YANCOAL
兖煤澳大利亚有限公司

MOOLARBENCOAL
PART OF THE YANCOAL AUSTRALIA GROUP

Annual Environmental Management Report
2012-2013

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Name of mine	Moolarben Coal Mines
Titles/Mining Leases	EL 6288, 7073, 7074 ML 1605, 1606, 1628
MOP Commencement Date	January 2013
MOP Completion Date	December 2017
AEMR Commencement Date	01/09/2012
AEMR Completion Date	31/08/2013
Name of Leaseholder	Moolarben Coal Mines Pty Limited
Name of Operator (if different)	Moolarben Coal Operations Pty Ltd
Reporting Officer	John Blanning
Title	General Manager
Date:	31st October 2013

Signature:

DISTRIBUTION

NSW Department of Planning and Infrastructure
NSW Department of Resources and Energy
NSW Environment Protection Authority
NSW Office of Environment and Heritage
NSW Office of Water
Department of Sustainability, Environment, Water, Population and Communities
Mid-Western Regional Council
Moolarben Coal Operations Community Consultative Committee Members
Moolarben Coal Operations Environment and Community Relations Manager
Moolarben Coal Operations Environment and Community Relations Superintendent
Moolarben Coal Operations Environment and Community Relations Coordinators
Moolarben Coal Operations General Manager
Moolarben Coal Operations Website
Yancoal Australia

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ACRONYMS

AEMR	Annual Environmental Management Report
CCC	Community Consultative Committee
DP&I	Department of Planning and Infrastructure
DRE	Department of Resources and Energy
EPA	Environment Protection Authority
EPBC	Environment Protection and Biodiversity Conservation Act
OEH	Office of Environment and Heritage
MWRC	Mid-Western Regional Council
NOW	NSW Office of Water
SEWPAC	Sustainability, Environment, Water, Population and Communities

1.0 INTRODUCTION

The Moolarben Coal Project (MCP) is located in the Western Coalfields of New South Wales, east of Ulan and approximately 40 km northeast of Mudgee, in the Mid-Western Regional local government area, and is adjacent to the Ulan and Wilpinjong coal mines. The MCP is operated by Moolarben Coal Operations Pty Ltd (MCO).

1.1 STRUCTURE OF THIS REPORT

The structure of this report is based on the document "Guidelines and Format for Preparation of Annual Environmental Management Report", Department of Mineral Resources, Document No. EDG03 MREMP Guide V3 dated January 2006 and incorporates the reporting requirements stipulated in the Moolarben Project Approval, specifically Schedule 5, Condition 5. This report also incorporates the reporting requirements in the "Draft DWE Water Reporting Requirements for Mines", the reporting requirements in Condition 4 of MCO's Environment Protection and Biodiversity Conservation Act (EPBC) approval and the reporting requirements in Conditions 4 and 5 of Mining Leases 1605, 1606 and 1628, which include the requirement to report against compliance with the Mining Operations Plan.

This Annual Environmental Management Report (AEMR) provides a summary of activities, environmental management and performance at MCO from 1st September 2012 to 31st August 2013 (herein referred to as the 'reporting period'). This reporting period was selected to meet Condition 5, Schedule 5 of the Project Approval which requires this AEMR to be submitted within 12 months of the date of approval.

In accordance with Condition 5, Schedule 5 of the Project Approval, copies of this AEMR will be made available to:

- Department of Planning and Infrastructure (DP&I);
- Department of Resources and Energy (DRE);
- Environment Protection Authority (EPA);
- Office of Environment and Heritage (OEH);
- Department of Primary Industries – NSW Office of Water (NOW);
- Mid-Western Regional Council (MWRC); and
- MCO Community Consultative Committee (CCC).

In accordance with condition 4 of the EPBC approval a copy of the report will be supplied to Department of Sustainability, Environment, Water, Population and Communities (SEWPAC).

1.2 APPROVALS, LEASES AND LICENCES

Project approval 05_0117 was granted by DP&I in September 2007 for the operation of Moolarben Coal Mine. This approval covers Stage 1 of the project. Stage 1 includes the construction and operation of three separate open cut mines (OC1, OC2 and OC3), an underground mine (UG4), the coal handling and preparation plant (CHPP) and infrastructure area.

Stage 1 has approval to extract up to 8 million tonnes per annum (Mtpa) of run-of-mine (ROM) coal from the open cut mines and up to 4 Mtpa ROM coal from the underground mine. It can produce up to 10 Mtpa of product coal, which can only be transported from the site by rail. Stage 1 is approved to operate until 20th December 2028.

Since gaining approval for Stage 1, MCO has made eight separate applications under S75W of the EP&A Act to modify the Minister's approval for the project. These are detailed below:

- In August 2008, an application was made to DP&I to make administrative changes and to rearrange specific items of approved infrastructure so as to improve operational efficiency and provide improved conservation outcomes. The application (05_0117 MOD 1) was approved on 26 November 2008;
- In December 2008, an application was made to the DP&I to allow preliminary construction activities to commence prior to completion of required mine access road works. The application (05_0117 MOD 2) was approved on 18 December 2008;
- In February 2009, an application was made to the DP&I to allow Stage 1 to receive and process run-of-mine (ROM) coal from the proposed Stage 2 project; increase throughput of processing, handling and rail loading to 17 Mtpa ROM coal and 13 Mtpa product coals; increase off-site transport of product coal to 13 Mtpa; and extend the approved operating life of Stage 1 infrastructure so that Stages 1 and 2 of the MCP will be fully integrated. The application (05_0117 MOD 3) is currently being assessed by the DP&I;
- In April 2009, an application was made to the DP&I to change the configuration of the rail loop from a figure-8 to a balloon loop layout. The application (05_0117 MOD 4) was approved on 30 June 2009;
- In June 2009, an application was made to the DP&I to relocate the ROM coal facility and develop a water sharing pipeline from the Ulan coal mine. The application (05_0117 MOD 5) was approved on 5 October 2009;
- In December 2009, an application was made to the DP&I to make a minor adjustment to the location of the rejects bin and to increase its throughput. The application (05_0117 MOD 6) was approved on 11 January 2010;
- In March 2010, an application was made to the DP&I to enable the development and operation of a dewatering and water supply borefield. The application also made amendments to the Stage 1 Vegetation Offset Strategy. The application (05_0117 MOD 7) was approved on 3 February 2011; and
- In April 2010 an application was made to the DP&I to allow for a 100,000 tonne ROM stockpile at the approved ROM coal facility. The application (05_0117 MOD 8) was approved on 27 May 2010.

During the reporting period an application was made to DP&I to allow the extension of mining in Open Cuts 1 and 2, to allow the construction and operation of additional water management infrastructure and to make minor changes to the rehabilitation sequencing and final landform. The modification also requests an extension of the Stage 1 approval from 2028 to 2033. The application (05_0117 MOD 9) was still awaiting approval at the end of the reporting period.

During the reporting period a variation was made to MCO's Environmental Protection Licence (EPL12932). This variation allows for an increase in the daily discharge limits at MCO. Other changes include changes to the discharge locations at MCO, to allow sediment dams to "spill and fill" under certain weather conditions and to introduce a Dust Pollution Reduction Program.

During the reporting period the Mining Operations Plan (MOP) was updated to cover the remaining mining in Open Cut 1. This MOP was approved by NSW Trade and Investment (Division of Resources and Energy) on 21 December 2012. The period of the MOP is 1 January 2013 to 31 December 2017. A subsequent modification to the MOP was requested during the reporting period to cover initial mining in Open Cut 2 and to make changes to the rehabilitation sequence in Open Cut 1. This modification was awaiting approval at the end of the reporting period.

In November 2012 an application was made by MCO to DTI to allow for the drilling of one exploration borehole with EL6288 to determine the presence and extent of a known igneous feature near MCO Underground 1. This application was approved in November 2012.

In December 2012 an application was made by MCO to DTI to allow for 7 partially cored exploration boreholes within EL6288. These 7 boreholes were used to determine the structure, coal quality, geotechnical properties and desorpable gas content of the Ulan Seam in Moolarben's Open Cut 2 prospect. This application was approved in December 2012.

During February 2013 a further application was made by MCO to DTI to allow for up to 112 boreholes within the Open Cut 2 area of EL6288. A Review of Environmental Factors accompanied this application. This application was approved in March 2013.

In March 2013 MCO submitted a Surface Disturbance Notice (SDN) to DTI to allow for the drilling of 15 exploration boreholes within EL6288. Approval for this application was received in April 2013.

During June MCO submitted another application to DTI for the drilling of 12 exploration boreholes within EL6288. Approval was received in July 2013.

An application was submitted to DTI in August 2013 for the drilling of 113 boreholes within the Open Cut 2 area of EL6288. Approval was received in August 2013.

Six new water licences were obtained by MCO during the reporting period. These water licences were for exploration in EL6288.

During the reporting period MCO received correspondence on 29 May 2013 from the Dams Safety Committee (DSC) that as MCO's mining operations no longer encroached on a prescribed dam (Moolarben Dam) the conditions of the Moolarben-1 approval have ceased.

Table 1 presents a summary of the approvals, leases and licences currently held by MCO.

Table 1: Leases, Licences and Approvals

Type	Approval	Number	Approval Authority	General Description	Date Granted	Expiry/Renewal Date
Exploration Licences						
EL	Exploration Licence (Mining Act 1992)	6288	NSW Department Resources and Energy	Covers Stage 1 OC and Underground 4 areas	02/12/2009	22/08/2012. Renewal lodged in August 2012. Remains undetermined
EL	Exploration Licence (Mining Act 1992)	7074	NSW Department Resources and Energy	35ha in 2 parcels of land	17/06/2013	12/05/2015
EL	Exploration Licence (Mining Act 1992)	7073	NSW Department Resources and Energy	1,110ha to the south of OC3 adjacent to the southern boundary of EL6288	17/06/2013	12/05/2015
Mining Leases						
ML	Mining Lease (Mining Act 1992)	1605	NSW Department Resources and Energy	Underground 4 and CHPP infrastructure area	20/12/2007	20/12/2028
ML	Mining Lease (Mining Act 1992)	1606	NSW Department Resources and Energy	OC1 and associated infrastructure area	20/12/2007	20/12/2028
ML	Mining Lease (Mining Act 1992)	1628	NSW Department Resources and Energy	260.5ha	24/02/2009	24/02/2030
MOP						

Type	Approval	Number	Approval Authority	General Description	Date Granted	Expiry/Renewal Date
MOP	Moolarben Coal Mines MOP		NSW Department Resources and Energy	Addresses mining within Open Cut 1 and construction activities planned for the site.	Dec-12	Dec-17
Project Approvals						
DC	Project Approval (Section 75J)	05_0117	NSW Department of Planning and Infrastructure	Construction and operation of an open-cut and underground coal mining operation and associated infrastructure. Development of Stage 1 - OC 1-3 and UG 4 and associated infrastructure.	06/09/2007	20/12/2028
DC	Project Approval (Section 75W)	05-0117 (M1)	NSW Department of Planning and Infrastructure	This proposal involves amending the layout of the main infrastructure area and modifying Condition 12 of Schedule 2 and Conditions 42(b) and 56 of Schedule 3 of the project approval.	26/11/2008	20/12/2028
DC	Project Approval (Section 75W)	05-0117 (M2)	NSW Department of Planning and Infrastructure	The application seeks to modify Condition 51(a) of Schedule 3 of the project approval to allow minor preliminary construction activities to commence on site.	18/12/2008	20/12/2028
DC	Project Approval (Section 75W)	05-0117 (M4)	NSW Department of Planning and Infrastructure	Balloon Loop Modification to Stage 1 of the Moolarben Coal Project	30/06/2009	20/12/2028

Type	Approval	Number	Approval Authority	General Description	Date Granted	Expiry/Renewal Date
DC	Project Approval (Section 75W)	05-0117 (M5)	NSW Department of Planning and Infrastructure	Constructing and operating a pipeline to facilitate water sharing with the Ulan Coal Mine; - relocating the run-of-mine coal dump hopper and associated facilities; - increasing construction hours to 24 hours a day; - regularising mining lease boundary fence line clearing and other minor site and administrative adjustments.	05/10/2009	20/12/2028
DC	Project Approval (Section 75W)	05-0117 (M6)	NSW Department of Planning and Infrastructure	Relocating the rejects bin to a preferred location about 250m northwest of its approved location.	11/01/2010	20/12/2028
DC	Project Approval (Section 75W)	05-0117 (M7)	NSW Department of Planning and Infrastructure	Development and operation of a dewatering and water supply borefield and amendments to the Stage 1 Vegetation Offset Strategy.	03/02/2011	20/12/2028
DC	Project Approval (Section 75W)	05-0117 (M8)	NSW Department of Planning and Infrastructure	Establishing a 100,000 tonne ROM coal stockpile adjacent to the ROM coal dump hopper, at the ROM coal facility.	27/05/2010	20/12/2028
EPBC	EPBC Act Approval	2007/ 3297	Department of Sustainability, Environment, Water, Populations and Communities	Establishment of a coal mine and associated infrastructure as per the EPBC Referral dated 16/02/2007	24/10/2007	31/12/2027
Licences						

Type	Approval	Number	Approval Authority	General Description	Date Granted	Expiry/Renewal Date
LIC	Environmental Protection Licence	12932	NSW Environment Protection Authority	Licence authorising the carrying out of coal mining scheduled activity	18/08/2008	Not applicable
LIC	Apparatus Licence	1920464	Australian Communications and Media Authority	This Fixed licence authorises the operation of one point to multipoint station	18/09/2012	17/09/2013
LIC	Apparatus Licence	1920482	Australian Communications and Media Authority	This Land Mobile Licence authorises the operation of 1 land mobile	18/09/2012	17/09/2013
LIC	Apparatus Licence	1914519	Australian Communications and Media Authority	This Land Mobile Licence authorises the operation of 1 land mobile system-GPS	30/06/2013	29/06/2014
LIC	Apparatus Licence	1913125	Australian Communications and Media Authority	This Land Mobile Licence authorises the operation of 1 land mobile	12/09/2012	17/09/2013
LIC	Apparatus Licence	1913126	Australian Communications and Media Authority	This Land Mobile Licence authorises the operation of 1 land mobile	12/09/2012	17/09/2013
LIC	Apparatus Licence	1913127	Australian Communications and Media Authority	This Land Mobile Licence authorises the operation of 1 land mobile	18/09/2012	17/09/2013
LIC	Apparatus Licence	1913128	Australian Communications and Media Authority	This Land Mobile Licence authorises the operation of 1 land mobile	18/09/2012	17/09/2013
LIC	Radiation Licence	RL41761	NSW Environment Protection Authority	Licence for the operation of a radiation device on site	31/01/2013	31/01/2016

Type	Approval	Number	Approval Authority	General Description	Date Granted	Expiry/Renewal Date
LIC	Dangerous Goods Licence	35/ 038029	Workcover NSW	Licence for the storage of Dangerous Goods on site	08/01/2010	08/01/2014
Agreements						
AGR	Voluntary Planning Agreement		Mid-Western Regional Council	Planning Agreement under Section 93F of the Environmental Planning & Assessment Act 1979. Details Development Contributions payable to MWRC.	23/04/2009	Ongoing
AGR	Ancillary Deed		Native Title Party	Agreement between MCO and the Native Title Party to enable mining over Crown Land.	07/07/2008	Upon surrender of all MLs
Dams Safety Committee						
DSC	Mining within the Moolarben Creek Dam Notification Area	10.123.107	NSW Dams Safety Committee	Sets out conditions related to mining within the Moolarben Creek Dam Notification Area	08/04/2009	31/12/2013
Occupancy Licences						
CL	Occupancy Licence (Crown Lands Act 1989)	404558	NSW Department of Lands	Grazing	22/11/2007	Discretion of the Minister
CL	Occupancy Licence (Crown Lands Act 1989)	403442	NSW Department of Lands	Grazing and Groundwater monitoring	24/12/2007	Discretion of the Minister
CL	Occupancy Licence (Crown Lands Act 1989)	409273	NSW Department of Lands	Northern Borefield	04/03/2009	Discretion of the Minister
Water Licences						
WL	Bore Licence Certificate (Water Act 1912)	20BL168749	Department of Primary Industries	Irrigation	08/05/2013	07/05/2018
WL	Bore Licence Certificate (Water Act 1912)	20BL169899	Department of Primary Industries	Monitoring	08/11/2005	Perpetuity

Type	Approval	Number	Approval Authority	General Description	Date Granted	Expiry/Renewal Date
WL	Bore Licence Certificate (Water Act 1912)	20BL171922	Department of Primary Industries	Test Bore	14/07/2008	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL171923	Department of Primary Industries	Monitoring	14/07/2008	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL171924	Department of Primary Industries	Monitoring	14/07/2008	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL171925	Department of Primary Industries	Monitoring	14/07/2008	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL171926	Department of Primary Industries	Monitoring	14/07/2008	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL171927	Department of Primary Industries	Monitoring	14/07/2008	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL171928	Department of Primary Industries	Monitoring	14/07/2008	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL171959	Department of Primary Industries	Monitoring	20/03/2009	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL171960	Department of Primary Industries	Monitoring	20/03/2009	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL171961	Department of Primary Industries	Monitoring	20/03/2009	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL171962	Department of Primary Industries	Monitoring	20/03/2009	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL171963	Department of Primary Industries	Monitoring	20/03/2009	Perpetuity

Type	Approval	Number	Approval Authority	General Description	Date Granted	Expiry/Renewal Date
WL	Bore Licence Certificate (Water Act 1912)	20BL171964	Department of Primary Industries	Monitoring	20/03/2009	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL171965	Department of Primary Industries	Monitoring	20/03/2009	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL171966	Department of Primary Industries	Monitoring	20/03/2009	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL171967	Department of Primary Industries	Monitoring	20/03/2009	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL171968	Department of Primary Industries	Monitoring	20/03/2009	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL171969	Department of Primary Industries	Monitoring	20/03/2009	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL171970	Department of Primary Industries	Monitoring	20/03/2009	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL171971	Department of Primary Industries	Monitoring	20/03/2009	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL171972	Department of Primary Industries	Monitoring	20/03/2009	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL171973	Department of Primary Industries	Monitoring	20/03/2009	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL171974	Department of Primary Industries	Monitoring	20/03/2009	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL171975	Department of Primary Industries	Monitoring	20/03/2009	Perpetuity

Type	Approval	Number	Approval Authority	General Description	Date Granted	Expiry/Renewal Date
WL	Bore Licence Certificate (Water Act 1912)	20BL171976	Department of Primary Industries	Monitoring	20/03/2009	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL171977	Department of Primary Industries	Monitoring	20/03/2009	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL171978	Department of Primary Industries	Monitoring	20/03/2009	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL171979	Department of Primary Industries	Monitoring	20/03/2009	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL171980	Department of Primary Industries	Monitoring	20/03/2009	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL171981	Department of Primary Industries	Monitoring	20/03/2009	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL171982	Department of Primary Industries	Monitoring	20/03/2009	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL171983	Department of Primary Industries	Monitoring	20/03/2009	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL171984	Department of Primary Industries	Monitoring	20/03/2009	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL171985	Department of Primary Industries	Monitoring	20/03/2009	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL171986	Department of Primary Industries	Monitoring	20/03/2009	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL171987	Department of Primary Industries	Monitoring	20/03/2009	Perpetuity

Type	Approval	Number	Approval Authority	General Description	Date Granted	Expiry/Renewal Date
WL	Bore Licence Certificate (Water Act 1912)	20BL171988	Department of Primary Industries	Monitoring	20/03/2009	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL171989	Department of Primary Industries	Monitoring	20/03/2009	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL171990	Department of Primary Industries	Monitoring	20/03/2009	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL171991	Department of Primary Industries	Monitoring	20/03/2009	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL171992	Department of Primary Industries	Monitoring	20/03/2009	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL171993	Department of Primary Industries	Monitoring	20/03/2009	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL171994	Department of Primary Industries	Monitoring	20/03/2009	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL171998	Department of Primary Industries	Mining – 150ML/year extraction	27/01/2009	26/01/2014
WL	Bore Licence Certificate (Water Act 1912)	20BL171999	Department of Primary Industries	Mining – 1,200ML/year extraction	27/11/2009	26/11/2014
WL	Bore Licence Certificate (Water Act 1912)	20BL172000	Department of Primary Industries	Mining – 150ML/year extraction	27/01/2009	26/01/2014
WL	Bore Licence Certificate (Water Act 1912)	20BL172001	Department of Primary Industries	Mining – 450ML/year extraction	20/04/2009	19/04/2014
WL	Bore Licence Certificate (Water Act 1912)	20BL172002	Department of Primary Industries	Mining – 750ML/year extraction	27/11/2009	26/11/2014

Type	Approval	Number	Approval Authority	General Description	Date Granted	Expiry/Renewal Date
WL	Bore Licence Certificate (Water Act 1912)	20BL172003	Department of Primary Industries	OC1 Excavation	06/05/2009	05/05/2014
WL	Bore Licence Certificate (Water Act 1912)	20BL172106	Department of Primary Industries	Monitoring	20/03/2009	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL172167	Department of Primary Industries	Monitoring	20/04/2009	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL172168	Department of Primary Industries	Monitoring	20/04/2009	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL172169	Department of Primary Industries	Monitoring	20/04/2009	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL172189	Department of Primary Industries	Test Bore	05/05/2009	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL172300	Department of Primary Industries	Dewatering (Groundwater) – 150ML/year extraction	16/02/2010	15/02/2015
WL	Bore Licence Certificate (Water Act 1912)	20BL172743	Department of Primary Industries	Monitoring	22/03/2011	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL172744	Department of Primary Industries	Monitoring	22/03/2011	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL172837	Department of Primary Industries	Monitoring	06/06/2011	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL172838	Department of Primary Industries	Monitoring	06/06/2011	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL172839	Department of Primary Industries	Monitoring	06/06/2011	Perpetuity

Type	Approval	Number	Approval Authority	General Description	Date Granted	Expiry/Renewal Date
WL	Bore Licence Certificate (Water Act 1912)	20BL172840	Department of Primary Industries	Monitoring	06/06/2011	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL172842	Department of Primary Industries	Monitoring	06/06/2011	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL172843	Department of Primary Industries	Monitoring	06/06/2011	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL172893	Department of Primary Industries	Monitoring	14/07/2011	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL172894	Department of Primary Industries	Monitoring	14/07/2011	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL172895	Department of Primary Industries	Monitoring	14/07/2011	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL172896	Department of Primary Industries	Monitoring	14/07/2011	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL172897	Department of Primary Industries	Monitoring	14/07/2011	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL172898	Department of Primary Industries	Monitoring	14/07/2011	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL172899	Department of Primary Industries	Monitoring	14/07/2011	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL172900	Department of Primary Industries	Monitoring	14/07/2011	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL172901	Department of Primary Industries	Monitoring	14/07/2011	Perpetuity

Type	Approval	Number	Approval Authority	General Description	Date Granted	Expiry/Renewal Date
WL	Bore Licence Certificate (Water Act 1912)	20BL172953	Department of Primary Industries	Monitoring	15/08/2011	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL172954	Department of Primary Industries	Monitoring	15/08/2011	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL172955	Department of Primary Industries	Monitoring	15/08/2011	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL172956	Department of Primary Industries	Monitoring	15/08/2011	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL173006	Department of Primary Industries	Monitoring	24/10/2011	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL173039	Department of Primary Industries	Monitoring	15/11/2011	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL173041	Department of Primary Industries	Monitoring	15/11/2011	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL173167	Department of Primary Industries	Monitoring	30/04/2012	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL173168	Department of Primary Industries	Monitoring	30/04/2012	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL173169	Department of Primary Industries	Monitoring	30/04/2012	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL173170	Department of Primary Industries	Monitoring	30/04/2012	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL173171	Department of Primary Industries	Monitoring	30/04/2012	Perpetuity

Type	Approval	Number	Approval Authority	General Description	Date Granted	Expiry/Renewal Date
WL	Bore Licence Certificate (Water Act 1912)	20BL173342	Department of Primary Industries	Monitoring	05/10/2012	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL173342	Department of Primary Industries	Monitoring	05/10/2012	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL173342	Department of Primary Industries	Monitoring	05/10/2012	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL173339	Department of Primary Industries	Monitoring	05/10/2012	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL173341	Department of Primary Industries	Monitoring	05/10/2012	Perpetuity
WL	Bore Licence Certificate (Water Act 1912)	20BL173340	Department of Primary Industries	Monitoring	05/10/2012	Perpetuity
Works Licences-Water						
WL	Water Supply Works Approval (Water Management Act 2000)	20WA210797	Department of Primary Industries	Splitters Hollow dam works licence.	01/08/2009	03/09/2022
Development Consents-MWRC						
DC	Development Consent	0363/2009	Mid-Western Regional Council	Utility Installation, Ulan Pipeline-Lot 43 DP 1098748 Crown Land Ulan Rd Ulan NSW	17/07/2009	17/07/2014
DC	Development Consent	0178/2010	Mid-Western Regional Council	Demolition of Dwelling and Associated Outbuildings - Lot 5 Sec 4 DP 759017 - 2-4 John St Ulan	11/01/2010	11/01/2015
DC	Development Consent	0179/2010	Mid-Western Regional Council	Demolition of Weatherboard Dwelling and Outbuilding - Lot 4 Sec 4 DP 759017 - 6-8 John St Ulan	11/01/2010	11/01/2015

Type	Approval	Number	Approval Authority	General Description	Date Granted	Expiry/Renewal Date
DC	Development Consent	0180/ 2010	Mid-Western Regional Council	Demolition of Dwelling and Associated Outbuilding - Lot 3 Sec 1 DP 759017 - 38-40 Main St Ulan	11/01/2010	11/01/2015

1.3 MINE CONTACTS

Table 2: Mine Contacts for Environmental Matters

Area of Responsibility	Name	Contact Number(s)
General Manager	John Blanning	02 6376 1520 0419 792 057
Environment and Community Relations Manager	Luke Bowden	02 6376 1568 0429 223 688
Environment and Community Relations Superintendent	Julie Thomas	02 6376 1511 0427 228 412
Environment and Community Relations Coordinator	Klay Marchant	02 6376 1507 0400 239 291
Environment and Community Relations Coordinator	Trent Cini	02 6376 1436 0408 312 269
Community Relations Coordinator	Scott Fittler	02 6376 1587 0428 083 449
Environmental Contact Line	**1800 556 484**	
Address	Locked Bag 2003, Mudgee, NSW, 2850	

1.4 ACTIONS REQUIRED FROM PREVIOUS AEMR REVIEW

On 11 December 2012 representatives from DRE and EPA visited the site for a meeting regarding the 2011-2012 AEMR and to conduct their annual inspection of MCO's operations. DP&I, NOW and MWRC were invited to attend this meeting, however, were unable to attend due to other commitments. This visit and inspection was positive with neither DRE nor EPA providing formal comments on the 2011-2012 AEMR.

2.0 ACTIVITIES DURING THE REPORTING PERIOD

2.1 EXPLORATION

Between September and November 2012 six partially cored boreholes were drilled in EL6288. The partially cored holes ranged in depth from 12.0m to 96.84m. The core obtained was used for coal quality and washability analysis of the Ulan and Moolarben Seams (where present) and geotechnical testing. All of these boreholes were drilled in pasture land requiring minimal disturbance of vegetation. An operational area of approximately 30m by 30m was cleared at each site. The majority of access was via existing farm tracks, which were upgraded where necessary. Where existing tracks were not present a 3m wide track was slashed to the site. All drill pads have been rehabilitated, and all boreholes have been fully cemented.

Between December 2012 and February 2013, six exploration holes and one fully cored NGERS hole were drilled to determine the structure, coal quality and geotechnical properties of the Ulan Seam (and Moolarben Seam, in selected boreholes) in the Open Cut 4 prospect of EL6288. One fully cored hole was also drilled in the UG1 prospect to investigate an igneous body. The partially cored holes were drilled to depths of up to 100m (terminating up to 20m below the Ulan Seam). The fully cored holes were drilled to 110m-150m (terminating 7m-20m below the Ulan Seam). The majority of these boreholes were drilled in cleared lands with minimal vegetation disturbance required. An operational area of 50m by 50m was cleared for each site. The majority of access was via existing farm tracks, which were upgraded where necessary. Where existing tracks were not present a 3m wide track was slashed to the sites. All drill pads have been rehabilitated, and all boreholes have been fully cemented.

During March 2013 five exploration boreholes were drilled and sampled to determine the structure, coal quality and geotechnical properties of the Ulan Seam in Moolarben's Open Cut 2 prospect. The partially cored HQ holes were drilled to depths of approximately 35 to 55m (up to 10m below the predicted base of the Ulan Seam). An operational area of 50m by 50m was cleared for each site. The majority of access was via existing farm tracks, which were upgraded where necessary. Where existing tracks were not present a 4m wide track was slashed to the sites. All drill pads have been rehabilitated, and all boreholes have been fully cemented.

Two fully cored NGERS boreholes were drilled in the Open Cut 4 prospect in May 2013, with final depths of up to 87m (20m below the Ulan Seam).

Between May and July 2013 fifty four exploration boreholes were drilled within MCO's Open Cut 2 area of EL6288. These were shallow rotary air boreholes along each of the eleven "lox lines" designed to determine the limit of oxidation on the sub cropping Ulan Seam. The rotary air boreholes were drilled using a hammer bit to depths of between approximately 20 to 40m. Lox lines were cleared with a maximum width of 30m and drill sites were set up along the length of the lines. The majority of access was via existing farm tracks, which were upgraded where necessary. Where existing tracks were not present a 4m wide track was slashed to the sites. All drill pads have been rehabilitated, and all boreholes have been fully cemented. At the same time, a further two partially cored boreholes were drilled in the OC2 prospect, with final depths of 40 to 50m. Additionally, two fully cored NGERS boreholes were drilled in the Open Cut 2 prospect in May 2013, with final depths of 58m and 63m (20m below the Ulan Seam).

Between July and August 2013 a further 12 holes were drilled within MCO's Open Cut 4 area of EL6288. Ten of these were partially cored holes and two were "open" ("chip") holes. The partially cored boreholes were drilled and sampled to determine the structure, coal quality and geotechnical properties of the Ulan Seam. The partially cored HQ holes were drilled to depths of approximately 90m (up to 10m below the predicted base of the Ulan Seam).

The majority of the Open Cut 4 drill sites were 50m by 50m with sites located within timbered areas cleared to a maximum of 30m by 30m. The majority of access was via existing farm tracks, which were upgraded where necessary. Where existing tracks were not present a 4m wide track was slashed to the sites. At the end of the reporting period all holes had been logged and fully cemented with rehabilitation underway.

All exploration activities are conducted in consultation with members of MCO's Environment and Community Department. The Ground Disturbance Permit Process (see Section 2.2 for more information) is followed for each exploration program.

2.2 LAND PREPARATION

An additional 44.1ha of land was disturbed this reporting period for Open Cut mining operations. 31.5ha of disturbed land was rehabilitated during the reporting period. The areas disturbed this reporting period are shown in **Figure 1**.

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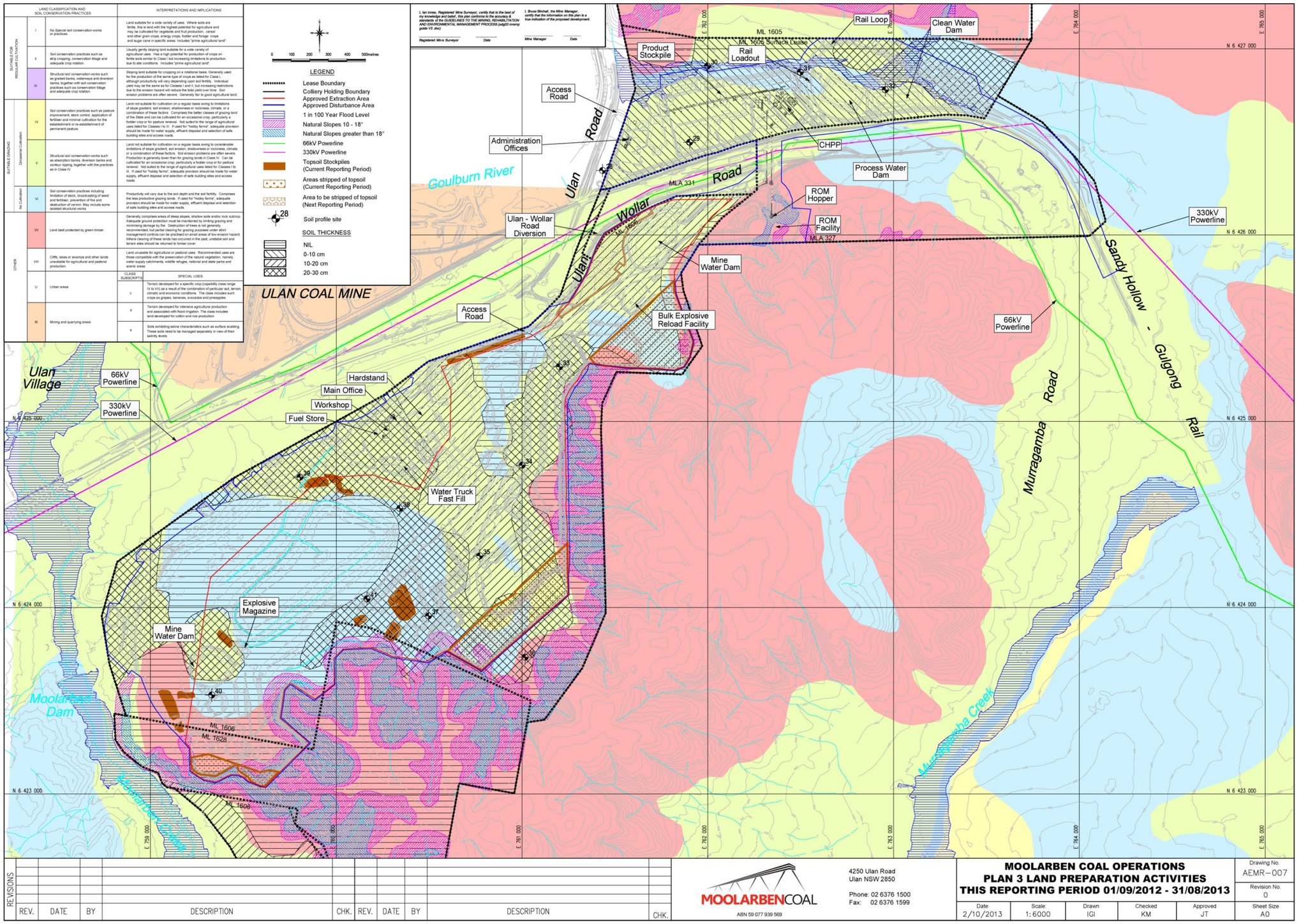


Figure 1: Land Preparation Activities This Reporting Period

2.2.1 Ground Disturbance Permit

Before any land is disturbed at MCO a Ground Disturbance Permit (GDP) needs to be authorised by a member of the Environment and Community Department. A plan of the area to be disturbed along with supporting documentation is provided to the Environment and Community Department and identifies the following:

- location of the disturbance works;
- land ownership;
- approval boundaries;
- location of proposed erosion and sediment control structures;
- management of topsoil;
- management of cleared vegetation;
- management of salvageable hollow bearing trees;
- location of known Aboriginal and/or European heritage sites; and
- information on members of the public that may need additional consideration (e.g. private landowner for exploration works).

The proposed disturbance area is pegged and clearly marked prior to any work commencing. If required, an inspection of the site is undertaken by a member of the Environment and Community Department to identify any additional environmental issues that may need further management. Where required, a qualified ecologist will conduct a pre-clearance flora and fauna survey of the area to identify threatened flora and fauna species, and potential habitat features that may need additional management. Where required, due diligence works will be undertaken to manage Aboriginal heritage matters.

2.2.2 Vegetation Clearing

All potential habitat trees are clearly marked during the pre-clearance flora and fauna survey. The first step in the clearing process is to remove the trees that haven't been marked as potential habitat trees. The potential habitat trees are left standing in open ground for at least 24 hours to encourage native fauna to relocate from the trees. Habitat trees are then gently felled under the supervision of a member of the Environment and Community Department. The trees are inspected to identify if any fauna are present in the trees and to identify if there are any salvageable hollows for reuse in rehabilitation programs. If injured fauna are identified they are captured and given to a wildlife rehabilitation expert or to the local vet for treatment.

After a habitat tree has been felled it is left in place for at least 24 hours to allow fauna still in the tree time to relocate. If fauna hasn't relocated after this time assistance may be required to help them relocate. Habitat trees with salvageable hollows are relocated to final rehabilitation areas or stockpiled for future use in rehabilitation programs.

MCO utilise two methods for the management of trees that don't have salvageable hollows. Trees are either snipped into short lengths for placement on rehabilitation or mulched and mixed in with topsoil for use on rehabilitation areas.

2.2.3 Topsoil Management

The extent of the topsoil boundary was identified during the Environmental Assessment process for MCO's operations. This boundary is used when identifying the extent of salvageable topsoil during clearing processes. Topsoil is salvaged during the clearing process,

along with the mulch that is generated during the vegetation clearing process, and is used directly on rehabilitation areas or stockpiled for future use.

2.3 CONSTRUCTION

No specific construction works were undertaken during the reporting period.

2.4 MINING

All mining activities this reporting period have occurred in Open Cut 1 with operations occurring 24 hours a day, seven days a week. The status of the mining activities at the end of the reporting period is shown in **Figure 2**.

Mining operations at MCO are undertaken in accordance with the Mining Operations Plan and the relevant planning approvals. The stratigraphy of the coal seam mined at MCO is shown in **Plate 1**. Mining at MCO occurs in the Ulan Seam.

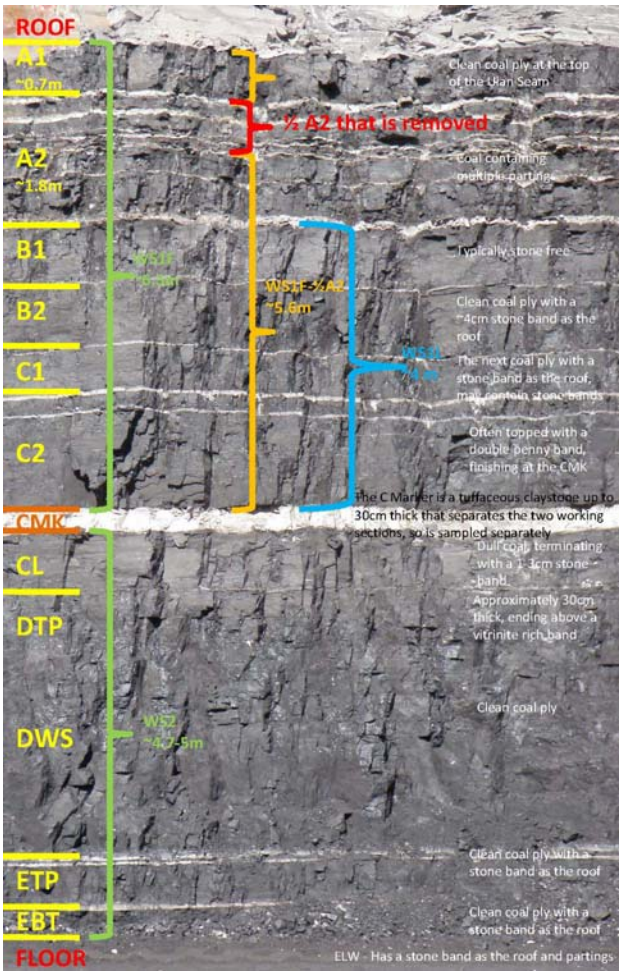


Plate 1: Coal Stratigraphy

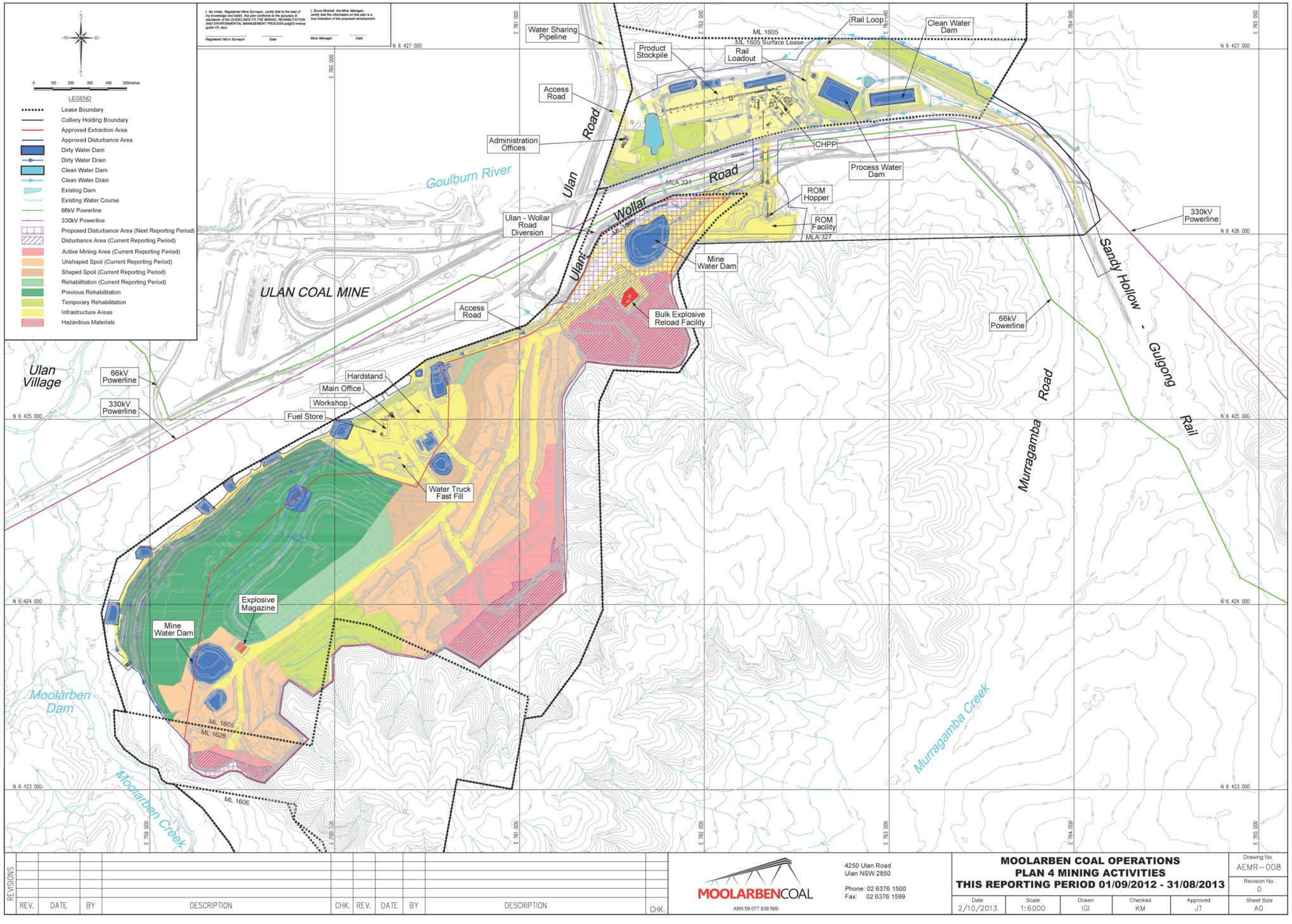


Figure 2: Mining Activities This Reporting Period

Mining is carried out by excavators and haul trucks supported by ancillary equipment including water carts, dozers, graders, fuel and service carts, loaders and drills. The mining equipment used at MCO includes:

- 3 x 996 excavators;
- 1 x 9350 excavator;
- 1 x PC450 support excavator;
- 1 x 6050 shovel;
- 1 x 1200 front end loader;
- 2 x drills;
- 5 x 475 dozers;
- 3 x 375 dozers;
- 2 x D11 dozers;
- 1 x WA900 dozer;
- 2 x 825 graders;
- 1 x 24M grader;
- 3 x 785 water trucks;
- 17 x 830E rear dump trucks; and
- 3 x WA200 (wheel loaders).

Rejects generated from the processing of coal at the CHPP are transported back to the open cut operations for final disposal. Rejects are placed in selective areas of the open cut and are managed so that there will be at least a 5m cover over the rejects in the final landform.

2.5 EMPLOYMENT

During the reporting period the number of employees working at MCO slightly increased.

Table 3: Employment Statistics

Month	Employees
September 2012	257
October 2012	260
November 2012	258
December 2012	257
January 2013	255
February 2013	256
March 2013	258
April 2013	266
May 2013	267
June 2013	273
July 2013	275
August 2013	275

2.6 COAL TRANSPORT

5,839,352 tonnes of coal were transported by rail during the reporting period. The amount of coal transported from the site and timing of train movements was conducted in accordance with the conditions of approval from DP&I.

2.7 WASTE MANAGEMENT

During the reporting period MCO continued to maintain a Total Integrated Waste Management Service to manage all waste streams generated on site. This includes general waste, cardboard and paper recycling, co-mingled recycling, waste oil, and steel. The volumes of total waste and recycled material removed from site are shown in **Table 4** and **Figure 3**. The Waste Management Plan sets a recycling target of 70% for MCO. During the reporting period 82.52% of all waste removed from site was recycled. This is an improvement from last reporting period and is reflective of the work MCO are doing in consultation with the waste management contractor to identify opportunities to improve the recycling rates at MCO.

Table 4: Waste Removal Volumes

Month	Total Waste Removed (kg)	Waste Recycled (kg)	Percentage Waste Recycled
Sep-12	68,092	48,782	71.64%
Oct-12	93,922	70,276	74.82%
Nov-12	68,232	53,296	78.11%
Dec-12	86,078	64,244	74.63%
Jan-13	177,895	146,257	82.22%
Feb-13	82,498	70,366	85.29%
Mar-13	98,904	73,966	74.79%
Apr-13	75,652	58,079	76.77%
May-13	107,953	88,697	82.16%
Jun-13	95,752	83,820	87.54%
Jul-13	139,117	130,466	93.78%
Aug-13	129,594	121,485	93.74%
Yearly Total	**1,223,689**	**1,009,734**	**82.52%**

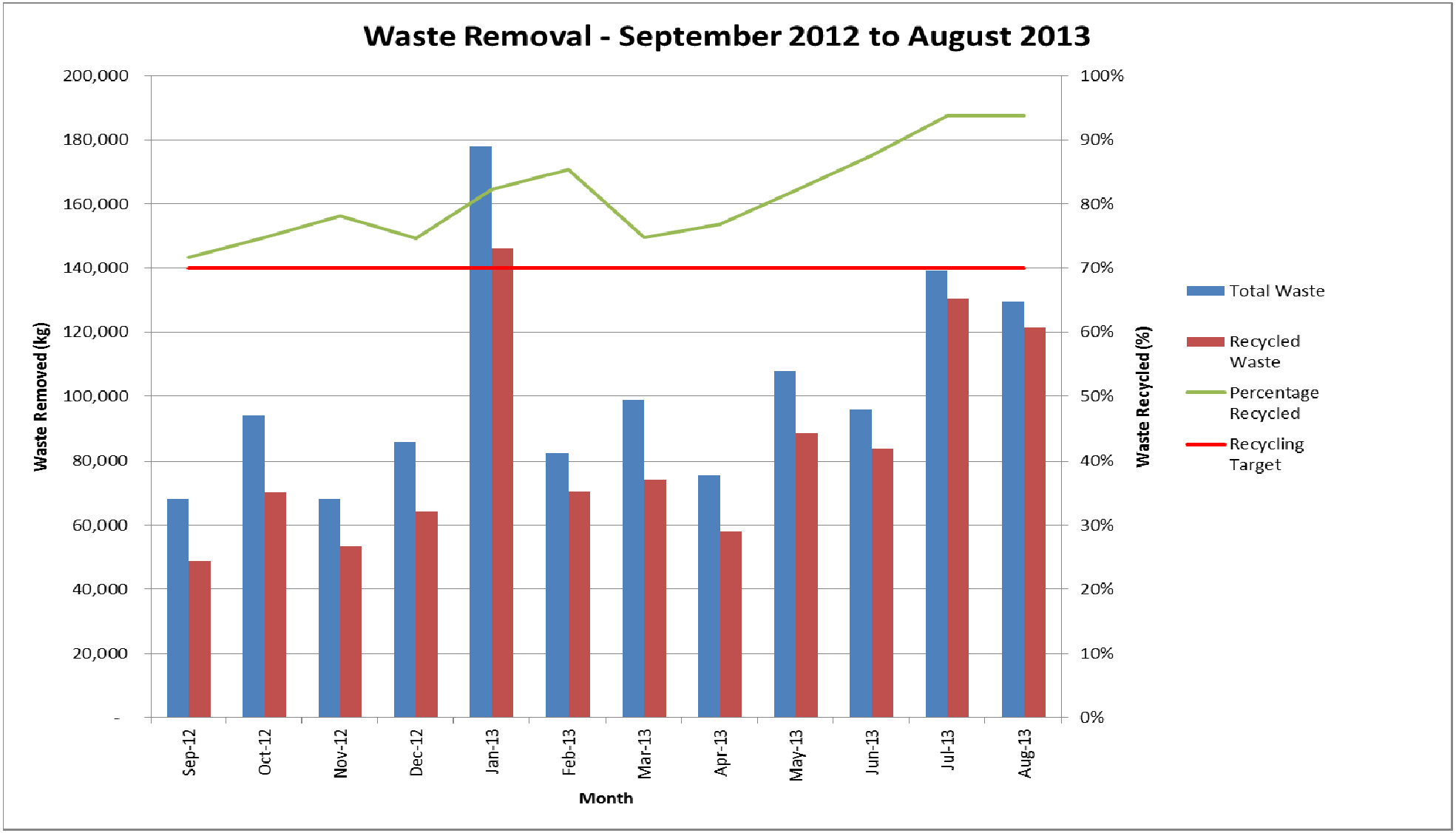


Figure 3: Waste Removed from Site

2.8 HAZARDOUS MATERIALS MANAGEMENT

MCO have a Dangerous Goods licence from Workcover NSW to store fuels and chemicals on site.

In addition to the licence, MCO have a Hazardous Substances Management Procedure that outlines the requirements for bringing hazardous and dangerous goods onto site, how to store hazardous and dangerous goods and how to dispose of the hazardous and dangerous goods. Before any hazardous and dangerous goods are brought onto site they need to be approved by the Health and Safety Manager.

2.9 WATER MANAGEMENT

Water management activities this reporting period related to managing clean and dirty water around the operations and securing water sources for future mining operations.

During the reporting period MCO received a variation to MCO's Environmental Protection Licence (EPL12932), which increases the daily discharge to 10ML/day and changes to the locations of the discharge points. This variation also included changes to the discharge locations, and the allowance of sediment dams to 'fill and spill' under certain weather conditions.

MCO have continued to progress upgrading water infrastructure around the site. These upgrades require a modification to the Project Approval and have been included as part of Modification 9. The application (05_0117 MOD 9) was still being assessed at the end of the reporting period.

2.9.1 Site Water Balance

The site water balance for the reporting period can be seen in **Table 5** and shows that there was an additional 180.3ML of water stored on site at the end of the reporting period. Due to the lower than average rainfall, higher reliance on water from Ulan Coal Mines Limited was required; however no groundwater extraction was necessary.

The priority for water usage at MCO is:

1. Surface Water Runoff;
2. Groundwater Inflow;
3. Water from Ulan Coal; and
4. Groundwater Extraction.

Table 5: Site Water Balance

Water Sources (ML)	
Ulan Coal East Pit	613.3
Northern Borefield	0.0
Southern Borefield	0.0
Rainfall/runoff	411
Open Cut Seepage	0.0
Potable Supply	5.6
ROM feed	527.1
Total	**2,273.6**
Water Loss (ML)	
Evaporation	159.4
Seepage	0.0
Construction & dust suppression	639.1
Discharges	0.0
Tailings/Coarse Reject	423.4
Product	153.9
Effluent	0.8
Total	**1,376.7**
Water Balance	**180.3**
Water Usage (ML)	
CHPP	577.3
Construction & dust suppression	639.1
Underground	0.0
Total	**1,216.4**

Note: Some of these figures are estimates only.

The actual volumes extracted from MCO's groundwater sources against licence allocation can be seen in **Table 6**.

Table 6: Groundwater Extraction

Licence Number	Site	Volume Extracted (ML)	Licence Allocation (ML)
20BL172001	TB179	0.00	150
20BL172000	TB052a	0.00	150
20BL172300	TB190	0.00	150
20BL172002	Northern Borefield	0.00	750
20BL171999	Northern Borefield	0.00	1,200
20BL169455	IB002	0.00	11
20BL172001	Northern Borefield	0.00	450
20BL172003	Open Cut 1	0.00	0
20BL168749	IB001	0.00	30

2.10 PRODUCTION AND WASTE SUMMARY

The amount of production and associated waste generated by MCO is detailed in **Table 7**.

Table 7: Production and Waste Summary

	CUMULATIVE PRODUCTION		
	Start of this Reporting Period	At end of this Reporting Period	Estimate, end of next Reporting Period
Topsoil Stripped (m^3)	447,412	557,662	766,192
Topsoil used/spread (m^3)	196,482	275,232	327,025
Topsoil stockpiled (m^3)	250,930	198,000	479,700
Waste Rock (BCM)	36,724,632	53,934,264	76,251,107
Open Cut ROM Coal (t)	16,927,061	24,793,925	32,580,218
Underground ROM Coal (t)	0	0	0
Total Coal (t)	16,927,061	24,793,925	32,580,218
Processing Waste (t)	5,075,122	7,113,642	9,729,706
Open Cut Product Coal (t)	11,851,939	17,680,283	22,850,512
Underground Product Coal (t)	0	0	0
Total Product Coal (t)	11,851,939	17,680,283	22,850,512

3.0 ENVIRONMENTAL MONITORING AND PERFORMANCE

3.1 ENVIRONMENTAL MANAGEMENT

Work continued during the reporting period on developing, implementing and improving MCO's Environmental Management System (EMS). This included the development and update of environmental management plans to address impacts from mining in Open Cut and Open Cut 3. In addition procedures, forms and training packages were updated during the reporting period.

In order to measure compliance with the management plans, the project approval and various licences, MCO undertake a comprehensive monitoring program in the vicinity of the MCO mining areas. The locations of the sites monitored during the reporting period are shown on **Figure 4** to **Figure 5**. More details on the individual monitoring programs are provided below.

3.2 METEOROLOGICAL

During the reporting period MCO has two meteorological monitoring stations. One is located at the mine site's administration office (referred to as WS01) and the other station is located on a property on Ulan Road and is referred to as WS03. WS03 is linked into the real-time monitoring system and is the main weather station for reporting purposes with WS01 used to supplement weather data as required.

Data capture for WS03 was 98.9% for the reporting period. Missing data was as a result of system function errors.

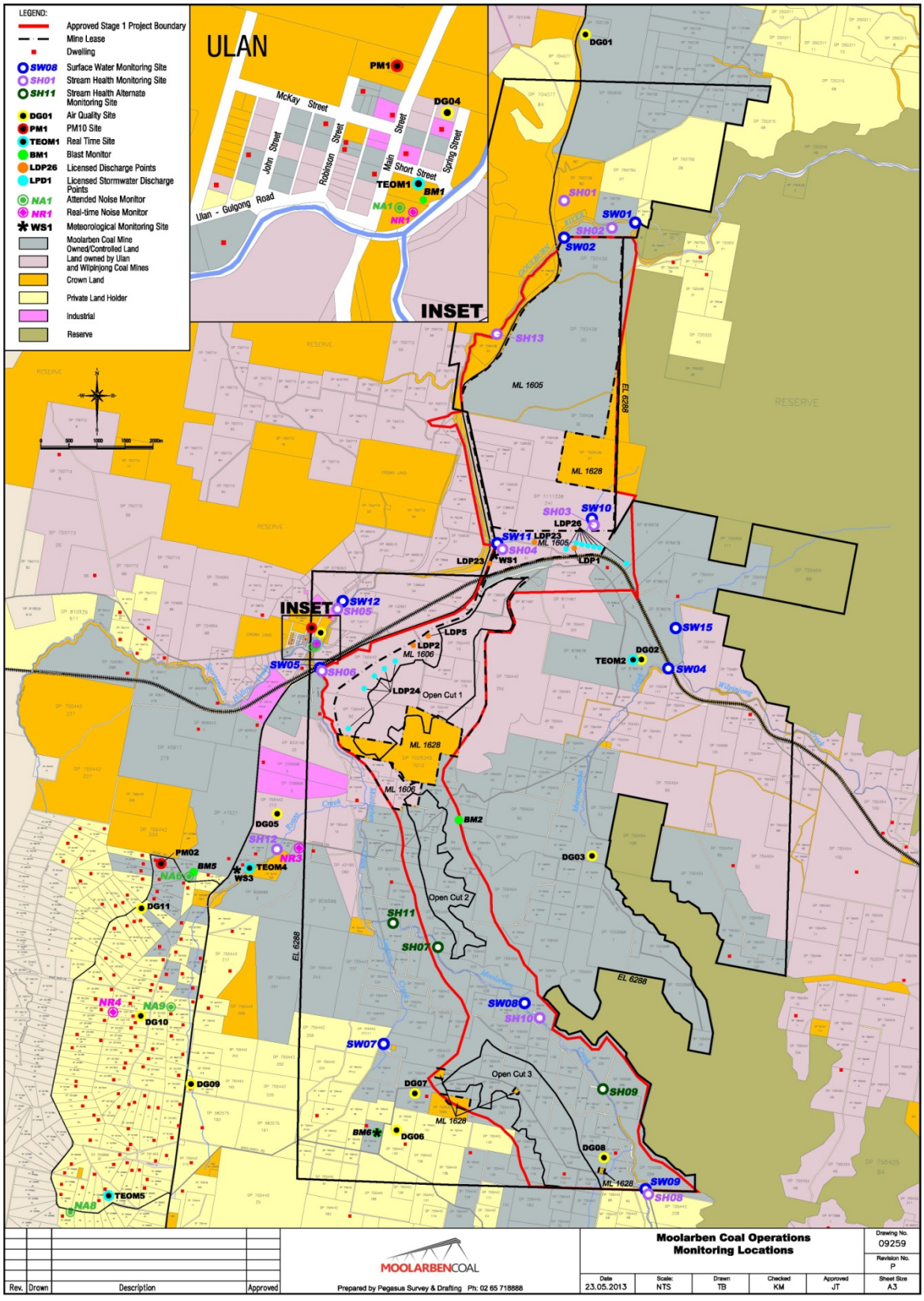


Figure 4: Environmental Monitoring Locations (excl. Groundwater)

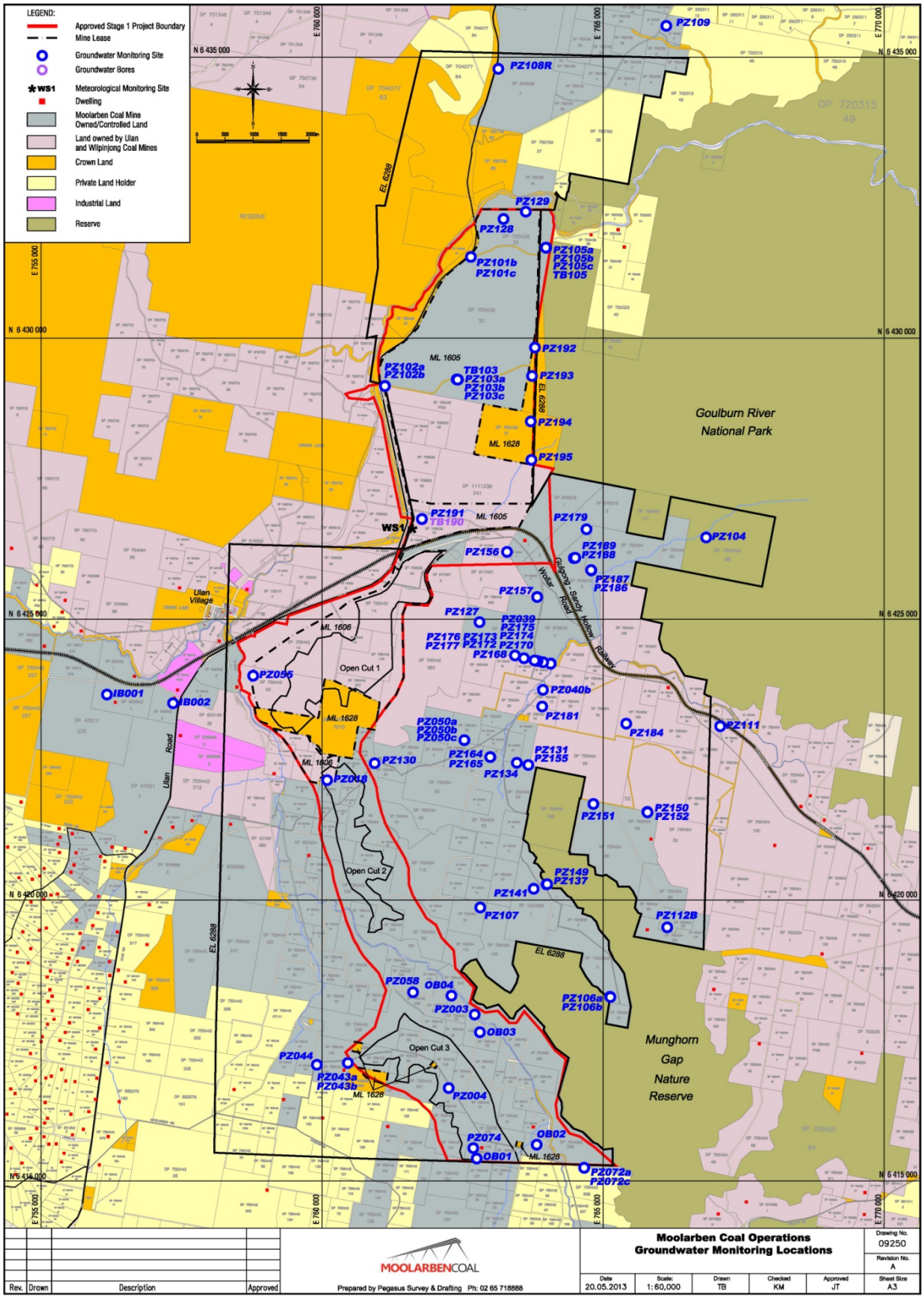


Figure 5: Groundwater Monitoring Locations

3.2.1 Rainfall

Table 8 summarises the rainfall over the reporting period at weather station WS03 and compares the data to the long term median rainfall from Gulgong Post Office while **Figure 6** presents the data graphically.

Rainfall recorded at WS03 during the reporting period was 628.0mm This is well below the rainfall received during the previous reporting period (881.4mm) and is slightly below long-term average rainfall recorded at the Gulgong Post Office which is reported to be 653.9mm (Bureau of Meteorology website). **Figure 6** shows that the monthly rainfall between September 2012 and December 2012 and in April 2013, May 2013, July 2013 and August 2013 was lower than the monthly average. However, between January 2013 and March 2013 and in June 2013 rainfall was above the monthly average.

Table 8: Rainfall Data

Month	WS03 Rainfall (mm)	Long Term Average Rainfall* (mm)
September 2012	39.2	46.8
October 2012	9.2	56.6
November 2012	42.2	60.0
December 2012	55.0	67.4
January 2013	131.6	70.2
February 2013	110.4	62.5
March 2013	81.2	54.8
April 2013	4.2	44.2
May 2013	23.8	45.4
June 2013	98.4	50.5
July 2013	23.8	49.3
August 2013	9.0	46.5
Total	**628.0**	**653.9**

*Long Term Average Data from Bureau of Meteorology, for Gulgong Post Office.

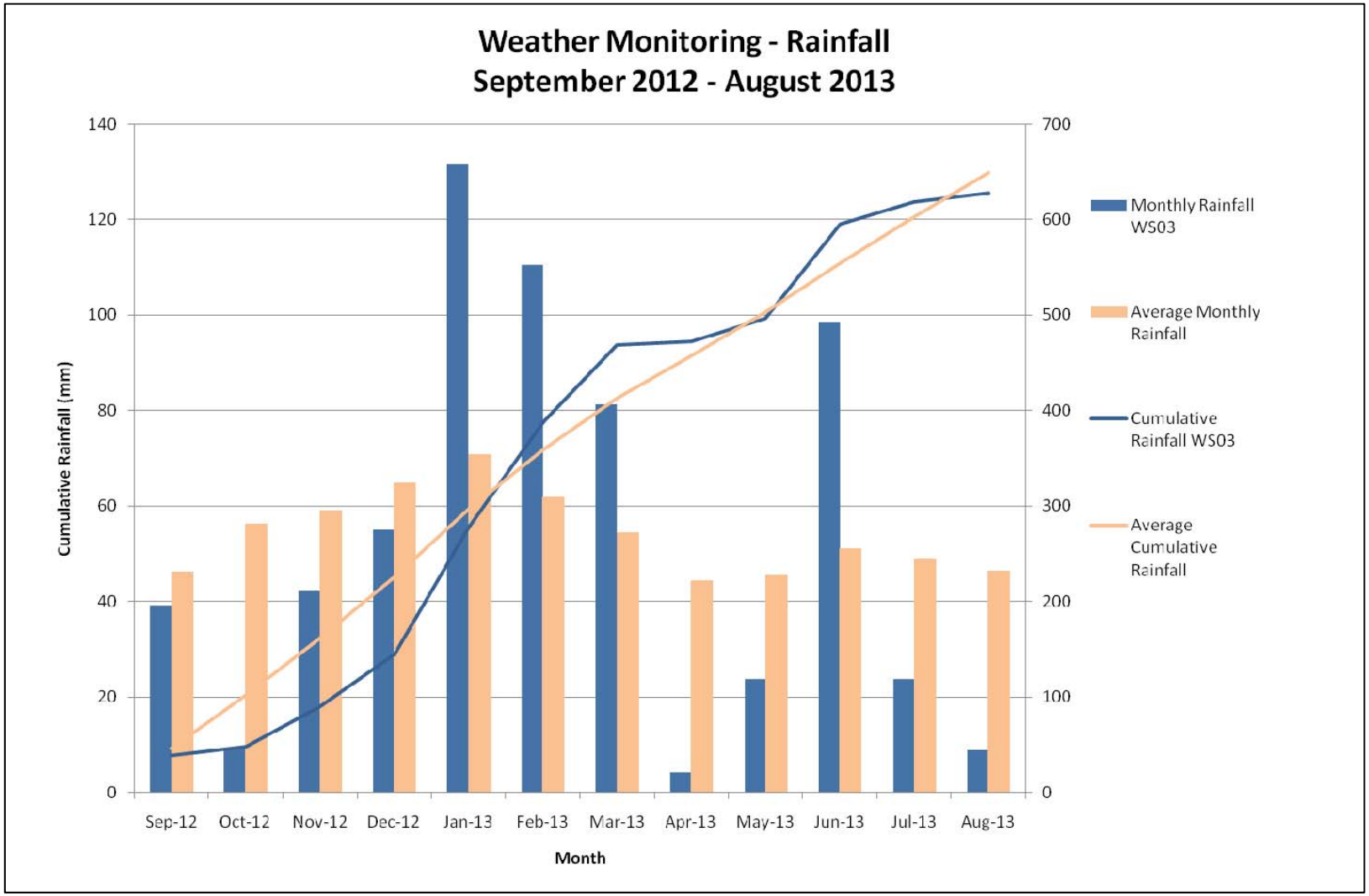


Figure 6: Rainfall Data

3.2.2 Temperature

Temperatures recorded during the reporting period are presented in **Table 9** and in **Figure 7**. During the reporting period, the coldest temperature recorded was -3.7°C in July 2013 and the hottest temperature recorded was 41.8°C in January 2013.

Table 9: Temperature Data

Month	Min. Temperature °C Woodhead (WS03)	Max. Temperature °C Woodhead (WS03)
September 2012	-3.1	27.9
October 2012	-0.2	31.3
November 2012	4.2	38.5
December 2012	4.2	38.7
January 2013	12.3	41.8
February 2013	8.0	33.7
March 2013	5.8	31.1
April 2013	0.9	29.8
May 2013	-2.4	27.1
June 2013	-1.9	18.6
July 2013	-3.7	20.0
August 2013	-3.0	24.0

3.2.3 Wind Speed and Direction

The monthly wind roses for WS03 for the reporting period are presented in **Appendix 1**. Prevailing wind conditions for the reporting period were generally variable but were dominated by south-west winds during the winter months and north-east and east during the summer months. Summer winds tended to reach a maximum speed of 7.1m/s. Winds during winter generally reached speeds of 6.0m/s. These results are generally consistent with previous reporting periods.

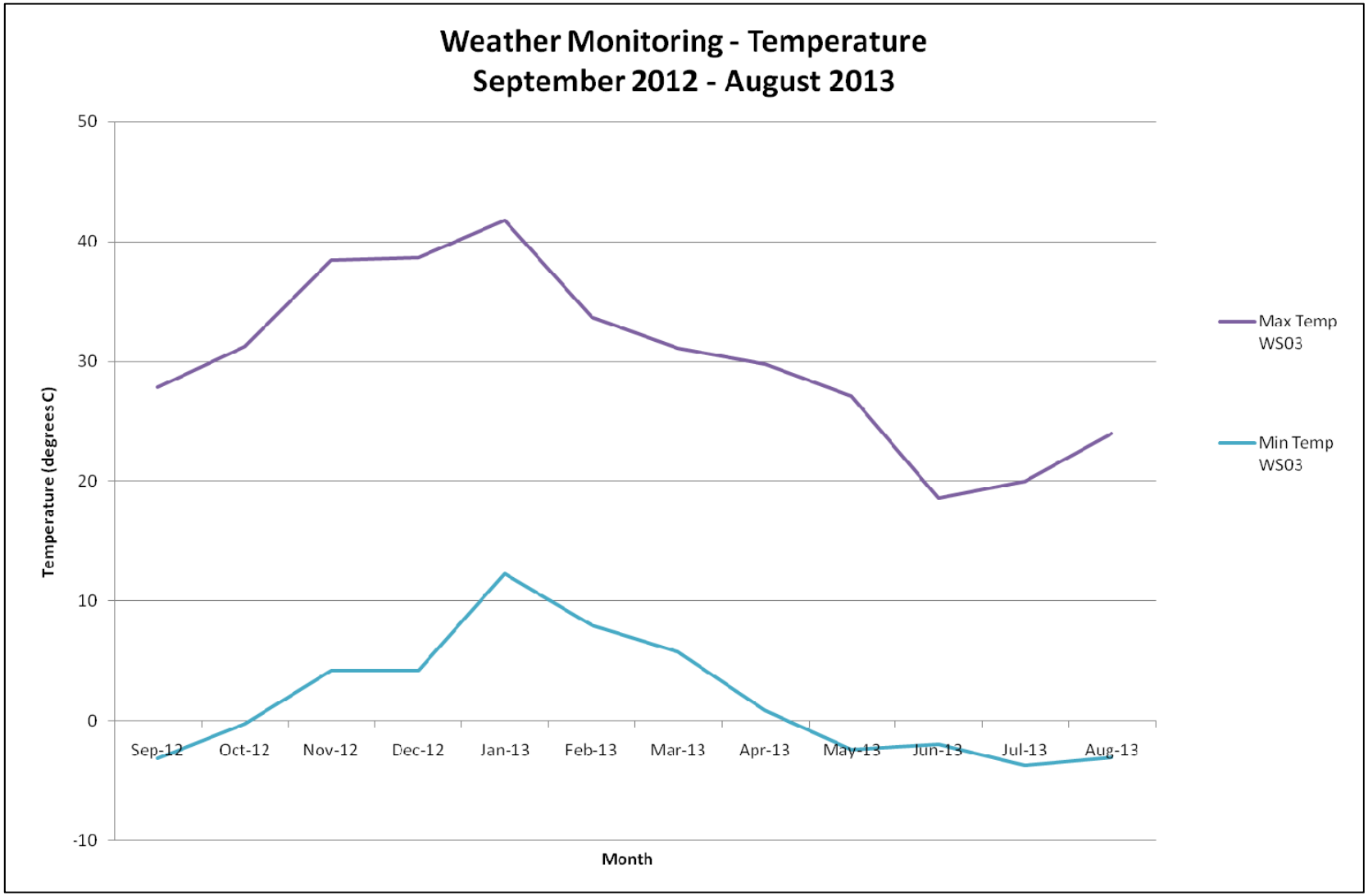


Figure 7: Temperature Data

3.3 AIR QUALITY

3.3.1 Activities This Reporting Period

Operational processes for MCO to reduce dust emissions include:

- Understanding the geology of the mining area;
- Disturb only the minimum area necessary for mining. Only one strip ahead of the active mining operations will be disturbed;
- Adoption of progressive rehabilitation of mining operations, to minimise exposed soils;
- Ensure coal handling facilities employ appropriate dust suppression methods;
- Use water carts on all trafficked areas to minimise dust generation as necessary and practicable;
- Use of chemical dust suppressants if necessary;
- Use of constructed roads only, minimisation of access roads and removal of obsolete access roads;
- Keeping disturbed active mining areas to a minimum as far as practicable;
- Maintain coal-handling areas and stockpiles in a moist condition using water carts and/or water sprays;
- Relocate, modify and/or stop mining operations in adverse meteorological conditions to minimise the short term air quality impacts;
- Dust suppression systems will be fitted to stationary and mobile plant (such as the dump hopper, transfer stations, drill rigs) to reduce dust levels and to minimise fugitive dust;
- Use of 240t haul trucks rather than 170t on the internal haul road in Open Cut 1 to reduce vehicle traffic;
- Access tracks used by topsoil stripping equipment during their loading and unloading cycle will be watered;
- Long term topsoil stockpiles, not used for over 6 months will be revegetated;
- Dust aprons will be lowered during drilling;
- All drills will be equipped with water injection systems;
- Partial enclosure of raw coal transfer and rejects conveyors where possible;
- Water injection will be used when high levels of dust are being generated by drilling activities; and
- All blasting will be undertaken in accordance with the Blast Management Plan with consideration given to prevailing wind conditions and residential receivers.

A review of the AQMP was undertaken during the reporting period to assist with management of air quality related impacts associated with mining operations in Open Cut 1, Open Cut 2, Open Cut 3, operation of the CHPP Infrastructure and the Northern Borefield. The AQMP was reviewed in consultation with EPA and was awaiting approval from DP&I at the end of the reporting period. The key updates to the AQMP included:

- Revision of the air quality monitoring network to include two additional depositional dust gauges and one Real Time PM10 TEOM. The additional monitoring locations are representative of non-mine owned residences south west of OC1 and OC2 and west of OC3;
- Inclusion of the Best Practice Pollution Reduction Program; and
- Revision of the Real Time Response Triggers to include mining operations outside of Open Cut 1.

Air quality monitoring continued to be undertaken throughout the reporting period.

The AQMP includes a process for the review of data on a monthly basis against relevant criteria. This review process continued throughout the reporting period. The AQMP outlines response triggers for the real-time PM_{10} monitoring stations. When the trigger has been reached a SMS alarm is sent to operational personnel and members of the Environment and Community Department. The real-time response triggers that have been established and the management/control actions are shown in **Table 10**. These triggers were reviewed and validated during the reporting period with no changes being made.

Table 10: Air Quality Real-Time Response Triggers

No	Trigger	Management/Control Actions	Responsibility
1	Winds from NE-SE and 24 hour average >38µg/m^3 at monitoring locations to the NW-SW of the operations	• Review weather data and trends • Review weather predictions • Review current dust generating activities • Review current dust control • Ensure standard mitigation measures are in place • Monitor changes in PM10	Area Supervisor (assistance can be sought from the environmental department)
2	Winds from NE-SE and 24 hour average >45µg/m^3 at monitoring locations to the NW-SW of the operations	• Actions as per Trigger 1. • Make operational changes as appropriate. For example: dumping in protected locations, shutting down equipment	Area Supervisor (assistance can be sought from the environmental department)
3	Winds from NE-SE and two consecutive 15 minute periods >50µg/m^3 at monitoring locations to the NW-SW of the operations	• Actions as per Trigger 1. • Make operational changes as appropriate. For example: dumping in protected locations, shutting down equipment	Area Supervisor (assistance can be sought from the environmental department)

During the reporting period MCO developed a monitoring program in response to the requirements of the EPA enforced Pollution Reduction Programs (PRP) for particulate matter. The PRP's require NSW coal mines to implement monitoring to demonstrate compliance with an 80% level of haul road dust control, to monitor adverse weather conditions causing excessive dust during hauling and handling of overburden, and to investigate means to reduce emissions during overburden handling.

During the previous reporting period MCO completed an initial PRP which required NSW Mines to report on the practicability of implementing best practice measures to reduce particle emissions from their operations. MCO completed a report; Moolarben Coal Particulate Matter Control Best Practice Pollution Reduction Program (PAEHolmes, 2012). The report concluded "..... there is only any potential value in introducing additional best practice control measures to the following activities:

- haulage; and
- materials transfer of coal"

and that additional measures on any other activities would have no measureable benefit.

The report also indicated that best practice controls are already being applied to coal transfer and that a water surplus at MCO allows for greater than average rates of water suppression commensurate with best practice.

The current PRP effectively follows on from this initial PRP to confirm effective implementation of best practice measures for hauling and handling of overburden through a monitoring program to demonstrate the effectiveness of these controls. The monitoring program in this report focuses on monitoring the effectiveness of control measures for;

- wheel-generated dust; and
- disturbing and handling overburden in adverse weather conditions.

The PRP requires a trial of the effectiveness of a variety of measures to minimise dust from activities on overburden.

3.3.2 Air Quality Monitoring

The air quality criteria for MCO are shown in **Table 11**.

Table 11: Air Quality Criteria

Pollutant	Averaging Period	Criteria
Total Suspended Particulate	Annual	90µg/m^3
Particulate Matter (<10µg/m^3)	Daily	50µg/m^3
Particulate Matter (<10µg/m^3)	Annual	30µg/m^3
Deposited Dust – maximum total	Annual	4g/m^2/month
Deposited Dust – incremental increase	Annual	2g/m^2/month above background average

3.3.2.1 Total Suspended Particulates (TSP)

Total suspended particulates (TSP) are the component of the dust that is less than 50µg and is broken down into the following particle size range:

- $PM_{2.5}$ – 5% of TSP;
- $PM_{2.5-10}$ – 35% of TSP; and
- PM_{10-50} – 60% of TSP.

TSP isn't directly measured at MCO but based on the above breakdown a calculation can be made from the PM_{10} monitoring results to show that MCO is complying with the TSP criteria. The calculated TSP results can be seen in **Table 12**. These calculations show that MCO were below the TSP criteria at the monitoring locations.

Table 12: Calculated Total Suspended Solids Results

Site	Average PM_{10} Result (µg/m^3)	Calculated Average TSP Result (µg/m^3)
TEOM01 (Ulan School)	12.4µg/m^3	31.0µg/m^3
TEOM02 (Murragamba)	11.8µg/m^3	29.5µg/m^3
TEOM03 (Toole Road)	10.5µg/m^3	26.3µg/m^3
PM01 (Ulan Village)	11.7µg/m^3	29.3µg/m^3
PM02 (Ridge Road)	10.2µg/m^3	25.6µg/m^3

3.3.2.2 Particulate Matter <10µg (PM_{10})

The location of the PM_{10} monitoring stations are presented on **Figure 4**. There are two types of PM_{10} monitoring undertaken at MCO. Continuous real-time monitoring is undertaken at three locations using Tapered Element Oscillating Membrane (TEOM) units. Two permanent locations are at a property at Murragamba and at Ulan School. During the entire reporting period a mobile unit was located at a property on Ulan Road. Two HVAS units are sampled every six (6) days. Both of these units are fixed units with one located in Ulan Village and the

other one located on Ridge Road. All monitoring is conducted in accordance with EPA guidelines and relevant Australian Standards.

Figure 8, **Figure 9** and **Figure 10** summarise the real-time PM_{10} results for the reporting period including the rolling average compared to the criteria. **Figure 11** summarises the HVAS PM_{10} results for the reporting period including a comparison of the rolling average against the criteria. The full data set for the real-time PM_{10} and HVAS PM_{10} is shown in **Appendix 2**.

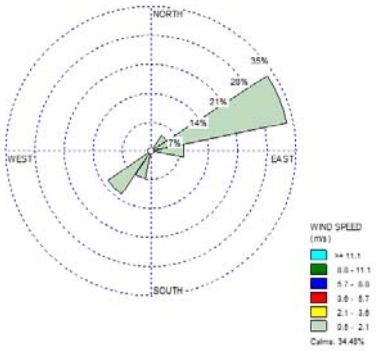
The average PM10 monitoring results remained below the Project Approval criteria of 30µg/m^3 at all sites during the reporting period. The average at the end of the reporting period and the maximum rolling average throughout the reporting period are shown in **Table 13**. Data capture rates for the reporting period are also included in **Table 13**. Data was lost at TEOM04 due to an air conditioner malfunction and power outage. Data was lost at PM01 and PM02 on 16 and 22 December 2012 due to a field collection error whereby a filter wasn't replaced, thus contaminating both sets of data.

Table 13: PM_{10} Averages and Data Capture Rate

Location	Reporting Period Final Average	Reporting Period Maximum Average	Data Capture Rate
TEOM01 (Ulan School)	12.4µg/m^3	12.4µg/m^3	100%
TEOM02 (Murragamba)	11.8µg/m^3	11.8µg/m^3	100%
TEOM03 (Ulan Road)	10.5µg/m^3	10.5µg/m^3	96%
PM01 (Ulan Village)	11.7µg/m^3	12.8µg/m^3	97%
PM02 (Ridge Road)	10.2µg/m^3	10.5µg/m^3	97%

There was one result recorded above the 24 hour average goal of 50µg/m^3 that required further analysis. Details of this analysis are shown in **Table 14**.

Table 14: Explanation of TEOM Results Above the Daily Criteria

Site	Date	Result (µg/m^3)	Wind Rose	Comment
TEOM2 – Murragamba Valley	30 Apr 2013	59.7		A general smoke haze was present in the area on that day. Predominate wind direction was blowing from the TEOM02 unit towards MCO, downwind unit results 29.5µg/m^3 at Ulan School and 36.7µg/m^3 at Ulan Road

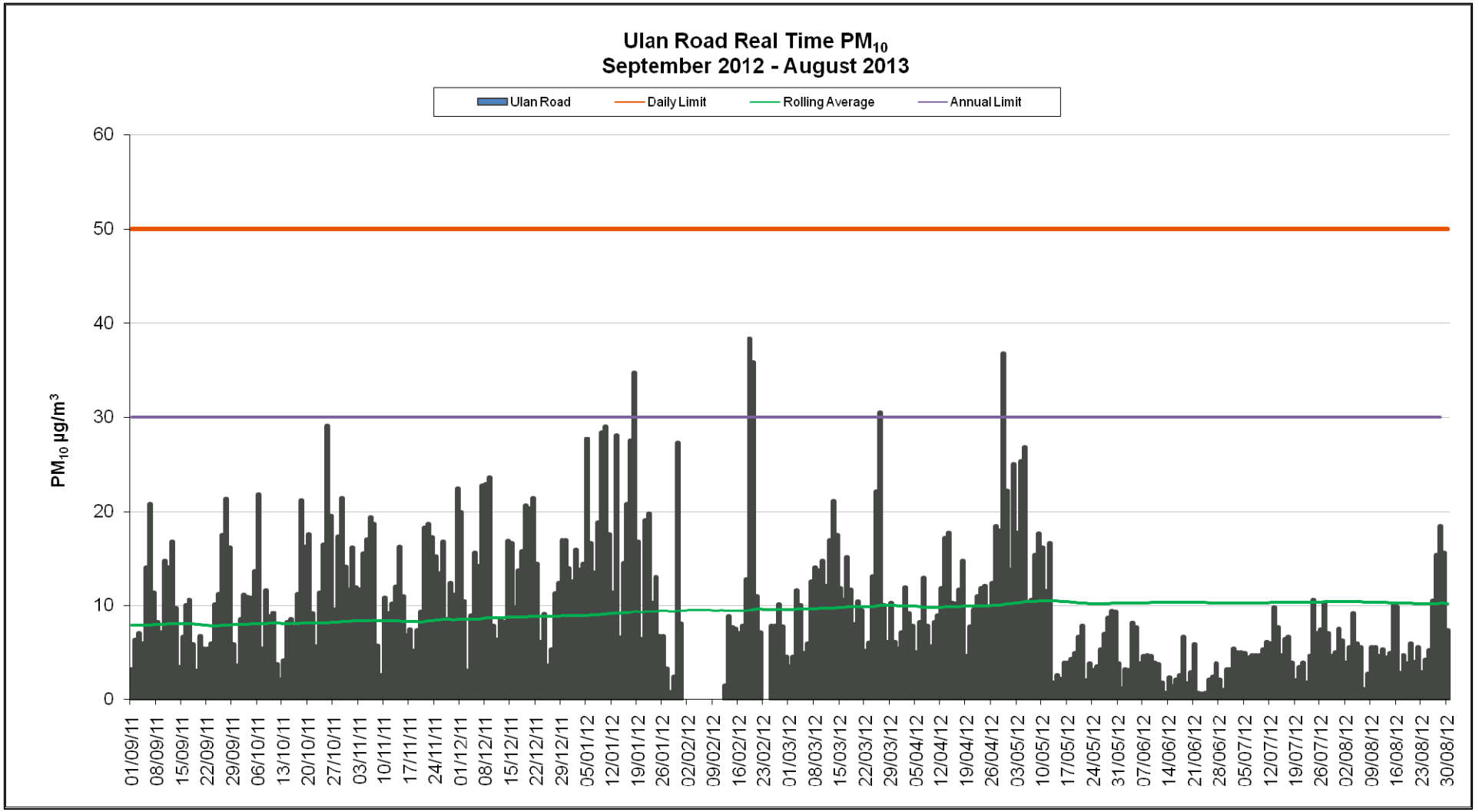


Figure 8: Real-Time PM10 Results – Ulan School

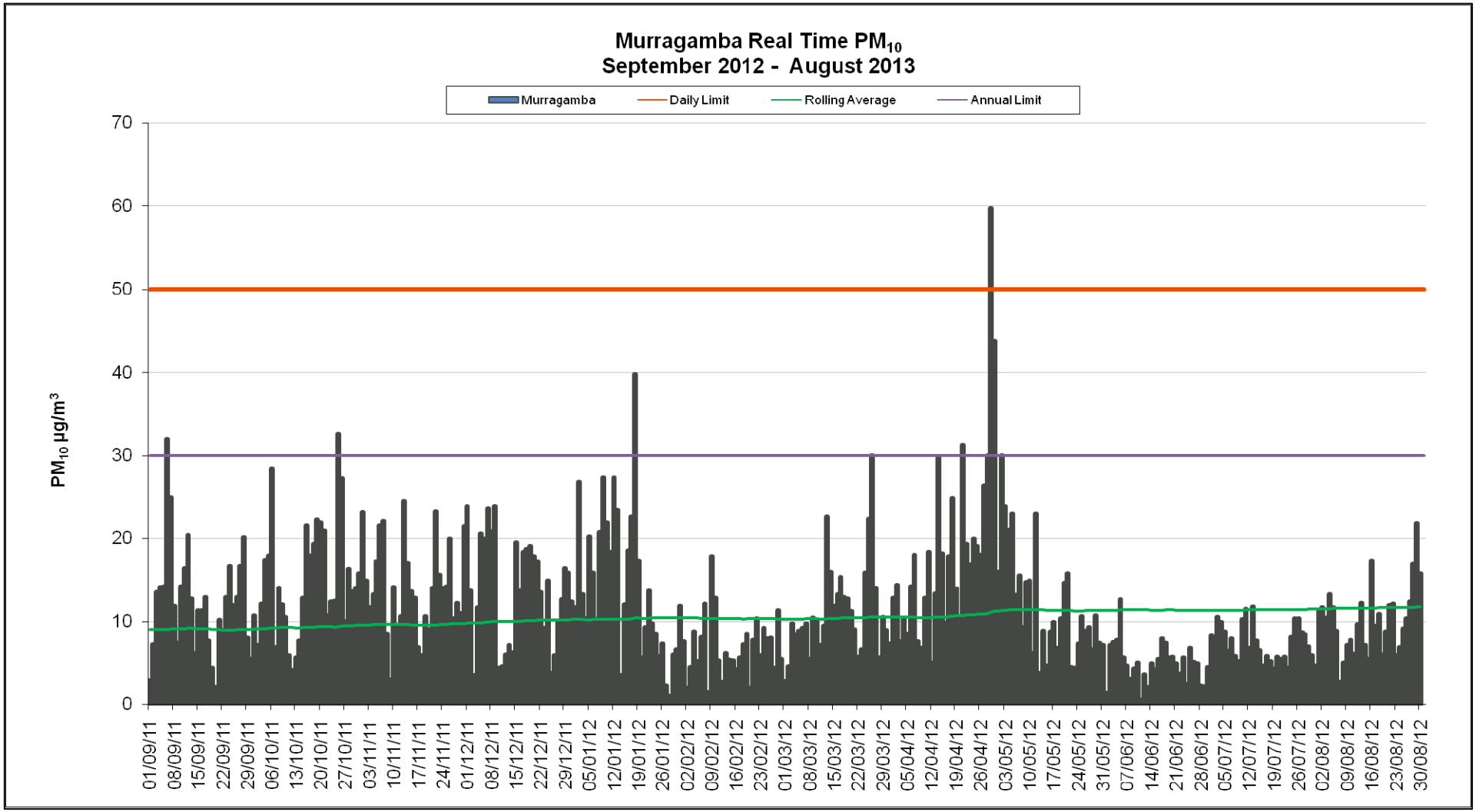


Figure 9: Real-Time PM10 Results – Murragamba

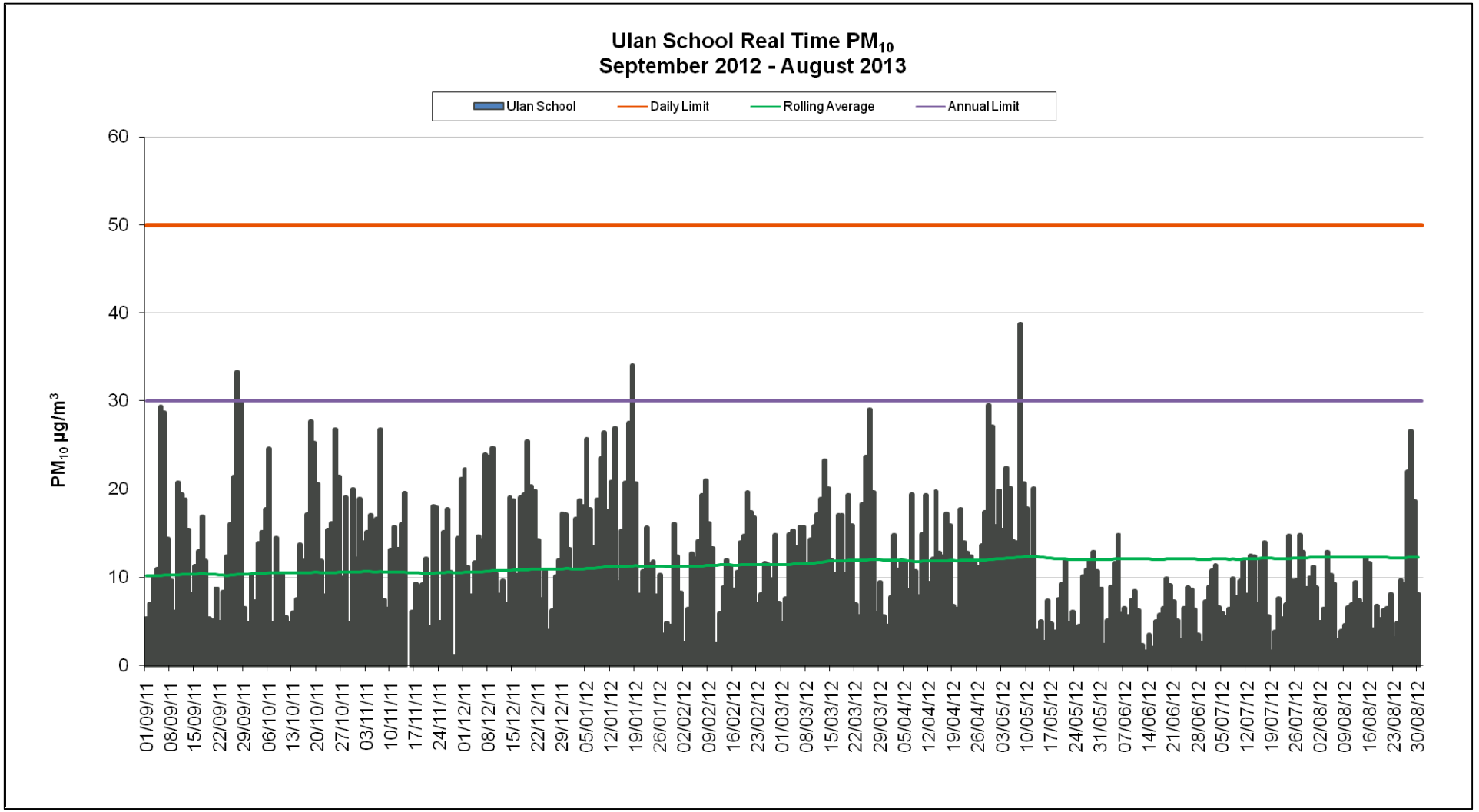


Figure 10: Real-Time PM10 Results – Ulan Road

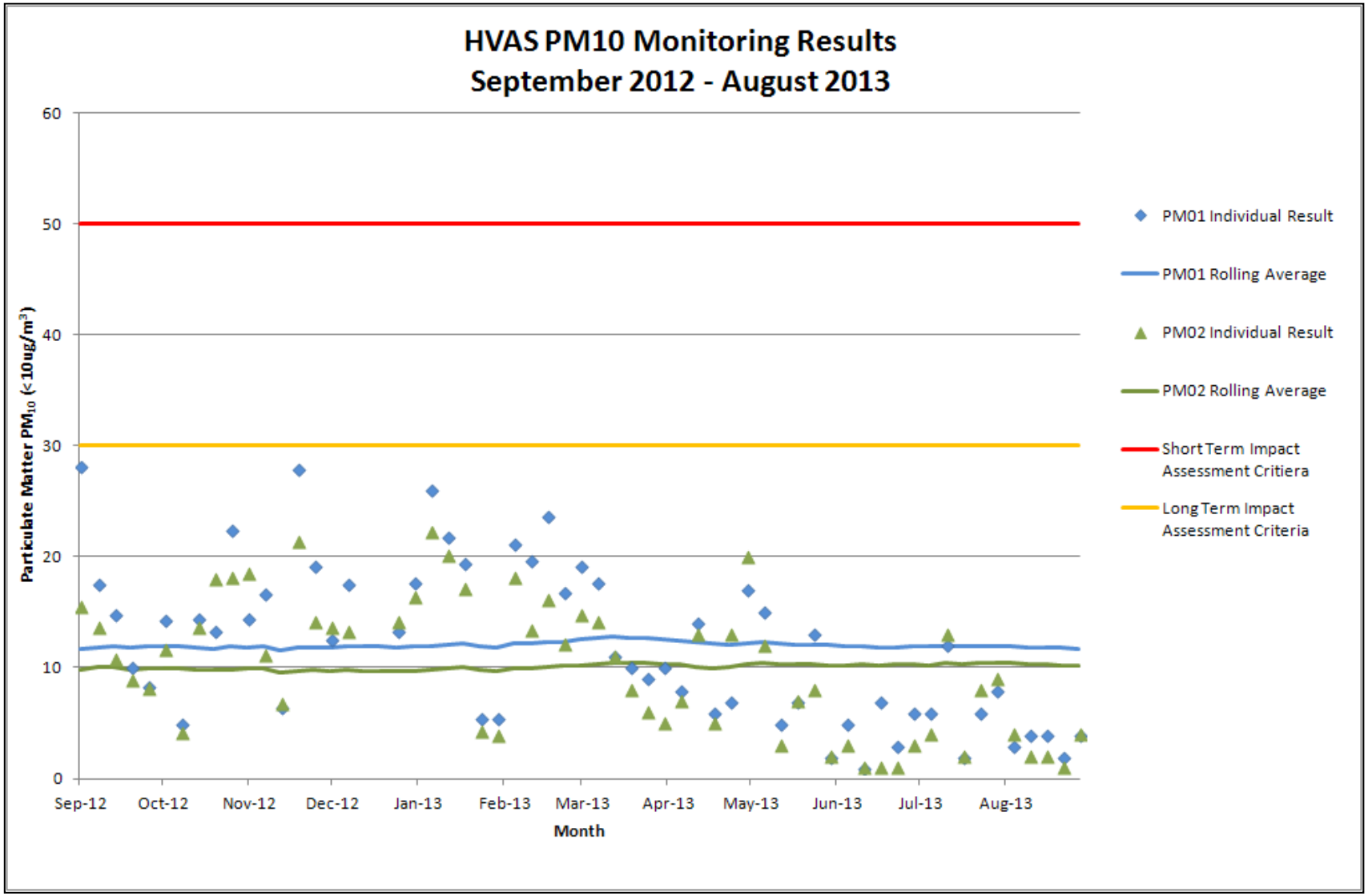


Figure 11: HVAS PM_{10} Results – Ulan School and Ridge Road

3.3.2.3 Dust Deposition

Depositional dust is monitored at nine locations (**Figure 4**) around the operations in accordance with EPA guidelines and relevant Australian Standards.

Samples are generally collected every 30 days with a tolerance of ± 2 days. Results from dust deposition gauges are expressed as insoluble solids and ash residue. Dust gauge results can become excessively contaminated from bird droppings, vegetation (such as plant matter, algae, pollen, seeds), and insects (classed as combustible matter). Over the reporting period less than 2% of records were contaminated with organic matter such as bird droppings compared to 5% last reporting period and 5% for the reporting period before that. Bird deterrent rings have been installed on all dust gauges to minimise contamination by bird droppings.

Dust deposition results are presented in **Table 15** with contaminated results being excluded from the annual average. The annual averages are presented graphically in **Figure 12**. All uncontaminated results were below the annual average dust limit of 4 g/m^2/month. The annual average dust deposition results for uncontaminated insoluble solids ranged from 0.3g/m^2/month at site DG01 to 1.9g/m^2/month at DG02.

Figure 13 shows the 2012-2013 average compared to the background average. This figure shows that at no site has the average increased by more than 2g/m^2/month and therefore the incremental increase criteria has not been exceeded. In fact there has been a drop in the depositional dust average at every location except for DG02. There was insufficient data collected from DG09 to calculate a background average.

Table 15: Depositional Dust Gauge Results

Month	Insoluble Solids (g/m^2/month)	Ash Residue (g/m^2/month)	Insoluble Solids (g/m^2/month)	Ash Residue (g/m^2/month)	Insoluble Solids (g/m^2/month)	Ash Residue (g/m^2/month)
	DG01 – Bobadeen		DG02 – Hillview		DG03 – Oakey Park	
Sep-12	0.4	0.2	1.5	0.7	1.8	0.9
Oct-12	0.1	<0.1	2.7	1.0	0.7	0.4
Nov-12	0.5	0.4	2.4	1.3	2.8	1.4
Dec-12	0.5	0.3	Contaminated		2.9	1.3
Jan-13	0.5	0.4	2.4	1.1	1.3	0.9
Feb-13	0.2	0.2	1.8	0.8	0.8	0.6
Mar-13	0.3	0.2	Contaminated		1.6	1.2
Apr-13	0.5	0.3	2.5	1.4	0.6	0.4
May-13	0.3	0.2	1.9	0.9	1.0	0.7
Jun-13	0.1	0.1	0.6	0.3	0.4	0.2
Jul-13	0.3	0.1	0.6	0.3	0.5	0.3
Aug-13	0.2	0.1	2.2	1.4	0.5	0.3
Annual Average	**0.3**	**0.2**	**1.9**	**1.1**	**1.2**	**0.7**

Month	Insoluble Solids (g/m^2/month)	Ash Residue (g/m^2/month)	Insoluble Solids (g/m^2/month)	Ash Residue (g/m^2/month)	Insoluble Solids (g/m^2/month)	Ash Residue (g/m^2/month)
	DG04 – Ulan Village		**DG05 – Glenmoor**		**DG06 – Barcoo**	
Sep-12	0.7	0.5	0.5	0.3	0.5	0.3
Oct-12	1.7	1.4	1.0	0.3	0.3	0.1
Nov-12	1.2	0.9	0.9	0.7	0.9	0.6
Dec-12	0.9	0.5	Contaminated		0.7	0.4
Jan-13	0.9	0.6	0.7	0.5	0.9	0.7
Feb-13	1.1	0.8	0.8	0.6	0.8	0.5
Mar-13	3.2	1.7	0.9	0.5	1.3	0.9
Apr-13	1.2	0.8	0.8	0.4	0.6	0.4
May-13	1.0	0.7	0.8	0.5	0.4	0.3
Jun-13	1.0	0.6	1.8	1.1	0.4	0.3
Jul-13	0.8	0.5	0.9	0.5	0.3	0.1
Aug-13	0.6	0.5	0.4	0.2	0.4	0.2
Annual Average	**1.2**	**0.8**	**0.9**	**0.5**	**0.6**	**0.4**
	DG07 – Hillside		**DG08 – Croydon**		**DG09 – Wilga**	
Sep-12	0.4	0.3	0.8	0.3	0.5	0.4
Oct-12	1.1	0.3	0.6	0.3	0.5	0.3
Nov-12	1.8	0.8	0.4	0.8	0.6	0.5
Dec-12	0.4	0.2	0.5	0.2	0.4	0.4
Jan-13	0.7	0.6	0.6	0.6	0.9	0.8
Feb-13	2.1	0.9	0.7	0.9	0.7	0.5
Mar-13	0.7	0.5	1.7	0.5	0.8	0.6
Apr-13	0.4	0.3	0.4	0.3	0.4	0.3
May-13	1.4	0.6	0.5	0.6	0.5	0.3
Jun-13	0.3	0.2	0.3	0.2	0.2	0.1
Jul-13	0.3	0.2	0.2	0.2	0.3	0.2
Aug-13	0.6	0.2	0.2	0.2	0.2	0.1
Annual Average	**0.9**	**0.4**	**0.6**	**0.4**	**0.5**	**0.4**

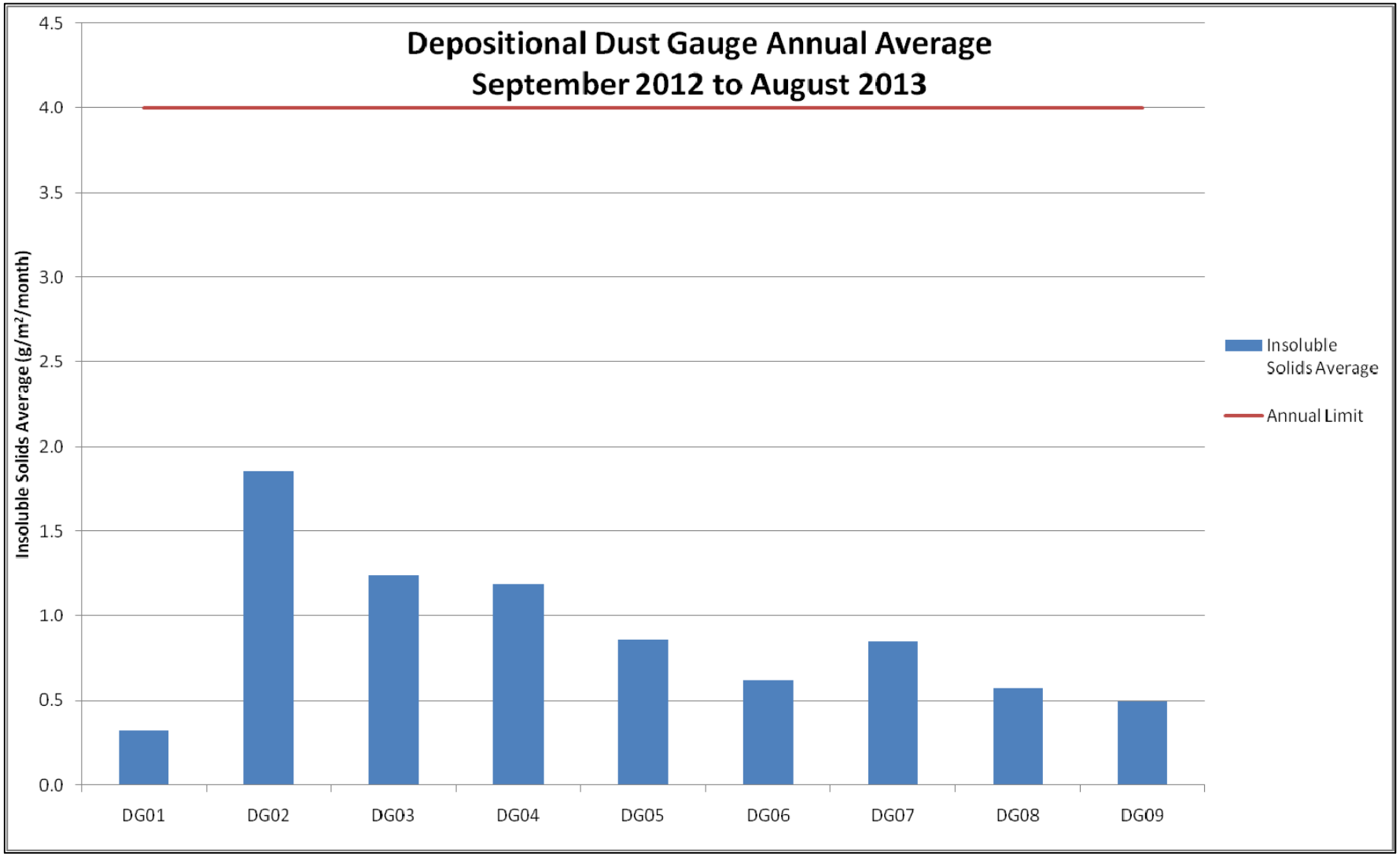


Figure 12: Depositional Dust Annual Average

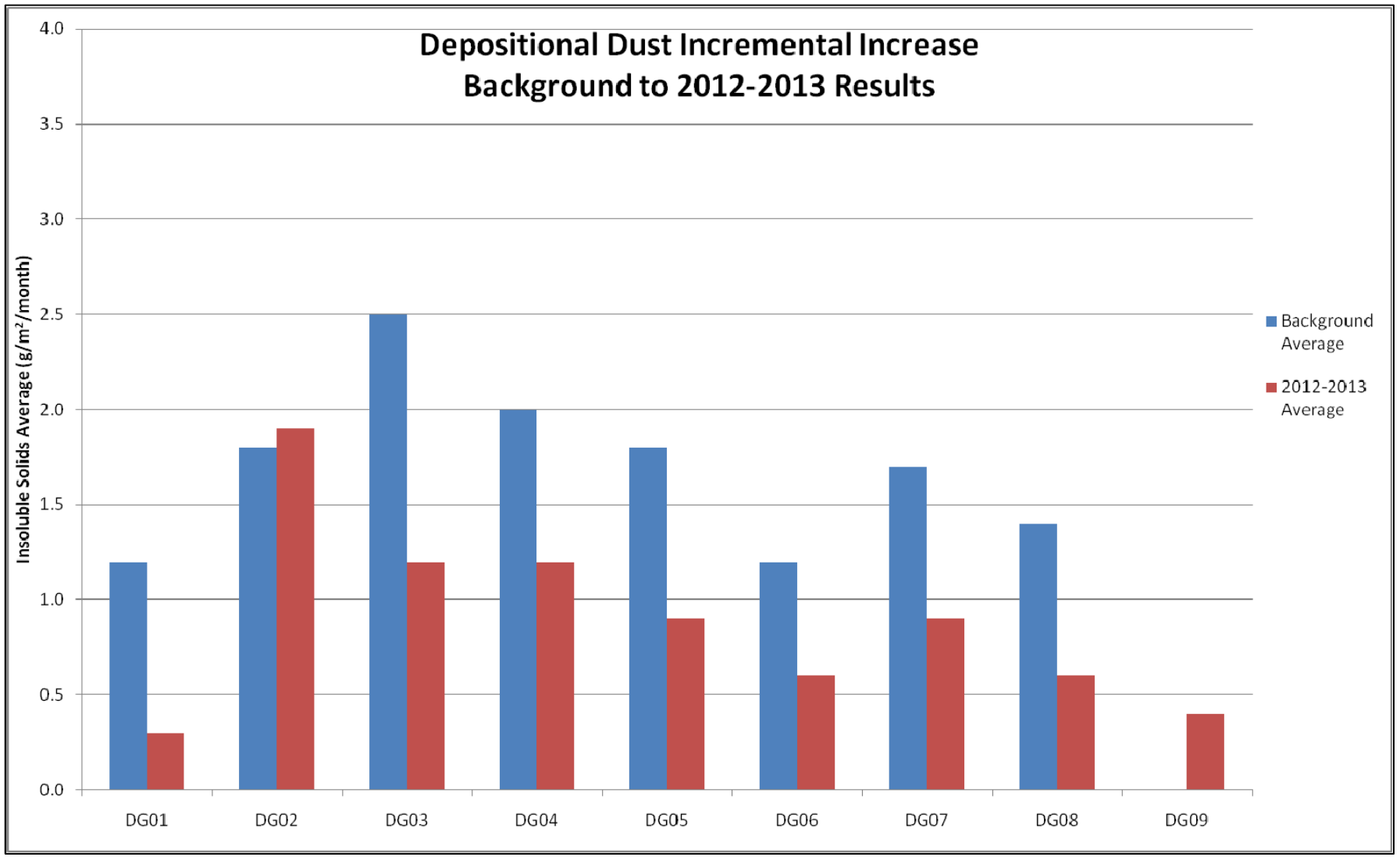


Figure 13: Depositional Dust Incremental Increase

3.3.3 Comparison to Previous Air Quality Monitoring and Predicted Levels

Table 16 to **Table 18** compares the air quality data from this reporting period to background levels and previous monitoring results. Contaminated depositional dust results have been removed from the results. The predicted values in these tables relate to the predicted air quality results at Year 5 of the operation. Year 5 has been chosen as it is the most reflective of the current mining operations at MCO.

Table 16: Comparison of Real-Time PM_{10} Results to Background and Predicted PM_{10}

Site	Background Range ($\mu g/m^3$)	Predicted Range ($\mu g/m^3$)	Previous Results Range ($\mu g/m^3$)	2012-2013 Data Range ($\mu g/m^3$)	Comment on 2012-2013 Data
Ulan Road	This site was installed after March 2009 so there are no background results	NA	0.0 – 41.9	0.0 – 38.4	Consistent with previous monitoring
Murragamba Road	0.0 – 102.3	NA	0.0 – 227.4	0.0 – 59.7	Lower than previous monitoring
Ulan School	2.2 – 114.1	NA	0.0 – 119.4	0.0 – 38.7	Lower than previous monitoring
Site	**Background Average ($\mu g/m^3$)**	**Predicted Average ($\mu g/m^3$)**	**Previous Average Range ($\mu g/m^3$)**	**2012-2013 Average ($\mu g/m^3$)**	**Comment on 2012-2013 Data**
Ulan Road	This site was installed after March 2009 so there are no background results	18.9	10.3	10.5	The average result at this site is similar to previous results and lower than predicted levels.
Murragamba Road	11.8	19.8	8.5 – 12.3	11.8	The average result at this site is equal to background results, and lower than previous results and predicted levels.
Ulan School	15.1	26.4	9.5 – 13.4	12.4	The average result at this site is lower than background results, previous results and predicted levels.

All of the real-time PM_{10} averages were within the predicted levels for Year 5 of the operation.

Table 17: Comparison of HVAS Results to Background and Predicted HVAS

Site	Background Range ($\mu g/m^3$)	Predicted Range ($\mu g/m^3$)	Previous Results Range ($\mu g/m^3$)	2012-2013 Data Range ($\mu g/m^3$)	Comment on 2012-2013 Data
Ulan Village	1.2 – 44.5	NA	1.6 – 53.9	1.0 – 28.1	Consistent with previous monitoring

Site	Background Range (µg/m^3)	Predicted Range (µg/m^3)	Previous Results Range (µg/m^3)	2012-2013 Data Range (µg/m^3)	Comment on 2012-2013 Data
Ridge Road	This site was installed in May 2009 so there is no background data available	NA	1.7 – 44.3	1.0 – 22.0	Consistent with previous monitoring
Site	**Background Average (µg/m^3)**	**Predicted Average (µg/m^3)**	**Previous Average Range (µg/m^3)**	**2012-2013 Data Average (µg/m^3)**	**Comment on 2012-2013 Data**
Ulan Village	17.9	26.3	11.1 – 13.6	11.7	The average result at this site is lower than background results, previous results and predicted levels.
Ridge Road	This site was installed in May 2009 so there is no background data available	Assumed to be less than 20 as this site wasn't modelled	6.6 – 11.7	10.2	The average result at this site is consistent with previous results and lower than predicted levels.

All of the HVAS PM_{10} averages were within the predicted levels for Year 5 of the operation.

Table 18: Comparison of Insoluble Solids Results to Background and Predicted Insoluble Solids Results

Site	Background Range (Insoluble Matter) (g/m^2/month)	Predicted Range (Insoluble Matter) (g/m^2/month)	Previous Results Range (Insoluble Matter) (g/m^2/month)	2012-2013 Data Range (Insoluble Matter) (g/m^2/month)	Comment on 2012-2013 Data
DG01 – Bobadeen	0.2 – 3.1	NA	0.1 – 4.5	0.1 – 0.5	Consistent with previous monitoring
DG02 – Hillview	0.2 – 3.3	NA	0.5 – 3.3	0.6 – 2.7	Consistent with previous monitoring
DG03 – Oakey Park	1.2 – 3.8	NA	0.3 – 4.7	0.4 – 2.9	Consistent with previous monitoring
DG04 – Ulan Village	0.3 – 3.9	NA	0.5 – 4.8	0.6 – 3.2	Consistent with previous monitoring
DG05 – Glenmoor	0.5 – 3.6	NA	0.3 – 3.9	0.4 – 1.8	Consistent with previous monitoring
DG06 – Barcoo	0.2 – 3.2	NA	0.2 – 3.7	0.3 – 1.3	Consistent with previous monitoring
DG07 – Hillside	0.2 – 3.7	NA	0.1 – 3.4	0.3 – 2.1	Consistent with previous monitoring
DG08 – Croydon	0.3 – 3.6	NA	0.2 – 3.5	0.2 – 1.7	Consistent with previous monitoring
DG09 – Wilga	0.7 – 1.6	NA	0.1 – 4.5	0.2 – 0.9	Lower than previous monitoring

Site	Background Average (Insoluble Matter) (g/m^2/month)	Predicted Average (Insoluble Matter) (g/m^2/month)	Previous Results Average Range (Insoluble Matter) (g/m^2/month)	2012-2013 Data Average (Insoluble Matter) (g/m^2/month)	Comment on 2012-2013 Data
DG01 – Bobadeen	1.2	1.4	1.2 – 1.7	0.3	Lower than previous monitoring and predicted levels
DG02 – Hillview	1.8	1.5	1.0 – 2.1	1.9	Consistent with previous monitoring and slightly higher than predicted levels
DG03 – Oakey Park	2.5	1.5	1.2 – 2.2	1.2	Consistent with previous monitoring and predicted levels
DG04 – Ulan Village	2.0	2.1	1.8 – 2.4	1.2	Consistent with previous monitoring and predicted levels
DG05 – Glenmoor	1.8	1.9	0.2 – 2.7	0.9	Consistent with previous monitoring and predicted levels
DG06 – Barcoo	1.2	1.4	0.6 – 1.4	0.6	Consistent with previous monitoring and predicted levels
DG07 – Hillside	1.7	1.4	0.5 – 2.1	0.9	Consistent with previous monitoring and predicted levels
DG08 – Croydon	1.4	1.4	0.4 – 2.2	0.6	Consistent with previous monitoring and predicted levels
DG09 – Wilga	Insufficient Data	No modelled predictions	0.4 – 1.2	0.5	As there is no background data or predicted data it is not possible to compare results to background or predicted levels

Generally, all of the depositional dust averages were within the predicted levels for Year 5 of the operation.

3.3.4 Activities Next Reporting Period

The revised AQMP will be implemented during the next reporting period. The specific changes to the AQMP will include real time PM10 monitoring on Ridge Road and depositional dust gauge monitoring also on Ridge Road and Winchester Crescent. The Dust PRP monitoring program will commence during the next reporting period.

3.4 GREENHOUSE

The *National Greenhouse and Energy Reporting Act 2007* establishes a national framework for corporations to report greenhouse gas emissions and energy consumption and production. The Act makes registration and reporting mandatory for corporations whose energy production, energy use or greenhouse gas emissions exceed specified thresholds. MCO submits National

Greenhouse Energy Reporting (NGER) returns through its parent company, Yancoal Australia Ltd.

The most recent report on Greenhouse Gas Emissions for MCO stated total emissions to be 91,773 CO_2^{-e} for the period 1 July 2012 to 30 June 2013. This is a 78% decrease in total emissions compared to the previous reporting period. The contributing factor to the significant decrease is the emission factor (0.00023) (Method 2) used for fugitive emission calculation for open cut mining. Based on extensive drilling and sampling, MCO did not use the default emission factor (0.0450) (Method 1) for this NGERs reporting period. There was also a 5% decline in ROM tonnes from the previous NGERs reporting period.

MCO have developed an Energy Savings Action Plan that outlines actions to be taken to reduce energy usage at MCO. **Table 19** gives an update on the status of outstanding actions from the end of the last reporting period.

Table 19: Energy Management Actions and Opportunities

Action	Current Status
Investigate corporate policies with respect to energy savings.	Corporate policies have been developed in accordance with EEO reporting.
Target efficiency.	Efficiency targets are still to be established. This will be done in accordance with EEO reporting.
Comply with EEO and NGER legislation	MCO will comply with NGER legislation and report for the period 1 July 2012 to the 30 June 2013 by 31 October 2013. The first EEO reporting will be in December 2013.
Investigate corporate policy for energy management.	Corporate policies have been developed in accordance with EEO reporting.
Develop appropriate policy and processes for energy management.	Corporate policies have been developed in accordance with EEO reporting.
Include energy efficiency awareness in induction procedures, and ongoing training.	Energy efficiency awareness is included in the induction. Ongoing training is captured in the Environmental Training Needs Analysis.
Continue awareness of legislative requirements.	MCO have subscribed to Environmental Essentials and receive regular email updates on legislative changes.
Develop an Energy Management System	Development of the Energy Management System has not commenced due to MCO requirement for EEO reporting.
Include regulatory requirements in Energy Management System.	Regulatory requirements will be included in the Energy Management System once developed.

3.5 EROSION AND SEDIMENT

3.5.1 Activities This Reporting Period

All active mining and rehabilitation areas are designed to incorporate water management structures such as drains and sedimentation dams to retain runoff water to allow for the settlement of sediments. All structures were independently designed in accordance with the MCO Water Management Plan and industry guidelines such as Managing Urban Stormwater.

Regular inspections of the erosion and sediment control structures were undertaken prior to predicted rainfall events and following rainfall events. Sediment dams have been desilted as required to maintain capacity.

The water infrastructure upgrade discussed in the last AEMR was unable to be completed during the reporting period as the modification to the approval has not been received.

3.5.2 Activities Next Reporting Period

MCO anticipate the approval of the water infrastructure upgrades during the next reporting period. When approval is received MCO will begin the construction of the surface water management upgrades across the site.

The other key erosion and sediment activities in the next reporting period will include the incorporation of controls in to the expansion to Open Cut 2.

The adequacy of the erosion and sediment control structures will continue to be monitored during the next reporting period. Where new land is to be disturbed erosion and sediment control structures will be installed prior to disturbance.

3.6 SURFACE WATER QUALITY

3.6.1 Activities This Reporting Period

Active surface water quality management strategies adopted at MCO during the reporting period include:

- Continued installation of clean and dirty water diversion drains;
- Continued building containment dams throughout the site; and
- Ongoing monitoring of surface water surrounding the site.

During the reporting period MCO reviewed and updated the WMP to include proposed activities in Open Cut 2 and Open Cut 3. At the end of the reporting MCO were awaiting approval of the updated WMP from DP&I. Key changes to the WMP include the design of erosion and sediment control structures for new mining areas and changes to the monitoring program to accommodate the new mining areas.

The Water Management Plan (WMP) includes a process for the review of data on a monthly basis against trigger levels. This review was ongoing throughout the reporting period and did not trigger the need for any specialised review of the results.

The WMP includes management response actions if it is found that MCO are impacting on surface water quality or quantity. MCO were not required to implement any of these actions during the reporting period. These actions include:

- Investigations into the cause of the impact, involving surface water experts where required;
- Reporting the impact to regulators and affected users;
- Investigating the adequacy of existing water management infrastructure and controls; and
- Implementing any mitigation where required and where possible.

3.6.2 Surface Water Monitoring

MCO do not have any surface water quality criteria except those that relate to water discharges from the site. These discharge criteria are presented below in **Table 20**. The WMP identifies trigger values that have been developed to act as triggers for investigations into surface water

quality. Where insufficient site data was available to calculate these triggers the default ANZECC criteria have been used. These triggers can be seen in **Table 21**. The 80th percentile figure is used for internal investigation purposes only. If an investigation into results outside the maximum range finds that MCO is responsible for this result, it will be treated as a non-compliance and reported to regulators and affected landowners. If the investigation finds that MCO is not responsible no further action will be taken and the site will continue to be monitored.

Table 20: Discharge Water Criteria

Pollutant	Units of Measure	50 percentile concentration limit	100 percentile concentration limit
Discharge Points 1 and 2			
Conductivity	µS/cm	800	900
Iron	mg/L	---	5
pH	pH	---	6.5-8.5
Oil and Grease	mg/L	---	10
Total Suspended Solids	mg/L	---	50
Turbidity	NTU	---	25
Zinc	mg/L	---	5
Discharge Points 24 and 26			
pH	pH	---	6.5-8.5
Total Suspended Solids	mg/L	---	50
Turbidity	NTU	---	25

Table 21: Surface Water Quality Trigger Levels

Site No.	pH		Electrical Conductivity (µS/cm)		Total Suspended Solids (mg/L)	
	80th Percentile Trigger Value	Maximum Range Reported	80th Percentile Trigger Value	Maximum Range Reported	80th Percentile Trigger Value	Maximum Range Reported
SW01	6.5-8.0	5.4-8.1	922	1,500	50	310
SW02	6.5-8.0	4.4-7.9	1,162	1,560	50	71
SW12	6.5-8.0	N/A	350	N/A	50	N/A
SW10	6.5-8.0	N/A	350	N/A	50	N/A
SW11	6.5-8.0	N/A	350	N/A	50	N/A
SW05	6.5-8.0	5.3-7.7	1,168	1,590	50	2,600
SW08	6.5-8.0	4.5-7.6	5,020	5,910	69	510
SW09	6.5-8.0	5.2-7.9	5,076	5,750	50	140
SW04	6.5-8.0	5.1-7.8	1,480	2,260	97	440
SW07	6.5-8.0	5.3-8.0	5,180	6,540	50	64

Note: Shaded cells indicate ANZECC (2000) criteria; Unshaded cells indicate site developed criteria

The surface water monitoring locations are shown in **Figure 4** and described in **Table 22**.

Table 22: Surface Water Monitoring Site

Monitoring Station	Stream	Location
SW01	Goulburn River	Downstream of the Drip
SW02	Goulburn River	The Drip Picnic Area
SW03	Murragamba Creek	Murragamba Road crossing
SW04	Murragamba Creek	Off the Ulan-Wollar Road
SW05	Moolarben Creek	Below the Ulan - Cassilis Road near the Ulan Village
SW06	Ryan's Creek	Ulan - Cassilis Road
SW07	Lagoon Creek	Rayner Property
SW08	Moolarben Creek	Rayner Property
SW09	Moolarben Creek	Moolarben Road
SW10	Bora Creek	Upstream of operations
SW11	Bora Creek	Downstream of operations
SW12	Goulburn River	Crossing behind Ulan School

Table 23 to **Table 26** present the range of results for pH, EC, TDS and TSS for the reporting period with **Figure 14** to **Figure 17** presenting the pH, EC, TDS and TSS results graphically. The full data set for the surface water quality in the reporting period is shown in **Appendix 3**.

Table 23: pH Results

pH	SW01	SW02	SW04	SW05	SW07	SW08	SW09	SW10	SW11	SW12
Min	7.8	7.2	7.2	6.9	7.4	6.0	6.4	6.5	6.0	6.6
Med	8.1	7.9	7.9	7.5	8.3	7.2	7.2	6.5	7.3	7.3
Max	8.5	8.7	8.9	7.9	9.0	7.7	7.8	6.5	8.1	7.8

Table 24: Electrical Conductivity (µS/cm) Results

EC	SW01	SW02	SW04	SW05	SW07	SW08	SW09	SW10	SW11	SW12
Min	425	742	490	496	1,890	1,910	2,010	90	105	415
Med	787	832	1,417	741	3,028	2,955	3,093	90	239	605
Max	960	892	1,984	1,060	4,380	4,420	3,760	90	410	920

Table 25: Total Dissolved Solids (mg/L) Results

TDS	SW01	SW02	SW04	SW05	SW07	SW08	SW09	SW10	SW11	SW12
Min	225	444	422	296	1170	1230	1420	76	93	256
Med	465	506	789	427	1906	1678	1787	76	216	425
Max	560	580	1210	551	3090	2500	2070	76	308	819

Table 26: Total Suspended Solids (mg/L) Results

TSS	SW01	SW02	SW04	SW05	SW07	SW08	SW09	SW10	SW11	SW12
Min	<2	<2	5	7	4	6	4	5	5	6
Med	3	<2	26	15	72	30	246	5	60	15
Max	3	3	72	28	189	96	1910	5	429	28

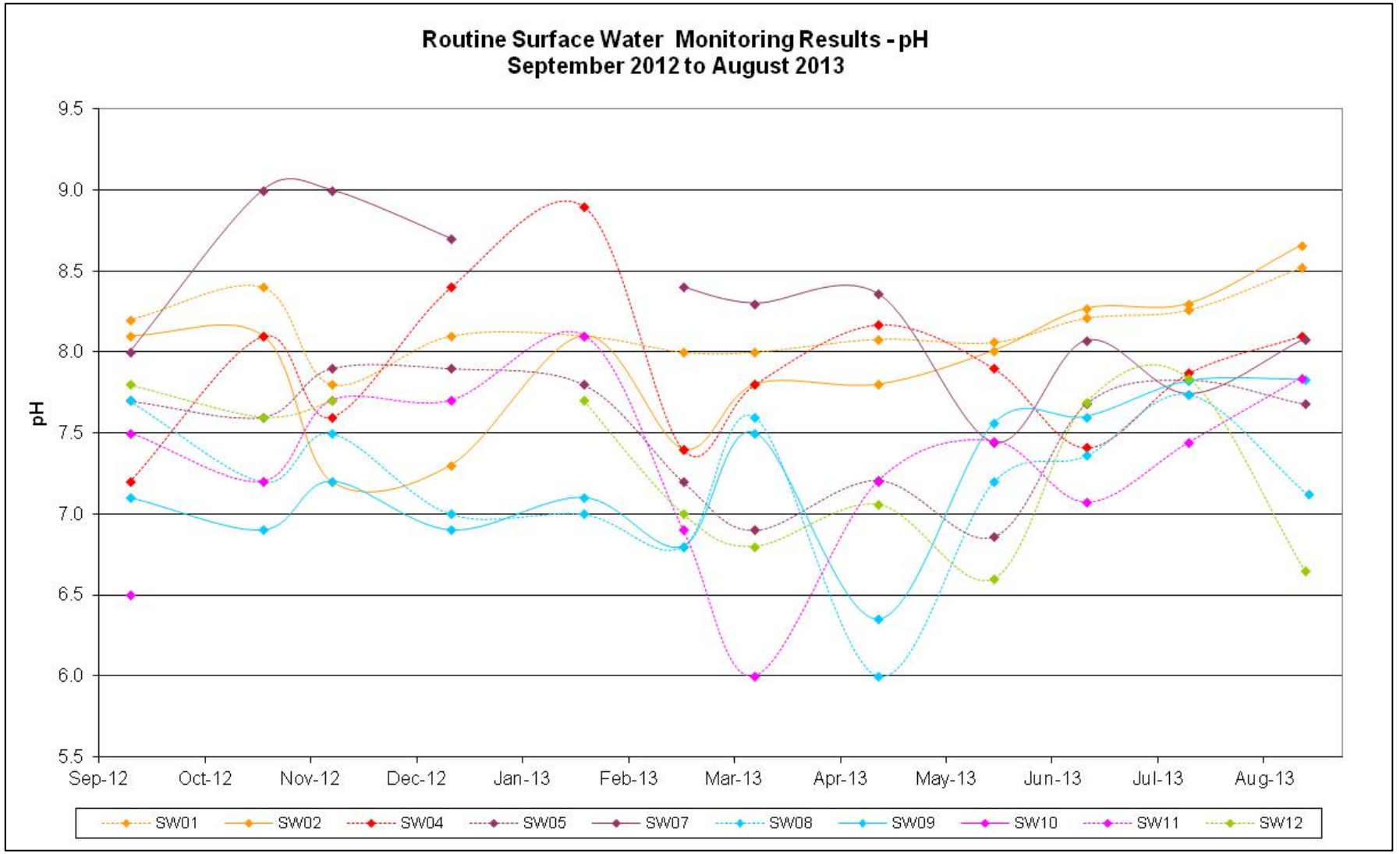


Figure 14: Surface Water pH Results

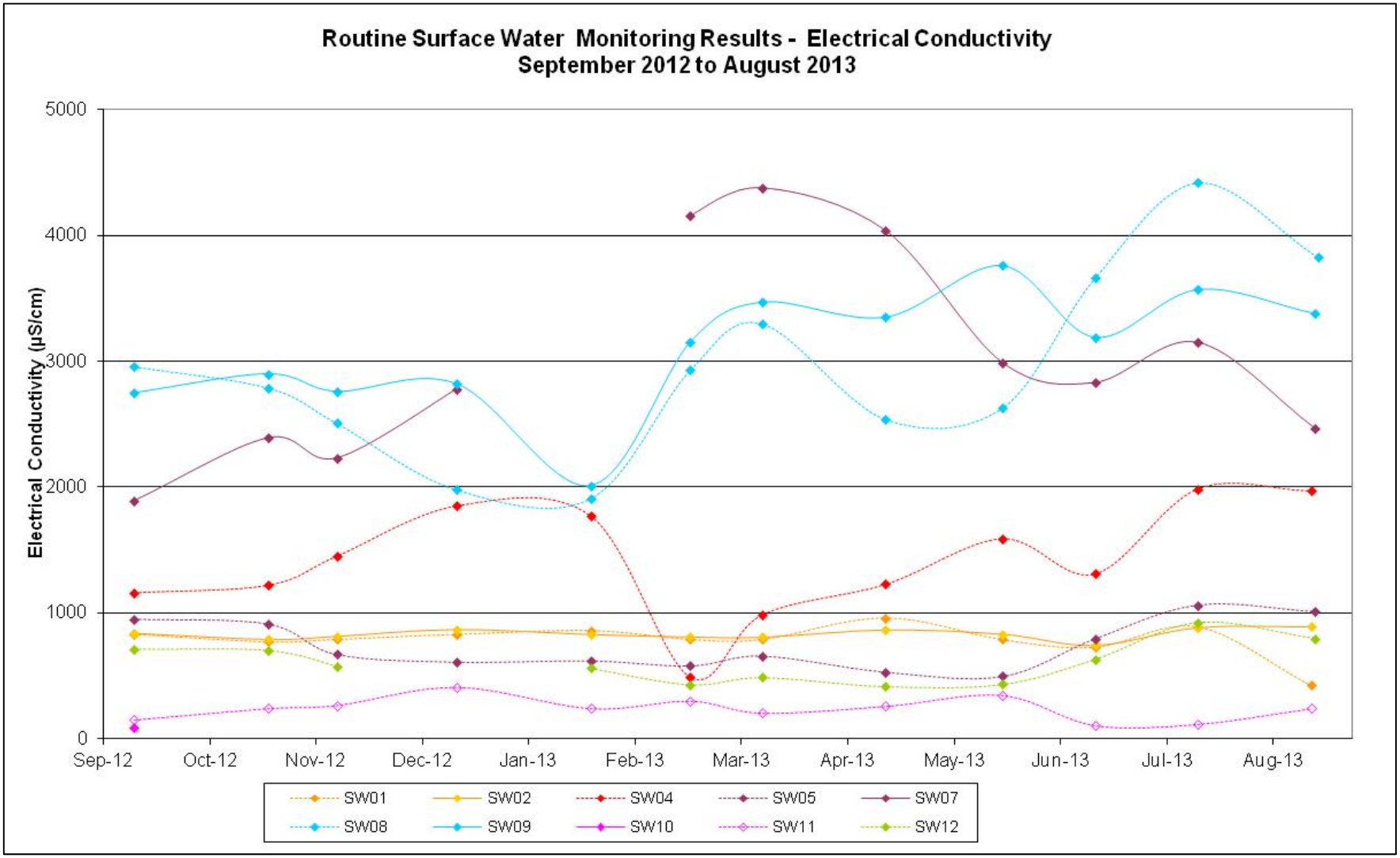


Figure 15: Surface Water Electrical Conductivity Results

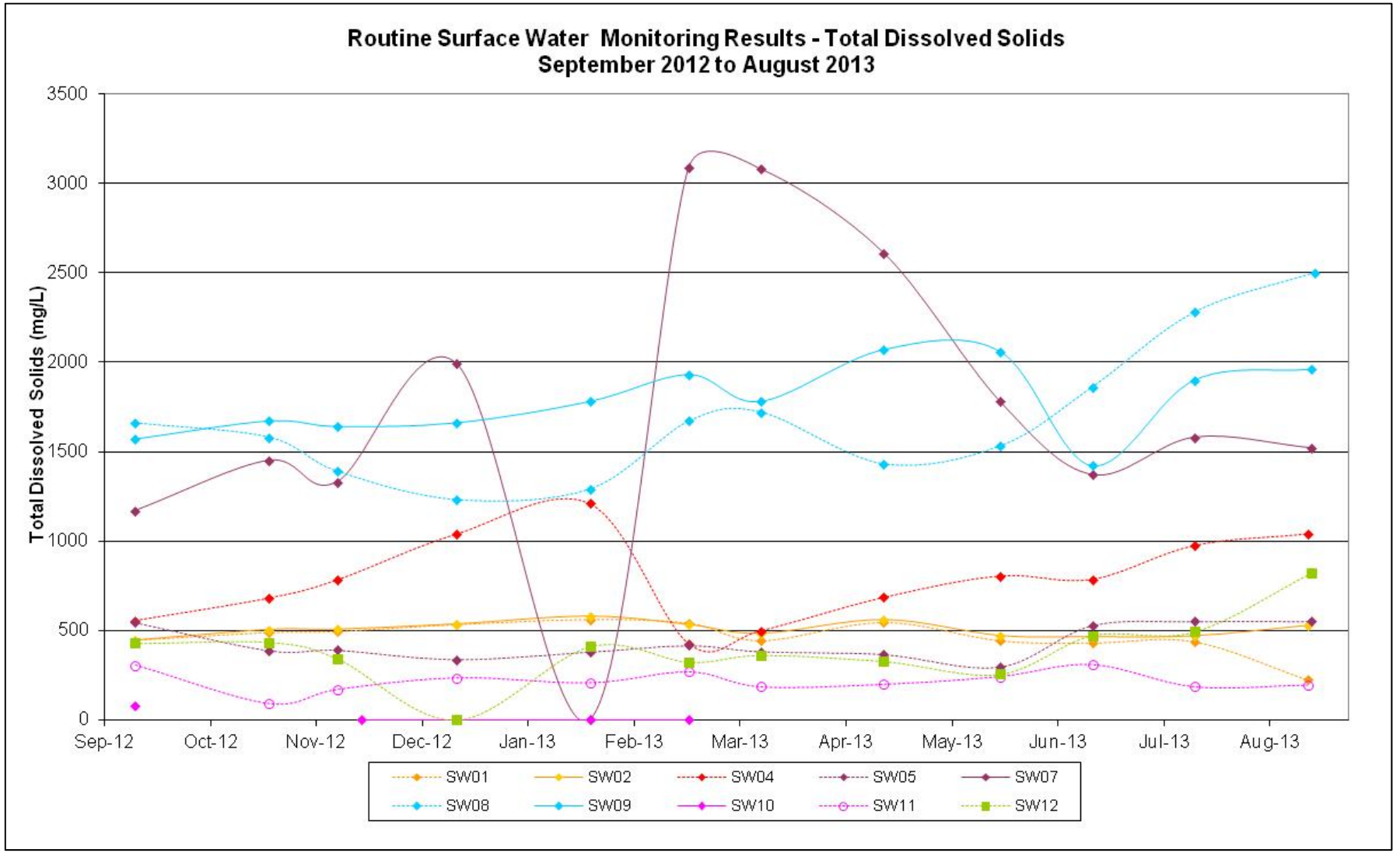


Figure 16: Surface Water Total Dissolved Solids Results

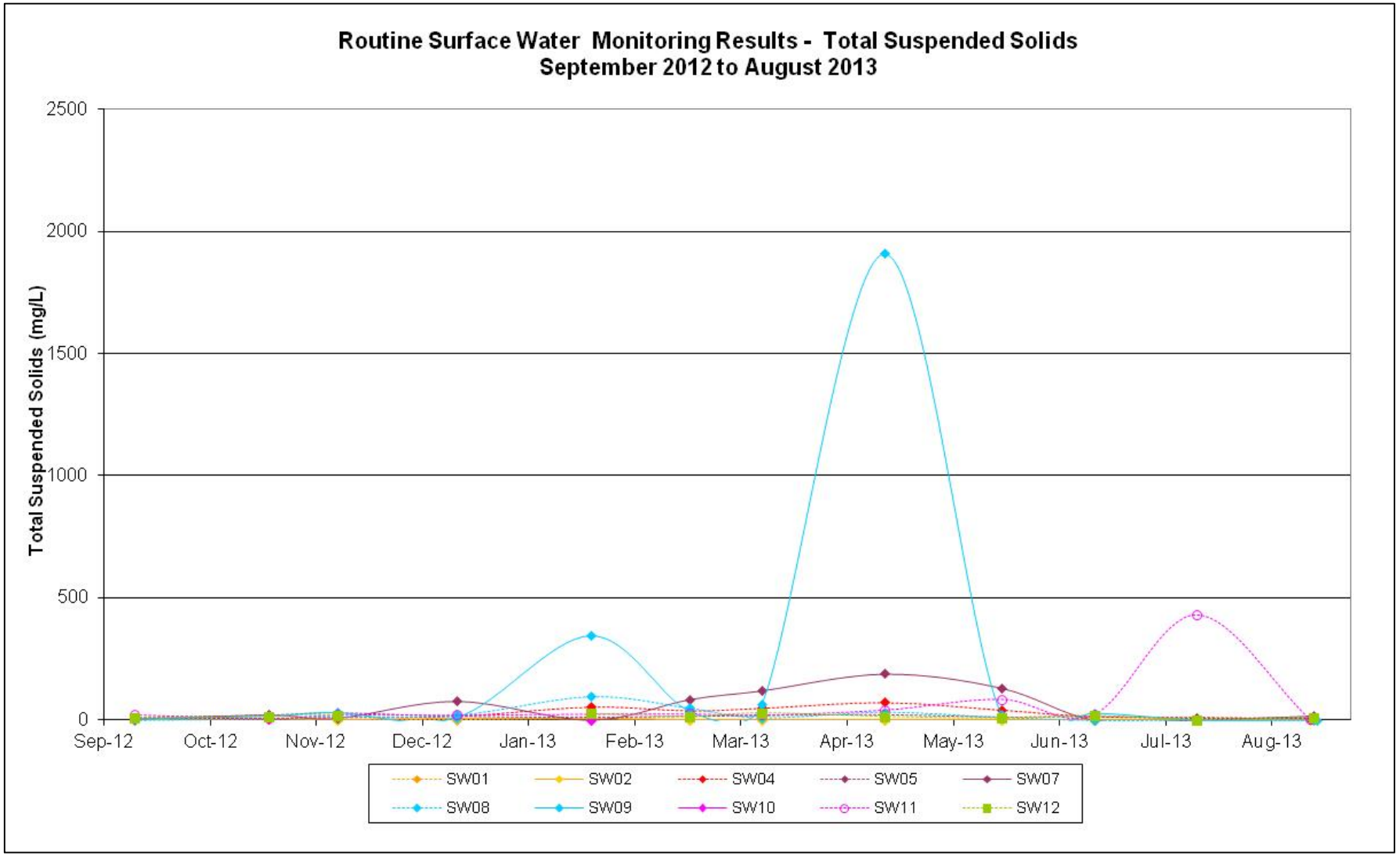


Figure 17: Surface Water Total Suspended Solids Results

3.6.3 Comparison to Previous Surface Water Quality Monitoring and Predicted Levels

Table 27 to **Table 30** compares water quality data from this reporting period to the background levels and previous monitoring results. There was no modelling conducted in the Environmental Assessment on predicted water quality surrounding the mining operations so a comparison isn't able to be made to predicted water quality.

Table 27: Comparison of Surface Water pH to Background pH

Site	Background Range	Previous Data Range	2012-2013 Data Range	Comment on 2012-2013 Data
SW01	5.4 – 8.1	6.0 – 8.4	7.8 – 8.5	Generally consistent with previous monitoring
SW02	4.4 – 7.9	5.9 – 8.5	7.2 – 8.7	Generally consistent with previous monitoring
SW04	5.1 – 7.8	4.8 – 7.8	7.2 – 8.9	As this site is located in a different catchment to the mining operations the high result is not attributable to MCO's operations
SW05	5.3 – 7.7	5.8 – 8.0	6.9 – 7.9	Consistent with previous monitoring
SW07	5.3 – 8.0	6.2 – 8.8	7.4 – 9.0	As this site is located upstream of mining operations at MCO, the high result is not attributable to MCO's operations
SW08	4.5 – 7.6	5.2 – 8.0	6.0 – 7.7	Consistent with previous monitoring
SW09	5.2 – 7.9	5.9 – 8.6	6.4 – 7.8	Consistent with previous monitoring
SW10	No samples were collected due to the site being dry during the background sampling	6.1 – 7.2	6.5	Consistent with previous monitoring
SW11	5.5 – 7.2	4.7 – 7.5	6.0 – 8.1	The high result was a one off occurrence during the reporting period and was sampled during low flow from a pool of still water. The remaining results are generally consistent with previous monitoring
SW12	6.0 – 7.0	5.4 – 7.8	6.6 – 7.8	Consistent with previous monitoring

Table 28: Comparison of Surface Water EC to Background EC

Site	Background Range (µS/cm)	Previous Data Range (µS/cm)	2012-2013 Data Range (µS/cm)	Comment on 2012-2013 Data
SW01	300 – 1,500	415 – 1,220	425 – 960	Consistent with previous monitoring
SW02	200 – 1,560	310 – 1,280	742 – 942	Consistent with previous monitoring
SW04	60 – 2,260	290 – 2,190	490 – 1,984	Consistent with previous monitoring
SW05	290 – 1,590	310 – 1,340	496 – 1,060	Consistent with previous monitoring

Site	Background Range (µS/cm)	Previous Data Range (µS/cm)	2012-2013 Data Range (µS/cm)	Comment on 2012-2013 Data
SW07	750 – 6,540	410 – 6,950	1,890 – 4,380	Consistent with previous monitoring
SW08	2,060 – 6,990	340 – 4,580	1,910 – 4,420	Consistent with previous monitoring
SW09	490 – 5,750	655 – 5,600	2,010 – 3,760	Consistent with previous monitoring
SW10	No samples were collected due to the site being dry during the background sampling	65 – 125	90	Consistent with previous monitoring
SW11	40 – 150	85 – 1,060	105 – 410	Lower than previous monitoring
SW12	50 – 670	115 – 1,080	415 – 920	Consistent with previous monitoring

Table 29: Comparison of Surface Water TDS to Background TDS

Site	Background Range (mg/L)	Previous Data Range (mg/L)	2012-2013 Data Range (mg/L)	Comment on 2012-2013 Data
SW01	194 – 700	246 – 562	225 – 560	Consistent with previous monitoring
SW02	199 – 790	310 – 564	444 – 580	Consistent with previous monitoring
SW04	157 – 1,100	200 – 1,280	442 – 1,210	Consistent with previous monitoring
SW05	288 – 848	196 – 756	296 – 551	Consistent with previous monitoring
SW07	502 – 4,100	286 – 4,458	1,170 – 3,090	Consistent with previous monitoring
SW08	1,100 – 6,400	246 – 2,900	1,230 – 2,500	Consistent with previous monitoring
SW09	346 – 4,000	416 – 3,990	1,420 – 2,070	Consistent with previous monitoring
SW10	No samples were collected due to the site being dry during the background sampling	26 – 134	76	Consistent with previous monitoring
SW11	70 – 314	152 – 8,285	93 – 308	Consistent with previous monitoring
SW12	232 – 392	142 – 628	256 – 819	Generally consistent with previous monitoring

Table 30: Comparison of Surface Water TSS to Background TSS

Site	Background Range (mg/L)	Previous Data Range (mg/L)	2012-2013 Data Range (mg/L)	Comment on 2011-2012 Data
SW01	<2 – 310	<2 – 13	<2 – 3	Consistent with previous monitoring
SW02	<2 – 844	<2 – 47	<2 – 3	Consistent with previous monitoring

Site	Background Range (mg/L)	Previous Data Range (mg/L)	2012-2013 Data Range (mg/L)	Comment on 2011-2012 Data
SW04	4 – 440	<2 – 186	5 – 72	Consistent with previous monitoring
SW05	<2 – 2,600	<2 – 82	7 – 28	Consistent with previous monitoring
SW07	<2 – 64	<2 – 49	4 – 89	Consistent with previous monitoring
SW08	<2 – 510	<2 – 53	6 – 96	Generally consistent with previous monitoring
SW09	2 – 140	<2 – 322	2 – 1,910	The high sample was collected from a pool of water with red sludge, when water levels in the creek were low. This was an isolated result.
SW10	No samples were collected due to the site being dry during the background sampling	<2 – 77	5	Consistent with previous monitoring
SW11	13 – 66	<2 – 223	5 – 429	The high sample was collected when water levels in the creek were low and the sample was taken from a pool of water. This was an isolated result.
SW12	<2 – 564	<2 – 166	6 – 28	Consistent with previous monitoring

The surface water quality results recorded this reporting period are generally consistent with the background results (up to March 2009), with any exceptions commented on in the tables above. There were no high results that are attributable to MCO's operations.

3.6.4 Rainfall Event Sampling

During the reporting period there were five occasions where rainfall events triggered the requirement to collect additional water samples. A summary of the results is shown in **Table 31** with the full set of results shown in **Appendix 3**.

Table 31: Rainfall Event Results

Location	Date	pH	Electrical Conductivity (µS/cm)	Total Suspended Solids (mg/L)
SW01 – Goulburn River	26-Dec-2012	7.9	820	<5
SW02 – Goulburn River	26-Dec-2012	7.7	835	<5
SW04 – Murragamba Creek	26-Dec-2012	6.9	1,620	151
SW05 – Moolarben Creek	26-Dec-2012	7.4	465	10
SW07- Lagoons Creek	26-Dec-2012	8.0	4,960	19
SW08 – Moolarben Creek	26-Dec-2012	7.1	1,880	12
SW09 – Moolarben Creek	26-Dec-2012	7.0	1,220	34

Location	Date	pH	Electrical Conductivity (µS/cm)	Total Suspended Solids (mg/L)
SW10 – Bora Creek	26-Dec-2012	No Flow		
SW11 – Bora Creek	26-Dec-2012	6.4	100	272
SW12 – Goulburn River	26-Dec-2012	7.2	370	29
SW01 – Goulburn River	23-Jan-2013	8.0	870	<2
SW02 – Goulburn River	23-Jan-2013	7.6	920	3
SW04 – Murragamba Creek	23-Jan-2013	7.6	520	202
SW05 – Moolarben Creek	23-Jan-2013	7.7	490	10
SW07- Lagoons Creek	23-Jan-2013	8.1	4,600	8
SW08 – Moolarben Creek	23-Jan-2013	6.8	1,910	22
SW09 – Moolarben Creek	23-Jan-2013	6.6	3,420	81
SW10 – Bora Creek	23-Jan-2013	No Flow		
SW11 – Bora Creek	23-Jan-2013	6.7	130	142
SW12 – Goulburn River	23-Jan-2013	7.7	480	10
SW01 – Goulburn River	27-Jan-2013	7.8	790	<2
SW02 – Goulburn River	27-Jan-2013	7.8	780	<2
SW04 – Murragamba Creek	27-Jan-2013	7.2	180	136
SW05 – Moolarben Creek	27-Jan-2013	7.2	450	20
SW07- Lagoons Creek	27-Jan-2013	7.8	4,450	2
SW08 – Moolarben Creek	27-Jan-2013	6.4	2,310	40
SW09 – Moolarben Creek	27-Jan-2013	7.0	3,620	17
SW10 – Bora Creek	27-Jan-2013	No Flow		
SW11 – Bora Creek	27-Jan-2013	6.9	100	234
SW12 – Goulburn River	27-Jan-2013	7.1	410	38
SW01 – Goulburn River	29-Jan-2013	7.2	340	112
SW02 – Goulburn River	29-Jan-2013	7.1	350	126
SW04 – Murragamba Creek	29-Jan-2013	6.8	790	198
SW05 – Moolarben Creek	29-Jan-2013	7.1	390	48
SW07- Lagoons Creek	29-Jan-2013	7.5	2,480	6

Location	Date	pH	Electrical Conductivity (µS/cm)	Total Suspended Solids (mg/L)
SW08 – Moolarben Creek	29-Jan-2013	7.0	3,060	7
SW09 – Moolarben Creek	29-Jan-2013	7.1	2,560	14
SW10 – Bora Creek	29-Jan-2013	5.9	170	10
SW11 – Bora Creek	29-Jan-2013	7.0	130	37
SW12 – Goulburn River	29-Jan-2013	6.9	280	85
SW01 – Goulburn River	02-Feb-2013	7.1	310	152
SW02 – Goulburn River	02-Feb-2013	7.0	310	143
SW04 – Murragamba Creek	02-Feb-2013	6.9	200	131
SW05 – Moolarben Creek	02-Feb-2013	6.7	230	48
SW07- Lagoons Creek	02-Feb-2013	7.0	1,560	<2
SW08 – Moolarben Creek	02-Feb-2013	7.1	530	15
SW09 – Moolarben Creek	02-Feb-2013	7.0	1,050	74
SW10 – Bora Creek	02-Feb-2013	6.0	180	4
SW11 – Bora Creek	02-Feb-2013	6.9	140	85
SW12 – Goulburn River	02-Feb-2013	6.4	120	242

3.6.5 Discharges

MCO did not have any licensed discharges during the reporting period.

3.6.6 Flow Monitoring

During the reporting period flow monitors were established on Wilpinjong Creek, Murragamba Creek and Eastern Creek. Initial works have been undertaken for the installation of a flow monitor on Bora Creek. It is proposed that the Bora Creek monitor will be fully operational by 31 of December 2013.

Flow monitoring data for Moolarben Creek has been obtained from UCML at Moolarben Dam. The flow monitor located at Eastern Creek was unable to record any significant data during the reporting period due to insufficient flow calculation; these calculations will be refined during the next reporting period. All other flow monitoring data collected during the reporting period is shown graphically in **Figure 18** and **Figure 19**.

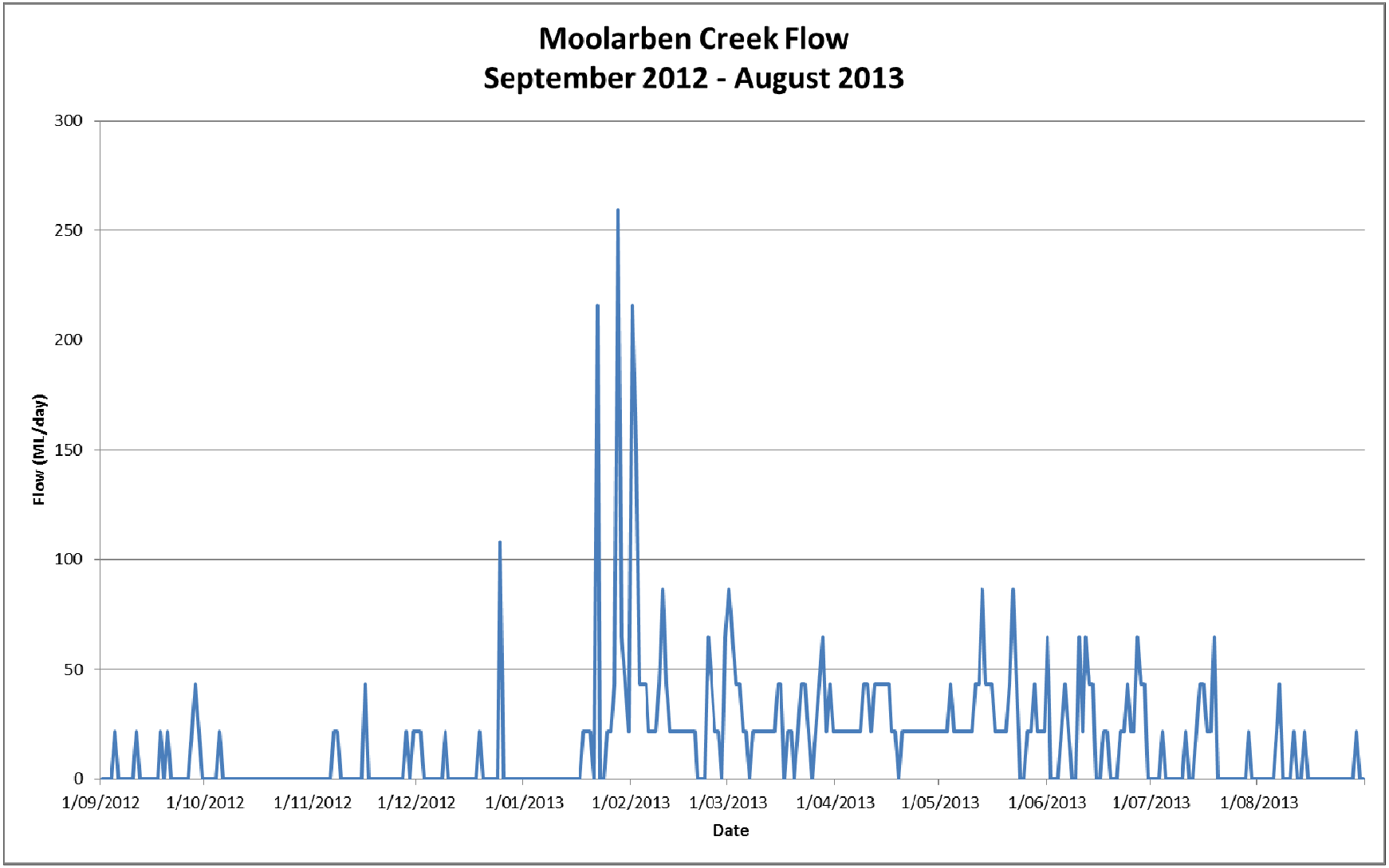


Figure 18: Flow Monitoring – Moolarben Creek

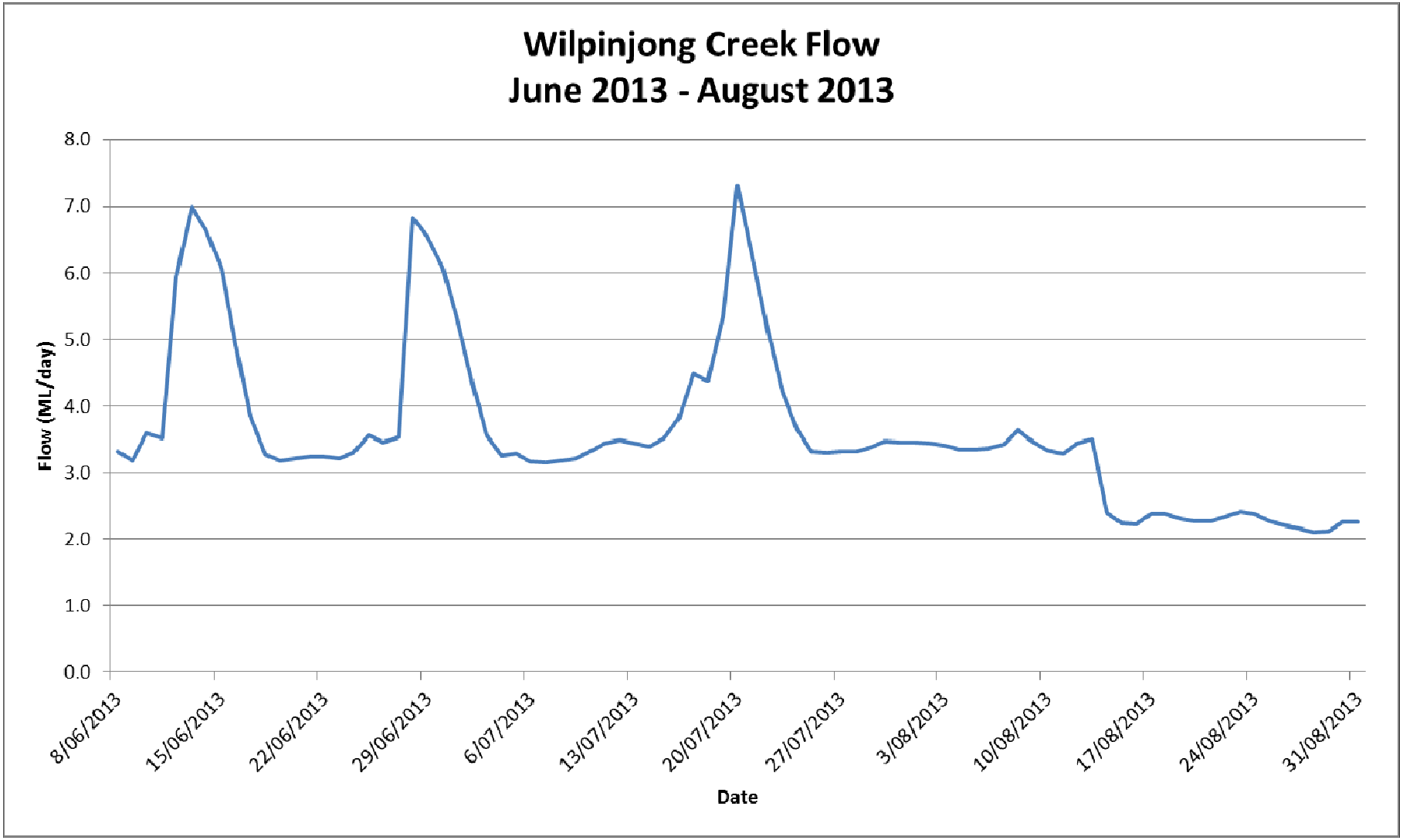


Figure 19: Flow Monitoring – Wilpinjong Creek

3.6.7 Effluent Monitoring

MCO's Environmental Protection Licence (EPL) has a requirement for water samples to be collected from the effluent systems on a quarterly basis. The results from the sampling of the effluent systems at the Administration, CHPP and Open Cut offices are shown in **Table 32**.

Table 32: Effluent System Monitoring

Sample Location	Sample Date	Biological Oxygen Demand (mg/L)	Total Nitrogen (mg/L)	Oil & Grease (mg/L)	Total Phosphorus (mg/L)	pH	Total Suspended Solids (mg/L)
Administration	13/09/12	<2	37.5	<5	14.1	4.9	14
CHPP	13/09/12	22	43.1	<5	9.36	7.3	75
Open Cut	13/09/12	8	5.8	<5	1.41	7.7	41
Administration	12/12/12	158	99.4	<5	23.8	7.9	15
CHPP	12/12/12	18	48.7	<5	15.4	7.8	13
Open Cut	12/12/12	27	58.6	<5	18.4	7.4	30
Administration	13/03/13	<2	57.6	<5	21.2	5.7	7
CHPP	13/03/13	35	248	<5	24.1	8.2	45
Open Cut	13/03/13	56	11.6	<5	1.01	7.5	17
Administration	26/06/13	247	115	<5	23.4	5.2	10
CHPP	26/06/13	244	93.7	<5	22.3	7.7	38
Open Cut	26/06/13	127	7.7	<5	0.74	7.9	62

3.6.8 Channel Stability Monitoring

Channel stability monitoring along Bora Creek and Moolarben Creek was undertaken in February 2013. The monitoring involved visual and written observational surveys and photographic records of each stream reach that included:

- Monitoring the reach of Bora Creek and a tributary from the western culvert of the MCO rail loop and its confluence with Goulburn River;
- Monitoring the reach of Moolarben Creek between Moolarben Dam and its confluence with Ryan Creek; and
- Monitoring at the confluence of Moolarben Creek, Sportsman Hollow Creek and the Goulburn River.

The channel stability monitoring locations can be seen on **Figure 20** and **Figure 21**. The methodology used for this monitoring program was the *CSIRO Ephemeral Stream Assessment.* The classifications used in this methodology are shown in **Table 33** and the results from the monitoring are shown in **Table 34**.

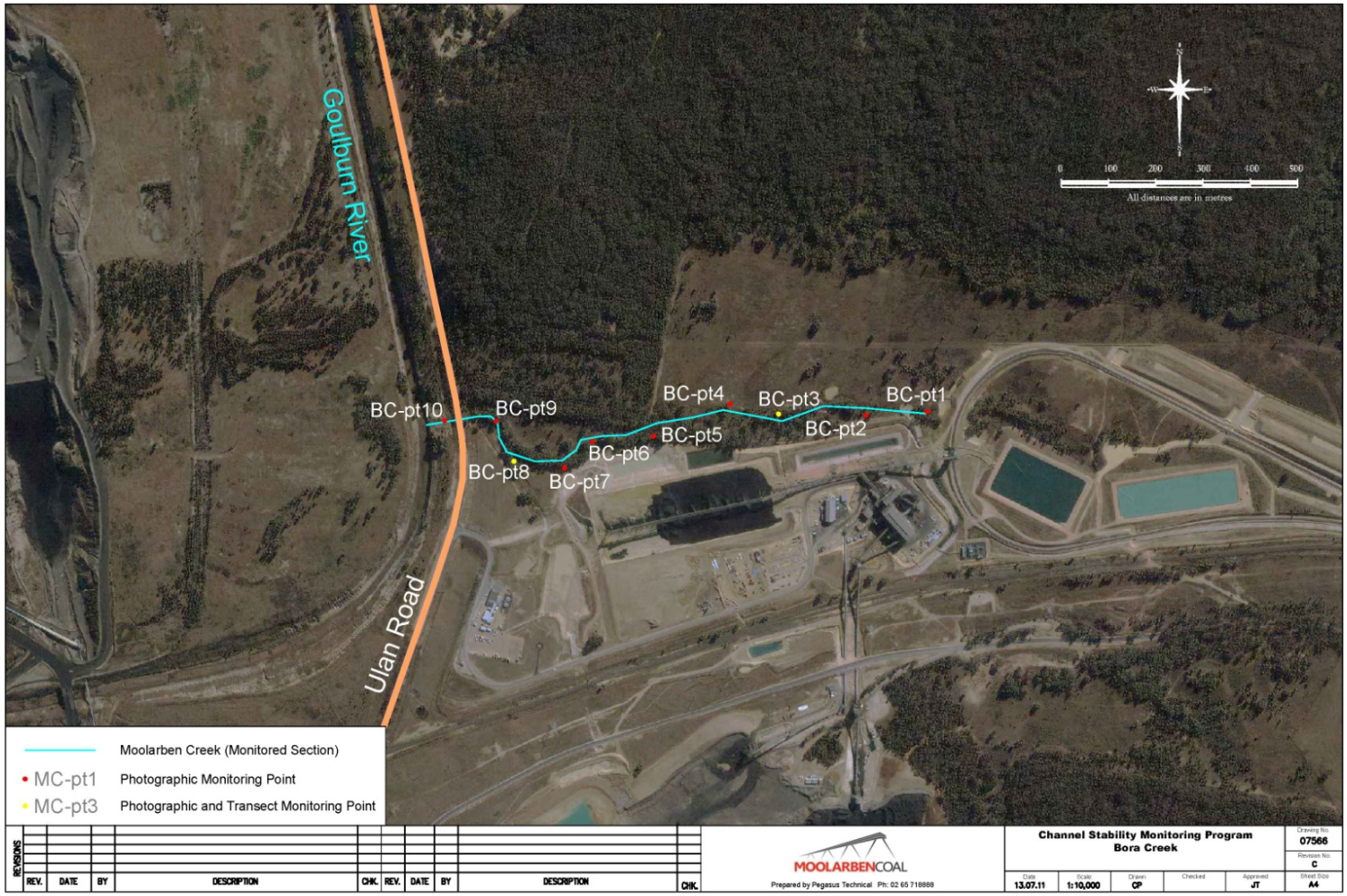


Figure 20: Channel Stability Monitoring – Bora Creek

Figure 21: Channel Stability Monitoring – Moolarben Creek

Table 33: Classification of Different Drainage Line States (CSIRO)

Activity Rating (%)	Classification	Discussion of Classification
80 +	Very Stable	Drainage line is very stable and likely to be in original form. It is able to withstand all flow velocities that have previously occurred in this area and only minimal monitoring is required, predominantly after high flow events, to ensure condition does not deteriorate
70-80	Stable	Drainage line is stable. It is important to assess this zone in relation to the other classifications and define whether this zone is moving from potentially stabilising to a more stable form or if it is deteriorating from a very stable form. The nature of this relationship will identify the type of monitoring required
60-69	Potentially Stabilising	Drainage line is potentially stabilising. Ongoing monitoring is required while rehabilitation works are not needed in the immediate future
50-59	Active	Drainage line is actively eroding and remedial actions are required. It is important to classify if erosion is caused primarily by upstream flows, lateral flows or unstable wall materials so that appropriate rehabilitation can be carried out.
< 50	Very Active	Drainage line is very actively eroding and immediate remedial actions are required. It is important to classify if erosion is caused primarily by upstream flows, lateral flows or unstable wall materials so that appropriate rehabilitation can be carried out.

Table 34: Classification of Channel Stability Monitoring Sites

Site Number	Classification 2009 – Background	Classification 2010	Classification 2011	Classification 2012	Classification 2013	Comments
Bora Creek						
BC-pt1	Very Stable	Very Stable	Very Stable	Very Stable	Very Stable	No changes in stability
BC-pt2 (upstream)	Potentially Stabilising	Potentially Stabilising	Potentially Stabilising	Potentially Stabilising	Potentially Stabilising	No changes in stability
BC-pt2 (downstream)	Stable	Stable	Stable	Stable	Very Stable	Slight improvement in stability over time
BC-pt3	Active/Potentially Stabilising	Potentially Stabilising	Potentially Stabilising	Potentially Stabilising	Potentially Stabilising	Slight improvement in stability over time
BC-pt4 (upstream)	Stable	Stable	Stable	Stable	Stable	No changes in stability
BC-pt4 (downstream)	Active	Potentially Stabilising	Potentially Stabilising	Stable	Stable	Slight improvement in stability over time
BC-pt5	Active	Active/Potentially Stabilising	Very Active	Active	Active	Slight improvement in stability over time
BC-pt6	Active	Active/Potentially Stabilising	Active	Active	Active	No changes in stability
BC-pt7	Active/Potentially Stabilising	Potentially Stabilising	Potentially Stabilising	Potentially Stabilising	Potentially Stabilising	Slight improvement in stability over time
BC-pt8	Active to Very Active	Active to Very Active	Active to Very Active	Active	Active	No changes in stability
BC-pt9	Very Active	Active	Active	Active	Active	Slight improvement in stability over time but the area is still eroding and unstable
BC-pt10	Active	Potentially Stabilising	Potentially Stabilising	Active	Potentially Stabilising	Slight improvement in stability over time
BCT-pt1	Not included in the monitoring program	Not included in the monitoring program	Not included in the monitoring program	Stable	Stable	Slight improvement in stability over time

Site Number	Classification 2009 – Background	Classification 2010	Classification 2011	Classification 2012	Classification 2013	Comments
BCT-pt2 (upstream)	Not included in the monitoring program	Not included in the monitoring program	Not included in the monitoring program	Potentially Stabilising	Stable	Slight improvement in stability over time
BCT-pt2 (downstream)	Not included in the monitoring program	Not included in the monitoring program	Not included in the monitoring program	Potentially Stabilising	Potentially Stabilising	No changes in stability
BCT-pt3	Not included in the monitoring program	Not included in the monitoring program	Not included in the monitoring program	Active	Active	No changes in stability
Moolarben Creek						
MC-pt1	As this site is a dam the CSIRO assessment could not be applied					No change
MC-pt2	As this site is a dam the CSIRO assessment could not be applied					No change
MC-pt3	As this site is a dam the CSIRO assessment could not be applied					No change
MC-pt4	As this site is a dam the CSIRO assessment could not be applied					No change
MC-pt5	As this site is a dam the CSIRO assessment could not be applied					No change
MC-pt6	Active	Potentially Stabilising	Potentially Stabilising	Active	Active	Western bank remains active however eastern side has greater vegetation cover
MC-pt7	Active	Active	Active	Active	Active	No changes in stability
MC-pt8	Active	Potentially Stabilising	Potentially Stabilising	Potentially Stabilising	Potentially Stabilising	Slight improvement in stability over time
Goulburn River						
GR-pt1	Very Stable	Very Stable	Very Stable	Very Stable	Very Stable	No changes in stability

The 2013 Channel Stability Monitoring Program for Bora Creek, Bora Creek Tributary, Moolarben Creek and the Goulburn River displayed large variability in channel stability, vegetation composition and erosion potential along each surveyed section of the watercourses. Bora Creek, Bora Creek Tributary and Moolarben Creek share similar characteristics associated with previous land management practices. The survey identified that some sections of Bora Creek and Moolarben Creek are still degraded and actively eroding due to natural influences, exacerbated by past land clearing and agricultural practices.

The extent of erosion in these sections of the creek over the last 12 months is considered to be minimal with only minor degradation noticed when compared to the 2012 survey. Those areas continuing to erode are associated with areas that have exposed dispersive soils, with the majority of these areas located on the creek banks. Vegetation establishment on dispersive soils is hampered by the development of a hard surface crust when the soil is dry, the 'melting' nature of the soil when wet and poor soil fertility. Alternatively, the survey recognised some sections of each creek displaying very stable environments, with respect to their low erosion potential and general improvement over time dating back to the 2009 baseline survey.

The Bora Creek Tributary showed no signs of mass movement or new erosion patterns since the upgrade works that occurred in 2012. The rock rip-rap protection which was installed as part of the upgrade works has provided structure to the cut banks of the tributary. There has been a slight increase in the vegetation cover within section of the creek bed. The vegetation strike along the re-graded eastern bank is very limited and is thought to be caused by poor soil fertility. The majority of the straw mulch used in the rehabilitation remains and is providing protection of the batter against erosion.

The vegetation coverage along the creek lines varied slightly compared to the 2012 survey. There was a slight increase in vegetation coverage within the channel bed of the Bora Creek Tributary, a slight decrease of vegetation coverage on the banks of Moolarben Creek and similar levels along Bora Creek. The vegetation coverage was still greater in all areas than observed during the 2009 baseline survey. There has been no notable invasion of weed species along the creek lines since the baseline survey.

It can be concluded that the sites experiencing active erosion along Bora Creek, Bora Creek Tributary and Moolarben Creek is predominantly the result of natural influences, exacerbated by past land clearing and agricultural practices exposing dispersive soils with only minimal contribution to the impacts observed being attributed to mining operations.

The channel stability monitoring program will continue on an annual basis or following significant flow events to monitor any changes in the channel stability of surrounding creeks.

3.6.9 Activities in the Next Reporting Period

Surface water monitoring will continue to be undertaken with the results to be provided in the next AEMR.

Installation of the new flow monitoring system on Bora Creek will be undertaken during the next reporting period.

The revised WMP will be implemented during the next reporting period including the establishment of additional monitoring sites.

3.7 GROUND WATER MANAGEMENT

3.7.1 Activities This Reporting Period

During the reporting period MCO continued to operate in accordance with its Water Management Plan (WMP). The WMP includes a process for the review of data on a monthly basis against trigger levels. This review was ongoing throughout the reporting period.

During the reporting period MCO reviewed and updated the WMP to include proposed activities in Open Cut 2 and Open Cut 3. At the end of the reporting period MCO was awaiting approval of the updated WMP from DP&I. Preparation of the updated WMP included a review of the adequacy of the groundwater monitoring program with no changes being made to the monitoring program.

Active groundwater management strategies were not required during the reporting period as there were no mining activities during the reporting period that impacted on groundwater.

3.7.2 Groundwater Monitoring

Piezometers have been installed to monitor water level and water quality associated with lithological units. These include:

- Quaternary Alluvium;
- Tertiary paleochannel deposits;
- Upper Triassic (and overlying Jurassic where present);
- Lower Triassic;
- Upper Permian coal measures;
- Middle Permian coal measures;
- Ulan Seam coal measures;
- Shoalhaven Group (Marrangaroo Formation and Nile SubGroup); and
- Basement (consisting mostly of granites and metavolcanics).

During the reporting period MCO monitored an extensive network of monitoring bores with depths ranging from less than 10m to over 150m. The locations of these piezometers are shown in **Figure 5**. Groundwater monitoring locations are sampled monthly for standing water level and chemical analysis is conducted in accordance with the WMP.

MCO do not have any groundwater quality criteria. Trigger values have been developed to act as triggers for further investigations into groundwater quality and depth. These triggers can be seen in **Table 35** and **Table 36**. The 80th percentile figure is used for internal investigation purposes only. If an investigation into results outside the maximum range finds that MCO is responsible for this result, it will be treated as a non-compliance and reported to regulators and affected landowners. If the investigation finds that MCO is not responsible no further action will be taken.

Table 35: Trigger Levels for Key Groundwater Monitoring Parameters

Site No.	pH		Electrical Conductivity (µS/cm)		Water Level (mAHD)		Justification for Monitoring Site
	80th Percentile Trigger Value	Maximum Range Reported	80th Percentile Trigger Value	Maximum Reported	80th Percentile Trigger Value	Minimum Reported	
PZ003	6.5-8.0	5.7-7.2	2,200	3,210	470.545	470.428	Located near OC3
PZ004	6.5-8.0	6.0-8.0	4,300	4,400	490.998	489.088	Located near OC3
PZ018	6.5-8.0	4.8-6.9	2,200	2,200	451.855	451.463	Background for Stage 2
PZ039	6.5-8.0	5.5-7.3	2,200	2,200	417.482	417.225	Background for Stage 2
PZ040b	6.5-8.0	5.5-7.1	2,200	2,200	419.740	419.444	Background for Stage 2
PZ041b	6.5-8.0	5.2-7.1	6,200	6,300	415.313	412.103	Background for Stage 2
PZ043a	6.5-8.0	5.8-7.2	2,552	2,600	489.574	489.318	Located near OC3
PZ043b	6.5-8.0	3.5-4.9	4,700	4,700	493.957	493.895	Located near OC3
PZ044	6.5-8.0	5.6-7.5	3,000	3,000	479.321	478.695	Located near OC3
PZ050b	6.5-8.0	5.5-7.5	2,200	2,200	432.031	431.711	Background for Stage 2
PZ050c	6.5-8.0	5.5-12.5	2,200	2,500	439.508	439.372	Background for Stage 2
PZ055	6.5-8.0	5.2-7.1	2,200	2,200	See Table 36		Located near OC1
PZ058	6.5-8.0	2.5-4.9	11,880	16,000	467.628	467.543	Located near OC3
PZ072a	6.5-8.0	6.2-7.9	2,200	2,200	496.112	494.852	Located near OC3
PZ072c	6.5-8.0	6.2-7.9	3,500	3,500	503.998	503.268	Located near OC3
PZ074	6.5-8.0	5.7-7.6	4,980	5,170	501.422	501.371	Located near OC3
PZ101b	6.5-8.0	6.0-8.0	2,200	2,200	363.858	363.484	Located above UG4
PZ101c	6.5-8.0	5.9-11.9	2,200	3,600	see Table 37		Located above UG4
PZ102a	6.5-8.0	6.1-8.3	2,432	2,550	357.997	355.627	Located above UG4
PZ102b	6.5-8.0	5.9-7.9	2,500	2,540	355.354	354.769	Located above UG4
PZ103a	6.5-8.0	5.4-8.1	2,200	2,200	357.927	355.985	Located above UG4
PZ103b	6.5-8.0	5.1-9.5	2,200	2,200	391.162	366.970	Located above UG4
PZ103c	6.5-8.0	5.1-13.1	2,200	13,000	see Table 37		Located above UG4
PZ104	6.5-8.0	5.9-13.1	8,360	8,900	380.681	380.166	Located near Southern Borefield
PZ105a	6.5-8.0	5.3-7.8	2,200	2,200	360.224	359.214	Located above UG4
PZ105b	6.5-8.0	6.2-7.9	2,200	2,200	376.660	375.052	Located above UG4
PZ105c	6.5-8.0	5.1-6.8	2,200	2,200	see Table 37		Located above UG4
PZ106a	6.5-8.0	5.8-12.3	2,200	3,800	427.943	424.817	Background for Stage 2
PZ106b	6.5-8.0	4.9-8.2	2,200	2,200	502.261	502.032	Background for Stage 2
PZ107	6.5-8.0	4.7-7.1	2,200	2,200	432.583	432.511	Background for Stage 2
PZ108R	6.5-8.0	5.6-8.0	2,200	2,200	333.953	332.843	Located near UG4
PZ109	6.5-8.0	6.1-12.3	2,200	2,200	383.045	382.990	Located near UG4
PZ111	6.5-8.0	5.8-7.0	2,200	2,200	379.794	379.703	Background for Stage 2
PZ112b	6.5-8.0	4.3-6.7	7,300	8,100	479.334	479.164	Background for Stage 2
PZ125	6.5-8.0	5.0-6.7	7,300	8,100	412.648	412.588	Located near OC1
PZ127	Not applicable due to vibrating wire piezometer being installed						Background for Stage 2
PZ128	Not applicable due to vibrating wire piezometer being installed						Located above UG4
PZ129	Not applicable due to vibrating wire piezometer being installed						Located near UG4
PZ130	Not applicable due to vibrating wire piezometer being installed						Background for Stage 2
PZ131	6.5-8.0	5.6-7.2	6,438	6,590	433.468	433.388	Background for Stage 2
PZ134	6.5-8.0	5.1-6.1	4,800	4,800	431.459	431.059	Background for Stage 2
PZ137	6.5-8.0	5.1-6.7	2,200	2,200	461.020	460.922	Background for Stage 2
PZ141	6.5-8.0	4.2-5.4	5,200	5,300	461.723	461.623	Background for Stage 2
PZ149	6.5-8.0	5.1-6.7	5,100	5,700	467.739	467.196	Background for Stage 2
PZ150	6.5-8.0	5.1-6.4	5,190	6,700	377.191	377.085	Background for Stage 2
PZ151	6.5-8.0	5.7-7.0	2,200	2,200	374.567	374.510	Background for Stage 2

Site No.	pH		Electrical Conductivity (µS/cm)		Water Level (mAHD)		Justification for Monitoring Site
	80th Percentile Trigger Value	Maximum Range Reported	80th Percentile Trigger Value	Maximum Reported	80th Percentile Trigger Value	Minimum Reported	
PZ152	6.5-8.0	5.1-6.4	6,800	6,800	442.200	442.000	Background for Stage 2
PZ155	6.5-8.0	5.8-6.6	7,980	8,000	438.042	437.979	Background for Stage 2
PZ156	6.5-8.0	4.3-7.1	2,200	2,200	372.591	372.278	Background for Stage 2
PZ157	6.5-8.0	5.9-7.6	2,200	2,200	373.723	373.153	Background for Stage 2
PZ164	6.5-8.0	3.4-5.1	9,200	10,000	See Table 36		Background for Stage 2
PZ165	6.5-8.0	5.9-6.2	2,200	2,200	See Table 36		Background for Stage 2
PZ168	6.5-8.0	5.8-7.0	2,200	2,200	427.836	427.800	Background for Stage 2
PZ170	6.5-8.0	5.4-6.7	4,412	4,700	420.984	420.926	Background for Stage 2
PZ172	6.5-8.0	5.7-6.4	7,264	7,400	See Table 36		Background for Stage 2
PZ173	6.5-8.0	6.3-7.2	14,000	14,000	See Table 36		Background for Stage 2
PZ174	6.5-8.0	5.4-6.5	8,860	11,900	418.109	418.068	Background for Stage 2
PZ175	6.5-8.0	5.3-7.0	16,472	18,000	419.965	419.323	Background for Stage 2
PZ176	6.5-8.0	5.0-7.8	2,200	2,200	See Table 36		Background for Stage 2
PZ177	6.5-8.0	5.8-6.7	8,260	8,500	See Table 36		Background for Stage 2
PZ179	Not applicable due to vibrating wire piezometer being installed				See Table 36		Located near production bore TB179
PZ181	6.5-8.0	5.3-5.9	2,200	2,200	See Table 36		Background for Stage 2
PZ184	6.5-8.0	3.9-5.6	4,360	4,460	412.456	412.299	Background for Stage 2
PZ186	6.5-8.0	6.5-8.0	2,200	2,200	New site – insufficient data	New site – insufficient data	Between production bore TB52a and Wilpinjong Creek
PZ187	6.5-8.0	6.5-8.0	2,200	2,200	New site – insufficient data	New site – insufficient data	Between production bore TB52a and Wilpinjong Creek
PZ188	6.5-8.0	6.5-8.0	2,200	2,200	New site – insufficient data	New site – insufficient data	Between production bore TB179 and Wilpinjong Creek
PZ189	6.5-8.0	6.5-8.0	2,200	2,200	New site – insufficient data	New site – insufficient data	Between production bore TB179 and Wilpinjong Creek
PZ191	6.5-8.0	6.5-8.0	2,200	2,200	New site – insufficient data	New site – insufficient data	Between production bore TB190 and Bora Creek
TB103	6.5-8.0	5.7-7.3	2,200	2,200	369.665	367.730	Potential production bore location
TB105	6.5-8.0	6.8-7.8	2,200	2,200	359.924	359.190	Potential production bore location
OB001	6.5-8.0	4.7-7.6	2,200	2,200	Not applicable as site is a spring		
OB002	6.5-8.0	5.5-7.9	2,200	2,200	495.056	6.5-8.0	
OB003	6.5-8.0	5.7-7.7	2,200	2,900	471.662	6.5-8.0	
OB004	6.5-8.0	3.1-4.8	2,200	2,200	Not applicable as site is a spring		

Note: Shaded cells indicate ANZECC (2000) criteria

Unshaded cells indicate site developed criteria

There are nine sites within 5km of Open Cut 1 that are predicted to show drawdown from mining operations. As it is predicted that there will be impact on these sites their trigger levels have been calculated differently and can be seen in Table 36. These trigger levels are set on an exceedance of 5% of the predicted drawdown following two years of mining and water extraction from the approved bores.

Table 36: Water Level Triggers for Selected Sites

Site No.	Minimum Observed/Predicted Groundwater Level (mAHD)	Trigger Level (mAHD)
PZ055	421.83	421.50
PZ164	431.49	431.46
PZ165	435.36	435.16
PZ172	421.08	421.05
PZ173	421.82	421.47
PZ176	416.36	416.34
PZ177	415.81	415.77
PZ179 (28m) PZ179 (33m) PZ179 (82m) PZ179 (145m)	418.77 413.15 349.40 351.15	418.68 412.35 344.90 347.95
PZ181	419.71	419.67

The cease-to-pump criteria for the licensed monitoring bores surrounding the production bores are provided in **Table 37** and have been determined based on deviation from the seasonal/climatic trends established in the baseline monitoring.

Table 37: Extraction Restriction Criteria

Monitoring Bore	Expected Drawdown Level (mAHD)	Cease-to-Pump Trigger Levels (mAHD)
PZ187	416.80	415.87
PZ188	415.41	414.79
PZ101c	NA	380.1
PZ103c	NA	397.7
PZ105c	NA	376.4
PZ129(35m)	NA	387.0

Summaries of the depth monitoring results from all piezometers (including vibrating wire piezometers) are presented in **Figure 22** to **Figure 34**. A summary of pH from all piezometers is presented in **Figure 35** to **Figure 41**. **Figure 42** to **Figure 48** present the groundwater electrical conductivity from all piezometers. The full data set for the groundwater monitoring is shown in **Appendix 4**.

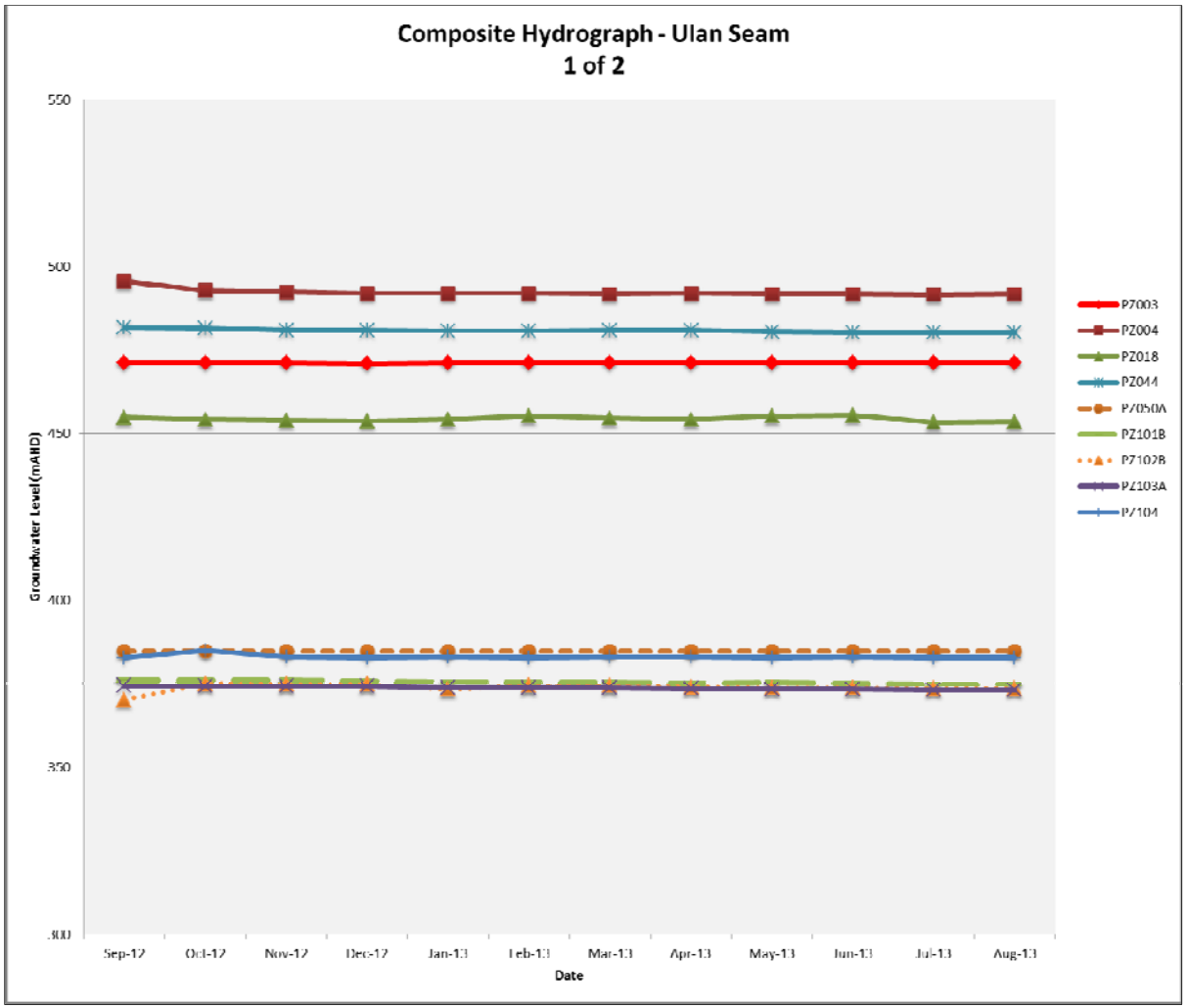


Figure 22: Composite Hydrograph 1

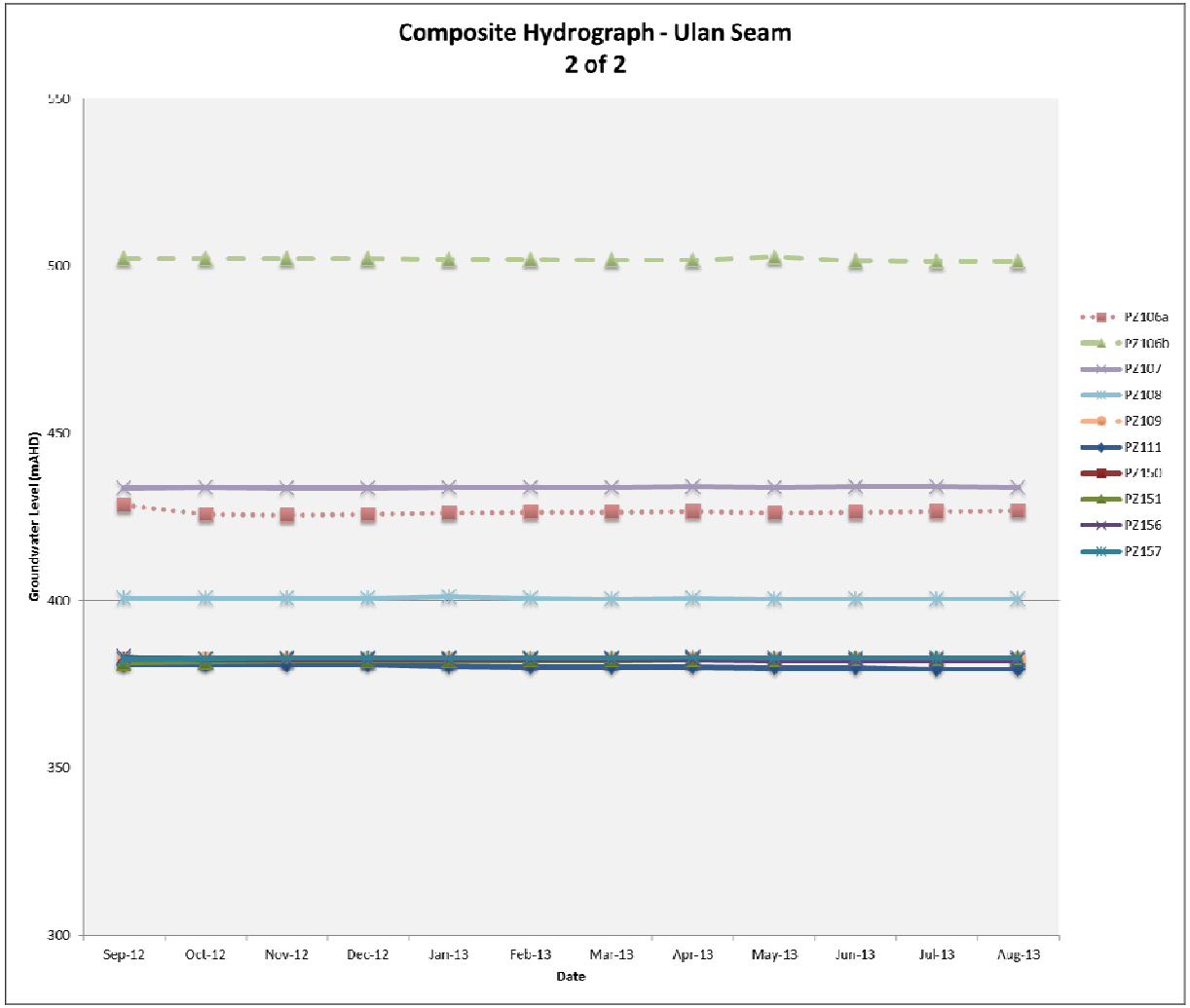


Figure 23: Composite Hydrograph 2

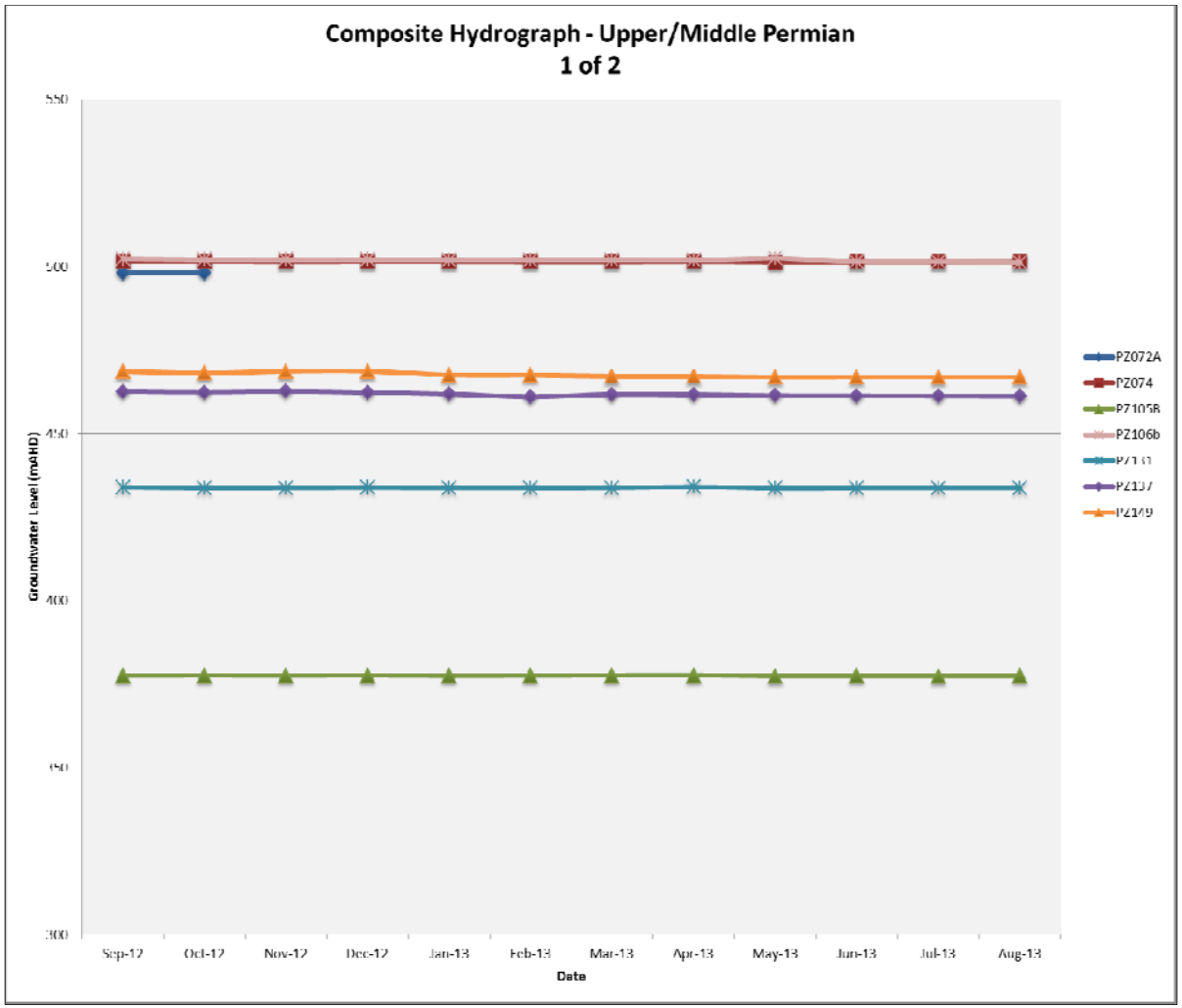


Figure 24: Composite Hydrograph 3

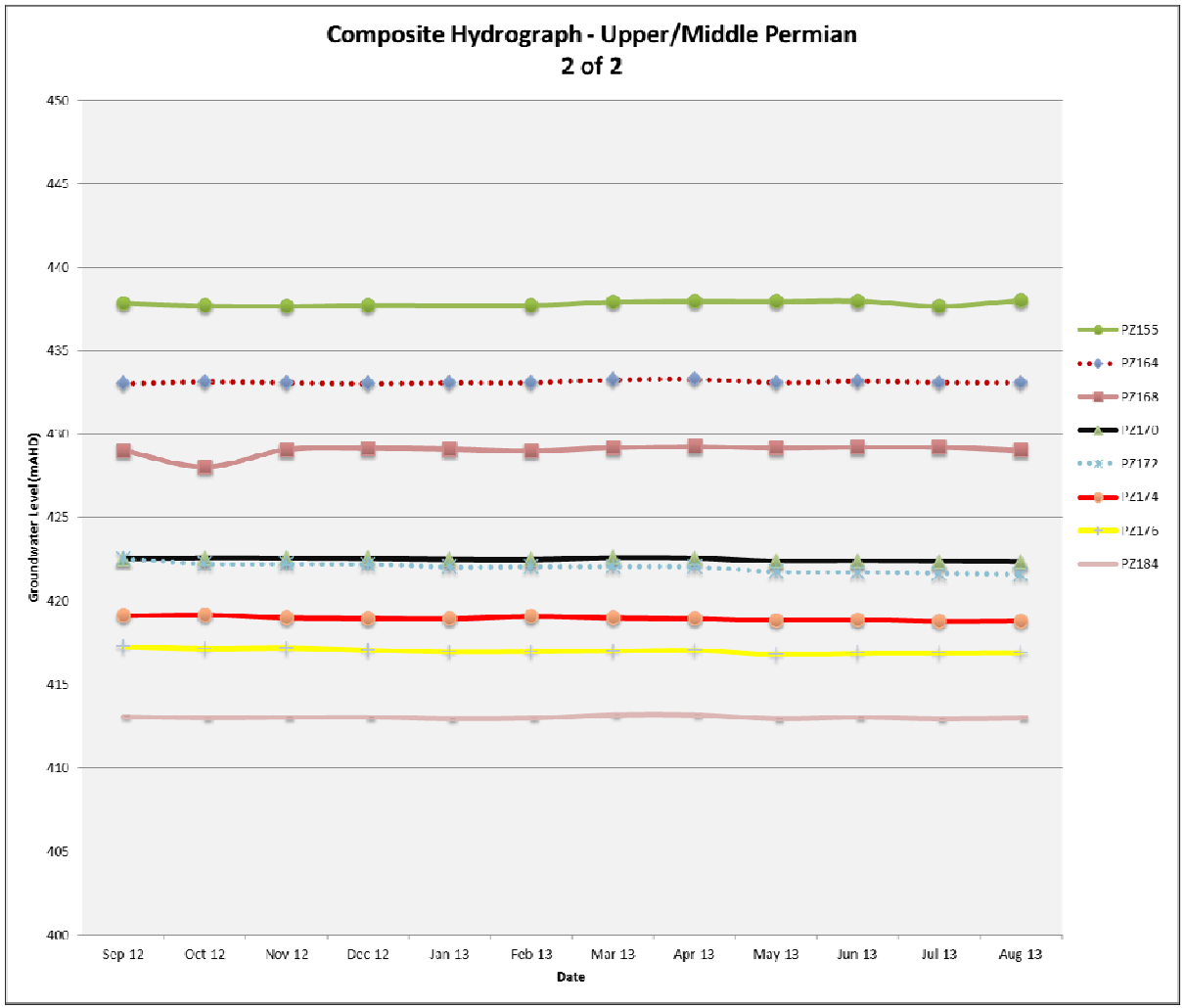


Figure 25: Composite Hydrograph 4

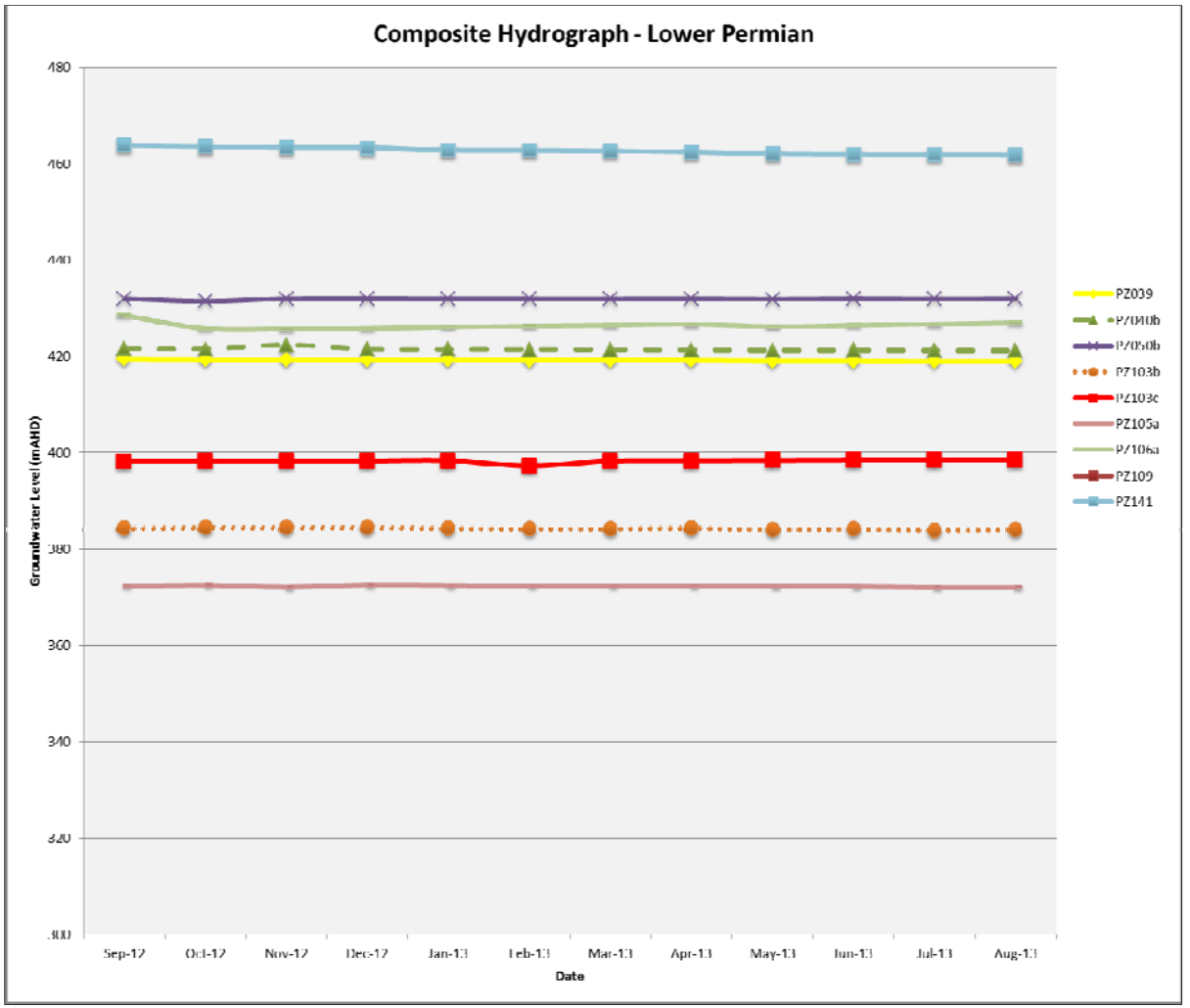


Figure 26: Composite Hydrograph 5

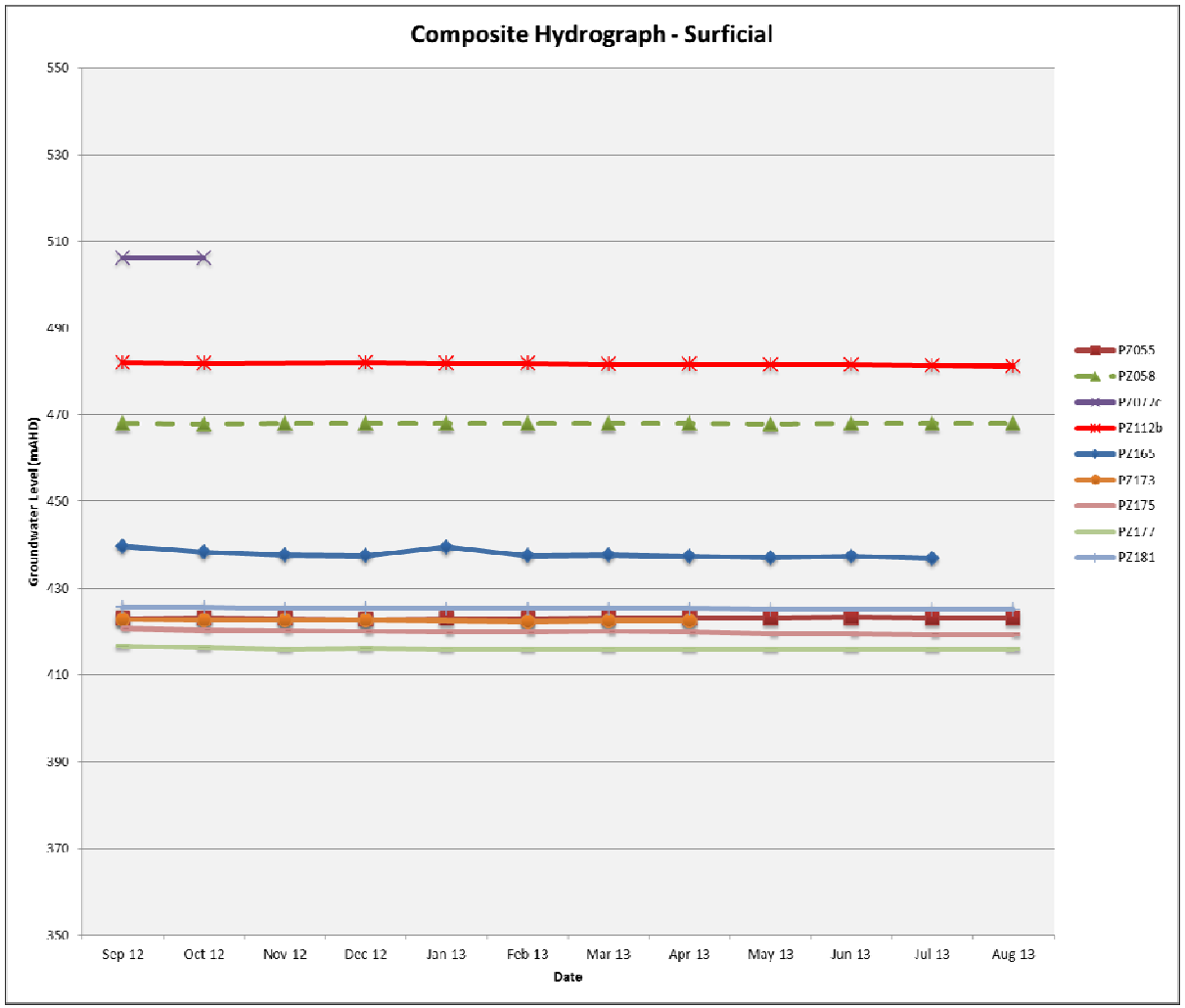


Figure 27: Composite Hydrograph 6

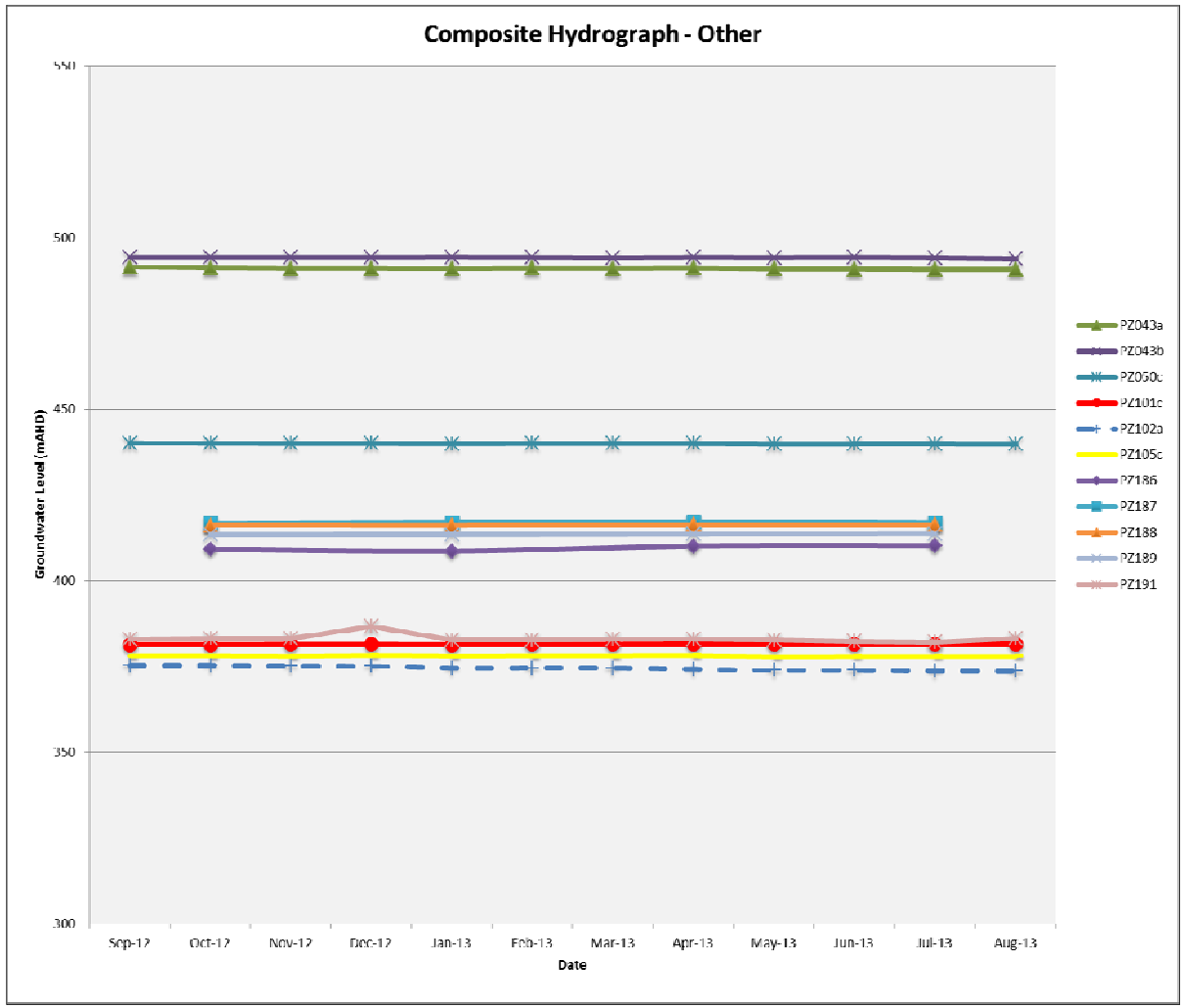


Figure 28: Composite Hydrograph 7

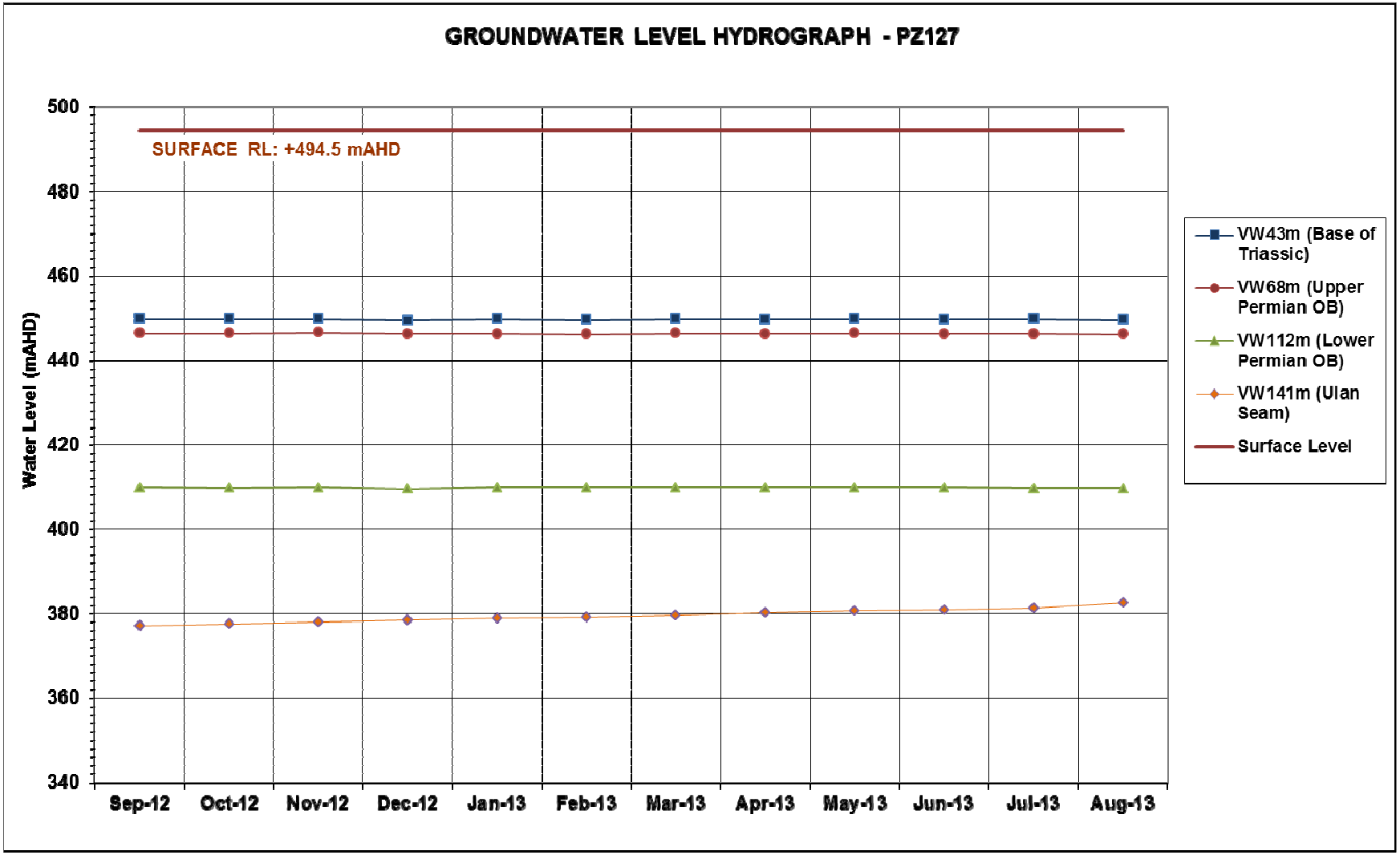


Figure 29: Hydrograph PZ127

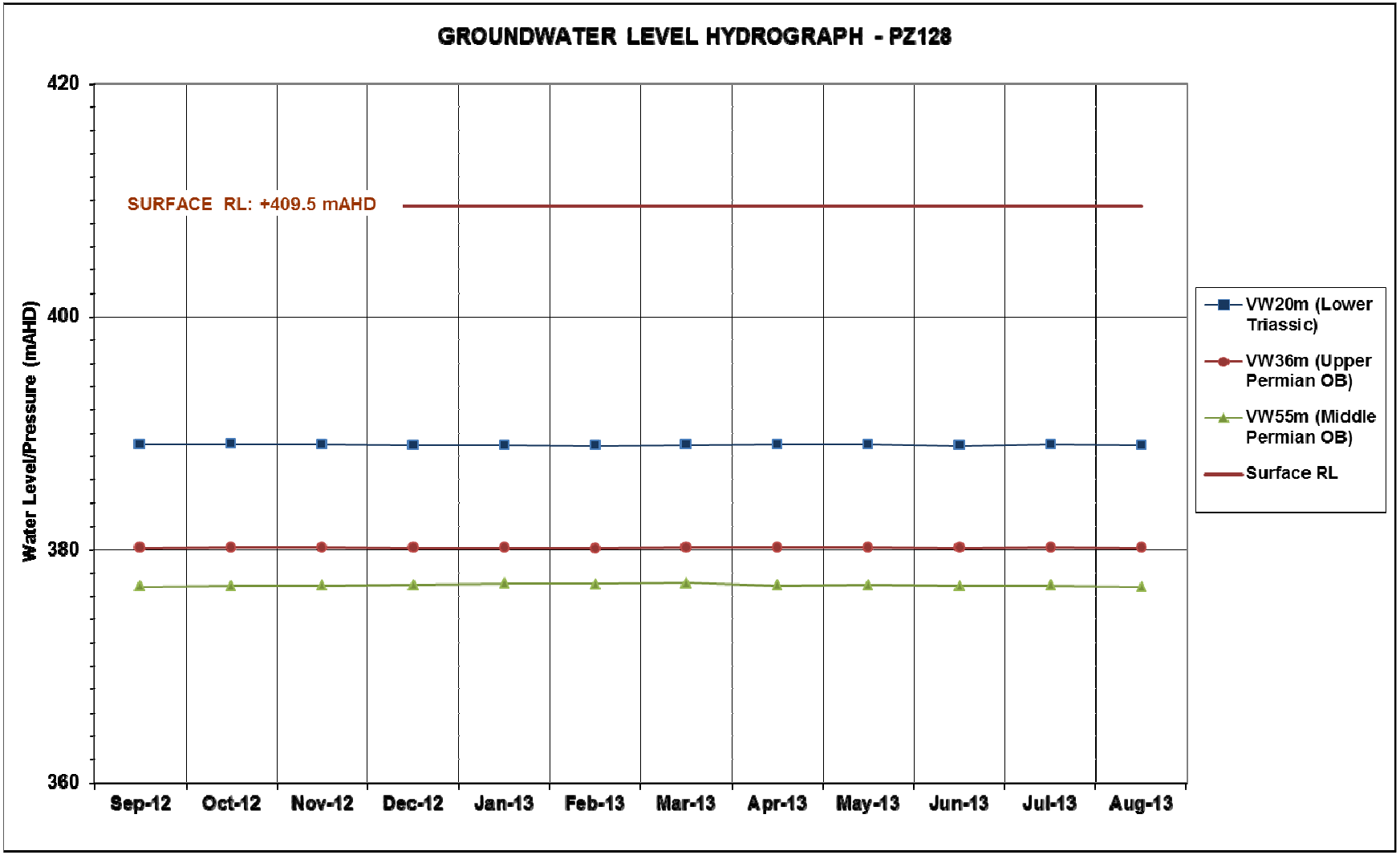


Figure 30: Hydrograph PZ128

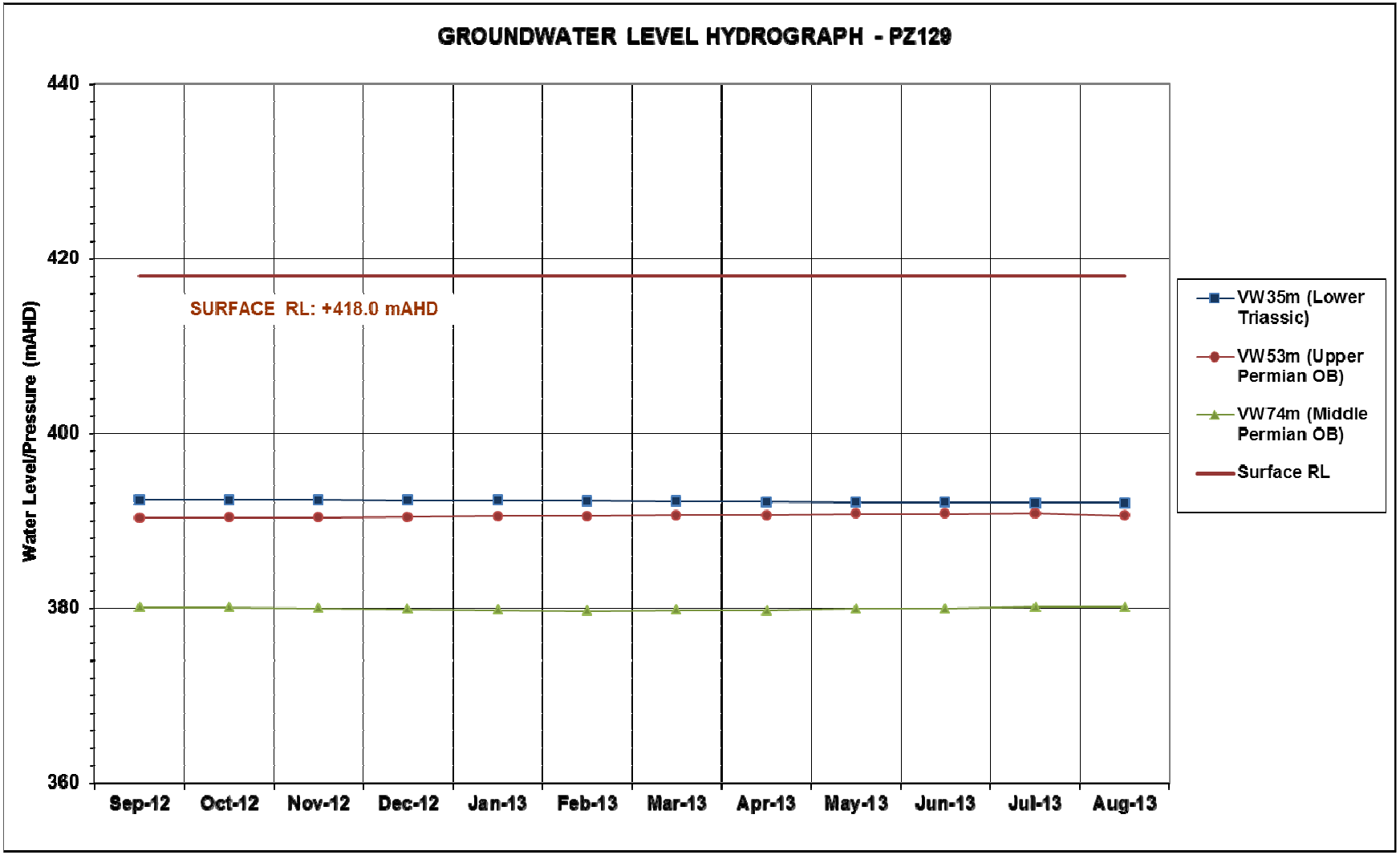


Figure 31: Hydrograph PZ129

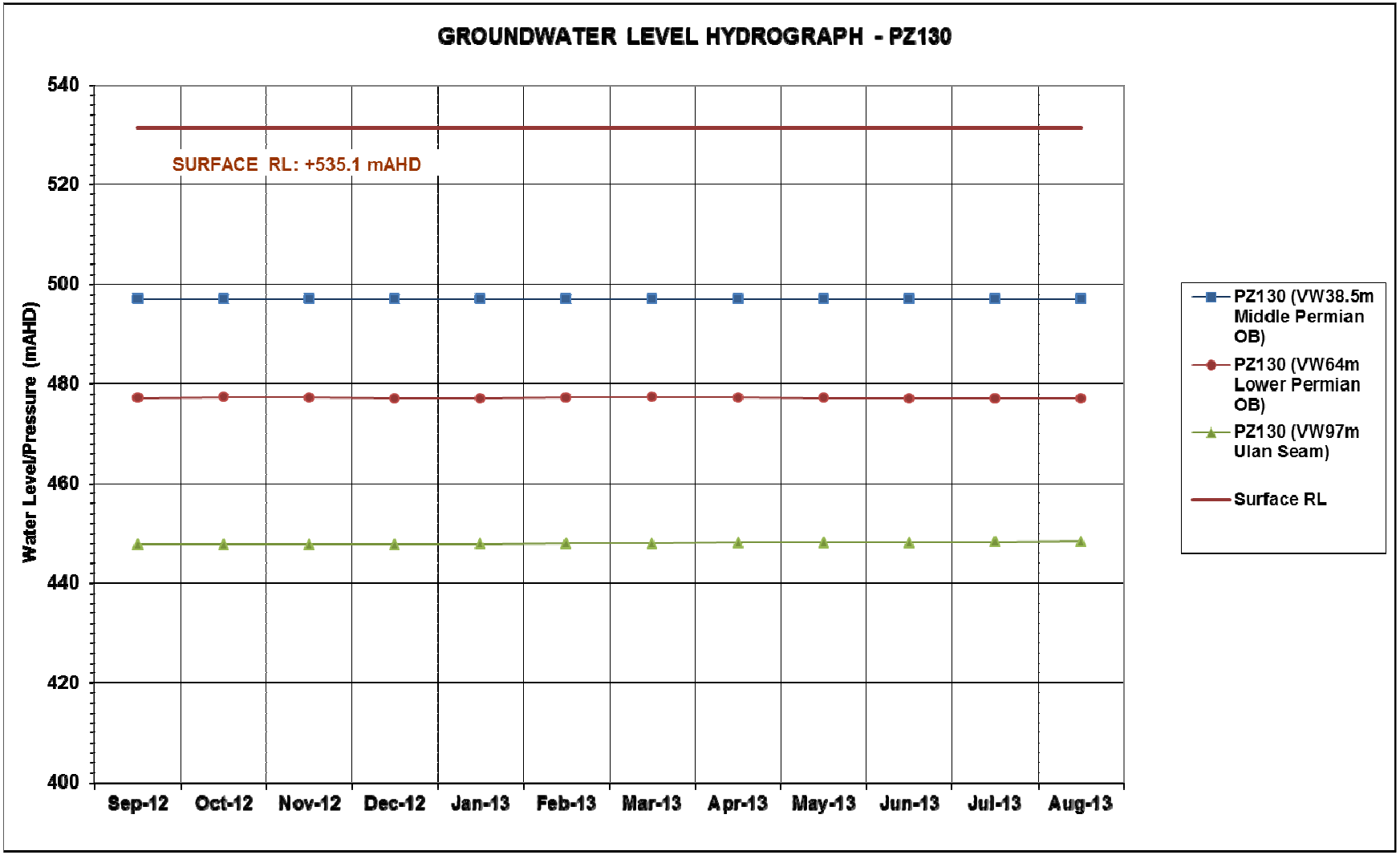


Figure 32: Hydrograph PZ130

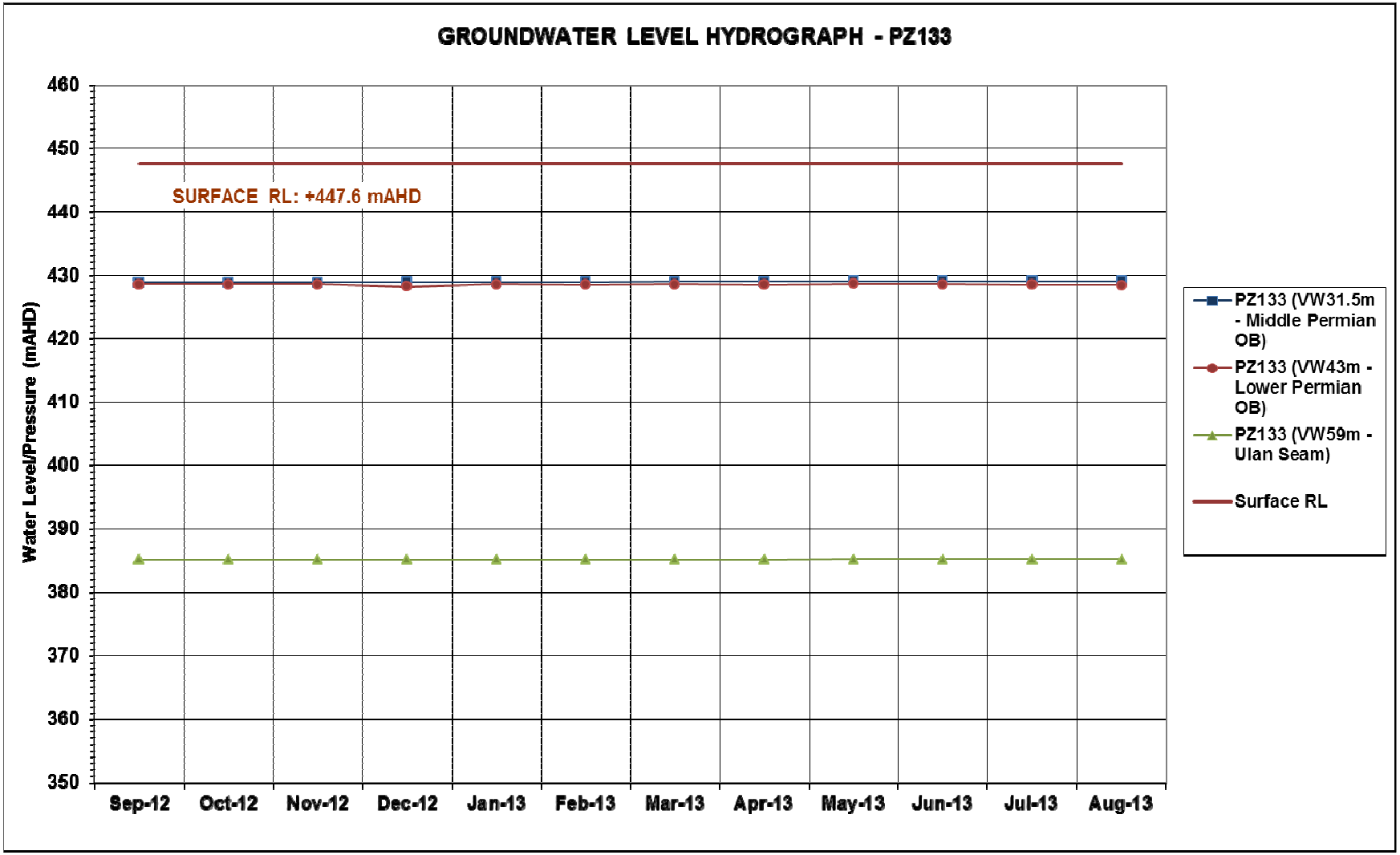


Figure 33: Hydrograph PZ133

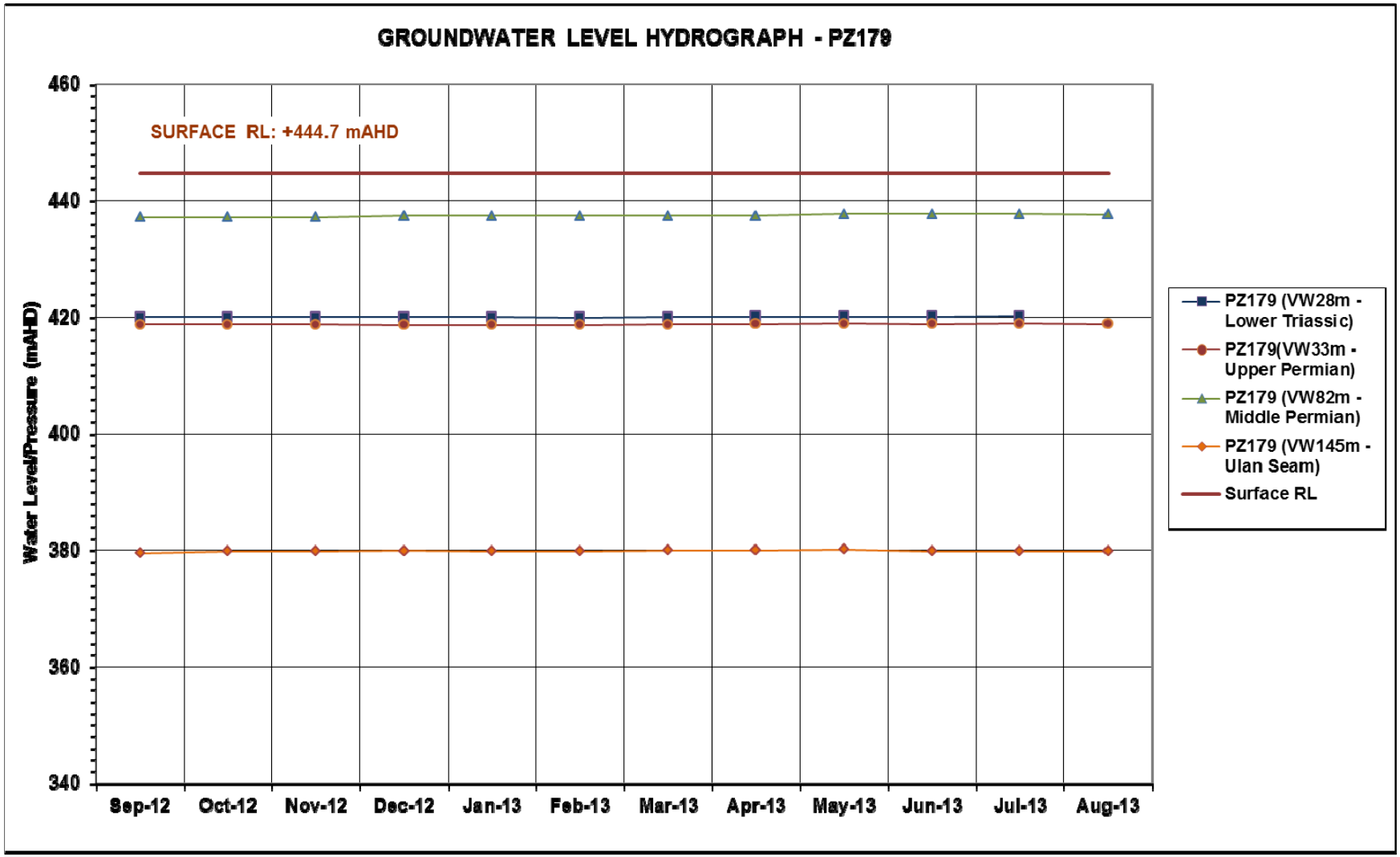


Figure 34: Hydrograph PZ179

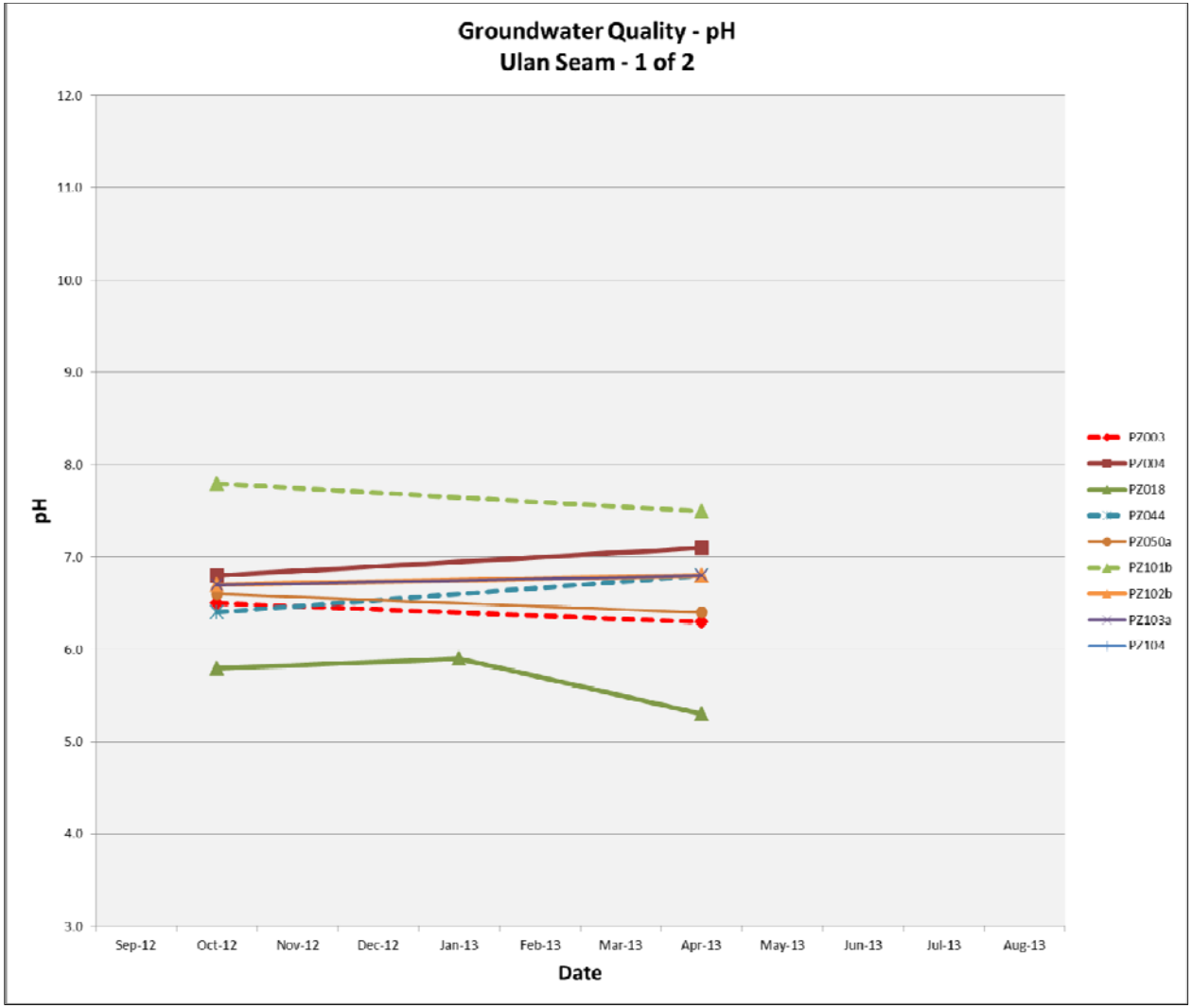


Figure 35: Groundwater pH 1

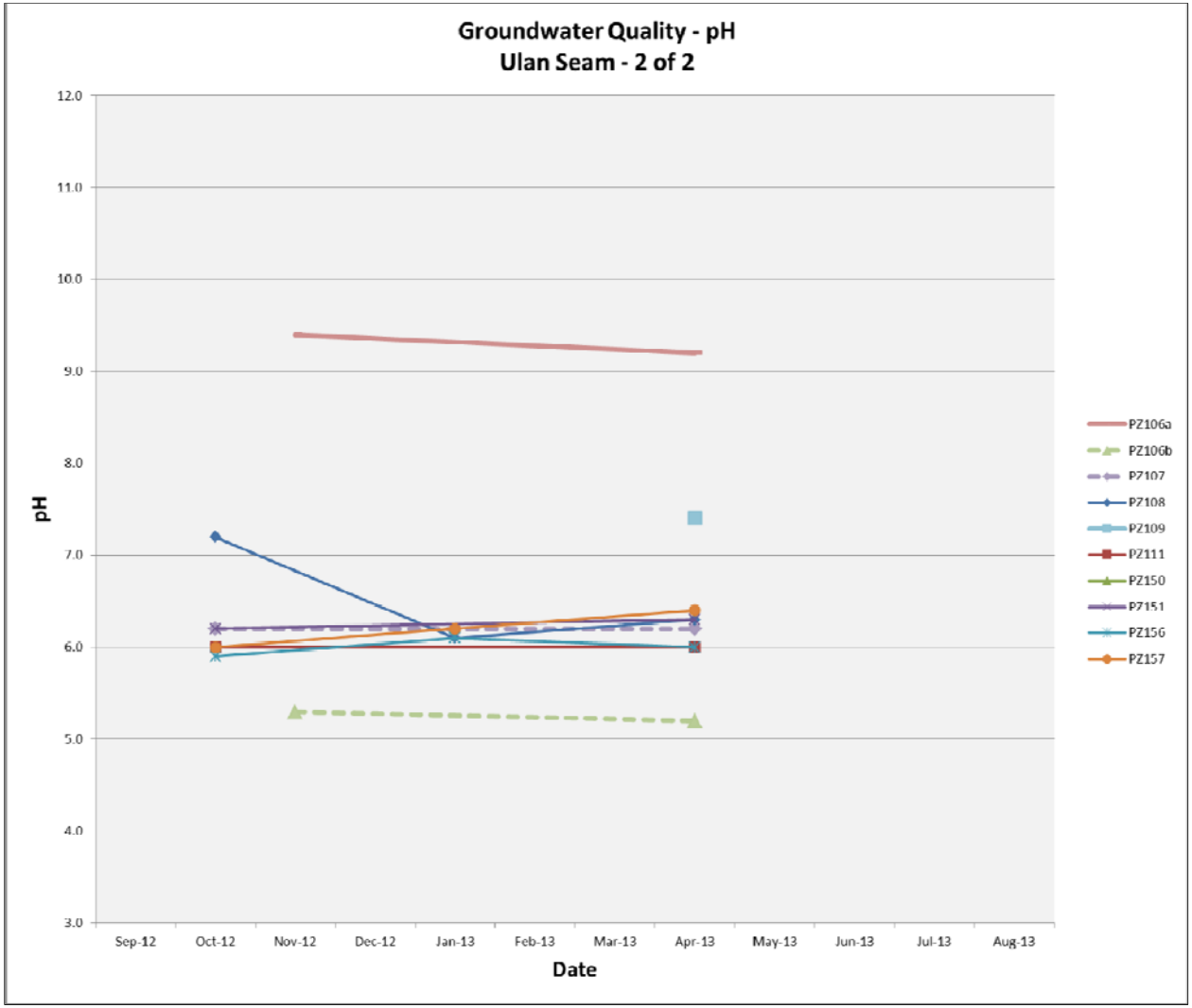


Figure 36: Groundwater pH 2

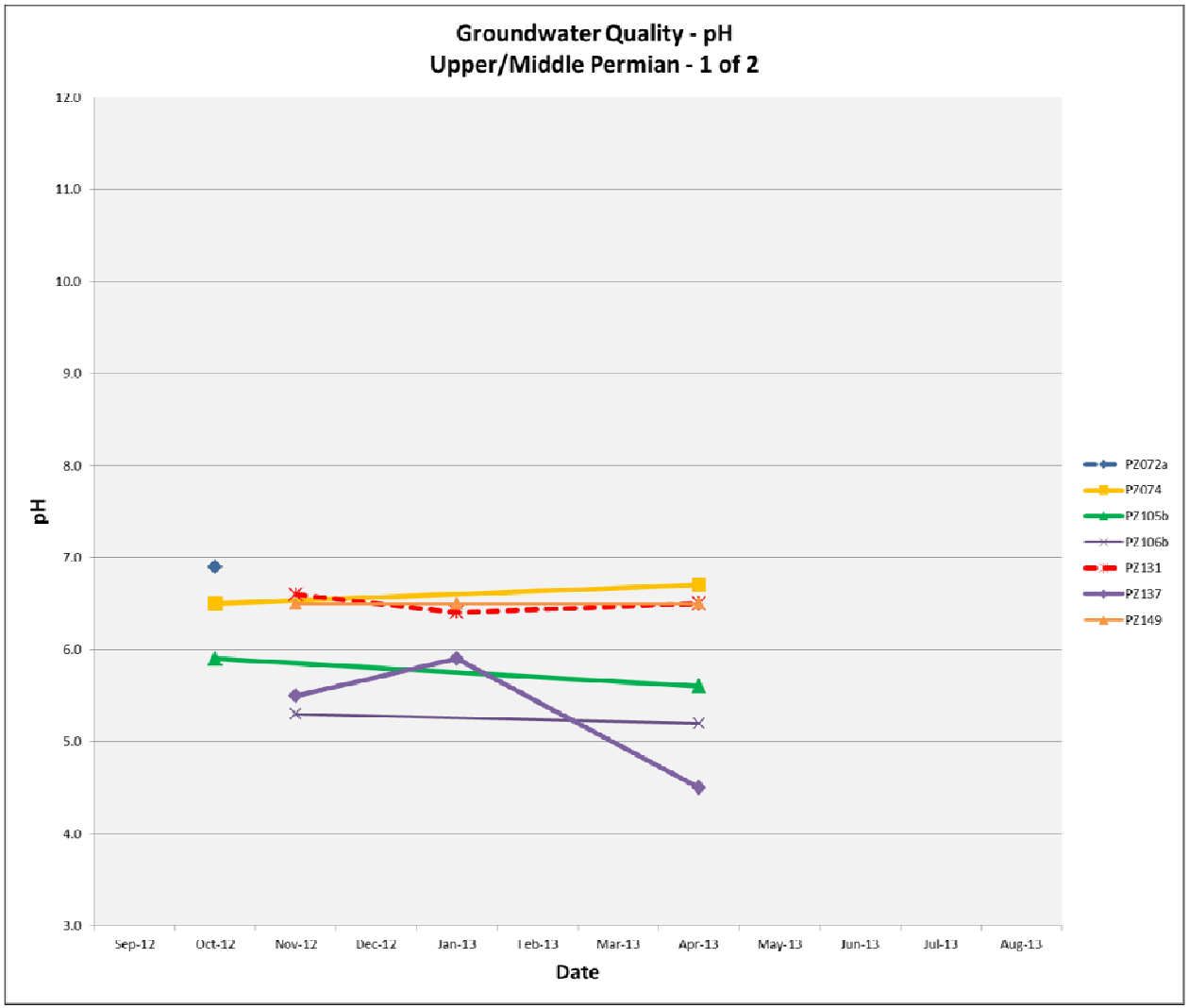


Figure 37: Groundwater pH 3

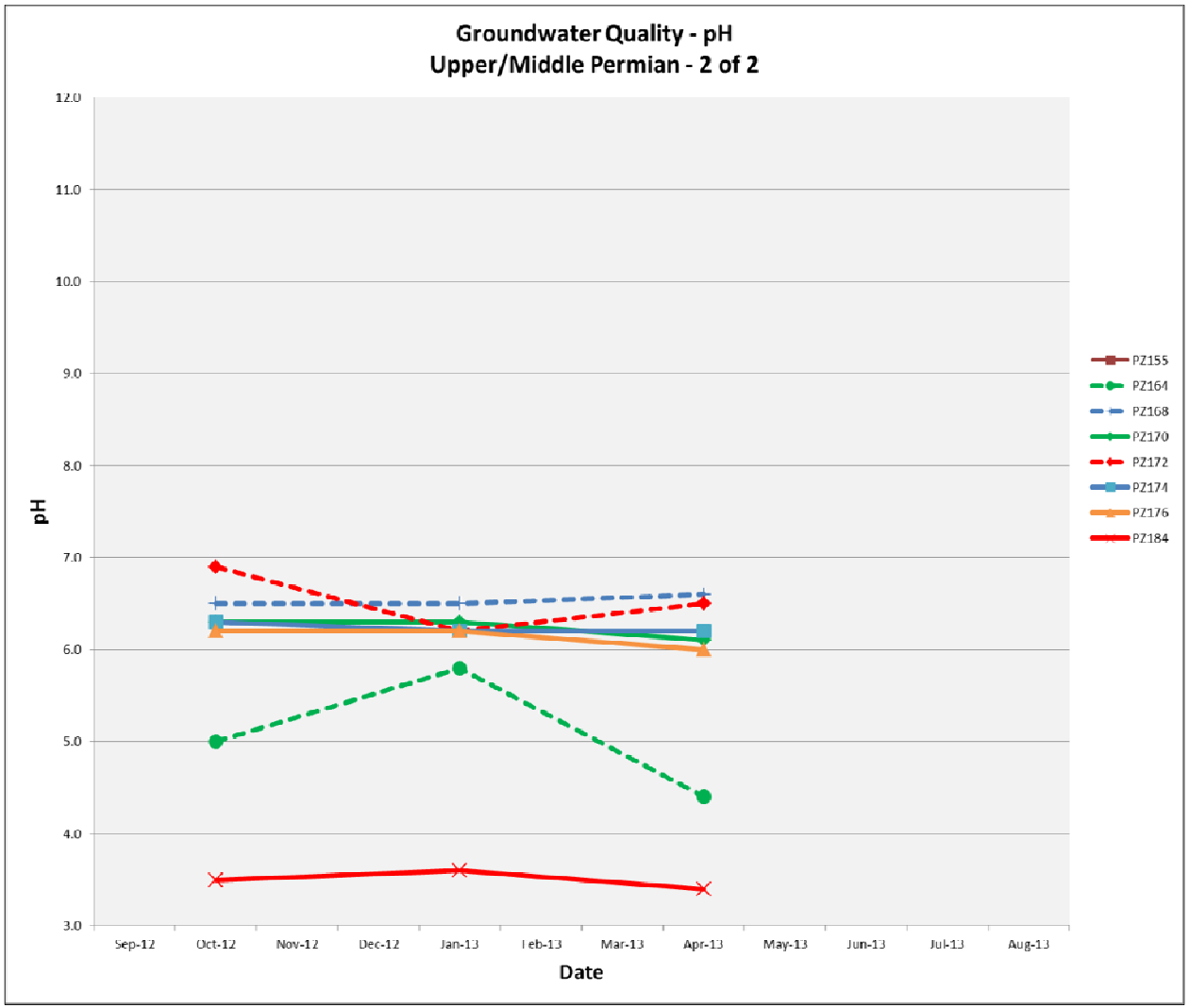


Figure 38: Groundwater pH 4

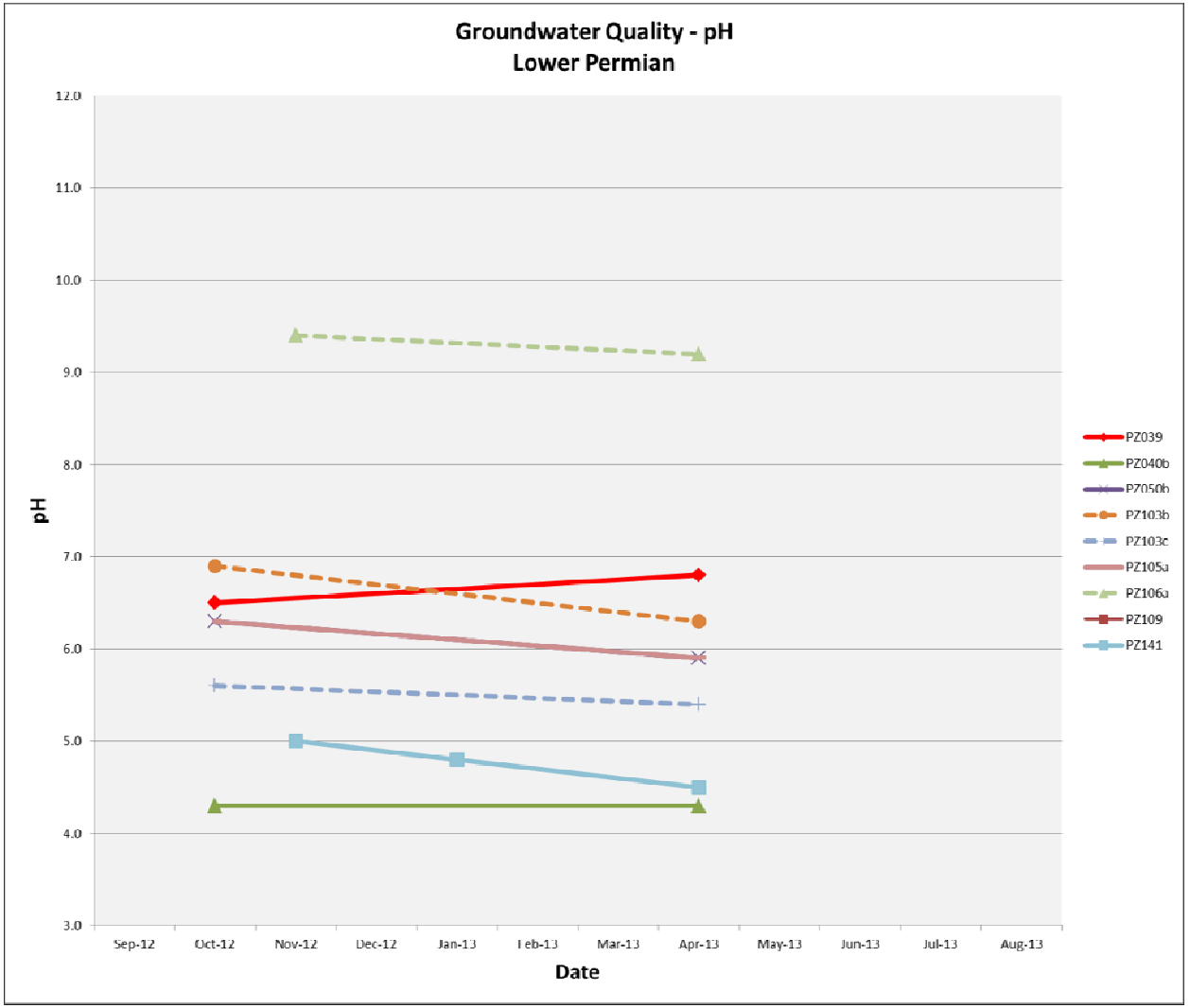


Figure 39: Groundwater pH 5

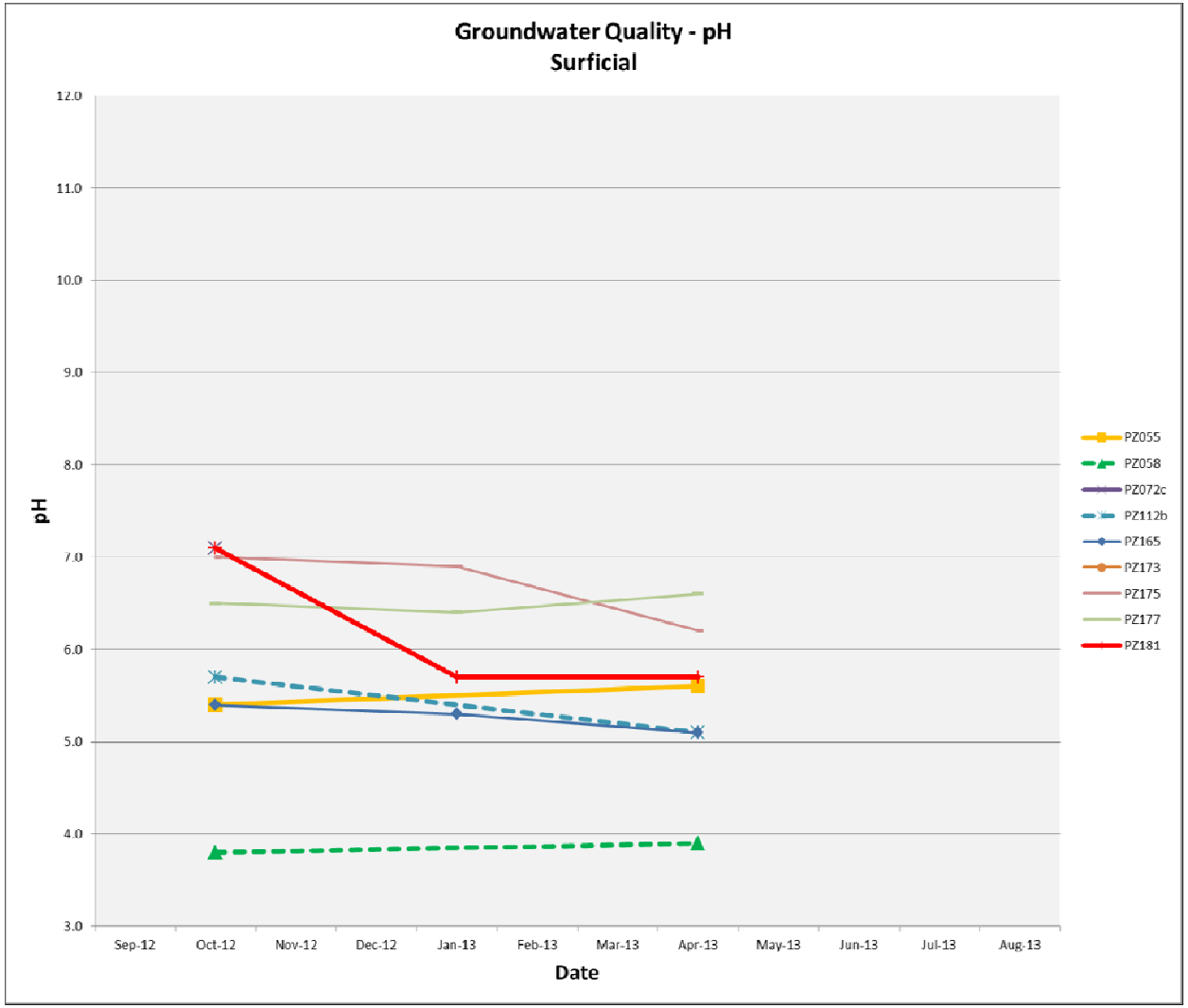


Figure 40: Groundwater pH 6

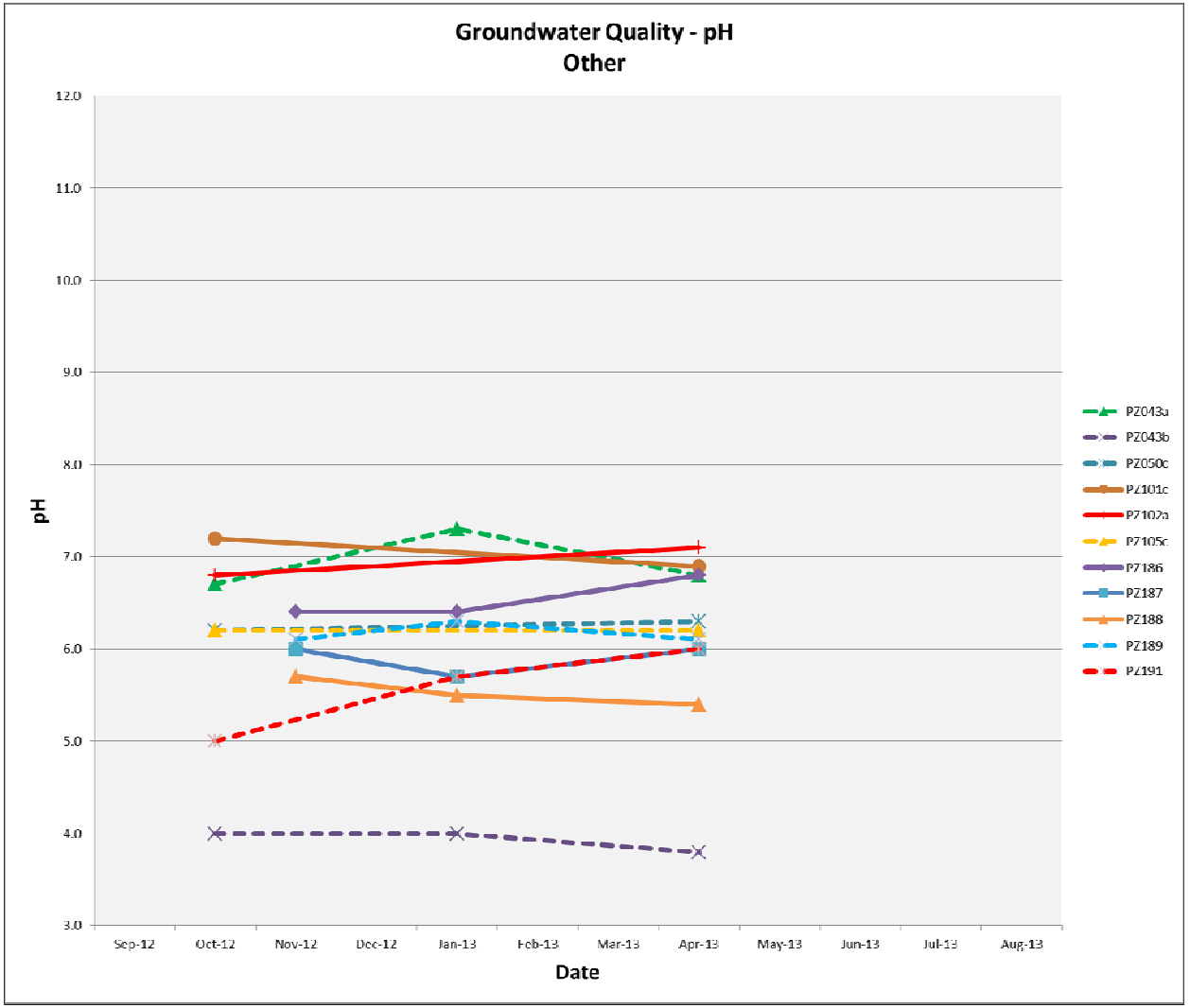


Figure 41: Groundwater pH 7

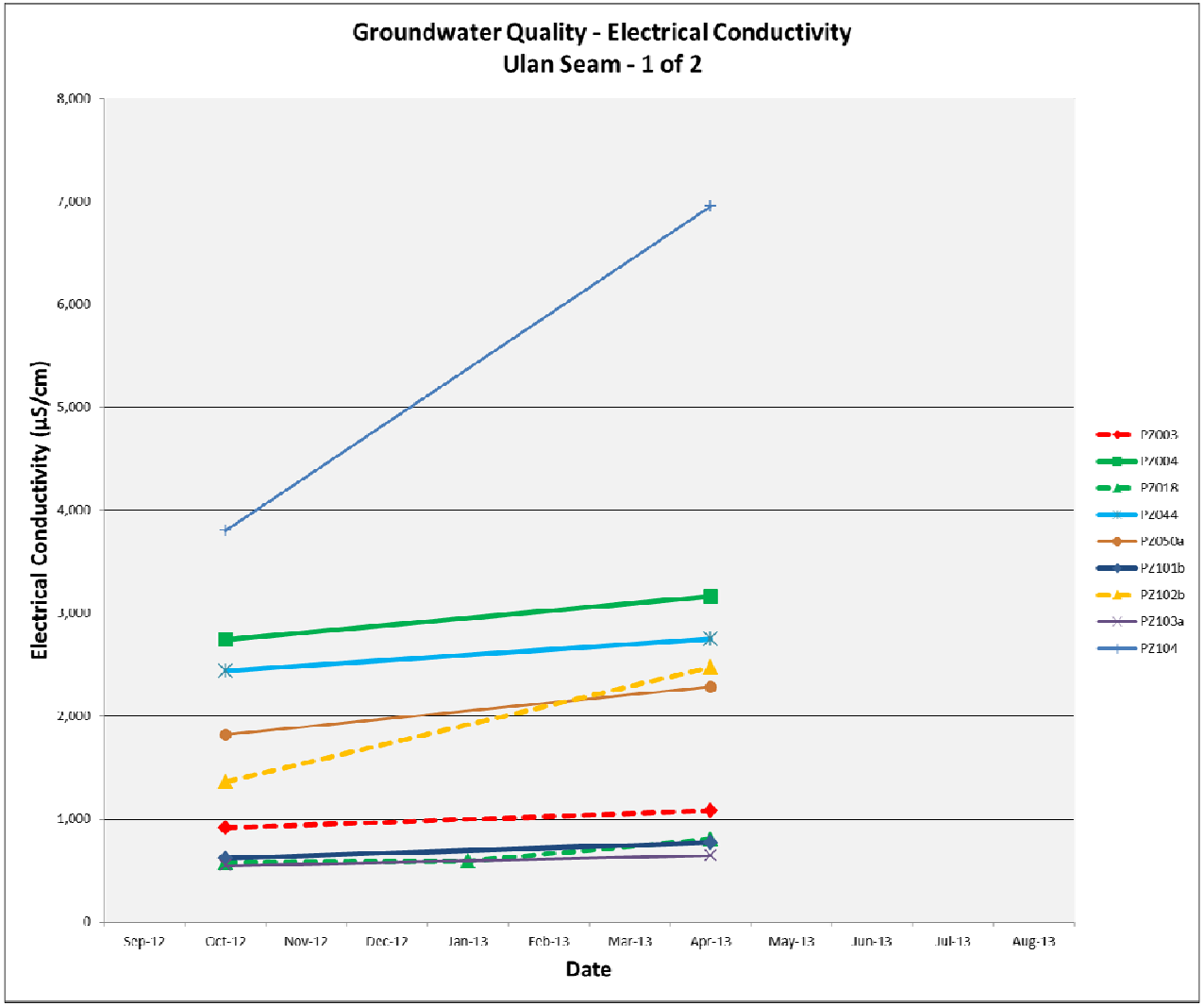


Figure 42: Groundwater Electrical Conductivity 1

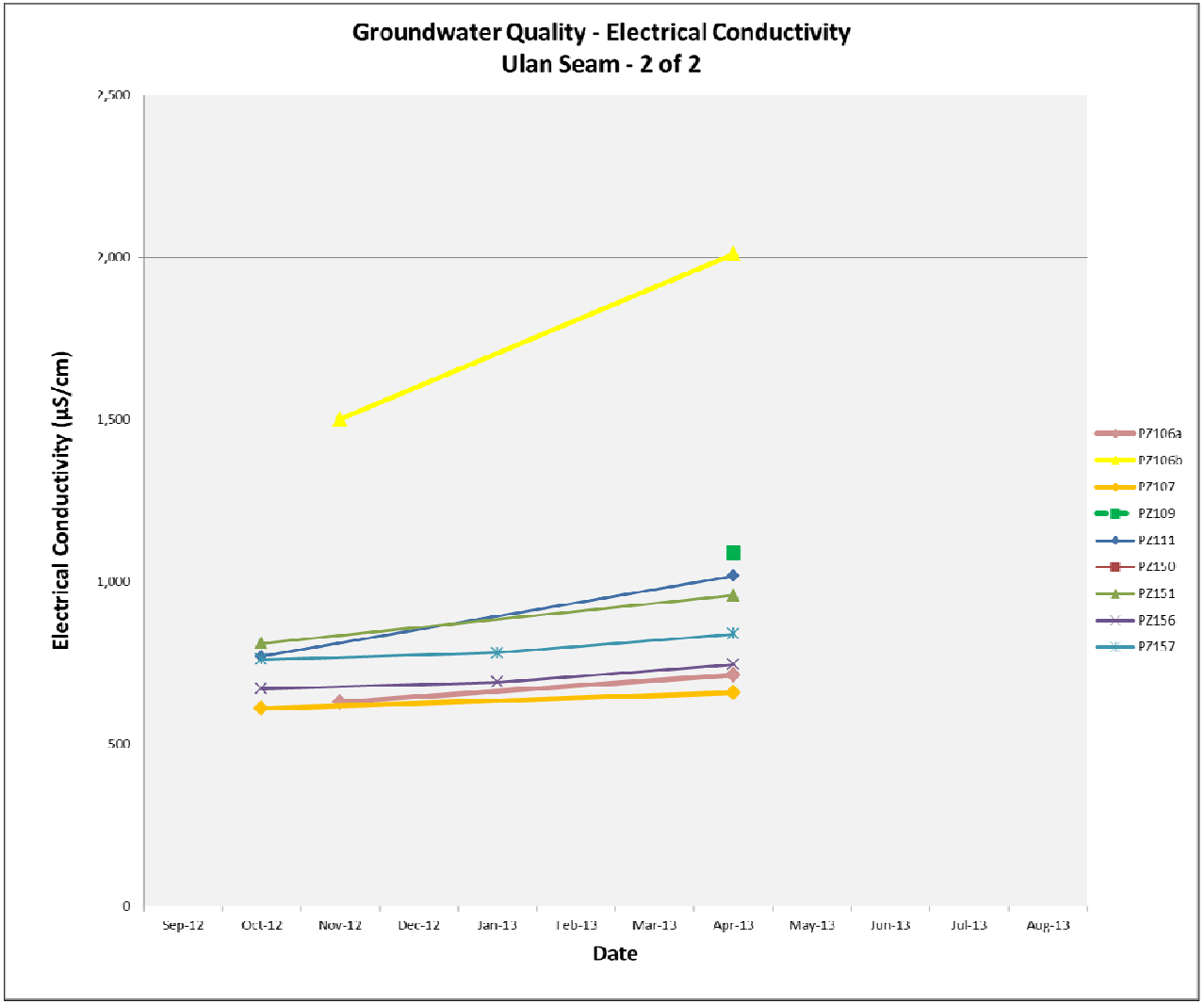


Figure 43: Groundwater Electrical Conductivity 2

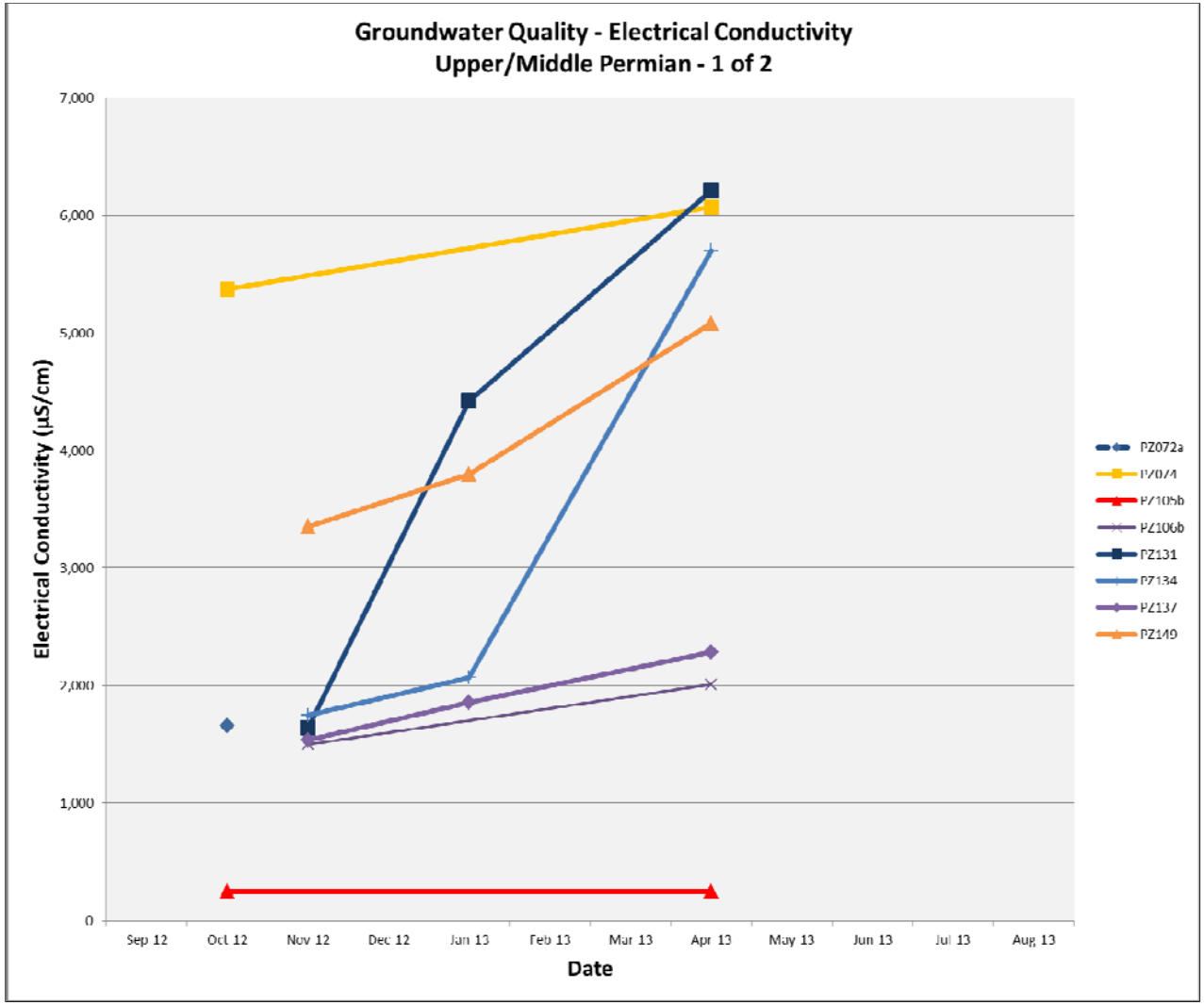


Figure 44: Groundwater Electrical Conductivity 3

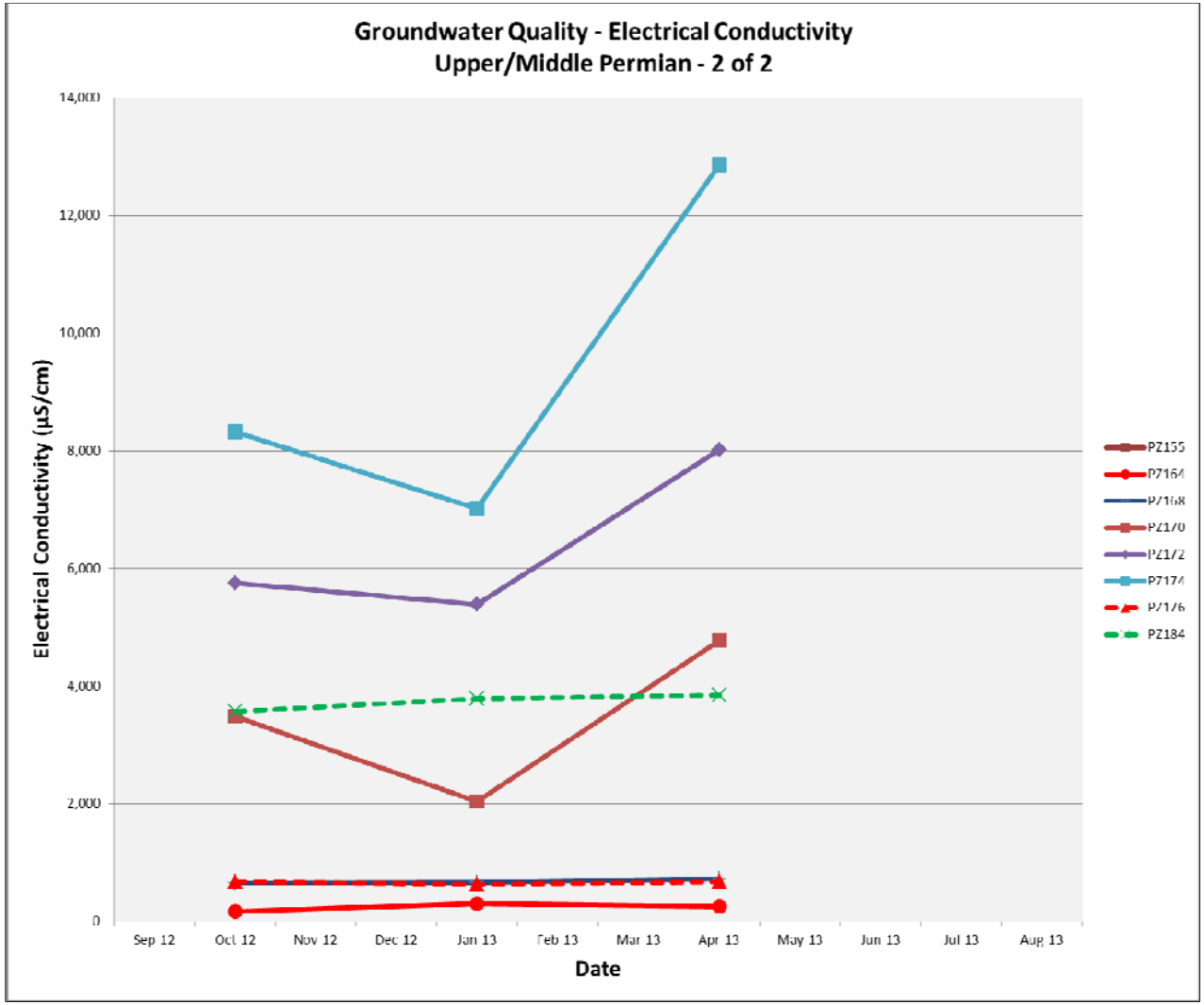


Figure 45: Groundwater Electrical Conductivity 4

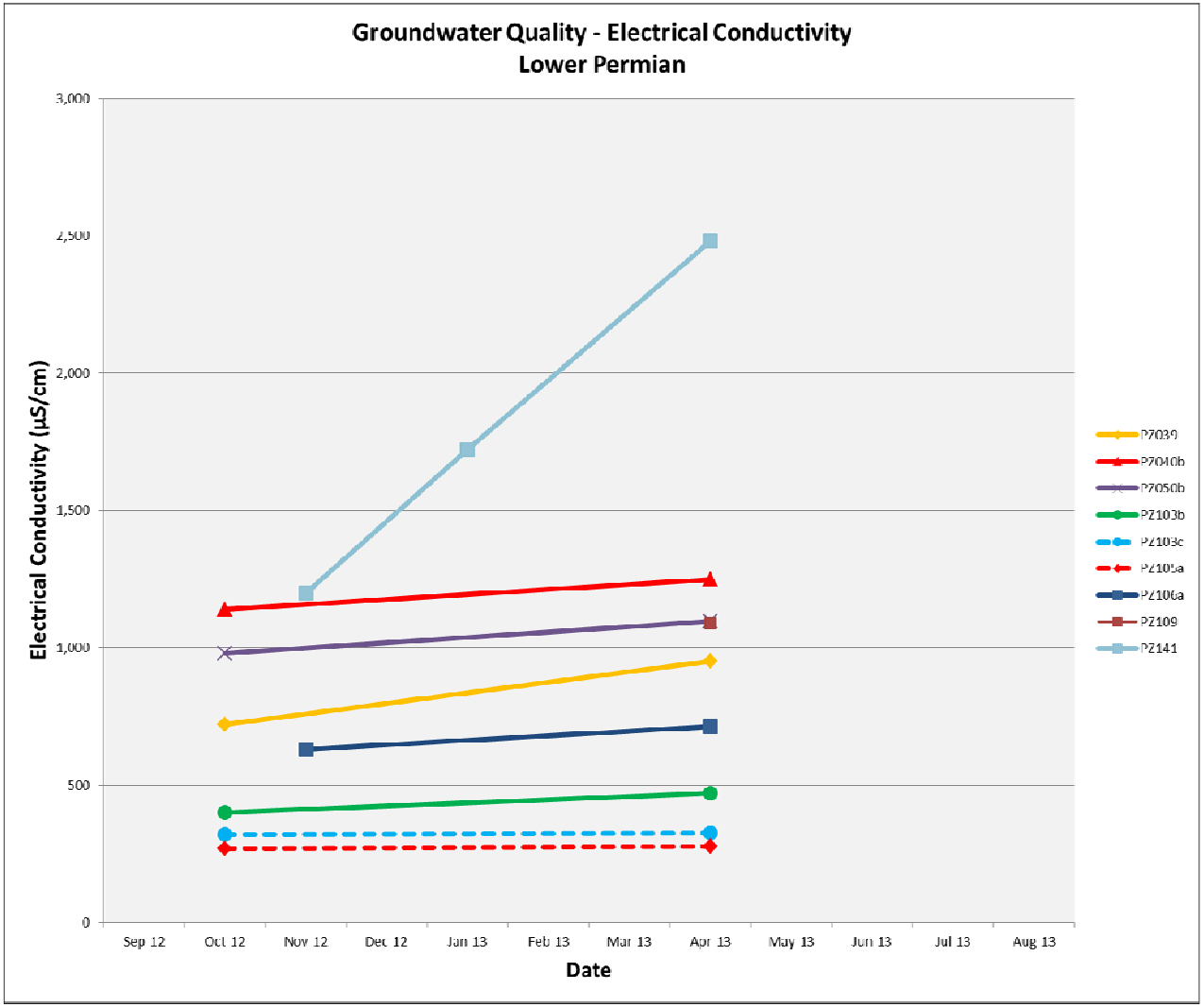


Figure 46: Groundwater Electrical Conductivity 5

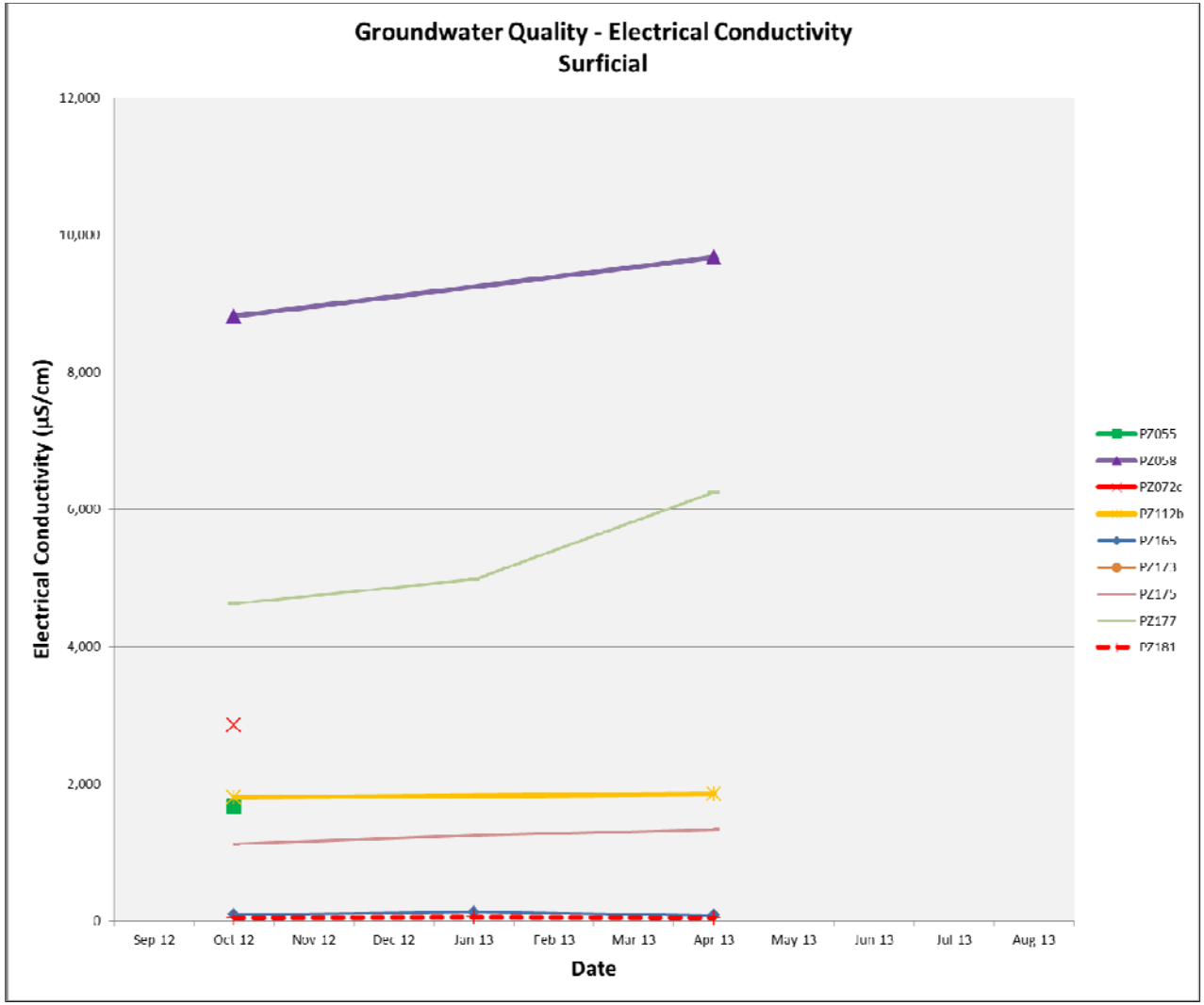


Figure 47: Groundwater Electrical Conductivity 6

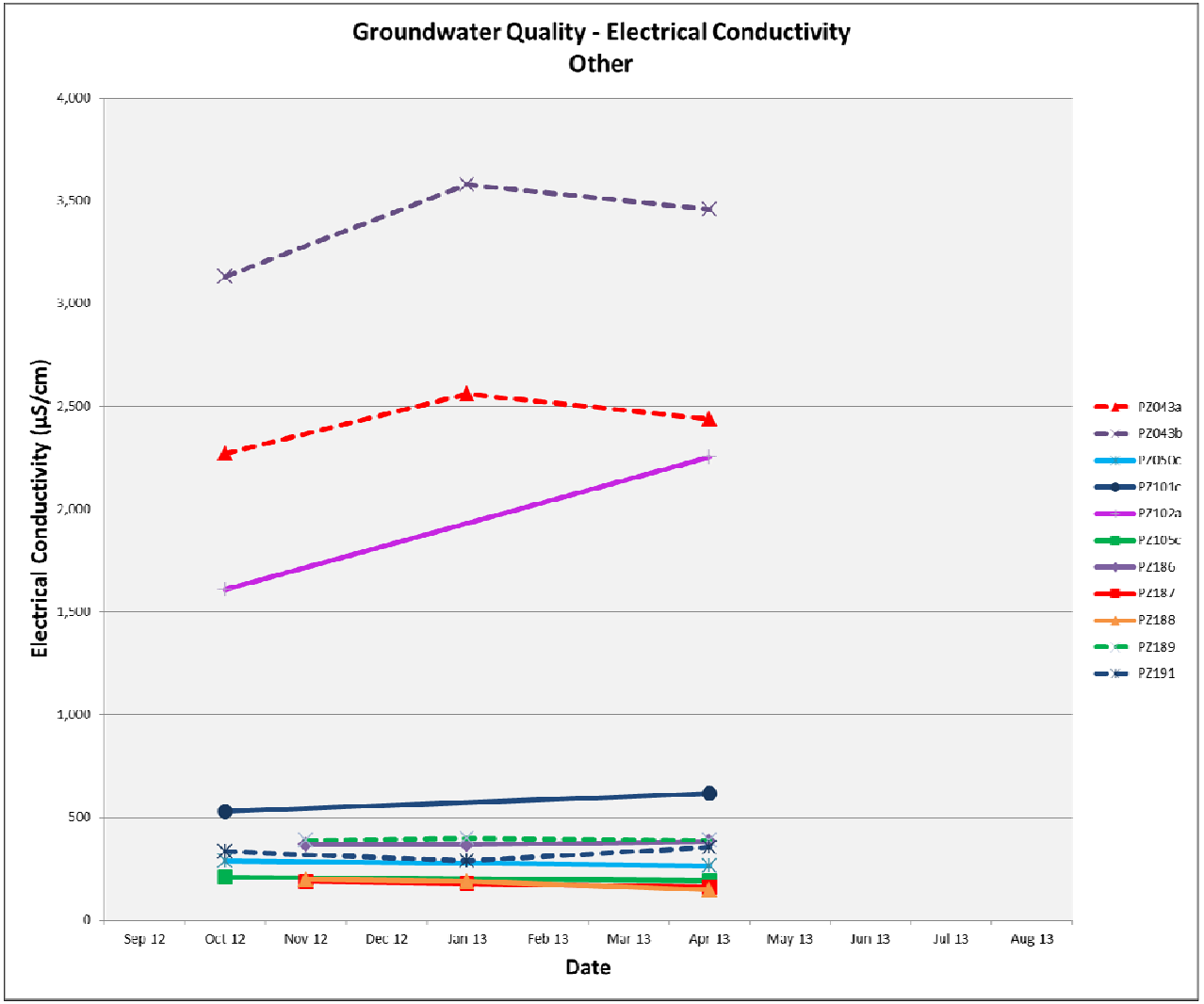


Figure 48: Groundwater Electrical Conductivity 7

3.7.3 Comparison to Previous Ground Water Monitoring and Predicted Levels

Table 38 compares the groundwater level data from this reporting period to background levels and previous monitoring results. **Table 39** and **Table 40** compares the pH and electrical conductivity water quality from this reporting period to background levels and previous monitoring results. The monitoring network was assessed for adequacy during the reporting period with no changes being made to the monitoring network.

There was no modelling conducted in the Environmental Assessment on predicted water quality surrounding the mining operations so a comparison can't be made to predicted water quality.

Based on the monitoring bore hydrographs, groundwater extraction to date would not have impacted the creeks. No bores, springs, groundwater-fed dams or soaks have been identified directly within or close to the Open Cut 1 area, and no impact on any existing user is assessed to have occurred.

Several soaks, springs and dams have been identified in the area south, east and west of pumping bores TB179 and TB052A. Based on there being no impact on groundwater levels in the monitoring bores in the alluvium it is concluded that none of these water sources have been impacted.

Eight registered groundwater bores are located within a 2km radius from the Open Cut 1. No impact from groundwater extraction is assessed to have occurred on existing groundwater users, based on the following:

- Most of the bores are located to the west of the Open Cut 1 in an area that has been previously affected by mining at Ulan open cut; and
- Monitoring bores located closer to Open Cut 1 mine indicate that there are currently no impacts from dewatering on the groundwater levels in either alluvium, Permian or Marrangaroo Formation.

Table 38: Comparison of Groundwater Levels to Background Levels

Site	Background Minimum Level (mAHD)	Previous Results Minimum Level Range (mAHD)	2012-2013 Minimum Level (mAHD)	Comment on 2012-2013 Data
OB001	N/A as the site is flowing	N/A as the site is flowing	N/A as the site is flowing	Consistent with previous monitoring
OB002	495.06	N/A as the site is flowing	N/A as the site is flowing	Consistent with previous monitoring
OB003	471.57	471.74 – 472.47	472.49	Consistent with previous monitoring
OB004	N/A as the site is flowing	N/A as the site is flowing	N/A as the site is flowing	Consistent with previous monitoring
PZ003	470.43	470.12 – 471.06	471.03	Consistent with previous monitoring
PZ004	489.09	488.10 – 492.38	491.63	Consistent with previous monitoring
PZ018	451.46	452.79 – 453.55	453.36	Generally consistent with previous monitoring
PZ039	417.23	417.41 – 418.54	418.93	Generally consistent with previous monitoring

Site	Background Minimum Level (mAHD)	Previous Results Minimum Level Range (mAHD)	2012-2013 Minimum Level (mAHD)	Comment on 2012-2013 Data
PZ040B	419.44	419.23 – 420.73	421.16	Generally consistent with previous monitoring
PZ043A	489.32	489.68 – 490.79	490.74	Consistent with previous monitoring
PZ043B	493.90	493.97 – 494.10	493.89	As this site is located near open cut 3 and mining hasn't commenced in this area, this result is most likely not attributable to MCO and is most likely due to natural variation
PZ044	478.70	479.38 – 480.45	480.27	Consistent with previous monitoring
PZ050A	383.55	384.42 – 384.80	384.68	Consistent with previous monitoring
PZ050B	431.71	430.89 – 432.32	431.43	Generally consistent with previous monitoring
PZ050C	439.37	439.68 – 440.07	439.81	Consistent with previous monitoring
PZ055	421.83	421.88 – 422.76	422.84	Consistent with previous monitoring
PZ058	467.54	467.49 – 467.86	467.87	Consistent with previous monitoring
PZ072A	494.85	496.88 – 497.97	498.12	Generally consistent with previous monitoring
PZ072C	503.27	503.70 – 505.79	506.10	Generally consistent with previous monitoring
PZ074	501.37	501.38 – 501.42	501.36	As this site is located near open cut 3 and mining hasn't commenced in this area, this result is most likely not attributable to MCO and is most likely due to natural variation
PZ101B	363.48	367.84 – 373.75	374.93	The water level has remained recharged following the rainfall event in late 2010 and subsequent follow up rain
PZ101C	380.75	380.83 – 381.07	381.35	Consistent with previous monitoring
PZ102A	355.63	369.37 – 373.19	373.61	The water level has remained recharged following the rainfall event in late 2010 and subsequent follow up rain
PZ102B	354.77	369.41 – 373.22	370.28	Consistent with previous monitoring
TB103	367.72	375.18 – 378.35	380.05	The water level has remained recharged following the rainfall event in late 2010 and subsequent follow up rain
PZ103A	355.99	368.65 – 371.90	373.28	The water level has remained recharged following the rainfall event in late 2010 and subsequent follow up rain
PZ103B	366.97	383.27 – 390.85	383.94	Consistent with previous monitoring

Site	Background Minimum Level (mAHD)	Previous Results Minimum Level Range (mAHD)	2012-2013 Minimum Level (mAHD)	Comment on 2012-2013 Data
PZ103C	398.03	397.24 – 398.25	397.22	Consistent with previous monitoring
PZ104	381.89	380.17 – 382.55	382.84	Consistent with previous monitoring
TB105	359.19	365.01 – 369.69	372.11	The water level has remained recharged following the rainfall event in late 2010 and subsequent follow up rain
PZ105A	359.21	364.98 – 369.83	372.13	The water level has remained recharged following the rainfall event in late 2010 and subsequent follow up rain
PZ105B	375.05	376.29 – 376.87	377.42	The water level has remained recharged following the rainfall event in late 2010 and subsequent follow up rain
PZ105C	377.26	377.23 – 377.52	377.86	Consistent with previous monitoring
PZ106A	424.82	429.91 – 435.90	425.63	As this site is located in the Murragamba Valley and mining hasn't commenced in Murragamba Valley this result is most likely not attributable to MCO and is most likely due to natural variation
PZ106B	502.04	501.61 – 502.14	501.38	As this site is located in the Murragamba Valley and mining hasn't commenced in Murragamba Valley this result is most likely not attributable to MCO and is most likely due to natural variation
PZ107	432.51	432.40 – 432.80	433.64	Consistent with previous monitoring
PZ108	332.84	400.65 – 401.34	400.50	Consistent with previous monitoring
PZ109	383.02	382.75 – 382.98	382.34	Consistent with previous monitoring
PZ111	379.90	380.18 – 380.74	379.35	As this site is located in the Murragamba Valley and mining hasn't commenced in Murragamba Valley this result is most likely not attributable to MCO and is most likely due to natural variation
PZ112B	479.16	479.23 – 481.18	481.25	The water level has remained recharged following the rainfall event in late 2010 and subsequent follow up rain
PZ127 – 43m	450.28	449.76 – 450.11	449.59	Consistent with previous monitoring
PZ127 – 68m	446.62	446.21 – 446.38	446.17	Consistent with previous monitoring

Site	Background Minimum Level (mAHD)	Previous Results Minimum Level Range (mAHD)	2012-2013 Minimum Level (mAHD)	Comment on 2012-2013 Data
PZ127 – 112m	393.23	406.33 – 409.05	409.56	The water level has remained recharged following the rainfall event in late 2010 and subsequent follow up rain
PZ127 – 141m	362.30	369.54 – 372.83	377.18	The water level has remained recharged following the rainfall event in late 2010 and subsequent follow up rain
PZ128 – 20m	388.41	388.86 – 389.03	388.91	Consistent with previous monitoring
PZ128 – 36m	380.45	380.00 – 380.40	380.10	Consistent with previous monitoring
PZ128 – 55m	375.90	376.16 – 376.53	376.80	Consistent with previous monitoring
PZ129 – 35m	382.72	388.68 – 392.60	391.98	Consistent with previous monitoring
PZ129 – 53m	376.77	380.68 – 385.80	390.28	The water level has remained recharged following the rainfall event in late 2010 and subsequent follow up rain
PZ129 – 74m	379.66	379.40 – 379.62	379.64	Consistent with previous monitoring
PZ130 – 38.5m	494.82	494.65 – 496.71	496.93	The water level has remained recharged following the rainfall event in late 2010 and subsequent follow up rain
PZ130 – 64m	470.78	476.51 – 476.98	477.09	The water level has remained recharged following the rainfall event in late 2010 and subsequent follow up rain
PZ130 – 97m	448.51	446.91 – 448.73	447.76	Consistent with previous monitoring
PZ131	433.39	432.00 – 433.61	433.69	Consistent with previous monitoring
PZ133 – 31.5m	419.96	427.42 – 428.06	428.86	Consistent with previous monitoring
PZ133 – 43m	419.75	427.54 – 428.12	428.25	Consistent with previous monitoring
PZ133 – 59m	387.98	385.16 – 387.10	385.16	As this site is located in the Murragamba Valley and mining hasn't commenced in Murragamba Valley this result is most likely not attributable to MCO and is most likely due to natural variation
PZ134	431.06	430.95 – 432.27	432.64	The water level has remained recharged following the rainfall event in late 2010 and subsequent follow up rain
PZ137	460.92	460.81 – 461.46	461.00	Consistent with previous monitoring
PZ141	461.62	461.46 – 462.27	461.76	Consistent with previous monitoring

Site	Background Minimum Level (mAHD)	Previous Results Minimum Level Range (mAHD)	2012-2013 Minimum Level (mAHD)	Comment on 2012-2013 Data
PZ149	467.20	466.84 – 467.53	466.97	Consistent with previous monitoring
PZ150	377.09	377.43 – 379.94	No samples were collected due to collapsed casing	
PZ151	374.51	375.44 – 379.48	381.31	The water level has remained recharged following the rainfall event in late 2010 and subsequent follow up rain
PZ152	441.22	442.00 – 442.33	441.99	Consistent with previous monitoring
PZ155	437.98	437.81 – 437.92	437.66	Consistent with previous monitoring
PZ156	372.28	375.81 – 379.40	382.22	The water level has remained recharged following the rainfall event in late 2010 and subsequent follow up rain
PZ157	373.15	376.51 – 379.83	382.52	The water level has remained recharged following the rainfall event in late 2010 and subsequent follow up rain
PZ164	431.49	431.51 – 431.70	433.03	As this site is located in the Murragamba Valley and mining hasn't commenced in Murragamba Valley this result is most likely not attributable to MCO and is most likely due to natural variation
PZ165	436.58	436.52 – 436.83	436.89	Consistent with previous monitoring
PZ168	427.80	428.04 – 429.02	428.04	Consistent with previous monitoring
PZ170	420.93	421.09 – 422.11	422.35	Generally consistent with previous monitoring
PZ172	421.23	420.72 – 421.64	421.59	Consistent with previous monitoring
PZ173	421.62	421.09 – 422.18	422.35	Generally consistent with previous monitoring
PZ174	418.07	417.38 – 418.31	418.77	Generally consistent with previous monitoring
PZ175	419.76	418.73 – 419.70	419.39	Consistent with previous monitoring
PZ176	416.47	416.08 – 416.62	416.81	Generally consistent with previous monitoring
PZ177	415.87	415.66 – 415.91	415.88	Consistent with previous monitoring
PZ179 – 28m	418.77	416.72 – 418.52	419.97	Generally consistent with previous monitoring
PZ179 – 33m	417.67	412.48 – 417.45	418.67	Generally consistent with previous monitoring
PZ179 – 82m	415.63	435.42 – 436.62	437.14	Generally consistent with previous monitoring
PZ179 – 145m	373.38	373.81 – 376.17	379.56	The water level has remained recharged following the rainfall event in late 2010 and subsequent follow up rain

Site	Background Minimum Level (mAHD)	Previous Results Minimum Level Range (mAHD)	2012-2013 Minimum Level (mAHD)	Comment on 2012-2013 Data
PZ181	424.76	410.16 – 425.15	425.02	Consistent with previous monitoring
PZ184	412.38	412.05 – 412.79	412.94	Generally consistent with previous monitoring
PZ186	No background data	401.75 – 408.46	408.59	Generally consistent with previous monitoring
PZ187	No background data	416.45 – 417.40	416.72	Consistent with previous monitoring
PZ188	No background data	415.22 – 415.81	416.12	The water level has remained recharged following the rainfall event in late 2010 and subsequent follow up rain
PZ189	No background data	409.27 – 412.85	413.41	The water level has remained recharged following the rainfall event in late 2010 and subsequent follow up rain
PZ191	No background data	376.43 – 380.28	382.10	The water level has remained recharged following the rainfall event in late 2010 and subsequent follow up rain

Table 39: Comparison of Groundwater pH to Background pH

Site	Background Range	Previous Results Data Range	2012-2013 Data Range	Comment on 2012-2013 Data
OB001	4.7 – 7.6	3.7 – 5.3	5.0 – 7.6	Consistent with previous monitoring
OB002	5.5 – 7.9	6.1 – 7.6	6.4 – 7.3	Consistent with previous monitoring
OB003	5.7 – 7.7	6.0 – 6.7	6.2 – 6.4	Consistent with previous monitoring
OB004	3.1 – 4.8	3.4 – 5.8	3.8 – 4.0	Consistent with previous monitoring
PZ003	5.7 – 7.2	5.8 – 6.7	6.3 – 6.5	Consistent with previous monitoring
PZ004	6.0 – 8.0	6.5 – 7.2	6.8 – 7.1	Consistent with previous monitoring
PZ018	3.9 – 6.9	4.1 – 5.8	5.3 – 5.9	Consistent with previous monitoring
PZ039	5.5 – 7.3	5.4 – 7.0	6.5 – 6.8	Consistent with previous monitoring
PZ040B	5.5 – 7.1	3.8 – 6.3	4.3 – 4.3	Consistent with previous monitoring
PZ043A	5.8 – 7.2	6.2 – 6.9	6.7 – 7.3	Generally consistent with previous monitoring
PZ043B	3.4 – 5.4	3.4 – 4.0	3.8 – 4.0	Consistent with previous monitoring
PZ044	5.6 – 7.5	6.0 – 6.8	6.4 – 6.8	Consistent with previous monitoring

Site	Background Range	Previous Results Data Range	2012-2013 Data Range	Comment on 2012-2013 Data
PZ050A	This site has had depth only readings between April 2007 and April 2010	6.4 – 6.6	6.4 – 6.6	Consistent with previous monitoring
PZ050B	5.5 – 7.5	5.2 – 6.1	5.9 – 6.3	Consistent with previous monitoring
PZ050C	5.5 – 12.5	5.3 – 6.5	6.2 – 6.3	Consistent with previous monitoring
PZ055	5.2 – 7.1	4.8 – 5.6	5.4 – 5.6	Consistent with previous monitoring
PZ058	2.5 – 4.9	3.2 – 3.8	3.8 – 3.9	Consistent with previous monitoring
PZ072A	6.2 – 7.9	6.2 – 7.0	6.9	Consistent with previous monitoring
PZ072C	6.2 – 7.9	6.5 – 7.2	7.1	Consistent with previous monitoring
PZ074	5.7 – 7.6	6.2 – 6.8	6.5 – 6.7	Consistent with previous monitoring
PZ101B	6.0 – 8.0	6.5 – 7.4	7.5 – 7.8	Consistent with previous monitoring
PZ101C	5.9 – 11.9	6.2 – 7.4	6.9 – 7.2	Consistent with previous monitoring
PZ102A	6.1 – 8.3	5.8 – 7.0	6.8 – 7.1	Consistent with previous monitoring
PZ102B	5.9 – 7.9	6.0 – 6.9	6.7 – 6.8	Consistent with previous monitoring
TB103	5.7 – 7.3	6.0 – 6.7	6.7 – 6.9	Generally consistent with previous monitoring
PZ103A	5.4 – 8.1	6.1 – 6.7	6.7 – 6.8	Consistent with previous monitoring
PZ103B	5.1 – 9.5	5.1 – 6.3	6.3 – 6.9	Consistent with previous monitoring
PZ103C	5.1 – 13.1	5.3 – 6.2	5.4 – 5.6	Consistent with previous monitoring
PZ104	5.9 – 13.1	11.4 – 12.0	12.4 – 12.6	Consistent with previous monitoring
TB105	6.8 – 7.8	6.4 – 7.3	7.3 – 7.5	Generally consistent with previous monitoring
PZ105A	5.3 – 7.8	5.4 – 7.0	5.9 – 6.3	Consistent with previous monitoring
PZ105B	5.3 – 7.9	4.6 – 5.5	5.6 – 5.9	Consistent with previous monitoring
PZ105C	5.1 – 6.8	5.3 – 6.0	6.2 – 6.2	Consistent with previous monitoring
PZ106A	5.8 – 12.3	9.6 – 10.8	9.2 – 9.4	Consistent with previous monitoring
PZ106B	4.9 – 8.2	4.3 – 6.4	5.2 – 5.3	Consistent with previous monitoring
PZ107	4.7 – 7.1	6.0 – 6.5	6.2 – 6.2	Consistent with previous monitoring
PZ108R	5.6 – 8.0	5.5 – 6.1	6.1 – 7.2	Consistent with previous monitoring
PZ109	6.1 – 12.3	6.6 – 7.6	7.4	Consistent with previous monitoring

Site	Background Range	Previous Results Data Range	2012-2013 Data Range	Comment on 2012-2013 Data
PZ111	5.8 – 7.0	5.9 – 6.6	6.0 – 6.0	Consistent with previous monitoring
PZ112B	4.3 – 6.7	4.6 – 5.3	5.1 – 5.7	Consistent with previous monitoring
PZ127	Due to the presence of the vibrating wire piezometer, water quality monitoring cannot be undertaken on this piezometer			
PZ128	Due to the presence of the vibrating wire piezometer, water quality monitoring cannot be undertaken on this piezometer			
PZ129	Due to the presence of the vibrating wire piezometer, water quality monitoring cannot be undertaken on this piezometer			
PZ130	Due to the presence of the vibrating wire piezometer, water quality monitoring cannot be undertaken on this piezometer			
PZ131	5.6 – 7.2	6.0 – 6.7	6.4 – 6.6	Consistent with previous monitoring
PZ133	Due to the presence of the vibrating wire piezometer, water quality monitoring cannot be undertaken on this piezometer			
PZ134	5.1 – 6.1	5.3 – 6.5	5.7 – 6.5	Consistent with previous monitoring
PZ137	5.1 – 6.7	4.9 – 6.0	4.5 – 5.9	Consistent with previous monitoring
PZ141	4.2 – 5.4	3.8 – 5.5	4.5 – 5.0	Consistent with previous monitoring
PZ149	5.1 – 6.7	6.1 – 6.6	6.5 – 6.5	Consistent with previous monitoring
PZ150	5.1 – 6.4	5.0 – 6.0	No samples were collected due to collapsed casing	
PZ151	5.7 – 7.0	6.0 – 6.7	6.2 – 6.3	Consistent with previous monitoring
PZ152	5.1 – 6.4	4.9 – 5.9	5.5 – 5.6	Consistent with previous monitoring
PZ155	This site has been dry since March 2008		No samples were collected as the site was dry	
PZ156	4.3 – 7.1	4.7 – 5.8	5.9 – 6.1	Consistent with previous monitoring
PZ157	5.9 – 7.6	5.8 – 6.8	6.0 – 6.4	Consistent with previous monitoring
PZ164	3.4 – 5.1	3.6 – 4.2	4.4 – 5.8	Consistent with previous monitoring
PZ165	5.9 – 6.2	4.8 – 5.3	5.1 – 5.4	Consistent with previous monitoring
PZ168	5.8 – 7.0	5.9 – 6.6	6.5 – 6.6	Consistent with previous monitoring
PZ170	5.4 – 6.7	5.6 – 6.4	6.1 – 6.3	Consistent with previous monitoring
PZ172	5.7 – 6.4	5.9 – 6.4	6.2 – 6.9	The results this year are higher than previous data. As this site is located in the Murragamba Valley and mining hasn't commenced in Murragamba Valley this result is most likely not attributable to MCO and is most likely due to natural variation
PZ173	6.3 – 7.2	6.4 – 6.8	No samples were collected as the site was dry	
PZ174	5.4 – 6.5	5.8 – 6.4	6.2 – 6.3	Consistent with previous monitoring

Site	Background Range	Previous Results Data Range	2012-2013 Data Range	Comment on 2012-2013 Data
PZ175	5.3 – 7.0	6.0 – 7.8	6.2 – 7.0	Consistent with previous monitoring
PZ176	5.0 – 7.8	5.6 – 6.0	6.0 – 6.2	Consistent with previous monitoring
PZ177	5.8 – 6.7	6.0 – 6.7	6.4 – 6.6	Consistent with previous monitoring
PZ179	Due to the presence of the vibrating wire piezometer, water quality monitoring cannot be undertaken on this piezometer			
PZ181	5.3 – 5.9	4.6 – 5.9	5.7 – 7.1	The results this year are higher than previous data. As this site is located in the Murragamba Valley and mining hasn't commenced in Murragamba Valley this result is most likely not attributable to MCO and is most likely due to natural variation
PZ184	3.9 – 5.6	3.2 – 3.9	3.4 – 3.6	Consistent with previous monitoring
PZ186	No background data	5.8 – 6.4	6.4 – 6.8	No pumping has occurred from nearby boreholes during the reporting period, indicating that this result is most likely due to natural variation
PZ187	No background data	5.3 – 6.6	5.7 – 6.0	Consistent with previous monitoring
PZ188	No background data	4.6 – 5.5	5.4 – 5.7	Generally consistent with previous monitoring
PZ189	No background data	5.7 – 6.2	6.1 – 6.3	Generally consistent with previous monitoring
PZ191	No background data	3.9 – 6.9	5.0 – 6.0	Consistent with previous monitoring

Table 40: Comparison of Groundwater Electrical Conductivity to Background Electrical Conductivity

Site	Background Range (µS/cm)	Previous Results Data Range (µS/cm)	2012-2013 Data Range (µS/cm)	Comment on 2012-2013 Data
OB001	90 – 110	80 – 120	85 – 95	Consistent with previous monitoring
OB002	1,800 – 2,000	1,420 – 2,080	1,900 – 1,947	Consistent with previous monitoring
OB003	1,730 – 2,900	1,580 – 2,085	1,740 – 1,883	Consistent with previous monitoring
OB004	400 – 490	335 – 780	320 – 336	Consistent with previous monitoring
PZ003	620 – 3,210	680 – 5,290	915 – 1,081	Consistent with previous monitoring
PZ004	2,300 – 4,400	2,380 – 3,420	2,740 – 3,160	Consistent with previous monitoring

Site	Background Range (µS/cm)	Previous Results Data Range (µS/cm)	2012-2013 Data Range (µS/cm)	Comment on 2012-2013 Data
PZ018	390 – 960	140 – 575	575 – 808	Consistent with previous monitoring
PZ039	510 – 2,100	820 – 2,600	720 – 950	Consistent with previous monitoring
PZ040B	500 – 1,430	820 – 1,800	1,140 – 1,247	Consistent with previous monitoring
PZ043A	2,480 – 2,600	2,350 – 2,640	2,270 – 2,560	Consistent with previous monitoring
PZ043B	4,000 – 5,100	3,060 – 4,500	3,130 – 3,580	Consistent with previous monitoring
PZ044	2,800 – 3,000	2,770 – 2,980	2,440 – 2,750	Consistent with previous monitoring
PZ050A	This site has had depth only readings between April 2007 and April 2010	1,770 – 2,180	1,820 – 2,280	Generally consistent with previous monitoring
PZ050B	1,300 – 2,200	1,110 – 1,600	980 – 1,095	Consistent with previous monitoring
PZ050C	340 – 2,500	325 – 1,150	264 – 290	Consistent with previous monitoring
PZ055	190 – 440	245 – 2,120	1,670 – 1,670	Consistent with previous monitoring
PZ058	7,600 – 16,000	9,730 – 13,430	8,820 – 9,670	Consistent with previous monitoring
PZ072A	1,500 – 1,700	1,635 – 1,780	1,660	Consistent with previous monitoring
PZ072C	3,200 – 3,500	3,010 – 3,310	2,850	Generally consistent with previous monitoring
PZ074	4,700 – 5,170	4,910 – 5,600	5,370 – 6,070	This site is located near Open Cut 3 and as mining hasn't commenced in Open Cut 3 this result is not attributable to MCO and is most likely due to natural variation
PZ101B	620 – 1,000	740 – 780	620 – 768	Consistent with previous monitoring
PZ101C	620 – 3,600	610 – 750	530 – 616	Generally consistent with previous monitoring
PZ102A	550 – 2,550	2,190 – 3,800	1,610 – 2,253	Consistent with previous monitoring
PZ102B	1,100 – 2,540	2,180 – 2,540	1,360 – 2,470	Consistent with previous monitoring
TB103R	520 – 610	535 – 640	560 – 676	Consistent with previous monitoring
PZ103A	370 – 645	570 – 630	550 – 646	Consistent with previous monitoring
PZ103B	340 – 630	350 – 500	400 – 471	Consistent with previous monitoring
PZ103C	340 – 13,000	310 – 395	320 – 327	Consistent with previous monitoring

Site	Background Range (µS/cm)	Previous Results Data Range (µS/cm)	2012-2013 Data Range (µS/cm)	Comment on 2012-2013 Data
PZ104	590 – 8,900	1,060 – 2,440	3,800 – 6,950	The results are generally high but are still lower than the approved trigger levels. Monitoring will continue to be undertaken at this location
TB105	500 – 755	370 – 740	600 – 730	Consistent with previous monitoring
PZ105A	250 – 545	250 – 700	270 – 276	Consistent with previous monitoring
PZ105B	210 – 560	200 – 250	249 – 250	Consistent with previous monitoring
PZ105C	275 – 545	200 – 275	193 – 210	Generally consistent with previous monitoring
PZ106A	660 – 3,800	690 – 850	630 – 713	Generally consistent with previous monitoring
PZ106B	750 – 1,600	1,590 – 4,303	1,500 – 2,010	Consistent with previous monitoring
PZ107	610 – 2,000	645 – 690	610 – 658	Consistent with previous monitoring
PZ108R	240 – 350	385 – 420	360 – 413	Consistent with previous monitoring
PZ109	650 – 1,500	1,040 – 1,090	1,088	Consistent with previous monitoring
PZ111	720 – 1,200	725 – 990	770 – 1,018	Generally consistent with previous monitoring
PZ112B	2,500 – 8,100	1,310 – 4,380	1,800 – 1,854	Consistent with previous monitoring
PZ127	Due to the presence of the vibrating wire piezometer, water quality monitoring cannot be undertaken on this piezometer			
PZ128	Due to the presence of the vibrating wire piezometer, water quality monitoring cannot be undertaken on this piezometer			
PZ129	Due to the presence of the vibrating wire piezometer, water quality monitoring cannot be undertaken on this piezometer			
PZ130	Due to the presence of the vibrating wire piezometer, water quality monitoring cannot be undertaken on this piezometer			
PZ131	5,800 – 6,590	5,810 – 6,560	1,640 – 6,210	Generally consistent with previous monitoring
PZ133	Due to the presence of the vibrating wire piezometer, water quality monitoring cannot be undertaken on this piezometer			
PZ134	4,350 – 4,800	3,850 – 4,560	1,750 – 5,700	This site is located in the Murragamba Valley and as mining hasn't commenced in Murragamba Valley this result is most likely not attributable to MCO and is most likely due to natural variation
PZ137	420 – 1,010	1,000 – 1,530	1,540 – 2,285	This site is located in the Murragamba Valley and as mining hasn't commenced in Murragamba Valley this result is most likely not attributable to MCO and is most likely due to natural variation
PZ141	4,490 – 5,300	1,970 – 7,940	1,200 – 2,480	Consistent with previous monitoring

Site	Background Range (µS/cm)	Previous Results Data Range (µS/cm)	2012-2013 Data Range (µS/cm)	Comment on 2012-2013 Data
PZ149	3,370 – 5,700	4,350 – 4,870	3,350 – 5,080	Consistent with previous monitoring
PZ150	2,700 – 6,700	5,660 – 6,500	No sample collected due to collapsed casing	
PZ151	420 – 1,050	790 – 1,270	810 – 958	Consistent with previous monitoring
PZ152	5,680 – 6,800	5,690 – 6,520	4,840 – 6,070	Consistent with previous monitoring
PZ155	7,900 – 8,000	This site has been dry since May 2008	No samples were collected as the site was dry	
PZ156	440 – 520	415 – 650	670 – 744	As this site is located in the Murragamba Valley and mining hasn't commenced in Murragamba Valley this result is most likely not attributable to MCO and is most likely due to natural variation
PZ157	445 – 500	460 – 750	760 – 838	This site is located in the Murragamba Valley and as mining hasn't commenced in Murragamba Valley this result is most likely not attributable to MCO and is most likely due to natural variation
PZ164	4,560 – 10,000	240 – 8,810	170 – 300	This site is located in the Murragamba Valley and is in the alluvium close to Murragamba Creek. A review of the data, weather conditions and site observations indicate that this result has been influenced by surface flow in Murragamba Creek and the results are consistent with last reporting period's results
PZ165	75 – 210	10 – 180	81 – 130	Consistent with previous monitoring
PZ168	640 – 720	615 – 750	650 – 722	Consistent with previous monitoring
PZ170	2,500 – 4,700	4,500 – 5,150	2,040 – 4,770	Generally consistent with previous monitoring
PZ172	7,000 – 7,400	7,490 – 8,710	5,390 – 8,020	This site is located in the Murragamba Valley and as mining hasn't commenced in Murragamba Valley this result is most likely not attributable to MCO and is most likely due to natural variation
PZ173	9,400 – 14,000	425 – 14,190	No samples were collected as the site was dry	
PZ174	2,400 – 11,900	7,440 – 14,660	7,020 – 12,860	Consistent with previous monitoring

Site	Background Range (µS/cm)	Previous Results Data Range (µS/cm)	2012-2013 Data Range (µS/cm)	Comment on 2012-2013 Data
PZ175	13,000 – 18,000	1,430 – 16,360	1,120 – 1,330	This site is located in the Murragamba Valley and is in the alluvium close to Murragamba Creek. A review of the data, weather conditions and site observations indicate that this result has been influenced by surface flow in Murragamba Creek and the results are consistent with last reporting period's results
PZ176	710 – 840	650 – 840	630 – 680	Consistent with previous monitoring
PZ177	1,235 – 8,500	350 – 7,740	4,630 – 6,250	Consistent with previous monitoring
PZ179	Due to the presence of the vibrating wire piezometer, water quality monitoring cannot be undertaken on this piezometer			
PZ181	190 – 220	30 – 255	40 – 50	Consistent with previous monitoring
PZ184	3,900 – 4,460	3,510 – 8,020	3,570 – 3,850	Consistent with previous monitoring
PZ186	No background data	370 – 510	370 – 382	Consistent with previous monitoring
PZ187	No background data	150 – 760	163 – 190	Consistent with previous monitoring
PZ188	No background data	200 – 935	149 – 200	Generally consistent with previous monitoring
PZ189	No background data	265 – 475	389 – 400	Consistent with previous monitoring
PZ191	No background data	210 – 370	290 – 355	Consistent with previous monitoring

3.7.4 Groundwater Logger Data

Groundwater licences 20BL171998 and 20BL172000 required MCO to install hard rock and alluvial monitoring piezometers associated with water extraction from bores TB052a and TB179. Each of the monitoring bores has been fitted with an automatic data logger set to record water levels at hourly frequencies.

Piezometers PZ186 and PZ187 were installed for monitoring of water levels in the hard rock and alluvial between TB052A and Wilpinjong Creek. PZ188 and PZ189 were installed for monitoring of water levels in the alluvium and hard rock between TB179 and Wilpinjong Creek.

Pumping from bores TB052A and TB179 commenced in mid August 2009. As part of the Water Management Plan, MCO have developed "cease to pump" trigger levels for the alluvial aquifers (PZ187 and PZ188). The hydrographs shown in **Figure 49** and **Figure 50** indicate these trigger levels have not been exceeded.

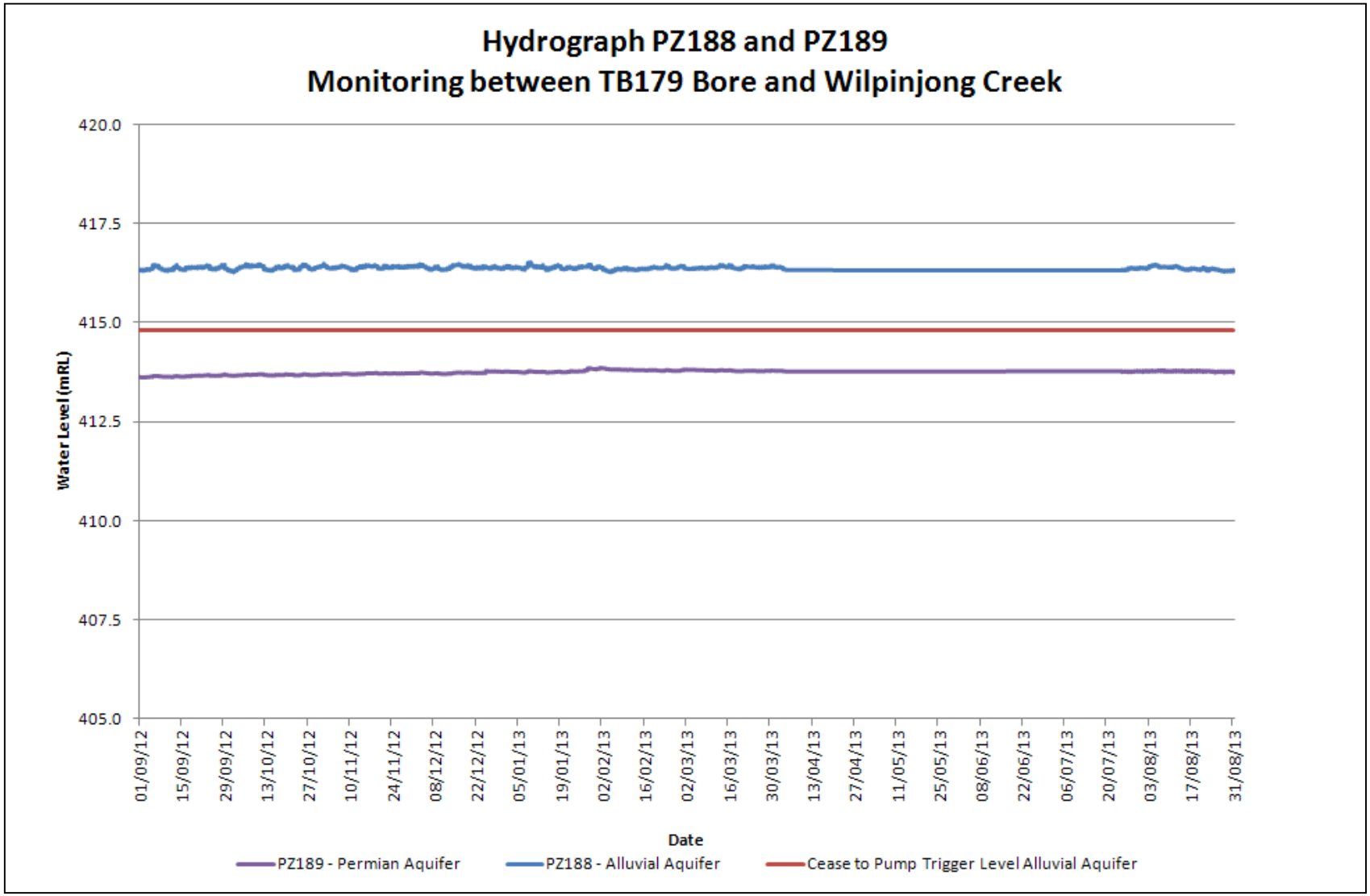


Figure 49: Monitoring Hydrograph for TB52a

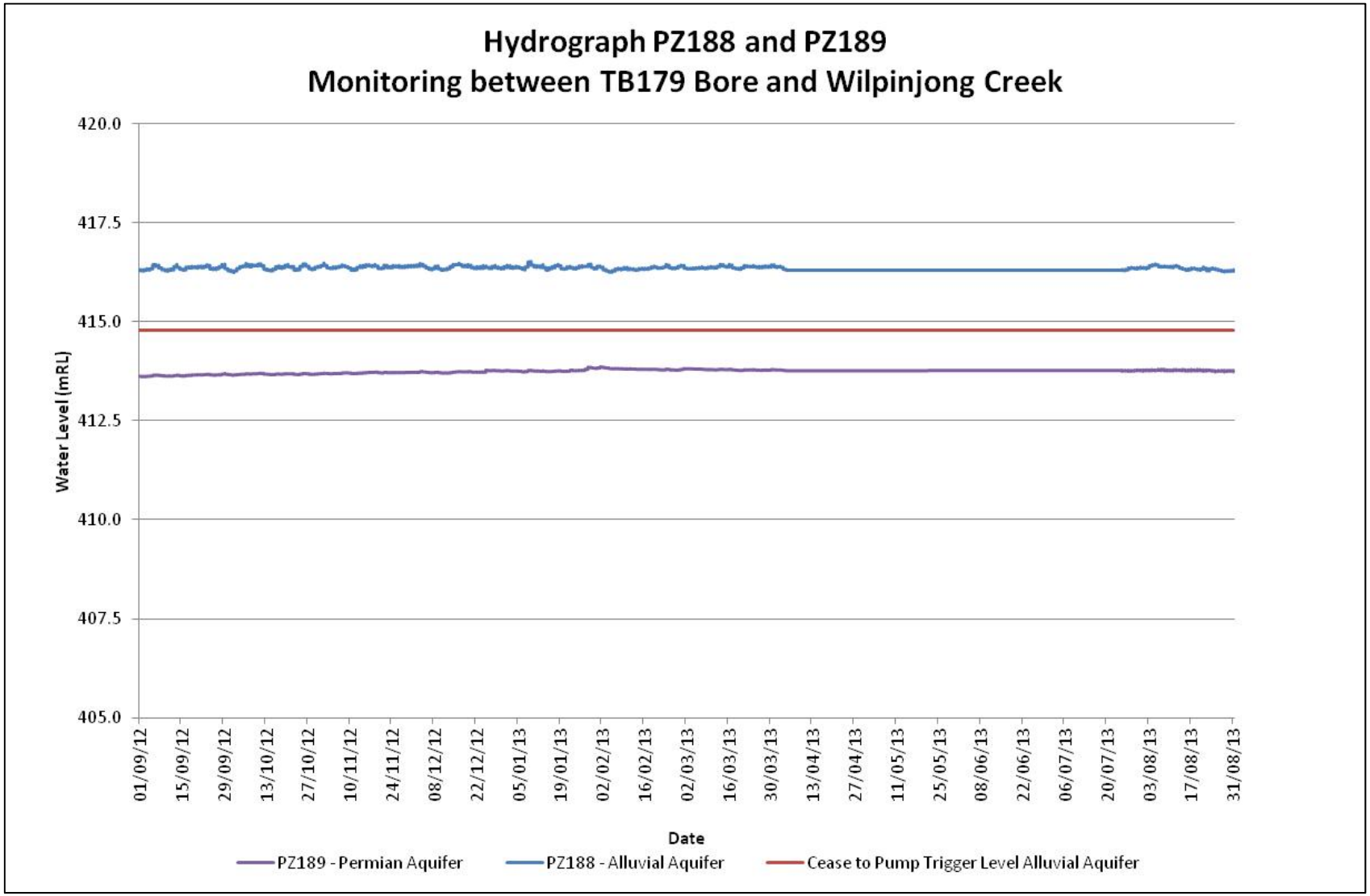


Figure 50: Monitoring Hydrograph for TB179

3.7.5 Groundwater Model Calibration

MCO are in the process of obtaining approval for additional mining areas. As part of the review and update of the WMP the groundwater model has been calibrated, however these results were not available at the end of the reporting period.

3.7.6 Groundwater Census

Groundwater census surveys were undertaken in 2005 and 2007 to support the preparation of the groundwater assessments for the Moolarben Coal Project – Environmental Assessment. Surveys were conducted in 2009 and 2011 to supplement the existing baseline dataset for each site and were also extended to include any new groundwater-fed sites identified by landholders.

The groundwater census for 2013 commenced during the reporting period, however, it wasn't completed during the reporting period. The results will be presented in the next AEMR.

3.7.7 Activities in the Next Reporting Period

Groundwater monitoring will continue to be undertaken with the results to be provided in the next AEMR. The revised WMP will be implemented during the next reporting period. As part of the review and update of the WMP the groundwater model will be calibrated and provided in the next AEMR.

3.8 CONTAMINATED AND POLLUTED LAND

There was no action taken or required this reporting period to manage contaminated or polluted land within lands owned or managed by MCO.

3.9 FLORA AND FAUNA

3.9.1 Activities This Reporting Period

During the reporting period MCO continued to clear vegetation for the advancement of mining operations in Open Cut 1. The process outlined in **Section 2.2** was followed for these clearing activities. No additional management measures were required to manage threatened flora and fauna during these clearing activities.

On ground revegetation works continued in the Vegetation Offset Areas during the reporting period. More information on these works is discussed in **Section 5.3**. Protection of 1,282ha of existing native vegetation and 6ha of White Box Yellow Box Blakely's Red Gum Grassy Woodland endangered ecological community continued during the reporting period by limiting access through locked gates and fencing.

Flora and fauna monitoring in the Vegetation Offset Areas continued during the reporting period. Results of this monitoring are shown in **Section 3.9.2**.

During the reporting period the Landscape Management Plan was reviewed and updated in preparation for mining activities in Open Cut 2. At the end of the reporting period MCO were awaiting approval of the updated Landscape Management Plan from DP&I.

The flora and fauna monitoring program was rationalised this year based on previous results and the outcomes of the review of the LMP. Key changes included removing Winter monitoring and reducing the number of monitoring sites.

3.9.2 Flora and Fauna Monitoring Results

Flora and fauna monitoring was undertaken during Spring 2012 and Autumn 2013 and was conducted for flora (floristic and Landscape Function Analysis) and fauna (amphibians, diurnal birds, nocturnal birds, mammals, microbats and reptiles). Geochemical analysis is undertaken every three years and wasn't required during this reporting period. The following areas (**Figure 51** to **Figure 54**) were targeted during the monitoring:

- Offset Area 1 (Red Hills) – located off Ulan-Wollar Rd, comprising an area of approximately 441 ha.
- Offset Area 2 – located off Ulan Rd, to the north of current mining operations and incorporates an area of approximately 725 ha. The area includes the approved Underground (UG) 4.
- Offset Area 3 – this offset area is located off Lagoons Rd, to the southwest of the current mining operations and incorporates an area of approximately 473 ha.
- Bora Creek – Riparian vegetation along Bora Creek located off Ulan Rd.

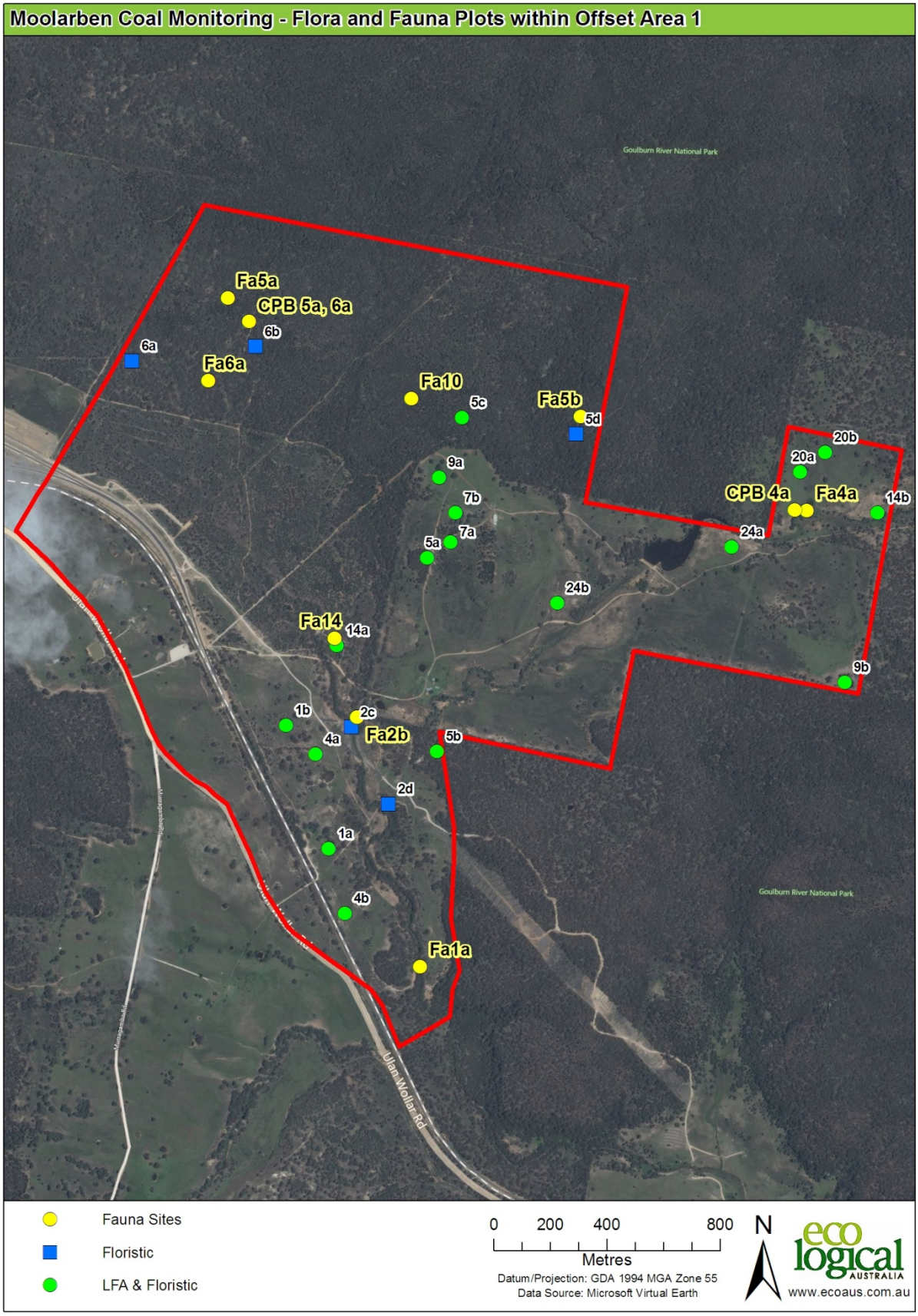


Figure 51: Offset Area 1 Flora and Fauna Monitoring Sites

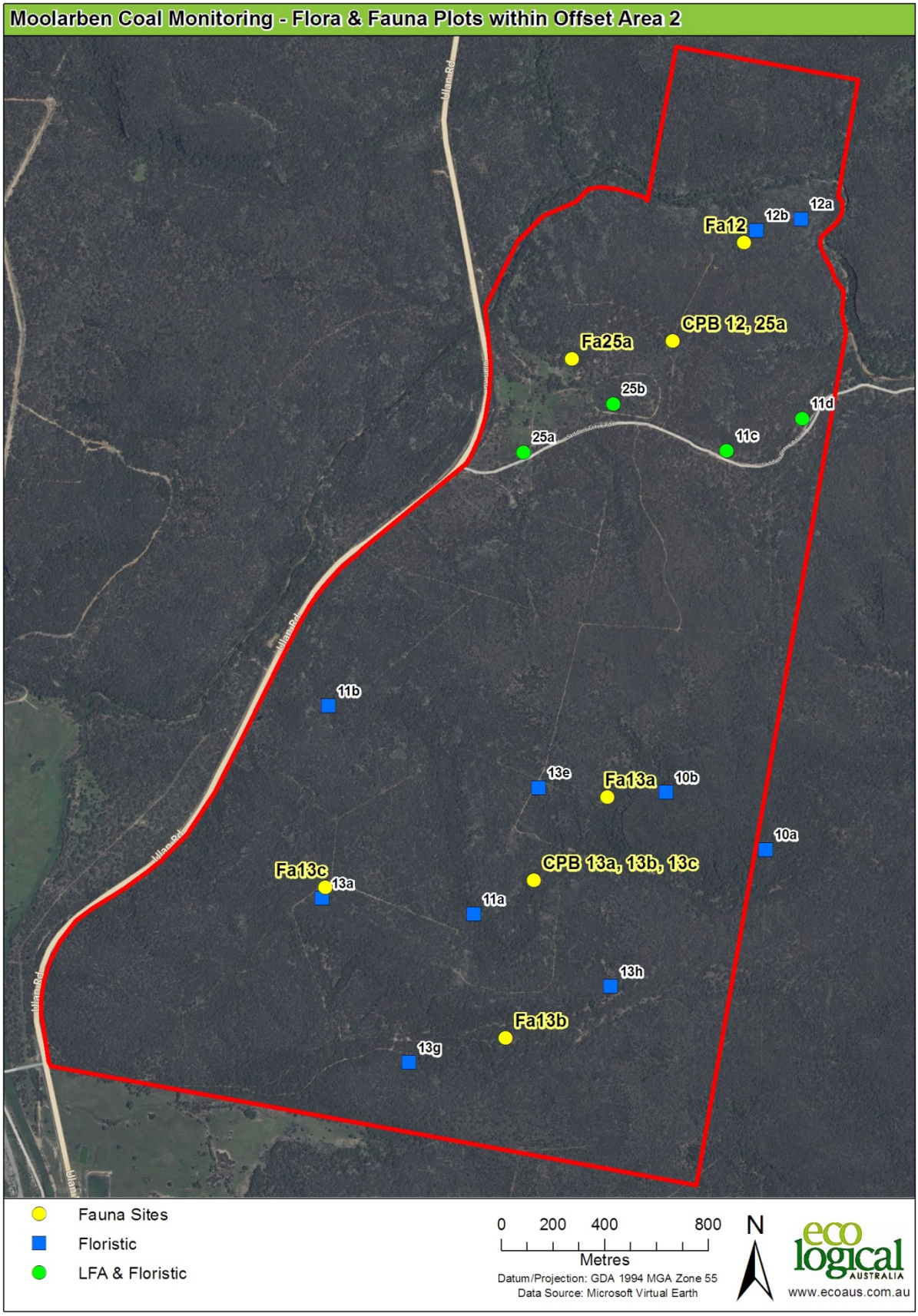


Figure 52: Offset Area 2 Flora and Fauna Monitoring Sites

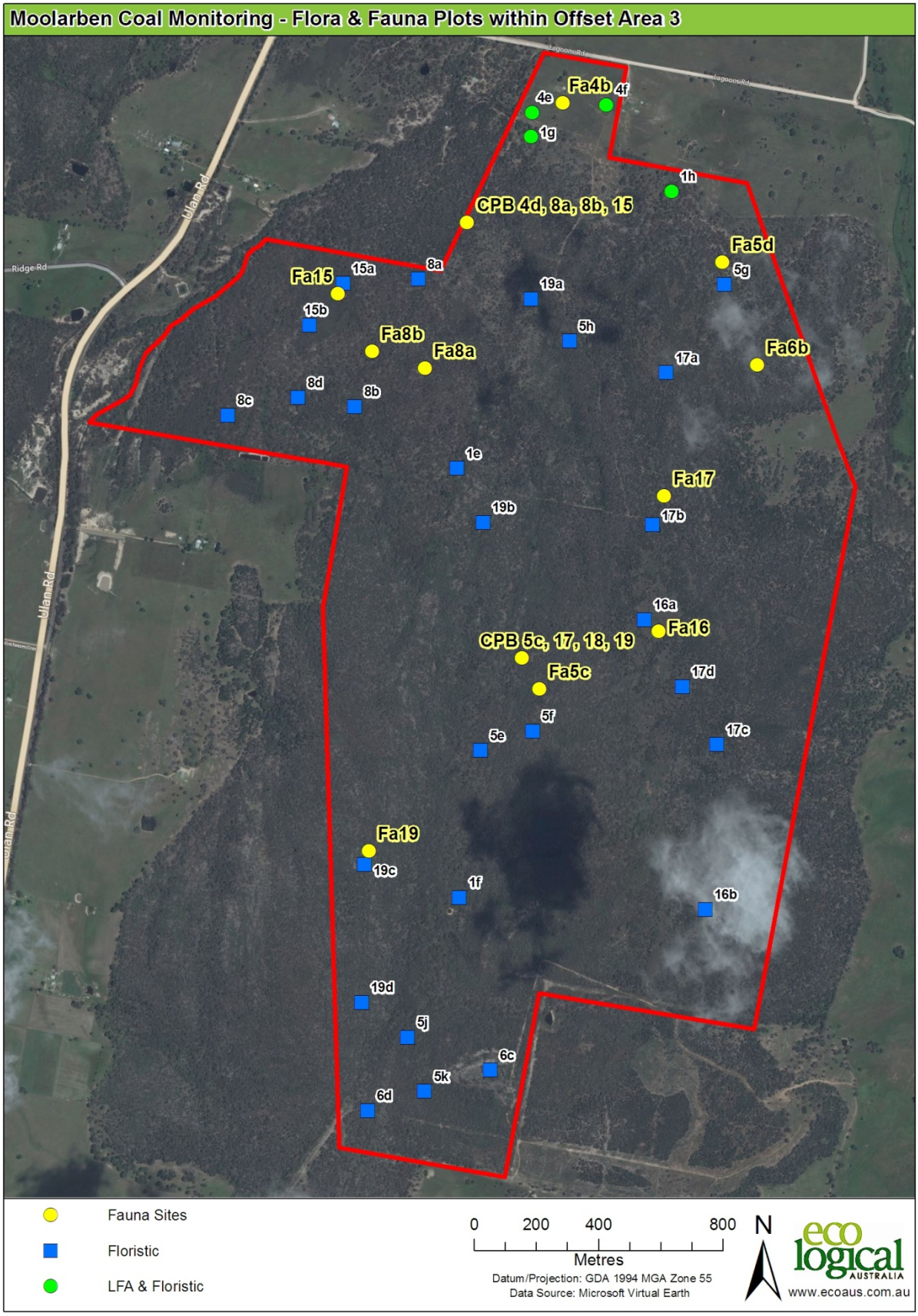


Figure 53: Offset Area 3 Flora and Fauna Monitoring Sites

Figure 54: Bora Creek Flora and Fauna Monitoring Sites

All monitoring during the reporting period was undertaken in accordance with the methods and survey techniques prescribed in the LMP and recommendations from each subsequent monitoring period. **Table 41** below summarises the methods utilised for each component of the monitoring program.

Table 41: Flora and Fauna Monitoring Methodology

	Spring 2012	Autumn 2013	Methodology
Flora			
Landscape Function Analysis (LFA)	✓		At each site, a 20 m by 50 m nested quadrat (20 m x 20 m floristic plot and 50 m transect incorporated into 0.1 ha quadrat) was established. Within each nested quadrat LFA attributes were recorded on field data sheets in accordance with four main components of the method, as follows: • Geographic setting of the site; • Landscape organisation; • Soil surface assessment; • Vegetation dynamics.
Floristic Survey	✓	✓	Full floristic survey plots were completed in each 20 m x 20 m plot of the nested 0.1 ha quadrat to collect floristic data. All visible vascular species were recorded, with each species being assigned to one of six foliage cover classes (Walker & Hopkins 1984). Vegetation structure was recorded for each plot, specifically the height and total foliage cover of each stratum. All vascular plant species observed in the plots were identified to species level (where suitable material was available for identification), recorded and compiled into the species list.
Fauna			
Amphibians	✓		Amphibian monitoring targeted water bodies including dams and ephemeral creeks. Amphibian monitoring included active searches during the day and night for a total period of 1 h person hours per site.
Diurnal Birds	✓		Diurnal bird monitoring involved conducting a census of birds along a randomly selected transect between two fixed points. Birds were recorded while walking along the random transect for a total period of 1 hour (0.5 hour in the morning and 0.5 hour in the afternoon), with all birds recorded either through direct observation, calls or other evidence (such as feathers and scats).
Nocturnal Birds	✓		Nocturnal bird monitoring involved using call playback and spotlighting survey techniques. Call playback was undertaken at each site for a period of 0.75 hours over one night, targeting the Powerful Owl, Masked Owl and Barking Owl at each site. The call playback involved 5 minutes playback, followed by 5 five minutes listening, then 5 minutes spotlighting within the immediate area where the call playback was undertaken. This was completed for each targeted species.
Mammals	✓		Mammal monitoring was targeted at ground dwelling mammals. The spring 2012 monitoring included the use of Elliott traps (using 'A' and 'B' sized traps), an infra-red camera with a closed baited cage trap, hair tubes (mixture of small (Entrance Diameter 50mm) and large (Entrance Diameter 110 x 70mm)) and spotlighting. A trap line was set up at each of the monitoring sites and contained a combination of trap types and survey techniques.
Microbats	✓		Microbat monitoring was undertaken using ultrasonic echolocation recording (Anabat detection). Two Anabat detection devices were set up at each site over two nights, targeting both terrestrial and aquatic habitat.
Reptiles	✓		Reptile monitoring included active searches during the day for 0.5 person hours per site. The search involved rock rolling, searching beneath woody debris, litter searches, and beneath other debris.

	Spring 2012	Autumn 2013	Methodology
Habitat Assessment	✓		Habitat assessment included the identification of scats, scratches and diggings along each trapping transect line. All feral animal scratchings, warrens and scats were mark with a GPS and noted.

3.9.2.1 Landscape Function Analysis

LFA is a tool that assists in measuring the recovery of biological processes at the soil surface. LFA monitoring transects have been established in offset areas within stratification units undergoing active rehabilitation and in near pristine examples of the same stratification/vegetation type (analogue sites) to measure and compare trends, landscape organisation (key features observed included the distribution, width and length of patches of grass, litter, logs, cryptogams and bare ground), soil stability, nutrient cycling, water infiltration and plant density. This was undertaken utilising the Landscape Organisation and Soil Surface Assessment (SSA) components of the LFA methodology.

In terms of interpreting the LFA results, the Landscape Organisation results are presented in a index, which essentially provides a proportion of the transect occupied by patches - patches being landscape elements that are relatively permanent and provide stable, resource accumulating structures, such as grassy tussocks, ground cover and logs. Therefore a higher Landscape Organisation index implies a more stable transect that is less prone to erosion. The SSA results go one step further than this and provide an index on stability, infiltration and nutrient cycling for all patch and inter-patch types for the whole of landscape (transect) and have been presented in a line graph using consecutive years of data, again, to identify any early trends.

The results for each Derived Native Grassland (DNG) vegetation type sampled are discussed. When analysing trends in monitoring data, long-term, multi-year monitoring is far more informative, as variables such as climatic conditions and different monitoring technicians can influence results. The earliest LFA data recorded at Moolarben was during surveys conducted in spring 2010, though not all sites were sampled in 2010 as some new sites were added to the monitoring program in 2011.

Blakely's Red Gum Grassy Woodland Derived Native Grassland

Landscape organisation

Generally, the DNG sites showed stable or upward trends in the proportion of vegetation patches across the transects. Site 4b is the only exception to this trend, with a gradual reduction in the index from 2010 to 2011 and a marked reduction in 2012. As expected, analogue sites had much higher measures and greater stability, recording a landscape organisation index of 0.99 at both analogue sites compared to a range of 0.62 to 0.89 for the DNG sites.

Soil Surface assessment

In terms of soil surface stability, all DNG sites and analogue sites are showing improvements in stability or are remaining stable, which is important when considering a transects susceptibility to erosion. Both infiltration and nutrient cycling is showing improvement for sites 4a and 4b. The infiltration and nutrient cycling at sites 4e and 4f appear to be trending downwards in the last two years of monitoring. However, at the same time, a similar downward trend for these indices is apparent in the analogue sites. All sites appear to be remaining constant or trending towards improved soil stability. This can be contributed to the fact that these sites have sandy soils (high porosity). Soil stability has also been improved as a result of two good rainfall and

growing seasons in 2010 and 2011, exclusion of livestock from the monitoring sites, and increased accumulation of leaf litter.

Ironbark – Cyprus – Stringybark Forest DNG

Landscape organisation
Based on the landscape organisation results, both DNG sites show relatively high proportions of grass/ground cover, with indices between 0.80 and 0.97, suggesting good stability. This is comparable to the analogue examples, which had indices of 0.98 to 1.

Soil Surface assessment
Soil surface stability appears to be improving across all sites which is important for the DNG sites when considering a transects susceptibility to erosion. Infiltration scores varied across the sites, with 7a, A5a and A5b either remaining stable or trending towards improvement. Site 7b trended down slightly for infiltration. Nutrient cycling remained constant in comparison to previous monitoring periods, or dropped slightly for 7a, 7b and A5b, whilst A5a increased marginally. Analogue sites similarly showed some marginal reductions in nutrient cycling and no real changes in infiltration. A dry winter and spring during 2012 created particularly dry conditions observed during the spring 2012 survey period and as such, some reductions in infiltration and nutrient cycling would be expected subject to these climatic changes.

Grey Box – Blakely's Red Gum Open Forest Derived Native Grassland

Landscape organisation
The landscape organisation of the Grey Box – Blakely's Red Gum Open Forest DNG community offset and analogue sites showed that Site 9a had an increase in the proportion of patches, whilst 9b showed a marked decline from 0.71 to 0.45. This is likely to be as a result of a dry winter and spring. Both analogue sites are stable.

Soil Surface assessment
Soil surface stability appears to be improving across both of the DNG sites. Stability scores were consistent between the two analogue sites, with both A8a and A8b decreasing slightly. Both infiltration and nutrient cycling increased for site 9a and stayed relatively stable for 9b. Analogue site A8a showed an increase in infiltration and nutrient cycling. However, site A8b showed a decrease in infiltration and nutrient cycling. Conditions observed on the DNG sites, particularly 9b, were dry, a consequence of relatively dry winter and spring in 2012, and some reductions in infiltration and nutrient cycling would be expected subject to these climatic changes. This is supported by the Landscape Organisation results for 9b which shows a strong reduction in the proportion of patches, most probably due to a die back or reduction in grass tussocks and loss of other patch types such as litter patches.

Yellow Box Grassy Woodland Derived Native Grassland

Landscape organisation
Landscape organisation for the Yellow Box Grassy Woodland DNG community offset and analogue sites indicates that the DNG variant of this community was similar to analogue sites, with all sites recording indices of between 0.98 and 1. Additionally, all the sites showed consistent results between monitoring years, suggesting these sites are quite stable.

Soil Surface assessment
Soil surface stability appears to be improving across all DNG and analogue sites. Similarly, infiltration and nutrient cycling is improving or remaining mostly stable for sites 21a, A20b and A20b. Site 21b is showing a slight decrease in infiltration and nutrient cycling. However, as observed on other sites, the higher clay content and dry conditions on these sites are likely to have increased surface resistance and therefore reduced infiltration scores. The results for the

Yellow Box Grassy Woodland DNG sites are generally constant across monitoring periods or showing improvement. These results can be contributed to the high productivity and resilience of the soils where the DNG sites are positioned. This is further supported by the landscape organisation scores which show a stable and patch dominated transect.

Rough-barked Apple Woodland on valley flats Derived Native Grassland
Due to the scarcity of this community within the offset sites, analogue sites were located within Offset Area 1 rather than within the local conservation reserve system. This was considered a valid approach given the remnant patch of this community in Offset Area 1 was in good condition.

Landscape organisation
The results of the landscape organisation for the Rough-barked Apple Woodland on valley flats DNG community at offset and analogue sites indicates that site 24a remained stable when compared to previous years. Site 24b showed a decrease in landscape organisation, indicating that patches are becoming less dominant across the transects. The reduction in the proportion of patches along the transect at site 24b is of note; however, this may be attributed to the dry winter and spring months and is consistent with what has been observed on other sites. Both analogue sites appear to be stable or improving.

Soil Surface assessment
Soil surface stability appears to be remaining relatively constant. Stability scores also remained consistent for the analogue sites. Both infiltration and nutrient cycling increased or remained unchanged for monitoring sites 24a and 24b which suggests that these sites are stable or improving under existing management. Analogue sites maintained similar scores for both infiltration and nutrient cycling.

Blakely's Red Gum – Rough-barked Apple Woodland DNG
For the purpose of analysing the LFA and vegetation dynamics recorded for these sites, the Rough-barked Apple Alluvial Woodland analogue sites have been compared with data from this DNG vegetation community due to similarities in landscape position and general vegetation structure.

Landscape organisation
Site 25a was found to be comparable to the analogue equivalents, with proportionally higher grass/ground cover compared to bare soil. Both of the DNG sites showed an increase in the proportion of patches found across the transects, indicating an increase in stability of vegetation across the site.

Soil Surface assessment
With the exception of site A2a, all DNG sites and analogue sites are showing trends towards greater soil stability. In addition, the presence of cryptogams at sites 25a and 25b suggests that the soil surface is relatively stable. Infiltration is decreasing at sites 25a and 25b and in analogue A2b, though this reduction is not considered substantial between the 2011 and 2012 monitoring periods. Analogue site A2a is trending slightly upwards for infiltration between 2011 and 2012. The results for nutrient cycling varied across the sites. Sites 25a and A2a both trend slightly down between 2011 and 2012, whilst sites 25b and A2b both trend slightly upward between these years. Some explanation for the downward trends shown across the sites may be due to a particularly dry winter and early spring in 2012 leading to a firmer more surface resistant soil.

3.9.2.2 Floristic Surveys

A total of 428 species (366 native species and 62 exotic species) were recorded across all floristic monitoring sites during the spring 2012 and autumn 2013 survey. Within individual sites, species richness ranged between 12 to 60 species, with exotic species ranging from 0 to 17 species. A reduction in species richness from spring to autumn is to be expected as many annuals and cryptic spring flowering species are more likely to be recorded in spring surveys than surveys conducted in autumn.

The spring 2012 survey represents the third spring survey period although the majority of floristic monitoring sites were established in spring 2011 and hence have only been sampled during two spring monitoring periods. The changes in species richness from spring 2010 to spring 2011 are presented in the spring 2011 monitoring report (ELA 2012a) which identified a decrease in native species richness from spring 2010 to spring 2011 across 12 of the 16 monitored sites, with decreases occurring at both offset and analogue sites. Similarly, exotic species richness declined at all sites where exotic species were present, for the same period (**Figure 55**).

From spring 2011 to spring 2012 native species richness was variable with increases observed at 44 sites and declines recorded at 31 sites, with 5 sites remaining consistent between the two survey periods. In general, changes in species richness at individual sites were relatively small and generally related to understorey species and particularly those species which were rare (<3 individuals) to uncommon (>3 individuals but not common) within each site. No trends were identified in relation to individual species or groups of species (**Figure 55**).

The autumn 2013 survey represents the third survey period although the majority of floristic monitoring sites were established in spring 2011 and hence have only been sampled during two spring monitoring periods. It is noted that for those sites established in spring 2010, for which data exists for three autumn survey periods (autumn 2011, 2012 and 2013), a general decline in native species richness occurred from autumn 2011 to autumn 2012, and a general increase in native species richness occurred from autumn 2012 to autumn 2013. This general trend occurred at both offset sites and analogue sites and as such is likely a response to environmental conditions, specifically the wetter conditions during the spring 2010 survey compared to the following seasons. Exceptions to this trend appear to be related to site-specific factors with no individuals trends observed in relation to individual species, groups of species or vegetation communities (**Figure 55**).

As for native species richness, in spring 2012 exotic species abundance was relatively consistent with that observed in spring 2011 but remains below that observed in spring 2010. Fluctuations in exotic species richness were similar for offset and analogue sites and no trends were identified in relation to individual species or families, though decreases in exotic species occurred from spring 2011 to spring 2012 at all sites within the Blakely's Red Gum Grassy Woodland – Derived Native Grasslands vegetation community (**Figure 56**).

During the autumn survey periods, generally, the number of exotic species also declined during the three year survey period. The magnitude of change (decline) in species abundance from autumn 2011 to autumn 2012 and autumn 2013 was generally greater for exotic species than native species. The greater decline in species richness for exotic species compared to native species may indicate the success of rehabilitation strategies, though given this trend also occurred at analogue sites, the trend is more likely to be the result of environmental conditions more broadly (**Figure 56**).

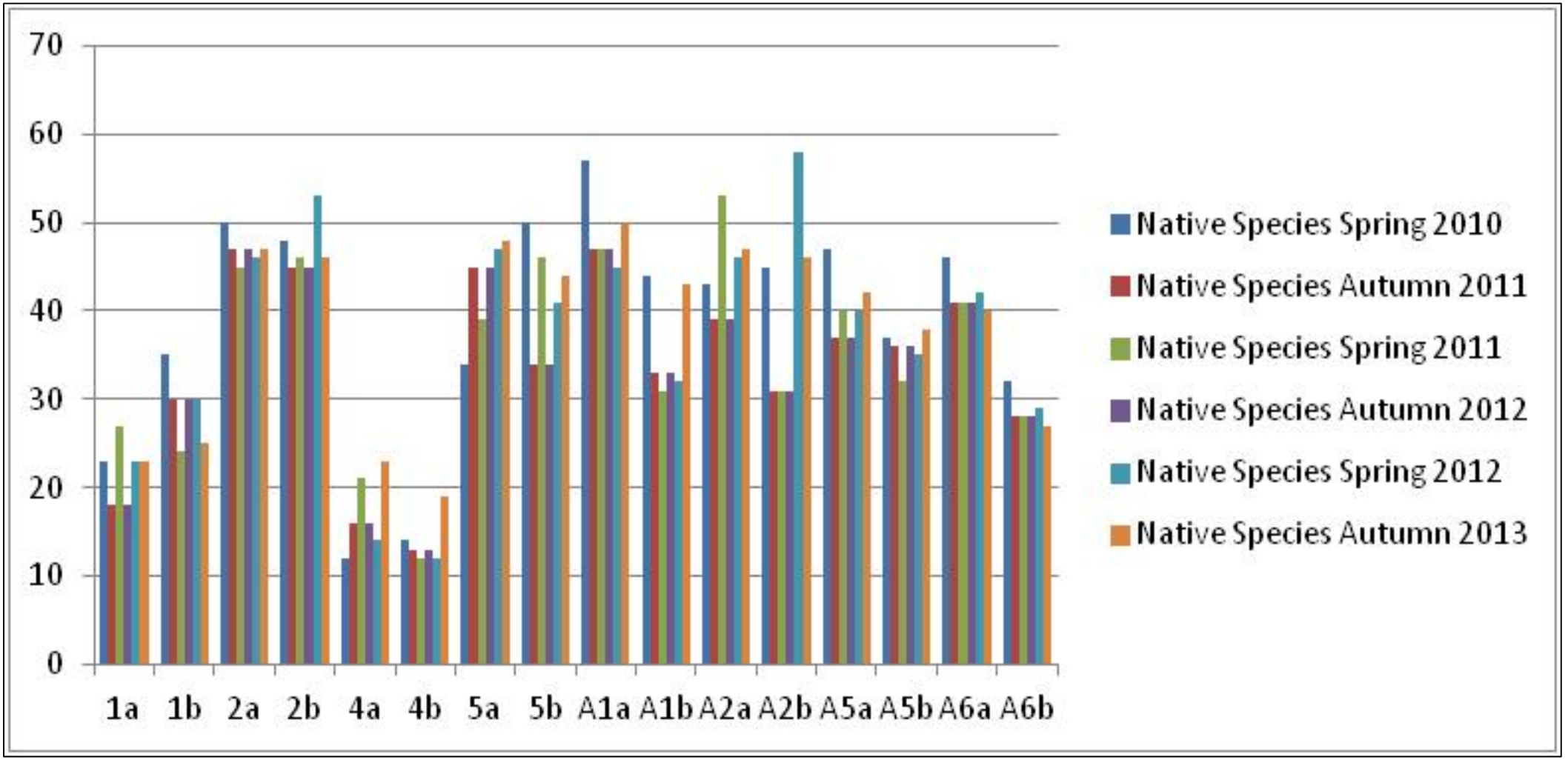


Figure 55: Native Species Richness within Existing Monitoring Sites (established Spring 2010)

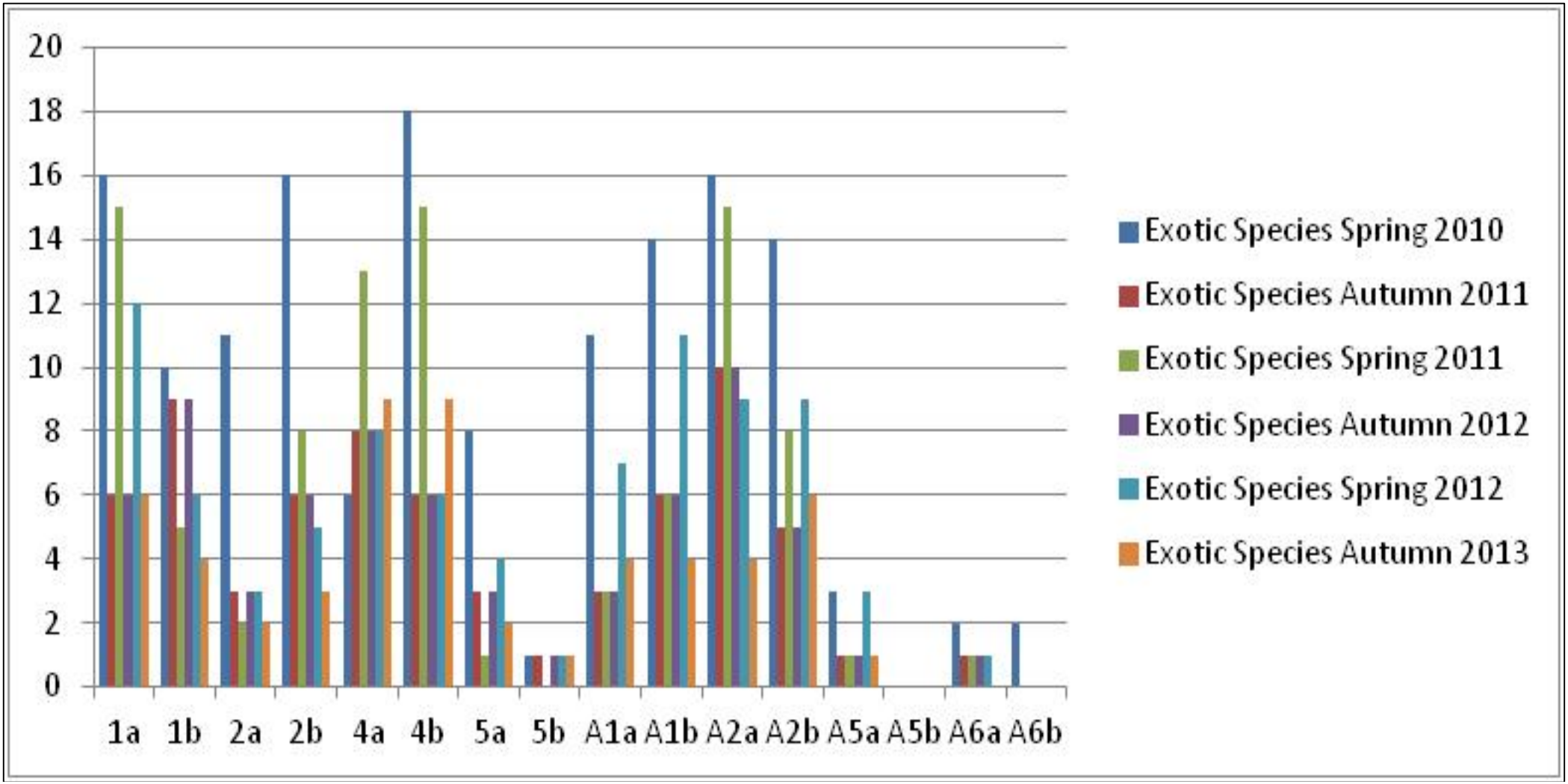


Figure 56: Exotic Species Richness within Existing Monitoring Sites (established Spring 2010)

Fauna

Fauna data collected during Spring 2012 is summarised below in **Table 42**.

Table 42: Fauna Monitoring Results Summary

Monitoring Site	Amphibian	Birds	Mammal	Microbats	Reptile
Fa1a	2	34	3	8	3
Fa1b	0	31	3	8	1
Fa2a	5	29	6	7	1
Fa2b	3	29	3	9	0
Fa4a	4	37	6	10	0
Fa4b	3	22	6	9	0
Fa5a	1	18	3	5	0
Fa5b	0	25	6	6	0
Fa5c	0	12	5	10	1
Fa5d	0	32	5	11	1
Fa6a	0	27	3	8	1
Fa6b	0	31	7	9	0
Fa8a	0	30	3	6	0
Fa10	0	19	5	9	1
Fa12	0	20	3	3	1
Fa13a	0	26	4	6	0
Fa13b	1	23	4	9	0
Fa13c	0	21	2	10	0
Fa14	0	35	4	9	2
Fa15	6	36	2	10	2
Fa16	0	22	3	10	0
Fa17	2	25	3	10	0
Fa19	1	28	8	8	0
Fa25a	1	31	7	8	0

Within Offset Area 1, six bird, two microchiropteran bat and one reptile species listed as vulnerable under the NSW Threatened Species Conservation Act 1995 (TSC Act) were observed (**Table 43**), including *Calyptorhynchus lathami* (Glossy Black-cockatoo), *Climacteris picumnus victoriae* (Brown Treecreeper (eastern subspecies)), *Daphoenositta chrysoptera* (Varied Sittella), *Melanodryas cucullata* (Hooded Robin), Pyrrholaemus sagittatus (Speckled Warbler), *Stagonopleura guttata* (Diamond Firetail), *Varanus rosenbergi* (Rosenberg's Monitor), *Chalinolobus dwyeri* (Large-eared Pied Bat), and *Miniopterus schreibersii oceanensis* (Eastern Bentwing Bat). The Large-eared Pied Bat is also listed as vulnerable under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). One migratory bird species listed under the EPBC Act was recorded, *Merops ornatus* (Rainbow Bee-eater).

Table 43: Threatened Fauna Recorded in Offset Area 1

Common Name	TSC Act	EPBC Act	Fa1a	Fa2b	Fa4a	Fa5a	Fa6a	Fa10	Fa11a	Fa14
Glossy Black-Cockatoo	V	-				✓				
Brown Treecreeper (eastern subspecies)	V	-	✓	✓	✓		✓			✓
Varied Sittella	V	-					✓			
Hooded Robin	V	-	✓	✓						
Rainbow Bee-eater	-	M	✓		✓					
Speckled Warbler	V	-	✓							
Diamond Firetail	V	-		✓	✓					✓
Large-eared Pied Bat	V	V		✓	✓					
Eastern Bentwing Bat	V	-	✓	✓	✓		✓	✓	✓	
Rosenberg's Goanna										✓

Within Offset Area 2, two bird and two microchiropteran bat species listed as vulnerable under the TSC Act were recorded (**Table 44**). These included the Glossy Black-cockatoo, *Ninox strenua* (Powerful Owl), Large-eared Pied Bat, Eastern Bentwing Bat. The Large-eared Pied Bat is also listed as vulnerable under the Commonwealth EPBC Act.

Table 44: Threatened Fauna Recorded at Offset Area 2

Common Name	TSC Act	EPBC Act	Fa12	Fa13a	Fa13b	Fa13c	Fa25a	Opp
Glossy Black-Cockatoo	V	-		✓				✓
Powerful Owl	V	-						✓
Large-eared Pied Bat	V	V				✓	✓	
Eastern Bentwing Bat	V	-			✓	✓	✓	

Within Offset Area 3, three bird and one microchiropteran species listed as vulnerable under the TSC Act were recorded (**Table 45**). These were the Powerful Owl, Varied Sittella, *Hieraaetus morphnoides* (Little Eagle) and Eastern Bentwing Bat.

Table 45: Threatened Fauna Recorded at Offset Area 3

Common Name	TSC Act	EPBC Act	Fa 1b	Fa 4b	Fa 5c	Fa 5d	Fa 6b	Fa 8a	Fa 8b	Fa 15	Fa 17	Fa 19
Powerful Owl	V	-		✓								
Varied Sittella	V	-	✓		✓	✓		✓	✓		✓	
Little Eagle	V	-		✓								✓
Eastern Bentwing Bat	V	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	

Four introduced mammals were observed within Offset Area 1 during the monitoring periods, including *Canis familliaris* (Dingo/Domestic Dog), *Oryctolagus cunniculus* (European Rabbit),

Sus scrofa (Feral Pig) and *Vulpes vulpes* (Fox). Four introduced mammals were observed within Offset Area 2 during the monitoring periods, including the Rabbit, Dingo/Dog and Fox. Three introduced mammals were observed within Offset Area 3 during the monitoring periods, including Rabbit, Dingo/Dog, Fox, *Felis cattus* (Feral Cat). Three introduced mammals were observed within Bora Creek during the monitoring periods, including the Rabbit, Feral Pig and Fox.

3.9.3 Activities in the Next Reporting Period

Revegetation works in the Vegetation Offset Areas will continue during the next reporting period. The flora and fauna monitoring program will continue to be implemented.

3.10 STREAM HEALTH MONITORING

3.10.1 Activities This Reporting Period

Stream Health Monitoring was undertaken during Spring 2012 and Autumn 2013. The monitoring locations are illustrated in **Figure 4**.

3.10.2 Monitoring Results and Comparison to Previous Stream Health Monitoring

The monitoring for Spring 2012 was performed in November 2012. The results from this monitoring and comparison to previous results can be seen in **Table 46**. There was no modelling conducted in the Environmental Assessment on predicted stream health surrounding the mining operations so a comparison can't be made to predicted stream health.

Table 46: Spring 2012 Stream Health Monitoring Results

Index	Site	SH01	SH02	SH03	SH04	SH05	SH06	SH08	SH10	SH12	SH13
RCE	Mean	75.70	83.66	ND	64.28	52.75	52.20	51.25	54.37	68.27	73.40
RCE	SD	6.05	4.55	ND	11.91	3.49	3.91	6.48	0.96	8.92	5.21
RCE	Spring 2012	69.23	76.92	ND	78.85	55.77	57.69	53.85	55.77	75.00	73.08
RCE	**Compare to baseline**	**IR**	**Low**	**-**	**High**	**IR**	**High**	**IR**	**High**	**IR**	**IR**
Diversity	Mean	25.63	27.75	ND	17.714	23.50	19.13	17.75	20.63	24.57	24.43
Diversity	SD	5.95	9.90	ND	3.04	4.93	4.05	4.89	3.89	7.46	5.09
Diversity	Spring 2012	30	26	ND	20	31	20	12	29	29	21
Diversity	**Compare to baseline**	**IR**	**IR**	**-**	**IR**	**High**	**IR**	**Low**	**High**	**IR**	**IR**
SIGNAL	Mean	4.08	4.17	ND	3.67	3.71	3.73	3.32	3.68	4.46	4.31
SIGNAL	SD	0.48	0.48	ND	0.64	0.43	0.41	0.45	0.59	0.53	0.46
SIGNAL	Spring 2012	4.90	4.42	ND	3.70	4.06	4.25	3.92	4.14	4.24	4.43
SIGNAL	**Compare to baseline**	**High**	**IR**	**-**	**IR**	**IR**	**High**	**High**	**IR**	**IR**	**IR**

ND represents no data. Comparison to baseline compares present seasonal score to long term mean ± standard deviation. IR means In Range.

Aquatic Habitat Condition (RCE Index)
RCE Scores in Spring 2012 were within the comparable range for SH01, SH05, SH08, SH12 and SH13. SH02 was below the comparable range, perhaps a reflection of an increase in filamentous algae cover in-stream. Sites SH04, SH06 and SH10 were above the comparable range which is likely due to an increase in seasonal groundcover providing greater bank stability. RCE for SH04 and SH12 have displayed a trend of increasing RCE scores since sampling commenced, indicating that the ecological condition of the riparian and channel is improving steadily. RCE at SH01 and SH02 is showing an overall declining trend over the two years of sampling.

Aquatic Macro Invertebrate Diversity
More taxa were collected during Spring 2012 than in any previous survey for sites SH10 and SH05. Diversity was below the comparable range at only one site, SH08, above the comparable range at SH05 and SH10 and within the comparable range at the remaining sites. Macro invertebrate diversity has increased at all sites since autumn 2012 sampling, with the exception of site SH08 and SH13 where it has decreased slightly.

Pollution Tolerance Site SIGNAL Scores
SIGNAL2 scores in Spring 2012 were similar to most previous surveys for all sites except for SH01, SH06 and SH08 which exceeded the comparable range. SH01 had the highest SIGNAL2 score recorded to date and SH02, SH05 and SH10 had the highest recorded SIGNAL2 scores since spring 2008. Condition improved at sites SH05 and SH10 since the autumn 2012 survey with SIGNAL2 scores indicating moderate impairment rather than severe impairment. Condition declined at SH08 since the autumn 2012 survey with the SIGNAL2 score indicating severe rather than moderate impairment.

The monitoring for Autumn 2013 was performed in March 2013. The results from this monitoring and comparison to previous results can be seen in **Table 47**. There was no modelling conducted in the Environmental Assessment on predicted stream health surrounding the mining operations so a comparison can't be made to predicted stream health.

Table 47: Autumn 2013 Stream Health Monitoring Results

Index	Site	SH01	SH02	SH03	SH04	SH05	SH06	SH08	SH10	SH12	SH13
RCE	Mean	76.58	83.06	ND	66.10	53.13	52.65	51.09	55.03	69.78	74.73
RCE	SD	6.12	4.55	ND	12.17	3.40	3.83	6.01	2.06	9.07	5.91
RCE	Autumn 2013	82.69	78.85	ND	78.85	55.77	55.77	50.00	59.62	78.85	82.69
RCE	**Compare to baseline**	**IR**	**IR**	**-**	**High**	**IR**	**IR**	**IR**	**High**	**IR**	**High**
Diversity	Mean	26.78	28.00	ND	18.75	23.89	19.33	17.22	19.89	24.13	25.38
Diversity	SD	6.55	9.29	ND	4.06	4.76	3.84	4.84	4.26	7.02	5.42
Diversity	Autumn 2013	36	30	ND	26	27	21	13	14	21	32
Diversity	**Compare to baseline**	**High**	**High**	**-**	**High**	**IR**	**IR**	**IR**	**Low**	**IR**	**High**
SIGNAL	Mean	4.12	4.20	ND	3.63	3.72	3.77	3.35	3.63	4.43	4.39
SIGNAL	SD	0.47	0.46	ND	0.61	0.40	0.40	0.43	0.56	0.51	0.48
SIGNAL	Autumn 2013	4.46	4.37	ND	3.33	3.86	4.07	3.52	3.22	4.17	4.94
SIGNAL	**Compare to baseline**	**High**	**High**	**-**	**IR**	**IR**	**IR**	**IR**	**IR**	**IR**	**High**

ND represents no data. Comparison to baseline compares present seasonal score to long term mean ± standard deviation. IR means In Range.

Aquatic Habitat Condition (RCE index)
RCE Scores in Autumn 2012 were within the comparable range for SH01, SH02, SH05, SH06, SH08 and SH12. SH04, SH10 and SH14 were above the comparable range, which is likely due to an increase in seasonal groundcover providing greater bank stability. RCE for SH04 and SH12 have displayed a trend of increasing RCE scores since sampling commenced, indicating that the ecological condition of the riparian and channel zones are improving steadily. Although RCE scores range from being low (SH05, SH06 and SH10) to high (SH01, SH02 and SH13) they appear to be quite stable over time, with most fluctuations attributable to relatively quick response biological components such as sedge and ground cover vegetation and algal cover.

Aquatic Macro Invertebrate Diversity
Taxa diversity was inside or above the comparable range at all sites with the exception of SH10 where it was below and the lowest recorded yet. This low invertebrate diversity was probably caused by an increase in EC and turbidity since spring. Highest diversity was recorded at SH01, SH02 and SH13, with SH01 being higher than any previous survey. There are no seasonal patterns or mine-related impacts apparent in the data.

Pollution Tolerance Site SIGNAL Scores
Although SIGNAL2 scores declined at all sites from spring 2012, with the exception of SH13, they remained within the comparable range at most sites, including SH10 where diversity was at the lowest recorded for that site. SH01, SH02 and SH13 had SIGNAL2 scores above the comparable range, with SH13 score being the highest since spring 2008. Despite being within the comparable range, the SIGNAL2 score for SH05 and SH10 fell from 4.07 to 3.77, and 4.14 to 3.22, indicating that they have gone from being moderately impaired to severely impaired. SH05 has been in the severely impacted category on all but two occasions, spring 2008 and spring 2012 where it was moderately impaired. SH10 has fluctuated between being severely and moderately impaired since spring 2008, however it is more common for it to be severely impaired.

3.10.3 Activities Next Reporting Period

Stream health monitoring will continue to be undertaken with the results to be provided in the next AEMR.

3.11 WEEDS AND FERAL ANIMALS

3.11.1 Activities This Reporting Period

MCO undertook a weed survey during October 2012 targeting noxious weeds. Noxious weeds identified during this survey included:

- Bathurst Burr;
- Blackberry;
- Blue Heliotrope;
- Cineraria;
- Spiny Burr Grass;
- St John's Wort; and
- Tree-of-Heaven.

Treatment for Blackberry, St Johns Wort, Tree-of-Heaven and Blue Heliotrope was undertaken during the reporting period.

MCO were involved in regional feral animal treatment programs that targeted dogs and pigs. This involved on-ground baiting.

3.11.2 Activities Next Reporting Period

Weed and feral animal control will continue to be conducted during the next reporting period.

3.12 BLASTING

3.12.1 Activities This Reporting Period

Blast monitoring continued to be undertaken throughout the reporting period. A review of the adequacy of the blast monitoring network was undertaken this reporting period and was found to be adequate. As a result no changes have been made to the monitoring network.

During the reporting period the Blast Management Plan (BMP) was reviewed and updated to manage blast related impacts associated with blasting in Open Cut 1, Open Cut 2 and Open Cut 3. The BMP was reviewed in consultation with EPA and was awaiting approval from DP&I at the end of the reporting period. Additional blast monitoring locations along Ridge Road and Moolarben Road have been added to the BMP.

During the reporting period the NSW Dam Safety Committee de-prescribed Moolarben Dam and removed MCO's requirement to monitor blasts at Moolarben Dam.

Blasting within 500m of public roads continued during this reporting period. These blasts require the roads to be closed to maintain public safety. This procedure outlines the process for notifications prior to the blast, what process to follow if emergency services need to get through the road closure and what inspections are taken of the public road before and after blasting. All road closures have been successful with members of the public being appreciative of the notification they receive.

3.12.2 Blast Monitoring

Blasting criteria for MCO are shown in **Table 48**.

Table 48: Blasting Assessment Criteria

Receiver	Air Blast Overpressure Level dB (linear Peak)	Allowable Exceedance
Residence on privately owned land	>115	5% of the total number of blasts over a period of 12 months
	>120	Nil
Receiver	**Peak Particle Velocity (mm/s)**	**Allowable Exceedance**
Residence on privately owned land	5	5% of the total number of blasts over a period of 12 months
	10	0%
330kV transmission line	50	0%
Aboriginal rock shelters	40	0%
Railway culverts/bridges	100	0%
Moolarben Creek Dam	10	0%

The blast monitoring locations can be seen in **Figure 4** and the results from the blasting can be seen in **Table 49**, **Figure 57** and **Figure 58**. Blasting within 2km of the Aboriginal rock shelters

continued during the reporting period, triggering the requirement to monitor at these shelters. The results from these blasts can be seen in **Table 49**. Blasting within 500m of Transgrid's power lines continued during the reporting period. Results from this blasting can be seen in **Table 50**. Only those towers within 500m of the blast were monitored.

As shown in the blasting results, blasting activities were only carried out between 9am and 5pm Monday to Saturday inclusive. Blasting activities were also limited to:

- 2 blasts a day;
- 9 blasts a week, averaged over any 12 month period, including;
- a maximum of 4 blasts a week, averaged over any 12 month period, with a maximum instantaneous charge (MIC) of greater than 650kg.

There were no occasions where vibration or overpressure results exceeded the criteria set in the Project Approval and Environment Protection Licence.

There were two occasions when blast fume was generated from overburden blasts in the northern part of Open Cut 1. These incidents are discussed further in **Section 3.23.1**.

Table 49: Blast Monitoring Results

Date	Time	Blast Location	Type	BM1 Ulan School		BM2 Rock Shelters		BM3 Moolarben Dam Wall		BM4 Lagoons Rd	
				Ground Vibration (mm/s)	Blast Overpressure (dBL)	Ground Vibration (mm/s)	Blast Overpressure (dBL)	Ground Vibration (mm/s)	Blast Overpressure (dBL)	Ground Vibration (mm/s)	Blast Overpressure (dBL)
04/09/12	12:59	S04B15	Overburden	0.54	95.9	Blast centroid >2 km from rock shelters. No monitoring is required to be undertaken		0.61	not required	0.15	91.5
07/09/12	12:05	S05B15	Overburden	0.47	97.5			0.54	not required	0.15	110.2
12/09/12	12:03	S05B19-20	Overburden	0.72	97.5			0.76	not required	0.16	94.0
17/19/12	12:03	S04B19	Coal	0.55	101.0			0.23	not required	0.12	98.8
19/09/12	12:04	S04B18	Coal	0.28	94.0			0.19	not required	0.09	88.0
21/09/12	12:07	S02B12	Coal	0.17	88.0			0.09	not required	0.09	95.9
25/09/12	12:05	S04B18	Coal	0.33	97.5			0.42	not required	0.09	91.5
28/09/12	13:00	S06B16	Overburden	0.16	94.0			0.22	not required	0.09	98.8
03/10/12	11:59	S04B19	Coal	0.36	91.5			0.25	not required	0.09	91.5
05/10/12	12:03	S04B19	Coal	0.21	91.5			0.18	not required	0.09	100.0
10/10/12	12:00	S05B35-37	Coal	0.35	100.0	0.13	not required	1.38	not required	0.19	103.5
12/10/12	11:56	S05B35-37	Coal	0.34	102.8	0.09	not required	1.11	not required	0.14	102.8
17/10/12	10:59	S06B20	Overburden	0.81	94.0	Blast centroid >2 km from rock shelters. No monitoring is required to be undertaken		1.25	not required	0.21	94.0
19/10/12	13:01	S05B35-37	Coal	0.30	101.0	0.08	107.5	0.90	not required	0.05	88.00
24/10/12	13:01	S05B19-20	Overburden	0.59	97.5	Blast centroid >2 km from rock shelters. No monitoring is required to be undertaken		0.98	not required	0.59	97.5
26/10/12	12:05	S05B19-20	Overburden	0.46	97.5			0.95	not required	0.19	106.0

Date	Time	Blast Location	Type	BM1 Ulan School		BM2 Rock Shelters		BM3 Moolarben Dam Wall		BM4 Lagoons Rd	
				Ground Vibration (mm/s)	Blast Overpressure (dBL)	Ground Vibration (mm/s)	Blast Overpressure (dBL)	Ground Vibration (mm/s)	Blast Overpressure (dBL)	Ground Vibration (mm/s)	Blast Overpressure (dBL)
31/10/12	12:00	S05B19-20	Overburden	0.35	95.5			0.78	not required	0.13	88.0
02/11/12	13:03	S06B17-18	Overburden	0.48	95.9			1.73	not required	0.21	88.0
07/11/12	10:30	S06B19	Overburden	0.57	95.9			0.94	not required	0.16	91.5
14/11/12	12:00	S06B20	Overburden	0.56	104.2			0.66	not required	0.14	98.8
21/11/12	12:00	S06B19	Overburden	0.47	88.0			0.33	not required	0.16	88.0
23/11/12	12:00	S04B39-40	Overburden	0.30	100.0	0.17	not required	0.76	not required	0.10	97.5
28/11/12	13:00	S04B39	Overburden	0.30	100.0	0.16	not required	0.75	not required	0.12	95.9
30/11/12	12:00	S05B38	Overburden	0.20	91.5	0.13	not required	0.76	not required	0.12	94.0
06/12/12	12:00	S06B17	Overburden	0.47	91.5	Blast centroid >2 km from rock shelters. No monitoring is required to be undertaken		0.93	not required	0.18	91.5
13/12/12	12:00	S03B17	Coal	0.26	106.5			0.34	not required	0.10	97.5
10/01/13	11:00	S06B17-18	Overburden	0.66	100.0			0.25	not required	0.25	98.8
12/01/13	09:30	S06B18	Overburden	0.25	94.0			0.78	not required	0.12	88.0
15/01/13	15:35	S06B19	Overburden	0.39	95.9			0.78	not required	0.16	94.0
18/01/13	10:59	S03B15-16	Coal	0.24	91.5			0.29	not required	0.10	98.8
21/01/13	10:59	S06B20	Overburden	0.35	97.5			0.99	not required	0.15	95.9
23/01/13	11:00	S03B15-16	Coal	0.20	102.8			0.21	not required	0.09	102.8
25/01/13	11:00	S06B22	Overburden	0.21	102.8			0.34	not required	0.09	100.0
30/01/13	11:00	S04B16	Coal	0.21	100.0			0.27	not required	0.09	101.0
01/02/13	11:00	S04B39	Overburden	0.22	94.0	0.20	not required	1.44	not required	0.11	115.80
07/02/13	12:05	S06B22	Overburden	0.09	91.5	Blast centroid >2 km from		0.08	not required	0.08	88.0

Date	Time	Blast Location	Type	BM1 Ulan School		BM2 Rock Shelters		BM3 Moolarben Dam Wall		BM4 Lagoons Rd	
				Ground Vibration (mm/s)	Blast Overpressure (dBL)	Ground Vibration (mm/s)	Blast Overpressure (dBL)	Ground Vibration (mm/s)	Blast Overpressure (dBL)	Ground Vibration (mm/s)	Blast Overpressure (dBL)
07/02/13	12:08	S03B16	Coal	0.46	100.0	rock shelters. No monitoring is required to be undertaken		0.85	not required	0.17	91.5
14/02/13	12:00	S07B19	Overburden	0.70	105.5			1.04	not required	0.29	103.5
15/02/13	12:00	S04B39	Overburden	0.28	101.0	0.16	not required	0.87	not required	0.10	94.0
21/02/13	12:00	S06B22	Overburden	0.58	107.5	Blast centroid >2 km from rock shelters. No monitoring is required to be undertaken		0.58	not required	0.21	102.8
22/02/13	12:30	S04B16-17	Coal	0.23	106.0			0.23	not required	0.10	104.9
01/03/13	10:16	S06B22	Overburden	0.52	102.8			0.78	not required	0.21	98.8
07/03/13	12:05	S06B21-23	Overburden	0.71	101.9			1.32	not required	0.27	88.0
07/03/13	12:09	S04B16	Coal	0.17	88.0			0.15	not required	0.09	88.0
09/03/13	11:00	S07B19-20	Overburden	0.41	91.5			1.09	not required	0.25	95.9
14/03/13	12:00	S04B16	Coal	0.28	106.0			0.28	not required	0.09	101.9
15/03/13	12:00	S07B17-18	Overburden	0.19	101.9			0.19	not required	0.09	88.0
15/03/13	12:00	S04B16	Coal	0.57	101.9			0.70	not required	0.21	95.9
19/03/13	12:00	S02B10	Overburden	0.27	108.0			0.23	not required	0.09	94.0
22/03/13	12:01	S02B10	Overburden	0.29	103.5			0.37	not required	0.10	104.2
27/03/13	12:05	S02B09	Overburden	0.35	91.5			0.28	not required	0.09	102.8
27/03/13	12:09	S07B28	Overburden	0.45	95.9			0.84	not required	0.28	91.5
05/04/13	12:02	S07B21	Overburden	0.45	100.0			0.75	not required	0.25	98.8
09/04/13	12:00	S03B08	Overburden	0.42	101.0			0.30	not required	0.12	95.9
12/04/13	11:59	S03B07	Overburden	0.10	98.8			0.26	not required	0.31	98.8
12/04/13	12:03	S04B16	Coal	0.09	97.5			0.25	not required	0.21	104.2
16/04/13	11:57	S03B08	Overburden	0.34	97.5			0.38	not required	0.13	91.5

Date	Time	Blast Location	Type	BM1 Ulan School		BM2 Rock Shelters		BM3 Moolarben Dam Wall		BM4 Lagoons Rd	
				Ground Vibration (mm/s)	Blast Overpressure (dBL)	Ground Vibration (mm/s)	Blast Overpressure (dBL)	Ground Vibration (mm/s)	Blast Overpressure (dBL)	Ground Vibration (mm/s)	Blast Overpressure (dBL)
19/04/13	12:00	S03B07	Overburden	0.46	81.9			0.25	not required	0.09	97.4
19/04/13	12:04	S04B15	Coal	0.22	101.9			0.09	not required	0.10	100.0
24/04/13	12:09	S02B07	Overburden	0.35	94.0			0.27	not required	0.12	91.5
26/04/13	12:07	S04B15	Coal	0.20	98.8			0.39	not required	0.09	101.9
30/04/13	12:00	S03B07	Overburden	0.34	97.5			0.24	not required	0.09	94.0
03/05/13	12:00	S02B07	Overburden	0.33	94.0			0.34	not required	0.11	100.0
03/05/13	12:00	S05B39	Overburden	0.21	95.9	0.31	not required	0.80	not required	0.17	107.5
08/05/13	12:00	S02B06	Overburden	0.51	102.8	Blast centroid >2 km from rock shelters. No monitoring is required to be undertaken		0.27	not required	0.09	95.9
09/05/13	12:00	S07B22	Overburden	0.43	98.8			0.74	not required	0.23	91.5
10/05/13	12:00	S03B07	Overburden	0.09	103.5			0.21	not required	0.09	104.9
15/05/13	11:57	S07B23	Overburden	0.61	97.5			0.91	not required	0.27	100.0
15/05/13	12:03	S05B18	Coal	0.23	94.0			0.51	not required	0.09	100.0
20/05/13	12:00	S07B23	Overburden	0.98	91.5			1.57	not required	0.38	100.0
22/05/13	12:00	S03B07	Overburden	0.18	95.9			0.15	not required	0.10	100.0
22/05/13	12:06	S05B18	Coal	0.08	101.0			0.39	not required	0.09	104.2
24/05/13	11:56	S04 B20	Coal	0.31	98.8			0.39	not required	0.01	100.0
28/05/13	11:58	S03 B07	Overburden	0.09	88.0			0.09	not required	0.10	91.5
31/05/13	11:54	S07 B24	Overburden	1.09	94.0			1.70	not required	0.41	100.0
04/06/13	11:55	S08B24	Overburden	0.58	109.9			0.37	not required	0.29	94.0
07/06/13	08:26	S08B23-24	Overburden	0.30	105.0			0.30	not required	0.84	100.0
14.06/13	09:58	S8B24	Overburden	0.31	88.0			0.24	not required	0.16	94.0
18/06/13	12:02	S03B06	Overburden	0.18	94.0			0.15	not required	0.10	95.9
18/06/13	03:02	S05B20	Coal	0.27	91.5			0.44	not required	0.12	101.0

Date	Time	Blast Location	Type	BM1 Ulan School		BM2 Rock Shelters		BM3 Moolarben Dam Wall		BM4 Lagoons Rd	
				Ground Vibration (mm/s)	Blast Overpressure (dBL)	Ground Vibration (mm/s)	Blast Overpressure (dBL)	Ground Vibration (mm/s)	Blast Overpressure (dBL)	Ground Vibration (mm/s)	Blast Overpressure (dBL)
21/06/13	12:00	S08B22	Overburden	0.57	107.0			0.29	not required	0.29	95.9
28/06/13	11:58	S05B20	Overburden	0.32	106.0			0.32	not required	0.15	100.0
03/07/13	11:54	S03B05	Overburden	0.25	101.0			0.21	not required	0.12	94
05/07/13	12:00	S03B05	Overburden	0.33	88.0			0.21	not required	0.10	109.2
05/07/13	12:03	S05B19	Overburden	0.17	94.0			0.29	not required	0.09	105.5
09/07/13	12:00	S05B16	Coal	0.20	108.8			0.32	not required	0.10	108.0
11/07/13	12:01	S05B16	Coal	0.22	106.0			0.24	not required	0.11	103.5
12/07/13	12:03	S02B05	Overburden	0.18	95.9			0.17	not required	0.10	91.5
17/07/13	12:02	S03B06	Overburden	0.19	91.5			0.23	not required	0.10	88.0
17/07/13	12:08	S06B19	Coal	0.16	101.0			0.22	not required	0.09	100.0
19/07/13	12:00	S08B19-21	Overburden	0.24	94.0			0.19	not required	0.15	91.5
25/07/13	12:00	S08B19-21	Overburden	0.42	97.5			0.25	not required	0.31	102.8
26/07/13	12:00	S06B18-20	Coal	0.20	97.5			0.37	not required	0.10	98.8
31/07/13	11:58	S04B06	Overburden	0.32	104.9			0.32	not required	0.17	103.5
02/08/13	11:56	S04B06	Overburden	0.23	91.5			0.32	not required	0.12	95.9
07/08/13	12:00	S03B09	Overburden	0.23	100.0			0.34	not required	0.09	97.5
09/08/13	12:55	S04B05	Overburden	0.27	91.5			0.38	not required	0.14	97.5
14/08/13	12:00	S02B08	Overburden	0.53	88.0			0.51	not required	0.28	98.8
16/08/13	12:00	S03B05	Overburden	0.27	97.5			0.27	not required	0.10	94.0
21/08/13	11:59	S02B08	Overburden	0.47	94.0			0.55	not required	0.15	102.8
23/08/13	12:00	S02B04	Overburden	0.29	88.0			0.29	not required	0.10	101.0
28/08/13	12:00	S05B38	Overburden	0.23	105.6	0.75	not required	1.66	not required	0.23	101.9

Date	Time	Blast Location	Type	BM1 Ulan School		BM2 Rock Shelters		BM3 Moolarben Dam Wall		BM4 Lagoons Rd	
				Ground Vibration (mm/s)	Blast Overpressure (dBL)	Ground Vibration (mm/s)	Blast Overpressure (dBL)	Ground Vibration (mm/s)	Blast Overpressure (dBL)	Ground Vibration (mm/s)	Blast Overpressure (dBL)
30/08/13	12:00	S06B18	Coal	0.24	94.0	Blast centroid >2 km from rock shelters. No monitoring is required to be undertaken		0.37	not required	0.12	109.2

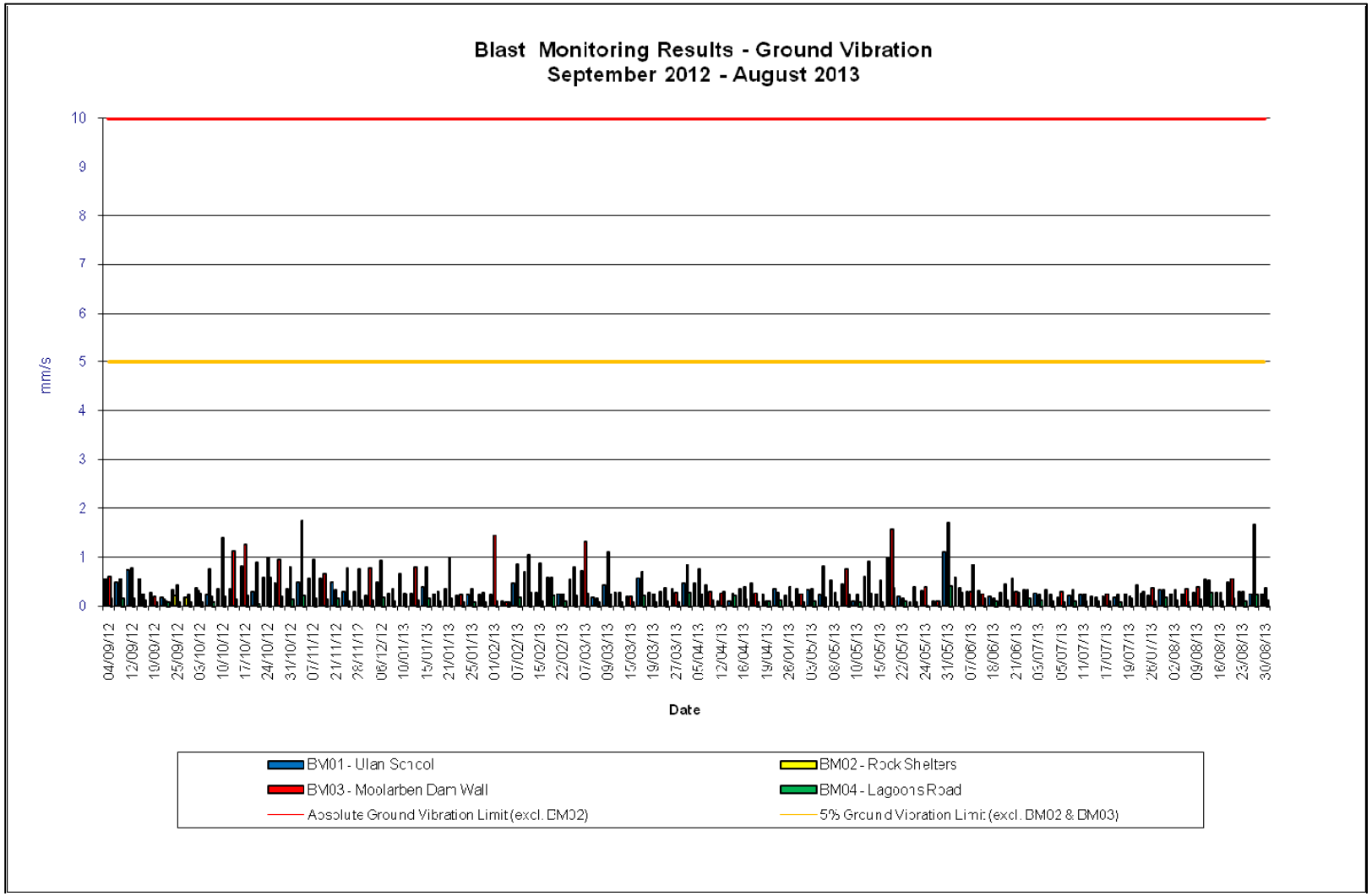


Figure 57: Vibration Results

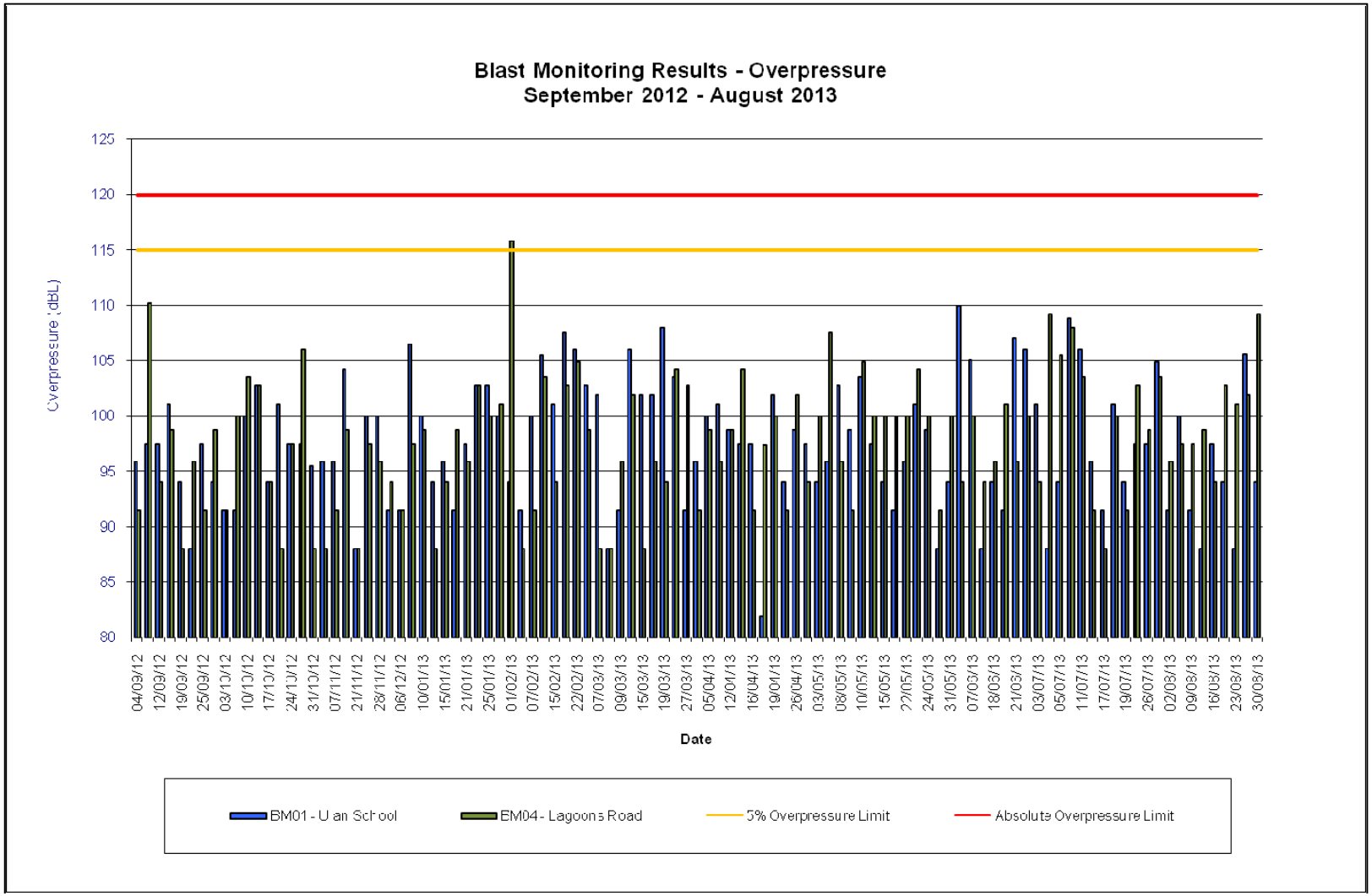


Figure 58: Overpressure Results

Table 50: Blasting Results at Transgrid's Power Lines

Date	Transgrid 330kV – Tower 79 (all results in mm/s)
27/03/13	4.44
09/04/13	5.87
12/04/13	4.56
16/04/13	3.05
19/04/13	6.25

3.12.3 Comparison to Previous Blast Monitoring and Predicted Levels

A comparison of this year's blasting results to previous year's results and predictions in the Environmental Assessment is shown in **Table 51**.

Table 51: Comparison of Blasting Results to Previous Results

Site	Vibration Predictions in Environmental Assessment (mm/s)	Previous Year's Vibration Range (mm/s)	2012-2013 Vibration Range (mm/s)	Comments on 2012-2013 Results
Ulan School	2.3	0.08 – 1.54	0.08 – 1.09	Consistent with previous results and below predicted levels
Lagoons Road	2.6	0.08 – 0.54	0.01 – 0.84	Consistent with previous results and below predicted levels
Moolarben Dam Wall	6.2	0.09 – 2.54	0.08 – 1.73	Consistent with previous results and below predicted levels
Site	**Overpressure Predictions in Environmental Assessment (dB(L))**	**Previous Year's Overpressure Range (dB(L))**	**2012-2013 Overpressure Range (dB(L))**	**Comments on 2012-2013 Results**
Ulan School	114.0	81.9 – 113.3	81.9 – 109.9	Consistent with previous results and below predicted levels
Lagoons Road	114.0	88.0 – 113.8	88.0 – 115.8	Consistent with previous results and slightly above predicted levels

3.12.4 Activities During the Next Reporting Period

The revised BMP will be implemented during the next reporting period. The specific changes to the BMP will include monitoring at Ridge Road (BM5) in lieu of Lagoons Road (BM4) due to recent changes in land ownership. MCO will also undertake predictive blast modelling on rock shelters near Open Cut 2 with results to be provided in next year's AEMR.

Blast monitoring will continue to be undertaken with the results to be provided in the next AEMR.

3.13 NOISE MANAGEMENT

3.13.1 Activities This Reporting Period

During the reporting period the Noise Management Plan (NMP) was reviewed and updated to manage project specific, cumulative and traffic noise impacts associated with mining operations in Open Cut 1, Open Cut 2 and Open Cut 3, associated infrastructure areas and the Northern Borefield. The NMP was reviewed in consultation with EPA and was awaiting approval from DP&I at the end of the reporting period.

The key changes to the NMP include:

- Review of the Real Time Response Protocols and management actions for responding to alarms. The real time response trigger levels are based on DP&I *Interim Noise Monitoring Application Note.* The guideline includes a traffic light system (green, amber and red) for responding to noise alarms and what actions are required following alarms.
- Addition of two attended noise monitoring locations. Winchester Crescent (NA9) prior to mining in Open Cut 2; and Moolarben Road (NA10) prior to mining in Open Cut 3.
- Attended noise monitoring will be undertaken monthly instead of quarterly.
- Attended noise monitoring will be undertaken during night time only, except for Ulan School where monitoring will be undertaken during school hours only.

Operational processes for MCO to reduce noise emissions include:

- Separate day and night dumping areas when deemed necessary;
- Use of shielded areas in adverse weather conditions;
- Use of real-time noise monitoring data to assist operational personnel in proactive management of noise impacts;
- Use of production assistants to assess real-time noise monitoring levels on night shift;
- Regular maintenance of equipment, including sound attenuation components; and
- Sound power testing of mobile and stationary equipment.

Noise attenuation on MCO's equipment continued during the reporting period. The status of the noise attenuation program on the current fleet of equipment at the end of the reporting period is:

- The remaining 996 excavator has had the full noise attenuation kit fitted;
- Two of the 830E trucks are yet to have their Stage 3 noise attenuation kit fitted. This will be completed in late 2013.
- The remaining 830E trucks have their full noise attenuation kits fitted.

All future excavator and trucks purchased by MCO will have the factory noise attenuation kits assembled prior to the machine being commissioned on site.

During the previous reporting period MCO trialled a DuraTray body, which is constructed of rubber on the floor and the lower levels of the tray sides. MCO purchased four (4) DuraTray bodies during the reporting period and commissioned them in May 2013. Since commissioning, noise tests have indicated an 8-10 decibel noise reduction while being loaded, increased payload and reduced truck energy and extended tyre life.

The NMP outlines response triggers for the real-time noise monitoring stations. When the trigger has been reached a SMS alarm is sent to operational personnel and members of the Environment and Community Department. The real-time response triggers in the approved NMP and the management/control actions are shown in **Table 52**. These triggers have been reviewed as part of the NMP review with the updated triggers to be implemented once the NMP is approved by DP&I.

Table 52: Noise Real-Time Response Triggers

Time Period	Trigger	Management/Control Actions	Responsibility
Day	• Wind direction – 22.5^0-225^0 • Wind speed <5m/s • No rainfall • Low frequency L_{Aeq} 34dBA	• Review the audio to determine if MCO noise is audible. If so, - Review current noise generating activities - Review current noise control - Make operational changes as appropriate. For example: dumping in protected locations, shutting down equipment • Ensure standard mitigation measures are in place • Monitor changes in noise levels	Area Supervisor (assistance can be sought from the environmental department)
Evening	• Wind direction – 22.5^0-225^0 • Wind speed <5m/s • No rainfall • Low frequency L_{Aeq} 34dBA	• Review the audio to determine if MCO noise is audible. If so, - Review current noise generating activities - Review current noise control - Make operational changes as appropriate. For example: dumping in protected locations, shutting down equipment • Ensure standard mitigation measures are in place • Monitor changes in noise levels	Area Supervisor (assistance can be sought from the environmental department)
Night	• Wind direction – 22.5^0-225^0 • Wind speed <5m/s • No rainfall • Low frequency L_{Aeq} 34dBA	• Review the audio to determine if MCO noise is audible. If so, - Review current noise generating activities - Review current noise control - Make operational changes as appropriate. For example: dumping in protected locations, shutting down equipment • Ensure standard mitigation measures are in place • Monitor changes in noise levels	Area Supervisor (assistance can be sought from the environmental department)

During the reporting period, MCO did not perform any additional monitoring on private land in response to complaints or impacts at their properties.

3.13.2 Noise Monitoring

Impact Assessment Criteria

Noise Impact Assessment Criteria are set for day, evening and night time periods to protect the amenity of neighbouring residents. Impact Assessment Criteria are expressed as LA_{10} (15min). The noise impact assessment criteria for MCO are provided in **Table 53**.

Table 53: Project Specific Noise Impact Assessment Criteria for Mining

Land Number	Day	Evening	Night	
	$L_{Aeq(15min)}$	$L_{Aeq(15min)}$	$L_{Aeq(15min)}$	$L_{A1(1min)}$
63, 171	38	38	37	45
All other privately owned land (outside the village of Ulan)	35	35	35	45
Ulan Primary School[1]	43 (external) when in use and under all weather conditions *35 (internal) when in use and under all weather conditions*			-
Ulan Anglican Church, Ulan Catholic Church	35 (internal) when in use and under all weather conditions			-
Goulburn River National Park, Munghorn Gap Nature Reserve	50			-

Note: Properties 22, 23, 41a, 49, 64, 169, 170, 172 and 173 have been purchased by MCO since granting of Project Approval 05_0117 and have been removed from Table 53. Property 26 is now zoned industrial land and has been removed from Table 53.

Note: An independent noise study conducted at Ulan Primary School found that the difference between external and internal measurements was 8 dB(A) with windows normally open. The noise criterion as measured outside the school classrooms is therefore 43 dB(A).

Land Acquisition Criteria

All of the properties identified in Project Approval 05_0117 as having acquisition rights have been purchased by MCO.

If the noise generated by MCO exceeds the criteria in **Table 54** at any residence on privately owned land or on more than 25% of any privately owned land, MCO will upon receiving a written request from the landowner, acquire the land.

Table 54: Project Specific Land Acquisition Criteria

Day/Evening/Night $LA_{eq(15min)}$	Land Number
43 / 43 / 42	63, 171
40 / 40 / 40	All other private land owners

Note: Properties 22, 23, 41a, 64, 49, 169, 170, 172 and 173 have been purchased by MCO since granting of Project Approval 05_0117 and have been removed from Table 54. Property 26 is now zoned industrial land and has been removed from Table 54.

Traffic Noise Impact Assessment Criteria

MCO will take all reasonable and feasible measures to ensure that the traffic noise generated by the project combined with the traffic noise generated by other mines does not exceed the traffic noise impact assessment criteria in **Table 55.**

Table 55: Traffic Noise Impact Assessment Criteria

Road	Day/Evening $L_{Aeq(1\ hour)}$	Night $L_{Aeq(1\ hour)}$
Ulan Road	60	55

Note: Traffic noise generated by the project is to be measured in accordance with the relevant procedures in the OEH's Environmental Criteria for Road Traffic Noise.

Cumulative Noise Criteria

In order to protect the amenity of local residents, both amenity and land acquisition criteria have been set for cumulative noise generated by all mining operations audible at monitoring locations. MCO will take all reasonable and feasible measures to ensure that the noise generated by the operation, combined with the noise generated by other mines does not exceed the amenity criteria in **Table 56** on any privately owned land.

Table 56: Cumulative Noise Impact Criteria

Measurement	Amenity Criteria dB(A)	Acquisition Criteria dB(A)
LAeq(11 hour)-Day	50	53
LAeq(4 hour)-Evening	45	48
LAeq(9 hour)-Night	40	43

Results – Mining

The attended noise monitoring results during the reporting period can be seen in **Table 57** to **Table 64**. The monitoring period for each of these results is 15 minutes. Wind speed and/or estimated temperature inversion conditions resulted in development consent criteria not always being applicable. When properties 64, 170 and 172 were purchased the requirement to monitor in these locations was removed.

MCO complied with the project specific criteria at all monitoring sites during the reporting period.

Table 57: Attended Noise Monitoring Results – Quarter 4 2012

Location	Start Date/Time	Total L_{Aeq} dB	Wind Speed [1,8]	VTG [2,8]	$L_{Aeq(15min)}$ Criterion dB	Criterion Applies? [2]	MCO L_{Aeq} dB [4,5]	Exceedance [6]	$L_{A1(1min)}$ Criterion dB	Criterion Applies? [2]	MCO $L_{A1(1\ min)}$ dB [4,5]	Exceedance [6]
NA1	29/11/2012 12:17	46	1.7	-1.9	43	Y	IA	Nil	---	---	---	---
NA1	29/11/2012 12:34	43	1.6	-1.9	43	Y	IA	Nil	---	---	---	---
NA1	30/11/2012 10:38	47	2.7	-1.9	43	Y	IA	Nil	---	---	---	---
NA1	30/11/2012 10:55	48	2.8	-1.9	43	Y	IA	Nil	---	---	---	---
NA6	29/11/2012 13:02	34	1.0	-1.9	38	Y	IA	Nil	---	---	---	---
NA6	29/11/2012 13:22	34	1.5	-1.9	38	Y	IA	Nil	---	---	---	---
NA6	28/11/2012 19:06	48	2.9	-1.8	38	Y	IA	Nil	---	---	---	---
NA6	28/11/2012 20:27	40	1.8	3.0	38	N	IA	NA	---	---	---	---
NA6	28/11/2012 22:45	35	3.0	-1.0	37	N	<25	NA	45	N	<25	NA
NA6	28/11/2012 23:01	37	2.6	-1.0	37	Y	29	Nil	45	Y	31	Nil
NA6	30/11/2012 09:57	34	3.3	-1.8	38	N	IA	NA	---	---	---	---
NA6	30/11/2012 10:13	38	3.9	-1.8	38	N	IA	NA	---	---	---	---
NA6	29/11/2012 20:11	45	0.1	3.0	38	N	IA	NA	---	---	---	---
NA6	29/11/2012 20:32	44	0.1	3.0	38	N	NM	NA	---	---	---	---

Location	Start Date/Time	Total L_{Aeq} dB	Wind Speed [1,8]	VTG [2,8]	$L_{Aeq(15min)}$ Criterion dB	Criterion Applies? [2]	MCO L_{Aeq} dB [4,5]	Exceedance [6]	$L_{A1(1min)}$ Criterion dB	Criterion Applies? [2]	MCO $L_{A1(1\ min)}$ dB [4,5]	Exceedance [6]
NA6	29/11/2012 22:02	40	0.0	3.0	37	N	<25	NA	45	N	30	NA
NA6	29/11/2012 22:20	38	0.1	3.0	37	N	26	NA	45	N	26	NA
NA8	29/11/2012 13:50	35	1.7	-1.9	38	Y	IA	Nil	---	---	---	---
NA8	29/11/2012 14:07	39	1.2	-1.9	38	Y	IA	Nil	---	---	---	---
NA8	28/11/2012 20:58	36	2.4	-1.0	38	Y	IA	Nil	---	---	---	---
NA8	28/11/2012 21:17	38	2.9	-1.0	38	Y	IA	Nil	---	---	---	---
NA8	28/11/2012 22:01	49	3.0	-1.0	37	N	IA	NA	45	N	IA	NA
NA8	28/11/2012 22:17	50	2.9	-1.0	37	Y	IA	Nil	45	Y	IA	Nil
NA8	30/11/2012 09:09	34	2.8	-1.9	38	Y	IA	Nil	---	---	---	---
NA8	30/11/2012 09:27	42	3.4	-1.8	38	N	IA	NA	---	---	---	---
NA8	29/11/2012 19:19	33	0.7	-1.8	38	Y	IA	Nil	---	---	---	---
NA8	29/11/2012 19:38	37	0.9	-1.6	38	Y	IA	Nil	---	---	---	---
NA8	29/11/2012 22:50	39	0.1	3.0	37	N	IA	NA	45	N	IA	NA
NA8	29/11/2012 23:08	40	0.1	3.0	37	N	IA	NA	45	N	IA	NA

Notes: 1. *Wind speed in metres per second;*
2. *VTG - Vertical temperature gradient in degrees Celsius per 100 metres altitude. Estimated from wind speed and sigma theta data;*
3. *The noise emission limits apply under meteorological conditions of:*

- Wind speeds of up to 3 m/s at 10 metres above ground level; or
- Temperature inversion conditions of up to 3ºC/100m, and wind speeds of up to 2 m/s at 10 metres above ground level;

4. *Estimated or measured L_{Aeq} dB attributed to MCO;*
5. *NM denotes MCO audible but not measurable, IA denotes inaudible;*
6. *NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable;*
7. *Bolded results in red indicate exceedance of criteria; and*
8. *Atmospheric data is sourced from the MCO meteorological station; and*
9. *Night measurements not undertaken at NA1 as outside hours of use, so criterion not applicable.*

Table 58: Mining Operations – Quarter 4 2012

Day			Evening			Night		
Equipment Type	**Quantity[1]**	**Location**	**Equipment Type**	**Quantity[1]**	**Location**	**Equipment Type**	**Quantity[1]**	**Location**
Liebherr 996 excavator	1	S04B15 OB	Liebherr 996 excavator	1	S04B15 OB	Liebherr 996 excavator	1	S03B18 OB
Caterpillar 6050 shovel	1	S04B20 Coal	Caterpillar 6050 shovel	1	S04B20 Coal	Caterpillar 6050 shovel	1	S04B20 Coal
PC450 excavator	1	S03B18 Drain	PC450 excavator	1	S03B18 Drain	WA1200	1	ROM
WA200	2	MCOL (everywhere)	WA200	2	MCOL (everywhere)	D475 dozer	2	480 Rehab
DML drill	2	S06B19 S04B38	DML drill	2	S06B19 S04B38	D475 dozer	1	S04B39
D475 dozer	2	Dump	D475 dozer	2	Dump	D375 dozer	1	S03B18
D475 dozer	2	Rehab	D475 dozer	2	Rehab	D375 dozer	1	Dump
D475 dozer	1	Workshop	D475 dozer	1	Workshop	WD900 dozer	1	MCOL (everywhere)
D375 dozer	2	S04B15	D375 dozer	2	S04B15	825 grader	2	MCOL (everywhere)
D375 dozer	2	S04B16	D375 dozer	2	S04B16	785 water truck	1	MCOL (everywhere)
D375 dozer	1	Dump	D375 dozer	1	Dump	Komatsu 830E RDT	4	S03B18 to Dump

Day			Evening			Night		
Equipment Type	Quantity[1]	Location	Equipment Type	Quantity[1]	Location	Equipment Type	Quantity[1]	Location
WD900 dozer	1	S04B18	WD900 dozer	1	S04B18	Komatsu 830E RDT	3	S04B20 to ROM
825 grader	2	MCOL (everywhere)	825 grader	2	MCOL (everywhere)	Komatsu 830E RDT	2	Rejects
24M grader	1	MCOL (everywhere)	24M grader	1	MCOL (everywhere)			
785 water truck	2	MCOL (everywhere)	785 water truck	2	MCOL (everywhere)			
Komatsu 830E RDT	4	S04B20 to ROM	Komatsu 830E RDT	4	S04B20 to ROM			
Komatsu 830E RDT	5	EX102 to dump	Komatsu 830E RDT	5	EX102 to dump			
Komatsu 830E RDT	1	Rejects	Komatsu 830E RDT	1	Rejects			
Other Activities			Other Activities			Other Activities		
Pumping	-	Pit and fill points	Train loading	-	Active	CHPP Operations	-	Active
Train loading	-	Active	CHPP Operations	-	Active	Pumping	-	Pit and fill points
CHPP Operations	-	Active	Pumping	-	Pit and fill points			

Table 59: Attended Noise Monitoring Results – Quarter 1 2013

Location	Start Date/Time	Total L_{Aeq} dB	Wind Speed [1,8]	VTG [2,8]	$L_{Aeq(15min)}$ Criterion dB	Criterion Applies? [2]	MCO L_{Aeq} dB [4,5]	Exceedance [6]	$L_{A1(1min)}$ Criterion dB	Criterion Applies? [2]	MCO $L_{A1(1\ min)}$ dB [4,5]	Exceedance [6]
NA1	06/03/2013 14:08	53	2.2	-1.9	43	Y	NM	Nil	---	---	---	---
NA1	06/03/2013 14:24	52	2.6	-1.9	43	Y	NM	Nil	---	---	---	---

Location	Start Date/Time	Total L_{Aeq} dB	Wind Speed [1,8]	VTG [2,8]	$L_{Aeq(15min)}$ Criterion dB	Criterion Applies? [2]	MCO L_{Aeq} dB [4,5]	Exceedance [6]	$L_{A1(1min)}$ Criterion dB	Criterion Applies? [2]	MCO $L_{A1(1\ min)}$ dB [4,5]	Exceedance [6]
NA1	07/03/2013 11:27	46	1.9	-1.9	43	Y	IA	Nil	---	---	---	---
NA1	07/03/2013 11:43	48	2.0	-1.9	43	Y	IA	Nil	---	---	---	---
NA6	05/03/2013 21:35	41	3.4	-1.0	38	N	NM	NA	---	---	---	---
NA6	05/03/2013 21:51	41	4.3	-1.0	38	N	NM	NA	---	---	---	---
NA6	05/03/2013 22:14	41	4.5	-1.0	38	N	NM	NA	45	N	NM	NA
NA6	05/03/2013 22:31	42	3.6	-1.0	38	N	NM	NA	45	N	NM	NA
NA6	06/03/2013 13:27	39	2.1	-1.9	37	Y	IA	Nil	---	---	---	---
NA6	06/03/2013 13:43	38	1.6	-1.9	37	Y	IA	Nil	---	---	---	---
NA6	06/03/2013 21:28	37	0.2	-1.0	38	Y	<25	Nil	---	---	---	---
NA6	06/03/2013 21:44	37	0.0	0.5	38	Y	<25	Nil	---	---	---	---
NA6	06/03/2013 22:34	38	0.0	-1.0	38	Y	<25	Nil	45	Y	25	Nil
NA6	06/03/2013 22:53	36	0.2	-1.0	38	Y	NM	Nil	45	Y	NM	Nil
NA6	07/03/2013 10:47	39	1.7	-1.9	37	Y	IA	Nil	---	---	---	---
NA6	07/03/2013 11:03	37	1.5	-1.9	37	Y	IA	Nil	---	---	---	---
NA8	05/03/2013 20:51	39	3.3	-1.0	38	N	IA	NA	---	---	---	---

Location	Start Date/Time	Total L_{Aeq} dB	Wind Speed [1,8]	VTG [2,8]	$L_{Aeq(15min)}$ Criterion dB	Criterion Applies? [2]	MCO L_{Aeq} dB [4,5]	Exceedance [6]	$L_{A1(1min)}$ Criterion dB	Criterion Applies? [2]	MCO $L_{A1(1\ min)}$ dB [4,5]	Exceedance [6]
NA8	05/03/2013 21:07	40	2.6	-1.0	38	Y	IA	Nil	---	---	---	---
NA8	05/03/2013 22:59	38	3.8	-1.0	38	N	IA	NA	45	N	IA	NA
NA8	05/03/2013 23:15	41	2.9	-1.0	38	Y	IA	Nil	45	Y	IA	Nil
NA8	06/03/2013 12:45	39	2.7	-1.9	37	Y	IA	Nil	---	---	---	---
NA8	06/03/2013 13:01	36	2.2	-1.9	37	Y	IA	Nil	---	---	---	---
NA8	06/03/2013 20:46	31	0.8	3.0	38	N	IA	NA	---	---	---	---
NA8	06/03/2013 21:02	31	0.1	3.0	38	N	IA	NA	---	---	---	---
NA8	06/03/2013 23:20	29	0.0	4.1	38	N	IA	NA	45	N	IA	NA
NA8	06/03/2013 23:37	29	0.0	4.1	38	N	IA	NA	45	N	IA	NA
NA8	07/03/2013 10:06	36	2.1	-1.8	37	Y	IA	Nil	---	---	---	---
NA8	07/03/2013 10:22	35	2.7	-1.6	37	Y	IA	Nil	---	---	---	---

Notes:

1. *Wind speed in metres per second;*
2. *VTG - Vertical temperature gradient in degrees Celsius per 100 metres altitude. Estimated from wind speed and sigma theta data;*
3. *The noise emission limits apply under meteorological conditions of:*

   - Wind speeds of up to 3 m/s at 10 metres above ground level; or
   - Temperature inversion conditions of up to 3ºC/100m, and wind speeds of up to 2 m/s at 10 metres above ground level;

4. *Estimated or measured L_{Aeq} dB attributed to MCO;*
5. *NM denotes MCO audible but not measurable, IA denotes inaudible;*
6. *NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable;*
7. *Bolded results in red indicate exceedance of criteria; and*

8. Atmospheric data is sourced from the MCO meteorological station; and
9. Night measurements not undertaken at NA1 as outside hours of use, so criterion not applicable.

Table 60: Mining Operations – Quarter 1 2013

Day			Evening			Night		
Equipment Type	Quantity[1]	Location	Equipment Type	Quantity[1]	Location	Equipment Type	Quantity[1]	Location
Liebherr 996 excavator	1	S05B17	Liebherr 996 excavator	1	S05B17	Liebherr 996 excavator	1	S05B17/18
Caterpillar 6050 shovel	1	S02B16	Caterpillar 6050 shovel	1	S02B16	Caterpillar 6050 shovel	1	S05B38
WA1200	1	ROM	WA1200	1	ROM	WA1200	1	ROM
PC450 excavator	1	Waterfill Water Cart Access	PC450 excavator	1	Waterfill Water Cart Access	PC450 excavator	1	Windrows
WA200	2	MCO (everywhere)	WA200	2	MCO (everywhere)	WA1200	1	ROM Support
DML drill	2	S07B23 OB S07B23 OB	DML drill	2	S07B23 OB	DML Drill	1	S07B23 OB
D475 dozer	2	S04B37	D475 dozer	2	S04B37	D475 dozer	3	S03B18 Dump S05B17
D475 dozer	1	S02B17	D475 dozer	1	S02B17	D375 dozer	2	S03B16 Fill Point
D375 dozer	3	S02B19 Dump EX101	D375 dozer	3	S02B19 Dump EX101	825 grader	1	Roads
825 grader	2	Roads	825 grader	2	Roads	785 Water Cart	1	Roads
24M grader	1	Roads	24M grader	1	Roads	Komatsu 830E RDT	4	EX102 Support
785 water truck	2	Roads	785 water truck	2	Roads	Komatsu 830E RDT	3	6050 Support

Day			Evening			Night		
Equipment Type	**Quantity[1]**	**Location**	**Equipment Type**	**Quantity[1]**	**Location**	**Equipment Type**	**Quantity[1]**	**Location**
Komatsu 830E RDT	4	S05B17 to Dump	Komatsu 830E RDT	4	S05B17 to Dump	Komatsu 830E RDT	1	Reject
Komatsu 830E RDT	5	Reject/6050 shovel/ROM	Komatsu 830E RDT	5	Reject/6050 shovel/ROM	785 water truck	1	Roads
Train loading	-	Active	Train loading	-	Active	Train loading	-	Active (Night 2)
CHPP Operations	-	Active	CHPP Operations	-	Active	CHPP Operations	-	Active
Pit and fill points	Train loading	-	Active	CHPP Operations	-	Active		
Active	CHPP Operations	-	Active	Pumping	-	Pit and fill points		
Active	Pumping	-	Pit and fill points					

Table 61: Attended Noise Monitoring Results – Quarter 2 2013

Location	Start Date/Time	Total L_{Aeq} dB	Wind Speed [1,8]	VTG [2,8]	$L_{Aeq(15min)}$ Criterion dB	Criterion Applies? [2]	MCO L_{Aeq} dB [4,5]	Exceedance [6]	$L_{A1(1min)}$ Criterion dB	Criterion Applies? [2]	MCO $L_{A1(1\ min)}$ dB [4,5]	Exceedance [6]
NA1	05/06/2013 12:58	45	2.3	-1.9	43	Y	IA	Nil	---	---	---	---
NA1	05/06/2013 13:14	42	1.6	-1.9	43	Y	IA	Nil	---	---	---	---
NA1	06/06/2013 11:05	46	1.3	-1.9	43	Y	IA	Nil	---	---	---	---
NA1	06/06/2013 11:22	47	1.5	-1.9	43	Y	IA	Nil	---	---	---	---
NA6	04/06/2013 20:21	44	0.9	-1.0	38	Y	25	Nil	---	---	---	---

Location	Start Date/Time	Total L_{Aeq} dB	Wind Speed [1,8]	VTG [2,8]	$L_{Aeq(15min)}$ Criterion dB	Criterion Applies? [2]	MCO L_{Aeq} dB [4,5]	Exceedance [6]	$L_{A1(1min)}$ Criterion dB	Criterion Applies? [2]	MCO $L_{A1(1\ min)}$ dB [4,5]	Exceedance [6]
NA6	04/06/2013 20:38	43	0.7	3.0	38	N	26	NA	---	---	---	---
NA6	04/06/2013 22:48	45	1.0	-1.0	37	Y	NM	Nil	45	Y	NM	Nil
NA6	04/06/2013 23:04	41	0.7	-1.0	37	Y	27	Nil	45	Y	29	Nil
NA6	05/06/2013 20:53	42	0.7	3.0	38	N	IA	NA	---	---	---	---
NA6	05/06/2013 21:10	41	0.0	3.0	38	N	IA	NA	---	---	---	---
NA6	05/06/2013 22:00	29	0.5	-1.0	37	Y	IA	Nil	45	Y	IA	Nil
NA6	05/06/2013 22:18	39	1.0	0.5	37	Y	IA	Nil	45	Y	IA	Nil
NA6	20/06/2013 14:06	43	2.5	-1.8	38	Y	IA	Nil	---	---	---	---
NA6	20/06/2013 14:22	43	2.7	-1.6	38	Y	IA	Nil	---	---	---	---
NA6	21/06/2013 12:27	40	2.1	-1.9	38	Y	IA	Nil	---	---	---	---
NA6	21/06/2013 12:43	39	1.3	-1.9	38	Y	IA	Nil	---	---	---	---
NA8	04/06/2013 21:07	28	0.6	0.5	38	Y	IA	Nil	---	---	---	---
NA8	04/06/2013 21:24	29	0.6	0.5	38	Y	IA	Nil	---	---	---	---

Location	Start Date/Time	Total L_{Aeq} dB	Wind Speed [1,8]	VTG [2,8]	$L_{Aeq(15min)}$ Criterion dB	Criterion Applies? [2]	MCO L_{Aeq} dB [4,5]	Exceedance [6]	$L_{A1(1min)}$ Criterion dB	Criterion Applies? [2]	MCO $L_{A1(1\ min)}$ dB [4,5]	Exceedance [6]
NA8	04/06/2013 22:02	25	1.2	0.5	37	Y	IA	Nil	45	Y	IA	Nil
NA8	04/06/2013 22:18	27	0.7	3.0	37	N	IA	NA	45	N	IA	NA
NA8	05/06/2013 20:01	26	0.5	3.0	38	N	IA	NA	---	---	---	---
NA8	05/06/2013 20:19	26	1.0	0.5	38	Y	IA	Nil	---	---	---	---
NA8	05/06/2013 22:46	23	0.5	-1.0	37	Y	IA	Nil	45	Y	IA	Nil
NA8	05/06/2013 23:04	21	0.5	0.5	37	Y	IA	Nil	45	Y	IA	Nil
NA8	20/06/2013 14:49	39	2.3	-1.8	38	Y	IA	Nil	---	---	---	---
NA8	20/06/2013 15:05	36	2.6	-1.6	38	Y	IA	Nil	---	---	---	---
NA8	21/06/2013 11:44	38	3.2	-1.8	38	N	IA	NA	---	---	---	---
NA8	21/06/2013 12:00	37	2.8	-1.8	38	Y	IA	Nil	---	---	---	---

Notes:
1. *Wind speed in metres per second;*
2. *VTG - Vertical temperature gradient in degrees Celsius per 100 metres altitude. Estimated from wind speed and sigma theta data;*
3. *The noise emission limits apply under meteorological conditions of:*
   - *Wind speeds of up to 3 m/s at 10 metres above ground level; or*
   - *Temperature inversion conditions of up to 3ºC/100m, and wind speeds of up to 2 m/s at 10 metres above ground level;*
4. *Estimated or measured L_{Aeq} dB attributed to MCO;*
5. *NM denotes MCO audible but not measurable, IA denotes inaudible;*
6. *NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable;*
7. *Bolded results in red indicate exceedance of criteria; and*

8. Atmospheric data is sourced from the MCO meteorological station; and
9. Night measurements not undertaken at NA1 as outside hours of use, so criterion not applicable.

Table 62: Mining Operations – Quarter 2 2012

Day			Evening			Night		
Equipment Type	Quantity[1]	Location	Equipment Type	Quantity[1]	Location	Equipment Type	Quantity[1]	Location
Liebherr 996 excavator	1	S08B24	Liebherr 996 excavator	1	S08B24	Liebherr 996 excavator	1	S07B20 to RL415
Liebherr 996 excavator	1	S03B09	Liebherr 996 excavator	1	S03B09	Caterpillar 6050 shovel	1	S05B18 Coal
WA1200 loader	1	ROM rehandle and S02B05	WA1200 loader	1	ROM rehandle and S02B05	DML drill	1	S03B06 OB
DML drill	1	S03B06 OB	DML drill	1	S03B06 OB	D475 dozer	1	RL415
DML drill	1	S07B21 OB	DML drill	1	S07B21 OB	D475 dozer	1	S04 Coal Ramp
PC450 excavator	1	Pit maintenance	PC450 excavator	1	Pit maintenance	D475 dozer	1	S08 Drill Prep
D475 dozer	1	MIA 2 RL430	D475 dozer	1	MIA 2 RL430	D375 dozer	1	S07B20 floor assist
D11 dozer	2	S07 Drill Prep S07 Ramp and South Push	D11 dozer	2	S07 Drill Prep S07 Ramp and South Push	D375 dozer	1	S05B18 floor assist
D375 dozer	1	RL415	D375 dozer	1	RL415	WD900 dozer	1	S05B18 floor assist
D375 dozer	1	EX101 Support	D375 dozer	1	EX101 Support	825 grader	2	Roads
D375 dozer	1	EX102 Support	D375 dozer	1	EX102 Support	785 water truck	1	Roads
WD900 dozer	1	WA1200 Support	WD900 dozer	1	WA1200 Support	Komatsu 830E RDT	3	S07B20 to RL415
825 grader	3	Pit maintenance / Roads	825 grader	3	Pit maintenance / Roads	Komatsu 830E RDT	2	S05B18 to ROM
785 water truck	1	Roads	785 water truck	1	Roads			
Komatsu 830E	3	S08B24 to	Komatsu 830E	3	S08B24 to			

Day			Evening			Night		
Equipment Type	**Quantity[1]**	**Location**	**Equipment Type**	**Quantity[1]**	**Location**	**Equipment Type**	**Quantity[1]**	**Location**
RDT		RL430	RDT		RL430			
Komatsu 830E RDT	3	S03B09 to RL415	Komatsu 830E RDT	3	S03B09 to RL415			
Other Activities			**Other Activities**			**Other Activities**		
Pumping	-	Various	Pumping	-	-	Pumping	-	-
Train loading	-	Active	CHPP Operations	-	Active	CHPP Operations	-	Active
CHPP Operations	-	Active						

Table 63: Attended Noise Monitoring Results – Quarter 3 2013

Location	Start Date/Time	Total L_{Aeq} dB	Wind Speed [1,8]	VTG [2,8]	$L_{Aeq(15min)}$ Criterion dB	Criterion Applies? [2]	MCO L_{Aeq} dB [4,5]	Exceedance [6]	$L_{A1(1min)}$ Criterion dB	Criterion Applies ? [2]	MCO $L_{A1(1\ min)}$ dB [4,5]	Exceedance [6]
NA1	26/08/2013 10:06	44	3.2	-1.9	43	Yes	IA	Nil	---	---	---	---
NA1	26/08/2013 10:22	42	2.9	-1.8	43	Yes	IA	Nil	---	---	---	---
NA1	27/08/2013 10:28	49	2.2	-1.9	43	Yes	IA	Nil	---	---	---	---
NA1	27/08/2013 10:43	45	2.3	-1.9	43	Yes	IA	Nil	---	---	---	---
NA6	26/08/2013 09:25	35	3.6	-1.8	38	No	IA	NA	---	---	---	---
NA6	26/08/2013 09:41	34	3.2	-1.9	38	No	IA	NA	---	---	---	---
NA6	25/08/2013 20:56	36	0.4	3.0	37	No	IA	NA	---	---	---	---

Location	Start Date/Time	Total L_{Aeq} dB	Wind Speed [1,8]	VTG [2,8]	$L_{Aeq(15min)}$ Criterion dB	Criterion Applies? [2]	MCO L_{Aeq} dB [4,5]	Exceedance [6]	$L_{A1(1min)}$ Criterion dB	Criterion Applies ? [2]	MCO $L_{A1(1\ min)}$ dB [4,5]	Exceedance [6]
NA6	25/08/2013 21:13	38	1.4	3.0	37	No	IA	NA	---	---	---	---
NA6	25/08/2013 22:01	31	0.6	3.0	38	No	IA	NA	45	No	IA	NA
NA6	25/08/2013 22:19	30	0.2	0.5	38	Yes	IA	Nil	45	Yes	IA	Nil
NA6	27/08/2013 09:44	46	2.3	-1.9	37	Yes	IA	Nil	---	---	---	---
NA6	27/08/2013 10:01	41	1.8	-1.9	37	Yes	IA	Nil	---	---	---	---
NA6	26/08/2013 20:50	36	0.5	3.0	38	No	IA	NA	---	---	---	---
NA6	26/08/2013 21:06	41	0.4	3.0	38	No	IA	NA	---	---	---	---
NA6	26/08/2013 22:00	28	0.1	-1.0	37	Yes	IA	Nil	45	Yes	IA	Nil
NA6	26/08/2013 22:19	33	0.2	3.0	37	No	IA	NA	45	No	IA	NA
NA8	26/08/2013 10:51	30	3.4	-1.9	38	No	IA	NA	---	---	---	---
NA8	26/08/2013 11:08	29	3.5	-1.9	38	No	IA	NA	---	---	---	---
NA8	25/08/2013 20:08	23	0.9	3.0	37	No	IA	NA	---	---	---	---
NA8	25/08/2013 20:24	21	0.1	-1.0	37	Yes	IA	Nil	---	---	---	---

Location	Start Date/Time	Total L_{Aeq} dB	Wind Speed [1,8]	VTG [2,8]	$L_{Aeq(15min)}$ Criterion dB	Criterion Applies? [2]	MCO L_{Aeq} dB [4,5]	Exceedance [6]	$L_{A1(1min)}$ Criterion dB	Criterion Applies ? [2]	MCO $L_{A1(1\ min)}$ dB [4,5]	Exceedance [6]
NA8	25/08/2013 22:53	20	1.2	-1.0	37	Yes	IA	Nil	45	Yes	IA	Nil
NA8	25/08/2013 23:11	20	0.9	3.0	37	No	IA	NA	45	No	IA	NA
NA8	27/08/2013 08:58	33	1.5	-1.9	38	Yes	IA	Nil	---	---	---	---
NA8	27/08/2013 09:16	31	1.8	-1.9	38	Yes	IA	Nil	---	---	---	---
NA8	26/08/2013 20:05	22	0.1	3.0	38	No	IA	NA	---	---	---	---
NA8	26/08/2013 20:21	21	0.5	3.0	38	No	IA	NA	---	---	---	---
NA8	26/08/2013 22:48	24	0.2	3.0	37	No	23	NA	45	No	25	NA
NA8	26/08/2013 23:07	23	0.8	3.0	37	No	<25	NA	45	No	27	NA

Notes:

1. *The noise emission limits apply under meteorological conditions of:*
   - Wind speeds of up to 3 m/s at 10 metres above ground level; or
   - Temperature inversion conditions of up to 3ºC/100m, and wind speeds of up to 2 m/s at 10 metres above ground level;
2. *Estimated or measured $L_{A1,1minute}$ attributed to MCO;*
3. *NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable;*
4. *Bolded results in red indicate exceedance of criteria;*
5. *Atmospheric data is sourced from the MCO meteorological station; and*
6. *Night measurements not undertaken at NA1 as outside hours of use and criterion not applicable.*

Table 64: Mining Operations – Quarter 3 2012

Day			Evening			Night		
Equipment Type	**Quantity[1]**	**Location**	**Equipment Type**	**Quantity[1]**	**Location**	**Equipment Type**	**Quantity[1]**	**Location**
Liebherr 996 excavator	1	S08B22 OB	Liebherr 996 excavator	1	S08B22 OB	Liebherr 996 excavator	1	S07B20 OB
Liebherr 996 excavator	1	S04B06 OB	Liebherr 996 excavator	1	S04B06 OB	Liebherr 996 excavator	1	S04B06 OB
PC450 excavator	1	MCO everywhere	PC450 excavator	1	MCO everywhere	PC450 excavator	1	MCO everywhere
FEL WA1200	1	ROM	FEL WA1200	1	ROM	FEL WA1200	1	ROM Support
DML Drill	2	S03B08 S06B18	DML Drill	2	S03B08 S06B18	D475 dozer	1	EX103 Support
D475 dozer	1	EX103 Support	D475 dozer	1	EX103 Support	D475 dozer	1	450 Dump
D475 dozer	1	450 Dump	D475 dozer	1	450 Dump	D475 dozer	1	440 Ramp
D475 dozer	1	440 Dump	D475 dozer	1	440 Dump	D475 dozer	1	EX102 Support
D475 dozer	1	EX102 Support	D475 dozer	1	EX102 Support	Grader 825	2	Roads
Grader 825	2	Roads	Grader 825	2	Roads	Water Truck 785	2	Roads
Water Truck 785	2	Roads	Water Truck 785	2	Roads	Komatsu 830E RDT	3	450 Dump
Komatsu 830E RDT	5	EX102 to 440 dump	Komatsu 830E RDT	5	EX102 to 440 dump	Komatsu 830E RDT	2	440 Ramp
Komatsu 830E RDT	3	EX103 to 450 dump	Komatsu 830E RDT	3	EX103 to 450 dump			
Komatsu 830E RDT	1	Rejects	Komatsu 830E RDT	1	Rejects			
Other Activities			**Other Activities**			**Other Activities**		
Pumping	-	Various	Pumping	-	-	Pumping	-	-
Train loading	-	Active	CHPP	-	Active	CHPP	-	Active

Day			Evening			Night		
Equipment Type	Quantity[1]	Location	Equipment Type	Quantity[1]	Location	Equipment Type	Quantity[1]	Location
			Operations			Operations		
CHPP Operations	-	Active						

Results – Road Traffic

Road traffic noise assessments were undertaken on 14th December 2012 and 20th June 2013 with the results being shown in **Table 65**. The monitoring period for each of these events is 1 hour. MCO complied with the project specific criteria during this monitoring period.

Table 65: Road Traffic Noise Monitoring

Location	Start Date/Time	Criteria[2]	Measured $L_{Aeq(1\ hour)}$ dB[1]	Exceedance	Northbound Traffic Count	Southbound Traffic Count
RT1	14/12/12 06:30	55/60	49	Nil	251	80
RT1	20/06/13 06:30	55/60	52	Nil	241	88

1. *Measured LAeq(1 hour) may include contributions from road traffic not associated with MCO*
2. *Criteria presented are for night/day respectively*
3. *NA denotes not available.*

The measured $L_{Aeq\ (1\ hour)}$ conservatively includes contributions from all noise sources received at the monitoring location during the monitoring period. As the monitoring period straddles the shoulder period between night and day; measured levels have been assessed against both day and night criteria.

3.13.3 Comparison to Predicted Levels

Results – Mining

The noise predictions for Year 2 of the mining operations in the Environmental Assessment can be seen in **Table 66**. Year 2 has been chosen as it is the most reflective modelled scenario of the current mining operations at MCO. A comparison of the mining attended noise monitoring results to predictions made in the Environmental Assessment for Year 2 of mining operations can be seen in **Table 67** to **Table 70**.

Table 66: EA Predictions Under Various Weather Conditions

Location	Lapse	ENE	SW	Inversion
NA1 Ulan School[1]	35	39	35	44
NA6 Lower Ridge Rd[2]	<25	32	<25	37
NA8 South Ridge Rd[3]	<25	32	<25	37

Source: MCO EA (August 2006);
1. *Predicted levels for property 157 – Ulan Village;*
2. *Predicted levels for property 41A – Ulan Road;*
3. *Predicted levels for "all other receivers"*

Measured operational levels have been compared to the predicted levels in the EA for the relevant meteorological conditions. In the tables below, a positive difference is where the measured level is greater than the predicted level and a negative difference is where the measured levels are less than the predicted level. **Table 67** provides the difference between measured and predicted levels under lapse conditions, **Table 68** provides the difference between measured and predicted levels under ENE wind conditions, **Table 69** provides the difference between measured and predicted levels under SW wind conditions and **Table 70** provides the difference between measured and predicted levels under inversion conditions.

Table 67: Comparison to EA Predictions Under Lapse Conditions

Location	Quarter 4 2012[1,3]	Quarter 1 2013[1,3]	Quarter 2 2013[1,3]	Quarter 3 2013[1,3]
	Day			
NA1 Ulan School	NR/NR/NR/NR	NR/NR/NR/NR	NR/NR/NR/NR	NR/NR/NR/NR
NA6 Lower Ridge Rd	NR/NR/NR/NR	NR/NR/NR/NR	NR/NR/NR/NR	NR/NR/NR/NR
NA8 South Ridge Rd	NR/NR/NR/NR	NR/NR/NR/NR	NR/NR/NR/NR	NR/NR/NR/NR

1. *NR denotes met conditions not relevant, NA is not applicable, IA denotes conditions relevant but MCO not audible during monitoring, NM denotes conditions relevant but MCO not measureable during monitoring*
2. *Daytime lapse assumes calm conditions with –1ºC/100m VTG during monitoring; and*
3. *Day 1, Measurement 1/ Day 1, Measurement 2/ Day 2 Measurement 1/Day 2, Measurement 2.*

Table 68: Comparison to EA Predictions Under ENE Wind Conditions

Location	Quarter 4 2012[1,3,4]	Quarter 1 2013[1,3,4]	Quarter 2 2013[1,3,4]	Quarter 3 2013[1,3,4]
	Day			
NA1 Ulan School	IA/IA/NR/NR	NM/NR/IA/IA	NR/NR/NR/NR	NR/NR/NR/NR
NA6 Lower Ridge Rd	NR/NR/NR/NR	IA/IA/IA/NR	NR/IA/IA/NR	NR/NR/NR/NR

Location	Quarter 4 2012[1,3,4]	Quarter 1 2013[1,3,4]	Quarter 2 2013[1,3,4]	Quarter 3 2013[1,3,4]
NA8 South Ridge Rd	IA/IA/NR/NR	NR/NR/IA/IA	IA/IA/IA[3]/NR	NR/NR/NR/NR
Evening				
NA1 Ulan School	NA	NA	NA	NA
NA6 Lower Ridge Rd	NR/NR/NR/NR	NR[3]/NR/NR/NR	NR/NR/NR/NR	NR/NR/NR/IA
NA8 South Ridge Rd	IA/NR/NR/NR	NR/NR/IA/IA	NR/NR/NR/NR	NR/NR/NR/NR
Night				
NA1 Ulan School	NA	NA	NA	NA
NA6 Lower Ridge Rd	>-7/-3/NR/NR	NR/NR/NR/NR	NR/NR/NR/NR	NR/NR/NR/NR
NA8 South Ridge Rd	NR/IA/NR/NR	NR/NR/IA/IA	NR/NR/NR/NR	NR/NR/NR/NR

1. *NR denotes met conditions not relevant, NA denotes not applicable, IA denotes conditions relevant but MCO inaudible during monitoring, and NM denotes conditions relevant but MCO not measureable during monitoring.*
2. *ENE wind conditions assumes winds at speeds between 0.1 and 3.0 m/s from a wind direction of 45 to 90 degrees during monitoring;*
3. *Conditions relevant, however, wind speeds greater than 3 metres per second during monitoring;*
4. *Day 1, Measurement 1 / Day 1, Measurement 2 / Day 2, Measurement 1 / Day 2, Measurement 2.*

Table 69: Comparison to EA Predictions Under SW Wind Conditions

Location	Quarter 4 2012[1,3,4]	Quarter 1 2013[1,3,4]	Quarter 2 2013[1,3,4]	Quarter 3 2013[1,3,4]
Day				
NA1 Ulan School	NR/NR/NR/NR	NR/NR/NR/NR	NR/NR/NR/NR	NR/IA/NR/NR
NA6 Lower Ridge Rd	NR/NR/NR/NR	NR/NR/NR/NR	NR/NR/NR/NR	NR/IA[3]/NR/NR
NA8 South Ridge Rd	NR/NR/NR/NR	NR/NR/NR/NR	NR/NR/NR/NR	IA[3]/ IA[3]/NR/NR
Evening				
NA1 Ulan School	NA	NA	NA	NA
NA6 Lower Ridge Rd	NR/NR/NR/NR	NR/NR/NR/NR	>0/>1/IA/NR	IA/IA/IA/NR
NA8 South Ridge Rd	NR/NR/NR/NR	NR/NR/NR/NR	IA/NR/IA/NR	NR/NR/NR/IA
Night				
NA1 Ulan School	NA	NA	NA	NA
NA6 Lower Ridge Rd	NR/NR/NR/NR	NR/NR/0/NM	NR/>2/IA/IA	IA/IA/IA/IA
NA8 South Ridge Rd	NR/NR/NR/NR	NR/NR/NR/NR	IA/NR/IA/IA	IA/IA/-12/>-10

1. *NR denotes met conditions not relevant, NA is not applicable, IA denotes conditions relevant but MCO inaudible, NM denotes conditions relevant but MCO not measureable;*
2. *SW wind conditions assumes winds at speeds between 0.1 and 3.0 m/s from a wind direction of 202.5 to 247.5 degrees during monitoring;*
3. *Conditions relevant, however, wind speeds greater than 3 metres per second during monitoring;*
4. *Day 1, Measurement 1 / Day 1, Measurement 2 / Day 2, Measurement 1 / Day 2, Measurement 2.*

Table 70: Comparison to EA Predictions Under Inversion Conditions

Location	Quarter 4 2012[1,3]	Quarter 1 2013[1,3]	Quarter 2 2013[1,3]	Quarter 3 2013[1,3]
Evening				
NA1 Ulan School	NA	NA	NA	NA
NA6 Lower Ridge Rd	NR/IA/IA/NM	NR/NR/NR/NR	NR/-11/IA/IA	IA/IA/IA/IA
NA8 South Ridge Rd	NR/NR/NR/NR	NR/NR/IA/IA	NR/NR/IA/NR	IA/NR/IA/IA
Night				
NA1 Ulan School	NA	NA	NA	NA
NA6 Lower Ridge Rd	NR/NR/>-12/-11	NR/NR/NR/NR	NR/NR/NR/NR	IA/NR/NR/IA
NA8 South Ridge Rd	NR/NR/IA/IA	NR/NR/IA/IA	NR/IA/NR/NR	NR/IA/IA/>-10

1. *NR denotes met conditions not relevant, NA is not applicable, IA denotes conditions relevant but MCO inaudible during monitoring, and NM denotes conditions relevant but MCO not measureable during monitoring.*
2. *Inversion conditions assumes a 3ºC/100m VTG during monitoring; and*
3. *Night 1, Measurement 1 / Night 1, Measurement 2 / Night 2, Measurement 1 / Night 2, Measurement 2.*

As shown above, a comparison of predicted and measured levels from MCO operation varies greatly. This comparison does not take into account operational activities at the time of monitoring compared to predicted scenarios.

3.13.4 Activities Next Reporting Period

The revised NMP will be implemented during the next reporting period. Attended noise monitoring will commence at Winchester Crescent and monitoring will be undertaken monthly during night time only, except for Ulan School where monitoring will be undertaken during school hours. Attended noise monitoring results will be provided in the next AEMR. Independent noise studies and acquisitions of properties will be considered on a case by case basis during the next reporting period.

The updated real-time response measures protocol will also be implemented during the next reporting period with the adequacy and performance of the protocol to be reported in the next AEMR.

3.14 VISUAL, STRAY LIGHT

Potential lighting impacts from MCO are largely limited to a night-time glow for the open cut and CHPP operations areas. To minimise impacts on neighbours lighting plants are positioned such that light is directed towards work areas and not towards private residents.

3.15 ABORIGINAL HERITAGE

3.15.1 Activities This Reporting Period

During the reporting period MCO continued to engage a Native Title Cultural Heritage Officer (NTCHO) as an outcome of the negotiated Ancillary Deed Agreement with the Native Title Party (North East Wiradjuri). The role of the NTCHO is to co-ordinate the implementation of the Ancillary Deed. This includes planning, co-ordinating and implementing various activities

required by the Implementation Committee, co-ordinating liaison with the Aboriginal Stakeholder Groups, and undertaking other cultural heritage activities at MCO.

Meetings are held on a quarterly basis between MCO and the Implementation Committee and the Cultural Heritage Liaison Sub Committee. Progress on implementing the Ancillary Deed is discussed at these meetings.

MCO hold regular meetings with the registered Aboriginal Stakeholder Groups regarding Aboriginal heritage matters at MCO. Three meetings were held during the reporting period. The first meeting was held in September 2012 to discuss the draft Aboriginal Cultural Heritage Management Plan (ACHMP) that was being developed for the Moolarben Coal Complex. The second meeting was held in November 2012 to discuss the Stage 1 Optimisation Modification (Mod 9). The third meeting held in August 2013 discussed the upcoming field work for OC2 salvage and the ongoing revision of the ACHMP.

Training of the workforce on Aboriginal heritage continued throughout the reporting period. Posters displaying examples of Cultural Material are displayed in prominent locations around the site. Specialised presentations on Cultural Heritage have been presented at tool box talks and induction sessions for mine personnel and contractors to the mine.

A Care and Control Agreement between MCO and OEH for all artefacts salvaged from Stage 1 is in place. To house these artefacts a Keeping Place has been established with the approval of all registered Aboriginal stakeholder organisations.

An Aboriginal Heritage Impact Permit (AHIP) was obtained to salvage artefacts identified during the survey for the Ulan-Wollar Road diversion. This AHIP was developed in consultation with the registered Aboriginal stakeholder organisations.

The Aboriginal Cultural Heritage Management Plan (ACHMP) was updated during the reporting period to cover all of the approved mining operations in Stage 1. The previous ACHMP covered the Open Cut 1 and CHPP areas only. Consultation on the updated ACHMP was undertaken with the registered Aboriginal stakeholder organisations and was approved by DP&I in June 2013.

Field work undertaken by the registered Aboriginal stakeholder organisations included:

- Due diligence surveys for exploration activities.
- Salvage works for exploration drilling in Open Cut 2.
- Surveys of the areas included in the Stage 1 Optimisation Modification (Mod 9).
- Surveys and salvage works for the Ulan-Wollar road diversion.
- Surveys for the proposed Temporary Workers Accommodation.

3.15.2 Activities Next Reporting Period

Registered Aboriginal groups will continue to be involved in due diligence works associated with construction, exploration and mining activities.

Meetings of the Cultural Heritage Consultation Committee will continue.

Reviews of the ACHMP will be undertaken to include additional mining areas.

3.16 EUROPEAN HERITAGE

3.16.1 Activities This Reporting Period

Site 20 is a memorial garden that MCO are required to maintain. MCO maintained the inspection program of this garden to identify any maintenance required to maintain this garden. No active management activities to this site have been required during the reporting period.

No other European Heritage management activities were undertaken during the reporting period.

3.16.2 Activities Next Reporting Period

During the next reporting period MCO will continue to maintain Site 20 (Memorial Garden).

3.17 SPONTANEOUS COMBUSTION

There have been no spontaneous combustion incidences at MCO during the reporting year.

3.18 BUSHFIRE

There were no major outbreaks of fire at MCO during the reporting period.

3.19 MINE SUBSIDENCE

There was no underground mining during the reporting period. Consequently, there was no subsidence associated with MCO.

3.20 HYDROCARBON CONTAMINATION

Large scale hydrocarbon storage facilities have been constructed as part of the workshop, stores and blasting facilities. These storage facilities comply with the requirements of *AS1940 – The storage and handling of flammable and combustible liquids*. Activities undertaken on site to reduce the risk of hydrocarbon contamination include:

- The main fuel tanks are self bunded meaning that if the main layer is broken a second layer is in place to stop leakage from the tanks.
- Anti-siphon pipes have been installed on the fuel tanks to stop the tanks draining in the event of a leakage.
- Installation of an oil/water separator. Pipes at the refuel area and in the workshop are plumbed to flow through the oil/water separator. The water from the vehicle wash-down bay also flows through the oil/water separator.
- Spill kits are maintained in the workshop and in service vehicles to assist in the clean up any hydrocarbon spills.
- Dry-break couplings have been installed on the hydrocarbon hoses so that they are non-drip.
- Automatic fuel shut off systems have been installed so that tanks can't be overfilled.
- A dedicated waste oil tank has been installed so that the waste oil can be removed off site and disposed off correctly.

- Refuelling procedures have been developed for guidance on how to correctly refuel equipment.

Appropriate disposal of hydrocarbons to reduce the risk of hydrocarbon contamination is managed through the integrated Waste Management Service.

3.21 METHANE DRAINAGE/VENTILATION

As there was no underground mining at MCO during the reporting period, there was no methane drainage or ventilation required.

3.22 PUBLIC SAFETY

To maintain the safety of visitors, neighbours and the general public the following measures are implemented at MCO:

- Fencing of mining lease;
- Locking gates on access roads and entries into land owned by MCO;
- Placement of signage on gates and fences; and
- Installation of boom gates at main entrances into the operations.

3.23 COMPLIANCE SUMMARY

3.23.1 Independent Compliance Audits

During the reporting period MCO were subject to two external independent compliance audits. More details on these audits are provided below.

Department of Sustainability, Environment, Water, Population and Communities Independent Compliance Audit
Condition 5 of MCO's Environment Protection and Biodiversity Conservation Approval (EPBC 2007/3297) requires MCO to, at the direction of the Minister, undertake an independent audit of compliance with the conditions of approval and submit a report to the Minister. On 8 June 2012 MCO received a direction from the Department of Sustainability, Environment, Water, Population and Communities (SEWPaC) to undertake an independent audit. The audit was undertaken by an independent consultant who had been approved by SEWPaC prior to the audit commencing.

The audit was finalised in February 2013 following consultation with SEWPaC and the independent consultant on the findings of the audit.

A high level of compliance with the requirements of the Approval was identified during this audit. In particular, MCO has:

- transferred at least 130 hectares of the White Box-Yellow Box-Blakely's Red Gum Woodland and Derived Native Grassland listed ecological community to the NSW Minister for Climate Change Environment and Water;
- provided the NSW Department of Environment and Climate Change (DECCW) with funds to cover any reasonable costs associated with the transfer and ongoing management of this land;

- set aside and commenced to revegetate at least 38 hectares of disturbed land on the "Red Hills" property with Yellow Box-White Box-Blakely's Red Gum vegetation;
- set aside and commenced to revegetate at least 143 hectares of cleared land on the “Red Hills” and other adjoining or adjacent properties with suitable native vegetation to improve wildlife corridor linkages; and
- set aside to conserve and enhance at least 1262 hectares of existing native vegetation onsite.

Two non-conformances were recorded against the requirements of the Approval. These related to:

- the timeframe in which the transfer of land occurred; and
- arrangements had not been finalised to protect offset areas from development.

At the time of the audit, the offset and rehabilitation areas were being managed generally in accordance with the requirements of the approval and its Rehabilitation and Offset Management Plan although nine non-conformances were recorded against the requirements of the Plan.

A copy of the full report is available on MCO’s website (www.moolarbencoal.com.au).

Department of Planning and Infrastructure Independent Compliance Audit
In accordance with Condition 6, Schedule 5 of PA05_0117, MCO’s operations are required to be audited independently to determine compliance to the satisfaction of the Director-General of the DP&I. These audits are due within 2 years of the approval being granted and then every 3 years thereafter. This audit was MCO’s second audit and was conducted by an independent auditor who had been approved by DP&I prior to the audit commencing. The audit assessed the compliance status of the MCO against the Project Approval and other relevant environmental approvals and licences, for operations occurring between June 2010 and October 2012.

The audit was finalised in April 2013. Generally, the audit found that MCO has achieved a high level of compliance with the conditions of its Project Approval, EPL and Mining Leases. At the time of the audit, only OC1 and the CHPP and infrastructure areas had been constructed and were operational. A review of the EAs associated with the original project and the modifications approved to date found that the development has been constructed and operated generally in accordance with that outlined in the EAs.

A summary of the compliance assessment is provided in **Table 71**. It should be noted that one event (e.g. a blast exceedance) may result in more than one non-compliance, particularly where similar conditions are included in the Project Approval, EPL and Mining Lease for the site. A copy of the full report is available on MCO’s website (www.moolarbencoal.com.au).

Table 71: Summary of Statutory Compliance with Conditions

Approval/Licence	Not Triggered	Compliance	Non-Compliance	Verification Required	Observation
Project Approval 05_0117	72	238	11	1	21
EPL 12932	14	101	4	0	6
ML 1605	12	23	1	0	1
ML 1606	12	22	2	0	1
ML 1628	12	23	1	0	1

Note that the numbers refer to the number of conditions and subconditions.

3.23.2 Reportable Incidents This Reporting Period

Missing High Volume Air Sampler Runs – December 2012

Two High Volume Air Sampler (HVAS) runs in December 2012 were invalid due to the filter papers not being changed between scheduled runs. This affected the samples from both of the HVAS machines.

The cause of this incident was investigated and it was found that the monitoring contractor had included this change out in their schedule but had failed to complete the work. The monitoring contractor was reminded of their responsibilities and the implications of this work not being completed. Since this incident MCO have changed monitoring contractors.

This incident was reported to the EPA with no further correspondence received.

Missing High Volume Air Sampler Run – April 2013

On 21 April 2013 the High Volume Air Sampler (HVAS) in Ulan Village failed to run on its scheduled run date. A make up run was completed 2 days later.

The unit was inspected by MCO's monitoring contractor and the unit was found to be showing the general effects of age. The inspection shows that the cause was most likely related to the backup battery having failed leading to the incorrect date and time setting in the unit. Due to the age of the HVAS (>10 years) it was decided to replace it.

This incident was reported to the EPA with no further correspondence received.

Blast Generated Fume Event – April 2013

On 24 April 2013 at 12:09pm, MCO fired an overburden blast in Strip 02 Block 7 in Open Cut 1 resulting in blast related fume being generated. The overburden blast was located near Ulan Road and Ulan-Wollar road which resulted in the road being closed temporarily for the blast. At the time of the blast the wind direction was from the WSW and the wind speed was 2.4m/s (9km/h). The fume dissipated on MCO's Mining Lease approximately 3 minutes after the shot.

An investigation was undertaken into the cause of this fume generation. The root cause of the incident was identified to be the product used in the blasting process. The product used in this particular blast is not normally used in the blasting process at MCO and was used on this blast due to the unexpected presence of water in the holes.

This incident was reported in accordance with the Pollution Incident Response Management Plan (PIRMP) to the EPA with no further correspondence received.

Blast Generated Fume Event – August 2013

At 1:00pm on 9 August 2013, MCO fired an overburden blast in Strip 04 Block 6 in Open Cut 1 resulting in blast related fume being generated. The overburden blast was located near Ulan Road and Ulan-Wollar road which resulted in the road being closed temporarily for the blast. At the time of the blast wind direction was from the WSW and the wind speed was 1.3m/s. The fume dissipated on MCO Mining Lease to the NE of the blast, approximately 3-4 minutes after the shot.

An investigation was undertaken into the cause of this fume generation. The root cause of the incident was identified to be the product used in the blasting process and the presence of water in the holes. These are ongoing issues at MCO with attempts to address these issues ongoing.

The incident was reported to the EPA with no further corresponded received.

4.0 COMMUNITY RELATIONS

4.1 ENVIRONMENTAL COMPLAINTS

MCO has developed a Community Complaints Procedure which details how to receive, respond to, and record and action any community complaints. MCO will record specific details relating to any community complaint including;

- The location of the complaint;
- The nature of the complaint;
- The method of the complaint, e.g. telephone;
- Monitoring results, including meteorological conditions at the time of the complaint;
- Site investigation outcomes;
- Site activity and activity changes; and
- Any necessary actions assigned.

MCO maintains a 24 hour Community Hotline (1800 556 484) to respond to any complaints from neighbouring residents or interested stakeholders. The Community Hotline is advertised in the local media and is also available on the MCO website and in the community newsletters.

During the reporting period, MCO received 120 direct complaints. Whilst MCO is aware that EPA has received complaints relating to MCO's operations these complaints they have not been included in this report. A summary of the direct complaints and the investigation is provided in **Appendix 5**.

4.1.1 Comparison to Previous Complaints

The number and type of complaints received this reporting period is compared to previous complaints in **Table 72** and **Figure 59**. The complaints during this reporting period came from 18 residents. 55% of the complaints came from one resident.

There was a significant decrease in total complaints compared to the previous reporting period. This can be attributed to the proactive work that is being done by MCO including the addition of the DuraTray trucks to the mining fleet, the use of dedicated Mining and Production Environmental Assistants to provide real-time feedback to the mining operations, and mine planning to allow for protected work areas to be developed. Other work that contributed to this decline in complaints includes ongoing community consultation and acquisitions.

Table 72: Comparison of Community Complaints

Reporting Period	Noise	Blasting	Dust	Lighting	Water	Other	Total
2007-2008	0	0	0	0	0	2	**2**
2008-2009	4	0	1	0	2	0	**7**
2009-2010	35	8	10	0	2	1	**56**
2010-2011	110	3	0	0	0	0	**113**
2011-2012	334	17	2	0	3	3	**359**
2012-2013	117	0	1	0	0	2	**120**

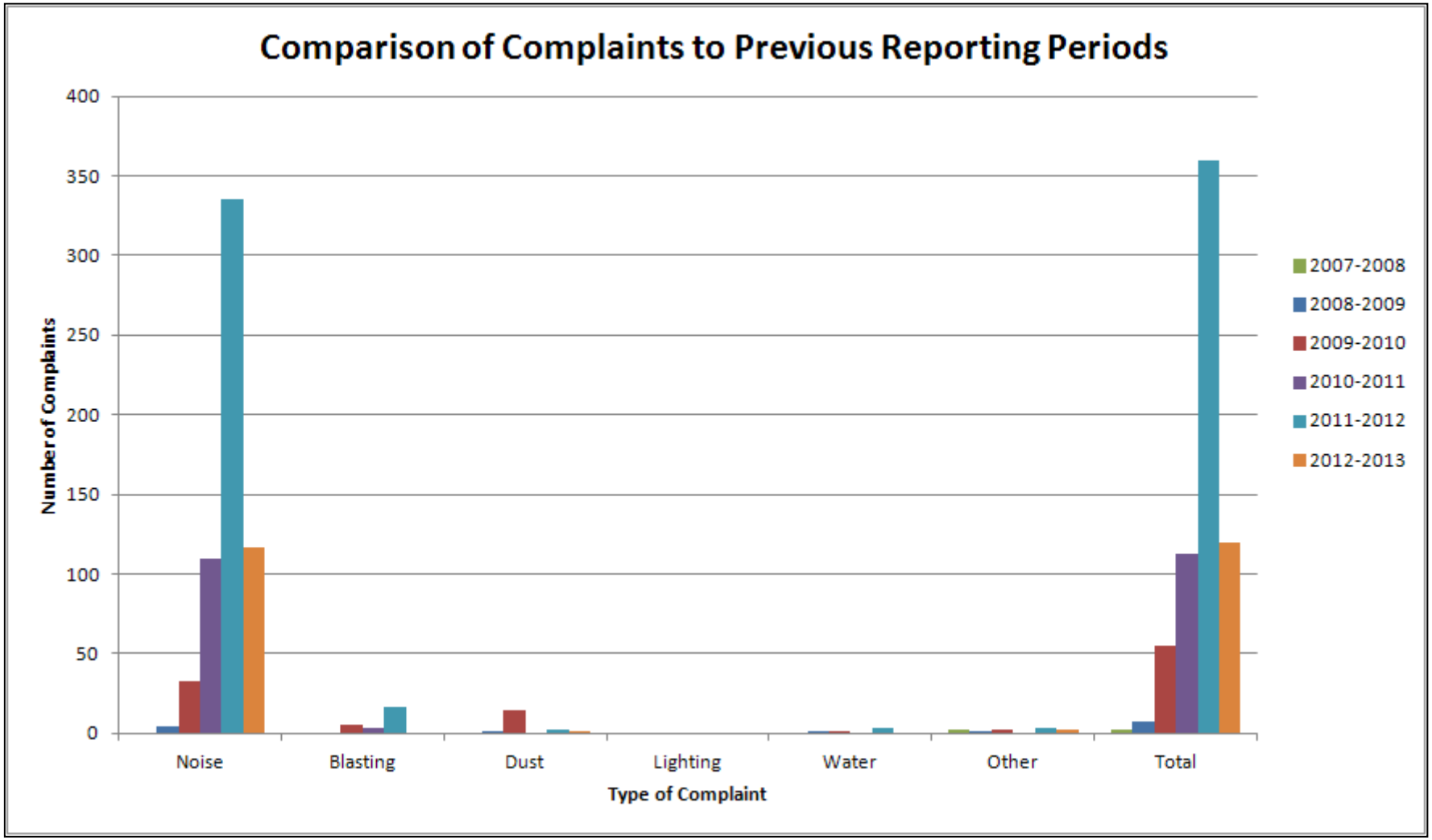


Figure 59: Comparison of Community Complaints

4.1.2 Activities Next Reporting Period

During the next reporting period MCO will continue to undertake the following actions to manage complaints:

- Continued noise attenuation of the equipment;
- Ongoing consultation with neighbouring landowners including acquisition as required;
- Ongoing training with the workforce on issues being raised through community complaints; and
- Modifying operations as required (including shutting down the operations).

4.2 COMMUNITY LIAISON, SPONSORSHIPS AND DONATIONS

4.2.1 Activities This Reporting Period

Community/stakeholder related activities undertaken during the reporting period include:

- Tours of the site by CCC members;
- Careers talks with local school students;
- School Partnership Meeting with Department of Education and Training;
- Tours by individual local schools;
- Participation in a local job expo to promote careers in the mining industry;
- Visit by 1st year Mining Engineering students from UNSW;
- Apprenticeships career information sessions;
- Emergency Response Team members are volunteers in the Rural Fire Service;
- Provide use of MCO's training facilities to the Rural Fire Service;
- Emergency Response Team respond to offsite emergencies; and
- Mentoring students through the Max Potential Program.

Approximately $65,000 of community donations and sponsorships were provided to local groups during the reporting period. The following groups were supported:

- Mudgee Readers Festival – support for event;
- Ulan Public School – support for learning program;
- Mudgee Rugby Club– support for club;
- Gulgong Historical Society – repairs to heritage building;
- Mudgee Gymnastics – support for club;
- Gulgong Prince of Wales Eisteddfod – support for event;
- Ulan Public School – Support Event;
- Rotary Club Of Rylstone – Kandos – support community programs;
- Life Skills – Support for Organisation;
- Gulgong Heritage Festival Committee – support for street parade;
- Mudgee District Netball – support for club;
- Pioneer Auxiliary Ladies – emergency blankets;
- Westpac Helicopter – donation;
- Mudgee Rescue Volunteer Association – support for new rescue truck;

- Mudgee Junior Rugby league – supply of first aid kits;
- Riding for the disabled – Mudgee – Mounting Ramp;
- Gulgong Rural Fire Brigade – Thermal Imaging Camera;
- Mudgee District Tennis Club – Renovation of Tennis Courts;
- Mudgee High School – Literacy Program;
- Mudgee Basketball Association – Gulgong Junior Basketball;
- Gulgong District Pony Club – Portable Dressage Arena;
- Mudgee Amateur Softball Association – Training and Fitness Program;
- Rylstone and Kandos volunteer search and rescue – vehicle update;
- Mudgee Police – sponsorship of the NSW Police Country Cup to be held in Mudgee;

In addition to the above donations, MCO also paid Mid-Western Regional Council $175,000 in accordance with the Voluntary Planning Agreement.

4.2.2 Activities Next Reporting Period

During the next reporting period MCO will continue to undertake the following actions in relation to community relations:

- Continuation of the Community Support Program;
- Obtain adequate media coverage in recognition for Community Support Program and any other community related activity;
- Have MCO recognised by way of signage banners, where possible when sponsoring;
- Attend local community meetings/functions where it is considered appropriate for MCO to attend;
- Conduct Community Consultation Committee meetings on a regular basis;
- Continue to establish and maintain positive relationships with local stakeholder groups; and
- Provide a community newsletter on a regular basis.

4.3 COMMUNITY CONSULTATIVE COMMITTEE

During the reporting period, four Community Consultative Committee (CCC) meetings were held. The meeting frequency was changed during this reporting period with meetings now held on a quarterly basis. The CCC contains members of the local community, representatives from Mid-Western Regional Council, and representatives of MCO. These meetings are chaired by an independent chairperson and all meetings are minuted with the minutes being available publicly on the MCO website (www.moolarbencoal.com.au). A summary of the items discussed in the meetings is shown in **Table 73.**

Table 73: CCC Meetings

Meeting Date	Items Addressed
11 December 2012	Presentation of 2011-2012 AEMR A Christmas dinner was provided by Moolarben Coal
12 March 2013	Tour of the Open Cut 1 area Discussion on the Stage 1 Optimisation Project General update on operations

Meeting Date	Items Addressed
17 April 2012	Update on exploration activities Discussion on the future of The Drip Update on Ulan Road strategy General update on operations
11 June 2013	Introduction of new General Manager Discussion on water management upgrades Discussion on Environmental Protection Licence variation General update on operations

5.0 REHABILITATION

5.1 BUILDINGS

No buildings were demolished during the reporting period.

5.2 REHABILITATION OF DISTURBED LAND – OPEN CUT

5.2.1 Activities This Reporting Period

During the reporting period MCO continued bulk reshaping of the 480RL and dump areas for rehabilitation with 31.5ha of land being rehabilitated this reporting period. Of the 31.5ha rehabilitated, 13.25ha of land is considered final rehabilitation. Approximately 18.3ha of land has been temporarily rehabilitated as it is proposed to further disturbance as part of MCO's expansion of OC1. These areas that have been temporarily rehabilitated were proposed to be final rehabilitation in the MOP; however, due to this proposed disturbance for OC1 expansion final rehabilitation hasn't occurred. Rehabilitation of alternative areas has been accelerated as a trade-off for this temporary rehabilitation.

Rehabilitation activities consist of bulk reshaping of overburden, installing water control systems consisting of drop structures, drainage lines, contours and sediment dams, spreading a mixture of topsoil and mulch at an approximate thickness of 100mm, deep ripping to a depth of 300mm and then spreading seed and fertiliser. The rehabilitation activities and locations of the water control systems can be seen in **Figure 62**.

All of the rehabilitation conducted to date has been on overburden spoil with the final landform proposed to be native vegetation. Depending on the location of the rehabilitation area two vegetation communities are used in the seeding mix. Box Gum Woodland is used on lower slopes and Ironbark Open Forest is used on upper slopes and elevated flat areas. This is consistent with the naturally occurring vegetation in the area. For the drainage lines, a drainage line mix is used. **Table 74** to **Table 76** show the seed mixes used on the rehabilitation program.

Table 74: Seed Mix for Box Gum Woodland

Genus	Species
Acacia	decora
	hakeoides
	polybotrya
	verniciflua
	implexa
	spectabilis
Angophora	floribunda
Dodonaea	spatulata
Eucalyptus	albens
	blakelyi
	crebra
	moluccana
Kunzea	ambigua
Leptospermum	polygalifolium
Melaleuca	thymifolia
Ghania	aspera
Austrodanthonia	sp

Genus	Species
Aristida	sp
Cynodon	dactylon
Chloris	truncata
Millet	Millet
Fertiliser	Granulock 12
Ameliorants	As required

Table 75: Seed Mix for Ironbark Open Forest

Genus	Species
Acacia	buxifolia
	gladiformis
	uncinata
	verniciflua
	spectabilis
	ulicifolia
	penninervous
Allocasuarina	gymnanthera
	diminuta
	verticilliata
Dodonaea	viscosa
	triangularis
Eucalyptus	crebra
	dweryii
	fibrosa
	macroryncha
	parramattensis
	punctata
	rossii
	sparsifolia
	agglomerata
Hakea	dactyloides
Ghania	aspera
Callitris	endlicherii
Microlaeana	stipoides
Austrodanthonia	sp
Aristida	sp
Cynodon	dactylon
Millet	Millet
Fertiliser	Granulock 12
Ameliorants	As required

Table 76: Seed Mix for Drainage Lines

Genus	Species
Callistemon	rigidus
Leptospermum	arachnoides
	continentale
	polygalifolium
Melaleuca	thymifolia

Genus	Species
Themeda	triandra
Microlaeana	stipoides
Cynodon	dactylon
Chloris	truncata
Millet	Millet
Fertiliser	Granulock 12
Ameliorants	As required

5.2.2 Rehabilitation Monitoring Results

Rehabilitation monitoring is scheduled to commence two years after final rehabilitation is completed with monitoring being undertaken for the first time during the reporting period. Monitoring was undertaken in spring 2012 and autumn 2013. Monitoring was conducted for flora (floristic and Landscape Function Analysis), fauna, geochemical characteristics, visual monitoring and associated analogue sites for flora and geochemical components of the monitoring program. The area in **Figure 60** was targeted during the monitoring, which comprised approximately 11ha in Open Cut 1.

All monitoring was undertaken in accordance with the methods and survey techniques prescribed in the LMP. **Table 77** below summarises the methods utilised for each component of the monitoring program.

Table 77: Rehabilitation Monitoring Methodology

	Spring 2012	Autumn 2013	Methodology
Flora			
Landscape Function Analysis (LFA)	✓		Two permanent 50m transects installed in accordance with requirements of LMP and EFA • Geographic setting of the site; • Landscape organization; • Habitat complexity; • Soil surface assessment; • Vegetation dynamics.
Floristic Survey	✓	✓	Full floristic survey plots were completed in each 20 m x 20 m plot quadrat to collect floristic data. All visible native and exotic vascular species were recorded, with each species being assigned to one of six foliage cover classes (Walker & Hopkins 1984). Vegetation structure was recorded for each plot, specifically the height and total foliage cover of each stratum. All vascular plant species observed in the plots were identified to species level (where suitable material was available for identification), recorded and compiled into the species list.
Fauna			
Microbats	✓		Microbat monitoring was undertaken using ultrasonic echolocation recording (Anabat detection). Two Anabat detection devices were set up at each site over two nights
Diurnal Birds	✓		Diurnal bird monitoring involved a timed, fixed area surveys for diurnal birds, observing and listening.
Herpetological searches			Direct searches for reptiles, scanning surfaces, rolling logs and rocks and raking leaf litter. Dams and waterways will be inspected for frogs, once by day and once by night.
Bird survey	✓		Timed, fixed area surveys for diurnal birds, observing and listening each site for 30 minutes.

	Spring 2012	Autumn 2013	Methodology
Flora			
Recording of scats	✓		Identify species occurance by sact type while undertkaing field surveys.
Habitat Assessment	✓		Habitat assessment included the identification of scats, scratches and diggings along each transect line.
Soil Samples	✓		Samples were collected in accordance with the LMP. Soil samples were taken using a 100 m diameter hand auger to a minimum depth of 300 mm (where possible), with samples taken from the 0–100 mm, 100–200 mm and 200–300 mm intervals. Samples were analysed for pH, electrical conductivity (EC), major cations, and exchangeable soil acids.

Landscape Function Analysis

The Landscape Function Analysis is primarily an assessment of the amount of area losing resources (interpatch areas) and those areas gaining resources (patches) along a transect. **Table 78** presents the monitoring results. Bare soil occupied over 95% of the rehabilitation monitoring sites. By comparison bare soils accounted for less than 5% of the area in the analogue sites. This demonstrates an opportunity to improve the landscape and soil surface conditions within the rehabilitation sites through improved vegetative cover and habitat structures (e.g. logs, rocks etc).

Table 78: Landscape Organisation – Percentage of Patch or Inter Patch Types Across the Sampled Transects

Patch/Interpatch Type	R1	R2	A1A	A1B
Bare Soil%	95.9	99.6	4.8	0.3
Ground Cover%	3.0	0.4	53.1	88.7
Log%	0.9	0	1.6	2.4
Shrubs %	0.2	0	-	-
Litter	-	-	40.5	8.6
	100	100	100	100

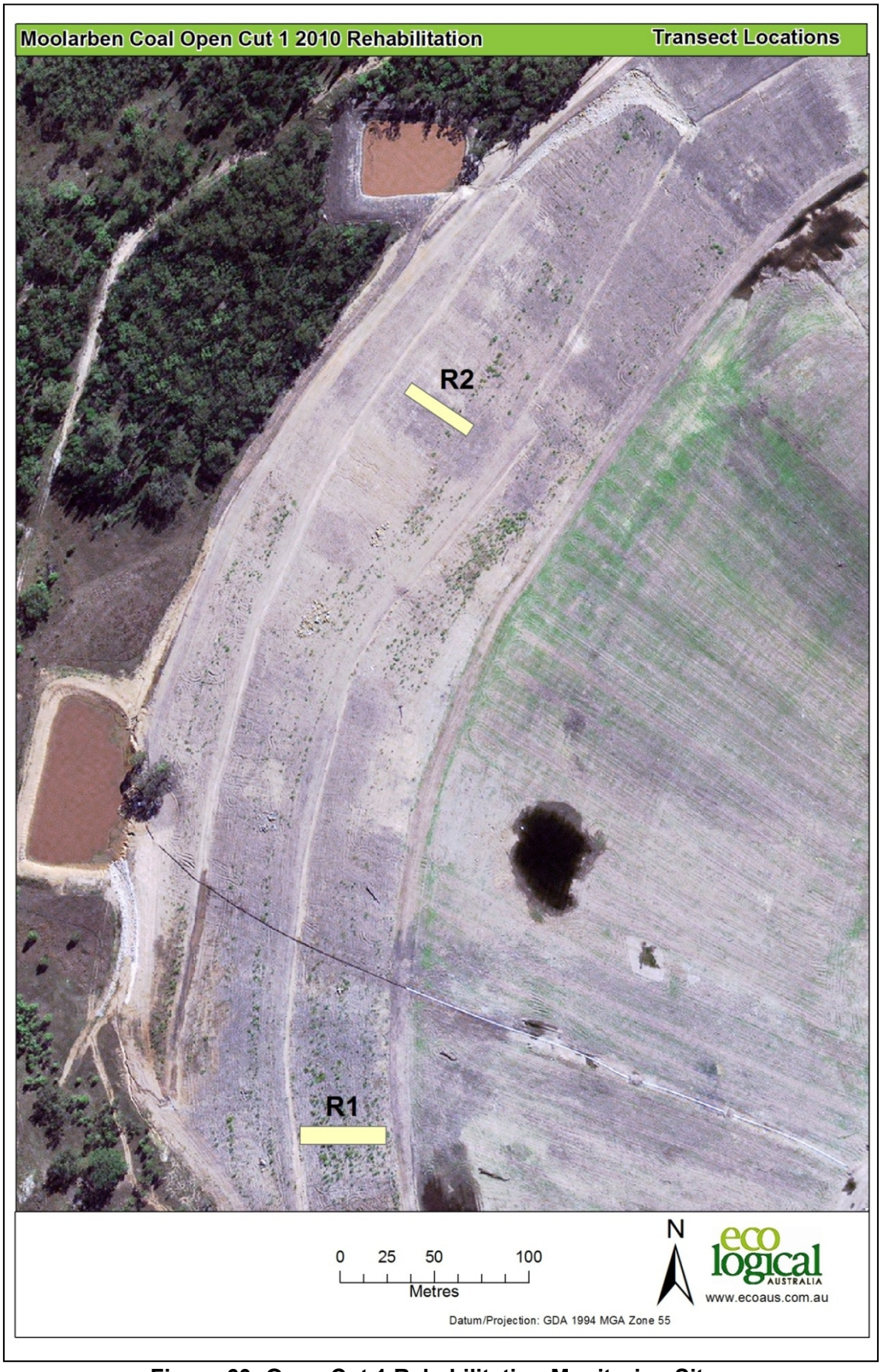


Figure 60: Open Cut 1 Rehabilitation Monitoring Sites

Soil Surface Assessment

The soil surface assessment presents the indices of stability, infiltration and nutrient cycling that was calculated for the site in analysing the 11 soil surface assessment attributes for each patch/interpatch type. **Table 79** presents these indices which show that with the rehabilitation monitoring sites, bare soil, being the largest feature within the sampled landscape, offers the greatest contribution to each of the three indices – stability, infiltration and nutrient cycling.

The analogue sites had a greater contribution to each of these indices through ground cover and to a lesser degree, leaf litter, with the total scores for the three attributes being greater (63.3 and 61 for A1a and A1b respectively) than the rehabilitation sites (48.2 and 43.2 for R1 and R2 respectively).

Table 79: Landscape Organisation – Percentage of Patch or Inter Patch Types Across the Sampled Transects

Plot	Stability				Infiltration				Nutrient Cycling			
	R1	R2	A1a	A1b	R1	R2	A1a	A1b	R1	R2	A1a	A1b
Bare Soil	46.4	43	1.9	0.1	28.3	26.9	1.5	0.1	17.7	16.6	0.9	0.1
Ground Cover	1.6	0.2	33.9	54.3	0.8	0.1	21.8	42.4	0.6	0.1	16.5	28.4
Log	-	-	1.0	1.7	-	-	0.5	1.3	-	-	0.4	1.4
Shrubs	0.2	-	-	-	0.1	-	-	-	0.1	-	-	-
Litter	-	-	26.5	4.9	-	-	18.8	4.6	-	-	15.5	3.4
Rock	-	-	0.1	-	-	-	0.1	-	-	-	0.1	-
Total	48.2	43.2	63.3	61.0	29.2	27	42.6	48.4	18.3	16.7	33.3	33.3

Vegetation Dynamics

The Vegetation Dynamics assessment collates the number of stems present in various growth form types and canopy volume along the 50m LFA transect, all converted to a measure per hectare. These measures provide an assessment of the functional role of vegetation in regulating resources. For instance the volume of canopy in the low shrub layer gives an indication of the rain splash protection provided to the soil.

As shown in **Table 80** the shrub canopy volume of monitoring site R1 (1,051m^3/ha) is providing a far higher level of ground protection by shrubs than monitoring site R2 (90m^3/ha). This variability in ground protection provided by trees and shrubs displayed between R1 and R2 was reflected in the broader visual assessment of vegetation cover undertaken at the site.

Additionally, the canopy volumes of the analogue sites (15,675m^3/ha and 12,508m^3/ha) indicate that the analogue sites have a higher level of ground protection than the rehabilitation monitoring sites.

Table 80: Density of Trees and Shrubs in Rehabilitation Plots in Open Cut 1 and Analogue Plots in Box-Gum Grassy Woodland

Plot	R1	R2	A1A	A1B
No. trees /hectare	0	0	166	153
No. shrubs/hectare	2,613	381	2,866	156
Canopy volume – m^3/hectare	1,051	90	15,675	12,508

Habitat Complexity

Habitat complexity is a simple scoring method (ranking of 0 to 3 for each feature) of a range of habitat features to indicate the value of the area to fauna species diversity compared to another area, or to track the progress of a site over time. The results for monitoring sites R1 and R2 are shown in **Table 81.** To date there has been no Habitat Complexity assessment undertaken for the Analogue Sites.

Table 81: Habitat Complexity Score for Open Cut 1 Rehabilitation Monitoring Plots

	R1	R2
Tree canopy	0	0
Shrub cover	1	1
Ground herbage	0	0
Locals rocks/debris	1	1
Soil moisture	0	0
TOTAL	2	2

Floristic Monitoring

The list of flora for the monitoring sites as indicated in **Table 82** shows that R1 (35 native species) has over twice the number of native species as R2 (16 native species). The cover abundance measures also show a variation between monitoring sites R1 and R2. Of particular note is that tree/shrub cover contribution for R1 (15%) is three times greater than that for site R2 (5%). Only site R1 recorded a species (*Acacia spectabilis*) that provided cover greater than 5%.

With regards to cover comparisons between rehabilitation and analogue sites, the tree/shrub cover varied from 5% to 15% for rehabilitation sites, whilst for analogues sites the tree/shrub cover ranged from 15% to 25%.

The vegetation stratum with a large difference in cover between rehabilitation and analogue sites was the groundcover. Analogue sites had greater than 95% groundcover, whilst rehabilitation sites had less than 10% (R1 5%-10% cover, R2, 1% cover). At the rehabilitation sites the two species providing most groundcover were the leguminous spreading creeper *Hardenbergia violaceae* and stoloniferous grass, *Cynodon dactylon*. At the analogue sites the common grasses were species such as *Echinopogon intermedius*, *Aristida spp*., *Austrodanthonia spp*., and *Microlena stipoides*. With regards to native species numbers, the analogue sites A1a and A1b had 47 and 31 native species respectively, whereas the rehabilitation sites R1 and R2 had 35 and 16 native species present.

The flora list for the rehabilitation monitoring site and the seed mix used for rehabilitation shows that seven of 25 native species in the seed mix distributed were recorded in surveys of rehabilitation monitoring plots R1 and R2. This means that 34 native species (80% of all native species rehabilitation monitoring plots) were not the result of seed broadcast. Species from the broadcast seed mix that are common in the rehabilitation monitoring area are *Acacia spectabilis* and *Acacia leucoloba*. Native species that are dominant in the rehabilitation monitoring plots but were not in the seed mix and most likely originated from the topsoil spread on the area are *Acacia gladiiformis*, *Acacia verniciflua* and *Pultenea microphylla*.

A total of seven different species of exotic plants occur in rehabilitation monitoring sites, with the greatest abundance being from the genera Conyza, which were rated as common but with less than 5% cover. None of the exotic species recorded in the monitoring plots are listed as noxious species within the Mid-Western Regional Council area.

Fauna Monitoring

One bird was observed on site (Australian Magpie - *Gymnorhina tibicen*), the other observations were either calls from the surrounding areas or fly-overs. However, a total of 17 and 25 birds were either heard or observed in areas surrounding sites R1 and R2, respectively. By comparison, within the fauna sites established for the Moolarben Offset Monitoring Program, bird numbers recorded ranged from 20 to 40 species. Anabat recordings over three nights recorded a total of eight (8) different microbat species, including the threatened Eastern Bent-wing Bat (*Miniopterus schreibersii oceanensis*). General microbat activity was low with calls recorded less than every ten minutes throughout the evenings. No reptiles were observed.

Table 82: Summary of Floristic at OC1 Rehabilitation Sites and Analogue Site with Regards Species Number, Height and Dominant Species

Vegetation Community	Site	Total Spp	Native	Exotic	Stratum	Lower Height	Upper Height	Percent Cover	Dominant Species
Rehabilitation 2010	R1	41	35	6	T	Nil			
					M	1.5m	2m	15	*Acacia gladiiformis, A. spectabilis, A. leucoloba*
					L	0-0m	0.25m	5-10	*Hardenbergia violacea, Cynodon dactylis*
Rehabilitation 2010	R2	21	16	5	T	nil			
					M	1.5m	2m	5	*Acacia gladiiformis, A. spectabilis, A. verniciflua*
					L (native)	0m	0.25m	1	*Cynodon dactylis, Pultenea microphylla, Daviesia ulicifolia*
					L (exotic)	*0m*	*0.25m*	*1*	*Hypochaeris radicata*
Blakely's Red Gum Grassy Woodland (analogue)	A1a	50	47	3	T	9m	10m	15	*Eucalyptus blakelyi, Eucalyptus albens, Eucalyptus crebra*
					M	8m	8m	10	*Brachychiton populneus* subsp. *populneus*
					L - native	0m	1m	95	*Aristida vagans*
					L - exotic	0m	0.8m	5	*Opuntia* spp.
Blakely's Red Gum Grassy Woodland (analogue)	A1b	37	31	6	T	11m	20m	20	*Eucalyptus blakelyi, Angophora floribunda*
					M	1m	1m	5	*Acacia spectabilis*
					L - native	0m	1m	90	*Microlaena stipoides* var. *stipoides, Aristida vagans*

Geochemical Monitoring

Geochemical monitoring shows that surface pH is lower in the rehabilitation area than Analogue sites as shown in **Table 83**. The topsoil range of pH is 4.9 to 5.1 for the rehabilitation area, whereas analogue sites have a pH range of 5.6 to 6.0. The subsurface pH range of the rehabilitation monitoring sites (4.9 to 5.4) intersects the pH range for analogue sites (5.1 to 5.8). The surface pH of the rehabilitation monitoring plots (4.9 to 5.1) is in the range where issues of aluminium and manganese toxicity can be triggered. However, a pH level of 4.9 is well within the range of the commonly occurring Yellow Podzolic soil of the Moolarben mine area. This soil ranges in pH from 4.5 to 5.5.

Electrical Conductivity (EC) indicates the salinity level of soils. High salinity levels can impede plant growth. EC of R1 and R2 ranged from 34 to 64µS/cm, whilst analogue sites ranged from 18 to 43µS/cm. The levels recorded in the rehabilitation plots are well below the 1000 µS/cm, which will allow even salinity sensitive plants to grow unimpeded (Handreck and Black, 2002).

Table 83: Geochemical Data for Rehabilitation Plots at Moolarben OC1 and Analogue Plots in Box-Gum Grassy Woodland

Factor	Rehab 1	Rehab 2	Analogue A1	Analogue A2
pH 0-100mm	5.1	4.9	5.6	6.0
pH 100-200mm	5.4	5.2	5.1	5.8
pH 200-300mm	5.2	4.9	5.1	5.7
Conductivity µS/cm 0mm-100mm	64	68	18	43
Conductivity µS/cm 100-200mm	35	35	19	23
Conductivity µS/cm 200-300mm	34	68	10	22

Completion Criteria Assessment

The LMP 2011 describes the preliminary completion criteria for both vegetation and soils, which are specified for 1 year, 5 year and 15 year time frames. The data collected during this monitoring period allows an assessment to be made of success in meeting a selected number of the completion criteria. This review is contained in **Table 84**.

Table 84: Review of Data Collected in November 2012 Against Preliminary Completion Criteria

Performance/Completion Criteria	Result	Comment
Species Diversity: The presence of at least four overstorey and four understorey species representative of the vegetation association in each monitoring plot at all ages. These species may be different for each vegetation association	R1 or R2 have perhaps one overstorey species of a Gum Box Woodland. R1 and R2 have Acacia spectabilis which is representative of the understorey of analogue site A1b. Site R1 has *Cassinia arcuata* which is representative of both analogue sites.	The very few eucalypt seedlings observed are too young to positively identify. The Box-Gum woodland analogues only have two or three representative canopy (overstorey) species whereas the criteria are seeking at least four overstorey species. This target needs to be reviewed. For understorey species there could be recruitment of species more typical of Box Gum woodland in future years as micro-environment conditions change and seed dispersal takes place. Currently the grass layer for producing a Gum Box Woodland is noticeably absent. If soil conditions are appropriate grass seed dispersal will ensure a grass layer in future years.
Stem Densities: minimum total tree/shrub densities: Year 1 – 3,000 stems/ha	R1 – stem density of 2613 at Year 2. R2 – stem density of 381 at Year 2	R2 stem density is not near the target. However, it may reach the target for year 5 (see below).
Stem Densities: minimum total tree/shrub densities: Year 5 – 1,000 stems/ha	Not applicable	Given current stem densities this target could be achieved. There may be further recruitment in R2 (currently 381 stems) due to further seed coming onto the site, existing vegetation regenerating or hard coated/dormant seeds germinating.
pH of replaced topsoil to be in the range of analogue sites after 5 years	At year 2 topsoil pH range of R1 and R2 is 4.9 to 5.1. For Analogue sites topsoil pH range is 5.6 to 6.	Within natural range of Yellow Podzolics (pH4.5 to pH5.5) of Moolarben area.
Conductivity of replaced topsoil to be within 20% of analogue sites after 5 years	Conductivity range of R1 and R2 is 64-68 µS/cm. For analogues site range is 18 to 43µS/cm.	Further leaching of R1 and R2 could result in lower conductivity measures.

5.2.3 Activities Next Reporting Period

During the next reporting period MCO plan to rehabilitate approximately 50ha of land in OC1 and 20ha in OC2. This rehabilitation will take place on overburden with the final land use proposed to be native vegetation (OC1) or agricultural use (OC2). The proposed areas to be disturbed and the proposed areas to be rehabilitated are shown in **Figure 62**. This figure shows disturbance activities occurring outside of the currently approved Mining Operations Plan (MOP). MCO will update the MOP and have it approved prior to this disturbance occurring.

The rehabilitation monitoring program will continue to be implemented during the next reporting period with the results reported in next year's AEMR.

5.3 REVEGETATION OF DISTURBED LAND – OFFSET AREAS

5.3.1 Activities This Reporting Period

During the reporting period on ground revegetation works continued in the Offset Areas. These works focused in the "Red Hills" area off Ulan-Wollar Road. The revegetation works required in

the "Dexter Mountain" area off Lagoons Road were completed previously. A third area above "UG4" consists mostly of native vegetation with no revegetation works undertaken during the reporting period. The project approval requirements for these areas are:

- Condition 42 (b) conserve and enhance at least 2.6 hectares of regenerating White Box Yellow Box Blakely's Red Gum Grassy Woodland endangered ecological community on Property 6 ("Dexter Mountain");
- Condition 42 (c) revegetate disturbed land with at least 48 hectares of White Box Yellow Box Blakely's Red Gum endangered ecological community on Properties 6, 10, 12, 13, 14 and 15 ("Red Hills", "UG4", and "Dexter Mountain"); and
- Condition 42 (d) revegetate at least 153 hectares of cleared land on the Properties 12, 13, 14 and 15 ("Red Hills").

At the end of the reporting period the following percentages of these requirements had been met:

- Condition 42 (b) = 112%
- Condition 42 (c) = 96.9% (inclusive of natural regeneration)
- Condition 42 (d) = 69.0% (inclusive of natural regeneration)

Physical on ground works continued during the reporting period with approximately 15ha being prepared for planting. This work involved:

- Setting out areas with respect to contour lines and other site constraints;
- Slashing 2m wide strips throughout the planting area;
- Ripping up-to a depth of 600mm throughout the planting area; and
- Mounding over rip lines for planting.

All planting spots had a dish constructed on the prepared mound, a Hiko or forestry size seedling was planted with a 20 gram slow release fertiliser tablet, marked with a bamboo cane and watered in thoroughly. Propagation of seedlings was undertaken by a local nursery using provenance seed drawn from MCO's native plant seed bank.

Table 85 lists the species and quantities planted to date. The species totals shows weighting toward the use of *Eucalyptus albens*, *Eucalyptus melliodora*, *Eucalyptus blakelyi*, *Eucalyptus crebra* and *Angophora floribunda*, as these are the dominant species found in the White Box Yellow Box Blakely's Red Gum Grassy Woodland endangered ecological community. All other species have been chosen to blend with and complement the existing native vegetation occurring within or adjacent to the planting area.

Table 85: Species Used in the Biodiversity Revegetation Program

Genus	Species	Number Planted
Acacia	*decora*	6
	implexa	712
Allocasuarina	*diminuta*	240
	luehmanii	511
Angophora	*floribunda*	917
Callistemon	*pinifolious*	1,047
Dodonaea	*cuneata*	415
Eucalyptus	*albens*	402
	agglomerata	217
	blakelyi	1,731
	bridgesiana	1,041

Genus	Species	Number Planted
	crebra	569
	dealbata	34
	fibrosa	524
	melliodora	1,185
	molucanna	1,501
	punctata	115
Hakea	*dactyloides*	34
Leptospermum	*continentale*	731
	polygalifolium	992
Lomandra	*longifolia*	58
Melaleuca	*erubescens*	582
	thymifolia	933
Kunzea	*ambigua*	497

Protection of 1,282ha of existing native vegetation and 6ha of White Box Yellow Box Blakely's Red Gum Grassy Woodland endangered ecological community continued during the reporting period by limiting access through locked gates and fencing.

5.3.2 Activities Next Reporting Period

Physical protection and revegetation of the offset areas will continue during the next reporting period. Arrangements for the long-term protection and management of the offset areas will continue.

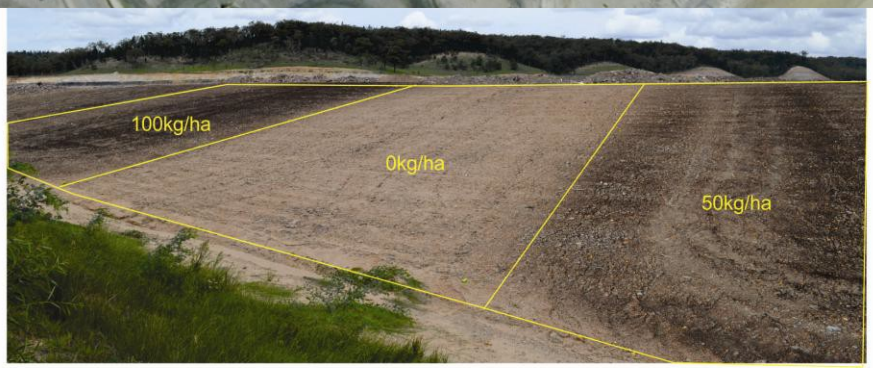
5.4 OTHER INFRASTRUCTURE

No infrastructure was required to be rehabilitated during the reporting period.

5.5 REHABILITATION TRIALS OR RESEARCH

Two rehabilitation trials were undertaken during the reporting period. Between 25 February 2013 and 4 March 2013 a compost trial was set up near Sediment Dam 7 over an area of approximately 3 ha (**Figure 61**). Soils were tested prior to the trial and can be summarised as being of moderate fertility, magnesic, strongly acidic, low available phosphorus and low to high sodium (dispersive).

Varying rates of compost (Nitrohumus) were applied to provide insight to the effectiveness of control ($0m^3$/ha), $50m^3$/ha and $100m^3$/ha. Seed, fertiliser application and ground preparation remained constant across all plots.



North west facing slope

West facing slope

Figure 61: Rehabilitation Trial Location and Set Up

A total of 15kg of native tree and shrub seed was applied at a rate of 6kg/ha. The seed mix is shown in **Table 86**. Twenty five per cent of *Acacia* seed was heat treated to induce early germination. Seed oats was also sown at a rate of 30kg/ha. Inorganic (quick release) and organic (slow release) fertiliser were also applied at a total combined rate of 400kg/ha. Gypsum was also spread at a rate of 2 tonne/ha.

Table 86: Box Gum Woodland Mix – Trial Area

Genus	Species	Box-Gum Woodland Association (g)
Acacia	*decora*	53
	Polybotrya	684
	Verniciflua	1,200
	Implexa	1,000
	Spectabilis	1,000
Allocasuarina	*luehmanii*	79
Angophora	*floribunda*	300
Callistemon	*Linearis*	47
Dodonaea	*cuneata*	400
	Viscosa	195
Eucalyptus	*Blakelyi*	4,000
	crebra	1,000
	dealbata	500
	melliodora	1,500
	molucanna	1,500
	Sideroxylon	400
Kunzea	*ambigua*	200
Leptospermum	*polygalifolium*	300
Melaleuca	*thymifolia*	343
Indigofera	*Australis*	275
Bursaria	*Spinosa*	24
	Total	15,000

Monitoring of the trial has consisted of two survey periods (8 May 2013 and 11 June 2013). Both surveys were conducted using the same methods. Twenty 1m x 1m quadrats were randomly selected in each treatment area. The total number of germinates from each species

present were recorded, along with the average height of germinates and any other opportunistic observations. The process of randomly selecting quadrats was intended to allow a representative number of upslope, mid-slope and down-slope quadrats within each treatment area.

The first survey period followed a period of low rainfall and as such minimal growth was observed. The highest growth was observed in the 100m^3/ha treatment class, with the lowest growth observed in the 0m^3/ha treatment class. Nearly all germinates recorded were *Avena sativa* (Common Oats).

The second survey period followed rain and existing germinates formed a more dense covering of the site. New monocotyledon germinates (less than 5 cm) were very common among all quadrats surveyed. Additionally, a number of *Eucalyptus spp.* and *Acacia spp*. germinates were recorded across the trial area however these examples were less common and scattered.

Further monitoring was undertaken in late August 2013 and future monitoring will be undertaken in October to maintain an adequate record of growth and species presence. These results will be presented in the next AEMR.

A second trail was undertaken in February 2013 and involved applying a different application method. An area approximately 1 ha in size was planted with tube stock and also sown with an *Acacia* mix and cover crop. The tube stock mix is shown in **Table 87**.

Table 87: Box Gum Woodland Mix – Tube Stock Trial Area

Genus	Species	Direct Sow (kg)	Plant Seedlings
Acacia	*decora*	1.0	
	gladiformis	0.5	
	linearfolia	0.5	
	verniciflua	1.0	
	Implexa		40
Allocasuarina	*luehmanii*		40
	diminuta		40
Angophora	*floribunda*		80
Dodonaea	*viscosa*		80
Eucalyptus	*blakelyi*		40
	crebra		40
	meliodora		40
	molluccana		80
Kunzea	*ambigua*		20
Cover Crop	*Oats, Millet, Rye, Couch, Lucerne*	37	

The area was ripped prior to planting and all planting spots had a dish constructed on the prepared mound, a Hiko or forestry size seedling was planted with a 20 gram slow release fertiliser tablet, marked with a bamboo cane and watered in thoroughly. Propagation of seedlings was undertaken by a local nursery using provenance seed drawn from MCO's native plant seed bank.

The trial area falls within the routine rehabilitation monitoring for Open Cut 1 and will be reported as part of Spring 2013 monitoring. However, during routine inspections, it is noted that there has been a 50% mortality rate amongst the plantings with the majority being eaten by animals. These areas will be replanted during Autumn 2014 and reported in the next AEMR.

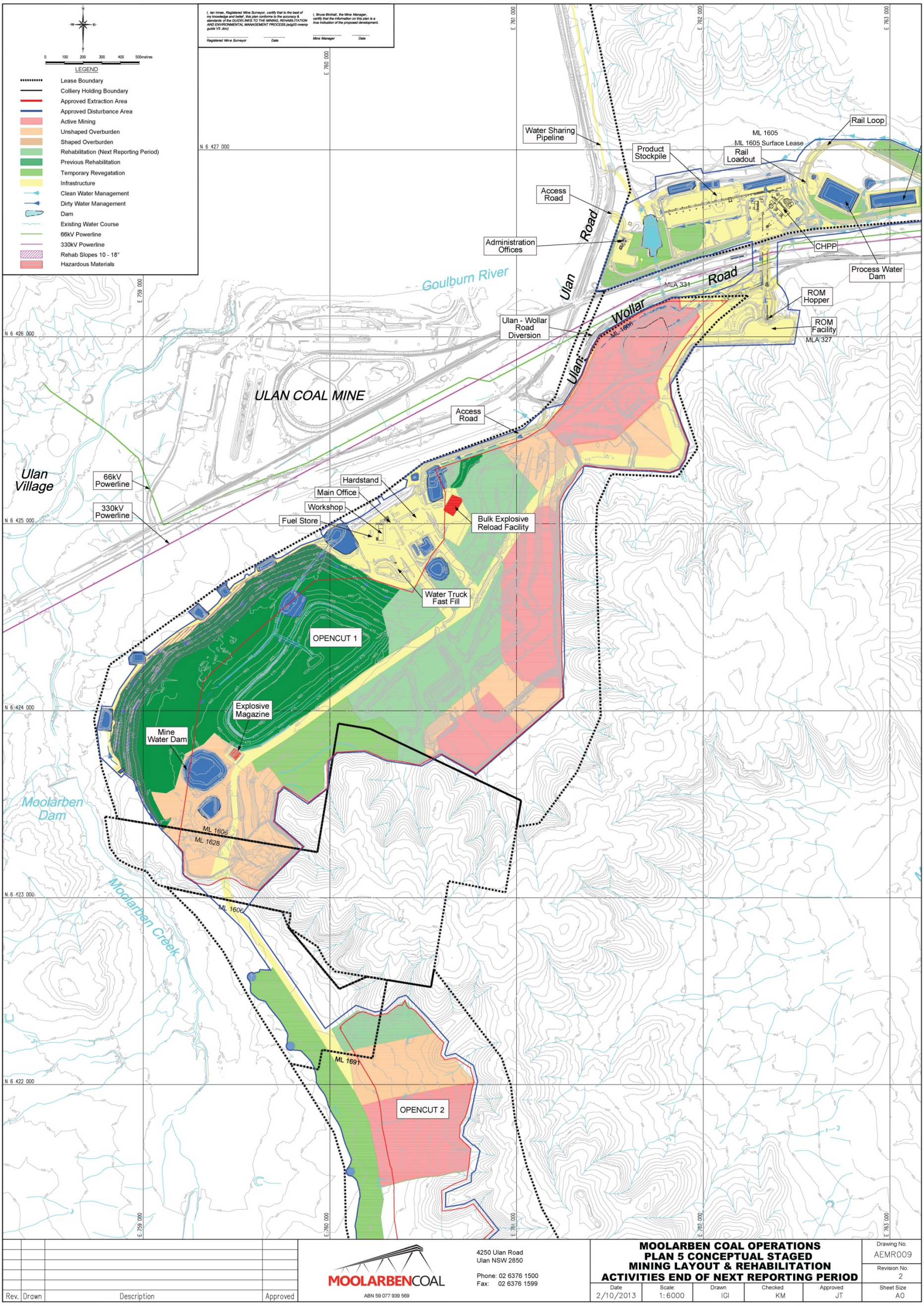


Figure 62: Proposed Disturbance Areas

5.6 REHABILITATION SUMMARY

Table 88: Rehabilitation Summary 2012-2013

	Area Affected / Rehabilitated (hectares)		
	To Date	Last Report	Next Report (estimated)
A: MINE LEASE AREA			
Mine Lease 1605	1,099.6		
Mine Lease 1606	495.4		
Mine Lease 1628	152.7		
Total	**1,747.7**		
B: DISTURBED AREAS			
B1 Infrastructure area	146.0	124.0	142.8
B2 Active Mining Area (Excluding B3 – B5)	61.7	73.0	87.8
B3 Waste Emplacement (Active / unshaped)	88.6	94.0	73.1
B4 Tailings emplacements (active / uncapped)	0.0	0.0	0.0
B5 Shaped waste emplacement (awaits final vegetation)	14.6	12.0	0.0
ALL DISTURBED AREAS	**310.9**	**307.0**	**303.7**
C. REHABILITATION PROGRESS			
C1 Total Rehabilitated Area (except for maintenance)	31.5	45	112.3
D. REHABILITATION ON SLOPES			
D1 10 to 18 degrees	0.0	27.0	0.0
D2 Greater than 18 degrees	0.0	0.0	0.0
E. SURFACE OF REHABILITATED LAND			
E1 Pasture and grasses	0.0	0.0	8.0
E2 Native forest / ecosystems	13.25	45.0	61.5
E3 Plantations and crops	0.0	0.0	
E4 Other (temporary rehabilitation)	18.3	0.0	42.8

Table 89: Maintenance Activities on Rehabilitated Land

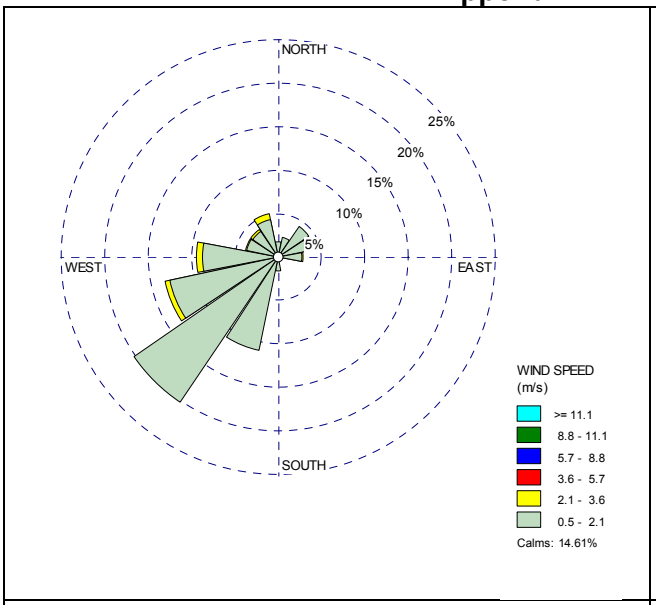
NATURE OF TREATMENT	Area Treated (ha)		Comment / control strategies / treatment detail
	Report Period	Next Period	
Additional erosion control works (drains re-contouring, rock protection)	0.0	0.0	Unknown – Erosion control works will depend on monitoring of rehabilitation areas throughout the reporting period.
Re-covering (detail – further topsoil, subsoil sealing, etc)	0.0	0.0	Unknown – Re-covering works will depend on monitoring of rehabilitation areas throughout the reporting period.
Soil treatment (detail – fertiliser, lime, gypsum, etc)	0.0	0.0	Unknown – Soil treatment works will depend on monitoring of rehabilitation areas throughout the reporting period.
Treatment / Management (detail – grazing, cropping, slashing, etc)	0.0	0.0	Not applicable - Lands rehabilitated to date do not include grazing or cropping lands.
Re-seeding / Replanting (detail – species density, season, etc)	1.0	0.0	1 ha plot was planted with tube stock (500 trees) in February 2013 as part of trial. The mix comprised of Box Gum Woodland species. A 5kg/ha *Acacia* mix was also direct seeded with a temporary grass mix.
Adversely Affected by Weeds (detail – type and treatment)	0.0	0.0	Unknown – Weed control works will depend on monitoring of rehabilitation areas throughout the reporting period.
Feral animal control (detail – additional fencing, trapping, baiting, etc)	0.0	0.0	Unknown – Erosion control works will depend on monitoring of rehabilitation areas throughout the reporting period.

6.0 ACTIVITIES PROPOSED IN THE NEXT AEMR PERIOD

Various activities are proposed to be undertaken during the next reporting period and are anticipated to include:

- Ongoing Exploration Activities;
- Implementation of updated water management strategy;
- Open Cut mining operations will move into Open Cut 2; and
- Continuous improvement of the environmental management system.

Appendix 1: Wind Rose Data



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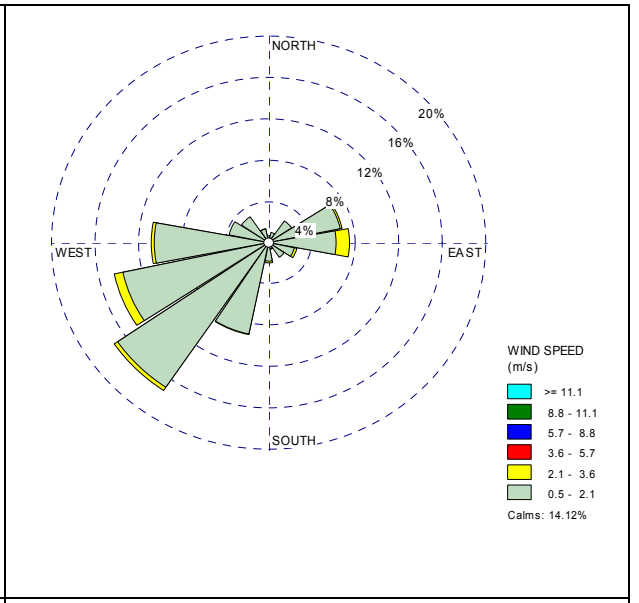

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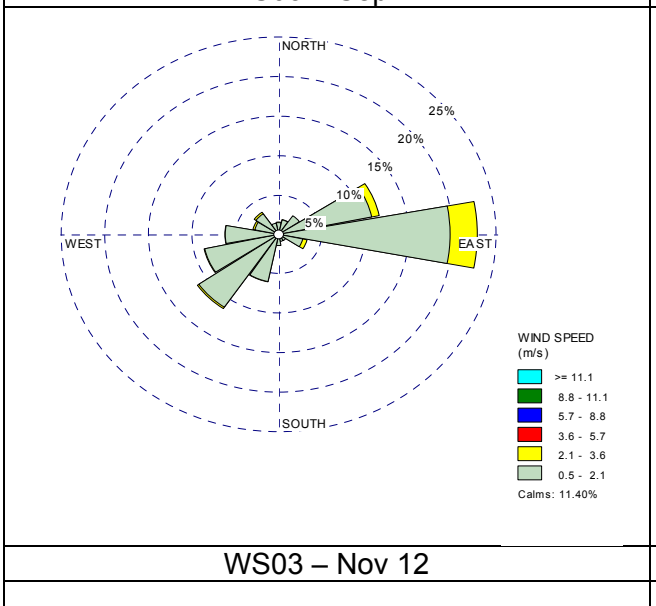

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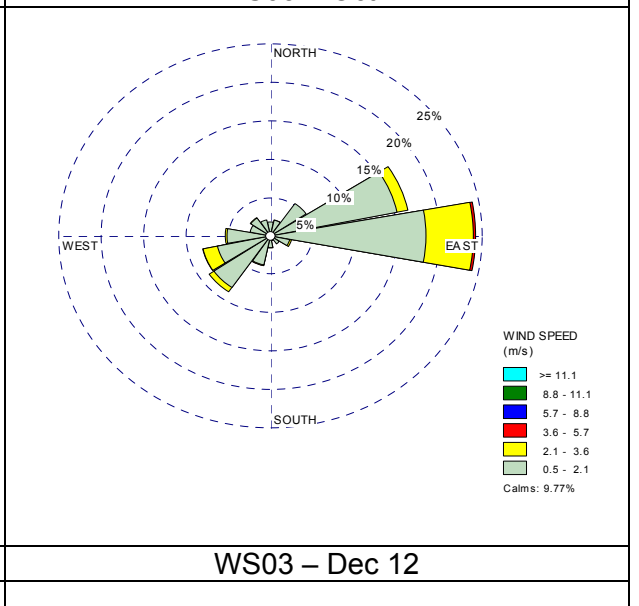

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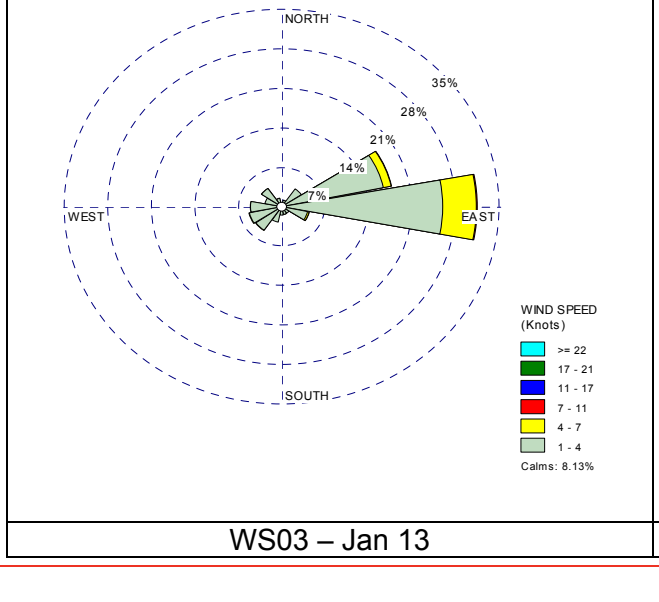

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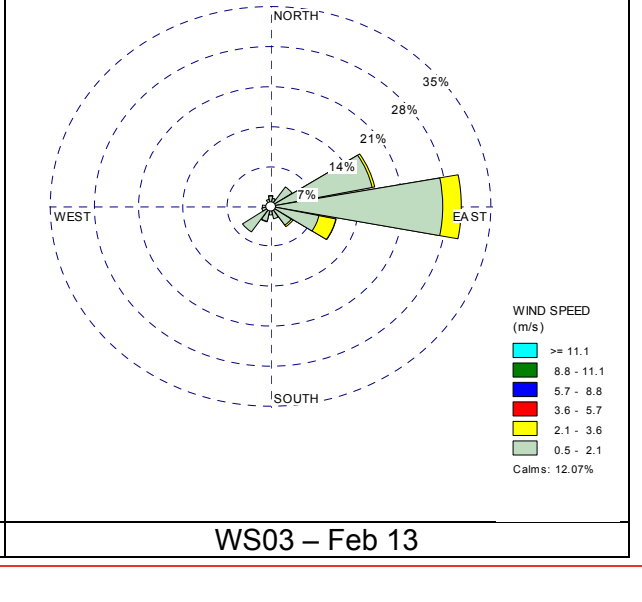

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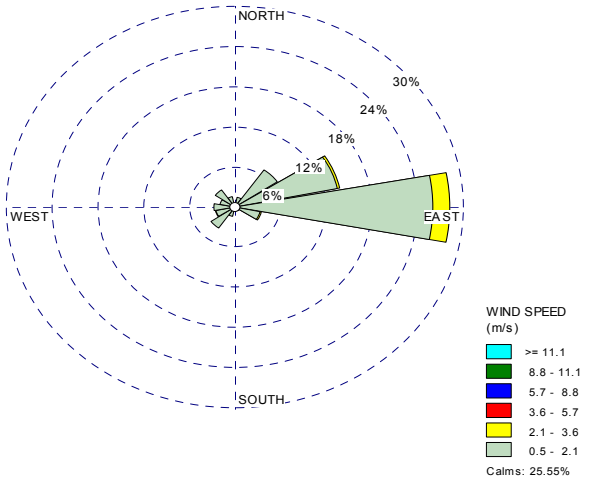

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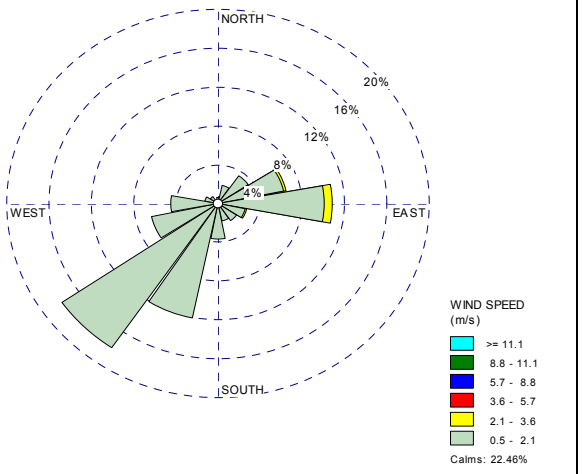

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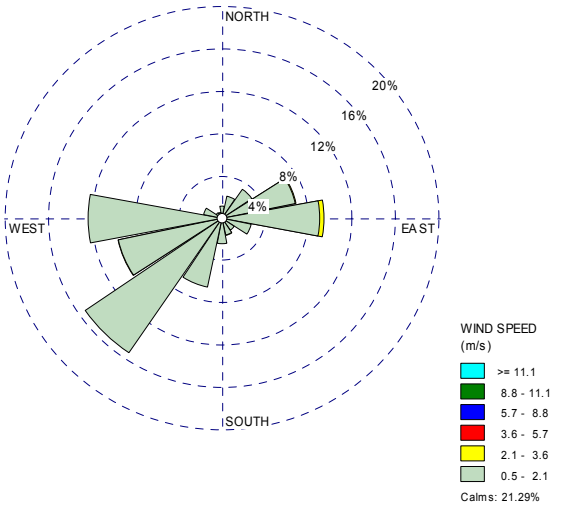

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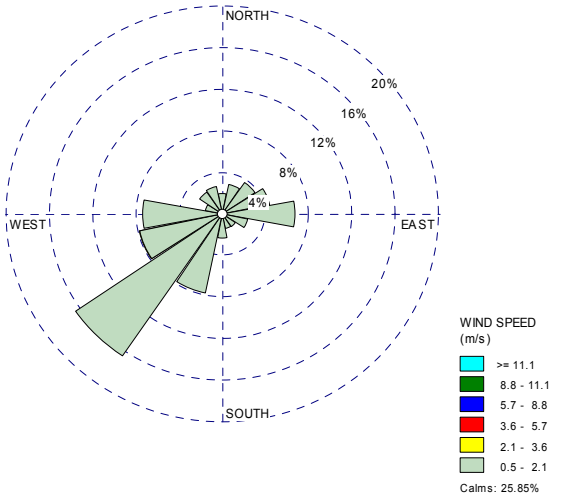

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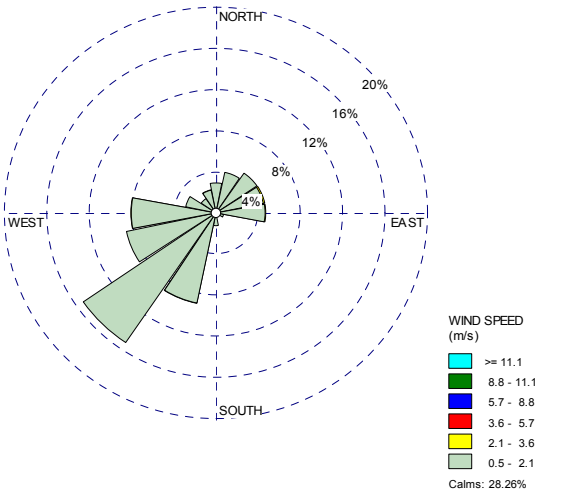

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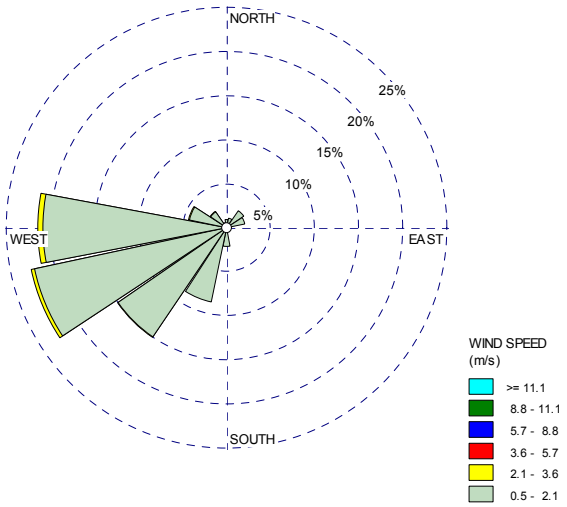

WS03 – Aug 13

Appendix 2: Air Quality Monitoring Data

Real-Time PM_{10} Data

TEOM Data Summary									
Date	Ulan Road	Murragamba	School	24hr Average Limit (µg/m^3)	Comment	Ulan Road	Murragamba	School	Annual Average Limit (µg/m^3)
	Daily Result					Average			
01/09/12	3.2	2.9	5.3	50		7.8	9.0	10.3	30
02/09/12	6.3	7.2	7.0	50		7.8	8.9	10.2	30
03/09/12	7.0	13.5	10.0	50		7.8	9.0	10.2	30
04/09/12	5.9	14.1	11.0	50		7.8	9.0	10.2	30
05/09/12	14.0	14.2	29.3	50		7.8	9.0	10.3	30
06/09/12	20.8	31.9	28.7	50		7.9	9.0	10.3	30
07/09/12	11.4	24.9	14.4	50		7.9	9.1	10.3	30
08/09/12	8.2	11.8	9.6	50		7.9	9.1	10.3	30
09/09/12	7.1	7.4	6.1	50		7.9	9.1	10.3	30
10/09/12	14.7	14.2	20.8	50		7.9	9.1	10.3	30
11/09/12	14.0	16.4	19.4	50		8.0	9.1	10.4	30
12/09/12	16.7	20.4	18.8	50		8.0	9.1	10.4	30
13/09/12	9.7	12.7	15.4	50		8.0	9.1	10.4	30
14/09/12	3.4	6.2	8.1	50		8.0	9.1	10.4	30
15/09/12	6.6	11.3	11.3	50		8.0	9.1	10.4	30
16/09/12	10.0	11.3	13.0	50		8.0	9.1	10.4	30
17/09/12	10.6	12.9	16.9	50		8.0	9.1	10.4	30
18/09/12	5.8	7.7	11.9	50		8.0	9.0	10.4	30
19/09/12	3.0	4.4	5.3	50		7.9	9.0	10.4	30
20/09/12	6.7	2.0	5.1	50		7.9	9.0	10.4	30
21/09/12	5.4	10.1	8.7	50		7.9	8.9	10.3	30
22/09/12	5.4	8.9	4.9	50		7.8	8.9	10.3	30
23/09/12	5.9	12.9	8.3	50		7.8	8.9	10.3	30
24/09/12	10.1	16.7	12.4	50		7.8	8.9	10.2	30
25/09/12	11.2	11.9	16.0	50		7.8	8.9	10.3	30

TEOM Data Summary									
Date	Ulan Road	Murragamba	School	24hr Average Limit (µg/m^3)	Comment	Ulan Road	Murragamba	School	Annual Average Limit (µg/m^3)
	Daily Result					Average			
26/09/12	17.4	12.9	21.4	50		7.8	8.9	10.3	30
27/09/12	21.3	16.7	33.3	50		7.9	9.0	10.4	30
28/09/12	16.1	20.1	29.9	50		7.9	9.0	10.4	30
29/09/12	5.8	8.0	6.5	50		7.9	9.0	10.4	30
30/09/12	3.6	5.5	4.7	50		7.9	9.0	10.4	30
01/10/12	8.5	10.7	10.3	50		7.9	9.0	10.4	30
02/10/12	11.1	7.1	7.2	50		7.9	9.0	10.4	30
03/10/12	10.9	12.1	13.9	50		7.9	9.1	10.5	30
04/10/12	10.8	17.4	15.1	50		8.0	9.1	10.5	30
05/10/12	13.6	17.9	17.7	50		8.0	9.1	10.5	30
06/10/12	21.8	28.4	24.6	50		8.0	9.2	10.5	30
07/10/12	5.4	6.9	4.8	50		8.0	9.2	10.5	30
08/10/12	11.6	14.0	14.5	50		8.0	9.2	10.5	30
09/10/12	8.8	12.0	10.2	50		8.0	9.2	10.6	30
10/10/12	9.2	10.5	10.3	50		8.1	9.2	10.6	30
11/10/12	3.7	5.9	5.5	50		8.1	9.2	10.6	30
12/10/12	2.1	4.1	4.8	50		8.0	9.2	10.6	30
13/10/12	4.1	5.6	6.0	50		8.0	9.2	10.5	30
14/10/12	8.2	7.7	7.5	50		8.0	9.2	10.5	30
15/10/12	8.5	12.8	13.7	50		8.0	9.2	10.5	30
16/10/12	7.6	21.5	11.9	50		8.0	9.2	10.5	30
17/10/12	11.2	17.9	17.1	50		8.0	9.3	10.5	30
18/10/12	21.2	19.3	27.7	50		8.1	9.3	10.6	30
19/10/12	16.2	22.2	25.3	50		8.1	9.3	10.6	30
20/10/12	17.5	21.9	20.6	50		8.1	9.3	10.6	30
21/10/12	9.1	20.9	11.9	50		8.1	9.3	10.6	30
22/10/12	5.6	10.7	7.9	50		8.1	9.3	10.5	30
23/10/12	11.4	12.3	15.4	50		8.0	9.3	10.5	30
24/10/12	16.4	12.4	16.1	50		8.0	9.3	10.5	30

TEOM Data Summary									
Date	Ulan Road	Murragamba	School	24hr Average Limit (µg/m^3)	Comment	Ulan Road	Murragamba	School	Annual Average Limit (µg/m^3)
	Daily Result					Average			
25/10/12	29.1	32.5	26.8	50		8.1	9.3	10.5	30
26/10/12	19.5	27.2	21.4	50		8.1	9.4	10.6	30
27/10/12	9.6	10.0	10.0	50		8.1	9.4	10.6	30
28/10/12	17.3	16.3	19.0	50		8.2	9.4	10.6	30
29/10/12	21.4	13.6	4.8	50		8.2	9.5	10.6	30
30/10/12	14.1	14.0	20.0	50		8.2	9.5	10.6	30
31/10/12	11.7	15.8	12.1	50		8.3	9.5	10.7	30
01/11/12	16.1	23.1	18.9	50		8.3	9.5	10.7	30
02/11/12	11.9	14.9	14.0	50		8.3	9.5	10.7	30
03/11/12	11.7	11.6	15.1	50		8.3	9.6	10.7	30
04/11/12	15.5	13.2	17.0	50		8.3	9.6	10.7	30
05/11/12	17.0	17.2	10.5	50		8.3	9.6	10.7	30
06/11/12	19.4	21.5	16.6	50		8.3	9.6	10.7	30
07/11/12	18.7	22.0	26.8	50		8.4	9.6	10.7	30
08/11/12	5.7	8.5	7.4	50		8.3	9.6	10.7	30
09/11/12	2.6	3.0	6.4	50		8.3	9.6	10.6	30
10/11/12	10.8	14.1	13.1	50		8.3	9.6	10.7	30
11/11/12	9.2	9.3	15.7	50		8.3	9.6	10.7	30
12/11/12	10.2	10.6	13.2	50		8.3	9.6	10.6	30
13/11/12	12.0	24.4	16.0	50		8.3	9.6	10.6	30
14/11/12	16.2	17.0	19.5	50		8.3	9.6	10.6	30
15/11/12	11.0	13.6	0.0	50		8.3	9.5	10.6	30
16/11/12	6.8	12.8	6.1	50		8.2	9.5	10.5	30
17/11/12	7.4	6.9	9.3	50		8.3	9.5	10.5	30
18/11/12	5.1	5.9	7.4	50		8.2	9.5	10.5	30

TEOM Data Summary									
Date	Ulan Road	Murragamba	School	24hr Average Limit (µg/m^3)	Comment	Ulan Road	Murragamba	School	Annual Average Limit (µg/m^3)
	Daily Result					Average			
19/11/12	7.3	10.6	9.2	50		8.2	9.5	10.5	30
20/11/12	9.3	9.0	12.1	50		8.2	9.5	10.5	30
21/11/12	18.2	14.0	4.3	50		8.2	9.5	10.5	30
22/11/12	18.7	23.2	18.0	50		8.3	9.5	10.5	30
23/11/12	17.2	15.6	17.9	50		8.3	9.6	10.5	30
24/11/12	15.2	14.0	4.9	50		8.4	9.6	10.5	30
25/11/12	13.4	14.2	15.1	50		8.4	9.6	10.6	30
26/11/12	16.7	19.9	17.7	50		8.4	9.7	10.6	30
27/11/12	8.5	10.3	10.6	50		8.4	9.7	10.6	30
28/11/12	12.4	12.2	1.1	50		8.5	9.7	10.6	30
29/11/12	11.1	10.9	14.5	50		8.4	9.7	10.6	30
30/11/12	22.4	21.4	21.2	50		8.5	9.7	10.6	30
01/12/12	19.9	23.8	22.3	50		8.5	9.8	10.6	30
02/12/12	10.4	13.7	11.2	50		8.5	9.8	10.6	30
03/12/12	3.0	3.5	7.9	50		8.5	9.8	10.6	30
04/12/12	8.9	11.6	11.7	50		8.5	9.8	10.6	30
05/12/12	15.6	20.5	14.6	50		8.5	9.8	10.6	30
06/12/12	14.2	19.9	14.2	50		8.5	9.8	10.7	30
07/12/12	22.7	23.5	23.9	50		8.5	9.9	10.7	30
08/12/12	22.9	20.8	23.7	50		8.6	9.9	10.7	30
09/12/12	23.6	23.8	24.7	50		8.6	10.0	10.8	30
10/12/12	7.8	4.4	10.5	50		8.7	10.0	10.8	30
11/12/12	6.3	4.6	8.0	50		8.6	10.0	10.8	30
12/12/12	8.5	6.0	9.6	50		8.7	10.0	10.8	30
13/12/12	8.2	7.1	6.9	50		8.7	10.0	10.8	30
14/12/12	16.8	6.3	19.0	50		8.7	10.0	10.8	30
15/12/12	16.6	19.5	18.7	50		8.7	10.0	10.8	30

TEOM Data Summary									
Date	Ulan Road	Murragamba	School	24hr Average Limit (µg/m^3)	Comment	Ulan Road	Murragamba	School	Annual Average Limit (µg/m^3)
	Daily Result					Average			
16/12/12	9.8	13.7	10.3	50		8.7	10.0	10.8	30
17/12/12	13.7	18.3	19.0	50		8.7	10.0	10.9	30
18/12/12	15.7	18.7	19.4	50		8.7	10.0	10.9	30
19/12/12	20.6	19.0	25.4	50		8.7	10.1	10.9	30
20/12/12	20.3	17.8	20.4	50		8.8	10.1	10.9	30
21/12/12	21.4	17.2	19.8	50		8.8	10.1	11.0	30
22/12/12	14.4	13.5	14.2	50		8.8	10.1	11.0	30
23/12/12	6.1	9.2	7.5	50		8.8	10.1	11.0	30
24/12/12	9.0	14.9	10.7	50		8.8	10.2	11.0	30
25/12/12	3.6	3.8	3.9	50		8.8	10.2	11.0	30
26/12/12	5.3	5.9	6.2	50		8.8	10.2	11.0	30
27/12/12	11.3	9.9	10.1	50		8.8	10.2	11.0	30
28/12/12	12.4	12.6	12.0	50		8.8	10.2	11.0	30
29/12/12	16.9	16.4	17.2	50		8.8	10.2	11.0	30
30/12/12	16.9	15.9	17.1	50		8.9	10.2	11.0	30
31/12/12	13.9	12.3	13.2	50		8.9	10.2	11.0	30
01/01/13	12.5	11.6	10.8	50		8.9	10.2	11.0	30
02/01/13	15.9	26.8	16.6	50		8.9	10.2	11.0	30
03/01/13	13.8	13.2	18.7	50		8.9	10.2	11.0	30
04/01/13	14.4	10.3	18.0	50		8.9	10.2	11.0	30
05/01/13	27.7	20.2	25.7	50		8.9	10.2	11.1	30
06/01/13	16.6	15.9	17.7	50		8.9	10.2	11.1	30
07/01/13	13.5	10.2	13.5	50		8.9	10.2	11.1	30
08/01/13	18.8	20.7	18.8	50		9.0	10.2	11.1	30
09/01/13	28.4	27.3	23.5	50		9.0	10.2	11.2	30
10/01/13	29.0	21.9	26.4	50		9.1	10.3	11.2	30
11/01/13	17.5	18.3	17.5	50		9.1	10.2	11.2	30
12/01/13	11.4	27.3	20.9	50		9.1	10.2	11.2	30
13/01/13	28.1	23.4	26.9	50		9.2	10.3	11.3	30

TEOM Data Summary									
Date	Ulan Road	Murragamba	School	24hr Average Limit (µg/m^3)	Comment	Ulan Road	Murragamba	School	Annual Average Limit (µg/m^3)
	Daily Result					Average			
14/01/13	6.5	3.5	9.5	50		9.1	10.2	11.2	30
15/01/13	14.5	12.0	15.3	50		9.2	10.2	11.2	30
16/01/13	20.8	18.5	20.8	50		9.2	10.3	11.2	30
17/01/13	27.5	22.6	27.5	50		9.2	10.3	11.3	30
18/01/13	34.7	39.8	34.1	50		9.3	10.4	11.3	30
19/01/13	16.7	17.3	20.7	50		9.3	10.4	11.3	30
20/01/13	6.4	5.6	8.0	50		9.3	10.4	11.3	30
21/01/13	19.1	9.3	10.7	50		9.3	10.4	11.3	30
22/01/13	19.8	13.7	15.6	50		9.4	10.4	11.3	30
23/01/13	10.3	9.7	11.5	50		9.4	10.4	11.3	30
24/01/13	13.0	8.5	11.8	50		9.4	10.4	11.3	30
25/01/13	6.7	5.8	7.9	50		9.4	10.4	11.3	30
26/01/13	6.7	7.3	10.3	50		9.4	10.4	11.3	30
27/01/13	3.3	2.3	3.5	50		9.4	10.4	11.3	30
28/01/13	0.8	1.0	4.8	50		9.4	10.4	11.3	30
29/01/13	2.4	6.0	4.5	50		9.4	10.4	11.2	30
30/01/13	27.2	6.6	16.0	50		9.4	10.4	11.3	30
31/01/13	8.0	11.8	12.4	50		9.4	10.4	11.3	30
01/02/13		7.6	8.2	50	Power interruption to Ulan Road unit resulting in lost data	9.4	10.4	11.3	30
02/02/13		1.9	2.5	50		9.5	10.4	11.3	30
03/02/13		4.5	6.4	50		9.5	10.4	11.3	30
04/02/13		8.7	12.7	50		9.5	10.4	11.3	30
05/02/13		5.2	12.1	50		9.5	10.4	11.3	30
06/02/13		8.1	14.1	50		9.5	10.3	11.3	30
07/02/13		12.1	19.3	50		9.5	10.4	11.3	30
08/02/13		1.4	21.0	50		9.5	10.3	11.4	30
09/02/13		17.8	16.1	50		9.5	10.3	11.4	30
10/02/13		12.8	13.3	50		9.5	10.3	11.4	30
11/02/13		5.3	2.4	50		9.5	10.4	11.4	30

TEOM Data Summary									
Date	Ulan Road	Murragamba	School	24hr Average Limit (µg/m^3)	Comment	Ulan Road	Murragamba	School	Annual Average Limit (µg/m^3)
	Daily Result					Average			
12/02/13	1.5	2.7	5.9	50		9.5	10.3	11.4	30
13/02/13	8.8	6.2	8.9	50		9.4	10.3	11.4	30
14/02/13	7.6	5.4	12.0	50		9.4	10.3	11.4	30
15/02/13	7.5	5.3	11.2	50		9.4	10.3	11.4	30
16/02/13	7.0	4.2	8.6	50		9.4	10.3	11.4	30
17/02/13	7.8	5.6	10.6	50		9.4	10.3	11.4	30
18/02/13	12.8	7.2	14.0	50		9.4	10.3	11.4	30
19/02/13	38.4	8.5	14.7	50		9.5	10.3	11.4	30
20/02/13	35.8	1.9	19.6	50		9.6	10.3	11.5	30
21/02/13	11.0	7.8	17.4	50		9.6	10.3	11.5	30
22/02/13	7.1	10.3	16.8	50		9.6	10.3	11.5	30
23/02/13		5.9	6.9	50	Air Conditioner fault at Ulan Road unit resulting in overheating of system and subsequent power failure	9.6	10.3	11.5	30
24/02/13		9.2	8.1	50		9.6	10.3	11.5	30
25/02/13	7.8	7.9	11.6	50		9.6	10.3	11.5	30
26/02/13	7.8	8.0	11.5	50		9.6	10.3	11.5	30
27/02/13	10.1	4.4	9.8	50		9.6	10.3	11.5	30
28/02/13	7.7	11.3	14.8	50		9.6	10.3	11.5	30
01/03/13	4.5	5.5	7.1	50		9.6	10.2	11.5	30
02/03/13	3.5	2.8	4.7	50		9.6	10.2	11.4	30
03/03/13	4.5	4.6	7.6	50		9.6	10.2	11.5	30
04/03/13	11.6	9.7	14.9	50		9.6	10.3	11.5	30
05/03/13	10.0	8.4	15.3	50		9.6	10.3	11.5	30
06/03/13	4.9	8.8	13.4	50		9.6	10.3	11.5	30
07/03/13	5.9	9.2	15.7	50		9.6	10.3	11.5	30
08/03/13	12.5	9.7	15.7	50		9.7	10.3	11.6	30

TEOM Data Summary									
Date	Ulan Road	Murragamba	School	24hr Average Limit (µg/m^3)	Comment	Ulan Road	Murragamba	School	Annual Average Limit (µg/m^3)
	Daily Result					Average			
09/03/13	14.0	5.5	11.4	50		9.7	10.3	11.6	30
10/03/13	13.7	10.4	14.3	50		9.7	10.3	11.6	30
11/03/13	14.7	10.1	15.8	50		9.7	10.3	11.7	30
12/03/13	12.1	7.1	17.1	50		9.7	10.3	11.7	30
13/03/13	16.9	9.4	18.9	50		9.7	10.3	11.7	30
14/03/13	21.1	22.6	23.3	50		9.8	10.3	11.8	30
15/03/13	17.4	16.0	20.1	50		9.8	10.3	11.8	30
16/03/13	11.8	11.8	12.0	50		9.8	10.4	11.9	30
17/03/13	10.6	13.2	10.4	50		9.9	10.4	11.8	30
18/03/13	15.1	15.3	17.0	50		9.9	10.4	11.9	30
19/03/13	11.7	12.9	17.0	50		9.9	10.4	11.9	30
20/03/13	7.9	12.7	10.4	50		9.9	10.4	11.9	30
21/03/13	10.4	11.2	19.3	50		9.9	10.4	11.9	30
22/03/13	9.5	9.0	15.9	50		9.9	10.5	12.0	30
23/03/13	5.1	5.7	6.9	50		9.9	10.4	11.9	30
24/03/13	6.0	6.6	5.6	50		9.9	10.4	11.9	30
25/03/13	13.1	15.9	18.3	50		9.9	10.4	12.0	30
26/03/13	22.1	22.3	23.7	50		10.0	10.5	12.0	30
27/03/13	30.5	30.0	29.0	50		10.0	10.5	12.0	30
28/03/13	10.0	14.0	19.6	50		10.0	10.5	12.0	30
29/03/13	6.1	5.6	5.9	50		10.0	10.5	12.0	30
30/03/13	10.3	10.5	9.5	50		10.0	10.5	12.0	30
31/03/13	6.1	8.9	5.6	50		10.0	10.5	12.0	30
01/04/13	5.4	7.3	4.5	50		10.0	10.5	12.0	30
02/04/13	7.1	12.8	7.7	50		10.0	10.5	12.0	30
03/04/13	11.9	14.4	14.8	50		10.0	10.5	12.0	30
04/04/13	9.1	7.6	10.9	50		10.0	10.5	12.0	30
05/04/13	7.8	10.2	12.0	50		10.0	10.5	11.9	30
06/04/13	5.0	8.5	11.7	50		10.0	10.5	11.9	30

TEOM Data Summary									
Date	Ulan Road	Murragamba	School	24hr Average Limit (µg/m^3)	Comment	Ulan Road	Murragamba	School	Annual Average Limit (µg/m^3)
	Daily Result					Average			
07/04/13	8.2	14.2	8.5	50		9.9	10.5	11.9	30
08/04/13	12.9	18.0	19.4	50		9.9	10.5	11.9	30
09/04/13	7.8	7.6	10.7	50		9.8	10.4	11.8	30
10/04/13	5.6	6.8	7.8	50		9.8	10.4	11.8	30
11/04/13	8.2	12.8	14.9	50		9.8	10.4	11.8	30
12/04/13	8.9	18.3	19.3	50		9.8	10.4	11.9	30
13/04/13	11.8	5.0	9.4	50		9.9	10.4	11.9	30
14/04/13	17.1	13.3	12.1	50		9.9	10.5	11.9	30
15/04/13	17.7	29.7	19.7	50		9.9	10.5	11.9	30
16/04/13	10.3	18.2	12.8	50		9.9	10.5	11.9	30
17/04/13	10.2	9.8	12.4	50		9.9	10.5	11.9	30
18/04/13	11.7	17.8	17.2	50		9.9	10.6	11.9	30
19/04/13	14.7	24.8	15.9	50		10.0	10.6	11.9	30
20/04/13	4.6	13.9	6.7	50		10.0	10.7	11.9	30
21/04/13	7.7	10.2	6.4	50		10.0	10.7	11.9	30
22/04/13	9.6	31.2	17.7	50		10.0	10.7	11.9	30
23/04/13	11.0	19.3	14.0	50		10.0	10.7	11.9	30
24/04/13	11.8	16.8	12.8	50		10.0	10.7	11.9	30
25/04/13	12.1	19.9	12.4	50		10.0	10.8	11.9	30
26/04/13	9.7	19.0	11.6	50		10.0	10.8	12.0	30
27/04/13	12.4	18.0	11.1	50		10.0	10.8	12.0	30
28/04/13	18.4	26.4	13.6	50		10.1	10.9	12.0	30
29/04/13	17.9	30.0	17.4	50		10.1	11.0	12.0	30
30/04/13	36.7	59.7	29.5	50		10.2	11.1	12.0	30
01/05/13	22.2	43.7	27.1	50		10.2	11.2	12.1	30
02/05/13	13.8	16.0	15.8	50		10.2	11.2	12.1	30
03/05/13	25.0	30.0	19.9	50		10.3	11.3	12.1	30
04/05/13	17.7	23.8	15.4	50		10.3	11.3	12.1	30
05/05/13	25.3	21.0	22.4	50		10.4	11.4	12.2	30

TEOM Data Summary									
Date	Ulan Road	Murragamba	School	24hr Average Limit (µg/m^3)	Comment	Ulan Road	Murragamba	School	Annual Average Limit (µg/m^3)
	Daily Result					Average			
06/05/13	26.8	22.9	20.2	50		10.4	11.4	12.2	30
07/05/13	10.3	13.1	14.1	50		10.5	11.4	12.2	30
08/05/13	10.6	15.5	14.0	50		10.5	11.4	12.3	30
09/05/13	15.3	9.3	38.7	50		10.5	11.4	12.3	30
10/05/13	17.6	14.7	20.7	50		10.5	11.4	12.3	30
11/05/13	16.1	14.9	17.8	50		10.5	11.4	12.4	30
12/05/13	11.5	6.2	12.3	50		10.5	11.4	12.4	30
13/05/13	16.6	22.9	20.1	50		10.5	11.4	12.4	30
14/05/13	1.8	3.8	3.9	50		10.5	11.4	12.4	30
15/05/13	2.6	8.8	5.0	50		10.5	11.4	12.3	30
16/05/13	2.2	4.7	2.7	50		10.5	11.3	12.3	30
17/05/13	3.9	8.7	7.3	50		10.5	11.3	12.2	30
18/05/13	3.9	9.9	4.7	50		10.4	11.3	12.2	30
19/05/13	4.3	6.8	3.8	50		10.4	11.3	12.2	30
20/05/13	4.9	10.3	7.5	50		10.4	11.3	12.1	30
21/05/13	6.6	14.6	9.3	50		10.3	11.3	12.1	30
22/05/13	7.8	15.8	12.0	50		10.3	11.3	12.1	30
23/05/13	2.0	4.5	4.8	50		10.3	11.3	12.1	30
24/05/13	3.8	4.4	6.1	50		10.2	11.3	12.1	30
25/05/13	3.1	7.3	4.4	50		10.2	11.2	12.0	30
26/05/13	3.5	10.6	4.5	50		10.2	11.3	12.0	30
27/05/13	5.3	8.8	10.1	50		10.2	11.3	12.0	30
28/05/13	6.9	9.3	10.9	50		10.2	11.3	12.1	30
29/05/13	8.6	6.6	11.9	50		10.3	11.3	12.1	30
30/05/13	9.4	10.7	12.9	50		10.3	11.3	12.1	30
31/05/13	9.3	7.4	10.7	50		10.3	11.3	12.1	30
01/06/13	3.8	7.1	8.7	50		10.3	11.3	12.1	30
02/06/13	1.2	1.3	2.3	50		10.3	11.3	12.0	30
03/06/13	3.2	7.1	5.1	50		10.3	11.3	12.1	30

TEOM Data Summary									
Date	Ulan Road	Murragamba	School	24hr Average Limit (µg/m^3)	Comment	Ulan Road	Murragamba	School	Annual Average Limit (µg/m^3)
	Daily Result					Average			
04/06/13	3.1	7.5	9.0	50		10.3	11.3	12.1	30
05/06/13	8.1	7.8	11.6	50		10.3	11.3	12.1	30
06/06/13	7.6	12.6	14.8	50		10.3	11.4	12.1	30
07/06/13	3.8	5.6	5.8	50		10.3	11.4	12.1	30
08/06/13	4.6	4.7	6.5	50		10.3	11.4	12.2	30
09/06/13	4.7	3.1	5.6	50		10.3	11.4	12.2	30
10/06/13	4.6	4.3	7.4	50		10.4	11.4	12.2	30
11/06/13	3.9	5.0	8.4	50		10.4	11.4	12.2	30
12/06/13	3.7	0.5	6.2	50		10.4	11.4	12.2	30
13/06/13	1.8	3.6	2.3	50		10.4	11.4	12.1	30
14/06/13	0.7	2.1	1.6	50		10.4	11.4	12.1	30
15/06/13	2.3	4.9	3.5	50		10.4	11.4	12.1	30
16/06/13	1.4	4.2	2.0	50		10.3	11.3	12.1	30
17/06/13	2.1	5.5	5.0	50		10.3	11.3	12.1	30
18/06/13	2.6	7.9	5.7	50		10.3	11.3	12.1	30
19/06/13	6.6	7.4	6.5	50		10.4	11.4	12.1	30
20/06/13	1.7	5.6	9.9	50		10.4	11.4	12.1	30
21/06/13	2.9	5.7	9.1	50		10.4	11.4	12.1	30
22/06/13	5.8	4.9	7.2	50		10.4	11.4	12.1	30
23/06/13	0.7	3.7	5.1	50		10.4	11.3	12.1	30
24/06/13	0.6	5.6	2.9	50		10.3	11.3	12.1	30
25/06/13	0.7	2.5	6.5	50		10.3	11.3	12.1	30
26/06/13	2.1	6.8	8.9	50		10.3	11.3	12.1	30
27/06/13	2.4	5.1	8.6	50		10.3	11.3	12.1	30
28/06/13	3.8	4.9	6.3	50		10.3	11.3	12.1	30
29/06/13	2.1	2.3	3.5	50		10.3	11.3	12.1	30
30/06/13	1.0	2.2	2.6	50		10.3	11.3	12.1	30
01/07/13	3.2	4.5	7.2	50		10.3	11.3	12.1	30
02/07/13	3.2	8.3	9.0	50		10.3	11.3	12.1	30

TEOM Data Summary									
Date	Ulan Road	Murragamba	School	24hr Average Limit (µg/m^3)	Comment	Ulan Road	Murragamba	School	Annual Average Limit (µg/m^3)
	Daily Result					Average			
03/07/13	5.4	7.8	10.8	50		10.3	11.3	12.1	30
04/07/13	5.0	10.5	11.4	50		10.3	11.3	12.1	30
05/07/13	5.0	9.9	6.6	50		10.3	11.3	12.1	30
06/07/13	4.9	8.7	5.9	50		10.3	11.3	12.1	30
07/07/13	4.4	6.4	5.5	50		10.3	11.3	12.1	30
08/07/13	4.7	7.9	6.4	50		10.3	11.3	12.1	30
09/07/13	4.7	5.8	9.9	50		10.3	11.3	12.1	30
10/07/13	4.7	5.2	7.7	50		10.3	11.3	12.1	30
11/07/13	5.3	10.2	9.6	50		10.3	11.3	12.1	30
12/07/13	6.1	11.5	11.9	50		10.3	11.4	12.1	30
13/07/13	5.9	6.8	8.0	50		10.3	11.4	12.1	30
14/07/13	9.8	11.7	12.5	50		10.4	11.4	12.1	30
15/07/13	7.6	7.7	12.4	50		10.4	11.4	12.1	30
16/07/13	4.7	6.5	7.0	50		10.4	11.4	12.2	30
17/07/13	6.4	4.7	12.0	50		10.4	11.4	12.2	30
18/07/13	6.6	5.8	14.0	50		10.4	11.4	12.2	30
19/07/13	3.9	5.2	5.6	50		10.4	11.4	12.2	30
20/07/13	2.0	4.3	1.6	50		10.4	11.4	12.2	30
21/07/13	3.4	5.7	3.8	50		10.4	11.4	12.2	30
22/07/13	3.9	5.5	7.6	50		10.4	11.4	12.2	30
23/07/13	1.8	5.7	5.3	50		10.4	11.4	12.2	30
24/07/13	4.6	4.4	6.9	50		10.4	11.4	12.2	30
25/07/13	10.6	8.1	14.7	50		10.4	11.4	12.2	30
26/07/13	7.0	10.3	9.6	50		10.4	11.4	12.2	30
27/07/13	7.4	10.3	9.7	50		10.4	11.4	12.2	30
28/07/13	10.3	8.6	14.8	50		10.4	11.4	12.2	30
29/07/13	7.0	8.4	12.9	50		10.5	11.4	12.2	30
30/07/13	4.6	7.0	8.8	50		10.5	11.4	12.2	30
31/07/13	5.0	5.9	10.0	50		10.5	11.4	12.3	30

TEOM Data Summary									
Date	Ulan Road	Murragamba	School	24hr Average Limit (µg/m^3)	Comment	Ulan Road	Murragamba	School	Annual Average Limit (µg/m^3)
	Daily Result					Average			
01/08/13	7.5	4.7	11.2	50		10.5	11.4	12.3	30
02/08/13	6.2	11.3	8.9	50		10.5	11.5	12.3	30
03/08/13	3.9	11.6	4.9	50		10.5	11.5	12.3	30
04/08/13	5.5	10.4	6.4	50		10.5	11.5	12.3	30
05/08/13	9.1	13.2	12.9	50		10.5	11.5	12.3	30
06/08/13	5.9	11.6	10.3	50		10.4	11.5	12.3	30
07/08/13	5.5	8.8	9.3	50		10.4	11.6	12.3	30
08/08/13	1.1	2.7	2.9	50		10.4	11.5	12.3	30
09/08/13	2.7	5.0	3.9	50		10.4	11.5	12.3	30
10/08/13	5.5	7.1	4.6	50		10.4	11.6	12.3	30
11/08/13	5.5	7.8	6.6	50		10.4	11.6	12.3	30
12/08/13	4.6	6.1	6.9	50		10.4	11.6	12.3	30
13/08/13	5.3	9.6	9.5	50		10.4	11.6	12.3	30
14/08/13	4.4	12.2	7.4	50		10.4	11.6	12.3	30
15/08/13	4.9	7.1	7.0	50		10.3	11.6	12.3	30
16/08/13	10.0	5.5	12.1	50		10.3	11.6	12.3	30
17/08/13	9.9	17.3	11.6	50		10.3	11.6	12.3	30
18/08/13	2.8	9.4	4.1	50		10.3	11.6	12.3	30
19/08/13	4.7	10.8	6.7	50		10.3	11.6	12.3	30
20/08/13	3.8	6.0	5.2	50		10.3	11.6	12.3	30
21/08/13	5.9	8.7	6.2	50		10.3	11.6	12.3	30
22/08/13	4.0	11.9	6.5	50		10.3	11.6	12.3	30
23/08/13	5.5	12.1	8.1	50		10.2	11.6	12.2	30
24/08/13	2.9	5.9	3.1	50		10.2	11.6	12.2	30
25/08/13	4.2	6.9	4.8	50		10.2	11.6	12.2	30
26/08/13	5.2	9.1	9.7	50		10.2	11.7	12.2	30
27/08/13	10.5	10.3	9.2	50		10.2	11.7	12.2	30
28/08/13	15.3	12.3	22.0	50		10.2	11.7	12.3	30
29/08/13	18.4	16.9	26.6	50		10.3	11.7	12.3	30

TEOM Data Summary									
Date	Ulan Road	Murragamba	School	24hr Average Limit (µg/m^3)	Comment	Ulan Road	Murragamba	School	Annual Average Limit (µg/m^3)
	Daily Result					Average			
30/08/13	15.6	21.8	18.6	50		10.3	11.7	12.3	30
31/08/13	7.3	15.8	8.1	50		10.3	11.8	12.3	30

HVAS PM_{10} Data

Sample Date	Sample Location	Particulate Matter 10 ($\mu g/m^3$)	Annual Rolling Average ($\mu g/m^3$)	Sample Location	Particulate Matter 10 ($\mu g/m^3$)	Annual Rolling Average ($\mu g/m^3$)
05-Sep-12	PM01	28.1	11.7	PM02	15.5	9.8
11-Sep-12	PM01	17.5	11.9	PM02	13.7	10.0
17-Sep-12	PM01	14.8	11.9	PM02	10.8	10.0
23-Sep-12	PM01	10.1	11.8	PM02	8.9	9.9
29-Sep-12	PM01	8.3	11.9	PM02	8.1	9.9
05-Oct-12	PM01	14.3	11.9	PM02	11.7	9.9
11-Oct-12	PM01	5.0	11.9	PM02	4.2	9.9
17-Oct-12	PM01	14.4	11.8	PM02	13.6	9.8
23-Oct-12	PM01	13.3	11.7	PM02	18.0	9.8
29-Oct-12	PM01	22.4	11.9	PM02	18.2	9.9
04-Nov-12	PM01	14.4	11.9	PM02	18.5	10.0
10-Nov-12	PM01	16.7	11.9	PM02	11.1	9.9
16-Nov-12	PM01	6.4	11.5	PM02	6.8	9.5
22-Nov-12	PM01	27.9	11.8	PM02	21.4	9.7
28-Nov-12	PM01	19.2	11.9	PM02	14.2	9.8
04-Dec-12	PM01	12.5	11.8	PM02	13.7	9.7
10-Dec-12	PM01	17.5	11.9	PM02	13.3	9.7
16-Dec-12	PM01	No result	11.9	PM02	No result	9.7
22-Dec-12	PM01	No result	11.9	PM02	No result	9.7
28-Dec-12	PM01	13.3	11.9	PM02	14.2	9.7
03-Jan-13	PM01	17.7	11.9	PM02	16.4	9.7
09-Jan-13	PM01	26.0	11.9	PM02	22.2	9.8
15-Jan-13	PM01	21.8	12.0	PM02	20.2	9.9
21-Jan-13	PM01	19.4	12.2	PM02	17.1	10.1
27-Jan-13	PM01	5.4	12.0	PM02	4.3	9.8
02-Feb-13	PM01	5.4	11.9	PM02	3.9	9.7
08-Feb-13	PM01	21.2	12.1	PM02	18.2	10.0
14-Feb-13	PM01	19.7	12.2	PM02	13.4	10.0
20-Feb-13	PM01	23.7	12.3	PM02	16.2	10.1
26-Feb-13	PM01	16.8	12.3	PM02	12.1	10.1
04-Mar-13	PM01	19.2	12.5	PM02	14.8	10.2
10-Mar-13	PM01	17.7	12.7	PM02	14.1	10.4
16-Mar-13	PM01	11	12.8	PM02	11	10.4
22-Mar-13	PM01	10	12.7	PM02	8	10.4
28-Mar-13	PM01	9	12.7	PM02	6	10.4
03-Apr-13	PM01	10	12.5	PM02	5	10.3
09-Apr-13	PM01	8	12.5	PM02	7	10.3
15-Apr-13	PM01	14	12.3	PM02	13	10.1
21-Apr-13	PM01	6	12.1	PM02	5	10.0
27-Apr-13	PM01	7	12.0	PM02	13	10.1
03-May-13	PM01	17	12.2	PM02	20	10.3
09-May-13	PM01	15	12.3	PM02	12	10.4
15-May-13	PM01	5	12.2	PM02	3	10.3
21-May-13	PM01	7	12.1	PM02	7	10.3

Sample Date	Sample Location	Particulate Matter 10 (µg/m^3)	Annual Rolling Average (µg/m^3)	Sample Location	Particulate Matter 10 (µg/m^3)	Annual Rolling Average (µg/m^3)
27-May-13	PM01	13	12.1	PM02	8	10.2
02-Jun-13	PM01	2	12.1	PM02	2	10.2
08-Jun-13	PM01	5	11.9	PM02	3	10.1
14-Jun-13	PM01	1	11.9	PM02	<1	10.3
20-Jun-13	PM01	7	11.8	PM02	1	10.2
26-Jun-13	PM01	3	11.8	PM02	<1	10.3
02-Jul-13	PM01	6	11.9	PM02	3	10.3
08-Jul-13	PM01	6	11.9	PM02	4	10.2
14-Jul-13	PM01	12	12.0	PM02	13	10.4
20-Jul-13	PM01	2	11.9	PM02	2	10.3
26-Jul-13	PM01	6	11.9	PM02	8	10.4
01-Aug-13	PM01	8	11.9	PM02	9	10.5
07-Aug-13	PM01	3	11.9	PM02	4	10.4
13-Aug-13	PM01	4	11.9	PM02	2	10.3
19-Aug-13	PM01	4	11.8	PM02	2	10.3
25-Aug-13	PM01	2	11.8	PM02	1	10.2
31-Aug-13	PM01	4	11.7	PM02	4	10.2

Appendix 3: Surface Water Monitoring Data

Surface Water Quality Data – Routine

Sample Location	Sample Date	Arsenic mg/L	Barium mg/L	Cadmium mg/L	Chromium mg/L	Copper mg/L	Dissolved Oxygen mg/L	Electrical Conductivity (Non Compensated) µS/cm	Iron mg/L	Lead mg/L	Lithium mg/L	Manganese mg/L	Nickel mg/L	Oil & Grease mg/L	pH - Field pH Unit	Selenium mg/L	Strontium mg/L	Temperature °C	Time	Total Dissolved Solids @ 180°C mg/L	Total Nitrogen as N mg/L	Total Phosphorus as P mg/L	Total Suspended Solids mg/L	Turbidity NTU	Zinc mg/L
SW01	10-Sep-12	<0.001	0.038	<0.0001	<0.001	<0.001	10.3	830	0.41	<0.001	0.056	0.036	0.004		8.2	<0.01	0.246	14.1	1202	446	0.3	<0.01	<2	2.8	<0.005
SW01	19-Oct-12							770							8.4			23.3	1436	488			2		
SW01	08-Nov-12							790							7.8			22	1216	494			<2		
SW01	13-Dec-12							830							8.1			25.8	1332	532			<2		
SW01	21-Jan-13							860							8.1			26.1	1307	560			3		
SW01	19-Feb-13							790							8.0			21.1	1206	540			>2		
SW01	12-Mar-13							790							8.0			24.1	1449	442			<5		
SW01	17-Apr-13	<0.001	0.023	<0.0001	<0.001	<0.001		960	0.26	<0.001	0.096	0.01	0.005		8.1	<0.01	0.213	20	12:50	544	0.1	<0.01	<5	1.5	<0.005
SW01	21-May-13							788							8.1			12.6	16:15	442			<5		
SW01	17-Jun-13							728							8.2			13.7	14:25	430			<5		
SW01	17-Jul-13							888							8.3			18.1	15:00	436			<5		
SW01	19-Aug-13							425							8.5			15.5	11:20	225			<5		
	Mean							425							7.8					225			2		
	Median							787							8.1					465			3		
	Max							960							8.5					560			3		
SW02	10-Sep-12	<0.001	0.038	<0.0001	<0.001	<0.001	10.5	840	0.48	<0.001	0.058	0.038	0.004		8.1	<0.01	0.256	14.1	1141	444	0.2	0.05	<2	3.5	<0.005
SW02	19-Oct-12							790							8.1			23.4	1411	504			2		
SW02	08-Nov-12							815							7.2			21.1	1154	506			<2		
SW02	13-Dec-12							870							7.3			22.1	1339	536			3		
SW02	21-Jan-13							830							8.1			24.2	1245	580			2		
SW02	19-Feb-13							810							7.4			21.5	1141	532			<2		
SW02	12-Mar-13							808							7.8			23.6	14:29	482			<5		
SW02	17-Apr-13	<0.001	0.022	<0.0001	<0.001	<0.001		866	0.23	<0.001	0.095	0.014	0.003		7.8	<0.01	0.226	18	12:30	560			<5	1.6	<0.005
SW02	21-May-13							832							8.0			12	16:00	470			<5		
SW02	17-Jun-13							742							8.3			12.9	13:45	463			<5		
SW02	17-Jul-13							884							8.3			16.4	14:30	468			<5		
SW02	19-Aug-13							892							8.7			15.4	11:10	527			<5		
	Mean							742							7.2					444			2		
	Median							832							7.9					506			2		
	Max							892							8.7					580			3		
SW04	10-Sep-12	<0.001	0.032	<0.0001	<0.001	<0.001	9.7	1,160	1.33	<0.001	0.003	0.258	0.001		7.2	<0.01	0.239	15.3	1331	554	0.4	<0.01	6	12.2	0.015
SW04	19-Oct-12							1,220							8.1			20.4	1306	680			5		
SW04	08-Nov-12							1,450							7.6			25	1311	782			9		
SW04	13-Dec-12							1,850							8.4			27.8	1117	1040			14		
SW04	21-Jan-13							1,770							8.9			29	1351	1210			53		
SW04	19-Feb-13							490							7.4			24.5	1336	422			37		
SW04	12-Mar-13							986							7.8			24.5	15:20	496			48		
SW04	17-Apr-13	0.001	0.045	<0.0001	0.002	0.002		1,227	1.84	0.001	0.003	0.198	0.003		8.2	<0.01	0.21	17.2	9:00	684	1.1	0.04	72	74.4	0.006
SW04	21-May-13							1,589							7.9			13.6	14:15	804			40		
SW04	17-Jun-13							1,309							7.4			13.3	15:00	785			12		
SW04	17-Jul-13							1,984							7.9			12.3	12:15	976			9		
SW04	19-Aug-13							1,968							8.1			16.5	15:15	1040			5		
	Mean							490							7.2					422			5		
	Median							1,417							7.9					789			26		
	Max							1,984							8.9					1210			72		

Sample Location	Sample Date	Arsenic mg/L	Barium mg/L	Cadmium mg/L	Chromium mg/L	Copper mg/L	Dissolved Oxygen mg/L	Electrical Conductivity (Non Compensated) µS/cm	Iron mg/L	Lead mg/L	Lithium mg/L	Manganese mg/L	Nickel mg/L	Oil & Grease mg/L	pH - Field pH Unit	Selenium mg/L	Strontium mg/L	Temperature °C	Time	Total Dissolved Solids @ 180°C mg/L	Total Nitrogen as N mg/L	Total Phosphorus as P mg/L	Total Suspended Solids mg/L	Turbidity NTU	Zinc mg/L
SW05	10-Sep-12	<0.001	0.027	<0.0001	<0.001	<0.001	10.2	950	0.51	<0.001	0.003	0.134	<0.001		7.7	<0.01	0.305	14.6	1351	544	1.1	0.1	9	6.2	<0.005
SW05	19-Oct-12							910							7.6			20.8	1255	388			20		
SW05	08-Nov-12							670							7.9			21.8	1327	390			28		
SW05	13-Dec-12							610							7.9			24.3	1208	338			15		
SW05	21-Jan-13							620							7.8			28.4	1409	380			11		
SW05	19-Feb-13							580							7.2			24.2	1354	416			15		
SW05	12-Mar-13							658							6.9			24.8	0:00	382			18		
SW05	17-Apr-13	<0.001	0.021	<0.0001	0.002	<0.001		531	1.18	<0.001	0.003	0.104	0.001		7.2	<0.01	0.135	15.4	8:15	366	0.6	0.02	21	15.5	0.006
SW05	21-May-13							496							6.9			12.5	13:55	296			12		
SW05	17-Jun-13							793							7.7			13.3	15:20	528			14		
SW05	17-Jul-13							1,060							7.8			9.6	11:50	550			7		
SW05	20-Aug-13							1,009							7.7			15.8	15:10	551			9		
	Mean							496							6.9					296			7		
	Median							741							7.5					427			15		
	Max							1,060							7.9					551			28		
SW07	10-Sep-12	0.001	0.072	<0.0001	<0.001	<0.001	10.4	1,890	0.19	<0.001	0.002	3.4	0.002		8.0	<0.01	0.824	20.4	1432	1170	0.7	0.08	4	1.7	0.022
SW07	19-Oct-12							2,390							9.0			26.7	1157	1450			20		
SW07	08-Nov-12							2,230							9.0			29.2	1412	1330			7		
SW07	13-Dec-12							2,780							8.7			32.5	1346	1990			77		
SW07	21-Jan-13	No sample was collected as the site was dr																	1443						
SW07	19-Feb-13							4,160							8.4			29.8	1508	3090			84		
SW07	12-Mar-13							4,380							8.3			26.2	1555	3080			120		
SW07	17-Apr-13	0.003	0.126	<0.0001	0.001	0.003		4,040	2.31	0.002	0.004	1.8	0.006		8.4	<0.01	2	21	14:15	2610	1.6	0.04	189	41.2	0.034
SW07	21-May-13							2,990							7.4				13:00	1780			131		
SW07	17-Jun-13							2,830							8.1			12.1	16:45	1370			<5		
SW07	17-Jul-13							3,150							7.7			10.3	10:00	1580			<5		
SW07	20-Aug-13							2,470							8.1			15.3	15:50	1520			16		
	Mean							1,890							7.4					1170			4		
	Median							3,028							8.3					1906			72		
	Max							4,380							9.0					3090			189		
SW08	10-Sep-12	<0.001	0.055	<0.0001	<0.001	<0.001	10.3	2,960	0.43	<0.001	0.004	0.06	0.001		7.7	<0.01	0.826	12.8	1458	1660	0.1	0.05	<2	1.7	<0.005
SW08	19-Oct-12							2,790							7.2			16.9	1218	1580			6		
SW08	08-Nov-12							2,510							7.5			19.4	1431	1390			14		
SW08	13-Dec-12							1,980							7.0			21.5	1411	1230			20		
SW08	21-Jan-13							1,910							7.0			23.2	1459	1290			96		
SW08	19-Feb-13							2,930							6.8			20	1532	1670			49		
SW08	12-Mar-13							3,300							7.6			20	1658	1720			10		
SW08	17-Apr-13	<0.001	0.069	<0.0001	<0.001	<0.001		2,540	5	<0.001	0.01	0.573	0.008		6.0	<0.01	0.522	15.7	16:00	1430	0.3	<0.01	33	19.2	0.005
SW08	21-May-13							2,630							7.2			9.4	12:40	1530			12		
SW08	17-Jun-13							3,660							7.4			11.4	16:30	1860			<5		
SW08	17-Jul-13							4,420							7.7			10.3	10:00	2280			<5		
SW08	21-Aug-13							3,830							7.1			10.7	9:30	2500			<5		
	Mean							1,910							6.0					1230			6		
	Median							2,955							7.2					1678			30		
	Max							4,420							7.7					2500			96		

Sample Location	Sample Date	Arsenic mg/L	Barium mg/L	Cadmium mg/L	Chromium mg/L	Copper mg/L	Dissolved Oxygen mg/L	Electrical Conductivity (Non Compensated) µS/cm	Iron mg/L	Lead mg/L	Lithium mg/L	Manganese mg/L	Nickel mg/L	Oil & Grease mg/L	pH - Field pH Unit	Selenium mg/L	Strontium mg/L	Temperature °C	Time	Total Dissolved Solids @ 180°C mg/L	Total Nitrogen as N mg/L	Total Phosphorus as P mg/L	Total Suspended Solids mg/L	Turbidity NTU	Zinc mg/L
SW09	10-Sep-12	<0.001	0.094	<0.0001	<0.001	<0.001	8.2	2,750	0.52	<0.001	<0.001	0.228	<0.001		7.1	<0.01	0.793	15.7	1520	1570	0.2	0.09	4	1.2	0.013
SW09	19-Oct-12							2,900							6.9			16.9	1232	1670			16		
SW09	08-Nov-12							2,760							7.2			19.2	1446	1640			30		
SW09	13-Dec-12							2,820							6.9			25.1	1223	1660			10		
SW09	21-Jan-13							2,010							7.1			26	1515	1780			345		
SW09	19-Feb-13							3,150							6.8			21.5	1548	1930			35		
SW09	12-Mar-13							3,470							7.5			22.1	16:30	1780			62		
SW09	17-Apr-13	0.038	1.51	<0.0001	0.014	0.008		3,350	761	0.006	0.002	8.76	0.014		6.4	<0.01	1.58	18.5	14:30	2070	10.2	4.43	1910	3920	0.045
SW09	21-May-13							3,760							7.6			13.6	12:10	2060			23		
SW09	17-Jun-13							3,190							7.6			12.5	16:00	1420			28		
SW09	17-Jul-13							3,570							7.8			11.3	10:45	1900			<5		
SW09	20-Aug-13							3,380							7.8			12.6	16:15	1960			<5		
	Mean							2,010							6.4					1420			4		
	Median							3,093							7.2					1787			246		
	Max							3,760							7.8					2070			1910		
SW10	10-Sep-12	<0.001	0.013	<0.0001	<0.001	<0.001	10.4	90	1.78	<0.001	<0.001	0.098	<0.001	<5	6.5	<0.01	0.005	25.8	1259	76	0.3	0.06	5	1.8	0.019
SW10	19-Oct-12	No sample was collected as the site was dry																	1329						
SW10	15-Nov-12	No sample was collected as the site was dry																	1258						
SW10	13-Dec-12	No sample was collected as the site was dry																	1128						
SW10	21-Jan-13	No sample was collected as the site was dr																	1159						
SW10	19-Feb-13	No sample was collected as the site was dry																	1256						
SW10	12-Mar-13	No sample was collected as the site was dry																							
SW10	17-Apr-13	No sample was collected as the site was dry																							
SW10	21-May-13	No sample was collected as the site was dry																							
SW10	01-May-13	No sample was collected as the site was dry																							
SW10	17-Jun-13	No sample was collected as the site was dry																							
SW10	07-Jul-13	No sample was collected as the site was dry																							
SW10	19-Aug-13	No sample was collected as the site was dry																							
	Mean							90							6.5					76			5		
	Median							90							6.5					76			5		
	Max							90							6.5					76			5		
SW11	10-Sep-12	0.001	0.018	<0.0001	0.002	0.002	8	150	2.2	<0.001	0.001	0.063	0.006	<5	7.5	<0.01	0.022	14.2	1230	306	0.6	0.14	21	118	0.012
SW11	19-Oct-12							240						<5	7.2			24.6	1353	93			8		
SW11	08-Nov-12							265						<5	7.7			23.8	1239	170			20		
SW11	13-Dec-12							410						16	7.7			27.7	1155	235			20		
SW11	21-Jan-13							240						<5	8.1			30.2	1338	207			24		
SW11	19-Feb-13							300						<5	6.9			22.1	1232	268			25		
SW11	12-Mar-13							204						<5	6.0			24.6	1400	185			21		
SW11	17-Apr-13	0.005	0.053	<0.0001	0.001	0.002		258	20.3	<0.001	0.001	0.674	0.006	<5	7.2	<0.01	0.086	17.8	15:30	199	2.2	0.14	41	61.7	0.005
SW11	21-May-13							345						<5	7.5			12.5	15:45	242			85		
SW11	17-Jun-13							105						<5	7.1			12	14:15	308			22		
SW11	17-Jul-13							115						<5	7.4			15.1	15:45	185			429		
SW11	19-Aug-13							239						<5	7.8			18.9	13:30	195			5		
	Mean							105							6.0					93			5		
	Median							239							7.3					216			60		
	Max							410							8.1					308			429		

Sample Location	Sample Date	Arsenic mg/L	Barium mg/L	Cadmium mg/L	Chromium mg/L	Copper mg/L	Dissolved Oxygen mg/L	Electrical Conductivity (Non Compensated) µS/cm	Iron mg/L	Lead mg/L	Lithium mg/L	Manganese mg/L	Nickel mg/L	Oil & Grease mg/L	pH - Field pH Unit	Selenium mg/L	Strontium mg/L	Temperature °C	Time	Total Dissolved Solids @ 180°C mg/L	Total Nitrogen as N mg/L	Total Phosphorus as P mg/L	Total Suspended Solids mg/L	Turbidity NTU	Zinc mg/L
SW12	10-Sep-12	<0.001	0.022	<0.0001	<0.001	<0.001	10.1	710	0.9	<0.001	0.003	0.072	<0.001		7.8	<0.01	0.224	16	1402	428	0.6	0.08	7	15.4	0.007
SW12	19-Oct-12							700							7.6			22.4	1416	434			14		
SW12	08-Nov-12							575							7.7			21.3	1338	344			19		
SW12	13-Dec-12	No sample was collected as the site was dry																	1249						
SW12	21-Jan-13							560							7.7			28.3	1416	410			25		
SW12	19-Feb-13							430							7.0			23.9	1359	324			13		
SW12	12-Mar-13							486							6.8			25.7	1305	362			28		
SW12	17-Apr-13	<0.001	0.019	<0.0001	<0.001	<0.001		415	1.5	<0.001	0.004	0.078	<0.001		7.1	<0.01	0.107	14.8	8:06	328	0.4	<0.01	13	17.5	<0.005
SW12	21-May-13							432							6.6				13:20	256			6		
SW12	17-Jun-13							629							7.7			12.8	15:35	472			17		
SW12	17-Jul-13							920							7.8			11.2	11:35	493			<5		
SW12	20-Aug-13							796							6.7			14.2	15:20	819			9		
	Mean							415							6.6					256			6		
	Median							605							7.3					425			15		
	Max							920							7.8					819			28		

The results highlighted in red indicate the results are above the maximum results reported for background surface water results or are above the ANZECC guidelines for this area and require further investigation into the cause of the result. The results in yellow are between the 80th percentile value and the maximum results or ANZECC guidelines and act as an early warning system that further investigations may be required. The outcomes of any investigations are discussed further in **Section 3.6.3**. The blue shading indicates that this analysis was not due required for this sample.

Surface Water Quality Data – Rainfall Event

Sample Location	Sample Date	Arsenic mg/L	Barium mg/L	Cadmium mg/L	Chromium mg/L	Copper mg/L	Dissolved Oxygen mg/L	Electrical Conductivity (Non Compensated) µS/cm	Iron mg/L	Lithium mg/L	Manganese mg/L	Nickel mg/L	pH - Field pH Unit	Selenium mg/L	Strontium mg/L	Total Dissolved Solids @ 180°C mg/L	Total Nitrogen as N mg/L	Total Phosphorus as P mg/L	Total Suspended Solids mg/L	Turbidity NTU	Zinc mg/L
SW01	2012	<0.001	0.038	<0.0001	<0.001	<0.001	9.2	820	0.35	0.081	0.029	0.006	7.9	<0.01	0.252	488	0.3	<0.01	<5	2.5	0.017
SW01	23-JAN-2013	<0.001	0.044	<0.0001	<0.001	0.001	10.6	870	0.37	0.082	0.088	0.008	8.0	<0.01	0.311	578	0.2	<0.01	<2	4.5	0.006
SW01	27-JAN-2013	<0.001	0.035	<0.0001	<0.001	<0.001	9.1	790	0.32	0.082	0.079	0.008	7.8	<0.01	0.236	496	0.1	0.02	<2	2.9	0.008
SW01	29-JAN-2013	0.002	0.034	0.0001	0.007	0.004	7.3	340	6.23	0.012	0.231	0.015	7.2	<0.01	0.089	402	1.1	0.09	112	189	0.031
SW01	02-FEB-2013	0.003	0.043	<0.0001	0.008	0.004	9.3	310	7.33	0.011	0.403	0.017	7.1	<0.01	0.086	396	1.3	0.14	152	143	0.033
	Mean							310					7.1						112		
	Median							626					7.6						132		
	Max							870					8.0						152		
SW02	2012	<0.001	0.033	<0.0001	<0.001	<0.001	9.1	835	0.63	0.074	0.059	0.008	7.7	<0.01	0.24	568	0.2	0.02	<5	5.5	0.007
SW02	23-JAN-2013	<0.001	0.038	<0.0001	<0.001	0.001	11.6	920	0.43	0.075	0.113	0.01	7.6	<0.01	0.321	668	0.3	0.01	3	5.7	0.011
SW02	27-JAN-2013	<0.001	0.03	<0.0001	<0.001	<0.001	9.9	780	0.29	0.084	0.097	0.008	7.8	<0.01	0.228	504	0.2	0.06	<2	2.5	0.008
SW02	29-JAN-2013	0.002	0.035	0.0001	0.008	0.004	7.6	350	6.9	0.013	0.221	0.013	7.1	<0.01	0.088	401	0.7	0.05	126	177	0.033
SW02	02-FEB-2013	0.002	0.04	<0.0001	0.008	0.004	8.6	310	6.72	0.011	0.301	0.014	7.0	<0.01	0.084	383	1.6	0.12	143	147	0.033
	Mean							310					7.0						3		
	Median							639					7.4						91		
	Max							920					7.8						143		
SW04	2012	0.002	0.08	<0.0001	0.005	0.004	4.8	1620	3.8	0.006	2.91	0.011	6.9	<0.01	0.282	996	1.3	0.14	151	165	0.025
SW04	23-JAN-2013	0.002	0.042	<0.0001	0.012	0.006	10	520	5.52	0.004	0.508	0.009	7.6	<0.01	0.104	438	1	0.08	202	240	0.025
SW04	27-JAN-2013	<0.001	0.023	<0.0001	0.002	0.003	7.7	180	0.95	0.001	0.29	0.003	7.2	<0.01	0.04	227	0.5	<0.01	136	157	0.016
SW04	29-JAN-2013	0.002	0.057	<0.0001	0.013	0.007	6.6	790	8.42	0.006	0.825	0.014	6.8	<0.01	0.13	680	0.7	0.05	198	273	0.033
SW04	02-FEB-2013	0.002	0.04	<0.0001	0.013	0.009	8.5	200	7.14	0.004	0.182	0.012	6.9	<0.01	0.043	419	2	0.16	131	208	0.024
	Mean							180					6.8						131		
	Median							662					7.1						164		
	Max							1,620					7.6						202		
SW05	2012	<0.001	0.02	<0.0001	<0.001	<0.001	7.3	465	0.98	0.004	0.163	<0.001	7.4	<0.01	0.119	374	0.7	0.04	10	8.2	0.005
SW05	23-JAN-2013	0.001	0.027	<0.0001	0.001	0.002	10.4	490	1.08	0.004	0.154	0.002	7.7	<0.01	0.136	334	0.5	<0.01	10	14.8	0.008
SW05	27-JAN-2013	0.001	0.024	<0.0001	0.001	0.002	8.5	450	1.29	0.004	0.173	0.002	7.2	<0.01	0.121	312	0.6	0.06	20	26.8	0.006
SW05	29-JAN-2013	0.001	0.03	<0.0001	0.002	0.002	6.5	390	2.84	0.004	0.118	0.002	7.1	<0.01	0.11	400	1	0.06	48	66.5	0.011
SW05	02-FEB-2013	<0.001	0.028	<0.0001	0.009	0.004	7.3	230	2.73	0.004	0.04	0.007	6.7	<0.01	0.078	332	1.6	0.07	48	97.7	0.02
	Mean							230					6.7						10		
	Median							405					7.2						27		
	Max							490					7.7						48		
SW07	2012	<0.001	0.119	<0.0001	<0.001	0.002	9.2	4960	0.11	0.005	1.4	0.004	8.0	<0.01	2.77	3730	2.7	0.18	19	2.9	0.006
SW07	23-JAN-2013	0.002	0.118	<0.0001	<0.001	0.002	11.3	4600	0.15	0.004	1.55	0.004	8.1	<0.01	3.88	4030	2.1	0.1	8	2.2	0.009
SW07	27-JAN-2013	<0.001	0.101	<0.0001	<0.001	0.001	8.5	4450	0.08	0.006	0.374	0.004	7.8	<0.01	3.3	3480	1	0.06	2	2.5	0.023
SW07	29-JAN-2013	<0.001	0.05	<0.0001	<0.001	0.001	9.2	2480	0.09	0.003	0.227	0.003	7.5	<0.01	1.25	1690	0.8	0.01	6	4.5	0.01
SW07	02-FEB-2013	<0.001	0.036	<0.0001	<0.001	0.001	8.5	1560	0.2	0.007	0.5	0.01	7	<0.01	0.598	1060	1	0.02	<2	3.8	0.037
	Mean							1,560					7.0						2		
	Median							3,610					7.7						9		
	Max							4,960					8.1						19		

Sample Location	Sample Date	Arsenic mg/L	Barium mg/L	Cadmium mg/L	Chromium mg/L	Copper mg/L	Dissolved Oxygen mg/L	Electrical Conductivity (Non Compensated) µS/cm	Iron mg/L	Lithium mg/L	Manganese mg/L	Nickel mg/L	pH - Field pH Unit	Selenium mg/L	Strontium mg/L	Total Dissolved Solids @ 180°C mg/L	Total Nitrogen as N mg/L	Total Phosphorus as P mg/L	Total Suspended Solids mg/L	Turbidity NTU	Zinc mg/L
SW08	2012	<0.001	0.071	<0.0001	<0.001	0.002	6.2	1880	1.13	0.003	0.294	0.007	7.1	<0.01	0.681	1320	2.3	0.17	12	20	0.009
SW08	23-JAN-2013	<0.001	0.084	<0.0001	<0.001	0.002	10.3	1910	7.17	0.013	0.903	0.006	6.8	<0.01	0.559	1320	1.1	0.12	22	48	0.009
SW08	27-JAN-2013	0.001	0.102	<0.0001	<0.001	0.002	7.1	2310	10.5	0.012	1.52	0.007	6.4	<0.01	0.565	1310	1	0.13	40	52.2	0.014
SW08	29-JAN-2013	<0.001	0.101	<0.0001	<0.001	0.001	7.2	3060	1.14	0.004	0.368	0.006	7.0	<0.01	0.922	1800	0.9	0.05	7	10.1	0.007
SW08	02-FEB-2013	<0.001	0.023	<0.0001	0.001	0.002	8	530	1.16	<0.001	0.099	0.005	7.1	<0.01	0.144	406	5.4	0.11	15	17	0.007
	Mean							530					6.4						7		
	Median							1,938					6.9						19		
	Max							3,060					7.1						40		
SW09	2012	<0.001	0.065	<0.0001	0.001	0.002	7	1220	1.81	0.002	0.192	0.007	7.0	<0.01	0.377	786	1.2	0.08	34	56	0.008
SW09	23-JAN-2013	0.002	0.307	<0.0001	<0.001	0.002	10.4	3420	52.1	0.002	6.96	0.004	6.6	<0.01	1.03	2040	0.8	0.16	81	171	0.012
SW09	27-JAN-2013	<0.001	0.227	<0.0001	<0.001	0.001	8.4	3620	5.88	0.001	4.34	0.002	7.0	<0.01	1.12	2280	0.7	0.03	17	17.9	0.011
SW09	29-JAN-2013	<0.001	0.134	<0.0001	<0.001	0.001	7.6	2560	1.49	0.001	1.76	0.004	7.1	<0.01	0.853	1550	0.5	<0.01	14	5.3	0.017
SW09	02-FEB-2013	0.002	0.05	<0.0001	0.004	0.005	8.2	1050	4.75	0.003	0.195	0.01	7.0	<0.01	0.256	744	1.2	0.13	74	149	0.018
	Mean							1,050					6.6						14		
	Median							2,374					6.9						44		
	Max							3,620					7.1						81		
SW10	2012	No sample was collected as the site was dry																			
SW10	23-JAN-2013	No sample was collected as the site was dry																			
SW10	27-JAN-2013	No sample was collected as the site was dry																			
SW10	29-JAN-2013	<0.001	0.043	<0.0001	<0.001	0.003	6.8	170	0.45	<0.001	0.552	0.002	5.9	<0.01	0.013	182	1.8	0.04	10	36.6	0.083
SW10	02-FEB-2013	<0.001	0.038	<0.0001	<0.001	0.002	8.3	180	0.57	<0.001	0.305	0.002	6	<0.01	0.01	157	2.1	0.06	4	2.9	0.013
	Mean							170					5.9						4		
	Median							175					6.0						7		
	Max							180					6.0						10		
SW11	2012	0.002	0.033	<0.0001	0.02	0.006	2	100	6.68	0.005	0.374	0.015	6.4	<0.01	0.021	386	1.1	0.08	272	520	0.038
SW11	23-JAN-2013	0.002	0.039	<0.0001	0.024	0.008	7.8	130	10.5	0.006	0.4	0.014	6.7	<0.01	0.039	396	1.3	0.1	142	578	0.044
SW11	27-JAN-2013	0.001	0.035	<0.0001	0.013	0.005	8.1	100	5	0.003	0.069	0.008	6.9	<0.01	0.023	567	1.1	0.14	234	758	0.039
SW11	29-JAN-2013	<0.001	0.021	<0.0001	0.004	0.004	8.2	130	1.51	0.001	0.025	0.005	7.0	<0.01	0.024	252	1.3	0.07	37	159	0.021
SW11	02-FEB-2013	0.001	0.027	<0.0001	0.014	0.005	8.6	140	5.34	0.003	0.025	0.008	6.9	<0.01	0.026	354	1.2	0.09	85	269	0.032
	Mean							100					6.4						37		
	Median							120					6.8						154		
	Max							140					7.0						272		
SW12	2012	0.001	0.021	<0.0001	0.002	0.002	7.7	370	2.12	0.004	0.168	0.002	7.2	<0.01	0.095	318	0.7	0.08	29	31	0.007
SW12	23-JAN-2013	0.001	0.025	<0.0001	0.001	0.002	8.4	480	1.36	0.004	0.14	0.002	7.7	<0.01	0.135	334	0.6	0.05	10	21.6	0.009
SW12	27-JAN-2013	0.001	0.027	<0.0001	0.002	0.002	8.1	410	1.88	0.004	0.146	0.003	7.1	<0.01	0.11	288	0.7	0.09	38	65.6	0.011
SW12	29-JAN-2013	0.002	0.04	<0.0001	0.006	0.004	6.5	280	6.69	0.007	0.112	0.003	6.9	<0.01	0.074	387	0.8	0.04	85	144	0.014
SW12	02-FEB-2013	0.003	0.041	<0.0001	0.009	0.005	8.4	120	9.22	0.01	0.062	0.005	6.4	<0.01	0.03	436	1.4	0.07	242	249	0.02
	Mean							120					6.4						10		
	Median							332					7.1						81		
	Max							480					7.7						242		

Appendix 4: Groundwater Monitoring Data

Groundwater Levels (mAHD)

BORE	OB-1	OB-2	OB-3	OB-4	PZ003	PZ004	PZ018	PZ039	PZ040B	PZ043A	PZ043B	PZ044	PZ050A	PZ050B	PZ050C	PZ055	PZ058	PZ072A	PZ072C	PZ074	PZ101B	PZ101C	PZ102A	PZ102B	TB103
Sep-12	#N/A	flowing	472.67	#N/A	471.19	495.54	454.74	419.34	421.57	491.42	494.21	481.83	384.71	431.87	440.12	422.98	468.03	498.20	506.10	501.51	375.96	381.35	375.27	370.28	380.68
Oct-12	#N/A	flowing	472.54	#N/A	471.11	492.76	454.23	419.28	421.48	491.21	494.20	481.55	384.68	431.43	440.04	423.18	467.89	498.12	506.10	501.53	375.99	381.37	375.27	375.27	380.90
Nov-12	#N/A	flowing	472.49	#N/A	471.16	492.49	453.97	419.25	422.34	491.06	494.18	481.06	384.73	431.88	439.98	422.92	467.97			501.47	375.96	381.41	375.10	375.04	380.88
Dec-12	#N/A	flowing	472.52	#N/A	471.03	492.01	453.83	419.23	421.43	491.05	494.21	480.98	384.85	431.92	439.98	422.84	467.99			501.51	375.83	381.41	375.03	374.96	380.80
Jan-13	#N/A	flowing	472.59	#N/A	471.21	491.91	454.25	419.20	421.38	490.99	494.25	480.67	384.82	431.88	439.90	422.89	468.01			501.49	375.62	381.38	374.48	373.50	380.53
Feb-13	#N/A	flowing	472.73	#N/A	471.25	491.94	455.35	419.12	421.36	491.09	494.19	480.83	384.81	431.86	439.98	422.97	467.95			501.42	375.52	381.41	374.52	374.59	380.60
Mar-13	#N/A	flowing	472.54	#N/A	471.18	491.72	454.65	419.15	421.32	491.06	494.10	480.92	384.77	431.85	439.95	423.06	467.94			501.40	375.52	381.44	374.49	374.52	380.59
Apr-13	#N/A	flowing	472.60	#N/A	471.25	491.91	454.16	419.11	421.27	491.10	494.20	480.94	384.79	431.90	439.95	423.15	468.02			501.50	375.31	381.54	374.21	374.24	380.55
May-13	#N/A	flowing	472.53	#N/A	471.23	491.78	455.33	419.00	421.21	490.88	494.17	480.45	384.72	431.81	439.83	423.18	467.87			501.36	375.32	381.47	373.87	373.88	380.21
Jun-13	#N/A	flowing	472.61	#N/A	471.24	491.78	455.39	419.00	421.23	490.85	494.23	480.43	384.77	431.91	439.85	423.25	467.92			501.38	375.15	381.51	373.85	373.85	380.20
Jul-13	#N/A	flowing	472.52	#N/A	471.21	491.63	453.36	418.93	421.17	490.75	494.12	480.31	384.76	431.83	439.86	423.14	467.94			501.42	374.93	381.52	373.65	373.66	380.05
Aug-13	#N/A	flowing	472.53	#N/A	471.17	491.80	453.63	418.93	421.16	490.74	493.89	480.27	384.76	431.90	439.81	423.12	467.94			501.44	374.93	381.56	373.61	373.65	380.06
min			*472.49*		*471.03*	*491.63*	*453.36*	*418.93*	*421.16*	*490.74*	*493.89*	*480.27*	*384.68*	*431.43*	*439.81*	*422.84*	*467.87*	*498.12*	*506.10*	*501.36*	*374.93*	*381.35*	*373.61*	*370.28*	*380.05*
max			*472.73*		*471.25*	*495.54*	*455.39*	*419.34*	*422.34*	*491.42*	*494.25*	*481.83*	*384.85*	*431.92*	*440.12*	*423.25*	*468.03*	*498.20*	*506.10*	*501.53*	*375.99*	*381.56*	*375.27*	*375.27*	*380.90*

Gaps in data indicate that no result is available

BORE	PZ103A	PZ103B	PZ103C	PZ104	TB105	PZ105A	PZ105B	PZ105C	PZ106A	PZ106B	PZ107	PZ108	PZ109	PZ111	PZ112B	PZ127	PZ128	PZ129	PZ130	PZ131	PZ133	PZ134	PZ137	PZ141	PZ149
Sep-12	374.55	384.29	398.06	382.91	372.26	372.37	377.54	378.08	428.45	502.23	433.65	400.70	382.74	380.71	481.95	VW	VW	VW	VW	433.93	VW	433.12	462.60	463.78	468.69
Oct-12	374.39	384.46	398.12	385.09	372.42	372.52	377.60	378.08	425.75	502.20	433.73	400.60	382.70	380.73	481.88	VW	VW	VW	VW	433.72	VW	433.05	462.40	463.60	468.19
Nov-12	374.46	384.45	398.14	383.02	372.15	372.21	377.56	377.99	425.63	502.11	433.71	400.67	382.34	380.69	#N/A	VW	VW	VW	VW	433.78	VW	433.08	462.63	463.34	468.73
Dec-12	374.27	384.49	398.20	382.84	372.47	372.57	377.61	378.14	425.78	502.12	433.64	400.74	382.79	380.63	481.96	VW	VW	VW	VW	433.85	VW	432.94	462.29	463.31	468.73
Jan-13	373.98	384.33	398.25	383.08	372.37	372.50	377.51	378.03	426.09	502.01	433.88	401.02	382.74	380.26	481.88	VW	VW	VW	VW	433.78	VW	432.88	461.88	462.80	467.57
Feb-13	374.00	384.23	397.22	382.94	372.30	372.39	377.54	378.06	426.29	501.93	433.87	400.59	382.67	380.04	481.81	VW	VW	VW	VW	433.76	VW	432.90	461.00	462.75	467.49
Mar-13	373.98	384.26	398.18	383.04	372.41	372.44	377.63	378.09	426.43	501.87	433.86	400.55	382.67	380.04	481.74	VW	VW	VW	VW	433.79	VW	432.88	461.77	462.63	467.21
Apr-13	373.80	384.38	398.25	383.05	372.43	372.44	377.66	378.11	426.61	501.88	433.96	400.67	382.73	380.05	481.73	VW	VW	VW	VW	434.04	VW	432.91	461.68	462.41	467.21
May-13	373.45	384.09	398.29	382.95	372.27	372.30	377.42	377.86	426.20	502.58	433.86	400.50	382.75	379.91	481.46	VW	VW	VW	VW	433.69	VW	432.68	461.37	462.06	466.97
Jun-13	373.50	384.15	398.35	383.01	372.26	372.29	377.48	377.92	426.41	501.56	433.96	400.55	382.69	379.79	481.49	VW	VW	VW	VW	433.77	VW	432.73	461.32	461.98	466.98
Jul-13	373.31	383.94	398.35	382.96	372.12	372.14	377.46	377.90	426.65	501.44	433.99	400.55	382.72	379.50	481.27	VW	VW	VW	VW	433.79	VW	432.64	461.24	461.86	466.99
Aug-13	373.28	384.06	398.37	382.95	372.11	372.13	377.48	377.93	426.90	501.38	433.90	400.54	382.65	379.35	481.25	VW	VW	VW	VW	433.78	VW	432.64	461.16	461.76	466.99
min	*373.28*	*383.94*	*397.22*	*382.84*	*372.11*	*372.13*	*377.42*	*377.86*	*425.63*	*501.38*	*433.64*	*400.50*	*382.34*	*379.35*	*#N/A*	*VW*	*VW*	*VW*	*VW*	*433.69*	*VW*	*432.64*	*461.00*	*461.76*	*466.97*
max	*374.55*	*384.49*	*398.37*	*385.09*	*372.47*	*372.57*	*377.66*	*378.14*	*428.45*	*502.58*	*433.99*	*401.02*	*382.79*	*380.73*	*#N/A*	*VW*	*VW*	*VW*	*VW*	*434.04*	*VW*	*433.12*	*462.63*	*463.78*	*468.73*

Gaps in data indicate that no result is available
VW = vibrating wire has been installed

BORE	PZ150	PZ151	PZ152	PZ155	PZ156	PZ157	PZ164	PZ165	PZ168	PZ170	PZ172	PZ173	PZ174	PZ175	PZ176	PZ177	TB179	PZ181	PZ184	PZ186	PZ187	PZ188	PZ189	PZ191
Sep-12		381.31	442.38	437.81	383.20	382.52	433.03	439.65	429.02	422.53	422.52	422.85	419.11	420.69	417.25	416.62	#N/A	425.61	413.06					383.01
Oct-12		381.61	442.24	437.68	382.34	382.58	433.12	438.27	428.04	422.58	422.22	422.68	419.16	420.43	417.14	416.23	#N/A	425.54	412.99	409.08	416.72	416.23	413.41	383.15
Nov-12				437.66	382.33	382.80	433.08	437.66	429.07	422.57	422.21	422.59	418.99	420.26	417.17	416.01	#N/A	425.30	413.02					383.19
Dec-12		381.92	442.21	437.71	382.42	382.76	433.03	437.55	429.15	422.55	422.18	422.60	418.96	420.10	417.05	416.03	#N/A	425.38	413.03					386.73
Jan-13		382.09	442.08		382.34	382.80	433.08	439.37	429.10	422.50	422.03		418.94	419.90	416.95	415.88	#N/A	425.25	412.95	408.59	416.96	416.12	413.52	382.71
Feb-13		382.17	442.08	437.71	382.36	382.78	433.08	437.50	429.00	422.49	422.05	422.35	419.07	419.94	416.97	415.88	#N/A	425.25	412.98					382.76
Mar-13		382.29	442.17	437.90	382.42	382.94	433.25	437.57	429.19	422.59	422.05	422.42	418.98	420.02	417.00	416.00	#N/A	425.26	413.16					382.88
Apr-13		382.45	442.22	437.95	382.48	383.03	433.29	437.39	429.26	422.57	422.03	422.40	418.94	419.87	417.04	415.97	#N/A	425.29	413.16	410.04	417.14	416.33	413.66	382.87
May-13		382.44	442.03	437.93	382.30	382.90	433.08	437.06	429.17	422.39	421.74		418.83	419.46	416.81	415.88	#N/A	425.07	412.95					382.71
Jun-13		382.63	442.09	437.96	382.30	382.93	433.16	437.36	429.22	422.39	421.72		418.86	419.47	416.88	415.93	#N/A		413.02					382.29
Jul-13		382.60	441.99	437.66	382.22	382.87	433.09	436.89	429.21	422.37	421.64		418.77	419.42	416.89	415.91	#N/A	425.02	412.94	410.13	416.88	416.26	413.73	382.10
Aug-13		382.79	442.00	437.99	382.22	382.92	433.08		429.03	422.35	421.59		418.79	419.39	416.90	415.93	#N/A	425.02	412.98					383.07
min		*381.31*	*441.99*	*437.66*	*382.22*	*382.52*	*433.03*	*436.89*	*428.04*	*422.35*	*421.59*	*422.35*	*418.77*	*419.39*	*416.81*	*415.88*	*N/A*	*425.02*	*412.94*	*408.59*	*416.72*	*416.12*	*413.41*	*382.10*
max		*382.79*	*442.38*	*437.99*	*383.20*	*383.03*	*433.29*	*439.65*	*429.26*	*422.59*	*422.52*	*422.85*	*419.16*	*420.69*	*417.25*	*416.62*	*N/A*	*425.61*	*413.16*	*410.13*	*417.14*	*416.33*	*413.73*	*386.73*

Gaps in data indicate that no result is available

The results highlighted in red indicate the results are below the minimum results reported for background groundwater levels and require further investigation into the cause of the result. The results in yellow are between the 80th percentile value and the minimum results and act as an early warning system that further investigations may be required. The outcomes of any investigations are discussed further in **Section 3.7.2**.

Groundwater Quality Data

Sample Location	Sample Date	Alkalinity - Bicarbonate mg CaCO3/L	Alkalinity - Carbonate mg CaCO3/L	Alkalinity - Hydroxide mg CaCO3/L	Alkalinity - Total as CaCO3 mg CaCO3/L	Anion Sum me/L	Arsenic - filterable_ mg/L	Boron - filterable_ mg/L	Cadmium - filterable_ mg/L	Calcium - total mg/L	Cation Sum me/L	Chloride mg/L	Chromium - filterable_ mg/L	Cobalt - filterable_ mg/L	Copper - filterable_ mg/L	Cyanide_ mg/L	Electrical Conductivity µS/cm - lab	Fluoride_ mg/L	Iron- filterable_ mg/L	Lead - filterable_ mg/L	Magnesium - total mg/L	Manganese - filterable_ mg/L	Nickel - filterable_ mg/L	Nitrates _ mg/L N	pH - lab	Phosphorus - total_ mg/L	Potassium - total mg/L	Selenium - filterable_ mg/L	Silver - filterable_ mg/L	Sodium - total mg/L	Sulfates mg/L	Temperature	Total Dissolved Solids @ 180°C_ mg/L	Total Nitrogen_ mg/L N	Zinc - filterable_ mg/L
OB001	Sep-12																																		
OB001	Oct-12																85								5.0							19	61		
OB001	Nov-12																																		
OB001	Dec-12																																		
OB001	Jan-13																																		
OB001	Feb-13																																		
OB001	Mar-13																																		
OB001	Apr-13	7	<1	<1	7		<0.001	<0.05	<0.0001			23	<0.001	0.0020	0.0140		95	<0.1	<0.05	<0.001		0.01	0.005	0.14	7.6	<0.01		<0.01	<0.001		1	20	178	0.10	0.045
OB001	May-13																																		
OB001	Jun-13																																		
OB001	Jul-13																																		
OB001	Aug-13																																		
	min																85								5.0										
	median																90								6.3										
	max																95								7.6										
OB002	Sep-12																																		
OB002	Oct-12																1,900								6.4							19	1,160		
OB002	Nov-12																																		
OB002	Dec-12																																		
OB002	Jan-13																																		
OB002	Feb-13																																		
OB002	Mar-13																																		
OB002	Apr-13	288	<1	<1	288		<0.001	<0.05	<0.0001			367	<0.001	<0.001	<0.001		1,947	0.7	0.31	<0.001		0.01	<0.001	0.02	7.3	0.04		<0.01	<0.001		174	18	1,190	0.70	0.009
OB002	May-13																																		
OB002	Jun-13																																		
OB002	Jul-13																																		
OB002	Aug-13																																		
	min																1,900								6.4										
	median																1,924								6.9										
	max																1,947								7.3										
OB003	Sep-12																																		
OB003	Oct-12																1,740								6.2							19	938		
OB003	Nov-12																																		
OB003	Dec-12																																		
OB003	Jan-13																																		
OB003	Feb-13																																		
OB003	Mar-13																																		
OB003	Apr-13	258	<1	<1	258		<0.001	<0.05	<0.0001			353	<0.001	<0.001	<0.001		1,883	0.5	8.30	<0.001		0.21	0.002	<0.01	6.4	0.15		<0.01	<0.001		144	18	1,140	0.50	0.020
OB003	May-13																																		
OB003	Jun-13																																		
OB003	Jul-13																																		
OB003	Aug-13																																		
	min																1,740								6.2										
	median																1,812								6.3										
	max																1,883								6.4										
OB004	Sep-12																																		
OB004	Oct-12																320								4.0							19	343		
OB004	Nov-12																																		
OB004	Dec-12																																		
OB004	Jan-13																																		
OB004	Feb-13																																		
OB004	Mar-13																																		
OB004	Apr-13	<1	<1	<1	<1		<0.001	<0.05	<0.0001			43	<0.001	0.0130	0.0020		336	<0.1	0.45	0.005		0.05	0.018	4.98	3.8	0.03		<0.01	<0.001		43	19	432	7.00	0.051
OB004	May-13																																		
OB004	Jun-13																																		
OB004	Jul-13																																		
OB004	Aug-13																																		
	min																320								3.8										
	median																328								3.9										
	max																336								4.0										

Sample Location	Sample Date	Alkalinity - Bicarbonate mg CaCO3/L	Alkalinity - Carbonate mg CaCO3/L	Alkalinity - Hydroxide mg CaCO3/L	Alkalinity - Total as CaCO3 mg CaCO3/L	Anion Sum me/L	Arsenic - filterable_ mg/L	Boron - filterable_ mg/L	Cadmium - filterable_ mg/L	Calcium - total mg/L	Cation Sum me/L	Chloride mg/L	Chromium - filterable_ mg/L	Cobalt - filterable_ mg/L	Copper - filterable_ mg/L	Cyanide_ mg/L	Electrical Conductivity µS/cm - lab	Fluoride_ mg/L	Iron- filterable_ mg/L	Lead - filterable_ mg/L	Magnesium - total mg/L	Manganese - filterable_ mg/L	Nickel - filterable_ mg/L	Nitrates_ mg/L N	pH - lab	Phosphorus - total_ mg/L	Potassium - total mg/L	Selenium - filterable_ mg/L	Silver - filterable_ mg/L	Sodium - total mg/L	Sulfates mg/L	Temperature	Total Dissolved Solids @ 180°C_ mg/L	Total Nitrogen_ mg/L N	Zinc - filterable_ mg/L
PZ003	Sep-12																																		
PZ003	Oct-12																915							6.5							17	482		
PZ003	Nov-12																																		
PZ003	Dec-12																																		
PZ003	Jan-13																																		
PZ003	Feb-13																																		
PZ003	Mar-13																																		
PZ003	Apr-13	90	<1	<1	90		<0.001	<0.05	<0.0001			247	<0.001	<0.001	<0.001		1,081	0.2	<0.05	<0.001		0.00	<0.001	0.24	6.3	<0.01		<0.01	<0.001		59	19	638	0.20	0.011
PZ003	May-13																																		
PZ003	Jun-13																																		
PZ003	Jul-13																																		
PZ003	Aug-13																																		
	min																915							6.3										
	median																998							6.4										
	max																1,081							6.5										
PZ004	Sep-12																																		
PZ004	Oct-12																2,740							6.8							20	1,730		
PZ004	Nov-12																																		
PZ004	Dec-12																																		
PZ004	Jan-13																																		
PZ004	Feb-13																																		
PZ004	Mar-13																																		
PZ004	Apr-13	642	<1	<1	642		<0.001	<0.05	<0.0001			423	<0.001	<0.001	<0.001		3,160	0.9	<0.05	<0.001		0.00	0.002	0.32	7.1	<0.01		<0.01	<0.001		502	19	1,950	0.40	0.018
PZ004	May-13																																		
PZ004	Jun-13																																		
PZ004	Jul-13																																		
PZ004	Aug-13																																		
	min																2,740							6.8										
	median																2,950							7.0										
	max																3,160							7.1										
PZ018	Sep-12																																		
PZ018	Oct-12																575							5.8							14	356		
PZ018	Nov-12																																		
PZ018	Dec-12																																		
PZ018	Jan-13						<0.001	<0.05	<0.0001	2		130	<0.001	<0.001	0.0010		590	<0.1	<0.05	<0.001	15	0.01	0.002	0.04	5.9		3.0	<0.01	<0.001	74	41	19	366	0.80	0.031
PZ018	Feb-13																																		
PZ018	Mar-13																																		
PZ018	Apr-13	14	<1	<1	14		<0.001	<0.05	0.00020			144	<0.001	<0.001	<0.001		808	<0.1	<0.05	<0.001		0.01	0.002	0.03	5.3	0.02		<0.01	<0.001		39	19	484	0.40	0.022
PZ018	May-13																																		
PZ018	Jun-13																																		
PZ018	Jul-13																																		
PZ018	Aug-13																																		
	min																575							5.3										
	median																590							5.8										
	max																808							5.9										
PZ039	Sep-12																																		
PZ039	Oct-12																720							6.5							20	358		
PZ039	Nov-12																																		
PZ039	Dec-12																																		
PZ039	Jan-13																																		
PZ039	Feb-13																																		
PZ039	Mar-13																																		
PZ039	Apr-13	69	<1	<1	69		<0.001	<0.05	<0.0001			231	<0.001	<0.001	<0.001		950	0.3	<0.05	<0.001		0.02	0.003	0.36	6.8	<0.01		<0.01	<0.001		37	19	586	0.50	0.018
PZ039	May-13																																		
PZ039	Jun-13																																		
PZ039	Jul-13																																		
PZ039	Aug-13																																		
	min																720							6.5										
	median																835							6.7										
	max																950							6.8										

Sample Location	Sample Date	Alkalinity - Bicarbonate mg CaCO3/L	Alkalinity - Carbonate mg CaCO3/L	Alkalinity - Hydroxide mg CaCO3/L	Alkalinity - Total as CaCO3 mg CaCO3/L	Anion Sum me/L	Arsenic - filterable_ mg/L	Boron - filterable_ mg/L	Cadmium - filterable_ mg/L	Calcium - total mg/L	Cation Sum me/L	Chloride mg/L	Chromium - filterable_ mg/L	Cobalt - filterable_ mg/L	Copper - filterable_ mg/L	Cyanide_ mg/L	Electrical Conductivity µS/cm - lab	Fluoride_ mg/L	Iron- filterable_ mg/L	Lead - filterable_ mg/L	Magnesium - total mg/L	Manganese - filterable_ mg/L	Nickel - filterable_ mg/L	Nitrates_ mg/L N	pH - lab	Phosphorus - total_ mg/L	Potassium - total mg/L	Selenium - filterable_ mg/L	Silver - filterable_ mg/L	Sodium - total mg/L	Sulfates mg/L	Temperature	Total Dissolved Solids @ 180°C_ mg/L	Total Nitrogen_ mg/L N	Zinc - filterable_ mg/L
PZ040B	Sep-12																																		
PZ040B	Oct-12																1,140								4.3							21	574		
PZ040B	Nov-12																																		
PZ040B	Dec-12																																		
PZ040B	Jan-13																																		
PZ040B	Feb-13																																		
PZ040B	Mar-13																																		
PZ040B	Apr-13	<1	<1	<1	<1		<0.001	<0.05	<0.0001			356	<0.001	0.0200	0.0020		1,247	<0.1	<0.05	0.00200		0.20	0.017	0.22	4.3	<0.01		<0.01	<0.001		10	19	720	0.20	0.076
PZ040B	May-13																																		
PZ040B	Jun-13																																		
PZ040B	Jul-13																																		
PZ040B	Aug-13																																		
	min																1,140								4.3										
	median																1,194								4.3										
	max																1,247								4.3										
PZ043A	Sep-12																																		
PZ043A	Oct-12																2,270								6.7							20	1,450		
PZ043A	Nov-12																																		
PZ043A	Dec-12																																		
PZ043A	Jan-13						0.005	<0.05	<0.0001	155		373	<0.001	<0.001	0.0010		2,560	0.9	2.80	<0.001	202	0.14	0.001	0.03	7.3		38.0	<0.01	<0.001	117	271	Recorded	1,540	0.40	0.029
PZ043A	Feb-13																																		
PZ043A	Mar-13																																		
PZ043A	Apr-13	528	<1	<1	528		0.002	<0.05	<0.0001			360	0.002	<0.001	<0.001		2,440	0.8	0.95	<0.001		0.18	0.001	<0.01	6.8	0.01		<0.01	<0.001		320	19	1,630	0.20	<0.005
PZ043A	May-13																																		
PZ043A	Jun-13																																		
PZ043A	Jul-13																																		
PZ043A	Aug-13																																		
	min																2,270								6.7										
	median																2,440								6.8										
	max																2,560								7.3										
PZ043B	Sep-12																																		
PZ043B	Oct-12																3,130								4.0							19	2,130		
PZ043B	Nov-12																																		
PZ043B	Dec-12																																		
PZ043B	Jan-13						0.014	<0.05	0.00130	16		640	0.002	0.2900	0.0230		3,580	0.5	1.90	0.01200	112	0.21	0.423	1.14	4.0		62.0	<0.01	<0.001	632	845	Recorded	2,380	3.10	2.170
PZ043B	Feb-13																																		
PZ043B	Mar-13																																		
PZ043B	Apr-13	<1	<1	<1	<1		0.016	<0.05	0.00100			624	0.002	0.2160	0.0200		3,460	0.3	0.35	0.00300		0.13	0.319	1.22	3.8	<0.01		<0.01	<0.001		820	19	2,360	2.70	1.660
PZ043B	May-13																																		
PZ043B	Jun-13																																		
PZ043B	Jul-13																																		
PZ043B	Aug-13																																		
	min																3,130								3.8										
	median																3,460								4.0										
	max																3,580								4.0										
PZ044	Sep-12																																		
PZ044	Oct-12																2,440								6.4							18	1,930		
PZ044	Nov-12																																		
PZ044	Dec-12																																		
PZ044	Jan-13																																		
PZ044	Feb-13																																		
PZ044	Mar-13																																		
PZ044	Apr-13	344	<1	<1	344		<0.001	<0.05	<0.0001			254	<0.001	<0.001	<0.001		2,750	0.2	<0.05	<0.001		0.19	0.002	0.24	6.8	<0.01		<0.01	<0.001		1,020	18	2,200	0.30	0.030
PZ044	May-13																																		
PZ044	Jun-13																																		
PZ044	Jul-13																																		
PZ044	Aug-13																																		
	min																2,440								6.4										
	median																2,595								6.6										
	max																2,750								6.8										

Sample Location	Sample Date	Alkalinity - Bicarbonate mg CaCO3/L	Alkalinity - Carbonate mg CaCO3/L	Alkalinity - Hydroxide mg CaCO3/L	Alkalinity - Total as CaCO3 mg CaCO3/L	Anion Sum me/L	Arsenic - filterable_ mg/L	Boron - filterable_ mg/L	Cadmium - filterable_ mg/L	Calcium - total mg/L	Cation Sum me/L	Chloride mg/L	Chromium - filterable_ mg/L	Cobalt - filterable_ mg/L	Copper - filterable_ mg/L	Cyanide_ mg/L	Electrical Conductivity µS/cm - lab	Fluoride_ mg/L	Iron- filterable_ mg/L	Lead - filterable_ mg/L	Magnesium - total mg/L	Manganese - filterable_ mg/L	Nickel - filterable_ mg/L	Nitrates_ mg/L N	pH - lab	Phosphorus - total_ mg/L	Potassium - total mg/L	Selenium - filterable_ mg/L	Silver - filterable_ mg/L	Sodium - total mg/L	Sulfates mg/L	Temperature	Total Dissolved Solids @ 180°C_ mg/L	Total Nitrogen_ mg/L N	Zinc - filterable_ mg/L
PZ050A	Sep-12																																		
PZ050A	Oct-12																1,820							6.6							23	1,240		
PZ050A	Nov-12																																		
PZ050A	Dec-12																																		
PZ050A	Jan-13																																		
PZ050A	Feb-13																																		
PZ050A	Mar-13																																		
PZ050A	Apr-13	318	<1	<1	318		<0.001	<0.05	<0.0001			482	<0.001	<0.001	<0.001		2,280	0.5	<0.05	<0.001		0.09	0.003	0.07	6.4	<0.01		<0.01	<0.001		71	21	1,310	<0.1	0.017
PZ050A	May-13																																		
PZ050A	Jun-13																																		
PZ050A	Jul-13																																		
PZ050A	Aug-13																																		
	min																1,820								6.4										
	median																2,050								6.5										
	max																2,280								6.6										
PZ050B	Sep-12																																		
PZ050B	Oct-12																980							6.3							21	568		
PZ050B	Nov-12																																		
PZ050B	Dec-12																																		
PZ050B	Jan-13																																		
PZ050B	Feb-13																																		
PZ050B	Mar-13																																		
PZ050B	Apr-13	11	<1	<1	11		<0.001	<0.05	0.00070			285	<0.001	0.0210	0.0010		1,095	<0.1	<0.05	<0.001		0.16	0.054	0.31	5.9	<0.01		<0.01	<0.001		73	19	584	0.40	0.178
PZ050B	May-13																																		
PZ050B	Jun-13																																		
PZ050B	Jul-13																																		
PZ050B	Aug-13																																		
	min																980								5.9										
	median																1,038								6.1										
	max																1,095								6.3										
PZ050C	Sep-12																																		
PZ050C	Oct-12																290							6.2							20	150		
PZ050C	Nov-12																																		
PZ050C	Dec-12																																		
PZ050C	Jan-13																																		
PZ050C	Feb-13																																		
PZ050C	Mar-13																																		
PZ050C	Apr-13	18	<1	<1	18		<0.001	<0.05	<0.0001			46	<0.001	0.0020	<0.001		264	<0.1	<0.05	<0.001		0.02	0.001	3.38	6.3	0.05		<0.01	<0.001		26	19	189	4.80	0.012
PZ050C	May-13																																		
PZ050C	Jun-13																																		
PZ050C	Jul-13																																		
PZ050C	Aug-13																																		
	min																264								6.2										
	median																277								6.3										
	max																290								6.3										
PZ055	Sep-12																																		
PZ055	Oct-12																1,670							5.4							18	1,080		
PZ055	Nov-12																																		
PZ055	Dec-12																																		
PZ055	Jan-13																																		
PZ055	Feb-13																																		
PZ055	Mar-13																																		
PZ055	Apr-13	24	<1	<1	24		<0.001	0.05	0.00010			401	<0.001	0.0620	0.0250			0.1	0.76	0.00100		1.20	0.048	0.01	5.6	0.03		0.040	<0.001		323		1,270	0.40	0.209
PZ055	May-13																																		
PZ055	Jun-13																																		
PZ055	Jul-13																																		
PZ055	Aug-13																																		
	min																1,670								5.4										
	median																1,670								5.5										
	max																1,670								5.6										

Sample Location	Sample Date	Alkalinity - Bicarbonate mg CaCO3/L	Alkalinity - Carbonate mg CaCO3/L	Alkalinity - Hydroxide mg CaCO3/L	Alkalinity - Total as CaCO3 mg CaCO3/L	Anion Sum me/L	Arsenic - filterable_ mg/L	Boron - filterable_ mg/L	Cadmium - filterable_ mg/L	Calcium - total mg/L	Cation Sum me/L	Chloride mg/L	Chromium - filterable_ mg/L	Cobalt - filterable_ mg/L	Copper - filterable_ mg/L	Cyanide_ mg/L	Electrical Conductivity µS/cm - lab	Fluoride_ mg/L	Iron- filterable_ mg/L	Lead - filterable_ mg/L	Magnesium - total mg/L	Manganese - filterable_ mg/L	Nickel - filterable_ mg/L	Nitrates_ mg/L N	pH - lab	Phosphorus - total_ mg/L	Potassium - total mg/L	Selenium - filterable_ mg/L	Silver - filterable_ mg/L	Sodium - total mg/L	Sulfates mg/L	Temperature	Total Dissolved Solids @ 180°C_ mg/L	Total Nitrogen_ mg/L N	Zinc - filterable_ mg/L
PZ058	Sep-12																																		
PZ058	Oct-12																8,820								3.8							19	6,930		
PZ058	Nov-12																																		
PZ058	Dec-12																																		
PZ058	Jan-13																																		
PZ058	Feb-13																																		
PZ058	Mar-13																																		
PZ058	Apr-13	<1	<1	<1	<1		0.013	<0.05	<0.0001			2,020	0.034	0.8860	<0.001		9,670	0.4	15.80	0.00100		1.00	1.180	<0.01	3.9	0.07		0.060	<0.001		2,750	18	7,490	1.00	0.188
PZ058	May-13																																		
PZ058	Jun-13																																		
PZ058	Jul-13																																		
PZ058	Aug-13																																		
	min																8,820								3.8										
	median																9,245								3.9										
	max																9,670								3.9										
PZ072A	Sep-12																																		
PZ072A	Oct-12																1,660								6.9							18	960		
PZ072A	Nov-12																																		
PZ072A	Dec-12																																		
PZ072A	Jan-13																																		
PZ072A	Feb-13																																		
PZ072A	Mar-13																																		
PZ072A	Apr-13	No Access																																	
PZ072A	May-13																																		
PZ072A	Jun-13																																		
PZ072A	Jul-13																																		
PZ072A	Aug-13																																		
	min																1,660								6.9										
	median																1,660								6.9										
	max																1,660								6.9										
PZ072C	Sep-12																																		
PZ072C	Oct-12																2,850								7.1							16	1680		
PZ072C	Nov-12																																		
PZ072C	Dec-12																																		
PZ072C	Jan-13																																		
PZ072C	Feb-13																																		
PZ072C	Mar-13																																		
PZ072C	Apr-13	No Access																																	
PZ072C	May-13																																		
PZ072C	Jun-13																																		
PZ072C	Jul-13																																		
PZ072C	Aug-13																																		
	min																2,850								7.1										
	median																2,850								7.1										
	max																2,850								7.1										
PZ074	Sep-12																																		
PZ074	Oct-12																5370								6.5							19	3,710		
PZ074	Nov-12																																		
PZ074	Dec-12																																		
PZ074	Jan-13																																		
PZ074	Feb-13																																		
PZ074	Mar-13																																		
PZ074	Apr-13	649	<1	<1	649		<0.001	<0.05	<0.0001			1,190	<0.001	<0.001	<0.001		6070	0.2	1.17	<0.001		0.17	0.001	<0.01	6.7	0.03		<0.01	<0.001		978	19	4,190	0.30	0.024
PZ074	May-13																																		
PZ074	Jun-13																																		
PZ074	Jul-13																																		
PZ074	Aug-13																																		
	min																5370								6.5										
	median																5720								6.6										
	max																6070								6.7										

Sample Location	Sample Date	Alkalinity - Bicarbonate mg CaCO3/L	Alkalinity - Carbonate mg CaCO3/L	Alkalinity - Hydroxide mg CaCO3/L	Alkalinity - Total as CaCO3 mg CaCO3/L	Anion Sum me/L	Arsenic - filterable_ mg/L	Boron - filterable_ mg/L	Cadmium - filterable_ mg/L	Calcium - total mg/L	Cation Sum me/L	Chloride mg/L	Chromium - filterable_ mg/L	Cobalt - filterable_ mg/L	Copper - filterable_ mg/L	Cyanide_ mg/L	Electrical Conductivity µS/cm - lab	Fluoride_ mg/L	Iron- filterable_ mg/L	Lead - filterable_ mg/L	Magnesium - total mg/L	Manganese - filterable_ mg/L	Nickel - filterable_ mg/L	Nitrates_ mg/L N	pH - lab	Phosphorus - total_ mg/L	Potassium - total mg/L	Selenium - filterable_ mg/L	Silver - filterable_ mg/L	Sodium - total mg/L	Sulfates mg/L	Temperature	Total Dissolved Solids @ 180°C_ mg/L	Total Nitrogen_ mg/L N	Zinc - filterable_ mg/L
PZ101B	Sep-12																																		
PZ101B	Oct-12																620								7.8							20	388		
PZ101B	Nov-12																																		
PZ101B	Dec-12																																		
PZ101B	Jan-13																																		
PZ101B	Feb-13																																		
PZ101B	Mar-13																																		
PZ101B	Apr-13	268	<1	<1	268		0.006	<0.05	<0.0001			72	<0.001	<0.001	<0.001		768	0.9	1.65	<0.001		0.32	<0.001	0.06	7.5	0.26		<0.01	<0.001		3	19	392	0.60	0.006
PZ101B	May-13																																		
PZ101B	Jun-13																																		
PZ101B	Jul-13																																		
PZ101B	Aug-13																																		
	min																620								7.5										
	median																694								7.7										
	max																768								7.8										
PZ101C	Sep-12																																		
PZ101C	Oct-12																530								7.2							19	320		
PZ101C	Nov-12																																		
PZ101C	Dec-12																																		
PZ101C	Jan-13																																		
PZ101C	Feb-13																																		
PZ101C	Mar-13																																		
PZ101C	Apr-13	175	<1	<1	175		<0.001	<0.05	<0.0001			74	<0.001	<0.001	<0.001		616	0.5	<0.05	<0.001		0.20	0.002	0.06	6.9	0.06		<0.01	<0.001		9	19	378	0.20	0.012
PZ101C	May-13																																		
PZ101C	Jun-13																																		
PZ101C	Jul-13																																		
PZ101C	Aug-13																																		
	min																530								6.9										
	median																573								7.1										
	max																616								7.2										
PZ102A	Sep-12																																		
PZ102A	Oct-12																1,610								6.8							20	1,490		
PZ102A	Nov-12																																		
PZ102A	Dec-12																																		
PZ102A	Jan-13																																		
PZ102A	Feb-13																																		
PZ102A	Mar-13																																		
PZ102A	Apr-13	288	<1	<1	288		<0.001	<0.05	<0.0001			206	<0.001	<0.001	<0.001		2,253	1.4	3.48	<0.001		0.24	0.004	0.03	7.1	<0.01		<0.01	<0.001		682	19	1,500	1.20	0.042
PZ102A	May-13																																		
PZ102A	Jun-13																																		
PZ102A	Jul-13																																		
PZ102A	Aug-13																																		
	min																1,610								6.8										
	median																1,932								7.0										
	max																2,253								7.1										
PZ102B	Sep-12																																		
PZ102B	Oct-12																1,360								6.7							21	1,830		
PZ102B	Nov-12																																		
PZ102B	Dec-12																																		
PZ102B	Jan-13																																		
PZ102B	Feb-13																																		
PZ102B	Mar-13																																		
PZ102B	Apr-13	179	<1	<1	179		<0.001	<0.05	<0.0001			121	<0.001	<0.001	<0.001		2,470	1.2	5.31	<0.001		0.99	0.003	<0.01	6.8	0.01		<0.01	<0.001		1,050	19	1,820	0.90	0.025
PZ102B	May-13																																		
PZ102B	Jun-13																																		
PZ102B	Jul-13																																		
PZ102B	Aug-13																																		
	min																1,360								6.7										
	median																1,915								6.8										
	max																2,470								6.8										

Sample Location	Sample Date	Alkalinity - Bicarbonate mg CaCO3/L	Alkalinity - Carbonate mg CaCO3/L	Alkalinity - Hydroxide mg CaCO3/L	Alkalinity - Total as CaCO3 mg CaCO3/L	Anion Sum me/L	Arsenic - filterable_ mg/L	Boron - filterable_ mg/L	Cadmium - filterable_ mg/L	Calcium - total mg/L	Cation Sum me/L	Chloride mg/L	Chromium - filterable_ mg/L	Cobalt - filterable_ mg/L	Copper - filterable_ mg/L	Cyanide_ mg/L	Electrical Conductivity µS/cm - lab	Fluoride_ mg/L	Iron- filterable_ mg/L	Lead - filterable_ mg/L	Magnesium - total mg/L	Manganese - filterable_ mg/L	Nickel - filterable_ mg/L	Nitrates_ mg/L N	pH - lab	Phosphorus - total_ mg/L	Potassium - total mg/L	Selenium - filterable_ mg/L	Silver - filterable_ mg/L	Sodium - total mg/L	Sulfates mg/L	Temperature	Total Dissolved Solids @ 180°C_ mg/L	Total Nitrogen_ mg/L N	Zinc - filterable_ mg/L
PZ103A	Sep-12																																		
PZ103A	Oct-12																550								6.7							20	340		
PZ103A	Nov-12																																		
PZ103A	Dec-12																																		
PZ103A	Jan-13																																		
PZ103A	Feb-13																																		
PZ103A	Mar-13																																		
PZ103A	Apr-13	170	<1	<1	170		<0.001	<0.05	<0.0001			86	<0.001	0.0010	<0.001		646	0.7	2.73	<0.001		0.08	0.006	<0.01	6.8	0.02		<0.01	<0.001		4	19	356	0.30	0.009
PZ103A	May-13																																		
PZ103A	Jun-13																																		
PZ103A	Jul-13																																		
PZ103A	Aug-13																																		
	min																550								6.7										
	median																598								6.8										
	max																646								6.8										
PZ103B	Sep-12																																		
PZ103B	Oct-12																400								6.9							21	256		
PZ103B	Nov-12																																		
PZ103B	Dec-12																																		
PZ103B	Jan-13																																		
PZ103B	Feb-13																																		
PZ103B	Mar-13																																		
PZ103B	Apr-13	88	<1	<1	88		<0.001	<0.05	<0.0001			75	<0.001	0.0010	<0.001		471	0.1	11.00	<0.001		0.23	0.006	<0.01	6.3	<0.01		<0.01	<0.001		7	18	266	0.10	0.023
PZ103B	May-13																																		
PZ103B	Jun-13																																		
PZ103B	Jul-13																																		
PZ103B	Aug-13																																		
	min																400								6.3										
	median																436								6.6										
	max																471								6.9										
PZ103C	Sep-12																																		
PZ103C	Oct-12																320								5.6							20	169		
PZ103C	Nov-12																																		
PZ103C	Dec-12																																		
PZ103C	Jan-13																																		
PZ103C	Feb-13																																		
PZ103C	Mar-13																																		
PZ103C	Apr-13	12	<1	<1	12		0.003	<0.05	<0.0001			68	<0.001	0.0410	<0.001		327	<0.1	2.74	<0.001		0.53	0.176	<0.01	5.4	0.01		<0.01	<0.001		24	18	244	<0.1	0.146
PZ103C	May-13																																		
PZ103C	Jun-13																																		
PZ103C	Jul-13																																		
PZ103C	Aug-13																																		
	min																320								5.4										
	median																324								5.5										
	max																327								5.6										
PZ104	Sep-12																																		
PZ104	Oct-12																3800								12.4							21	1,230		
PZ104	Nov-12																																		
PZ104	Dec-12																																		
PZ104	Jan-13																																		
PZ104	Feb-13																																		
PZ104	Mar-13																																		
PZ104	Apr-13	<1	53	1440	1490		<0.001	<0.05	<0.0001			14	0.032	<0.001	<0.001		6950	<0.1	<0.05	<0.001		0.00	<0.001	0.04	12.8	<0.01		<0.01	<0.001		7	20	1,590	0.20	0.005
PZ104	May-13																																		
PZ104	Jun-13																																		
PZ104	Jul-13																																		
PZ104	Aug-13																																		
	min																3,800								12.4										
	median																5,375								12.6										
	max																6,950								12.8										

Sample Location	Sample Date	Alkalinity - Bicarbonate mg CaCO3/L	Alkalinity - Carbonate mg CaCO3/L	Alkalinity - Hydroxide mg CaCO3/L	Alkalinity - Total as CaCO3 mg CaCO3/L	Anion Sum me/L	Arsenic - filterable_ mg/L	Boron - filterable_ mg/L	Cadmium - filterable_ mg/L	Calcium - total mg/L	Cation Sum me/L	Chloride mg/L	Chromium - filterable_ mg/L	Cobalt - filterable_ mg/L	Copper - filterable_ mg/L	Cyanide_ mg/L	Electrical Conductivity µS/cm - lab	Fluoride_ mg/L	Iron- filterable_ mg/L	Lead - filterable_ mg/L	Magnesium - total mg/L	Manganese - filterable_ mg/L	Nickel - filterable_ mg/L	Nitrates_ mg/L N	pH - lab	Phosphorus - total_ mg/L	Potassium - total mg/L	Selenium - filterable_ mg/L	Silver - filterable_ mg/L	Sodium - total mg/L	Sulfates mg/L	Temperature	Total Dissolved Solids @ 180°C_ mg/L	Total Nitrogen_ mg/L N	Zinc - filterable_ mg/L
PZ105A	Sep-12																																		
PZ105A	Oct-12																270								6.3							19	144		
PZ105A	Nov-12																																		
PZ105A	Dec-12																																		
PZ105A	Jan-13																																		
PZ105A	Feb-13																																		
PZ105A	Mar-13																																		
PZ105A	Apr-13	20	<1	<1	20		<0.001	<0.05	0.00010			65	<0.001	0.0090	<0.001		276	<0.1	<0.05	<0.001		0.15	0.074	0.06	5.9	0.01		<0.01	<0.001		4	18	168	<0.1	0.093
PZ105A	May-13																																		
PZ105A	Jun-13																																		
PZ105A	Jul-13																																		
PZ105A	Aug-13																																		
	min																270								5.9										
	median																273								6.1										
	max																276								6.3										
PZ105B	Sep-12																																		
PZ105B	Oct-12																250								5.9							18	163		
PZ105B	Nov-12																																		
PZ105B	Dec-12																																		
PZ105B	Jan-13																																		
PZ105B	Feb-13																																		
PZ105B	Mar-13																																		
PZ105B	Apr-13	24	<1	<1	24		<0.001	<0.05	0.00100			54	<0.001	0.0110	0.0060		249	<0.1	<0.05	<0.001		0.17	0.066	0.04	5.6	<0.01		<0.01	<0.001		2	18	131	<0.1	0.074
PZ105B	May-13																																		
PZ105B	Jun-13																																		
PZ105B	Jul-13																																		
PZ105B	Aug-13																																		
	min																249								5.6										
	median																250								5.8										
	max																250								5.9										
PZ105C	Sep-12																																		
PZ105C	Oct-12																210								6.2							18	127		
PZ105C	Nov-12																																		
PZ105C	Dec-12																																		
PZ105C	Jan-13																																		
PZ105C	Feb-13																																		
PZ105C	Mar-13																																		
PZ105C	Apr-13	16	<1	<1	16		<0.001	<0.05	<0.0001			42	<0.001	<0.001	<0.001		193	<0.1	<0.05	<0.001		0.17	0.028	0.08	6.2	<0.01		<0.01	<0.001		5	19	136	0.20	0.025
PZ105C	May-13																																		
PZ105C	Jun-13																																		
PZ105C	Jul-13																																		
PZ105C	Aug-13																																		
	min																193								6.2										
	median																202								6.2										
	max																210								6.2										
PZ106A	Sep-12																																		
PZ106A	Oct-12																																		
PZ106A	Nov-12																630								9.4							23	322		
PZ106A	Dec-12																																		
PZ106A	Jan-13																																		
PZ106A	Feb-13																																		
PZ106A	Mar-13																																		
PZ106A	Apr-13	24	<1	<1	24		<0.001	<0.05	<0.0001			183	<0.001	<0.001	0.0100		713	0.1	<0.05	<0.001		0.01	0.002	0.49	9.2	<0.01		<0.01	<0.001		15	20	344	0.70	0.017
PZ106A	May-13																																		
PZ106A	Jun-13																																		
PZ106A	Jul-13																																		
PZ106A	Aug-13																																		
	min																630								9.2										
	median																672								9.3										
	max																713								9.4										

Sample Location	Sample Date	Alkalinity - Bicarbonate mg CaCO3/L	Alkalinity - Carbonate mg CaCO3/L	Alkalinity - Hydroxide mg CaCO3/L	Alkalinity - Total as CaCO3 mg CaCO3/L	Anion Sum me/L	Arsenic - filterable_ mg/L	Boron - filterable_ mg/L	Cadmium - filterable_ mg/L	Calcium - total mg/L	Cation Sum me/L	Chloride mg/L	Chromium - filterable_ mg/L	Cobalt - filterable_ mg/L	Copper - filterable_ mg/L	Cyanide_ mg/L	Electrical Conductivity µS/cm - lab	Fluoride_ mg/L	Iron- filterable_ mg/L	Lead - filterable_ mg/L	Magnesium - total mg/L	Manganese - filterable_ mg/L	Nickel - filterable_ mg/L	Nitrates_ mg/L N	pH - lab	Phosphorus - total_ mg/L	Potassium - total mg/L	Selenium - filterable_ mg/L	Silver - filterable_ mg/L	Sodium - total mg/L	Sulfates mg/L	Temperature	Total Dissolved Solids @ 180°C_ mg/L	Total Nitrogen_ mg/L N	Zinc - filterable_ mg/L
PZ106B	Sep-12																																		
PZ106B	Oct-12																																		
PZ106B	Nov-12																1,500							5.3							20	1,050		
PZ106B	Dec-12																																		
PZ106B	Jan-13																																		
PZ106B	Feb-13																																		
PZ106B	Mar-13																																		
PZ106B	Apr-13	10	<1	<1	10		<0.001	<0.05	0.00590			576	<0.001	0.0450	<0.001		2,010	<0.1	<0.05	<0.001		1.02	0.076	<0.01	5.2	<0.01		<0.01	<0.001		40	18	1,120	0.10	0.184
PZ106B	May-13																																		
PZ106B	Jun-13																																		
PZ106B	Jul-13																																		
PZ106B	Aug-13																																		
	min																1,500								5.2										
	median																1,755								5.3										
	max																2,010								5.3										
PZ107	Sep-12																																		
PZ107	Oct-12																610							6.2							23	338		
PZ107	Nov-12																																		
PZ107	Dec-12																																		
PZ107	Jan-13																																		
PZ107	Feb-13																																		
PZ107	Mar-13																																		
PZ107	Apr-13	117	<1	<1	117		<0.001	<0.05	<0.0001			88	<0.001	<0.001	<0.001		658	0.2	<0.05	<0.001		0.01	0.004	0.12	6.2	0.06		<0.01	<0.001		49	20	362	0.10	0.092
PZ107	May-13																																		
PZ107	Jun-13																																		
PZ107	Jul-13																																		
PZ107	Aug-13																																		
	min																610								6.2										
	median																634								6.2										
	max																658								6.2										
PZ108R	Sep-12																																		
PZ108R	Oct-12	98	<1	<1	98	4.08	<0.001	<0.05	<0.0001	14	4.09	70	0.001	<0.001	0.0010	<0.004	360	0.1	<0.05	<0.001	20	0.01	0.005	0.29	7.2	0.02	2.0	<0.01	<0.001	39	7	19	212	0.50	0.048
PZ108R	Nov-12																																		
PZ108R	Dec-12																																		
PZ108R	Jan-13						<0.001	<0.05	<0.0001	11		65	0.001	<0.001	0.0020		410	0.1	<0.05	<0.001	18	0.01	0.005	0.33	6.1		3.0	<0.01	<0.001	41	6	20	238	0.70	0.032
PZ108R	Feb-13																																		
PZ108R	Mar-13																																		
PZ108R	Apr-13	85	<1	<1	85		<0.001	<0.05	<0.0001			61	0.001	<0.001	<0.001		413	0.2	<0.05	0.00200		0.00	0.004	0.27	6.3	0.04		<0.01	<0.001		7	20	204	0.50	0.024
PZ108R	May-13																																		
PZ108R	Jun-13																																		
PZ108R	Jul-13																																		
PZ108R	Aug-13																																		
	min																360								6.1										
	median																410								6.3										
	max																413								7.2										
PZ109	Sep-12																																		
PZ109	Oct-12	No Sample Bailer Stuck in Bore																																		
PZ109	Nov-12																																		
PZ109	Dec-12																																		
PZ109	Jan-13																																		
PZ109	Feb-13																																		
PZ109	Mar-13																																		
PZ109	Apr-13	448	<1	<1	448		<0.001	0.06	<0.0001			55	<0.001	<0.001	<0.001		1,088	1.9	0.36	<0.001		0.01	<0.001	<0.01	7.4	0.02		<0.01	<0.001		<1	20	632	1.50	0.007
PZ109	May-13																																		
PZ109	Jun-13																																		
PZ109	Jul-13																																		
PZ109	Aug-13																																		
	min																1,088								7.4										
	median																1,088								7.4										
	max																1,088								7.4										

Sample Location	Sample Date	Alkalinity - Bicarbonate mg CaCO3/L	Alkalinity - Carbonate mg CaCO3/L	Alkalinity - Hydroxide mg CaCO3/L	Alkalinity - Total as CaCO3 mg CaCO3/L	Anion Sum meL	Arsenic - filterable_ mg/L	Boron - filterable_ mg/L	Cadmium - filterable_ mg/L	Calcium - total mg/L	Cation Sum meL	Chloride mg/L	Chromium - filterable_ mg/L	Cobalt - filterable_ mg/L	Copper - filterable_ mg/L	Cyanide_ mg/L	Electrical Conductivity µS/cm - lab	Fluoride_ mg/L	Iron- filterable_ mg/L	Lead - filterable_ mg/L	Magnesium - total mg/L	Manganese - filterable_ mg/L	Nickel - filterable_ mg/L	Nitrates_ mg/L N	pH - lab	Phosphorus - total_ mg/L	Potassium - total mg/L	Selenium - filterable_ mg/L	Silver - filterable_ mg/L	Sodium - total mg/L	Sulfates mg/L	Temperature	Total Dissolved Solids @ 180°C_ mg/L	Total Nitrogen_ mg/L N	Zinc - filterable_ mg/L
PZ111	Sep-12																																		
PZ111	Oct-12																770							6.0							21	584		
PZ111	Nov-12																																		
PZ111	Dec-12																																		
PZ111	Jan-13																																		
PZ111	Feb-13																																		
PZ111	Mar-13																																		
PZ111	Apr-13	37	<1	<1	37		<0.001	<0.05	<0.0001			265	<0.001	0.0260	<0.001		1,018	0.1	31.10	<0.001		1.02	0.073	<0.01	6.0	<0.01		<0.01	<0.001		13	19	622	0.10	0.032
PZ111	May-13																																		
PZ111	Jun-13																																		
PZ111	Jul-13																																		
PZ111	Aug-13																																		
	min																770							6.0										
	median																894							6.0										
	max																1,018							6.0										
PZ112B	Sep-12																																		
PZ112B	Oct-12																1,800							5.7							17	1,140		
PZ112B	Nov-12																																		
PZ112B	Dec-12																																		
PZ112B	Jan-13																																		
PZ112B	Feb-13																																		
PZ112B	Mar-13																																		
PZ112B	Apr-13	6	<1	<1	6		<0.001	<0.05	0.00020			357	<0.001	0.0130	<0.001		1,854	<0.1	<0.05	<0.001		0.07	0.043	1.70	5.1	<0.01		<0.01	<0.001		368	20	1,060	2.20	0.056
PZ112B	May-13																																		
PZ112B	Jun-13																																		
PZ112B	Jul-13																																		
PZ112B	Aug-13																																		
	min																1,800							5.1										
	median																1,827							5.4										
	max																1,854							5.7										
PZ131	Sep-12																																		
PZ131	Oct-12																																		
PZ131	Nov-12																1,640							6.6							20	4,790		
PZ131	Dec-12																																		
PZ131	Jan-13						0.001	<0.05	<0.0001	469		1,400	<0.001	<0.001	0.0010		4,420	0.2	10.90	<0.001	387	0.34	0.002	0.01	6.4		82.0	<0.01	<0.001	566	1,260	23	4,480	0.90	0.016
PZ131	Feb-13																																		
PZ131	Mar-13																																		
PZ131	Apr-13	421	<1	<1	421		<0.001	<0.05	<0.0001			1,230	<0.001	<0.001	<0.001		6,210	0.2	9.79	<0.001		0.32	0.001	0.01	6.5	<0.01		<0.01	<0.001		1,250	19	4,030	0.90	0.016
PZ131	May-13																																		
PZ131	Jun-13																																		
PZ131	Jul-13																																		
PZ131	Aug-13																																		
	min																1,640							6.4										
	median																4,420							6.5										
	max																6,210							6.6										
PZ134	Sep-12																																		
PZ134	Oct-12																																		
PZ134	Nov-12																1,750							6.5							20	2,460		
PZ134	Dec-12																																		
PZ134	Jan-13						<0.001	<0.05	<0.0001	140		1,190	<0.001	0.0030	0.0020		2,070	<0.1	73.50	<0.001	116	2.33	0.007	0.01	6.4		66.0	<0.01	<0.001	554	301	21	2,470	1.40	0.032
PZ134	Feb-13																																		
PZ134	Mar-13																																		
PZ134	Apr-13	<1	<1	<1	<1		<0.001	<0.05	<0.0001			1,060	<0.001	0.0040	<0.001		5700	<0.1	45.60	<0.001		2.19	0.007	<0.01	5.7	<0.01		<0.01	<0.001		385	19	2,460	1.30	0.036
PZ134	May-13																																		
PZ134	Jun-13																																		
PZ134	Jul-13																																		
PZ134	Aug-13																																		
	min																1,750							5.7										
	median																2,070							6.4										
	max																5700							6.5										

Sample Location	Sample Date	Alkalinity - Bicarbonate mg CaCO3/L	Alkalinity - Carbonate mg CaCO3/L	Alkalinity - Hydroxide mg CaCO3/L	Alkalinity - Total as CaCO3 mg CaCO3/L	Anion Sum me/L	Arsenic - filterable_ mg/L	Boron - filterable_ mg/L	Cadmium - filterable_ mg/L	Calcium - total mg/L	Cation Sum me/L	Chloride mg/L	Chromium - filterable_ mg/L	Cobalt - filterable_ mg/L	Copper - filterable_ mg/L	Cyanide_ mg/L	Electrical Conductivity µS/cm - lab	Fluoride_ mg/L	Iron- filterable_ mg/L	Lead - filterable_ mg/L	Magnesium - total mg/L	Manganese - filterable_ mg/L	Nickel - filterable_ mg/L	Nitrates_ mg/L N	pH - lab	Phosphorus - total_ mg/L	Potassium - total mg/L	Selenium - filterable_ mg/L	Silver - filterable_ mg/L	Sodium - total mg/L	Sulfates mg/L	Temperature	Total Dissolved Solids @ 180°C_ mg/L	Total Nitrogen_ mg/L N	Zinc - filterable_ mg/L
PZ137	Sep-12																																		
PZ137	Oct-12																																		
PZ137	Nov-12																1,540								5.5							18	1,150		
PZ137	Dec-12																																		
PZ137	Jan-13						<0.001	<0.05	<0.0001	86		763	<0.001	0.0110	0.0010		1,860	<0.1	24.40	<0.001	94	1.61	0.022	0.08	5.9		45.0	<0.01	<0.001	288	58	21	1,530	0.80	0.073
PZ137	Feb-13																																		
PZ137	Mar-13																																		
PZ137	Apr-13	1	<1	<1	1		<0.001	<0.05	<0.0001			636	<0.001	0.0080	<0.001		2285	<0.1	<0.05	<0.001		1.19	0.018	0.22	4.5	<0.01		<0.01	<0.001		54	18	1,370	0.60	0.065
PZ137	May-13																																		
PZ137	Jun-13																																		
PZ137	Jul-13																																		
PZ137	Aug-13																																		
	min																1,540								4.5										
	median																1,860								5.5										
	max																2285								5.9										
PZ141	Sep-12																																		
PZ141	Oct-12																																		
PZ141	Nov-12																1,200								5.0							17	818		
PZ141	Dec-12																																		
PZ141	Jan-13						0.009	<0.05	0.00030	8		655	<0.001	0.0390	0.0020		1,720	0.1	4.08	<0.001	44	0.34	0.090	0.02	4.8		20.0	<0.01	<0.001	391	75	19	1,120	0.70	0.274
PZ141	Feb-13																																		
PZ141	Mar-13																																		
PZ141	Apr-13	<1	<1	<1	<1		0.012	<0.05	0.00020			643	<0.001	0.0400	<0.001		2,480	0.2	3.60	<0.001		0.33	0.094	0.06	4.5	0.06		<0.01	<0.001		83	18	1,240	0.80	0.280
PZ141	May-13																																		
PZ141	Jun-13																																		
PZ141	Jul-13																																		
PZ141	Aug-13																																		
	min																1,200								4.5										
	median																1,720								4.8										
	max																2,480								5.0										
PZ149	Sep-12																																		
PZ149	Oct-12																																		
PZ149	Nov-12																3,350								6.5							20	2,800		
PZ149	Dec-12																																		
PZ149	Jan-13						0.004	0.07	<0.0001	202		1,260	<0.001	0.0010	<0.001		3,800	0.1	2.04	<0.001	260	4.96	0.003	<0.01	6.5		58.0	<0.01	<0.001	463	106	20	2,800	3.30	<0.005
PZ149	Feb-13																																		
PZ149	Mar-13																																		
PZ149	Apr-13	447	<1	<1	447		0.010	0.07	<0.0001			1,130	<0.001	0.0020	<0.001		5,080	0.2	2.77	<0.001		6.35	0.006	<0.01	6.5	0.31		<0.01	<0.001		512	17	2,930	2.80	0.018
PZ149	May-13																																		
PZ149	Jun-13																																		
PZ149	Jul-13																																		
PZ149	Aug-13																																		
	min																3,350								6.5										
	median																3,800								6.5										
	max																5,080								6.5										
PZ150	Sep-12																																		
PZ150	Oct-12	No sample collected due to collapsed casing																																	
PZ150	Nov-12																																		
PZ150	Dec-12																																		
PZ150	Jan-13	No sample collected due to collapsed casing																																	
PZ150	Feb-13																																		
PZ150	Mar-13																																		
PZ150	Apr-13	No sample collected due to collapsed casing																																	
PZ150	May-13																																		
PZ150	Jun-13																																		
PZ150	Jul-13	No sample collected due to collapsed casing																																	
PZ150	Aug-13																																		
	min																NA								NA										
	median																NA								NA										
	max																NA								NA										

Sample Location	Sample Date	Alkalinity - Bicarbonate mg CaCO3/L	Alkalinity - Carbonate mg CaCO3/L	Alkalinity - Hydroxide mg CaCO3/L	Alkalinity - Total as CaCO3 mg CaCO3/L	Anion Sum me/L	Arsenic - filterable_ mg/L	Boron - filterable_ mg/L	Cadmium - filterable_ mg/L	Calcium - total mg/L	Cation Sum me/L	Chloride mg/L	Chromium - filterable_ mg/L	Cobalt - filterable_ mg/L	Copper - filterable_ mg/L	Cyanide_ mg/L	Electrical Conductivity µS/cm - lab	Fluoride_ mg/L	Iron- filterable_ mg/L	Lead - filterable_ mg/L	Magnesium - total mg/L	Manganese - filterable_ mg/L	Nickel - filterable_ mg/L	Nitrates_ mg/L N	pH - lab	Phosphorus - total_ mg/L	Potassium - total mg/L	Selenium - filterable_ mg/L	Silver - filterable_ mg/L	Sodium - total mg/L	Sulfates mg/L	Temperature	Total Dissolved Solids @ 180°C_ mg/L	Total Nitrogen_ mg/L N	Zinc - filterable_ mg/L
PZ151	Sep-12																																		
PZ151	Oct-12																810								6.2							22	328		
PZ151	Nov-12																																		
PZ151	Dec-12																																		
PZ151	Jan-13																																		
PZ151	Feb-13																																		
PZ151	Mar-13																																		
PZ151	Apr-13	131	<1	<1	131		<0.001	<0.05	<0.0001			166	<0.001	<0.001	0.0010		958	0.2	0.19	<0.001		0.01	0.005	0.44	6.3	0.02		<0.01	<0.001		54	20	498	0.60	0.072
PZ151	May-13																																		
PZ151	Jun-13																																		
PZ151	Jul-13																																		
PZ151	Aug-13																																		
	min																810								6.2										
	median																884								6.3										
	max																958								6.3										
PZ152	Sep-12																																		
PZ152	Oct-12																5,250								5.5							17	4,260		
PZ152	Nov-12																																		
PZ152	Dec-12																																		
PZ152	Jan-13						0.001	<0.05	0.00170	151		1,900	<0.001	0.3030	0.0020		4,840	<0.1	57.40	<0.001	193	17.70	1.070	<0.10	5.6		57.0	<0.01	<0.001	759	181	22	3,640	0.60	1.120
PZ152	Feb-13																																		
PZ152	Mar-13																																		
PZ152	Apr-13	<1	<1	<1	<1		0.001	<0.05	0.00190			1,810	<0.001	0.3250	<0.001		6,070	<0.1	64.10	<0.001		19.40	1.120	<0.01	5.6	<0.01		0.010	<0.001		185	18	3,400	0.30	1.110
PZ152	May-13																																		
PZ152	Jun-13																																		
PZ152	Jul-13																																		
PZ152	Aug-13																																		
	min																4,840								5.5										
	median																5,250								5.6										
	max																6,070								5.6										
PZ155	Sep-12																																		
PZ155	Oct-12	No sample could be collected as the site was dry																																	
PZ155	Nov-12																																		
PZ155	Dec-12																																		
PZ155	Jan-13	No sample could be collected as the site was dry																																	
PZ155	Feb-13																																		
PZ155	Mar-13																																		
PZ155	Apr-13	No sample could be collected as the site was dry																																	
PZ155	May-13																																		
PZ155	Jun-13																																		
PZ155	Jul-13																																		
PZ155	Aug-13																																		
	min																NA								NA										
	median																NA								NA										
	max																NA								NA										
PZ156	Sep-12																																		
PZ156	Oct-12																670								5.9							22	344		
PZ156	Nov-12																																		
PZ156	Dec-12																																		
PZ156	Jan-13						0.001	<0.05	<0.0001	24		172	<0.001	0.0130	<0.001		690	0.1	5.76	<0.001	21	0.32	0.057	0.04	6.1		12.0	<0.01	<0.001	62	27	23	322	0.40	0.015
PZ156	Feb-13																																		
PZ156	Mar-13																																		
PZ156	Apr-13	44	<1	<1	44		0.002	<0.05	<0.0001			172	<0.001	0.0140	<0.001		744	0.1	6.34	<0.001		0.32	0.062	<0.01	6.0	0.01		<0.01	<0.001		32	20	408	0.20	0.013
PZ156	May-13																																		
PZ156	Jun-13																																		
PZ156	Jul-13																																		
PZ156	Aug-13																																		
	min																670								5.9										
	median																690								6.0										
	max																744								6.1										

Sample Location	Sample Date	Alkalinity - Bicarbonate mg CaCO3/L	Alkalinity - Carbonate mg CaCO3/L	Alkalinity - Hydroxide mg CaCO3/L	Alkalinity - Total as CaCO3 mg CaCO3/L	Anion Sum me/L	Arsenic - filterable_ mg/L	Boron - filterable_ mg/L	Cadmium - filterable_ mg/L	Calcium - total mg/L	Cation Sum me/L	Chloride mg/L	Chromium - filterable_ mg/L	Cobalt - filterable_ mg/L	Copper - filterable_ mg/L	Cyanide_ mg/L	Electrical Conductivity µS/cm - lab	Fluoride_ mg/L	Iron- filterable_ mg/L	Lead - filterable_ mg/L	Magnesium - total mg/L	Manganese - filterable_ mg/L	Nickel - filterable_ mg/L	Nitrates_ mg/L N	pH - lab	Phosphorus - total_ mg/L	Potassium - total mg/L	Selenium - filterable_ mg/L	Silver - filterable_ mg/L	Sodium - total mg/L	Sulfates mg/L	Temperature	Total Dissolved Solids @ 180°C_ mg/L	Total Nitrogen_ mg/L N	Zinc - filterable_ mg/L
PZ157	Sep-12																																		
PZ157	Oct-12																760								6.0							21	448		
PZ157	Nov-12																																		
PZ157	Dec-12																																		
PZ157	Jan-13						<0.001	<0.05	<0.0001	42		166	<0.001	0.0040	<0.001		780	0.1	0.16	<0.001	37	0.16	0.021	0.03	6.2		10.0	<0.01	<0.001	47	18	24	446	0.30	0.026
PZ157	Feb-13																																		
PZ157	Mar-13																																		
PZ157	Apr-13	141	<1	<1	141		<0.001	<0.05	<0.0001			146	<0.001	0.0020	<0.001		838	0.3	1.58	<0.001		0.12	0.016	0.02	6.4	0.01		<0.01	<0.001		29	19	456	<0.1	0.024
PZ157	May-13																																		
PZ157	Jun-13																																		
PZ157	Jul-13																																		
PZ157	Aug-13																																		
	min																760								6.0										
	median																780								6.2										
	max																838								6.4										
PZ164	Sep-12																																		
PZ164	Oct-12																170								5.0							19	253		
PZ164	Nov-12																																		
PZ164	Dec-12																																		
PZ164	Jan-13						<0.001	<0.05	0.00020	2		46	<0.001	0.0180	0.0070		300	<0.1	0.14	0.00200	6	0.05	0.022	0.60	5.8		4.0	<0.01	<0.001	32	15	21	186	1.70	0.117
PZ164	Feb-13																																		
PZ164	Mar-13																																		
PZ164	Apr-13	<1	<1	<1	<1		<0.001	<0.05	0.00040			58	<0.001	0.0210	0.0060		260	<0.1	0.09	0.00200		0.05	0.029	0.79	4.4	<0.01		<0.01	<0.001		16	18	188	1.50	0.149
PZ164	May-13																																		
PZ164	Jun-13																																		
PZ164	Jul-13																																		
PZ164	Aug-13																																		
	min																170								4.4										
	median																260								5.0										
	max																300								5.8										
PZ165	Sep-12																																		
PZ165	Oct-12																90								5.4							16	56		
PZ165	Nov-12																																		
PZ165	Dec-12																																		
PZ165	Jan-13						<0.001	0.05	<0.0001	2		11	<0.001	0.0120	0.0040		130	<0.1	0.08	<0.001	3	0.03	0.007	5.91	5.3		5.0	<0.01	<0.001	10	4	24	104	7.80	0.014
PZ165	Feb-13																																		
PZ165	Mar-13																																		
PZ165	Apr-13	3	<1	<1	3		<0.001	<0.05	<0.0001			8	0.001	0.0050	0.0040		81	<0.1	0.28	<0.001		0.01	0.003	2.03	5.1	0.10		<0.01	<0.001		21	19	355	3.50	0.019
PZ165	May-13																																		
PZ165	Jun-13																																		
PZ165	Jul-13																																		
PZ165	Aug-13																																		
	min																81								5.1										
	median																90								5.3										
	max																130								5.4										
PZ168	Sep-12																																		
PZ168	Oct-12																650								6.5							22	326		
PZ168	Nov-12																																		
PZ168	Dec-12																																		
PZ168	Jan-13						<0.001	<0.05	<0.0001	43		115	<0.001	<0.001	0.0010		660	<0.1	<0.05	<0.001	39	0.00	<0.001	0.20	6.5		12.0	<0.01	<0.001	43	8	22	376	0.40	0.028
PZ168	Feb-13																																		
PZ168	Mar-13																																		
PZ168	Apr-13	173	<1	<1	173		<0.001	<0.05	<0.0001			100	<0.001	<0.001	0.0010		722	<0.1	<0.05	<0.001		0.00	0.002	0.20	6.6	<0.01		<0.01	<0.001		10	19	394	0.20	0.039
PZ168	May-13																																		
PZ168	Jun-13																																		
PZ168	Jul-13																																		
PZ168	Aug-13																																		
	min																650								6.5										
	median																660								6.5										
	max																722								6.6										

Sample Location	Sample Date	Alkalinity - Bicarbonate mg CaCO3/L	Alkalinity - Carbonate mg CaCO3/L	Alkalinity - Hydroxide mg CaCO3/L	Alkalinity - Total as CaCO3 mg CaCO3/L	Anion Sum me/L	Arsenic - filterable_ mg/L	Boron - filterable_ mg/L	Cadmium - filterable_ mg/L	Calcium - total mg/L	Cation Sum me/L	Chloride mg/L	Chromium - filterable_ mg/L	Cobalt - filterable_ mg/L	Copper - filterable_ mg/L	Cyanide_ mg/L	Electrical Conductivity µS/cm - lab	Fluoride_ mg/L	Iron- filterable_ mg/L	Lead - filterable_ mg/L	Magnesium - total mg/L	Manganese - filterable_ mg/L	Nickel - filterable_ mg/L	Nitrates_ mg/L N	pH - lab	Phosphorus - total_ mg/L	Potassium - total mg/L	Selenium - filterable_ mg/L	Silver - filterable_ mg/L	Sodium - total mg/L	Sulfates mg/L	Temperature	Total Dissolved Solids @ 180°C_ mg/L	Total Nitrogen_ mg/L N	Zinc - filterable_ mg/L
PZ170	Sep-12																																		
PZ170	Oct-12																3,480								6.3							21	3,060		
PZ170	Nov-12																																		
PZ170	Dec-12																																		
PZ170	Jan-13						<0.001	<0.05	<0.0001	231		1,490	<0.001	0.0210	0.0020		2,040	<0.1	4.36	<0.001	244	0.26	0.148	0.02	6.3		32.0	<0.01	<0.001	432	22	23	2,900	1.40	0.023
PZ170	Feb-13																																		
PZ170	Mar-13																																		
PZ170	Apr-13	162	<1	<1	162		<0.001	<0.05	<0.0001			1,370	<0.001	0.0200	<0.001		4770	<0.1	2.91	<0.001		0.25	0.157	<0.01	6.1	0.02		<0.01	0.001		33	19	3,180	0.20	0.333
PZ170	May-13																																		
PZ170	Jun-13																																		
PZ170	Jul-13																																		
PZ170	Aug-13																																		
	min																2,040								6.1										
	median																3,480								6.3										
	max																4770								6.3										
PZ172	Sep-12																																		
PZ172	Oct-12																5,750								6.9							19	4,580		
PZ172	Nov-12																																		
PZ172	Dec-12																																		
PZ172	Jan-13						0.001	<0.05	0.00290	164		2,880	<0.001	0.0400	0.0020		5,390	0.3	<0.05	<0.001	527	0.53	0.292	0.38	6.2		2.0	<0.01	<0.001	1,080	126	21	4,660	0.60	0.654
PZ172	Feb-13																																		
PZ172	Mar-13																																		
PZ172	Apr-13	404	<1	<1	404		0.001	<0.05	0.00270			2,580	<0.001	0.0280	0.0080		8020	0.4	<0.05	<0.001		0.42	0.295	0.51	6.5	0.02		<0.01	<0.001		137	19	4,230	0.80	0.648
PZ172	May-13																																		
PZ172	Jun-13																																		
PZ172	Jul-13																																		
PZ172	Aug-13																																		
	min																5,390								6.2										
	median																5,750								6.5										
	max																8020								6.9										
PZ173	Sep-12																																		
PZ173	Oct-12	No sample was collected as the site was dry																																	
PZ173	Nov-12																																		
PZ173	Dec-12																																		
PZ173	Jan-13	No sample was collected as the site was dry																																	
PZ173	Feb-13																																		
PZ173	Mar-13																																		
PZ173	Apr-13	No sample was collected as the site was dry																																	
PZ173	May-13																																		
PZ173	Jun-13																																		
PZ173	Jul-13																																		
PZ173	Aug-13																																		
	min																NA								NA										
	median																NA								NA										
	max																NA								NA										
PZ174	Sep-12																																		
PZ174	Oct-12																8,320								6.3							19	7,790		
PZ174	Nov-12																																		
PZ174	Dec-12																																		
PZ174	Jan-13						<0.001	<0.05	0.00010	244		4,780	<0.001	0.1780	0.0030		7,020	0.6	0.27	<0.001	846	1.10	0.093	0.03	6.2		6.0	<0.01	<0.001	1,820	439	20	8,210	0.50	0.077
PZ174	Feb-13																																		
PZ174	Mar-13																																		
PZ174	Apr-13	389	<1	<1	389		<0.001	<0.05	<0.0001			4,300	<0.001	0.1760	<0.001		12860	0.7	0.12	<0.001		1.13	0.089	<0.01	6.2	<0.01		<0.01	<0.001		550	19	7,490	0.30	0.066
PZ174	May-13																																		
PZ174	Jun-13																																		
PZ174	Jul-13																																		
PZ174	Aug-13																																		
	min																7,020								6.2										
	median																8,320								6.2										
	max																12860								6.3										

Sample Location	Sample Date	Alkalinity - Bicarbonate mg CaCO3/L	Alkalinity - Carbonate mg CaCO3/L	Alkalinity - Hydroxide mg CaCO3/L	Alkalinity - Total as CaCO3 mg CaCO3/L	Anion Sum me/L	Arsenic - filterable_ mg/L	Boron - filterable_ mg/L	Cadmium - filterable_ mg/L	Calcium - total mg/L	Cation Sum me/L	Chloride mg/L	Chromium - filterable_ mg/L	Cobalt - filterable_ mg/L	Copper - filterable_ mg/L	Cyanide_ mg/L	Electrical Conductivity µS/cm - lab	Fluoride_ mg/L	Iron- filterable_ mg/L	Lead - filterable_ mg/L	Magnesium - total mg/L	Manganese - filterable_ mg/L	Nickel - filterable_ mg/L	Nitrates_ mg/L N	pH - lab	Phosphorus - total_ mg/L	Potassium - total mg/L	Selenium - filterable_ mg/L	Silver - filterable_ mg/L	Sodium - total mg/L	Sulfates mg/L	Temperature	Total Dissolved Solids @ 180°C_ mg/L	Total Nitrogen_ mg/L N	Zinc - filterable_ mg/L
PZ175	Sep-12																																		
PZ175	Oct-12																1,120								7.0							18	668		
PZ175	Nov-12																																		
PZ175	Dec-12																																		
PZ175	Jan-13						<0.001	<0.05	<0.0001	6		398	0.002	0.0040	0.0090		1,250	0.2	0.15	<0.001	61	0.03	0.006	2.08	6.9		8.0	<0.01	<0.001	175	41	21	632	7.40	0.033
PZ175	Feb-13																																		
PZ175	Mar-13																																		
PZ175	Apr-13	31	<1	<1	31		<0.001	<0.05	<0.0001			350	0.002	0.0050	0.0120		1,330	0.2	0.17	<0.001		0.04	0.008	4.12	6.2	0.26		<0.01	<0.001		40	19	670	6.50	0.044
PZ175	May-13																																		
PZ175	Jun-13																																		
PZ175	Jul-13																																		
PZ175	Aug-13																																		
	min																1,120								6.2										
	median																1,250								6.9										
	max																1,330								7.0										
PZ176	Sep-12																																		
PZ176	Oct-12																680								6.2							19	312		
PZ176	Nov-12																																		
PZ176	Dec-12																																		
PZ176	Jan-13						<0.001	<0.05	<0.0001	19		175	<0.001	<0.001	0.0010		630	<0.1	13.10	<0.001	24	0.21	<0.001	0.01	6.2		5.0	<0.01	<0.001	69	<1	22	284	0.40	0.016
PZ176	Feb-13																																		
PZ176	Mar-13																																		
PZ176	Apr-13	40	<1	<1	40		<0.001	<0.05	<0.0001			164	<0.001	<0.001	<0.001		676	<0.1	11.90	<0.001		0.20	<0.001	<0.01	6.0	0.07		<0.01	<0.001		<1	21	338	0.20	0.008
PZ176	May-13																																		
PZ176	Jun-13																																		
PZ176	Jul-13																																		
PZ176	Aug-13																																		
	min																630								6.0										
	median																676								6.2										
	max																680								6.2										
PZ177	Sep-12																																		
PZ177	Oct-12																4,630								6.5							18	3,260		
PZ177	Nov-12																																		
PZ177	Dec-12																																		
PZ177	Jan-13						<0.001	<0.05	0.00010	29		1,850	<0.001	0.0060	0.0020		4,980	0.7	<0.05	<0.001	164	0.01	0.012	0.05	6.4		<1	<0.01	<0.001	1,210	218	22	3,560	0.40	0.017
PZ177	Feb-13																																		
PZ177	Mar-13																																		
PZ177	Apr-13	209	<1	<1	209		<0.001	<0.05	<0.0001			1,690	<0.001	0.0060	<0.001		6,250	0.8	0.05	<0.001		0.01	0.012	0.02	6.6	0.02		<0.01	<0.001		249	20	3,680	<0.1	0.023
PZ177	May-13																																		
PZ177	Jun-13																																		
PZ177	Jul-13																																		
PZ177	Aug-13																																		
	min																4,630								6.4										
	median																4,980								6.5										
	max																6,250								6.6										
PZ181	Sep-12																																		
PZ181	Oct-12	5	<1	<1	5	0.36	<0.001	<0.05	<0.0001	<1	0.35	7	<0.001	0.0010	0.0010	<0.004	40	<0.1	<0.05	0.00800	<1	0.01	0.002	0.40	7.1	0.06	<1	<0.01	<0.001	8	3	20	50	0.80	0.065
PZ181	Nov-12																																		
PZ181	Dec-12																																		
PZ181	Jan-13						<0.001	<0.05	<0.0001	<1		14	<0.001	<0.001	0.0020		50	<0.1	<0.05	<0.001	<1	0.01	0.002	0.43	5.7		<1	<0.01	<0.001	7	2	21	47	0.80	0.042
PZ181	Feb-13																																		
PZ181	Mar-13																																		
PZ181	Apr-13	3	<1	<1	3		<0.001	<0.05	<0.0001			9	<0.001	<0.001	0.0020		45	<0.1	0.06	<0.001		0.00	0.003	0.56	5.7	<0.01		<0.01	<0.001		3	19	63	0.70	0.037
PZ181	May-13																																		
PZ181	Jun-13																																		
PZ181	Jul-13																																		
PZ181	Aug-13																																		
	min																40								5.7										
	median																45								5.7										
	max																50								7.1										

Sample Location	Sample Date	Alkalinity - Bicarbonate mg CaCO3/L	Alkalinity - Carbonate mg CaCO3/L	Alkalinity - Hydroxide mg CaCO3/L	Alkalinity - Total as CaCO3 mg CaCO3/L	Anion Sum me/L	Arsenic - filterable_ mg/L	Boron - filterable_ mg/L	Cadmium - filterable_ mg/L	Calcium - total mg/L	Cation Sum me/L	Chloride mg/L	Chromium - filterable_ mg/L	Cobalt - filterable_ mg/L	Copper - filterable_ mg/L	Cyanide_ mg/L	Electrical Conductivity µS/cm - lab	Fluoride_ mg/L	Iron- filterable_ mg/L	Lead - filterable_ mg/L	Magnesium - total mg/L	Manganese - filterable_ mg/L	Nickel - filterable_ mg/L	Nitrates_ mg/L N	pH - lab	Phosphorus - total_ mg/L	Potassium - total mg/L	Selenium - filterable_ mg/L	Silver - filterable_ mg/L	Sodium - total mg/L	Sulfates mg/L	Temperature	Total Dissolved Solids @ 180°C_ mg/L	Total Nitrogen_ mg/L N	Zinc - filterable_ mg/L
PZ184	Sep-12																																		
PZ184	Oct-12	<1	<1	<1	<1	31.90	<0.001	<0.05	0.00050	26	34.90	941	<0.001	0.1290	0.0060	<0.004	3,570	0.2	11.20	0.00600	61	0.82	0.216	<0.01	3.5	0.08	9.0	<0.01	<0.001	651	257	18	2,060	1.40	0.356
PZ184	Nov-12																																		
PZ184	Dec-12																																		
PZ184	Jan-13						<0.001	<0.05	0.00040	24		939	0.001	0.1220	0.0070		3,790	0.3	8.51	0.01000	60	0.78	0.200	<0.01	3.6		9.0	<0.01	<0.001	670	295	24	2,030	1.40	0.307
PZ184	Feb-13																																		
PZ184	Mar-13																																		
PZ184	Apr-13	<1	<1	<1	<1		<0.001	<0.05	0.00050			933	0.001	0.1310	0.0070		3,850	0.3	9.91	0.00700		0.87	0.211	0.01	3.4	0.04		<0.01	<0.001		342	20	2,030	1.30	0.317
PZ184	May-13																																		
PZ184	Jun-13																																		
PZ184	Jul-13																																		
PZ184	Aug-13																																		
	min																3,570								3.4										
	median																3,790								3.5										
	max																3,850								3.6										
PZ186	Sep-12																																		
PZ186	Oct-12																																		
PZ186	Nov-12	74	<1	<1	74	3.31	0.028	<0.05	<0.0001	21	3.3	65	<0.001	<0.001	0.002	<0.004	370	0.2	13.4	0.008	11	0.208	0.002	0.03	6.4	0.32	10	<0.01	<0.001	25	<1	17	164	0.3	0.072
PZ186	Dec-12																																		
PZ186	Jan-13						0.011	<0.05	<0.0001	20		65	<0.001	<0.001	<0.001		370	0.2	8.17	<0.001	12	0.22	0.002	0.02	6.4		10.0	<0.01	<0.001	28	1	19	180	0.30	0.007
PZ186	Feb-13																																		
PZ186	Mar-13																																		
PZ186	Apr-13	70	<1	<1	70		0.006	<0.05	<0.0001			63	<0.001	<0.001	<0.001		382	0.2	5.11	<0.001		0.20	0.003	0.05	6.8	0.37		<0.01	<0.001		2	18	270	0.40	0.047
PZ186	May-13																																		
PZ186	Jun-13																																		
PZ186	Jul-13																																		
PZ186	Aug-13																																		
	min																370								6.4										
	median																370								6.4										
	max																382								6.8										
PZ187	Sep-12																																		
PZ187	Oct-12																																		
PZ187	Nov-12	26	<1	<1	26	1.7	0.007	<0.05	<0.0001	<1	1.56	42	0.001	<0.001	0.002	<0.004	190	<0.1	1.35	0.008	1	0.015	0.004	0.01	6.0	<0.01	<1	<0.01	<0.001	34	<1	18	111	0.4	0.047
PZ187	Dec-12																																		
PZ187	Jan-13						0.004	<0.05	<0.0001	<1		33	0.001	<0.001	0.0010		180	<0.1	0.71	<0.001	2	0.02	0.003	0.06	5.7		<1	<0.01	<0.001	33	<1	22	94	0.60	0.021
PZ187	Feb-13																																		
PZ187	Mar-13																																		
PZ187	Apr-13	22	<1	<1	22		0.004	<0.05	<0.0001			33	0.001	<0.001	<0.001		163	<0.1	0.50	<0.001		0.02	0.003	0.30	6.0	0.09		<0.01	<0.001		1	19	136	0.60	0.013
PZ187	May-13																																		
PZ187	Jun-13																																		
PZ187	Jul-13																																		
PZ187	Aug-13																																		
	min																163								5.7										
	median																180								6.0										
	max																190								6.0										
PZ188	Sep-12																																		
PZ188	Oct-12																																		
PZ188	Nov-12	7	<1	<1	7	1.78	<0.001	<0.05	<0.0001	<1	1.64	58	<0.001	0.005	0.002	<0.004	200	<0.1	0.41	0.680	3	0.024	0.015	0.07	5.7	<0.01	<1	<0.01	<0.001	32	<1	17	112	0.3	0.083
PZ188	Dec-12																																		
PZ188	Jan-13						<0.001	<0.05	<0.0001	<1		45	<0.001	0.0040	0.0020		190	<0.1	<0.05	<0.001	3	0.02	0.013	0.03	5.5		<1	<0.01	<0.001	31	<1	20	103	0.20	0.020
PZ188	Feb-13																																		
PZ188	Mar-13																																		
PZ188	Apr-13	8	<1	<1	8		<0.001	<0.05	<0.0001			37	<0.001	0.0030	0.0010		149	<0.1	<0.05	<0.001		0.02	0.012	0.19	5.4	<0.01		<0.01	<0.001		<1	19	126	0.40	0.023
PZ188	May-13																																		
PZ188	Jun-13																																		
PZ188	Jul-13																																		
PZ188	Aug-13																																		
	min																149								5.4										
	median																190								5.5										
	max																200								5.7										

Sample Location	Sample Date	Alkalinity - Bicarbonate mg CaCO3/L	Alkalinity - Carbonate mg CaCO3/L	Alkalinity - Hydroxide mg CaCO3/L	Alkalinity - Total as CaCO3 mg CaCO3/L	Anion Sum me/L	Arsenic - filterable_ mg/L	Boron - filterable_ mg/L	Cadmium - filterable_ mg/L	Calcium - total mg/L	Cation Sum me/L	Chloride mg/L	Chromium - filterable_ mg/L	Cobalt - filterable_ mg/L	Copper - filterable_ mg/L	Cyanide_ mg/L	Electrical Conductivity µS/cm - lab	Fluoride_ mg/L	Iron- filterable_ mg/L	Lead - filterable_ mg/L	Magnesium - total mg/L	Manganese - filterable_ mg/L	Nickel - filterable_ mg/L	Nitrates_ mg/L N	pH - lab	Phosphorus - total_ mg/L	Potassium - total mg/L	Selenium - filterable_ mg/L	Silver - filterable_ mg/L	Sodium - total mg/L	Sulfates mg/L	Temperature	Total Dissolved Solids @ 180°C_ mg/L	Total Nitrogen_ mg/L N	Zinc - filterable_ mg/L
PZ189	Sep-12																																		
PZ189	Oct-12																																		
PZ189	Nov-12	48	<1	<1	48	3.22	<0.001	<0.05	<0.0001	17	3.17	80	<0.001	<0.001	0.002	<0.004	390	0.2	19.5	0.003	11	0.353	<0.001	0.02	6.1	0.14	6	<0.01	<0.001	29	<1	18	180	0.3	0.089
PZ189	Dec-12																																		
PZ189	Jan-13						<0.001	<0.05	<0.0001	16		76	<0.001	<0.001	<0.001		400	0.2	16.40	<0.001	11	0.38	<0.001	0.02	6.3		7.0	<0.01	<0.001	33	1	19	192	0.20	0.016
PZ189	Feb-13																																		
PZ189	Mar-13																																		
PZ189	Apr-13	45	<1	<1	45		<0.001	<0.05	<0.0001			75	<0.001	<0.001	<0.001		389	0.2	13.70	<0.001		0.33	0.001	<0.01	6.1	<0.01		<0.01	<0.001		2	17	229	<0.1	0.027
PZ189	May-13																																		
PZ189	Jun-13																																		
PZ189	Jul-13																																		
PZ189	Aug-13																																		
	min																389								6.1										
	median																390								6.1										
	max																400								6.3										
PZ191	Sep-12																																		
PZ191	Oct-12	11	<1	<1	11	3.00	<0.001	<0.05	0.00010	16	2.93	86	0.005	0.0020	0.0100	<0.004	335	0.2	167.00	0.03800	8	0.45	0.007	0.11	5.0	1.71	5.0	<0.01	<0.001	31	17	19	184	1.20	0.306
PZ191	Nov-12																																		
PZ191	Dec-12																																		
PZ191	Jan-13						<0.001	<0.05	<0.0001	5		63	<0.001	<0.001	0.0060		290	<0.1	15.30	0.00400	5	0.29	0.003	0.04	5.7		4.0	<0.01	<0.001	24	1	23	158	1.40	0.056
PZ191	Feb-13																																		
PZ191	Mar-13																																		
PZ191	Apr-13	<1	<1	<1	<1		0.001	<0.05	<0.0001			78	<0.001	<0.001	<0.001		355	<0.1	27.20	<0.001		0.31	0.002	0.01	6.0	0.99		<0.01	<0.001		<1	20	204	0.30	0.071
PZ191	May-13																																		
PZ191	Jun-13																																		
PZ191	Jul-13																																		
PZ191	Aug-13																																		
	min																290								5.0										
	median																335								5.7										
	max																355								6.0										
TB103	Sep-12																																		
TB103	Oct-12																560								6.7							20	370		
TB103	Nov-12																																		
TB103	Dec-12																																		
TB103	Jan-13																																		
TB103	Feb-13																																		
TB103	Mar-13																																		
TB103	Apr-13	162	<1	<1	162		<0.001	<0.05	<0.0001			107	<0.001	<0.001	<0.001		676	0.8	0.86	<0.001		0.08	0.002	<0.01	6.9	<0.01		<0.01	<0.001		3	18	386	0.20	0.005
TB103	May-13																																		
TB103	Jun-13																																		
TB103	Jul-13																																		
TB103	Aug-13																																		
	min																560								6.7										
	median																618								6.8										
	max																676								6.9										
TB105	Sep-12																																		
TB105	Oct-12																600								7.3							18	404		
TB105	Nov-12																																		
TB105	Dec-12																																		
TB105	Jan-13																																		
TB105	Feb-13																																		
TB105	Mar-13																																		
TB105	Apr-13	288	<1	<1	288		<0.001	<0.05	<0.0001			42	<0.001	<0.001	<0.001		730	1.7	<0.05	<0.001		0.01	<0.001	<0.01	7.5	<0.01		<0.01	<0.001		<1	19	378	0.70	0.006
TB105	May-13																																		
TB105	Jun-13																																		
TB105	Jul-13																																		
TB105	Aug-13																																		
	min																600								7.3										
	median																665								7.4										
	max																730								7.5										

The results highlighted in red indicate the results are outside the maximum results reported for background groundwater quality or are above the ANZECC guidelines and require further investigation into the cause of the result. The results in yellow are between the 80th percentile value and the maximum results or ANZECC guidelines and act as an early warning system that further investigations may be required. The outcomes of any investigations are discussed further in **Section 3.7.2**. The blue shading indicates that the sample was not due for collection.

Appendix 5: Community Complaints

Number	Date	Location	Issue	Investigation and Follow Up
1.	3rd September 2012	Ulan Road	Traffic	The complainant rang to complain about a truck that passed the school bus at the Ulan Rd/Ridge Rd intersection (closest to the mines) going in excess of 100km/hr. The truck was passing at such a speed that it shook the bus causing the child whom was entering the bus at the time to fall back-out and land on their backside.
2.	9th September 2012	Ulan Road	Noise	The complainant rang to complain about noise at 9:40pm on 09/09/12. There were follow up phone calls at 11:05pm on 09/09/12, 2:40am on 10/09/12 and 4:20am on 10/09/12. <u>9:40pm complaint</u> Low frequency noise at Lagoons Road was 37.1dB and 34.3dB at Winchester Cres. The EP assistant parked at Winchester South parking bay at 9:55pm. Mine hum was very faintly audible. Road traffic constant and dominant sound. Dogs barking and crickets also audible. When no traffic, handheld noise monitor averaged 29-33dB. No distinguishable equipment identified. <u>11:05pm complaint</u> Low frequency noise at Lagoons Road was 39.2dB and 24.2dB at Winchester Cres. The OCE streamed the audio from the real-time noise monitors and shut down EX102, dozers and trucks to monitor levels. At 11:20pm the EP assistant parked at Winchester South parking bay. Mine rumble audible, but no distinguishable equipment identified. Handheld noise monitors averaged 29-31dB. <u>2:40am complaint</u> Low frequency noise at Lagoons Road was 35.8dB and 27.2dB at Winchester Cres. The EP assistant parked at Winchester South parking bay at 2:55am. Mine rumble dominant sound. No distinguishable equipment identified. Handheld noise monitors averaged 29-32dB. <u>4:20am complaint</u> Low frequency noise at Lagoons Road was 38.8dB and 28.6dB at Winchester Cres.
3.	10th September 2012	Maiala Road	Noise	The complainant rang at 8:50am on 10/09/12 to complain about noise from the night before (3am). Low frequency noise at 3am was 39.3dB at Lagoons Road and 31.4dB at Winchester Cres. There was no wind present. The EP assistant was parked at Winchester South parking bay at 2:55am. Mine rumble was the dominant sound. No distinguishable equipment was identified. Handheld noise monitor averaged 29-

Number	Date	Location	Issue	Investigation and Follow Up
				32dB. The EP assistant parked at Lagoons Rd at 3:10am. Mine rumble was the dominant sound from MCO direction. They could hear first loads quite loudly and a continual revving sound (digger or loader). The ECRC emailed a response to the complainant the following day.
4.	13th September 2012	Ulan Road	Noise	The complainant rang to complain about noise at 04:40am on 13/09/12. EX101 was operating in S04 B16 with OB hauling to 480RL dump. EX111 was operating in S02 B10 hauling coal to ROM. Low frequency noise at Lagoons Road was between 35.9dB and 37.9dB and between 28.4dB and 30.9dB at Winchester Cres. Wind speed was 0.4m/s from WSW. The complainant could not be contacted the following day to discuss their complaint.
5.	16th September 2012	Ulan Road	Noise	The complainant rang to complain about noise at 12:16am on 16/09/12. There were follow up calls at 1:34am, 2:41am and 4:50am on 16/09/12. <u>12:16am complaint</u> Low frequency noise at Lagoons Road was between 34.9-38.0dB and between 31.4-33.6dB at Winchester Cres. The handheld noise monitor at the complaint location recorded noise levels between 27.7-30.6dB. <u>1:34am complaint</u> Low frequency noise at Lagoons Road was between 33.9-37.5dB and between 31.2-32.6dB at Winchester Cres. The handheld noise monitor at the complaint location recorded noise levels between 26.2-30.2dB. <u>2:41am complaint</u> Low frequency noise at Lagoons Road was between 32.9-33.4dB and between 29.9-30.2dB at Winchester Cres. The handheld noise monitor at the complaint location recorded noise levels between 24.1-28.2dB. <u>4:50am complaint</u> Low frequency noise at Lagoons Road was 36.1dB and 25.0dB at Winchester Cres. The EP assistant was in the area approx half an hour prior to first complaint and noted regular road traffic with mine noise faintly audible. The EP assistant attended the complaint location after each complaint and noted road traffic, crickets, cows, dogs barking and wind whistling audible. Mine hum was faintly audible for the first complaint at 12:16am. Mine hum was faintly audible with crickets audible and dominant at 1:34am and was quieter than

Number	Date	Location	Issue	Investigation and Follow Up
				previous visit. Mine hum was faintly audible with occasional dozer track and crickets were audible and dominant at 2:41am. Complainant mentions decibel readings in complaints indicating the noise increased over the period of the three complaints; however noise actually decreased and was also observed to decrease by the EP assistant. The EP assistant also noted mine noise from Wilpinjong throughout the night. The complainant was contacted on 17/09/12. The complainant did not agree with the noise results from our units and did not agree with our observations. The complainant commented that they don't believe anything they are being told and requested that MCO stop contacting them.
6.	17th September 2012	Moolarben Road	Noise	The complainant rang to complain about noise on 17/09/12 at 9:05am to complain about noise. EX101 was operating in S03B14 with OB being hauled to 450RL dump. EX102 was operating in S03B14 with OB being hauled to 450RL dump. EX111 was operating in S02B10 with coal being hauled to the ROM. LF noise at 9:00am was 33.2dB at Lagoons Road and 32.7dB at Winchester Cres. Wind speed was 0.9m/s from east. The ECRM rang the complainant to discuss the complaint. The complainant was happy with the response.
7.	26th September 2012	Winchester Cres	Noise	The complainant rang to complain about noise at 01.52am on 26/09/12. EX101 was operating in S03B16 with OB hauling to 480RL dump. EX102 was operating in S04B14 with OB hauling to 480RL dump. LDR121 was operating in S02B12 with coal being hauled to ROM. Low frequency noise was between 34.7dB and 37.1dB at Lagoons Road and between 32.0dB and 34.5dB at Winchester Cres. Wind speed was 0.1m/s from SW. The EP Assistant was at Winchester Crescent at 01.30am and observed that no mine noise was audible, with crickets, frogs and birds the dominant noise between traffic. The EP assistant arrived at the complainants address at 01.55am and recorded 27.0-32.0dB with the hand held noise monitor, with crickets and frogs being the dominant noise until 02.30am when the EP assistant left. The ECRC contacted the complainant at 10.25am on the 26/09/12 with a general discussion being held with regards to the noise observed.
8.	26th September 2012	Moolarben Road	Noise	The complainant rang to complain about noise at 07.40am on the 26/09/12. EX101 was operating in S04B15 hauling OB to 480RL dump. EX102 was operating in S04B15 hauling OB to 480RL dump. Low frequency noise was between 33.6-38.9dB at Lagoons Road and between 31.7-34.2dB at Winchester Cres. Wind speed was 0.5-2.1ms/ from ENE. The complainant was called at 11.05am on the 26/09/12 with no answer, a message was left. The complainant returned the call at 12.20pm on the 26/09/12 to discuss the noise issues. They could hear the trucks, dozers and the rattle of trucks unloading but only when the wind was not blowing and the normal background noise dropped.

Number	Date	Location	Issue	Investigation and Follow Up
9.	17th October 2012	Ridge Road	Noise	The complainant rang to complain about noise at 2:21am on 17/10/12. EX101 was operating in S03-4 B13-14 pulling high wall and pre split. EX102 was operating in S03B16 with trucks hauling OB to 480RL dump. SHV112 was operating in S05B37 with coal hauling to ROM. Low frequency noise at Lagoons Road was 34.6-36.8dB and 25.8-27.0dB at Winchester Cres. The handheld noise unit measured 31.2-34.6dB at the complainant location. Wind speed was 0.7m/s from ENE. The EP Assistant drove to the complaint location. Mine drone with intermittent crashing sounds was audible from an indistinguishable direction. Faint dozer track was also audible. Crickets were audible and equally dominant to mine noise. The EP Assistant also stopped at the Cope Rd junction where general mine drone and rumble from another operation, including intermittent crashing and dozer track sounds were heard. No mine noise from MCO direction was audible. Complainant was contacted at 12:00pm on 17/10/12 and a message was left, complainant was contacted again at 4:10pm on 17/10/12 and another message was left. The ECRS spoke with the complainant on 18/10/12 at 2:00pm. The ECRS discussed the observations made by the EP Assistant and discussed the possibility of the droning noise coming from another operation. The complainant commented that they haven't heard that operation before and it was explained to them that the other operation have changed their operations, which has changed the noise environment in the area. The complainant commented that they were going to call the EPA and see what they thought.
10.	29th October 2012	Winchester Crescent	Noise	The complainant rang the ECRS directly at 8:50am on 29/10/12 to complain about noise at 2:00am on 29/10/12. The complainant commented that first loading activities were clearly audible and woke the household up. They also commented that the noise is getting worse and they believe MCO are doing nothing to reduce the noise. EX102 was operating in S04B15 with trucks hauling to RL465 dump. SHV112 was operating in S02B10 with trucks hauling to the ROM. LF noise at Lagoons Road was between 33.1-35.2dB and between 29.7-32.8dB at Winchester Cr. Wind speed was between 1.4-2.1m/s from NE. A review of the audio indicates that first loading activities and truck retard were clearly audible at Winchester Cr along with birds and wind.
11.	3rd November 2012	Winchester Crescent	Odour	The complainant rang to complain about burning coal odour at 3:15pm on 03/11/12. The ECRC spoke with OCE at 3:40pm on the day of the complaint. The OCE confirmed that the burning smell was not from MCO and was coming from another operation. The ECRC tried to contact the complainant at 4:00pm on the day of the complaint; however the contact phone number was incorrect. The ECRC contacted the complainant's brother on 05/11/12 and confirmed the incorrect number and provided a new contact number. ECRC discussed the issue with the complainant and they had already contacted the other operation.
12.	5th November 2012	Ridge Road	Noise	The complainant rang on 05/11/12 at 12:14am to complain about noise. EX102 was operating in S05B16 with trucks hauling OB to 465RL dump. SHV112 was operating in S04B19 with coal being

Number	Date	Location	Issue	Investigation and Follow Up
				hauled to the ROM. LDR121 was working on the ROM pad. Low frequency noise at Lagoons Road was 27.2-32.2dB and 26.0-32.3dB at Winchester Cres. The handheld noise monitor read 31.0-34.0dB at the complaint location. Wind speed was 0.1-0.7m/s from SW. At 12:40am, the EP Assistant was observing the noise in the area of the compliant at the north end of Ridge Rd. Mine noise was very faintly audible and at times not audible. Road traffic dominant noise when present. Crickets were also audible. The ECRC contacted the complainant at 9:40am on 05/11/12 and discussed the noise environment.
13.	12th November 2012	Ridge Road	Noise	The complainant rang to complaint about noise at 12:30am on 12/11/12. They commented that they could hear truck and bulldozer noise and was continuous all morning. EX101 was operating in S04B18 with trucks hauling OB to in pit ramp in S02. SHV112 was operating in S04B20 with coal being hauled to the ROM. Due to the wide timeframe a detailed analysis of the noise data hasn't been undertaken. The ECRM contacted complainant. The complainant advised that they had heard trucks and dozers pushing rocks. The ECRM offered to meet with the complainant directly to discuss the noise and discuss the Stage 2 project. Complainant advised that they would get back to the ECRM on the offer.
14.	26th November	Moolarben Road	Noise	The complainant rang to complain about noise at 8:15am on 26/11/12. EX101 was operating in S03B18 with trucks hauling OB to RL465 Dump. SHV112 was operating in S04B21 with trucks hauling coal to the ROM. Low frequency noise was 27.7-35.5dB at Lagoons Road and 27.8-30.9dB at Winchester Cres. Wind speed was 0.6-1.5m/s from NNE. The ECRC drove out to the area at 9.00am and observed a very faint mine hum, the dominant noise at the time were crows and cockatoos. The ECRC spoke with the complainant regarding the noise environment and the complainant reinforced that the noise was only audible during the early hours of the morning when the wind blows from the north.
15.	8th December 2012	Moolarben Road	Noise	The complainant rang at 9:08am on 08/12/12 to complain about noise that had been ongoing since 7:00am. EX101 was operating in S05B18 with trucks hauling to the S05 ramp. EX102 was operating in S03B18 with trucks hauling to the RL430 dump. LDR121 was operating in S04B17 with trucks hauling to the RL430 dump. LF at Lagoons Road was between 29.9-43.3dB and between 32.2-38.8dB at Winchester Cr. Wind speed was between 0.2-2.2m/s from N-NE. The ECRS rang the complainant at 9:22am to discuss the complaint. During the discussion it was identified that the noise the complainant was hearing was first loading activities, most likely from EX102. This was communicated to the OCE who commented they would review the situation.
16.	11th December 2012	Maiala Road	Noise	Complainant rang at 6:16am on 11/12/12 to complain about noise throughout the night. EX101 was operating on S05B15 hauling to Sways Dump. EX102 was operating in S04B14 hauling to S02 dump. SHV112 was in S05B37 hauling coal to the ROM. The pit did not operate after 5am. Due to the strong winds experienced all night the noise results were wind affected and are considered invalid.

Number	Date	Location	Issue	Investigation and Follow Up
17.	5th January 2013	Ulan Road	Noise	Complainant rang to complain about noise at 3:10am on 05/01/13. Caller advised of the loud machinery noise coming from the mine and the noise is continuous. EX101 was operating in S05B19 with OB reporting to the ramp dump. EX102 was operating in S06B17 with OB reporting to the ramp dump. SHV112 was operating in S05B36 with coal being hauled to the ROM and OB reporting to block tip. LDR121 was operating in S04B14 with OB reporting to S02 reject dump. Low frequency noise at the time of the complaint was between 33.4-33.8dB at Lagoons Road and between 26.7-30.5dB at Winchester Crescent. There was no wind. The Production Assistant drove to complaint location and observed that first loads into trucks were the only mining related noise heard. Occasional road traffic was also heard. The OCE instructed the shovel operator to change loading practices and this first load noise stopped. The ECRS spoke with the complainant at 8:42am on 05/01/13 and advised them of the noise levels and the observations of the Production Assistant. The complainant argued that MCO did not follow the agreed response to their complaint and that the Production Assistant was supposed to visit their house at the time of the complaint and measure the noise levels. The ECRS advised the complainant this wasn't their understanding of the process but would speak with the ECRM on Monday to confirm the agreed process. The complainant then complained to the EPA on 05/01/13 that MCO didn't follow the agreed process for responding to their complaint. Subsequent discussions between the ECRS and the ECRM, and the ECRM and the EPA confirm that MCO did follow the agreed process. During the conversation on 05/01/13 the complainant was adamant that all the noise at their place is coming from MCO and they aren't hearing other operations at all. They also don't believe the noise unit at Lagoons Road is applicable as all the land around it is owned by mining companies. It was explained to the complainant that this unit is used as a management tool and acts as an "early warning" system to advise MCO on increasing noise levels.
18.	11th January 2013	Ridge Road	Dust	The complainant called at 9:45 am on Friday 11/01/13 to complain about dust and noise. The caller requested representatives from the mine visit their property to discuss the issue particularly the effect of dust on health. At the time of the call dust levels at nearest unit D3 (Woodhead) were 12.2µg/m^3. The ECRM and the EC visited the caller at 10:30 am on the 11/01/13 and discussed a range of issues including MCO air quality monitoring network and strategies to minimise dust as well as noise management. The ECRM also discussed future mining with the resident. It was agreed by both parties that MCO would supply monitoring data in hard copy on a monthly basis to the resident. The resident was happy with the outcome of the conversation.
19.	13th January 2013	Ulan Road	Noise	The complainant rang to complain about noise at 3:21am on 13/01/13. EX101 was operating in S06B19 with OB reporting to RL450 dump. EX102 was operating in S05B19 with OB reporting to RL460 dump. LDR121 was operating from the Reject area and ROM road with OB reporting to S04 dump. Low frequency noise at the time of the complaint was between 28.8-32.2dB at Lagoons Road and between

Number	Date	Location	Issue	Investigation and Follow Up
				27-29.2dB at Winchester Crescent. Wind speed was 1.6m/s. The Production Assistant drove to complaint location and observed a faintly audible mine hum from Ulan/MCO direction. The Production Assistant then drove to Lagoons Road. No mine noise was audible from MCO but dozer track and dragline audible from another mining operation. The OCE was advised of the observations. The ECRC called the complainant the following day to discuss the observations from the Production assistant and the noise levels from the night before and early in the morning. The complainant stated it had been getting worse lately and it was also affecting his family. The ECRC reiterated that MCO supervisors had been monitoring noise levels throughout the evening.
20.	13th January 2013	Moolarben Road	Noise	The complainant rang to complain about noise at 9:51am on 13/01/13. Complainant rang regarding noise complaint mostly from trucks on site. EX101 was operating in S06B19 with OB reporting to RL450 dump. EX102 was operating in S05B20 with OB reporting to Magazine dump. Low frequency noise at the time of the complaint was between 31.8-39.3dB at Lagoons Road and between 34-38.2dB at Winchester Crescent. Wind speed was 4.2m/s with gust at 6m/s. The ECRC contacted the OCE immediately who advised that no equipment was running in the southern end of the operation during the early morning or at other exposed locations. The OCE and Project OCE had been monitoring wind speed and noise levels at all units throughout the morning. The ECRC also checked noise levels through the repository. The ECRC contacted the complainant to discuss the observations and noise levels. They mentioned that the noise had been noticeable around 5:00 am. The ECRC discussed MCO's protocol for responding to alarms and noise complaints. The complainant was appreciative of the phone call.
21.	16th January 2013	Ulan Road	Noise	The complainant rang to complain about noise at 1:43am on 16/01/13. EX102 was operating in S06B18. LDR121 was operating in S02B09. SHV112 was operating in S05B36. LF noise at the time of the complaint was 34dB at Lagoons Road and 26.8dB at Winchester Crescent. Wind speed was 0.1m/s. The Production Assistant drove to complaint location and observed a faintly audible mine hum from MCO as well as other operations. The Production Assistant then drove to Lagoons Road. Mine hum audible from Ulan/MCO. General machinery noise heard at MCO but dozer track and dragline audible from another operation. The OCE was advised. SHV112 was at stand from 2:10am to 2:20am. The Production Assistant drove back to complaint location and the noise level did not appear to drop and dragline was still audible. Attempts to contact the complainant were unsuccessful.
22.	16th January 2013	Ulan Road	Noise	Complainant rang to complain about noise at 3:13am on 16/01/13. EX102 was operating in S06B18. LDR121 was operating in S02B09. SHV112 was operating in S05B36. Low frequency noise at the time of the complaint was 28.1dB at Lagoons Road and 27.5dB at Winchester Crescent. There was no wind. The Production Assistant drove to complaint location and observed a faintly audible mine hum from Ulan/MCO direction. The Production Assistant then drove to Lagoons Road. Mine noise was audible

Number	Date	Location	Issue	Investigation and Follow Up
				from Ulan/MCO. The OCE was advised. OCE shutdown SHV112 at 3:30am. Noise level remained at similar level. Drove back to complaint location. No change in noise level was observed. Faint mine hum still audible.
23.	20th January 2013	Winchester Cres	Noise	The complainant rang to complain about noise at 10:42pm on 20/01/13. EX101 was operating in S06B17 with trucks hauling OB to 465RL dump. SHV112 was operating in S06B36 with trucks hauling coal to ROM. LF Noise at Lagoons Rd was between 32.3-35.3dB and between 36.2-41.0dB (wind affected) at Winchester Cr. Wind was 2.3-2.6m/s from the east. The Production Assistant drove to the complaint location and observed wind and regular road traffic as the dominant sounds, with no mine noise audible. No handheld reading was possible due to wind interference and lack of mining related noise. Messages were left with the complainant on 21/01/13. The ECRS spoke with the complainant on 22/01/13 at 11:46am. The observations of the Production Assistant and the noise levels were discussed. The complainant commented that they live on top of a hill so the noise environment is different to the noise levels on the flat. They commented the noise was that loud their front wall was shaking and the noise was audible over the TV. They commented that the noise is constantly there but they only complain when it is really loud. The complainant offered for MCO to put a noise monitor on their place if we needed to. It was explained that we have a noise unit nearby and based on our observations and the noise results we don't need to relocate it.
24.	24th January 2013	Ulan Road	Noise	The complainant rang to complain about noise at 2:09am on 24/01/13. EX102 was operating in S06B19 with trucks hauling to RL450 dump. LDR121 was operating in S02. SHV112 was operating in S03B15. Low frequency noise at the time of the complaint was 28.7-31.4dB at Lagoons Road and 36.2-36.5dB at Winchester Crescent. Wind speed was 2.4-3.0m/s. The Production Assistant drove to complaint location and observed a very faint mine hum audible from another operation to the east. Occasional bang was also audible from a different operation. Dominant noise was wind with birds also being heard. The Production Assistant then drove to Lagoons Road. Faintly audible mine hum from operation to the east. No mine noise was audible from MCO. Noise was heard from another operation on occasion. Crickets and birds were also heard.
25.	26th January 2013	Ulan Road	Noise	The complainant rang to complain about noise at 2:47am on 26/01/13. EX102 was operating in S06B17 with trucks hauling OB to 440RL dump. SHV112 was operating in S03B14 with trucks hauling coal to the ROM. Low frequency noise at Lagoons Road was between 23.3-30.2dB and between 25.9-31.5dB at Winchester Cres. Wind speed was 0.1-2.5m/s from the ENE-ESE. The hand held noise monitor at the complaint location was 32.0dB. The EP Assistant drove to complaint location and noted crickets and insects as the dominant noise. Occasional road traffic was also noted as dominant when present. General mine hum was audible along with intermittent dog barking. When only crickets and mine hum was heard, the handheld monitor sat consistently between 28-30dB.

Number	Date	Location	Issue	Investigation and Follow Up
26.	27th January 2013	Ulan Road	Noise	The complainant rang to complain about noise at 12:24am on 27/01/13. EX101 was operating in S05B16 with trucks hauling OB to 440RL dump. EX102 was operating in S06B19 with trucks hauling OB to 440RL dump. Low frequency noise was between 28.4-32.9dB at Lagoons Road and between 29.8-37.2dB (wind affected) at Winchester Cres. Wind speed was 1.5-3.1m/s from the east. The handheld noise monitor recorded noise levels at 33.7dB. The EP Assistant was in Winchester Cres at the time of the complaint. Crickets were the dominant sound at all locations in the area. Indistinct mine hum was faintly audible at complaint location. Music, talking/yelling from a party and dog barking were also audible. The EP Assistant attended the complaint location approx. half an hour after the complaint with the handheld noise monitor and noted road traffic, multiple dogs barking intermittently, party noise, crickets and insects were audible. Mine hum was now audible and intermittent sprinkling of rain was also present.
27.	27th January 2013	Ulan Road	Noise	The complainant rang to complain about noise at 11:50pm on 27/01/13. Follow up complaints were made at 1:35am and 4:40am. EX101 was operating in S06B19 with trucks hauling OB to 440RL dump. EX101 was shutdown at 3:25am. SHV112 was operating in S03B13 with trucks hauling coal to the ROM. <u>11:50pm complaint</u> Low frequency noise levels at Lagoons Rd were between 26.2-34.0dB and between 27.8-36.8dB at Winchester Cres. Wind speed was 0.1-2.0m/s from the NE-SE. The handheld noise unit read 29.0dB at the complaint location. The EP Assistant was at the complaint location 5 minutes before the complaint was made. Crickets and frogs were the dominant sounds with indistinct mine hum faintly audible. <u>1:35am complaint</u> Low frequency noise levels at Lagoons Rd were between 27.0-31.6dB and between 27.7-35.0dB at Winchester Cres. Wind speed was 0.0-1.6m/s from E-SE. The handheld noise unit read 29.8dB at the complaint location. The EP Assistant drove to the complaint location and noted crickets, insects and general mine rumble as the only sounds audible. The crickets had decreased in volume since previously in the night. <u>4:40am complaint</u> Low frequency noise levels at Lagoons Rd were between 29.1-33.4dB and between 33.7-35.6dB at Winchester Cres. Wind speed was 1.3-3.8m/s from E-ESE.

Number	Date	Location	Issue	Investigation and Follow Up
28.	28th January 2013	Ridge Road	Noise	The complainant rang to complain about noise at 2:48am on 28/01/13. EX101 was operating in S06B19 with trucks hauling OB to 440RL dump. SHV112 was operating in S03B13 with trucks hauling to the ROM. LDR121 was operating in S02B08 with trucks hauling OB to S02 dump. Low frequency noise at Lagoons Rd was between 33.3-38.9dB and between 32.1-42.6dB (wind affected) at Winchester Cres. Wind was 0.1-3.0m/s from the SE-S. The handheld noise monitor read 39.1dB at the complaint location. The EP Assistant drove to the complaint location and noted crickets as the dominant sound. General mine noise was also audible with the occasional thud heard. Wind was intermittently blowing in trees with the mine noise being faintly audible when this occurred. EX101 (including trucks and dozers) were shutdown from 03:25am resulting in a noticeable decrease in mine related noise audible. The handheld reading remained similar, suggesting the dominant sound of crickets was responsible/affecting the results. When wind was present, mine noise was no longer audible. The ECRC contacted the complainant on the 28/01/13 at 10.30am and discussed the noise environment and the observations of the Production Assistant. The complainant described the noise as a loud droning followed by a series of bangs. The ECRC offered to contact the complainant again on Tuesday with further information; the complainant was not interested in any further information.
29.	28th January 2013	Ulan Road	Noise	The complainant rang to complain about noise at 7:32am on 28/01/13. They commented that the noise was loud all weekend. Due to the wide timeframes a detailed analysis hasn't been undertaken.
30.	28th January 2013	Winchester Cres	Noise	The complainant rang to complain about noise at 7:44am on 28/01/13. EX101 was operating in S06B19 with trucks hauling OB to 440RL dump. SHV112 was operating in S03B13 with trucks hauling coal to the ROM. Low frequency noise levels were between 29.3-32.1dB at Lagoons Rd and between 33.6-41.2dB at Winchester Cres (wind affected). Wind speed was 1.6-2.7m/s from the east. The OCE went to the southern end of the pit and observed the mine noise was minimal. A review of the audio found constant wind was the dominant sound at SX39. Birds and road traffic were regularly audible and dog barking was occasionally audible. General mine hum (no distinct sounds) was audible at SX36 with birds also constant. The ECRC tried to contact the complainant on the 28/01/13 and left two messages. The complainant was contacted again on the 29/01/13 to discuss the complaint. The complainant explained that they have had issues with noise, the view being removed and the smell of wet coal. They also asked if the noise could be monitored at his place. The ECRC then discussed the observations of the Production Assistant and informed that that we will be back in touch with him regarding further monitoring. The ECRC contacted the complainant at 4:10pm on the 29/01/13 to inform them that we will undertake attended noise monitoring in their general area during the 1st quarter of 2013.
31.	28th January 2013	Maiala Road	Noise	The complainant rang to complain about noise at 8:14am on 28/01/13 about noise from the night before. EX101 was operating in S06B19 with trucks hauling OB to 440RL dump (shutdown 3:25am). SHV112 was operating in S03B13 with trucks hauling coal to the ROM. The EP Assistant observed the noise

Number	Date	Location	Issue	Investigation and Follow Up
				environment throughout the night and noted indistinct mine hum faintly audible for the majority of the night. EX101 was shutdown at 3:25am in response to noise observations at Ridge Rd. Crickets were the dominant noises at all locations at all times throughout the night. The ECRC contacted the complainant on 28/01/13 at 10.50am. The complainant described the noise as a regular banging and clanging noise. The ECRC discussed the observations of the Production Assistant and offered to contact then again on Tuesday with further information. The ECRC was unable to contact the complainant on the 29/01/13 to discuss the noise levels from the night of the complaint, three messages were left.
32.	28th January 2013	Ridge Road	Noise	The complainant rang to complain about noise at 12:28pm on 28/01/13 for noise over the last 3 nights. Due to the wide timeframe, a detailed noise analysis could not be conducted. The ECRC contacted the complainant on the 28/01/13 at 12.30pm. The complainant explained that there is more dust on their house and furniture, and the noise is getting worse. The noise was described as a rumble and moaning with the occasional banging, they don't believe that we are meeting any guidelines or anything we are telling him. The ECRC then explained the observations of the Production Assistant from the previous night.
33.	4th February 2013	Winchester Cres	Noise	The complainant called the complaints line to complain about noise at 8:28pm on 04/02/13. EX101 was operating in S05B18 with trucks hauling OB to 440RL dump. SHV112 was operating in S03B12 with trucks hauling coal to the ROM. LDR121 was operating in S07B19-20 with trucks hauling topsoil to 480RL dump. Low frequency noise levels were between 34.1-47.8dB at Lagoons Rd and between 36.9-43.6dB at Winchester Cres. All of these results were wind affected. Wind speed was 0.9-3.6m/s from SE. The EP Assistant drove to the complaint location and observed regular road traffic as the dominant sound. Crickets, insects and frogs were dominant when road traffic was absent. No mine noise was audible therefore no handheld reading was taken. The ECRC spoke with the complainant at 7:45 pm the following evening. The complainant raised a number of issues. Noise - They can on occasion hear first bucket and dozer track. They also hear reverse beepers and a constant rumbling sound which is worse as it keeps them from sleep. The ECRC explained to the complainant MCO's noise monitoring program, sound attenuation of equipment (including reverse quackers) and the role of the Production Assistants to assist with noise management during night shift. MCO current mining locations were also discussed. It was advised by MCO that complaints should be made at the time of disturbance so the Production Assistant can investigate immediately and provide feedback to the Production Supervisor. It was explained that this allows MCO to address any concerns quickly. It was also commented that due to the complex noise environment it can be difficult to determine the source of noise, however in the past MCO has shut down equipment and noise can be heard from neighbouring mines. Dust - The complainant commented that they had severe hay fever over the past 3 years

Number	Date	Location	Issue	Investigation and Follow Up
				which may be attributed to dust. The ECRC explained the MCO air quality monitoring program and its requirement to report all monitoring results to the EPA and also to the public via the web. Traffic - The complainant commented about the volume of traffic on Ulan Road. Whilst they agreed it was not all MCO traffic, they had experienced dangerous driving in the past particularly from contractors. It was advised by MCO that if they experience any reoccurrences they should take details of the vehicle, contractor, date and time and report to MCO immediately. It was explained to the complainant that all 3 mines have a coordinated approach to dealing with dangerous driving.
34.	6th February 2013	Ulan Road	Noise	The complainant rang to complain about noise at 3:29am on 06/02/13. EX102 was operating in S06B19 with trucks hauling OB to 440RL dump. SHV112 was operating in S03B14 with trucks hauling coal to the ROM. LDR121 was operating in S07B20 with trucks hauling topsoil to 480RL stockpile. Low frequency noise levels at Lagoons Rd were between 26.0-30.4dB and between 30.2-34.1dB at Winchester Cres. Wind speed was 0.0-0.9m/s from north. The handheld noise monitor read 29.8dB at the complaint location. The EP Assistant drove to the complaint location and observed general mine hum audible from MCO/Ulan direction. Crickets were audible as well and approx. equal in volume to mine noise. Occasional road traffic was dominant when present.
35.	7th February 2013	Ulan Road	Noise	The complainant rang to complain about noise at 4:18am on 07/02/13. EX101 was operating in S03B11 and was side casting. EX102 was operating in S04B18 with trucks hauling OB to RL450 dump. SHV112 was operating in S03B12 with trucks hauling coal to the ROM. Low frequency noise was between 27.0-33.0dB at Lagoons Rd: 27.0-33.0dB and between 24.7-36.1dB at Winchester Cres. Wind speed was between 0.0-1.2m/s from the north. The EP Assistant observed the noise environment throughout the night at the complaint location. Crickets were the dominant sound at the complaint location at all times throughout the night with indistinct mine hum being faintly audible. Mine noise was observed to have decreased later on in the night (03:00am) than earlier.
36.	17th February 2013	Winchester Cres	Noise	The complainant rang to complain about noise at 1:40am on 17/02/13. EX101 was operating in S06B19 with truck hauling OB to 480RL dump. EX102 was operating in S05B19 with trucks hauling OB to 440RL dump. LDR121 was operating in S02B16 with trucks hauling OB to Roads (1am-3am only). Low frequency noise was between 31.4-33.7dB at Lagoons Rd and between 33.9-42.4dB (wind affected) at Winchester Cres. The handheld noise monitor recorded 39.9dB (wind affected) at the complaint location. Wind speed was 1.7-2.9m/s from the east. The EP Assistant drove to the complaint location and observed multiple dogs barking constantly as the dominant sound. The wind was also frequently audible with gusts. General mine hum was faintly audible only briefly when the wind died right down. Three thumps (low rumbling sound) were heard over the 15 minute period. The complainant could not be contacted but was left a message.

Number	Date	Location	Issue	Investigation and Follow Up
37.	18th February 2013	Ulan Road	Noise	The complainant rang to complain about noise at 3:08am on 18/02/13. EX102 was operating in S06B19 with trucks hauling OB to 440RL dump. SHV112 was operating in S03B13 with trucks hauling coal to ROM. Low frequency noise was between 31.0-31.9dB at Lagoons Rd and between 35.4-40.5dB (wind affected) at Winchester Cres. Wind speed was 1.0-1.8m/s from ESE-SE. The handheld noise monitor recorded 26.0dB at the complaint location. The EP Assistant drove to the complaint location and observed wind as the dominant sound with crickets faintly audible. Mine hum was inaudible upon arrival and general mine hum was faintly audible when the breeze died down/was absent.
38.	18th February 2013	Ulan Road	Noise	The complainant rang on 18/02/2013 at 8:32pm to complaint about noise from earlier that morning (between 2:00am and 6:00am). EX102 was operating in S06B19 with trucks hauling OB to 440RL dump. SHV112 was operating in S03B13 with trucks hauling to ROM. The Production Assistant's notes indicate that wind was the dominant noise throughout the night. Indistinct mine hum was audible on occasion.
39.	19th February 2013	Ulan Road	Noise	The complainant rang to complain about noise on 19/02/2013 at 1:33am, 2:50am and 4:20am. EX102 was operating in S06B18 with trucks hauling OB to inpit bridge. SHV112 was operating in S03B18 with trucks hauling coal to the ROM. LDR121 was working on the ROM pad. <u>1:33am complaint</u> Low frequency noise was 25.4dB at Lagoons Road and 28.5dB at Winchester Cres. There was no wind. The handheld noise monitor recorded 29.3dB at the complaint location. The Production Assistant attended the complaint location and mine rumble was audible and the dominant noise from MCO/UCML direction. Occasional road traffic and crickets were also audible. No distinct equipment could be heard. <u>2:50am complaint</u> Low frequency noise was 29.9dB at Lagoons Road and 27.8dB at Winchester Cres. Wind speed was 0.1m/s. The handheld noise monitor recorded 31.8dB at the complaint location. The Production Assistant attended the complaint location and mine rumble was audible from MCO/UCML direction. No distinct equipment was heard. Cows and crickets were audible and aircraft noise was audible for some time. <u>4:20am complaint</u> Low frequency noise was 32.1dB at Lagoons Road and 28.3dB at Winchester Cres. Wind speed was 1.1m/s. The Production Assistant attended the complaint location and mine rumble was audible from MCO/UCML direction. Some revving and rumbling were heard but the source wasn't clear. By 4:45am, road traffic was fairly constant and dominant sound, mine noise no longer audible.

Number	Date	Location	Issue	Investigation and Follow Up
40.	20th February 2013	Ulan Road	Noise	The complainant rang on 20/02/13 at 3:52am to complain about noise. EX102 was operating in S06B18 with trucks hauling OB to 450RL dump. SHV112 was operating in S03B18 with trucks hauling coal to ROM. LDR121 was working on the ROM. Low frequency noise was 36.1dB at Lagoons Road and 24.0dB at Winchester Cres. There was no wind present. The hand held noise monitor read 28.5dB at the complaint location. The Production Assistant observed faintly audible mine hum from another operation to the east. Occasional road traffic was the dominant noise when present.
41.	21st February 2013	Ulan Road	Noise	The complainant rang on 21/02/13 at 1:45am and 3:41am to complain about noise. EX101 was operating in S06B17 with trucks hauling OB to 450RL dump. SHV112 was operating in S03B16 with trucks hauling coal to the ROM. <u>1:45am complaint</u> Low frequency noise was 28.7dB at Lagoons Rd and 26.8dB at Winchester Cres. Wind speed was 1.2m/s. Handheld noise monitor recorded 32.8dB at the complaint location. The Production Assistant attended the complaint location and observed that dogs barking were the dominant noise with mine hum audible from an operation to the east of the location. <u>3:41am complaint</u> Low frequency noise was 29.0dB at Lagoons Rd and 26.9dB at Winchester Cres. Wind speed was 0.6m/s. Handheld noise monitor recorded 23.5dB at the complaint location. The Production Assistant attended the complaint location and observed very faintly audible mine hum from an operation to the east of the location, which was at times inaudible. The noise environment was quieter than when they were previously at the location. Crickets and occasional barking dog were also audible.
42.	22nd February 2013	Ulan Road	Noise	The complainant rang on 22/02/13 at 1:27am to complain about noise. EX101 was operating in S06B17 with trucks hauling OB to 450RL dump. SHV112 was operating in S03B16 with trucks hauling coal to ROM. Low frequency noise was 27.8dB at Lagoons Rd and 32.9dB at Winchester Cres. Wind speed was 1.0m/s from SE. The handheld noise monitor recorded 27.3dB at the complaint location. The Production Assistant attended the complaint location and noticed that general mine hum was audible from an operation to the east and could hear revving and droning sounds. Crickets were also audible.
43.	24th February 2013	Ulan Road	Noise	The complainant rang to complain about noise at 3:43am on 24/02/13. EX101 was operating in S05B20 with trucks hauling OB to 450RL dump. Low frequency noise at Lagoons Rd was between 30.0-32.9dB and at Winchester Cres was between 25.3-29.8dB. Wind speed was between 0.4-2.7m/s from the east. The handheld monitor recorded 26.3dB at the complaint location. The EP Assistant drove to the complaint location in response to the complaint and observed wind as the dominant sound with crickets also audible. Indistinct mine hum was only very faintly audible at brief intervals when the wind

Number	Date	Location	Issue	Investigation and Follow Up
				completely died off.
44.	24th February 2013	Ulan Road	Noise	The complainant rang to complain about noise at 8:15am on 24/02/13. EX101 was operating in S05B18 with trucks hauling OB to 450RL dump. EX102 was operating in S06B18 with trucks hauling OB to 5 Ways dump. Low frequency noise at Lagoons Road was between 34.4-36.1dB and between 28.7-31.0dB at Winchester Crescent. Wind speed was 0.5-0.9m/s from East. A review of the audio indicated that birds were the dominant noise sources. Occasional dozer tracks were audible at Lagoons Road and occasional road traffic was audible at Winchester Crescent.
45.	24th February 2013	Winchester Cres	Noise	The complainant rang to complain about noise at 10:43pm on 24/02/13. EX102 was operating in S05B20 with trucks hauling OB to 450RL dump. SHV112 was operating in S03B17 with trucks hauling coal to ROM. Low frequency noise levels at Lagoons Rd were between 28.6-48.3dB (Wind and Rain affected) and between 29.7-39.6dB at Winchester Cres (Wind and Rain affected). Wind speed was between 1.4-1.8m/s from the SW. The handheld noise meter had a reading of 34.5dB at the complaint location. The EP Assistant was in the area approx. half an hour prior to the complaint and observed occasional road traffic and rain as the dominant sounds. Crickets were also audible. Mine hum from MCO/Ulan direction was very faintly audible only in the absence of road traffic and the rain. The EP Assistant drove to the complaint location in response to the complaint and noted regular road traffic as the dominant sound. General mine rumble was audible with no dozer track or banging noises observed (as described in complaint). When road traffic was present, mine rumble was only very faintly audible. The ECRS spoke with the complainant at 9:45am on 25/02/13. The complainant commented that the noise was very clear and loud last night and that they could hear the noise over the TV. The Production Assistant's observations and the presence of other mining related noise sources were discussed. Due to the differing information about the noise environment around the time of the complaint, the complainant was advised that MCO would do more investigating. A review of the audio by the ECRS supported the Production Assistant's observations.
46.	6th March 2013	Ulan Road	Noise	Complainant rang to complain about noise at 2:42am on 06/03/13. EX102 was operating in S05B17-18 with trucks hauling to RL458 dump. SHV112 was operating in S03B18 with trucks hauling to the ROM. Low frequency noise at Lagoons Road was between 33.1-34.6dB and between 33.1-36.6dB (wind affected) at Winchester Crescent. Wind speed was 2.5-3.0m/s from the east. The MPEA visited the complaint location and could not hear any mine related noise. Traffic, wind, crickets and frogs were audible.
47.	7th March 2013	Ulan Road	Noise	Complainant rang to complain about noise at 1:59am on 07/03/13. EX101 was operating in S05B17 with trucks hauling to the RL458dump. SHV112 was operating in S02B16 with trucks hauling to the ROM. LF noise at Lagoons Road was between 31.1-32.2dB and between 29.9-33.5dB at Winchester Crescent. Wind speed was 0.2-0.5m/s from SW. The hand held noise meter at the complaint location

Number	Date	Location	Issue	Investigation and Follow Up
				had a reading of 33.0dB. The MPEA drove to the complaint location. Mine noise was clearly audible from MCO/Ulan direction. First loads and trucks running were distinct. Barking dogs, crickets, frogs and cows were also audible. Based on these observations the operators were instructed to change loading practice from dropping to placing in trays.
48.	7th March 2013	Moolarben Road	Noise	The complainant was speaking with MCO's Senior Property Officer on another matter and wanted a message passed to the Environment team that noise had waken them around 4:00am on 07/03/13. EX101 was operating in S05B17 with trucks hauling to the RL458 dump. SHV112 was operating in S02B16 with trucks hauling to the ROM. Around 4:00am low frequency noise at Lagoons Road was between 30.5-32.2dB and between 27.8-29.5dB at Winchester Crescent. Wind speed was 0.0-0.3m/s from SW. A review of the audio indicated that no distinct mining noises could be heard around the time of the complaint. The ECRS spoke with the complainant who commented that mining noise could be heard from around 4:00am to 8:15am on 07/03/13. Dozer tracks were distinct and general mining noise was audible with no other distinct noises.
49.	8th March 2013	Winchester Cres	Noise	Complainant rang to complain about noise at 8:39am on 08/03/13. EX102 was operating in S06B17 with trucks hauling OB to RL458 dump. SHV112 was operating in S03B15 with trucks hauling coal to the ROM. Low frequency noise was between 27.5-38.8dB at Lagoons Road and between 33.0-36.3dB at Winchester Cres. Wind speed was 0.2m/s from the WSW. The ECRC attended the complainants address at 8:50am and observed the dominant sound to be traffic when present. First loads and mine hum was also audible from the MCO/Ulan direction. ECRC contacted the OCE and informed them of the observations. The ECRC contacted the complainant at 11.15am and explained the observations and actions undertaken by the OCE.
50.	9th March 2013	Ulan Road	Noise	Complainant rang to complain about noise at 4:36am on 09/03/13. EX101 was operating in S06B17 with trucks hauling OB to RL458 dump. SHV112 was operating in S03B15 with trucks hauling coal to the ROM. Low frequency noise at Lagoons Rd was between 23.9-36.9dB and between 24.9-31.9dB at Winchester Cres. Wind speed was 0.0-1.5m/s from ENE. The handheld noise monitor had a reading of 37.1dB at the complaint location. The MPEA drove to the complaint location (South Winchester parking bay). General mine hum was faintly audible from MCO/UCML direction. No distinct equipment heard. Traffic travelling north on Ulan Rd was fairly constant and audible for quite some distance to the south and north of monitoring location. Crickets were also audible.
51.	10th March 2013	Ulan Road	Noise	Complainant rang to complain about noise on 10/03/13 at 10:32pm. EX101 was operating in S06B22 with trucks hauling OB to 480RL dump. SHV112 was operating in S03B16 with trucks hauling coal to the ROM. Low frequency noise was between 30.3-37.3dB Lagoons Rd and at Winchester Cr was between 24.9 - 31.9dB. Wind speed was between 0.0-1.3m/s from ENE. Handheld noise readings at complaint location were 37.7dB. The MPEA drove to the complaint location. Mine hum was faintly

Number	Date	Location	Issue	Investigation and Follow Up
				audible from MCO/UCML direction. Barking dogs were the dominant noise when present. Occasional road traffic and crickets were also audible.
52.	10th March 2013	Ridge Road	Noise	Complainant rang to complain about noise on 10/03/13 at 11:41pm. EX101 was operating in S06B2 with trucks hauling OB to 480RL dump. SHV112 was operating in S03B16 with trucks hauling coal to the ROM. Low frequency noise was between 28.0-34.2dB at Lagoons Rd and between 24.8-31.6dB at Winchester Cres. Wind speed was 0.0-1.4m/s from the east. The noise reading on the handheld noise monitor was 30.1dB at the complain location. The MPEA parked at Upper Ridge Rd at 12:10am. General mining hum fluctuated between audible and faintly audible. No distinct equipment was heard. Crickets were also audible. The MPEA advised the OCE of observations. The ECRC attempted to contact the complainant at 9:05am on 11/03/13 with no answer a message was left. ECRC tried again at 4:00pm to contact the complainant and left another message.
53.	12th March 2013	Ulan Road	Noise	Complainant rang to complain about noise on 12/03/13 at 12:01am. EX102 was operating in S06B17 with trucks hauling OB to S02 MIA dump and S02 coal ramp dump. SHV112 was operating in S03B16 with trucks hauling coal to the ROM. Low frequency noise was between 24.9-29.6dB at Lagoons Rd and between 27.6-41.4dB (wind affected) at Winchester Cres. Wind speed was between 0.0-1.4m/s from NNE. The handheld noise monitor at the complaint location had a reading of 41.8dB. The MPEA drove to the complaint location. Wind, dogs barking and road traffic were the dominant noises when present. Mining hum was audible from another operation to the east when wind in trees and wind gusts were not present. The OCE was advised of the observations.
54.	12th March 2013	Ulan Road	Noise	Complainant rang to complain about noise on 12/03/13 at 2:39am. EX102 was operating in S06B17 with trucks hauling OB to S02 MIA dump and S02 coal ramp dump. SHV112 was operating in S03B16 with trucks hauling coal to the ROM. Low frequency noise at Lagoons Rd was between 25.3-32.3dB and between 24.9-31.5dB at Winchester Cres. Wind speed was between 0.0-0.1m/s from ESE. Handheld noise monitor results at complaint location were 27.4dB. The MPEA drove to the complaint location. General mining hum was faintly audible from MCO/UCML direction and to the east. This noise was mainly just a low droning sound with no distinct equipment heard. Crickets were audible.
55.	13th March 2013	Ridge Road	Noise	Complainant rang to complain about noise on 13/03/13 at 1:44am. EX102 was operating in S06B2 with trucks hauling OB to 480RL dump. SHV112 was operating in S03B16 with trucks hauling coal to the ROM. Low frequency noise levels at Lagoons Rd were between 27.6 - 33.5dB and at Winchester Cr were between 25.9 - 32.5dB. Wind speed was between 0.0-0.8m/s from the east. The handheld noise monitor results were 29.5dB at the complaint location. The MPEA drove to the complaint location. General mining hum was audible from MCO/UCML direction. The occasional rumbling and thumping sounds were heard. The ECRC contact the complainant at 1:00pm on 13/03/13 and discussed the observations and results recorded by the MPEA.

Number	Date	Location	Issue	Investigation and Follow Up
56.	13th March 2013	Ulan Road	Noise	Complainant rang to complain about noise on 12/03/13 at 3:47am. EX102 was operating in S06B2 with trucks hauling OB to 480RL dump. SHV112 was operating in S03B16 with trucks hauling coal to the ROM. Low frequency noise at Lagoons Rd was between 29.4-34.3dB and between 24.5-32.8dB at Winchester Cres. Wind speed was between 0.0-0.4m/s from the east. The handheld noise monitor generally read between 30-32dB. The MPEA drove to the complaint location. General mining hum was audible from MCO/UCML direction. The occasional rumbling was heard but no distinct equipment was heard.
57.	19th March 2013	Ulan Road	Noise	Complainant rang to complain about noise on 19/03/13 at 3:46am. Due to an emergency on site NO MCO machinery was running at time of complaint. Low frequency noise levels were between 27.4-35.3dB at Lagoons Rd and between 24.2-32.2dB at Winchester Cres. Wind speed was 0.0-0.3m/s from ENE. The MPEA drove to the complaint location. Faint audible mine hum from audible from an operation to the east of the location. Wind and crickets were also audible noise.
58.	21st March 2013	Ulan Road	Noise	The complainant rang to complain about noise at 2:30am on 21/03/13. EX102 was operating in S06B23 with trucks hauling OB to RL440 dump. SHV112 was operating in S03B17 with trucks hauling coal to the ROM. Low frequency noise was between 29.6-33.0dB at Lagoons Rd and between 23.9-32.8dB at Winchester Cres. The handheld noise unit recorded noise levels of 29.8dB at the complaint location. The MPEA drove to the complaint location and observed general mine hum from MCO/Ulan direction and crickets were audible.
59.	22nd March 2013	Ulan Road	Noise	The complainant rang to complain about noise at 9:55pm on 22/03/13. There were follow up calls at 11:23pm on 22/03/13 and 4:10am on 23/03/13. EX102 was operating in S06B24 with trucks hauling OB to RL460 dump. SHV112 was operating in S03B15 with trucks hauling coal to the ROM. LDR121 was operating in S08B20/21 with topsoil being hauled to RL480. <u>9:45pm complaint</u> Low frequency noise at Lagoons Rd was between 33.7-35.8db and between 29.7-32.3dB at Winchester Cres. Wind was between 0.6-0.9m/s from SW. The handheld monitor had results of 51.6dB at the complaint location. The MPEA drove to the complaint location. Very faintly audible mine hum from Ulan/MCO direction was audible. The dominant noise was road traffic with crickets, birds, frogs, dogs and sheep all heard as well. Based on the findings no changes were made to MCO operations. <u>11:25pm complaint</u> Low frequency noise at Lagoons Rd was between 33.5-38.8db and between 27.6-30.2dB at Winchester Cres. Wind was between 0.2-0.4m/s from SW. The handheld monitor had results of 36.1dB at the complaint location. The MPEA drove to the complaint location. During the 15 minute recording period

Number	Date	Location	Issue	Investigation and Follow Up
				no mine noise was audible. Thunder and road traffic were both dominant noise. Crickets, birds and frogs could also be heard when no other noise was present. 4:11am complaint Low frequency noise at Lagoons Rd was between 29.1-30.3db and between 24.8-29.5dB at Winchester Cres. Wind was between 0.1-0.4m/s from South. Handheld results haven't been recorded due to an anomaly with the results. The MPEA drove to the complaint location. Faint mine hum was audible from another operation to the east. Crickets were dominant with occasional road traffic. As a result of the observations no changes were made to mining operations at MCO.
60.	26th March 2013	Ridge Road	Noise	The complainant rang to complain about noise at 2:00am on 26/03/13. EX102 was operating in S06B21 with trucks hauling OB to RL425 dump. SHV112 was operating in S03B15 with trucks hauling coal to the ROM. LDR121 was operating in S08B20/21 with trucks hauling topsoil to RL460. Low frequency noise at Lagoons Rd was between 29.7-31.6db and between 26.9-27.3dB at Winchester Cr. There was no wind present. The handheld monitor recorded results of 38.3dB at the complaint location. The MPEA drove to the complaint location. General mine hum was audible from Ulan/MCO direction, but nothing distinct could be heard. Crickets were also audible. The ECRS spoke with the complainant at 12:30pm on 26/03/13. Complainant commented that they could hear a general rumbling noise until 10-11am this morning. They could also hear diesel engines, metal dragging on rocks and other banging noises. The weather impacts on noise were discussed and the complainant was thanked for their feedback on noise environment as it assists MCO identifies what is generating the noise.
61.	26th March 2013	Ulan Road	Noise	The complainant rang to complain about noise at 2:45am on 26/03/13. There was a follow up call at 4:07am on 26/03/13. EX102 was operating in S06B21 with trucks hauling OB to RL425 dump. SHV112 was operating in S03B15 with trucks hauling coal to the ROM. LDR121 was operating in S08B20/21 with trucks hauling topsoil to RL460. 2:45am complaint Low frequency noise at Lagoons Rd was between 29.1-29.7db and between 24.5-29.6dB at Winchester Cr. There was no wind. The handheld monitor recorded results of 33.8dB. The MPEA drove to the complaint location. Faintly audible mine hum from an operation to the east as well as very faint banging audible from Ulan/MCO direction. Crickets were dominant with frogs and birds were also audible. 4:07am complaint Low frequency noise at Lagoons Rd was between 33.4-35.2db and between 28.7-33.0dB at Winchester Cr. Wind was between 0.1-0.3m/s from SW. The handheld monitor recorded results of 35.9dB. The

Number	Date	Location	Issue	Investigation and Follow Up
				MPEA drove to the complaint location. Faintly audible mine hum from an operation to the east as well as faintly audible banging from Ulan/MCO direction. Crickets and frogs were dominant with occasional road traffic also audible.
62.	30th March 2013	Ridge Road	Noise	Complainant rang to complain about noise on 30/03/13 at 12:52am. EX102 was operating in S07B20, with trucks hauling OB to 460RL dump. SHV112 was operating in S04B16 with trucks hauling coal to the ROM. LDR121 was operating on the new ROM Road with topsoil being hauled to 460RL. EX102, SHV112 and LDR121 were shut down for crib break from 12:30am to 1:00am. Low frequency noise at Lagoons Rd was between 27.1-32.1dB and between 25.1-36.2dB at Winchester Cres. Wind speed was between 0.2m/s-1.5m/s from ESE. The handheld noise monitor recorded noise levels at 42.2dB. The MPEA drove to complaint location. General mining rumble was audible from MCO/UCML direction. There was occasional revving and an increase in rumbling sounds audible. The MPEA then parked at Lagoons Rd and observed general mine rumble audible from MCO/UCML direction. Dozer from MCO audible above general rumble. Drove to Cope Rd to identify potential source of noise. Both MCO and non-MCO operations were audible. The MPEA drove back to Lagoons Rd and rang OCE at 1:45am to advice of observations. They relocated the dozer operating towards south end of pit to reduce noise impact from MCO. The ECRC contacted the complainant 11:00am on the 30/03/13 for an initial brief discussion regarding the complaint. ECRC attempted to contact the complainant at 9:38am on the 02/04/12 with more information and left message.
63.	30th March 2013	Ulan Road	Noise	Complainant rang on 30/03/13 at 2:37am to complain about noise. EX102 was operating in S07B20 with trucks hauling OB to 460RL dump. SHV112 was operating in S04B16 with trucks hauling coal to the ROM. LDR121 was operating on the new ROM Road with trucks hauling topsoil to 460RL. Low frequency noise at Lagoons Rd was between 29.0-36.8dB and between 26.2-32.5dB at Winchester Cr was 26.2dB - 32.5dB. Wind speed was between 0.0m/s-0.2m/s from ESE. The handheld noise monitor recorded results of 43.5dB at the complaint location. The MPEA drove to complaint location. General mining rumble audible from MCO/UCML direction with occasional revving and an increase of a rumbling sound audible but no distinct equipment was identified. The MPEA drove to Winchester Cr where general mining rumble was audible but no there was no distinct equipment identified. Occasional barking dogs were the dominant sound when present.
64.	4th April 2013	Ulan Road	Noise	Complainant rang to complain about noise at 2:08am on 04/04/13. There was a follow up call at 3:59am. EX102 was operating in S06B21 with trucks hauling OB to 425RL dump. SHV112 was operating in S03B15 with trucks hauling coal to the ROM. LDR121 was operating in S01B06 with trucks hauling topsoil to 480RL. 2.08am complaint

Number	Date	Location	Issue	Investigation and Follow Up
				Low frequency noise at Lagoons Rd was between 32.5-38.3dB and between 24.4-35.6dB at Winchester Cr. Wind speed was between 0.0-1.1m/s from the south. Hand held noise monitor recorded mine noise levels at 25-28dB. The MPEA drove to complaint location. General mine hum was audible from MCO direction. Occasional first loads, truck retard and dozer track were audible. Frequent cows calling, dogs barking, crickets and infrequent road traffic were also audible. The findings were discussed with the OCE who instructed dozer operators to use first gear in reverse. <u>3.59 am complaint</u> Low frequency noise at Lagoons Rd was between 23.0-32.6dB and between 28.0-33.9dB at Winchester Cres. Wind speed was between 0.0-0.5 m/s from NW. The handheld monitor recorded a result of 48.0dB at the complaint location. The MPEA drove to complaint location. General mine hum from MCO direction was audible. Dozer track was distinct, with occasional truck retard and first loads also heard. Increasing road traffic was also audible. The findings were discussed with the OCE. Topsoil trucks were stopped at 4:00am to minimise noise and dozers were still running in first gear.
65.	6th April 2013	Ulan Road	Noise	Complainant rang on 06/04/13 at 1:27am to complain about noise. There was a follow up complaint at 4:29am. EX101 was operating in S06B21 with trucks hauling OB to new ROM road and S02 coal ramp. SHV112 was operating in S03B15 with trucks hauling coal to the ROM. LDR121 was working on the ROM. <u>1:27am complaint</u> Low frequency noise was between 29.5-31.0dB at Lagoons Rd and between 35.2-41.3dB at Winchester Cres. Wind speed was between 0.5-1.1m/s from ESE. Handheld noise monitor recorded results of 38.3dB (around 25-28dB when wind was not present). The MPEA drove to complaint location. Faint mine hum from easterly direction (other mining operation) was audible. Wind was the dominant noise. Cows, dogs and frogs were also faintly heard. The OCE was notified of observations. Digger operator instructed to lower bucket and dozers were put in first gear. <u>4:29am complaint</u> Low frequency noise was between 29.1-33.5dB at Lagoons Rd and between 30.9-33.9dB at Winchester Cres. Wind speed was between 0.0-0.3m/s from ESE. Handheld noise monitor recorded results of 38.2dB. The MPEA drove to complaint location. Mine hum was audible during observation with infrequent banging noises heard that weren't consistent with first loads. Occasional dozer track was heard. Increasing road traffic also audible along with infrequent dog barking and wind. By end of

Number	Date	Location	Issue	Investigation and Follow Up
				recording period MCO operations had ceased for crib and end of shift. Hand held hovered between 22 – 26dB.
66.	6th April 2013	Ridge Road	Noise	Complainant rang on 06/04/13 at 10:47am to complain about noise from the previous night. EX101 was operating in S05 with trucks hauling OB to RL440 dump. EX102 was operating in S06 with trucks hauling OB to RL430 dump. SHV112 was operating on old ROM Rd with trucks hauling OB to Coal ramp. The MPEA had been noise monitoring during the evening and noted faint mine noise and occasional dozer track. OCE took action at 2:20am and put dozers in first gear and instructed operator to lower bucket. The ECRC contacted the complainant and left a message.
67.	9th April 2013	Ulan Road	Noise	Complainant rang on 09/04/13 at 2:37am to complain about noise. EX102 was operating in S07B18 with trucks hauling OB to 425RL dump. SHV112 was operating in S04B16 with trucks hauling coal to ROM. LDR121 was working in S02B07 with trucks hauling OB to ROM road dump. Low frequency noise at Lagoons Road was between 31.1-34.1dB and between 24.0-33.7dB at Winchester Cres. Wind speed was between 0.0-1.0m/s from WSW. Handheld noise monitor recorded noise levels at 24.6dB at complaint location. The MPEA drove to complaint location. General mining hum was audible from northerly direction with occasional revving but no distinct equipment was identified. Occasional barking dog and crickets were audible. OCE was advised of the findings.
68.	10th April 2013	Ulan Road	Noise	Complainant rang on 10/04/13 at 3:33am to complain about noise. EX102 was operating in S07B19 with trucks hauling OB to 425RL dump. SHV112 was operating in S04B15 with trucks hauling coal to ROM. LDR121 was working on the ROM. Low frequency noise at Lagoons Road was between 29.9-33.7dB and between 23.7-28.9dB at Winchester Cres. Wind speed was between 0.0-0.6m/s from SSW. The handheld noise monitor recorded noise levels at 43.1dB at the complaint location. The MPEA drove to complaint location. General mining hum was audible from northerly direction and fluctuated between audible and faintly audible. One vehicle drove past and crickets were occasionally audible. Dozer tracks were audible, however this had no impact on the noise level/reading. The MPEA contacted the OCE to advise and the dozer was parked up at 3:50am in an attempt to reduce machinery noise.
69.	11th April 2013	Ulan Road	Noise	Complainant rang on 12/04/13 at 4:13am to complain about noise. EX102 was operating in S07B19 with trucks hauling OB to 425RL dump. LDR121 was working on the ROM. Low frequency noise at Lagoons Road was between 34.0-39.1dB and between 25.4-36.0dB at Winchester Cres. Wind speed was between 0.1-1.3m/s from SSW. The MPEA drove to complaint location. Very faintly audible mining hum from northerly direction was heard. One bang from a mine was heard but the source was unable to be identified. Road traffic was the dominant noise. Rooster and cricket's were also audible.
70.	12th April 2013	Ulan Road	Noise	Complainant rang on 12/04/13 at 2:02am to complain about noise. EX102 was operating in S07B19 with trucks hauling OB to 425RL dump. EX103 was operating in S07B19 with trucks hauling OB to 425RL dump. SHV112 was operating in S03B14 with trucks hauling coal to ROM. LDR121 was

Number	Date	Location	Issue	Investigation and Follow Up
				working on the ROM. Low frequency noise at Lagoons Road was between 28.3-32.9dB and between 24.1-36.2dB at Winchester Cres. Wind speed was between 0.0-1.5m/s. The handheld noise monitor recorded noise levels of 37.3dB at complaint location. The MPEA drove to complaint location. Faint mine hum was audible and first load was clearly audible on occasion from MCO. Road traffic dominant noise when present.
71.	12th April 2013	Ulan Road	Noise	Complainant rang on 12/04/13 at 8:25am to complain about noise. EX102 was operating in S06B19 with trucks hauling OB to 425RL dump. SHV112 was operating in S03B14 with trucks hauling coal to ROM. Low frequency noise was between 29.2-37.6dB at Lagoons Road and between 33.6-36.1dB at Winchester Cres. Wind speed was 0.1-2.1m/s from ENE. The ECRC drove to the complaints location at approximately 9:00am. No mine noise could be heard over pump running at complainant's house. No hand held measurements were taken due to other noise sources dominating environment.
72.	12th April 2013	Ridge Road	Noise	Complainant rang on 12/04/13 at 8:39am to complain about noise. EX102 was operating in S06B19 with trucks hauling OB to 425RL dump. SHV112 was operating in S03B14 with trucks hauling coal to ROM. 1 Dozer was working on Drill Prep in the South. Low frequency noise was between 29.2-37.6dB at Lagoons Road and 33.6-36.1dB at Winchester Cres. Wind speed was 0.1-2.1m/s from ENE. The handheld noise monitor recorded results of 34.6dB at complaint location. The ECRC drove to complaint location. Faint mine hum/rumble was audible when wind eased. The ECRC contacted the complainant at 11:10 am and left a message.
73.	17th April 2013	Ridge Road	Noise	The complainant rang to complain about noise at 1:16am on 17/04/13. EX101 was operating in S07B21 with trucks hauling OB to 435RL dump. SHV112 was operating in S04B14 with trucks hauling coal to ROM. Low frequency noise was between 27.7-33.7dB at Lagoons Road and between 22.9-31.9dB at Winchester Cres. Wind speed was between 0.1-0.5m/s from SW. The MPEA attended complaint location and observed general mine hum with occasional dozer track as faintly audible. There were occasional momentary increases in volume of overall noise also noted. Mine noise was between 23.0-29.2dB on the hand held noise meter. The ECRS rang the complainant at 9:12am on 17/04/13 and left a message.
74.	17th April 2013	Ulan Road	Noise	The complainant rang to complain about noise at 3:45am on 17/04/13. EX101 was operating in S07B21 with trucks hauling OB to 435RL dump. SHV112 was operating in S04B14 with trucks hauling coal to ROM. Low frequency noise was between 25.7-34.3dB at Lagoons Road and between 23.0-31.1dB at Winchester Cres. There was no wind present. The MPEA attended the complaint location and observed isolated road traffic upon arrival with cricket and roosters crowing also audible. A very low pitched mine hum was very faintly audible only on occasion and could barely be made out, with the direction being unclear. When only crickets and mine hum present, noise sat consistently on 22.0dB.

Number	Date	Location	Issue	Investigation and Follow Up
75.	18th April 2013	Ridge Road	Noise	The complainant rang to complain about noise at 12:38am on 18/04/13. EX103 was operating in S07B21 with trucks hauling OB to 425RL dump. SHV112 was operating in S03B14 with trucks hauling coal to the ROM. Low frequency noise was between 28.6-33.7dB at Lagoons Road and between 23.3-37.4dB at Winchester Cres. Handheld noise monitor results were 53.3dB at the complaint location. Wind speed was 0.0-0.9m/s from east. The MPEA attended the complaint location and observed almost constant dog barking as the dominant noise (explaining the high readings). Indistinct mine hum was audible from northerly direction along with crickets, and a party further up the road was intermittently audible. When only mine noise and crickets were present, noise was between 22.0-25.7dB. The ECRS spoke with the complainant at 12:49pm on 18/04/13. The MPEA's observations from the last two nights were discussed. The complainant commented that the main noise is rocks dropping. Further discussions indicate that the source is from coaling activities as the noise is generally not audible on weekends. The roll out of the DuraTray was discussed.
76.	18th April 2013	Ulan Road	Noise	The complainant rang to complain about noise at 2:04am on 18/04/13. EX103 was operating in S07B21 with trucks hauling OB to 425RL dump. SHV112 was operating in S03B14 with trucks hauling coal to ROM. Low frequency noise was between 32.2-36.7dB at Lagoons Road and between 23.7-30.1dB at Winchester Cres. The handheld noise monitor recorded results of 26.6dB at complaint location. Wind speed was 0.0-0.6m/s from east. The MPEA attended the complaint location and observed crickets as the dominant sound. Low pitched mine hum was very faintly audible from northerly direction with noise levels between 22.0dB and 26.0dB.
77.	20th April 2013	Ridge Road	Noise	The complainant rang to complain about noise at 9:10am on 20/04/13. EX101 was operating in S07B21 with trucks hauling OB to 435RL dump. EX103 was operating in S07B20 with trucks hauling OB to 434RL dump. Low frequency noise was between 29.7-38.7dB at Lagoons Road and between 31.4-38.8dB at Winchester Cres. Wind speed was 1.2-1.8m/s from WSW. The ECRC contacted the complainant at 9:15am on the 20/04/13. The complainant informed the ECRC that the main noise was a low rumbling sound that was not normally this loud. They had noticed the noise this weekend and last weekend to be unusually louder. The ECRC called the complainant back on Monday 22/04/13 and left a message.
78.	21st April 2013	Ulan Road	Noise	The complainant rang to complain about noise at 2:47am on 21/04/13. EX101 was operating in S07B21-23 with trucks hauling OB to 435RL dump. EX103 was operating in S02B09 with trucks hauling OB to 425RL dump. The handheld noise monitor recorded results of 22.0dB at complaint location. Wind speed was 0.4-1.2m/s from SSW. The MPEA attended the complaint location and observed general mining hum faintly audible from easterly direction and crickets. No mine noise was heard from the north.

Number	Date	Location	Issue	Investigation and Follow Up
79.	22nd April 2013	Ulan Road	Noise	The complainant rang on 22/04/13 at 2:24am about noise. EX103 was operating in S02B09 with trucks hauling OB to 425RL dump. SHV112 was operating in S03B14 with trucks hauling coal to the ROM. Low frequency noise was between 33.2-36.5dB at Lagoons Road and between 25.4-29.4dB at Winchester Cres. Handheld noise results were 26.5dB at complaint location. Wind speed was 0.2-1.3m/s from SSW. The MPEA parked at complaint location. General mining hum was audible from northerly direction. No distinct equipment heard with occasional barking dog audible.
80.	29th April 2013	Ridge Road	Noise	The complainant rang on 29/04/13 at 8:21pm to complain about noise. EX101 was operating in S07B22-23 with trucks hauling OB to 430RL dump. EX103 was operating in S07B20-21 with trucks hauling OB to 430RL dump. Low frequency noise was 21.3-43.2dB at Lagoons Road and between 25.0-36.3dB at Winchester Cres. There was no wind present. MPEA parked at complaint location. There was no mine noise audible. Frequent road traffic on Ulan Rd was the dominant sound. Crickets and occasional dogs barking were audible. The ECRC contacted the complainant and discussed the complaint and noise from the night before. The ECRC went through MCO requirements in terms of quarterly monitoring and real time monitoring and the actions taken by the MPEA.
81.	30th April 2013	Ulan Road	Noise	The complainant rang on 30/04/13 at 4:40am to complain about noise. EX101 was operating in S07B22-23 with trucks hauling OB to 430RL dump. EX103 was operating in S07B20-21 with trucks hauling OB to 430RL dump. Low frequency noise was between 33.3-38.1dB at Lagoons Road and between 24.6-34.8dB at Winchester Cres. Wind speed was between 0.0-1.4m/s.
82.	2nd May 2013	Ridge Road	Noise	The complainant rang on 02/05/13 at 9:36pm to complaint about noise. EX103 was operating in S06B14 with trucks hauling OB to 430RL dump. SHV112 was operating in S04B14 with trucks hauling coal to the ROM. Low frequency noise was between 30.4-34.2dB at Lagoons Road and between 30.4-38.4dB at Winchester Cres. Wind speed was between 1.3-2.3m/s from NE. The MPEA parked at complaint location. No mine noise was audible. There was faintly audible road traffic on Ulan Rd. There were occasional popping noise heard (gun shots) from a southerly direction. MPEA notified OCE of observations who instructed dozers to operate in 1st gear and to lower bucket when placing first loads, even though mining noise could not be heard. The ECRC contacted the complainant the following day and explained the actions taken by MCO during the night.
83.	3rd May 2013	Ridge Road	Noise	The complainant rang on 03/05/13 at 1:23am to complain about noise. EX103 was operating in S06B14 with trucks hauling OB to 430RL dump. SHV112 was operating in S04B14 with trucks hauling coal to the ROM. Low frequency noise at Lagoons Road was between 28.8-36.2dB and between 26.8-34.9dB at Winchester Cres. Handheld noise monitor recorded results of 38.2dB at complaint location. The wind speed was between 0.0-1.0m/s from NE. The MPEA parked at complaint location. Faint mine hum was audible from the north, with no distinct machinery being heard. Crickets, light breeze, frogs, road traffic and barking dogs were all audible. The MPEA notified the OCE who instructed operators to lower

Number	Date	Location	Issue	Investigation and Follow Up
				bucket. The ECRC contacted the complainant the following day and left a message.
84.	3rd May 2013	Ulan Road	Noise	The complaint rang on 03/05/13 at 1:05am to complain about noise. There were follow up calls at 2:13am and 3:18am. EX103 was operating in S06B14 with trucks hauling OB to 430RL dump. SHV112 was operating in S04B14 with trucks hauling coal to the ROM. LDR121 was working on the ROM. <u>1:05 am complaint</u> Low frequency noise was between 26.7-32.3dB at Lagoons Road and between 23.7-40.8dB at Winchester Cres. Wind speed was 0.0-0.2m/s. <u>2:13 am complaint</u> Low frequency noise was between 32.2-36.6dB at Lagoons Road and between 29.7-34.9dB at Winchester Cres. Wind speed was 0.0-0.9m/s. <u>3:18 am complaint</u> Low frequency noise was between 31.9-36.6dB at Lagoons Road and between 25.4-31.7dB at Winchester Cres. Wind speed was 0.0-0.9m/s.
85.	6th May 2013	Ridge Road	Noise	The complainant rang to complain about noise at 12:49am on 06/05/13. EX102 was operating in S06B22 with trucks hauling OB to 430RL dump. SHV112 was operating in S04B15 with trucks hauling coal to the ROM. Low frequency noise was between 27.7-33.1dB at Lagoons Road and between 29.0-31.9dB at Winchester Cres. The handheld noise monitor recorded noise levels of 27.1dB at complaint location. Wind speed was 0.0-1.3m/s from SE-E. The MPEA drove to the complaint location and observed general mine hum fluctuating between faintly audible and audible from northerly direction. Occasional dozer track and occasional thumps were noticed. Crickets were also audible. The ECRS rang the complainant at 10:58am on 06/05/13 and left a detailed message. The complainant was asked to call back if they wanted more details.
86.	6th May 2013	Ulan Road	Noise	The complainant rang to complain about noise at 2:52am on 06/05/13. EX102 was operating in S06B22 with trucks hauling OB to 430RL dump. SHV112 was operating in S04B15 with trucks hauling coal to the ROM. Low frequency noise was between 29.8-32.1dB at Lagoons Road and between 28.6-30.5dB at Winchester Cres. Wind speed was between 0.0-0.1m/s from east.
87.	7th May 2013	Ulan Road	Noise	The complainant rang to complain about noise at 1:10am on 07/05/13. EX103 was operating in S03B08 with trucks hauling OB to RL415 Dump. Low frequency noise was between 28.9-32.8dB at Lagoons Road and between 28.4-36.2dB at Winchester Cres. Wind speed was between 0.0-0.2m/s from SW.
88.	7th May 2013			The complainant rang to complain about noise at 11:11pm on 07/05/13. There were follow up complaints at 1:05am on 08/05/13 and 4:20am on 08/05/13. EX102 was operating in S07B21 with

Number	Date	Location	Issue	Investigation and Follow Up
				trucks hauling OB to New Haul Rd Dump. EX103 was operating in S02B08 with trucks hauling OB to RL415 Dump. SHV112 was operating in S04B15 with trucks hauling coal to the ROM. LDR121 was operating on the ROM. No machinery in operation from approx. 00:40am - 01:15am. Operators were at crib. <u>11:11pm complaint</u> Low frequency noise was between 28.3-37.2dB at Lagoons Road and between 27.5-37.4dB at Winchester Cres. There was no wind present. <u>1:05am complaint</u> Low frequency noise was between 24.1-29.8dB at Lagoons Road and between 25.9-34.0dB at Winchester Cres. There was no wind. <u>4:20am complaint</u> Low frequency noise was between 28.4-42.9dB at Lagoons Road and between 27.6-36.4dB at Winchester Cres. There was no wind. The MPEA made general observations throughout the night in the general vicinity of the complainant's residence. They noted that a general mine rumble was audible from northerly direction at times for the earliest complaint and that no mine noise was audible for the latest complaint.
89.	8th May 2013	Ridge Road	Noise	The complainant rang on 08/05/13 at 11:57pm to complain about noise. EX101 was operating in S07B20 with trucks hauling OB to southern highway dump. EX103 was operating in S02-3B08 with trucks hauling OB to 4115RL dump. SHV112 was operating in S04B15 with trucks hauling coal to ROM. Low frequency noise at Lagoons Road was between 29.7-34.0dB and between 24.3-37.6dB at Winchester Cres. The wind speed was 0.0-0.2m/s from NE. The MPEA drove to complaint location and observed general mining rumble from northerly direction. Occasional thumping/crash sounds were heard. Occasional road traffic was the dominant sound when present. Average noise level was approx 29-32dB for most of 15 minute interval. Advised OCE who will speak to EX/SHV operators to reduce first loading impacts. The ECRS rang the complainant and left a detailed message at 10:37am on 09/05/13.
90.	9th May 2013	Ulan Road	Noise	The complainant rang on 09/05/13 at 2:44am to complain about noise. EX101 was operating in S07B20 with trucks hauling OB to southern highway dump. EX103 was operating in S02-3B08 with trucks hauling OB to 415RL dump. SHV112 was operating in S04B15 with trucks hauling coal to the ROM. Low frequency noise levels were between 34.4-44.3dB at Lagoons Road and between 23.9-30.9dB at

Number	Date	Location	Issue	Investigation and Follow Up
				Winchester Cres. Wind speed was between 0.2-0.5m/s from NE.
91.	10th May 2013	Winchester Cres	Noise	The complainant rang on 10/05/13 at 11:53pm to complain about noise. EX102 was operating in S07B20 with trucks hauling OB to Southern Highway dump. SHV112 was operating in S04B17 with trucks hauling coal to the ROM. LDR121 was working on the ROM. Low frequency noise at Lagoons Road was between 23.7-32.1dB and between 29.1-41.2dB at Winchester Cres. There was no wind. The handheld noise monitor recorded results of 37.6dB at the complaint location. The MPEA parked at complaint location. A dog was barking for most of 15 minutes recording and there was no mine noise audible over it. Road traffic was clearly audible on Ulan Rd. MPEA rang the OCE, MCO operations were standing for crib. The ECRC contacted the complainant 11:45am on 11/05/13 and left a message. ECRC contacted the complainant again at 12:23pm and discussed the MPEA's observations. The complainant disagreed with the observations.
92.	11th May 2013	Cope Road	Noise	The complainant rang to complain about noise at 9:53am on 11/05/13. EX101 was operating in S04B17 with trucks hauling OB to block tip under the South Highway dump. EX102 was operating in S06B19 with trucks hauling OB to South Highway dump. EX103 was operating in S02B08 with trucks hauling to 415RL dump. Low frequency noise was between 27.6-34.5dB at Lagoons Road and between 32.5-56.5dB at Winchester Cres (wind affected). Wind speed was between 1.8-2.9m/s from NE-E. The MPEA attended the complaint location and observed regular road traffic as the dominant noise. Conditions were windy, even when the wind dropped a breeze was still present. Birds were audible. General mine drone ranged from inaudible to faintly audible and was only present when wind died down and no road traffic was audible. The mine noise was coming from NE direction. When the wind died down and road traffic was absent, the audible mine noise reading was between 28.4-30.7dB. The ECRC contacted the complainant at 11:47am and discussed the noise environment at the time of the complaint and the MPEA's observations. After a lengthy discussion regarding the complainants time in the area the complainant raised that they would like to discuss compensation options. This request was passed onto the ECRM.
93.	11th May 2013	Cope Road	Noise	The complainant rang to complain about noise at 9:55am on 11/05/13. EX101 was operating in S04B17 with trucks hauling OB to block tip under the South Highway dump. EX102 was operating in S06B19 with trucks hauling OB to South Highway dump. EX103 was operating in S02B08 with trucks hauling to 415RL dump. Low frequency noise was between 27.6-34.5dB at Lagoons Road and between 32.5-56.5dB at Winchester Cres (wind affected). Wind speed was between 1.8-2.9m/s from NE-E. The MPEA attended the complaint location and observed regular road traffic as the dominant noise. Conditions were windy, even when the wind dropped a breeze was still present. Birds were audible. General mine drone ranged from inaudible to faintly audible and was only present when wind died down and no road traffic was audible. The mine noise was coming from NE direction. When the wind died

Number	Date	Location	Issue	Investigation and Follow Up
				down and road traffic was absent, the audible mine noise reading was between 28.4-30.7dB. The ECRC attempted to contact the complainant at 12:08pm on 11/05/13 and spoke with the partner who was unaware of the complaint. The ECRC contacted the complainant at 1:45pm on 11/05/13 and discussed the noise environment at the time of the complaint. The complainant would like to discuss options for purchasing their property with MCO.
94.	11th May 2013	Ulan Road	Noise	The complainant rang on 11/05/13 at 11:44pm to complain about noise. EX101 was operating in S07B19 with trucks hauling OB to Southern Highway dump. EX102 was operating in S07B19 with trucks hauling OB to Southern Highway dump. EX103 was operating in S03B08 with trucks hauling OB to 415RL and S02 dump. Low frequency noise was between 28.2-32.6dB at Lagoons Road and between 30.3-40.4dB at Winchester Cres. Wind speed was between 0.0-0.2m/s from E-ESE.
95.	11th May 2013	Ulan Road	Noise	The complainant rang on 11/05/13 at 11:44pm to complain about noise. EX101 was operating in S07B19 with trucks hauling OB to Southern Highway dump. EX102 was operating in S07B19 with trucks hauling OB to Southern Highway dump. EX103 was operating in S03B08 with trucks hauling OB to 415RL and S02 dump. Low frequency noise was between 28.2-32.6dB at Lagoons Road and between 30.3-40.4dB at Winchester Cres. Wind speed was between 0.0-0.2m/s from ENE-E. Handheld noise monitor results were 38.9dB at complaint location. The MPEA parked at complaint location. Mine hum was faintly audible when no wind was present. Wind was the dominant sound and was making the trees creak a lot. Sheep were also heard. No road traffic was heard. No banging heard. The ECRC contacted the complainant at 2:50pm on the 12/05/13 and left a message. The complainant returned the ECRC call at 7:00pm on the 12/05/13 and the ECRC discussed the noise environment with the complainant. The complainant strongly disagreed with the ECRC and insisted that some need to come and see them regarding purchasing of the property as they don't want to be there anymore.
96.	11th May 2013	Winchester Cres	Noise	The complainant rang on 11/05/13 at 11:45pm to complain about noise. EX101 was operating in S07B19 with trucks hauling OB to Southern Highway dump. EX102 was operating in S07B19 with trucks hauling OB to Southern Highway dump. EX103 was operating in S03B08 with trucks hauling OB to 415RL and S02 dump. Low frequency noise was between 28.2-32.6dB at Lagoons Road and between 30.3-40.4dB at Winchester Cres. Wind speed was between 0.0-0.2m/s from ENE-E. Handheld noise monitor results were 38.9dB at complaint location. The MPEA was parked on Ulan Road at the time of the complaint. Mine hum was faintly audible when no wind present. The wind was the dominant sound and was making the trees creak a lot. Sheep were also heard. No road traffic was heard. No banging heard. The ECRC contacted the complainant at 2:55pm on 12/05/13 and discussed the observations of the MPEA and our operations during the night
97.	12th May 2013	Ulan Road	Noise	The complainant rang on 12/05/13 at 11:59pm to complain about noise. There was a follow up complaint at 2:54am on 13/05/13. EX102 was operating in S06B19 with trucks hauling OB to southern

Number	Date	Location	Issue	Investigation and Follow Up
				highway dump. SHV112 was operating in S04B17 with trucks hauling coal to the ROM. LDR121 was operating on the ROM. 11:59pm complaint Low frequency noise at Lagoons Road was between 29.6-45.3dB and between 24.7-42.5dB at Winchester Cres. Wind speed was between 0.7-1.3m/s. 2:54am complaint Low frequency noise at Lagoons Road was between 36.1-39.3dB and between 24.3-26.5dB at Winchester Cres. There was no wind.
98.	5th June 2013	Ulan Road	Noise	The complainant rang on 05/06/13 at 11:11pm to complain about noise. There was a follow up complaint on 06/06/13 at 3:38am. EX101 was operating in S06B21 with trucks hauling OB to 430RL dump. SHV112 was operating in S05B17 with trucks hauling coal to the ROM. 11:11pm complaint Low frequency noise was between 34.8-41.6dB at Lagoons Road and between 21.9-32.7dB at Winchester Cres. There was no wind. 3:38am complaint Low frequency noise was between 32.4-37.1dB at Lagoons Road and between 24.1-32.0dB at Winchester Cres. There was no wind.
99.	6th June 2013	Moolarben Road	Noise	The complainant rang MCO direct on 06/06/13 at 10:47am to complain about noise. EX103 was operating in S03B07 with trucks hauling OB to 415RL dump. DuraTray trucks were running on this circuit. SHV112 was operating in S05B18 with trucks hauling coal to the ROM. LDR121 was working on the ROM. Low frequency noise levels were between 33.4-39.4dB at Lagoons Rd and between 27.8-37.9dB at Winchester Cres. Wind speed was 0.0-0.2m/s. Handheld noise monitor recorded levels of 37.9dB at the complaint location. The ECRC and MPEA attended the complainants address at 11:30am. Mine hum was audible from the north and east direction in the form of faint hum, truck retard and one large rumble. Dominant noises were birds, sheep and planes. Road traffic on Ulan road was also audible. ECRC contacted the complainant at 12:50pm and discussed the observations and noise data.
100.	6th June 2013	Ulan Road	Noise	The complainant rang on 06/06/13 at 10:04pm to complain about noise. EX103 was operating in S02-3B08 with trucks hauling OB to 428RL dump. SHV112 was operating in S05B19 with trucks hauling coal to the ROM. Low frequency noise levels at Lagoons Road were between 32.0-49.6dB and between

Number	Date	Location	Issue	Investigation and Follow Up
				26.4-44.5dB at Winchester Cres. Wind speed was between 0.0-0.5m/s from ENE.
101.	9th June 2013	Ulan Road	Noise	The complainant rang on 09/06/13 at 1:54am to complain about noise. EX101 was operating in S07B20 with trucks hauling OB to 440RL dump. EX103 was operating in S02B08 with trucks hauling OB to 430RL dump. Low frequency noise levels were between 26.8-35.0dB at Lagoons Road and between 27.5-33.4dB at Winchester Cres. Wind speed was between 0.0-0.5m/s from north.
102.	10th June 2013	Moolarben Road	Noise	The complainant rang on 10/06/13 at 8:56am to complain about noise. EX102 was operating in S06B21 with trucks hauling OB to 440RL dump. EX103 was operating in S02B8 with trucks hauling OB to 430RL dump. SHV112 was operating in S05B18 with trucks hauling coal to the ROM. LDR121 was operating in S04B14 with trucks hauling coal to the ROM. Low frequency noise was between 36.8-38.3dB at Lagoons Road and between 26.7-49.8dB at Winchester Cres. Wind speed was between 0.0-0.3m/s. Handheld noise monitor results were 38.3dB at complaint location. The MPEA attended the complainants address at 9:20am. Mine hum was audible from the north direction in the form of a faint hum with no distinct machinery heard. Dominant noises were birds, motorbikes on a nearby property and isolated road traffic on Moolarben Road. Road traffic on Ulan Road was also audible. When no other sounds were present, the hand held results ranged between 26-31dB. The ECRM spoke with the complainant on the 11/06/13 and arranged a meeting later in the week to discuss noise and other issues.
103.	16th June 2013	Ulan Road	Noise	The complainant rang on 16/06/13 at 9:59am to complain about noise. EX102 was operating in S06B22 with trucks hauling OB to 440RL dump. EX103 was operating in S03B08 with trucks hauling OB to 440RL dump. Low frequency noise was between 26.7-36.9dB at Lagoons Road and between 29.7-35.0dB at Winchester Cres. Wind speed was between 0.4-1.0m/s from SW.
104.	28th June 2013	Ridge Road	Noise	Complainant rang at 1:40am on 28/06/13 to complain about noise from the operation. EX102 was operating in S07-8 with trucks hauling OB to 440RL dump. SHV112 was operating in S04B20 with trucks hauling coal to ROM. LDR121 was working on the ROM. Low frequency noise was between 28.1-31.4dB at Lagoons Road and between 27.1-34.6dB at Winchester Cres. There was no wind. The MPEA attended the complainants address at 2:20am. Consistent rain and road traffic was audible. The ECRC attempted to contact the complainant on several occasions but could not make contact.
105.	9th July 2013	Ridge Road	Noise	The complainant rang to complain about noise at 11:37pm on 09/07/13. EX102 was operating in S07B24 with trucks hauling OB to 440RL dump. SHV112 was operating in S05B20 with trucks hauling coal to the ROM. LDR121 was operating in S03B08 with trucks hauling OB to 440RL dump. Low frequency noise was between 29.3-33.5dB at Lagoons Road and between 32.5-42.7dB at Winchester Cres. Handheld noise monitor recorded levels of 32.5dB at complaint location. The MPEA drove to the complaint location and observed general mine rumble with intermittent thumps and crashing sounds audible, coming from the north over the mountain. Wind in the trees and occasional road traffic were

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				audible. When road traffic was absent and the wind died down, mine noise sat between 30-34dB. The OCE was notified of findings. EX102 dump was moved to a lower dump and dozers were put in 1st gear. The ECRS spoke with the complainant at 9:38am on 10/07/13 and provided feedback on the MPEA observations and the actions taken by the OCE. They commented that track noise was distinct and occurred through until approximately 2:30am. They could also hear the same noise this morning.
106.	10th July 2013	Ulan Road	Noise	The complainant rang to complain about noise at 12:26am on 10/07/13. EX102 was operating in S07B24 with trucks hauling OB to 440RL dump. SHV112 was operating in S05B20 with trucks hauling coal to the ROM. LDR121 was operating in S03B08 with trucks hauling OB to 440RL dump. Low frequency noise at Lagoons Road was between 28.5-31.5dB and between 32.1-36.7dB at Winchester Cres. Wind speed was between 0.2-1.0m/s from N-NE. The MPEA was at the complaint location a few minutes after the complaint was made. Regular road traffic and wind in the trees were the dominant sounds. Indistinct mine hum was audible only when road traffic absent and wind died down.
107.	14th July 2013	Ulan Road	Noise	The complainant rang to complain about noise at 12:39am on 14/07/13. EX102 was operating in S07B23 with trucks hauling OB to 440RL dump. EX103 was operating in S02B06 with trucks hauling OB to Rehab. SHV112 was operating in S05B18 with trucks hauling OB to 440RL. Low frequency noise was between 29.5-33.9dB at Lagoons Road and between 24.4-29.7dB at Winchester Cres. Wind speed was between 0.0-0.5m/s from NNE.
108.	17th July 2013	Ulan Road	Noise	Complainant rang to complain about noise at 1:49am on 17/07/13. EX103 was operating in S03B05 with trucks hauling to 440RL Dump. SHV112 was operating in S05B20 with trucks hauling to ROM. LDR121 was operating in S02B05 with trucks hauling to 440RL Dump. Low frequency noise was between 34.0-35.8dB at Lagoons Road and between 28.9-30.3dB at Winchester Cres. The wind speed was between 0.5-1.0m/s from NNE.
109.	19th July 2013	Ulan Road	Noise	The complainant rang on 19/07/13 at 1:09am to complain about noise. EX102 was operating in S07B23 with trucks hauling OB to 420RL dump. Low frequency noise was between 31.8-34.0dB at Lagoons Road and between 25.9-30.0dB at Winchester Cres. Wind speed was between 0.3-0.9m/s from SW.
110.	27th July 2013	Ulan Road	Noise	The complainant rang to complain about noise at 3:11am on 27/07/13. EX102 was operating in S07B20 with trucks hauling OB to 425RL dump. SHV112 was operating in S05B18 with trucks hauling coal to the ROM. Low frequency noise was between 29.9-36.3dB at Lagoons Road and between 26.5-34.7dB at Winchester Cres. Wind speed was 0.8m/s from SSE-SE. The MPEA was in the general are observing noise approx. 30 minutes prior to the complaint. There was no mine noise audible at this time.
111.	1st August 2013	Ulan Road	Noise	The complainant rang at 3:15am on 01/08/13 to complain about noise. EX102 was operating in S07B19 with trucks hauling OB to RL440 dump. SHV112 was operating in S05B16 with trucks hauling coal to the ROM. Low frequency noise at Lagoons Road was between 35.2-36.7dB and between 25.6-26.0dB

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				at Winchester Cres. Wind speed was 1.3m/s from SW. The MPEA was in the general area around the time of the complaint and could hear mine noise from UCML/MCO direction.
112.	2nd August 2013	Ulan Road	Noise	The complainant rang at 1:59am on 02/08/13 to complain about noise. EX102 was operating in S07B23 with trucks hauling OB to RL440 dump. SHV112 was operating in S05B16 with trucks hauling coal to the ROM. Low frequency noise at Lagoons Road was between 30.2-30.9dB and between 23.8-25.7dB at Winchester Cres. Wind speed was 0.8m/s from SW. The MPEA had been observing the noise throughout the night and could hear faintly audible mine noise from UCML/MCO direction. No action was taken.
113.	5th August 2013	Saddlers Creek Road	Noise	The complainant contacted the ECRM via email on 05/08/13 at 10:18am to complain about noise. EX103 was operating in S04B07 with trucks hauling OB to 445RL dump. SHV112 was operating in S05B18 with trucks hauling coal to the ROM. LDR121 was working on the ROM. 2 Dozers were operating on Coal Stockpile. Low frequency noise at Lagoons Road was between 30.3-41.6dB and between 27.5-52.2dB at Winchester Cres. Wind speed was 0.0-3.2m/s from NE-E. The MPEA had been observing the noise frequently between 7am and 9am with road traffic the dominant sound. The MPEA observed a faint mine hum from the North of the location, as well as banging and machinery noise from Westerly direction of Lagoons Road. Birds, a plane were also audible throughout the morning. The ECRC emailed the complainant on 06/08/13 with information regarding the complaint. The complainant responded requesting further information; the ECRC provided this information via email on the 07/08/13.
114.	12th August 2013	Saddlers Creek Road	Noise	The complainant rang to complain about noise at 08:16am on 12/08/13. EX102 was operating in S07B25 and was raking the high wall. EX103 was operating in S04B06 with trucks hauling OB to 440RL dump. SHV112 was operating in S06B18 with trucks hauling coal to the ROM. Low frequency noise was between 34.7-41.5dB at Lagoons Road and between 28.9-39.5dB at Winchester Cres. Wind speed was between 0.6-0.8m/s from ESE-W. The ECRC and the MPEA attended the complaint location and observed frequent road traffic as the dominant sound. A low pitched mine hum and faint dozer track were occasionally observed from a west and south west direction and were only audible when no road traffic was present. Bird noises were constantly audible. The ECRC contacted the complainant at 9:00 am to discuss the complaint.
115.	17th August 2013	Ulan Road	Noise	The complainant rang at 4:44am on 17/08/13 to complain about noise. EX102 was operating in S08B21 with trucks hauling OB to 425 Dump. EX103 was operating in S04B05. SHV112 was operating in S06B19 with trucks hauling coal to the ROM. Low frequency noise was between 35.1-37.0dB at Lagoons Road and between 26.8-30.5dB at Winchester Cres. Wind speed was 0.3m/s from NNW. The MPEA was in the general area around the time of the complaint and could hear MCO and non-MCO related mine noise from the north. Crickets were found to be the dominant noise, while barking dogs

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				were also audible. Based on these observations no action was taken.
116.	25th August 2013	Ulan Road	Noise	The complainant rang to complain about noise at 1:51am on 25/08/13. EX102 was operating in S07B20 with trucks hauling OB to RL425 dump. EX103 was operating in S04B06 with trucks hauling OB to RL440 dump. Low frequency noise was between 31.1-37.3dB at Lagoons Road and between 23.3-26.4dB at Winchester Cres. Wind speed was between 0.0-1.1m/s from SW. The MPEA was in the area at the time of the complaint and observed crickets as the dominant noise with a low pitched mine hum faintly audible from MCO/Ulan direction.
117.	29th August 2013	Winchester Cres	Noise	The complainant rang to complain about noise at 11:30pm on 28/08/13. EX102 was operating in S08B21 with trucks hauling OB to 460RL regrade. EX103 was operating in S03B05 with trucks hauling OB to North FSL ramp. Low frequency noise at Lagoons Road was between 28.8-31.4dB and between 28.9-39.1dB at Winchester Cres. Wind speed was between 0.2-1.3m/s from NNE. Hand held monitor recorded total results of 36.3dB. The MPEA was in the area at the time of the complaint and had observed constant road traffic as the dominant noise for 5 mins prior to complaint. No mining noise was audible during this time. Handheld noise monitoring was undertaken from 11:55pm with the monitor averaging 27-31dB for mining related noise. Frequent road traffic and dog barking was dominant noise during this time. When no traffic, mining hum was audible, with faintly audible dozer tracks. The MPEA notified the OCE of observations. Dozer operators put into first gear and continued to monitor noise levels. ECRC contacted the complainant at 9.40am on the 29/08/13 to discuss the noise environment at the time of the complaint. The complainant stressed that noise levels were very loud and the sound of the dozer was not faint.
118.	29th August 2013	Ridge Road	Noise	The complainant rang to complain about noise at 11:06pm on 29/08/13. EX102 was operating in S08B20 with trucks hauling OB to 460RL regrade. EX103 was operating in S03B05 with trucks hauling OB to FSL ramp. Low frequency noise was between 35.2-40.3dB at Lagoons Rd and between 24.3-38.9dB at Winchester Cres. Wind speed was between 0.0-0.9m/s from the NW. Hand held noise monitor recorded total results of 35.7dB. The MPEA was monitoring at Lagoons Road at the time of the complaint and mining noise from MCO/UCML was audible with faintly audible dozer tracks. It had also just started to rain and crickets and occasional road traffic was audible. Conducted handheld monitoring near complaint location from 11:24pm. Mining hum fluctuated between audible and inaudible. No distinct equipment was heard. Rain and frequent road traffic were the dominant sounds and audible throughout monitoring period. The ECRC reviewed the audio and confirmed the observation of the MPEA. Complainant was contacted at 11.50am on the 30/08/13 to discuss the noise environment. The complainant informed the ECRC that the main noise was a banging noise that initially woke them up.

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119.	30th August 2013	Ulan Road	Noise	The complainant rang to complain about noise at 4:17am on 30/08/13. EX102 was operating in S08B20 with trucks hauling OB to 460RL regrade. EX103 was operating in S03B05 with trucks hauling OB to FSL ramp. Low frequency noise was between 33.4-36.8dB at Lagoons Rd and between 26.4-33.1dB at Winchester Cres. Wind speed was between 0.0-0.9m/s from the SSW. The MPEA observed a similar noise environment throughout the night consisting of a low general mine rumble.
120.	30th August 2013	Saddlers Creek Road	Noise	The complainant rang at 11:52pm on 30/08/13 to complain about noise. EX101 was operating in S07B22 and EX103 was operating in S03B05. Low frequency noise at Lagoons Road was between 34.2-37.1dB at Lagoons Rd and between 25.4-27.6dB at Winchester Cres. Wind speed was between 0.0-1.1m/s from SW. Handheld noise monitor recorded total results of 32.4dB. The MPEA conducted handheld monitoring near complaint location from 12:17am. No distinct mining noise was audible except for occasional dozer tracks from a non MCO direction. ECRC contacted the complainant on the 31/08/13 at 8:30am, the complainant explained that the noise was similar to an alarm, a very high pitched whining noise. The ECRC emailed the complainant further details on the 02/09/13.