	220				14								
19-Jul-16	7.2	220	4	153	0.41	12								
22-Aug-16	7.7	190				9								
28-Sep-16	7.5	200				5								
20-Oct-16	7.8	200	3	153	0.19	10	39	28	23	12	5	19	3	
24-Nov-16	7.7	190				8								
21-Dec-16	6.7	200				4								
30-Jan-17	7.8	227	2	139	0.08	2								
27-Feb-17	7.6	200				5								
31-Mar-17	7.3	210				9								
26-Apr-17	7.2	230	5	181	0.66	10	28	30	41	9	6	29	4	
30-May-17	7	300				11								
28-Jun-17	7.2	235				22								
27-Jul-17	6.9	228	6	152	0.62	17								
30-Aug-17	6.9	200				17								
28-Sep-17	7.9	235				8								
24-Oct-17	7.2	246	3	182	0.22	7	29	33	33	11	5	28	3	
28-Nov-17	6.5	220				6								
13-Dec-17	7.9	240				4								
29-Jan-18	7.8	289	5	168	0.09	4								
22-Feb-18	7.6	270				6								
29-Mar-18	7.2	170				25								
26-Apr-18	7.9	210	4	174	0.46	11	30	25	29	6.8	4.4	26	2.8	
21-May-18	7.5	210				12								
25-Jun-18	7.6	212				14								
25-Jul-18	7	210	4	140	0.33	13								
29-Aug-18	7.8	200				11								
28-Sep-18	7.3	210				5								
24-Oct-18	7.7	200	6	120	0.3	6	30	29	27	8.8	4.4	20	3	
29-Nov-18	7.6	210				14								
18-Dec-18	7	200				23								
31-Jan-19	7.5	228	7	126	0.28	10								
28-Feb-19	8.2	225				16								
28-Mar-19	6.7	160				14								
10-Apr-19	7.3	200	6	126	0.14	4	32	19	26	12	4.2	15	2.9	
27-May-19	7	230				6								
28-Jun-19	7.6	190				7								
30-Jul-19	7.3	207	2	128	0.29	6								
29-Aug-19	7.8	200				6								
24-Sep-19	7	220				9								
29-Oct-19	8.2	221	3	123	0.09	8	34	22	26	11	4.8	21	3.3	
27-Nov-19	7.9	250				8								
23-Dec-19	8.2	380				7								

Site  
WM8 Lake Foster

Date	pH	Specific Conductance (µS/cm)	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Iron (mg/l)	Turbidity (NTU)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Comments
24-Sep-09	8.30	5,900	10	4,400	0.06	51								
13-Oct-09	8.10	5,900	11	4,700	0.05	6	340		456	213	251	846	28	
03-Nov-09	8.50	5,000	3	3,600	0.06	29								
13-Dec-09	8.10	6,300	3	6,200	0.08	45								
13-Jan-10	7.80	6,600	14	5,600	0.05	9	271		497	265	290	1050	30	
09-Feb-10	7.60	9,300	13	5,200	0.05	11								
04-Mar-10	8.70	9,700	1	110	0.16	8								
08-Apr-10	8.70	7,720	4	6,100	0.05	6	315		556	302	318	1210	32	
14-May-10	8.20	7,670	9	5,730	0.05	7								
10-Jun-10	7.50	4,800	8	4,320	0.05	7								
07-Jul-10	8.10	5,610	6	4,390	0.05	3	325		459	237	270	988	23	
25-Aug-10	8.08	6,000	5	4,730	0.05	3								
20-Sep-10	8.15	5,110	5	4,610	0.05		375	2100	478	192	245	887	20	
19-Oct-10	8.31	5,710	2	4,600	0.05									
19-Nov-10	7.94	5,670	6	4,420	0.05									
21-Dec-10	7.89	6,110	<5	4,960	0.05									
14-Jan-11	8.26	6,410	8	4,890	0.05		275	2840	489	286	397	960	29	
22-Feb-11	8.28	5,700	<5	5,500	0.05									
24-Mar-11	8.33	6,560	8	5,530	0.09									
27-Apr-11	8.05	4,960	9	3,650	0.05		200	1640	508	136	179	811	18	
26-May-11	8.10	6,330	23	5,120	0.05									
27-Jun-11	8.03	4,160	6	3,210	0.05									
25-Jul-11	6.83	2,410	22	1,630	0.11		55	848	163	94	87	291	9	
26-Aug-11	8.10	4,750	7	3,710	0.05									
21-Sep-11	8.29	5720	12	4510	0.05									
26-Oct-11	8.5	5360	12	4330	0.05		245	2210	414	224	234	843	25	
22-Nov-11	8.1	5500	12	4670	0.06									
15-Dec-11														No access
25-Jan-12	8.47	5710	10	4950	0.05		307	2330	486	186	259	903	25	
17-Feb-12	7.02	5150	8	4170	0.05									
30-Mar-12	8.27	4070	11	3130	0.05									
27-Apr-12	7.77	3980	8	3490	0.05		122	2010	277	206	205	646	21	
24-May-12	8.12	5310	26	4480	0.05									
27-Jun-12	7.7	4160	12	3460	0.05									
27-Jul-12	7.43	4960	35	4220	0.05		235	2250	440	237	246	857	24	
30-Aug-12	7.95	5770	18	4840	0.05									
25-Sep-12	8.1	6060	50	4340	0.05									
25-Oct-12	8.36	5910	21	4330	0.05		329	2340	561	157	232	953	25	
29-Nov-12	8.31	6750	6	5100	0.05									
20-Dec-12	8.36	6750	18	5290	0.05									
24-Jan-13	8.28	7070	12	5350	0.05		428	2990	648	144	260	1460	22	
25-Feb-13	7.79	2110	68	1420	0.12									
22-Mar-13	8.25	5360	15	3850	0.05									
22-Apr-13	7.75	5200	12	4160	0.05		213	2310	404	182	221	945	25	
17-May-13	8.17	6580	12	5020	0.05									
21-Jun-13	7.99	6230	5	4930	0.05									
24-Jul-13	7.96	5810	6	4320	0.05		131	2580	374	232	201	1030	22	
28-Aug-13	8.24	5940	5	2910	0.05									
17-Sep-13	8.21	7090	10	5690	0.05									
22-Oct-03	8.25	7140	5	5920	0.05		354	3090	569	246	324	1160	31	
14-Nov-13	8.45	6230	5	4730	0.05									
11-Dec-13	8.23	4910	5	3910	0.05									
24-Jan-14	8.32	8200	5		0.05									
20-Feb-14	8.42	5610	23		0.05									
25-Mar-14	8.41	6860	5		0.05									
30-Apr-14	8.45	4130	21	2570	0.05		94	1620	282	155	149	619	18	
28-May-14	7.86	4510	5		0.05									
26-Jun-14	8.1	5940	5		0.05									
28-Jul-14	8.28	5260	9	3730	0.05									
31-Aug-14	7.33	4050	10		0.05									
22-Sep-14	7.5	5400				4.6								
27-Oct-14	7.7	5500	7	4980	0.12	4.7	176	2420	422	266	262	829	26	
21-Nov-14	8	6900				34								
22-Dec-14	8.5	6100				5.7								

Date	pH	Specific Conductance (µS/cm)	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Iron (mg/l)	Turbidity (NTU)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Comments
29-Jan-15	7.6	3080	24	2380	0.01	35.2								
20-Feb-15	8.1	5520				5.9								
30-Mar-15	8.1	7060				6.9								
28-Apr-15	7.3	1400	61	986	0.05	114	63	530	83	58	60	155	7.8	
28-May-15	7.4	2900				11								
24-Jun-15	7.7	4040				8								
27-Jul-15	8.3	4940	4	4620	0.01	4								
27-Aug-15	8.3	5830				3								
28-Sep-15	8	5800				3.7								
22-Oct-15	8.4	5990	5	5150	0.02	7.8	300	2630	425	275	300	790	31	
30-Nov-15	8.5	6100				3								
21-Dec-15	7.3	4720				7								
29-Jan-16	5.9	1650	5	1230	0.06	10.5								
26-Feb-16	7.5	5030				7.2								
31-Mar-16	8.1	5210				11								
28-Apr-16	8	5210	3	5510	0.01	4	160	3000	385	300	300	865	30	
26-May-16	8.3	4600				3.5								
29-Jun-16	7.6	4840				2								
19-Jul-16	7.8	5000	1	4460	0.01	4								
22-Aug-16	8.1	3850				4								
28-Sep-16	8.4	4900				2								
20-Oct-16	7.8	5900	2	5490	0.01	1	240	2800	370	260	300	1000	28	
24-Nov-16	8	3950				48								
21-Dec-16	8.2	5800				4								
30-Jan-17	8.4	5230	4	5890	0.01	4								
27-Feb-17	8.4	5360				3								
31-Mar-17	7.8	2750				7								
26-Apr-17	7.3	3120	10	3030	0.01	4	44	1600	210	170	190	510	14	
30-May-17														Too low to sample
28-Jun-17	5.5	2720				5								
27-Jul-17	7.9	4870	2	4890	0.01	5								
30-Aug-17	8.3	6200				5								
28-Sep-17														Too low to sample
24-Oct-17	7.5	6280	6	6290	0.01	7	170	3200	420	320	350	1200	34	
28-Nov-17	8.2	5800				8								
13-Dec-17	8.3	6100				3								
29-Jan-18	8.3	5470	6	5830	0.01	5								
22-Feb-18	7.9	6300				4								
29-Mar-18	7.3	1720				8								
26-Apr-18	8.1	3380	2	2740	0.01	3	170	1200	210	120	140	610	14	
21-May-18	8.5	5500				4								
25-Jun-18	8.1	4400				3								
25-Jul-18	8.2	5840	2	5730	0.01	4								
29-Aug-18	7.9	6300				4								
28-Sep-18	7.8	6520				3								
24-Oct-18	8.1	4850	3	5010	0.01	4	120	2800	360	230	260	670	25	
29-Nov-18	7.8	5400				26								
18-Dec-18	6.4	3600				13								
31-Jan-19	8.1	4850	3	5930	0.01	4								
28-Feb-19	8.2	6400				5								
28-Mar-19	6.5	4650				6								
10-Apr-19	4.3	3960	4	4190	0.15	7	30	2400	240	240	240	610	20	
27-May-19	7.6	6600				5								
28-Jun-19	6.7	5000				5								
30-Jul-19	7.8	4600	2	6080	0.01	5								
29-Aug-19	7.9	6400				6								
24-Sep-19	4.8	3200				9								
29-Oct-19	8.5	4140	2	4110	0.01	4	190	2100	340	180	230	870	19	
27-Nov-19	8.2	7500				6								
23-Dec-19	8.1	7400				6								



Site WM9		Lake Kennerson													
Date	pH	Specific Conductance (µS/cm)	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Iron (mg/l)	Turbidity (NTU)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Comments	
24-Sep-09	10.00	3,000	23	1,900	0.05	11									
13-Oct-09	9.90	3,600	8	2,400	0.21	19	38		355	45	131	528	12		
03-Nov-09	9.60	4,500	29	3,200	0.05	31									
13-Dec-09	8.10	6,000	5	5,500	0.05	27									
13-Jan-10	7.70	5,600	18	4,300	0.05	6	355		602	122	257	1100	24		
09-Feb-10	8.30	8,500	14	4,400	0.05	18									
04-Mar-10	8.90	8,800	15	530	0.05	6									
08-Apr-10	9.00	8,830	6	4,700	0.06	20	331		652	110	251	1130	23		
14-May-10	8.10	9,000	6	4,800	0.05	14									
10-Jun-10	7.80	2,190	30	1,800	0.06	48									
07-Jul-10	8.30	2,790	8	1,840	0.05	2	177		237	74	98	488	12		
25-Aug-10															
20-Sep-10	8.36	4,100	2	3,080	0.05		242	1440	373	105	167	648	15		
19-Oct-10	8.64	4,090	2	2,760	0.05										
19-Nov-10	9.15	2,990	3	1,680	0.05										
21-Dec-10	8.44	3,850	5	2,200	0.05										
14-Jan-11	8.59	4,440	7	2,970	0.05		310	983	638	88	132	816	15		
22-Feb-11	8.53	4,820	16	3,770	0.05										
24-Mar-11	8.68	5,070	6	3,690	0.08										
27-Apr-11	8.48	3,600	7	2,350	0.05		244	864	484	56	113	636	13		
26-May-11	8.65	4,730	78	2,790	0.07										
27-Jun-11	8.70	3,060	5	1,890	0.05										
25-Jul-11	8.20	2,770	58	1,640	0.05		186	435	482	50	55	497	7		
26-Aug-11	8.59	3,310	26	1,920	0.05										
21-Sep-11	8.68	4320	5	2900	0.05										
26-Oct-11	8.92	3960	6	2760	0.05		280	1350	419	118	134	673	13		
22-Nov-11	8.73	3250	36	2250	0.10										
15-Dec-11	7.90	2350	48	1370	0.05										
25-Jan-12	8.76	4900	12	4070	0.05		305	1780	575	97	204	852	18		
17-Feb-12	7.34	2389	20	1460	0.05										
30-Mar-12	8.35	2320	18	1410	0.05										
27-Apr-12	8.92	2,140	8	1,430	0.05		169	499	307	59	59	368	9		
24-May-12	8.55	2,910	18	1,810	0.05										
27-Jun-12	8.67	2,510	20	1,580	0.05										
27-Jul-12	8.25	2,620	12	1,630	0.05		224	418	549	50	46	532	8		
30-Aug-12	8.61	3,860	102	2,650	0.05										
25-Sep-12	8.52	4,270	5	2,800	0.05										
25-Oct-12	8.87	3,860	6	2,590	0.05		204	853	623	32	106	722	12		
29-Nov-12	9.2	4,450	6	2,920	0.05										
20-Dec-12	8.63	5,270	103	3,520	0.05										
24-Jan-13	8.39	6,650	8	4,770	0.05		505	2500	672	59	214	1440	16		
25-Feb-13	8.44	5,000	30	3,230	0.05										
22-Mar-13	8.36	4,240	5	3,040	0.05										
22-Apr-13	8.44	4,010	294	2,670	0.05		272	1070	501	80	115	738	13		
17-May-13	8.35	5,090	8	3,560	0.05										
21-Jun-13	8.38	4,460	5	2,770	0.05										
24-Jul-13	8.29	4,800	5	3,320	0.05		384	1430	525	126	159	873	14		
28-Aug-13	8.52	4,270	5	1,820	0.05										
17-Sep-13	8.66	4,640	5	2,910	0.05										
22-Oct-13	8.83	5,470	8	3,740	0.05		256	1880	571	74	225	938	17		
14-Nov-13	9.07	5,710	5	4,030	0.05										
11-Dec-13	8.23	5,370	5	3,760	0.05										
24-Jan-14	8.63	7,520	5		0.05										
20-Feb-14	8.23	4,910	38		0.05										
25-Mar-14	8.27	6,190	6		0.05										
30-Apr-14	8.44	4,070	19	3,000	0.05		365	1610	395	139	178	809	20		
28-May-14	8.51	3,790	5		0.05										
26-Jun-14	8.45	4,290	6		0.05										
28-Jul-14	8.39	5,190	5	3,530	0.05										
31-Aug-14	8.39	5,430	6		0.05										
22-Sep-14	8.4	6,000				3.8									
27-Oct-14	8.3	6,700	4	4,360	0.05	8.6	534	2020	605	85	210	1060	19		
21-Nov-14	8.5	6,000				3.8									
22-Dec-14	8.3	6,300				17									

Date	pH	Specific Conductance (µS/cm)	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Iron (mg/l)	Turbidity (NTU)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Comments
29-Jan-15	8.5	4,100	23	2,980	0.01	36.8								
20-Feb-15	8.4	5,480				4.9								
30-Mar-15	8.6	5,760				30.3								
28-Apr-15	7.7	1,490	167	954	0.05	314	205	350	130	37	39	215	8.1	
28-May-15	8.3	1,390				62								
24-Jun-15	8.2	3,230				7								
27-Jul-15	8.4	4,530	5	3,640	0.01	2.3								
27-Aug-15	8.5	1,940				17								
28-Sep-15	8.3	3,300				3.7								
22-Oct-15	8.5	5,580	3	4,370	0.03	6	475	1940	480	150	220	875	24	
30-Nov-15	8.5	5,810				4.3								
21-Dec-15	8.3	5,610				6								
29-Jan-16	8.2	1,530	20	1,020	0.02	38.9								
26-Feb-16	7.5	5,800				12								
31-Mar-16	8.3	5,010				15.1								
28-Apr-16	8.1	4,640	4	4,570	0.01	5	415	2360	320	190	230	910	17	
26-May-16	8.2	5,600				4								
29-Jun-16	7.8	3,450				4								
19-Jul-16	7.8	5,170	1	4,230	0.01	2								
22-Aug-16	8.2	5,490				4								
28-Sep-16	8.7	4,710				5								
20-Oct-16	8.5	5,900	1	5,100	0.02	2	360	2500	360	170	280	1100	20	
28-Nov-16	8	5,800				11								
21-Dec-16	8	5,700				11								
30-Jan-17	7.9	4,810	13	4,440	0.01	15								
27-Feb-17	8	5,400				3								
31-Mar-17	7.7	4,600				3								
26-Apr-17	8.4	3,590	4	3,250	0.01	3	370	1500	290	150	160	780	15	
30-May-17	8.4	5,160				4								
28-Jun-17	8.6	3,540				9								
27-Jul-17	8.4	4,300	4	4,030	0.01	6								
30-Aug-17	8.6	5,400				2								
28-Sep-17	8.5	5,900				3								
24-Oct-17	8	5,450	4	5,210	0.02	6	430	2300	370	220	290	1100	23	
28-Nov-17	7.8	6,400				5								
13-Dec-17	8.2	6,200				4								
29-Jan-18	8.8	4,440	17	3,770	0.01	19								
22-Feb-18	8.3	5,100				4								
29-Mar-18	8	1,520				19								
26-Apr-18	8.6	3,390	7	2,190	0.01	11	760	390	360	28	31	880	6.7	
21-May-18	8.5	4,450				6								
25-Jun-18	8.3	4,000				5								
25-Jul-18	8.4	4,340	2	3,400	0.01	4								
29-Aug-18	8.2	4,200				5								
28-Sep-18	8.3	4,510				5								
24-Oct-18	8.5	3,660	3	2,300	0.01	5	500	820	380	42	75	860	9.2	
29-Nov-18	8.2	4,300				8								
18-Dec-18	7.7	1,350				46								
31-Jan-19	8.1	2,910	3	2,900	0.01	3								
28-Feb-19	8.5	3,900				9								
28-Mar-19	8	6,100				9								
10-Apr-19	8.6	3,090	35	2,230	0.01	30	30	750	360	48	71	720	8.9	
27-May-19	7.9	4,800				6								
28-Jun-19	8.4	3,100				26								
30-Jul-19	9	3,310	6	2,460	0.01	7								
29-Aug-19	9.1	3,800				5								
24-Sep-19	8.7	1,700				38								
29-Oct-19	9.3	2,830	6	2,180	0.01	9	260	980	280	42	100	610	12	
27-Nov-19	8.5	5,400				12								
23-Dec-19	8.2	5,500				7								

Site  
WM10

Four Mile Creek @ John Renshaw Drive

Date	pH	Specific Conductance (µS/cm)	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Iron (mg/l)	Turbidity (NTU)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Comments
24-Sep-09	8.50	460			2.33									
13-Oct-09	8.30	440			1.26	66	84		109	10	13	73	7	
03-Nov-09	8.50	380	18	430	2.10	120								
13-Dec-09														Dry
13-Jan-10														Dry
09-Feb-10														Dry
04-Mar-10														Dry
08-Apr-10	8.70	241	17	230	1.28	21	74		29	9	7	31	4	
14-May-10	8.00	255	50	210	0.61	21								
10-Jun-10	7.70	408	14	324	0.69	47								
07-Jul-10	7.80	470	28	262	0.77	16	52		88	12	11	63	5	
25-Aug-10	7.74	512	4	308	0.90	17								
20-Sep-10	7.42	516	5	306	1.07		63	17	109	14	10	72	6	
19-Oct-10	7.47	512	12	268	0.42									
19-Nov-10	7.07	448	13	312	1.21									
21-Dec-10	7.20	505	8	352	2.91									
14-Jan-11	7.13	478	32	294	1.96		73	1	92	9	10	60	8	
22-Feb-11														Dry
24-Mar-11														Dry
27-Apr-11	6.96	258	21	174	0.73		60	21	25	11	7	29	4	
26-May-11	7.03	261	17	251	0.63									
27-Jun-11	7.23	559	16	308	0.62									
25-Jul-11	6.53	401	14	282	0.67		24	23	87	5	8	52	6	
26-Aug-11	7.25	411	8	290	0.86									
21-Sep-11	7.65	527	8	250	1.3									
26-Oct-11	7.32	595	42	362	0.98		56	22	138	14	14	83	7	
22-Nov-11	7.72	446	26	306	2.36									
15-Dec-11	8.29	369	12	268	1.34									
25-Jan-12	7.03	514	10	322	3.55		79	1	100	11	12	64	7	
17-Feb-12	5.68	316	8	272	1.16									
30-Mar-12	7.24	456	6	278	1.28									
27-Apr-12	7.78	375	10	280	1.6		46	14	85	8	10	54	6	
24-May-12	7.6	525	12	202	1.64									
27-Jun-12	7.51	501	18	324	1.22									
27-Jul-12	7.42	352	21	298	1.5		46	15	77	6	9	51	6	
30-Aug-12	6.08	527	11	348	1.86									
25-Sep-12	7.18	432	20	254	0.86									
25-Oct-12	7.92	470	84	302	1.32		72	10	95	10	11	60	8	
29-Nov-12	7.51	4,900	24	3,390	0.05									
20-Dec-12														Dry
24-Jan-13	7.63	428	5	260	1.08		106	10	75	12	12	55	12	
25-Feb-13	6.86	388	41	360										
22-Mar-13	6.94	353	7	268	1.1									
22-Apr-13	7.31	238	92	262	1.13		31	10	41	4	5	39	5	
17-May-13	7.32	274	36	276	1.2									
21-Jun-13	7.22	328	5	244	1.09									
24-Jul-13	6.97	382	10	249	1.24		45	12	70	6	8	49	6	
28-Aug-13	7.24	373	15	258	0.98									
17-Sep-13	7.4	362	14	234	1.1									
22-Oct-13	7.39	475	21	334	2.31		88	10	86	9	10	60	10	
14-Nov-13	6.75	199	6	197	1									
11-Dec-13	6.69	328	5	262	0.95									
24-Jan-14	7.94	465	18		1.52									
20-Feb-14														Dry
25-Mar-14	7.33	187	5		0.46									
30-Apr-14	7.35	168	17	217	1.17		29	11	34	4	4	31	5	
28-May-14	6.39	175	8		0.65									
26-Jun-14	7.14	194	7		0.57									
28-Jul-14	7.01	144	6	188	0.38									
31-Aug-14	7.16	348	7		0.88									
22-Sep-14	7.5	400				38.7								
27-Oct-14	7.2	250	19	207	1.63	32.1	51	10	50	7	6	34	6	
21-Nov-14	7.3	260				37.6								
22-Dec-14	7.2	230				36								

Date	pH	Specific Conductance (µS/cm)	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Iron (mg/l)	Turbidity (NTU)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Comments
29-Jan-15	6.5	180	20	217	1	38.9								
23-Feb-15	7	190				31.5								
30-Mar-15	7	130				31.1								
28-Apr-15	6.8	255	25	230	0.88	75	20	20	48	5.8	7	28	6.5	
28-May-15	7.2	160				47								
24-Jun-15	7.3	160				67								
27-Jul-15	7.2	247	11	215	2.1	43								
27-Aug-15	7.4	250				27								
28-Sep-15	7.8	240				29.6								
22-Oct-15	7.2	230	10	230	1.4	18.8	78	9	23	17	9.9	17	4.6	
30-Nov-15	7.3	220				26.1								
21-Dec-15	7.1	320				41								
29-Jan-16	6.9	210	14	190	1.4	34.3								
26-Feb-16	6.8	260				22								
31-Mar-16	7.2	220				36								
28-Apr-16	7.3	230	5	220	3.6	36	62	7	26	9	8	20	7	
26-May-16	6.8	190				58								
29-Jun-16	6.8	120				65								
19-Jul-16	7.3	150	8	176	1.1	43								
23-Aug-16	7	120				66								
28-Sep-16	7.3	160				40								
20-Oct-16	7.5	170	8	179	4.3	30	72	3	19	9	7	18	5	
28-Nov-16	7.2	190				14								
21-Dec-16	7.1	180				14								
30-Jan-17	6.9	177	19	147	0.77	23								
27-Feb-17	7.2	110				45								
30-Mar-17	7.3	180				22								
26-Apr-17	7.2	280	10	236	3.5	18	48	11	64	9	9	43	7	
30-May-17	6.7	295				25								
28-Jun-17	6.9	310				27								
27-Jul-17	7.1	383	4	232	2.3	28								
30-Aug-17	6.8	330				23								
28-Sep-17	7.5	380				15								
24-Oct-17	7.1	265	12	233	1.1	28	65	20	26	12	7	32	3	
28-Nov-17	6.9	190				37								
13-Dec-17	7.7	220				34								
29-Jan-18														Dry
22-Feb-18	7	165												Stagnant
29-Mar-18	6.9	230				28								
26-Apr-18	6.8	280	5	263	6.1	23	55	11	46	8.7	7.3	39	6.3	
21-May-18	7.7	330				32								
26-Jun-18	7.3	215				45								
25-Jul-18	7.2	253	4	316	0.49	35								
29-Aug-18	7.5	120				124								
28-Sep-18	7.5	210				30								
24-Oct-18	7	400	4	300	1.2	25	40	23	77	10	8.5	61	5.8	
29-Nov-18	7.5	180				77								
18-Dec-18	7	240				32								
31-Jan-19	7	350	38	211	1.3	134								No flow
28-Feb-19														Dry
28-Mar-19	6.7	150				31								
10-Apr-19	7	182	7	145	1.3	20	43	13	16	8.3	4.8	15	4.6	
27-May-19														Dry
28-Jun-19	7.3	150				77								
30-Jul-19	7	173	8	218	0.54	60								
29-Aug-19														Dry
24-Sep-19	6.6	180				63								
29-Oct-19	7	217	17	241	0.64	43	68	4	23	12	6	21	6.1	
27-Nov-19														Dry
23-Dec-19														Dry

**Site**  
**WM11**      **Four Mile Creek U/S New England Highway**

Date	pH	Specific Conductance (µS/cm)	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Iron (mg/l)	Turbidity (NTU)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Comments
24-Sep-09	8.10	3,100	8	2,100	0.23	14								
13-Oct-09	7.40	3,500	24	2,700	0.10	16	166		240	139	136	452	17	
03-Nov-09	8.10	4,400	33	3,200	0.10	17								
13-Dec-09	7.30	3,100	55	3,500	0.05	27								
13-Jan-10	6.50	530	18	370	0.38	11	146		63	22	18	81	6	
09-Feb-10	6.10	320	45	310	0.33	10								
04-Mar-10	8.40	550	16	4,500	0.05	15								
08-Apr-10	8.60	356	10	260	0.32	18	76		49	16	10	48	4	
14-May-10	8.20	818	27	202	0.08	117								
10-Jun-10	6.60	721	21	476	0.18	30								
07-Jul-10	7.80	2,840	10	2,050	0.05	8	114		203	110	113	438	13	
25-Aug-10	6.59	3,240	6	2,430	0.05	8								
20-Sep-10	7.59	3,860	5	3,020	0.05		145	1590	264	168	163	509	16	
19-Oct-10	7.43	712	8	402	0.11									
19-Nov-10	7.70	3,630	12	2,410	0.13									
21-Dec-10	7.60	3,080	5	2,200	0.20									
14-Jan-11	7.70	5,420	11	4,030	0.05		284	2330	472	217	231	843	23	
22-Feb-11	7.68	4,530	<5	3,840	0.07									
24-Mar-11	7.86	5,040	6	3,750	0.06									
27-Apr-11	7.18	671	14	432	0.26		89	109	72	17	18	89	4	
26-May-11	8.02	5,710	16	4,470	0.05									
27-Jun-11	7.47	2,690	16	1,920	0.08									
25-Jul-11	7.69	2,510	41	1,580	0.14		138	586	299	61	65	388	9	
26-Aug-11	7.26	2,580	30	1,880	0.10									
21-Sep-11	8.17	3560	10	2630	0.05									
26-Oct-11	7.90	890	22	524	0.15		51	184	125	23	23	126	5	
22-Nov-11	7.92	1243	32	832	0.32									
15-Dec-11	8.14	3160	40	2180	0.05									
25-Jan-12	8.29	4950	24	4050	0.08		318	1910	546	115	209	841	19	
17-Feb-12	6.98	1428	24	1140	0.72									
30-Mar-12	8.04	3430	16	2390	0.05									
27-Apr-12	7.74	3000	15	1490	0.21		133	1190	244	133	138	438	16	
24-May-12	7.72	2650	24	1880	0.18									
27-Jun-12	8.12	4680	42	3570	0.05									
27-Jul-12	7.23	3040	25	2250	0.07		228	938	400	105	120	525	12	
30-Aug-12	6.48	1,043	25	724	0.27									
25-Sep-12	7.94	4,240	14	2,900	0.06									
25-Oct-12	7.52	1,706	32	1,000	0.18		163	332	222	40	52	257	9	
29-Nov-12	7.90	4,580	19	3,000	0.05									
20-Dec-12	8.18	5,020	12	3,510	0.07									
24-Jan-13	7.78	2,940	34	1,970	0.18		242	825	301	82	103	475	13	
25-Feb-13	7.80	2,530	47	1,580	0.14									
22-Mar-13	7.72	4,150	8	3,070	0.05									
22-Apr-13	8.24	4,120	30	2,880	0.05		275	1310	415	104	149	716	15	
17-May-13	7.92	3,370	14	2,510	0.06									
21-Jun-13	8.06	2,480	5	1,610	0.05									
24-Jul-13	7.78	2,710	5	1,920	0.08		107	1020	205	109	116	386	12	
28-Aug-13	7.86	1,960	5	1,270	0.09									
17-Sep-13	7.75	1,710	7	1,040	0.12									
22-Oct-13	7.86	2,420	6	1,500	0.06		247	537	297	46	67	141	10	
14-Nov-13	7.84	5,270	15	3,570	0.06									
11-Dec-13	7.48	3,790	17	2,730	0.06									
24-Jan-14	7.65	8,070	5		0.27									
20-Feb-14	6.74	1,582	22		0.09									
25-Mar-14	7.82	2,830	43		0.37									
30-Apr-14	8.01	3,970	14	2,960	0.05		328	1610	379	154	176	757	19	
28-May-14	7.61	880	8		0.09									
26-Jun-14	7.98	2,840	6		0.05									
28-Jul-14	8.41	4,890	5	3,990	0.05									
31-Aug-14	7.75	2,551	13		0.07									
22-Sep-14	6.90	4,050				15.7								
27-Oct-14	7.90	2,650	9	1,700	0.06	14.2	237	756	259	49	76	398	9	
21-Nov-14	7.20	1,300				73								
22-Dec-14	8.00	3,950				14.5								

Date	pH	Specific Conductance (µS/cm)	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Iron (mg/l)	Turbidity (NTU)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Comments
29-Jan-15	8.20	2,390	18	1,590		30.9								
20-Feb-15	8.00	4,700				6.6								
30-Mar-15	7.60	1,960				11.8								
28-Apr-15	7.40	2,280	21	1,640	0.10	42	86	870	180	89	95	275	11	
28-May-15	7.50	2,430				23								
24-Jun-15	7.50	1,960				29								
27-Jul-15	7.60	931	7	632	0.16	20								
27-Aug-15	8.20	5,100				10								
28-Sep-15	8.20	4,570				14.9								
22-Oct-15	7.40	1,030	37	658	0.07	60	105	230	120	31	31	135	7.1	
30-Nov-15	8.20	3,300				22.8								
21-Dec-15	7.80	3,600				64								
29-Jan-16	7.50	3,510	12	2,810	0.11	19.7								
26-Feb-16	7.50	4,200				36.7								
31-Mar-16	8.30	4,900				10								
28-Apr-16	7.80	3,620	39	3,000	0.01	40	28	1380	265	110	130	510	12	
26-May-16	7.50	1,600				27								
29-Jun-16	7.30	4,000				19								
19-Jul-16	7.70	4,100	14	3,460	0.01	23								
22-Aug-16	7.60	1,800				33								
28-Sep-16	8.10	4,580				11								
20-Oct-16	8.40	4,300	24	3,520	0.01	33	330	1700	310	130	190	880	15	
28-Nov-16	8.20	4,300				72								
21-Dec-16	7.60	4,300				41								
30-Jan-17	8.00	4,240	46	3,680	<0.01	16								
27-Feb-17	8.10	5,100				4								
30-Mar-17	7.40	3,900				12								
26-Apr-17	7.70	1,300	12	1,050	0.23	16	150	390	150	48	53	240	8	
30-May-17	8.00	3,550				13								
28-Jun-17	7.50	2,516				13								
27-Jul-17	7.40	720	22	879	0.32	32								
30-Aug-17	6.60	1,730				37								Not flowing
28-Sep-17	7.80	5,150				68								
24-Oct-17	8.10	5,080	22	4,520	0.01	21	360	1700	290	160	250	1000	19	
28-Nov-17	7.50	3,150				42								Not flowing
13-Dec-17	7.80	3,540				48								Not flowing
29-Jan-18	7.80	1,670	50	1,320	0.06	67								Not flowing
22-Feb-18	5.60	1,280				19								Ashtonfield runoff
29-Mar-18	6.50	2,000				29								
26-Apr-18	7.60	3,560	8	2,810	0.01	15	240	1200	250	110	140	670	13	
21-May-18	7.60	2,600				16								
25-Jun-18	7.70	3,400				13								
25-Jul-18	7.40	866	7	541	0.07	17								
29-Aug-18	7.80	4,800				9								
28-Sep-18	7.50	3,400				17								
24-Oct-18	7.60	2,400	26	1,310	0.01	36	210	720	210	67	77	460	9.6	
29-Nov-18	7.80	3,900				23								Discharging
18-Dec-18	6.70	550				27								
31-Jan-19	7.90	1,350	56			33								No flow
28-Feb-19	7.60	5,400				23								
28-Mar-19	6.90	890				28								
10-Apr-19	7.70	3,590	11	3,400	0.01	17	230	1900	310	160	190	690	16	
27-May-19	7.80	2,900				29								No flow
28-Jun-19	7.80	4,400				6								
30-Jul-19	7.80	3,110	20	3,020	0.01	28								
29-Aug-19	8.00	3,800				25								No flow
24-Sep-19	7.10	1,100				26								
29-Oct-19	7.60	1,250	18	801	0.09	22	190	210	170	35	39	180	7.4	
27-Nov-19	8.00	1,850				22								
23-Dec-19	8.00	1,900				26								

Site  
WM12 Shamrock Creek / Four Mile Creek Junction

Date	pH	Specific Conductance (µS/cm)	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Iron (mg/l)	Turbidity (NTU)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Comments
24-Sep-09	8.00	2,800	16	1,800	0.74	52								
13-Oct-09	7.10	3,500	16	2,500	0.22	20	193		217	139	139	448	17	
03-Nov-09	8.30	6,200	2	5,200	<0.05	5								
13-Dec-09	7.30	550	64	300	<0.05	10								
13-Jan-10	6.10	310	6	190	0.30	16	90		39	13	8	32	4	
09-Feb-10	5.50	230	22	150	0.29	58								
04-Mar-10														
08-Apr-10	8.70	276	10	190	0.19	21	55		37	16	8	27	3	
14-May-10	7.50	200	6	171	0.07	9								
10-Jun-10	7.10	1,560	36	1,380	0.09	44								
07-Jul-10	7.70	2,750	16	1,960	0.09	17	110		194	111	110	414	13	
25-Aug-10	7.54	3,150	10	2,360	<0.05	20								
20-Sep-10	7.58	2,650	8	1,970	0.14		106	1050	183	116	111	364	12	
19-Oct-10	7.40	1,520	8	936	0.07									
19-Nov-10	7.86	4,370	30	3,080	0.06									
21-Dec-10	7.67	3,920	10	3,010	0.55									
14-Jan-11	7.78	5,840	12	4,420	<0.05		252	2230	462	245	244	813	26	
22-Feb-11	7.91	4,680	12	3,720	<0.05									
24-Mar-11	8.07	5,060	16	3,670	0.07									
27-Apr-11	7.41	420	26	304	0.43		66	66	44	14	11	51	3	
26-May-11	8.24	5,690	24	3,980	<0.05									
27-Jun-11	7.49	3,390	16	2,640	<0.05									
25-Jul-11	7.81	2,800	44	1,860	0.13		160	702	327	75	77	434	10	
26-Aug-11	7.62	2,130	22	1,510	0.17									
21-Sep-11	7.14	1,943	16	1,230	0.05									
26-Oct-11	8.17	774	134	502	0.33		43	189	86	25	25	93	5	
22-Nov-11	8.13	2,341	58	1,630	0.18									
15-Dec-11	8.12	3,440	30	2,420	0.05									
25-Jan-12	8.17	4,940	12	4,050	0.05		333	1910	527	116	216	843	19	
17-Feb-12	6.62	1,582	18	1,200	0.7									
30-Mar-12	8.03	4,510	18	3,470	0.05									
27-Apr-12	7.76	3,300	18	2,700	0.3		147	1580	254	166	171	532	18	
24-May-12	7.66	1,066	63	684	0.62									
27-Jun-12	8	4,860	32	3,800	0.14									
27-Jul-12	6.48	2,180	43	2,270	0.25		104	824	232	91	95	331	10	
30-Aug-12	6.83	1,029	62	712	0.26									
25-Sep-12	7.92	2,930	22	1,910	0.05									
25-Oct-12	7.57	728	145	446	0.15		92	138	89	21	22	98	5	
29-Nov-12	7.95	4,950	24	3,270	0.05									
20-Dec-12	6.4	4,480	12	3,040	0.05									
24-Jan-13														Dry
25-Feb-13														No Access
22-Mar-13	7.69	3,430	6	2,530	0.17									
22-Apr-13														No access
17-May-13														No access
21-Jun-13														No access
24-Jul-13	7.87	3,280	19	2,530	0.12		124	1350	228	144	151	477	15	
28-Aug-13	7.74	1,040	5	669	0.29									
17-Sep-13														Dry
22-Oct-13	7.75	1,370	5	742	0.06		160	270	152	25	34	217	6	
14-Nov-13	7.98	5,140	7	3,700	0.05									
11-Dec-13	7.44	1,830	6	1,250	0.13									
24-Jan-14	8.2	8,260	8		0.05									
20-Feb-14	8.42	4,170	29		0.05									
25-Mar-14	7.95	3,910	5		0.06									
30-Apr-14	7.85	4,390	10	3,250	0.05		306	2000	397	199	210	817	22	
28-May-14	7.34	1,752	6		0.11									
26-Jun-14	8	2,790	5		0.05									
28-Jul-14	8.44	5,000	18	3,660	0.05									
31-Aug-14	7.6	2,570	15		0.12									
22-Sep-14	7.3	5,030				8.1								
27-Oct-14	7.6	1,200	9	778	0.76	13.8	124	340	122	26	35	175	5	
21-Nov-14	7.4	1,000				8.8								
22-Dec-14	8	2,640				6.8								

[illegible]



Site  
WM13      Buttai Creek @ Buchanan Road

Date	pH	Specific Conductance (µS/cm)	Total Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)	Iron (mg/l)	Turbidity (NTU)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Comments
20-Sep-10	7.33	556	5	378	1.54		56	28	120	10	12	81	7	
19-Oct-10	7.36	603	4	320	0.81									
19-Nov-10	6.75	359	13	260	2.17									
21-Dec-10	7.36	525	5	338	2.00									
14-Jan-11	7.17	542	5	320	1.05		86	14	101	11	12	74	5	
22-Feb-11	7.38	495	5	480	0.62									
24-Mar-11	7.63	594	10	416	0.39									
27-Apr-11	6.07	1100	24	766	0.05		5	378	76	39	44	118	8	
26-May-11	6.59	1110	22	880	0.05									
27-Jun-11	7.02	826	10	518	0.28									
25-Jul-11	6.39	413	22	302	0.57		17	35	83	6	8	54	5	
26-Aug-11	7.01	593	35	372	0.76									
21-Sep-11	7.19	868	24	490	0.34									
26-Oct-11	7.84	949	21	554	0.48		55	44	237	15	22	145	6	
22-Nov-11	7.47	1,323	27	860	0.37									
15-Dec-11	8.46	386	74	380	1.03									
25-Jan-12	7.82	906	36	612	0.52		83	113	170	18	24	137	6	
17-Feb-12	6.37	291	50	339	1.06									
30-Mar-12	7.42	966	40	548	0.13									
27-Apr-12	7.3	459	26	384	1.2		51	41	96	11	13	69	5	
24-May-12	7.39	1,044	37	550	0.3									
27-Jun-12	7.44	882	32	526	0.78									
27-Jul-12	6.36	575	50	591	0.78		43	42	150	13	16	85	5	
30-Aug-12	6.89	135	37	788	0.19									
25-Sep-12														Dry
25-Oct-12	7.58	1,573	18	844	0.05		105	91	408	27	37	242	9	
29-Nov-12														Dry
20-Dec-12														Dry
24-Jan-13														Dry
25-Feb-13	6.94	475	35	358	0.62									
22-Mar-13	7.21	1,010	5	574	0.48									
22-Apr-13	6.78	1,600	14	1,020	0.25		22	407	253	51	48	248	11	
17-May-13	7.38	907	38	540	0.05									
21-Jun-13	7.24	1,120	6	646	0.16									
24-Jul-13	7.28	727	11	417	0.46		54	45	151	11	15	105	6	
28-Aug-13	7.53	869	5	443	0.11									
17-Sep-13	7.59	930	6	469	0.06									
22-Oct-13	7.53	1,080	8	541	0.05		74	74	218	19	23	155	9	
14-Nov-13	7.39	1,100	15	577	0.05									
11-Dec-13	6.81	599	18	364	0.56									
24-Jan-14	8.05	941	30		0.05									
20-Feb-14	8.35	957	22		0.05									
25-Mar-14	7.59	849	12		0.05									
30-Apr-14	6.89	282	6	204	0.91		33	21	66	4	6	55	7	
28-May-14	6.63	472	5		0.93									
26-Jun-14	7.65	475	5		0.3									
28-Jul-14	7.32	580	5	384	0.11									
31-Aug-14	7.57	352	13		0.73									
22-Sep-14	7.7	570				41.8								
27-Oct-14	7.4	560	60	337	1.33	15.9	69	10	116	9	12	74	8	
21-Nov-14	7.6	660				18.6								
22-Dec-14	7.5	690				16.4								
29-Jan-15	6.8	240	16	236	1.3	38.5								
23-Feb-15	7.2	560				7.8								
30-Mar-15	7	600				9.3								
28-Apr-15	6.5	274	44	234	3.5	63	41	22	42	11	8.2	25	8.3	Floodwater
28-May-15	7.3	640				33								
24-Jun-15	6.7	620				47								
27-Jul-15	7.6	919	4	542	0.42	9								
27-Aug-15	7.2	1,100				7								
28-Sep-15	7.5	760				9.1								
22-Oct-15	7.1	900	2	533	0.28	5	88	21	210	19	21	120	7.2	
30-Nov-15	7.5	590				10.2								
21-Dec-15	7	640				9.4								
29-Jan-16	7	640	11	383	0.94	12.5								

26-Feb-16	6.9	840				7								
31-Mar-16	7.1	450				13								
28-Apr-16	8	930	3	524	0.04	4	115	14	210	19	21	130	6	
26-May-16	7.6	960				19								
29-Jun-16	6.9	1,200				5								
19-Jul-16	7.8	1,180	8	757	0.01	7								Stagnant
22-Aug-16	7.5	790				13								Stagnant
28-Sep-16	7.5	800				5								
20-Oct-16	7.6	860	2	536	0.35	3	97	81	150	25	24	130	13	
28-Nov-16	7.6	940				11								Stagnant
21-Dec-16	7.7	960				9								Stagnant
30-Jan-17	8	1,060	8	623	0.02	8								
27-Feb-17	8.1	1,100				270								Cattle
30-Mar-17	7.4	390				41								
26-Apr-17	7.3	454	8	356	2.1	10	65	26	110	13	13	72	8	
30-May-17	7.1	580				7								
28-Jun-17	6.7	510				28								
27-Jul-17	7.2	547	4	364	1	12								
30-Aug-17	7.6	590				6								Not flowing
28-Sep-17	7.9	695				6								Not flowing
24-Oct-17	7.5	711	2	428	0.19	6	77	53	120	16	16	110	8	
28-Nov-17	7.5	630				8								Not flowing
13-Dec-17	7.7	670				8								Not flowing
29-Jan-18	7.8	779	22	489	0.08	29								Not flowing
22-Feb-18	8	800				39								Stagnant - cattle
29-Mar-18	7	500				18								Cattle
26-Apr-18	6.5	560	6	367	2	12	64	31	110	13	13	84	7.3	Cattle
21-May-18	8	610				8								
26-Jun-18	7.7	500				19								
25-Jul-18	7.6	536	2	334	1.1	6								
29-Aug-18	7.7	520				6								
28-Sep-18	8.1	550				5								Not flowing
24-Oct-18	7.1	450	13	486	1.6	13	57	22	83	8.5	9.4	71	7	
29-Nov-18	8.3	480				13								
18-Dec-18	6.4	250				40								
31-Jan-19	7.4	410	6	222	1.8	8								No flow
28-Feb-19	8	450				16								
28-Mar-19	7	280				38								
10-Apr-19	7.1	364	11	251	1.1	18	40	17	65	7.6	7.5	48	7.6	
27-May-19	7.7	544				19								
28-Jun-19	7.4	380				15								
30-Jul-19	7.4	405	15	206	0.06	20								
29-Aug-19	8.1	560				18								
24-Sep-19	6.7	270				69								
29-Oct-19	7.7	323	14	206	1.1	19	50	12	54	7.8	6.9	43	5.9	
27-Nov-19	7.4	390				16								
23-Dec-19	7.5	490				55								

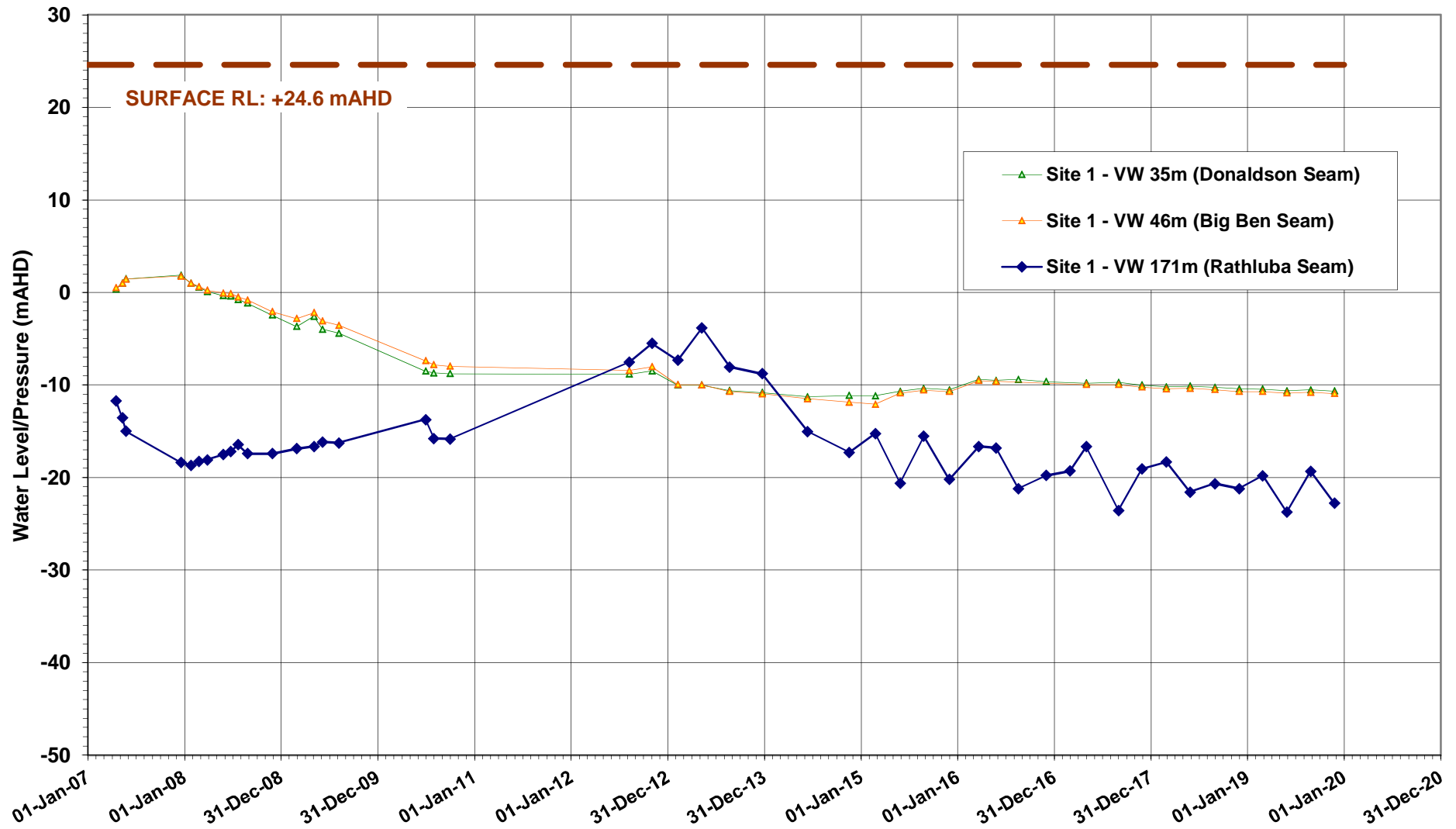
**Table C1 - Discharge Monitoring Results 2019**

DATE	pH	TOTAL SUSPENDED SOLIDS (mg/l)	TOTAL DISSOLVED SOLIDS (mg/l)	SPECIFIC CONDUCTANCE (uS/cm)	IRON (mg/l)	DISCHARGE VOLUME (ML/day)
09-Feb-19	7.3	11	3,650	3,460	<0.01	40
21-Feb-19	7.9	7	4,270	4,090	<0.01	40
22-Feb-19	8.1	5	3,720	3,540	<0.01	40
23-Feb-19	8.1	3	3,740	3,510	<0.01	20
10-Mar-19	7.8	15	4,660	4,520	<0.01	40
11-Mar-19	7.9	2	4,940	4,690	<0.01	20
16-Mar-19	7.9	3	4,970	4,730	<0.01	40
17-Mar-19	8.0	14	3,880	3,860	<0.01	20
18-Mar-19	8.0	13	3,850	3,770	<0.01	10
30-Mar-19	7.9	14	4,380	4,590	<0.01	40
31-Mar-19	8.0	26	4,470	4,320	<0.01	20
05-Apr-19	8.0	8	5,240	4,790	<0.02	30
06-Apr-19	7.9	8	4,920	4,660	<0.02	20
04-May-19	7.9	2	5,530	4,670	<0.01	40
05-May-19	8.2	3	4,020	3,780	<0.01	40
02-Jun-19	7.9	4	5,610	4,650	<0.01	40
03-Jun-19	8.0	2	5,270	4,320	<0.01	40
04-Jun-19	8.0	5	5,230	4,500	<0.01	20
05-Jun-19	8.1	2	4,660	4,280	<0.01	20
24-Jun-19	7.8	2	6,100	5,060	<0.01	30
25-Jun-19	7.9	3	6,100	5,070	<0.01	30
26-Jun-19	8.3	4	4,610	4,180	<0.01	20
04-Jul-19	7.9	5	6,240	5,100	0.04	35
05-Jul-19	8.3	8	4,150	4,100	<0.01	5
30-Aug-19	7.9	2	5,260	4,820	<0.01	30
<b>Max</b>	<b>8.3</b>	<b>26</b>	<b>6,240</b>	<b>5,100</b>	<b>0.04</b>	<b>40</b>
<b>Min</b>	<b>7.3</b>	<b>2</b>	<b>3,650</b>	<b>3,460</b>	<b>&lt;0.01</b>	<b>5</b>
<b>Average</b>	<b>8.0</b>	<b>7</b>	<b>4,779</b>	<b>4,362</b>	<b>&lt;0.04</b>	<b>29</b>

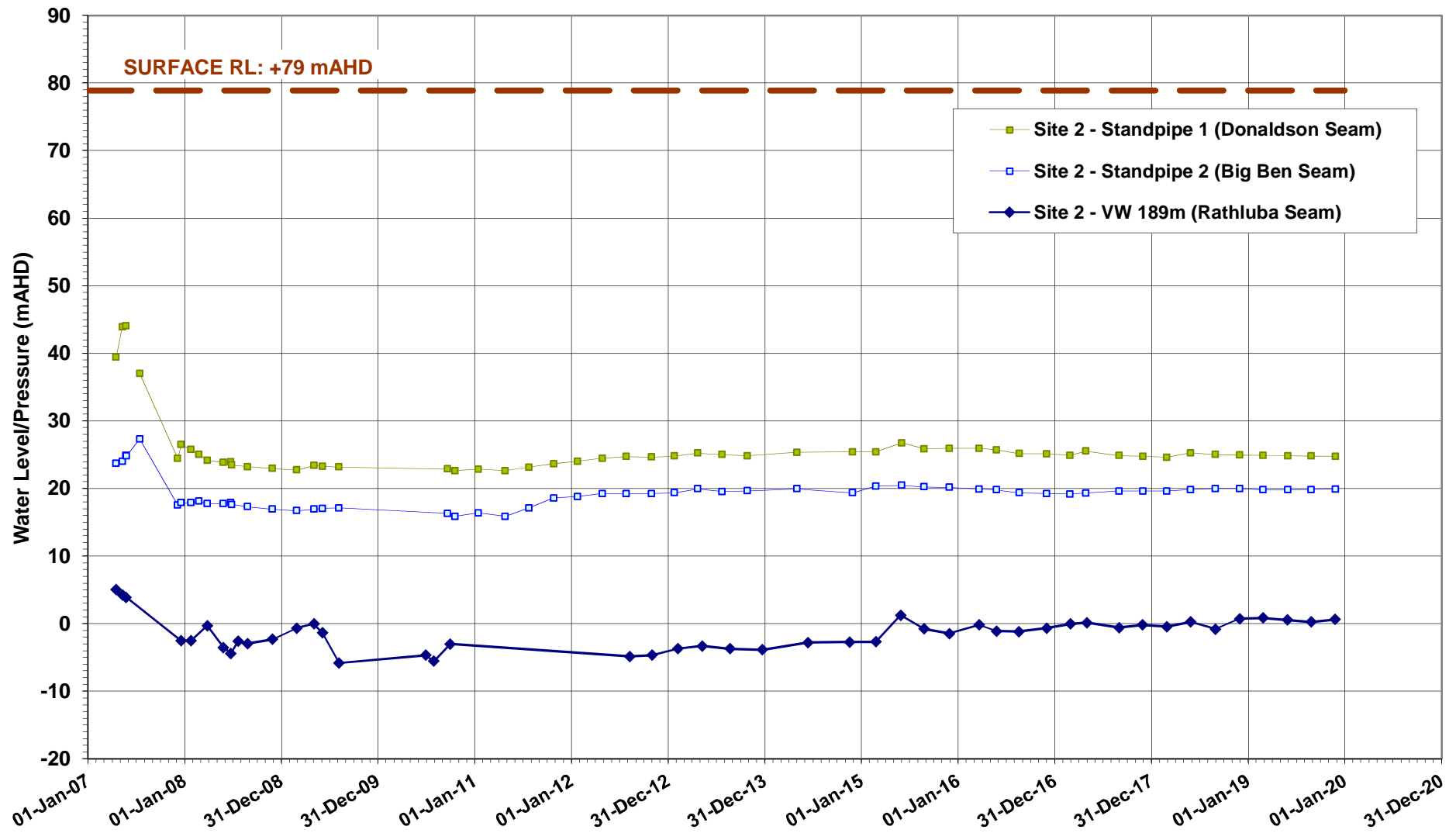
## **APPENDIX D**

### **GROUNDWATER MONITORING RESULTS**

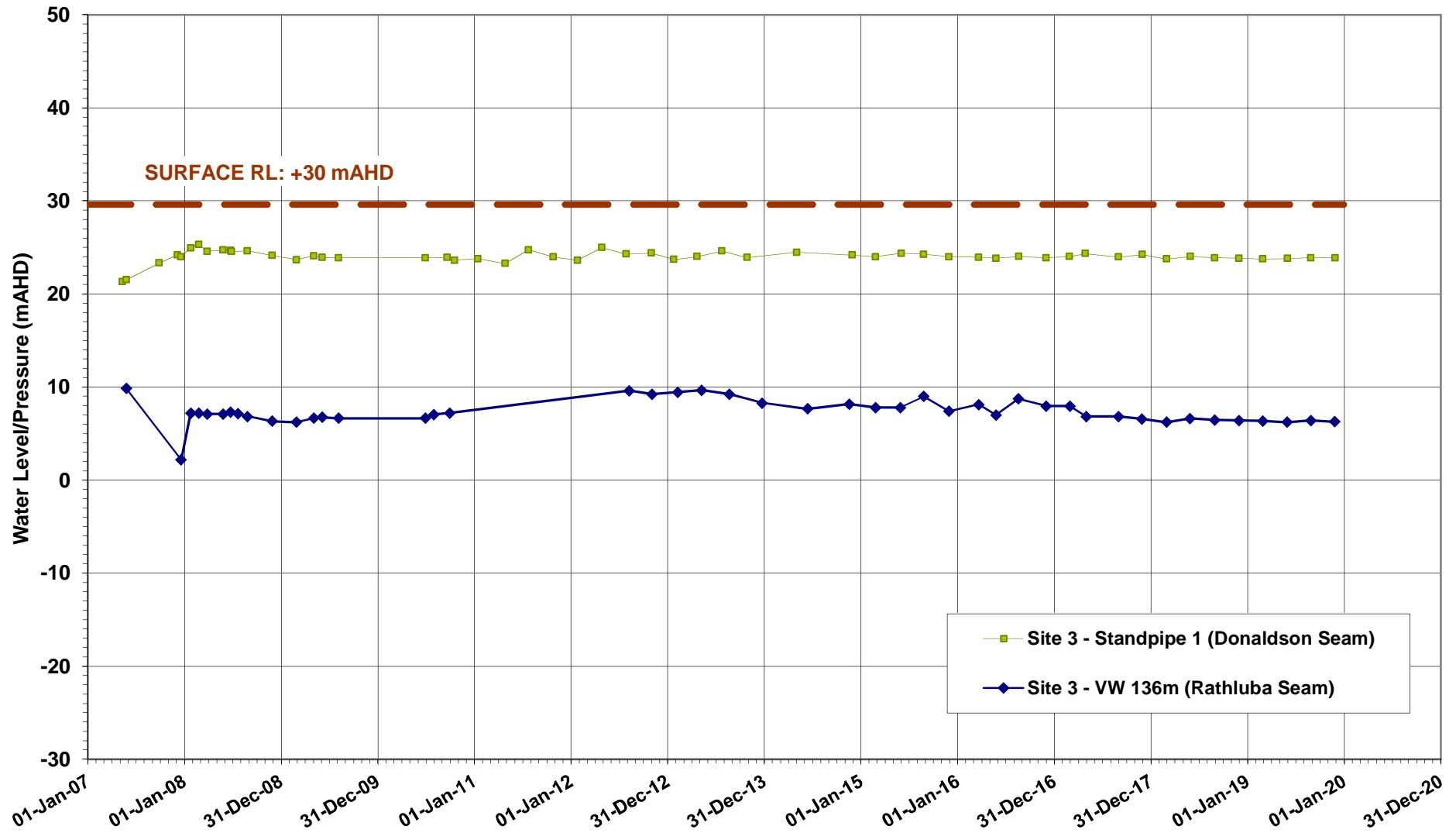
# GROUNDWATER LEVEL HYDROGRAPH - BLOOMFIELD Site PD1



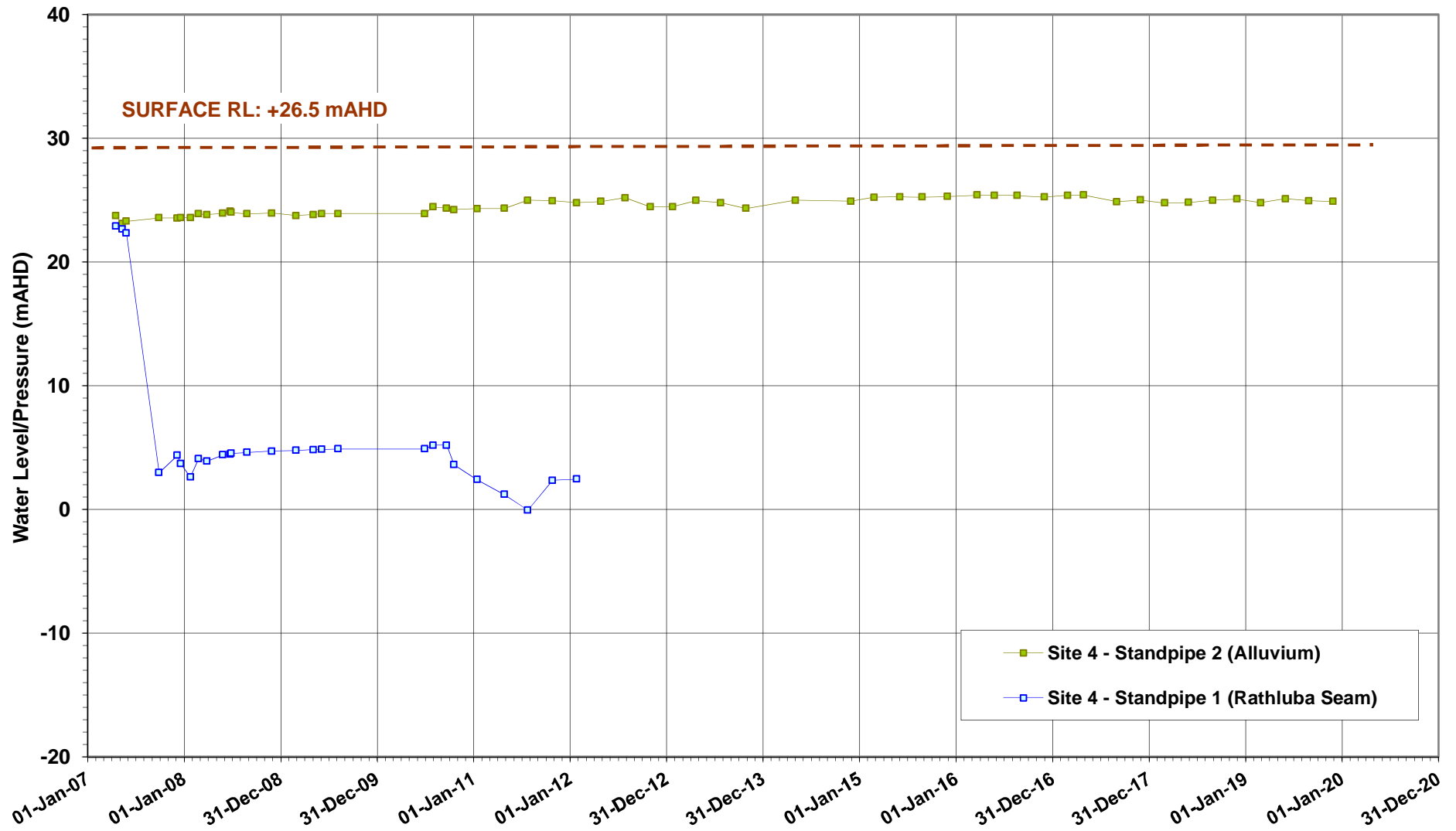
## GROUNDWATER LEVEL HYDROGRAPH - BLOOMFIELD Site PD2



# GROUNDWATER LEVEL HYDROGRAPH - BLOOMFIELD Site PD3

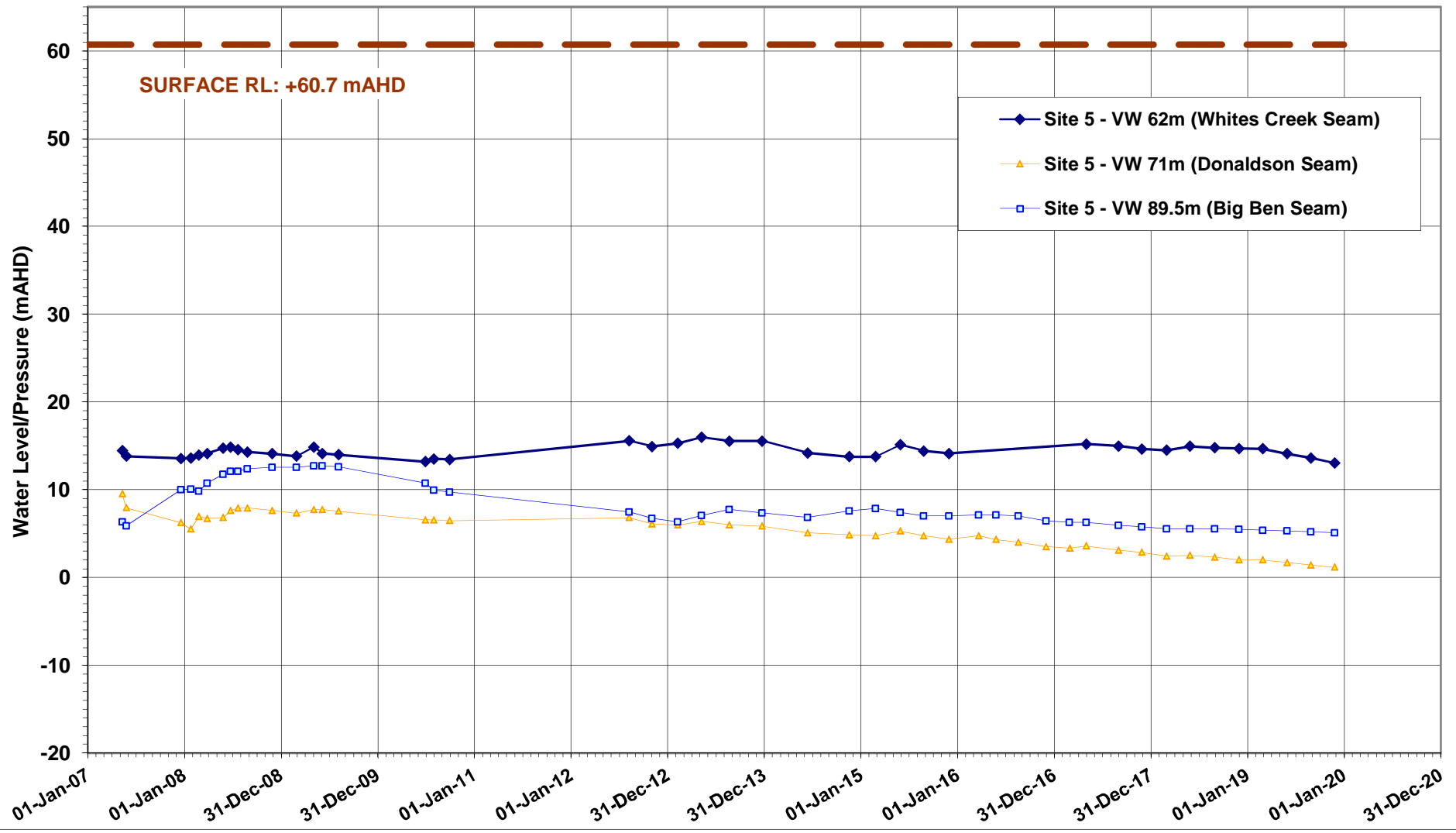


# GROUNDWATER LEVEL HYDROGRAPH - BLOOMFIELD Site PD4

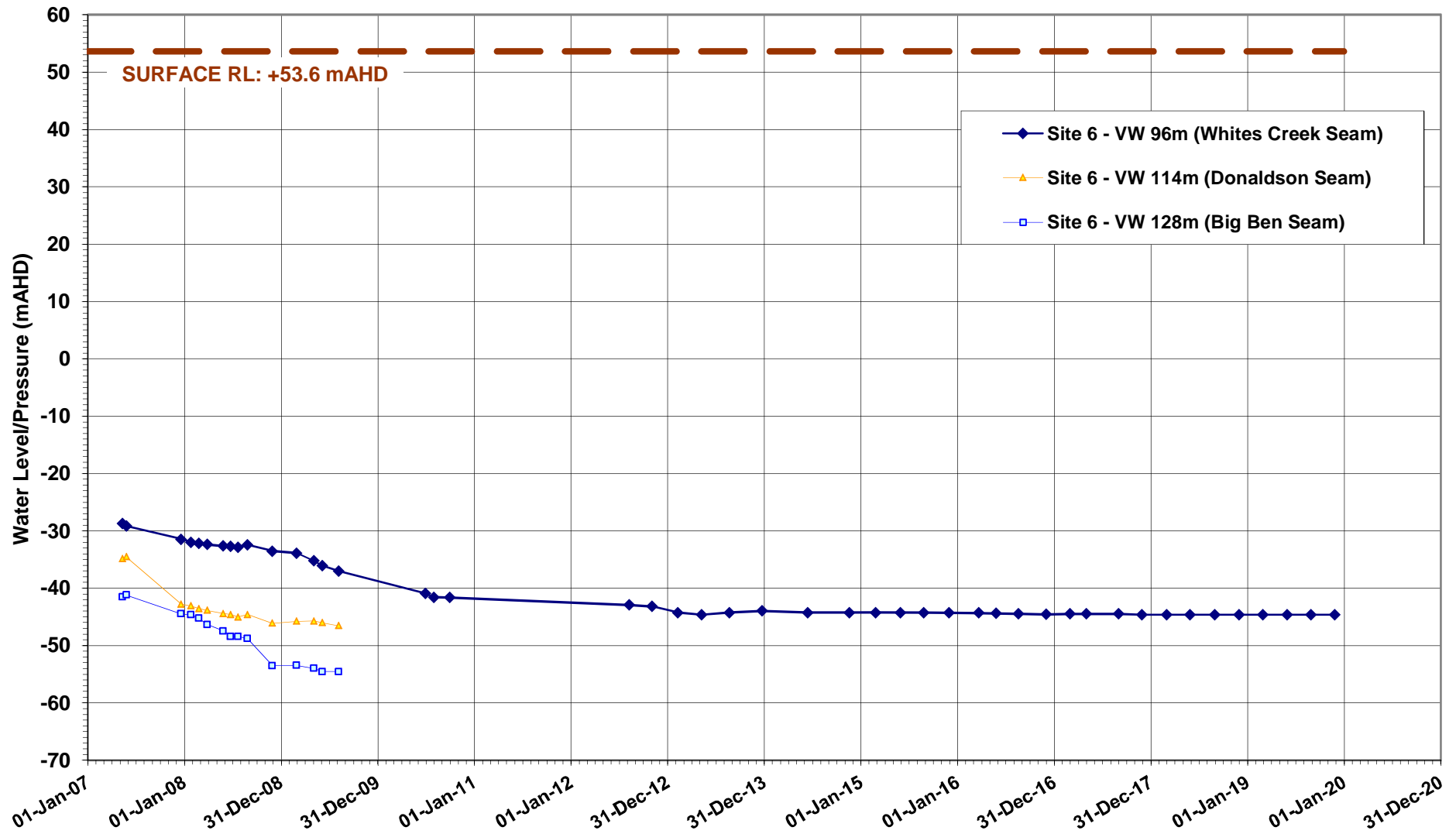




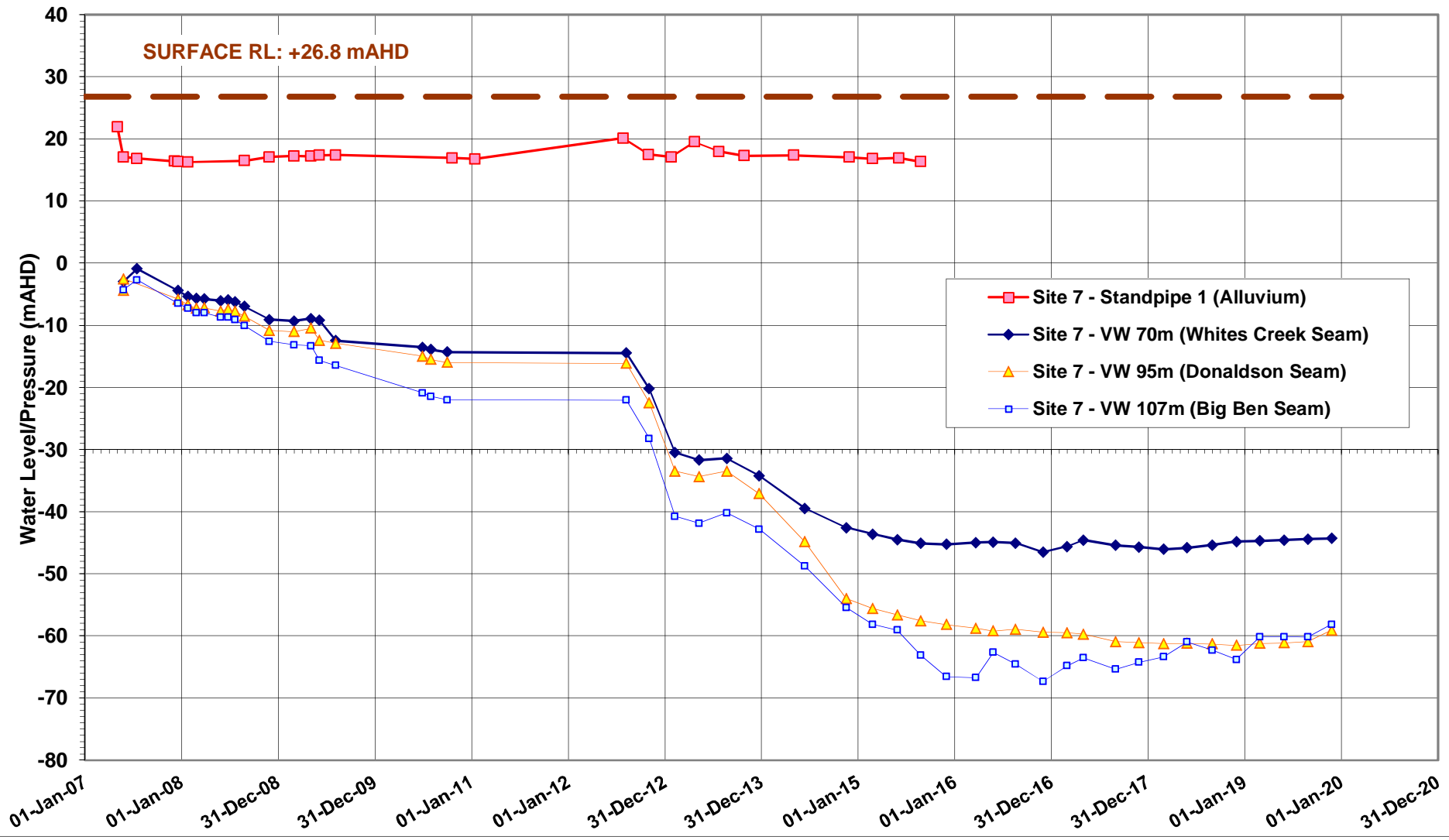
# GROUNDWATER LEVEL HYDROGRAPH - BLOOMFIELD Site PD5



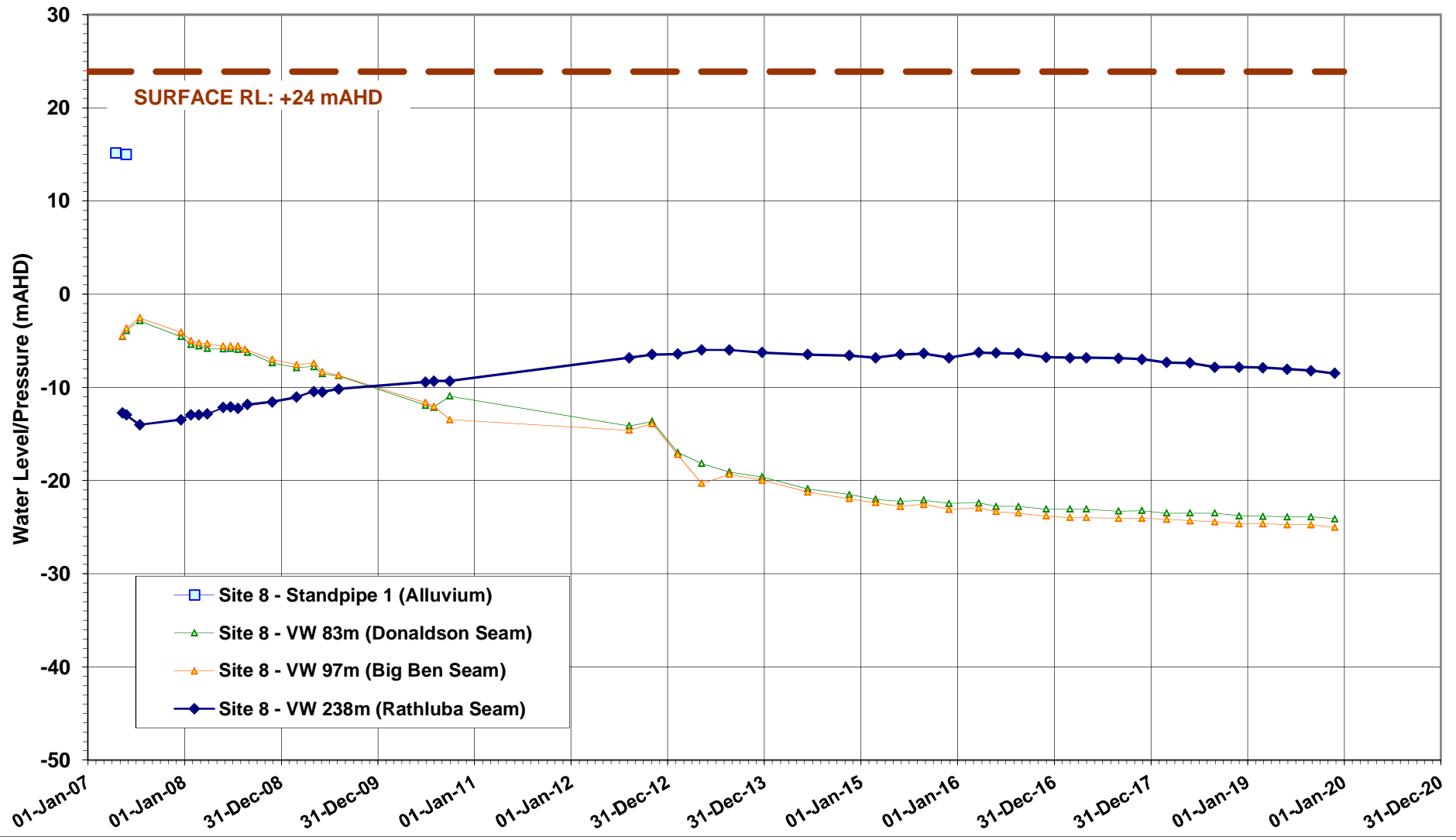
# GROUNDWATER LEVEL HYDROGRAPH - BLOOMFIELD Site PD6



# GROUNDWATER LEVEL HYDROGRAPH - BLOOMFIELD Site PD7



# GROUNDWATER LEVEL HYDROGRAPH - BLOOMFIELD Site PD8



## Bore PD2.1

## Buttai Reservoir

Date	RL	Depth (m)	pH	EC (uS/cm)	TDS (mg/L)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Iron (mg/L)	
20-Sep-10	22.87	56.33	6.67	5350	3780	569	730	1330	32	74	1150	24	0.29	
19-Oct-10	22.63	56.57	6.72	6000	3100	553	802	1210	34	78	1330	27	2.45	
14-Jan-11	22.84	56.36	6.6	6420	3750	598	718	1260	30	73	1310	28	1.47	
27-Apr-11	22.61	56.59	6.6	6560	3610	483	953	1120	32	90	1200	26	2.14	
25-Jul-11	23.13	56.07	6.64	6320	3810	541	621	1230	30	72	1280	28	1.28	
26-Oct-11	23.64	55.56	7.09	6170	3660	503	506	1290	27	67	1270	29	1.61	
25-Jan-12	24.02	55.18	7.06	5720	3330	430	607	1300	34	56	1180	29	1.39	
27-Apr-12	24.44	54.76	6.64	5270	3490	409	418	1270	36	47	1130	29	1	
27-Jul-12	24.71	54.49	7.32	6120	3830	355	608	1650	134	74	1320	35	0.05	
31-Oct-12	24.64	54.56	6.74	5950	3990	592	874	1240	48	79	1370	33	11.4	
24-Jan-13	24.80	54.40	7.3	6360	4130	590	816	1190	67	78	1320	31	0.85	
22-Apr-13	25.23	53.97	6.81	6080	4170	549	654	1210	54	79	1220	30	0.79	
24-Jul-13	25.00	54.20	7.21	6820	3830	212	450	1700	159	34	1290	37	1.99	
28-Oct-13	24.82	54.38	6.87	6380	3990	622	726	1200	38	80	1310	31	2.06	
02-May-14	25.34	53.86	6.84	6460	3800									
29-Nov-14	25.40	53.80	7.3	6460	3740	560	503	1600	96	53	1220	27	0.05	
24-Feb-15	25.42	53.78												
03-Jun-15	26.72	52.48	6.7	6350	3170									
26-Aug-15	25.87	53.33												
30-Nov-15	25.92	53.28	6.9	5520	3420	350	310	1300	87	33	1300	33	0.05	
21-Mar-16	25.92	53.28												
25-May-16	25.70	53.50	7	5000	2600									
19-Aug-16	25.17	54.03												
30-Nov-16	25.12	54.08	7.3	4700	3010	330	220	1200	120	16	1100	29	0.01	
27-Feb-17	24.89	54.31												
01-May-17	25.54	53.66	8	3920	2513									
31-Aug-17	24.86	54.34												
29-Nov-17	24.74	54.46	7	4650	3020	280	400	1200	72	25	1100	24	0.02	
28-Feb-18	24.61	54.59												
29-May-18	25.28	53.92	6.9	5900	3770									
30-Aug-18	25.02	54.18												
30-Nov-18	24.94	54.26	7.1	4900	3490	440	600	1200	120	170	590	24	0.01	
27-Feb-19	24.90	54.30												
31-May-19	24.82	54.38	7.1	5200	3600									
27-Aug-19	24.78	54.42												
27-Nov-19	24.76	54.44	7	4930	3640	540	770	1200	48	70	1200	31	0.01	

## Bore PD2.2

## Buttai Reservoir

Date	RL	Depth (m)	pH	EC (uS/cm)	TDS (mg/L)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Iron (mg/L)	
20-Sep-10	16.29	63.37	6.69	5140	4500	319	1890	695	183	180	943	20	4.22	
19-Oct-10	15.88	63.78	6.79	5780	4300	333	2010	706	185	180	1040	22	8.83	
14-Jan-11	16.38	63.28	6.65	6170	4220	342	2300	728	191	189	1070	24	9.19	
27-Apr-11	15.87	63.79	6.42	6270	4500	288	1890	701	171	206	952	23	7.52	
25-Jul-11	17.12	62.54	6.29	6090	4250	239	1800	806	167	209	972	27	31.1	
26-Oct-11	18.58	61.08	7.03	5960	4320	206	1740	791	157	204	1000	29	6.23	
25-Jan-12	18.81	60.85	7.07	6460	4840	483	1480	1130	100	177	1170	33	0.05	
27-Apr-12	19.23	60.43	6.44	5720	4230	282	1360	1110	106	194	1090	33	23.6	
27-Jul-12	19.21	60.45	6.52	5720	4390	272	1710	1070	97	182	1110	32	30.5	
31-Oct-12	19.23	60.43	6.35	5650	4040	205	1840	892	100	178	1190	33	32.9	
24-Jan-13	19.36	60.30	6.73	5810	4110	241	1820	838	115	203	1140	31	29.1	
22-Apr-13	19.95	59.71	6.4	5480	3990	217	1480	852	76	160	1070	30	32.4	
24-Jul-13	19.53	60.13	6.81	6120	4100	246	1520	899	84	168	1140	32	12.2	
28-Oct-13	19.65	60.01	6.54	6450	4140	271	1490	901	79	154	1160	30	26.4	
02-May-14	19.94	59.72	6.46	6260										
29-Nov-14	19.36	60.30	6.7	5880	3610	302	1440	1010	70	127	1040	24	0.05	
24-Feb-15	20.35	59.31												
03-Jun-15	20.44	59.22	6.7	6110	3050									
26-Aug-15	20.22	59.44												
30-Nov-15	20.16	59.50	6.6	5670	4180	310	1300	890	66	150	1200	34	10	
21-Mar-16	19.90	59.76												
25-May-16	19.79	59.87	6.8	5800										
19-Aug-16	19.36	60.30												
30-Nov-16	19.24	60.42	6.7	5730	5510	400	2100	690	280	230	1200	25	1.9	
27-Feb-17	19.18	60.48												
01-May-17	19.32	60.34	7.3	5370	3447									
31-Aug-17	19.60	60.06												
29-Nov-17	19.63	60.03	6.8	5670	4030	360	1300	1100	55	120	1400	28	0.01	
28-Feb-18	19.62	60.04												
29-May-18	19.82	59.84	7.1	6400	4050									
30-Aug-18	19.99	59.67												
30-Nov-18	19.99	59.67	7	5380	4170	420	1300	1100	50	110	1000	27	0.01	
27-Feb-19	19.80	59.86												
31-May-19	19.79	59.87	6.9	5450	4200									
27-Aug-19	19.83	59.83												
27-Nov-19	19.91	59.75	7.2	5460	4130	400	1300	1100	60	130	1200	31	0.01	

## Bore PD3

## Shamrock Lane

Date	RL	Depth (m)	pH	EC (uS/cm)	TDS (mg/L)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Iron (mg/L)	
20-Sep-10	23.88	7.12	4.1	2660	2090	1	958	220	34	112	374	21	0.09	
19-Oct-10	23.62	7.38	6.37	5890	5120	217	2710	510	262	311	884	27	22.6	
14-Jan-11	23.78	7.22	6.59	6040	4940	168	2890	507	247	300	878	29	0.05	
27-Apr-11	23.27	7.73	6.7	6680	5390	134	2790	545	256	333	863	28	0.05	
25-Jul-11	24.75	6.25	6.24	6520	5280	134	2440	614	247	309	874	30	7.05	
26-Oct-11	23.97	7.03	6.52	6420	5170	120	2780	615	267	328	1010	34	0.05	
25-Jan-12	23.62	7.38	7.03	6580	6640	130	3160	595	273	347	980	33	0.06	
27-Apr-12	24.97	6.03	6.26	6190	5280	185	2670	604	286	331	957	33	0.38	
27-Jul-12	24.29	6.71	6.35	6350	5860	158	3530	622	308	345	985	33	0.61	
25-Oct-12	24.38	6.62	6.54	6820	5880	98	3280	599	362	380	1020	35	0.05	
24-Jan-13	23.70	7.30	6.07	6520	5430	2	3880	484	354	365	977	33	0.11	
22-Apr-13	24.01	6.99	5.74	5800	5340	46	3070	433	210	354	896	34	113	
24-Jul-13	24.61	6.39	5.76	6520	5720	85	3240	448	281	377	915	35	34.2	
22-Oct-13	23.92	7.08	4.63	6660	5480	1	3030	444	241	351	874	35	62.1	
02-May-14	24.48	6.52	6.2	6970										
29-Nov-14	24.17	6.83	3.5	6840	6390	5	3690	547	317	332	870	28	2.97	
24-Feb-15	23.98	7.02												
03-Jun-15	24.36	6.64	5.9	3820	1900									
26-Aug-15	24.27	6.73												
30-Nov-15	23.98	7.02	6.2	5550	5720	110	2700	400	290	330	960	37	71	
21-Mar-16	23.93	7.07												
25-May-16	23.84	7.16	6	3500	1800									
19-Aug-16	24.02	6.98												
30-Nov-16	23.89	7.11	5.2	3480	3190	15	1500	220	130	170	640	24	0.01	
27-Feb-17	24.03	6.97												
01-May-17	24.33	6.67	6.3	3740	2399									
31-Aug-17	23.97	7.03												
29-Nov-17	24.24	6.76	5.9	4670	4660	28	2600	390	240	270	990	29	17	
28-Feb-18	23.75	7.25												
29-May-18	24.03	6.97	6.3	7400	4750									
30-Aug-18	23.89	7.11												
30-Nov-18	23.83	7.17	5.9	5580	6920	34	3600	550	320	360	890	33	34	
27-Feb-19	23.75	7.25												
31-May-19	23.80	7.20	6.1	5700	4600									
27-Aug-19	23.88	7.12												
27-Nov-19	23.88	7.12	5.9	5770	6930	57	3800	530	370	410	1100	38	18	

**Bore PD4.1**

### Product Stockpile Pad

[illegible]



## Bore PD4.2

## Product Stockpile Pad

Date	RL	Depth (m)	pH	EC (uS/cm)	TDS (mg/L)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Iron (mg/L)	
20-Sep-10	24.30	2.69	5.63	8390	7870	69	3900	1150	123	424	1500	30	19.5	
19-Oct-10	24.24	2.75	5.59	9060	8630	73	4870	438	163	527	1700	34	45	
14-Jan-11	24.31	2.68	5.4	9970	8880	55	5740	462	134	492	1790	37	36.8	
27-Apr-11	24.33	2.66	5.36	10800	8770	45	5470	398	147	531	1690	37	33	
25-Jul-11	24.99	2	4.32	9440	5990	1	4670	364	179	510	1540	37	0.87	
26-Oct-11	24.96	2.03	5.72	8220	4600	24	4550	358	261	520	1330	34	57.1	
25-Jan-12	24.80	2.19	5.63	7610	8550	7	4370	277	195	482	1180	31	50.6	
27-Apr-12	24.89	2.10	5.35	5890	5710	1	3210	230	168	366	930	26	63.3	
27-Jul-12	25.19	1.80	5.44	5440	6400	12	4260	238	182	415	1030	29	44.1	
25-Oct-12	24.46	2.53	3.82	7210	6780	1	4580	245	286	489	1110	31	65.4	
24-Jan-13	24.48	2.51	5.67	6760	5960	26	4940	176	298	465	1060	27	71	
22-Apr-13	24.98	2.01	5.16	6180	6430	22	4500	156	272	465	1030	26	89.2	
24-Jul-13	24.80	2.19	5.41	7160	6940	26	4410	184	351	475	1010	26	79.4	
28-Oct-13	24.34	2.65	5.7	7650	7390	1	4370	229	326	474	1050	26	77.5	
02-May-14	24.99	2.00	5.75	7100										
29-Nov-14	24.91	2.08	4.2	7300	7260	5	4600	338	410	403	958	21	16.5	
24-Feb-15	25.24	1.75												
03-Jun-15	25.28	1.71	5.5	7780	3870									
26-Aug-15	25.26	1.73												
30-Nov-15	25.29	1.70	5.9	5930	7310	49	4400	270	360	400	1100	31	50	
21-Mar-16	25.41	1.58												
25-May-16	25.39	1.60	5.5	6200	3400									
19-Aug-16	25.38	1.61												
30-Nov-16	25.26	1.73	5.5	5730	6640	25	3900	230	360	360	1000	25	0.06	
27-Feb-17	25.40	1.59												
01-May-17	25.41	1.58	6.6	5740	3681									
31-Aug-17	24.88	2.11												
29-Nov-17	25.02	1.97	6.2	5910	7420	49	4500	220	440	390	1200	26	36	
28-Feb-18	24.78	2.21												
29-May-18	24.81	2.18	6.1	7360	4720									
30-Aug-18	25.00	1.99												
30-Nov-18	25.10	1.89	6	6040	9970	47	5900	130	490	530	990	24	140	
27-Feb-19	24.79	2.20												
31-May-19	25.12	1.87	6.5	5600	4000									
27-Aug-19	24.95	2.04												
27-Nov-19	24.89	2.10	3.5	7080	9720	30	6600	110	480	680	1100	28	110	

**Bore PD7.1**

### South Cut Boundary

[illegible]

**APPENDIX E**

**COMPLAINTS REGISTER**

**BLOOMFIELD COLLIERY**  
**COMPLAINTS REGISTER**  
**2019**



No.	About *	Time/Date	Location	Details	Action Taken / Findings
19_01	N	8/4/2019 9:00am	Black Hill	Complaint via phone call directly to Mine Manager. Complained about noise during night shift on 7/4/19 at around 1am.	Mine Manager discussed noise complaint with complainant. Explained to them that improvements will be made to the review of the noise model for the Sunday nightshift.
19_02	N	11/4/2019 2:10pm	Ashtonfield	Complaint via email to Environmental Advisor. Complained about noise during night shift on 10/4/19 at around 1am.	Environmental Advisor responded by email on 12/4/19. Explained that Bloomfield tries to avoid night shift at the CHPP, however for operational reasons it was necessary. Atmospheric conditions on the 11/4/19 were predicted to be similar and as a result the night shift was cancelled. The noise predictive model was recently updated to include the CHPP operations and Bloomfield is learning to interpret the data.
19_03	N	11/4/2019 3:08pm	Ashtonfield	Complaint via 'Hotline'. Complaint about noise on night shift 10/4/19.	Environmental Advisor rang complainant on 11/4/19. Explained that we try to avoid night shift at the CHPP, however for operational reasons it was necessary. Atmospheric conditions on the 11/4/19 were predicted to be similar and as a result the night shift was cancelled. The noise predictive model was recently updated to include the CHPP operations and we are learning to interpret the data.
19_04	O	7/8/2019 5:05pm	Black Hill	Complaint via phone call to Mine Manager. Complaint about odour during previous days.	Mine Manager explained that extensive works had been carried out on a problem area of spon comb. More work may be conducted where considered necessary.

19_05	O	17/10/19	Black Hill	Complaint via phone call to Mine Manager. Complaint about odour.	Environmental Advisor immediately drove to residence. No odour noticeable.
19_06	B	17/10/19 10:29am	Buchanan	Complaint was forwarded to Bloomfield by NSW EPA. Complaint from private landowner north-west of the mine alleging high overpressure and vibration from blast on 16/10/19.	Environmental Advisor responded to EPA via email on 18/10/19. Blast monitors located west and north-west of the mine site were within allowable limits for both vibration and overpressure.
19_07	N	28/10/19	Buttai	Complaint received at CCC meeting. Complaint about noise from mining operations on the evening of Friday 18/10/19.	Complaint received 10 days after event. Operations on 18/10/19 would have ceased at around 9:45 pm. No night shift on Friday's.

\* D = Dust, N = Noise, B = Blasting, V = Visual, L = Lighting, W = Weeds, O = Other