ULAN
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In accordance with Condition 4, Schedule 5 of PA08_0184 this plan has been subject to updates and revisions submitted to the NSW Department of Planning, Industry and Environment (DPIE) (See Change Information Section 8.3). The Effective date of this document represents the latest acknowledgement from DPIE that this plan has been prepared to the satisfaction of the Director-General.

Surface Water Monitoring Program

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Owner:	Environment and Community Manager

Table of Contents

List of Figures

List of Tables

Preparation of Water Management Plan (WMP) and associated Surface Water Monitoring Program (SWMP)

Project approval was granted for the Ulan Coal - Continued Operations Project by the Minister for Planning on 10 November 2010 (Project Approval (PA 08_0184)). Condition 34(a) of Schedule 3 of the project approval requires that a WMP be prepared by suitably qualified and experienced persons whose appointment has been approved by the Director-General. This SWMP forms one component of the WMP (ULNCX-111515275-99).

In accordance with Condition 34 (b), Schedule 3 of the project approval, Ulan Coal Mines Proprietary Limited (UCMPL) received notification from the Director-General of the Department of Planning, Industry and Environment (DPIE) that the Department approved the appointment of Susan Shield, Technical Engineering Manager at Umwelt (Australia) Pty Limited, suitably qualified and experienced to prepare the WMP (refer to **Appendix A** for correspondence).

This SWMP was initially prepared and reviewed by Susan Shield of Umwelt (Australia) Pty Limited in consultation with UCMPL. This version of the SWMP has been reviewed and updated by UCMPL as required by Schedule 5 Condition 4 of PA08_0184 and the recent granting of Modification 5.

1 Commitment and Policy

1.1 Introduction

The Ulan Mine Complex is situated in the central west of New South Wales. It is located in the Mid-Western Regional Council (MWRC) Local Government Area (LGA) near the village of Ulan; approximately 38 kilometres north-northeast of Mudgee and 19 kilometres northeast of Gulgong (**Figure 1.1**). Ulan Coal Mines Proprietary Limited (UCMPL) operates the mine as a joint venture, managed by Glencore Coal Assets Australia (GCAA).

UCMPL owns or has long term leases over the majority of land within the project area that will be subject to mining activities and required for surface facilities. The area is primarily surrounded by rural landholdings, native bushland and primary industries including agriculture, forestry, mining (including other coal mining operations) and extractive industries. The UCMPL landholdings are located within the headwaters of the Goulburn and Talbragar River catchment areas.

Project Approval (PA 08_0184) was issued by NSW Planning, Industry and Environment (DPIE), on 15 November 2010 for continued operations. PA08_0184 authorises current and proposed mining of the Ulan Mine Complex for the next 21 years, and production of up to 20 Mtpa (million tonnes per annum) of product coal. The approval provides for an open cut and Ulan West and Ulan Underground mines to operate twenty-four hours a day, 7 days per week. Infrastructure and supporting operations include the Bobadeen Irrigation Scheme (BIS) and Bobadeen Basalt Quarry (**Figure 1.2**). The approval was modified as follows:

- Environmental Assessment: Ulan Coal Continued Operations North 1 Underground Mining Area, Minor Modification to Ulan Underground & Ulan West Mine Plans & Proposed Concrete Batching Plant (Umwelt, 2011) - (MOD1) approved 7 December 2011
- Land and Environment Court final orders issued on the 5 April 2012.
- Ulan West Mine Plan and Construction Blasting (Umwelt, 2012) – (MOD2) approved 29 May 2012
- Environmental Assessment: Ulan West Modification (southern extension) (Umwelt 2015) – (MOD 3) Approved 14 March 2016.
- Environmental Assessment: Ulan Continued Operations Project, Longwall Optimisation Project (Ecological, 2018) – (MOD 4), as modified by the Response to Submissions, dated August 2018, approved 17 July 2019.
- Revision of Ulan West Operational Mine Plan – Modification 5 approved 7th August 2020

To satisfy Condition 34, Schedule 3 of the Project Approval, UCMPL are required to prepare a SWMP. This SWMP has been developed in accordance with the conditions of the Project Approval and Statement of Commitments specified in **Table 2.1**

In accordance with Condition 34 (b), Schedule 3 of the Project Approval this SWMP was initially prepared and subsequently reviewed by Susan Shield of Umwelt (Australia) Pty Limited in consultation with UCMPL. This update of the SWMP has been undertaken internally in accordance with Schedule 5 Condition 4 of PA08_0184.

This SWMP was prepared as a component of the *WMP (ULNCX-111515275-99)*, and should be read in conjunction with the WMP.

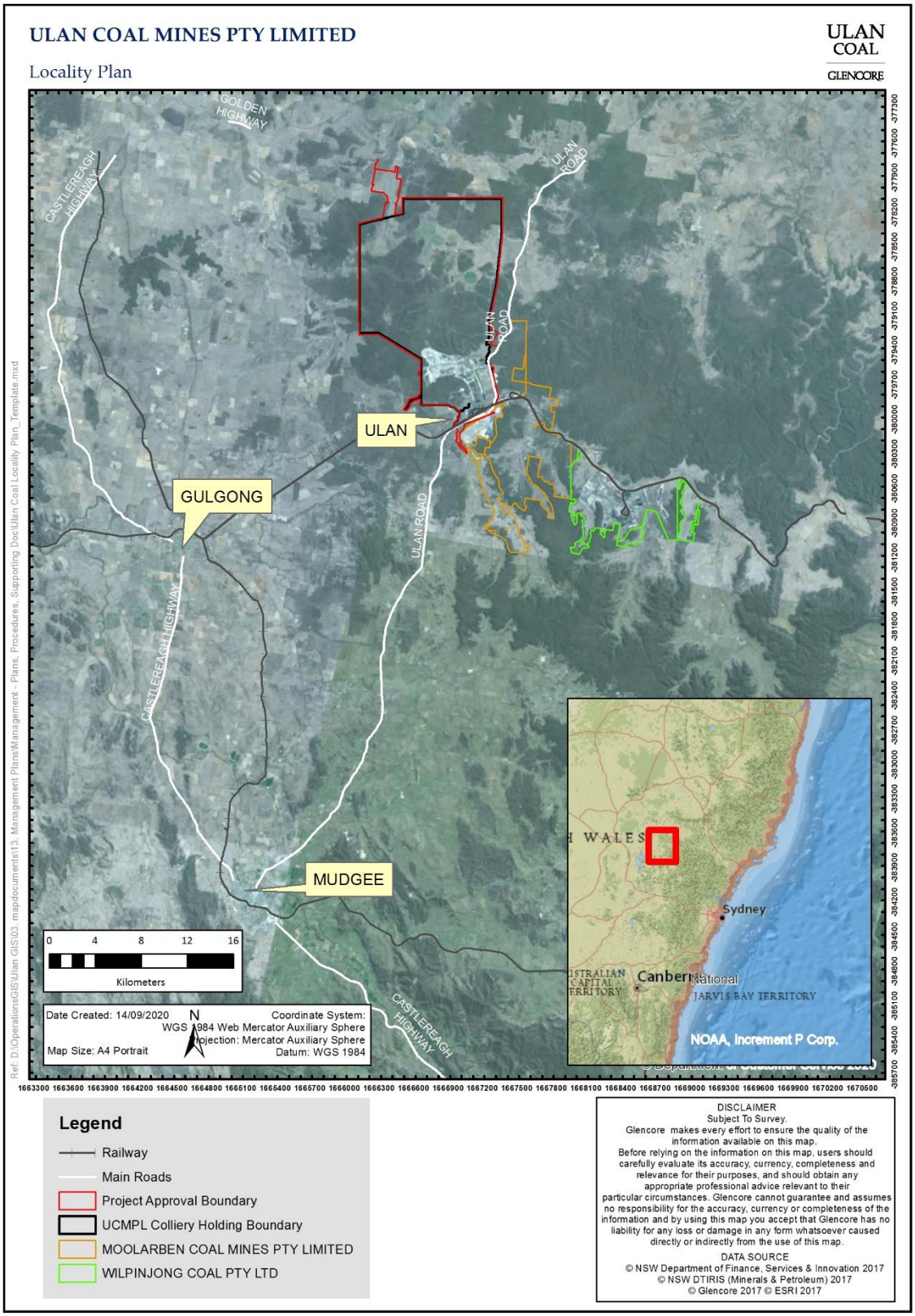

Figure 1.1 Locality Plan

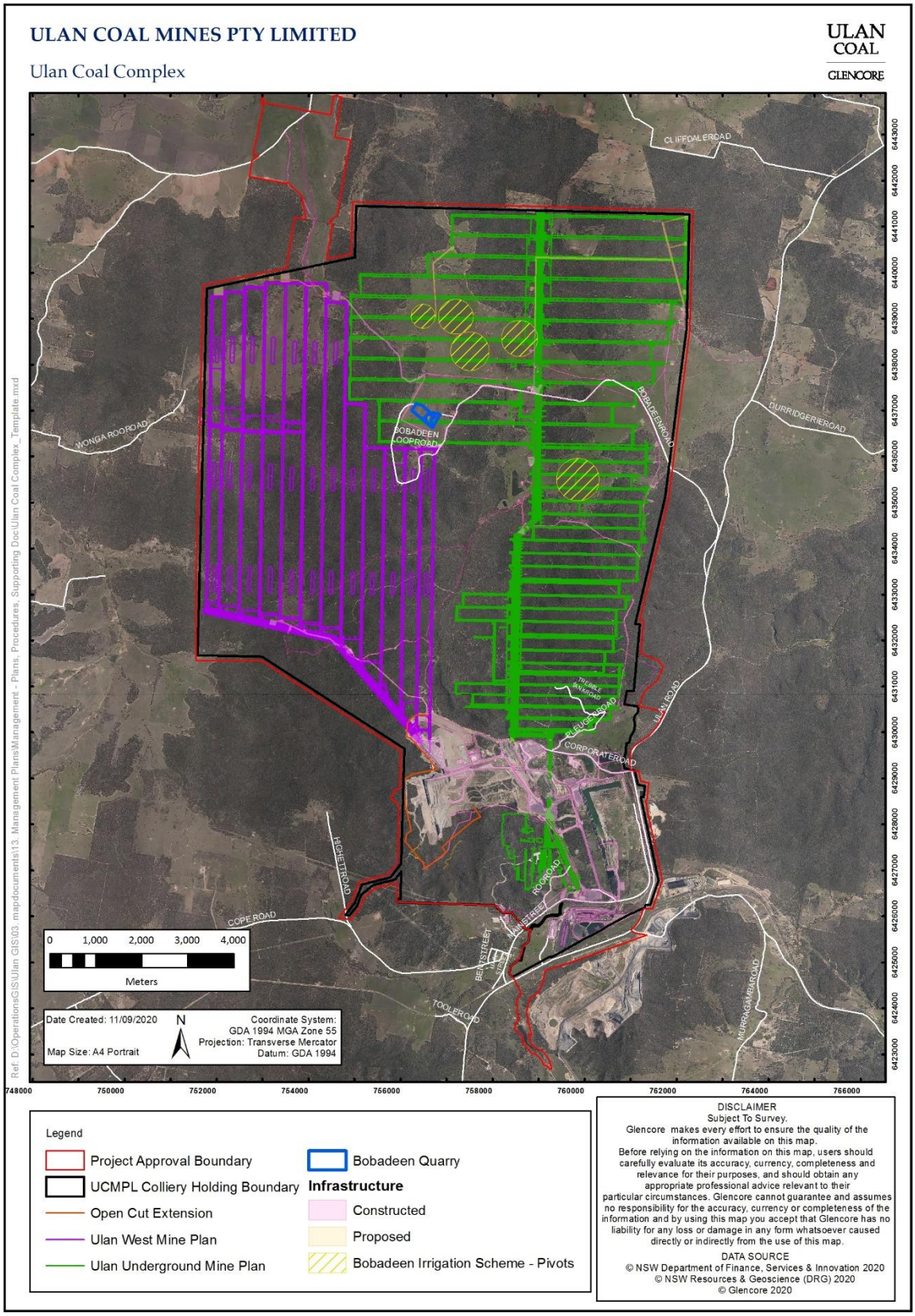

Figure 1.2 Ulan Complex Approved Operations

1.2 Purpose and Scope

This SWMP has been developed to ensure compliance with the conditions of PA08_0184 (refer to **Section 2.1**). SWMP details the program to measure and assess changes in stream health (including base flows) and channel stability that could be attributable to the mining activities and establishes the monitoring and reporting requirements to enable water quality and quantity trends to be reported against Environment Protection Licence (EPL) 394 conditions (refer to **Section 2.3.1**).

The surface water monitoring program will be undertaken in accordance with the current version of *Approved Methods for the Sampling and Analysis of Water Pollutants in New South Wales*, Department of Environment and Conservation (DEC), 2004.

The SWMP provides details on the following:

- description of the local surface water regime (refer to **Section 3.1**);
- stream health and impact assessment (refer to **Section 3.1.3.3**
- surface water monitoring methodology (refer to **Section 3.2.1**);
- assessment criteria refer to **Section 3.2.2**);
- reporting requirements (refer to **Section 5**); and
- plan review and improvement (refer to **Section 6**).

1.3 Objectives

The objectives of this SWMP are to:

- detail the integrated surface water monitoring strategy;
- provide detailed historical baseline data on surface water quality in creeks, diversion channels and other waterbodies that could potentially be affected by the operations;
- provide methods to monitor and assess stream health and channel stability in creeks and diversion channels;
- provide methods to monitor and assess the operations' impacts on baseflows in the Goulburn River and the Talbragar River;
- outline relevant surface water and stream health impact assessment criteria and establish a protocol for the assessment and response to monitoring data;
- provide methods to assess compliance with conditions of PA08_0184 and EPL 394 and legislation relating to surface waters; and
- outline the reporting requirements for the results of the monitoring program.

In addition to the objectives above, the SWMP also aims to:

- address key risks identified in the UCMPL Sustainable Development Risk Register (Appendix B of ULNCX-111515275-870) in accordance with ULNCX-111515275-870 Environmental Management Strategy (EMS), and detail the necessary mitigation & management measures.
- align UCMPL's operating philosophy with the relevant GCAA Protocols and other corporate requirements.

2 Planning

2.1 Project Approvals

PA08_0184 was assessed under Part 3A of the EP&A Act and approval was gained from the Minister of Planning on 15 November 2010 (PA 08_0184). Since that time, five modifications have been made to the approval, as well as changes resulting from a court judgement and associated Orders. Conditions of PA 08_0184 relevant to surface water monitoring, and an indication of where they are addressed within this plan, are provided in **Table 2.1.**

Table 2.1 Project Approval (08_0184) Conditions

Project Approval Conditions	Section of this Document
The Surface Water Monitoring Program must include: a) detailed baseline data on surface water flows and quality in creeks and other waterbodies that could be affected by the project (including the Goulburn River, Talbragar River, Spring Gully, Ulan Creek, Bobadeen Creek, Curra Creek, Mona Creek and Cockabutta Creek);	Section 3.1.3
b) a program to augment the baseline data over the life of the project;	Section 3.1.3
c) surface water quality and stream health assessment criteria, including trigger levels for investigating any potentially adverse surface water impacts; and	Section 3.2.2
d) a program to monitor: • surface water flows, quality, and impacts on water users; • stream health; and • channel stability in the Goulburn River, Talbragar River, Spring Gully, Ulan Creek, Bobadeen Creek, Curra Creek, Mona Creek and Cockabutta Creek.	Section 4.1
6.5.3 In addition to the detailed mine water seepage monitoring outlined in Commitment 6.4.1, water usage, rainfall, dam volumes and discharges (including transfers) will be monitored to assist in the management of the mine water management system. This monitoring will be conducted in a manner that enables the detailed water balance to be maintained and updated at least annually for ongoing operations. The water balance will be used on an ongoing basis for operational management and will also be reported in annual review required by project approval conditions.	Section 4.1.7

2.2 Extraction Plan and SMP Approvals

UCMPL have prepared the relevant Subsidence Management Plans (SMPs) and Extraction Plans (EPs) to satisfy conditions of PA 08_0184, mining leases and SMP Approvals affecting existing and future mining areas. Specific surface water monitoring relevant to the active extraction plans is described within each extraction plan. For further information regarding surface water monitoring and reporting requirements as they relate to the active SMP/EPs, refer to:

- Section 2.2 of the WMP;
- Appendix A of the Extraction Plan for Ulan West LW1 to 6;
- Appendix A of the Extraction Plan for Ulan Underground LW30, LWW6-LWW8; and
- Subsidence Monitoring Program for Ulan Underground LW27 to 29 and W4 and W5.

2.3 Legislation and Guidelines

Surface water monitoring is undertaken in accordance with the policies, principles, regulations and guidelines contained within:

- *Protection of the Environment Operations Act 1997* (POEO Act) administered by the Environment Protection Authority (EPA);
- *Water Management Act 2000*, administered and regulated by the NSW Department of Planning, Industry and Environment–Water (DPIE - Water) (formally Department of Industry (Water) – DOI- Water);
- *Water Act 1912*, administered by DPIE - Water;
- *Environmental Planning and Assessment Act 1979 (EP&A Act)*, administered by DPIE;
- Approved Methods for the Sampling and Analysis of Water Pollutants in New South Wales (OEH, 2004);
- Managing Urban Stormwater – Soils and Construction, Volume 1 (Blue Book) (Landcom, 2004);
- Managing Urban Stormwater – Soils and Construction, Volume 2A Installation of services (DECC, 2008);
- Managing Urban Stormwater – Soils and Construction, Volume 2C Unsealed Roads (DECC, 2008);
- Managing Urban Stormwater – Soils and Construction, Volume 2D Main Road Construction (DECC, 2008);
- Managing Urban Stormwater – Soils and Construction, Volume 2E Mines and Quarries (DECC, 2008);
- Catchment Management Authority (CMA) Catchment Action Plans and associated targets for flow and salinity; and
- National Water Quality Management Strategy: Australian Guidelines for Fresh and Marine Water Quality (ANZECC, 2000).

2.3.1 Environment Protection Licence

EPL 394 currently permits discharges to surface waters at the following locations:

- EPL Point 1 – Effluent Storage Dam;
- EPL Point 2 - Millers Dam;
- EPL Point 3 - Outlet from Rowans Dam to Ulan Creek;
- EPL Point 4 - Drainage outlet from Truckfill Dam to unnamed watercourse;
- EPL Point 6 - Discharge to Ulan Creek from the Bobadeen Water Treatment Facility;
- EPL Point 19 – Discharge to Ulan Creek for the North West Sediment Dam and
- EPL Point 23 – Ulan Box Cut clean water diversion water.

Surface water monitoring will be undertaken in accordance with the conditions of EPL 394. Conditions relating to surface water monitoring, and an indication of where they are located within this document are provided in **Table 2.2.**

Table 2.2 EPL Conditions

EPL Conditions	Section of this Document
P1 Monitoring Locations	Figure 3.1
L2 Concentration Limits	Section 3.2.2
L3 Volume and Mass Limits	Section 3.2.2
M1 Monitoring records	Section 4.2.1
M2 Requirement to monitor concentration of pollutants discharged	Section 3.2.2
M3 Testing methods – concentration limits	Section 3.2.2

EPL Conditions	Section of this Document
M6 Requirement to monitor volume or mass	Section 3.2.2

Conditions R2 and R3 of the EPL require UCMPL to report incidents causing or threatening material harm to the environment as soon as practicable to EPA and to submit a written report to EPA following an environmental pollution incident or non-compliance with the EPL. Details regarding the process for notifying EPA of incidents and the development of an incident report are included in the *Surface Water and Groundwater Response Plan (SWGWRP) (ULNCX- 111515275- 1644)*.

2.4 Consultation

Extensive consultation with government authorities was undertaken during the preparation of the *Ulan Coal – Continued Operations Environmental Assessment* (EA) (Umwelt, 2009) including project briefings, a Planning Focus Meeting and separate meetings with relevant government authorities to discuss specific issues. The consultation undertaken during the preparation of the EA is described in Section 3 of the EA (Umwelt, 2009). UCMPL also consulted with the then relevant government departments, including - NSW Office of Water, EPA, Department of Trade and Investment, Regional Infrastructure and Services , now DPIE and MWRC prior to submission of this SWMP through a detailed presentation on 23 March 2011. Feedback from the agencies was considered during the preparation of this plan.

Subsequent consultation has occurred as required in relevant Project Approval Modifications, SMP Approvals and Annual Reviews. This SWMP was revised and resubmitted to DPIE in December 2016, June 2017 and February 2019. It was last revised and resubmitted to DPIE in September 2019.

Section 8.3 provides information on the latest revision of this plan and the date the version was approved by DPIE.

3 Implementation

3.1 Surface Water Regime and Baseline Data

3.1.1 Watercourse

The Ulan Mine Complex is located at the headwaters of both the Goulburn River system and the Talbragar River system (refer to **Figure 3.1**). The catchments for these river systems are separated by the Great Dividing Range with the Goulburn River system draining east into the Hunter River Catchment and the Talbragar River system draining west to the Macquarie River Catchment and to the Murray-Darling Basin. All of the tributaries within the Ulan Mine Complex draining to the Goulburn River and Talbragar River are ephemeral by nature (refer to **Figure 3.2)**

There are eight subcatchment areas of these river systems that lie partly within the boundary of the Ulan Mine Complex. The Spring Gully, Ulan Creek, Bobadeen Creek, Curra Creek, Sportsman's Hollow Creek and Moolarben Creek catchments flow into the Goulburn River system while the Mona Creek and Cockabutta Creek catchments flow into the Talbragar River system (refer to **Figure 3.1**). The Ulan Creek catchment is the largest within the Ulan Mine Complex, comprising approximately 3,720 hectares out of the total Ulan Mine Complex of approximately 13,480 hectares.

3.1.1.1 Goulburn River System

The Goulburn River is a tributary of the Hunter River, and is classified as a category 3 stream under the Strahler stream ordering system (DIPNR, 2005). This classification indicates that the Goulburn River is potentially a primary source of high quality surface water and alluvial groundwater.

The Goulburn River flows in an easterly then northerly direction through the southern section of the Ulan Mine Complex near the site boundary. The Goulburn River has been modified as a component of previous mining activities on the site and a diversion has been constructed along the majority of the length of the Goulburn River within the Ulan Mine Complex boundary.

Within the Ulan Mine Complex, the catchments flowing into the Goulburn River are Ulan Creek, Spring Gully, Bobadeen Creek, Curra Creek, Sportsman's Hollow Creek and Moolarben Creek (refer to **Figure 3.1**).

Ulan Creek

Ulan Creek is a fourth order stream and flows in a southerly then easterly direction through the site before joining the Goulburn River approximately 250 metres north-east of the mine water management system (refer to **Figure 3.1**). Ulan Creek is naturally an ephemeral creek system with natural flows only occurring in the creek during storm events or after prolonged rainfall. Water is discharged to Ulan Creek from the Ulan Mine Complex water management system via the Bobadeen Water Treatment Facility and Rowans Dam licensed discharge points, in accordance with EPL 394.

Spring Gully

Spring Gully is a second order stream and flows through the eastern section of the Ulan Mine Complex joining Bobadeen Creek approximately 350 metres upstream of its confluence with the Goulburn River (refer to **Figure 3.1**). Spring Gully is an ephemeral creek system with flows only occurring in the creek during storm events or after prolonged rainfall. The watercourse lies within an area previously mined by UCMPL and is not located within the predicted subsidence affectation zone for future underground mining activities.

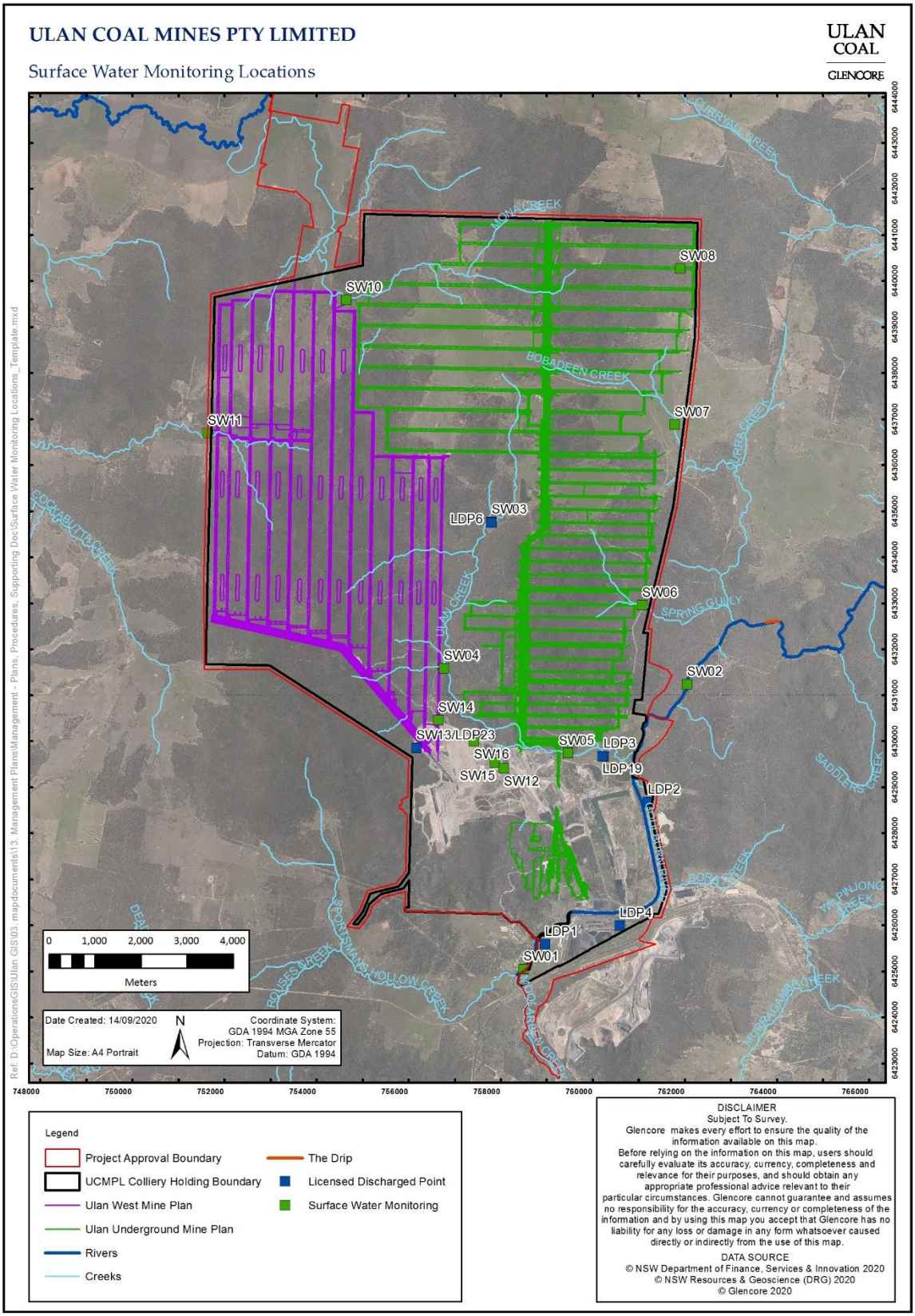

Figure 3.1 Surface Water Monitoring Locations

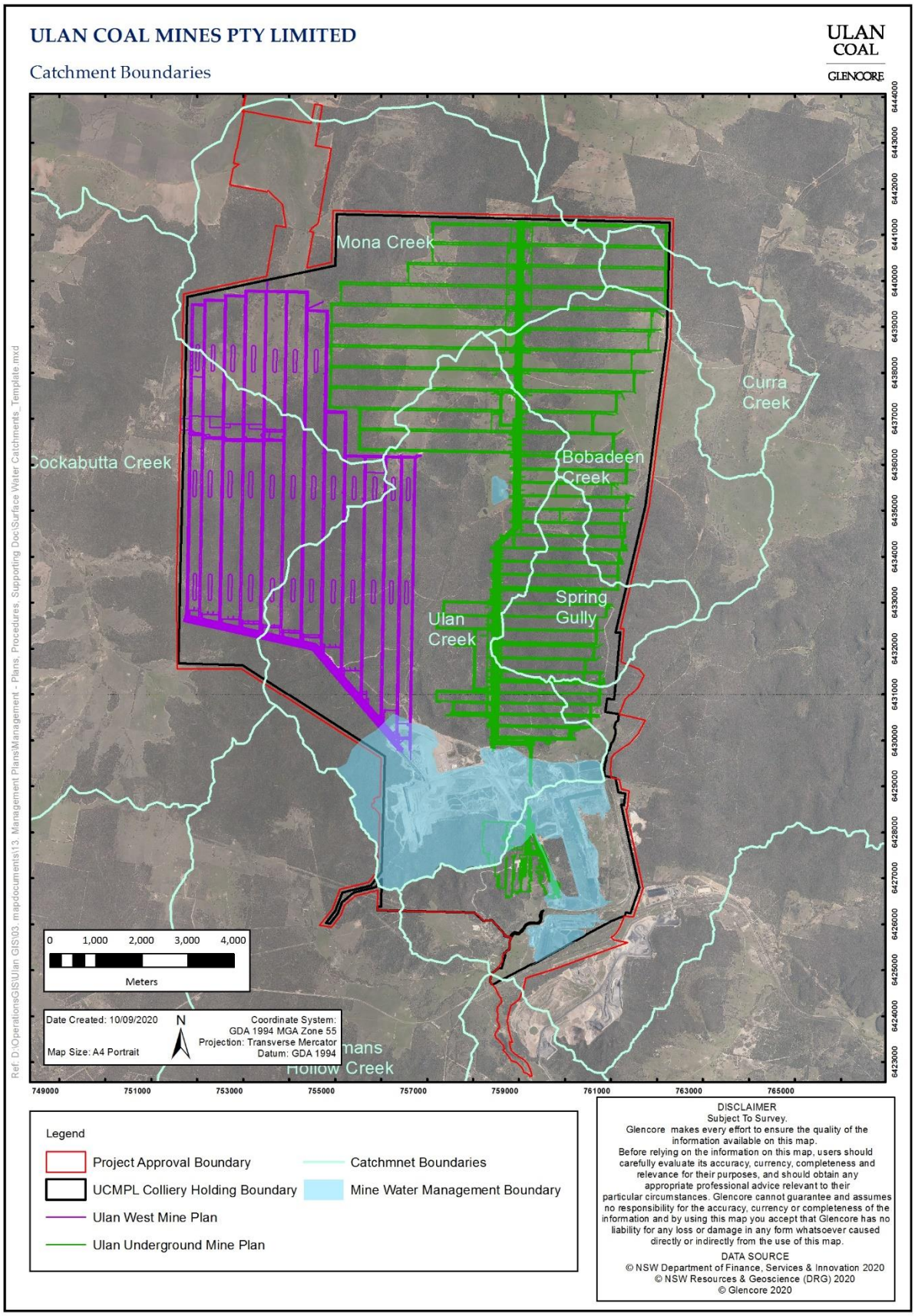

Figure 3.2 UCMPL Surface Water Catchment Boundaries

Bobadeen Creek

Bobadeen Creek is a fourth order stream and flows through the north-east section of the Ulan Mine Complex in a south-easterly direction to the Goulburn River (refer to **Figure 3.1**). The creek is ephemeral and generally experiences very low flows, with some pools of permanent or semi-permanent water present in the downstream reaches. The Bobadeen Creek catchment area is approximately 2,360 hectares with approximately 1,400 hectares located within the Ulan Mine Complex.

Curra Creek

Curra Creek is a third order stream and flows typically in a southerly direction through the north-eastern section of the Ulan Mine Complex joining Bobadeen Creek approximately 600 metres upstream of Bobadeen Creek's confluence with the Goulburn River (refer to **Figure 3.1**). Curra Creek is an ephemeral creek system with flows only occurring in the creek during storm events or after prolonged rainfall. Approximately 200 hectares of the total 1,060 hectares of the Curra Creek catchment is located within the boundary of the Ulan Mine Complex.

Sportsman's Hollow Creek

Sportsman's Hollow Creek is a third order stream and flows in a south-easterly then north-easterly direction outside the boundary of and to the south of the Ulan Mine Complex (refer to **Figure 3.1**). Approximately 60 hectares (one per cent) of the Sportsman's Hollow Creek catchment lies within the Ulan Mine Complex boundary.

Moolarben Creek

Moolarben Creek is a fourth order stream and flows in a northerly direction within the southern section of the site near the boundary before joining Sportsman's Hollow Creek to form the Goulburn River (refer to **Figure 3.1**). The Ulan Mine Complex extends approximately 2.6 kilometres into the Moolarben Creek catchment and includes the Moolarben Creek Dam located on Moolarben Creek. The Moolarben Creek Dam has a storage volume of approximately 170 ML. UCMPL has a licence to extract up to 650 ML per year of water from Moolarben Creek Dam.

3.1.1.2 Talbragar River System

The Talbragar River is a category 3 stream and a tributary of the Macquarie River on the western side of the Great Dividing Range. The Macquarie River forms part of the Murray-Darling Basin. The Talbragar River flows in a south-westerly direction across the northern corner of the Ulan Mine Complex (refer to **Figure 3.1**). The following table provides the catchment areas for the Talbragar River with reference to the subsidence and project approval areas.

Table 3.1 Catchment Areas Flowing into the Talbragar River System

Creek	Stream Category#	Stream Category# - within Predicted Subsidence Affectation Area	Total Catchment Area (ha)	Catchment Area within UCMPL site (ha)	Catchment Area within UCMPL site (%)
Talbragar River	3	-	485,000*	8	<0.002%
Mona Creek	2 (4th order)	2 (3rd order)	4,720	3,220	68%
Cockabutta Creek	1 (2nd order)	1 (2nd order)	10,330	1,500	15%

* Total catchment area measured at the confluence with the Hunter River (DIPNR, 2006)

DIPNR (2005) classifies streams using the Strahler stream order system in order to understand the potential catchment contribution of the stream.

Within the Ulan Mine Complex, the catchments flowing into the Talbragar River are Mona Creek and Cockabutta Creek (refer to **Figure 3.1**).

Mona Creek

Mona Creek is a fourth order stream and flows through the northern section of the Ulan Mine Complex in a north-westerly direction to the Talbragar River (refer to **Figure 3.1**). Generally Mona Creek experiences very low flows, with some pools of permanent or semi-permanent water present in the downstream reaches. The Mona Creek catchment area is approximately 4720 hectares with approximately 3220 hectares located within the boundary of the Ulan Mine Complex.

Cockabutta Creek

Cockabutta Creek is a second order stream and flows through the western section of the Ulan Mine Complex in a westerly direction to the Talbragar River catchment area (refer to **Figure 3.1**). Cockabutta Creek is an ephemeral creek system with flows only occurring in the creek during storm events or after prolonged rainfall. Approximately 1500 hectares of the total 10,330 hectare catchment area lies within the boundary of the Ulan Mine Complex. An unnamed second order tributary that runs to Cockabutta Creek is predicted to be affected by subsidence with the extraction of additional areas as approved in MOD 3 of PA08_0184, additional monitoring, required to address potential impacts is described in section 4.1.5.

3.1.2 Water Management System

Runoff from the footprint of the mining disturbance area within the Ulan Mine Complex is captured by the Ulan Mine Complex water management system. The area serviced by the Ulan Mine Complex water management contains the open cut pits, overburden emplacement areas and infrastructure areas. The current catchment area of the Ulan Mine Complex water management system is approximately 1,520 hectares.

The water management system at UCMPL consists of clean and mine water systems and also includes:

- mine dewatering systems;
- water storages;
- the Bobadeen Irrigation Scheme;
- water treatment facilities;
- sedimentation and retention basins;
- settling and tailings ponds;
- clean water diversion drains and dirty water catch drains;
- levee banks and earth bunding around stockpiles;
- hardstand areas; and
- refuelling areas.

The key functions of the UCMPL water management system include:

- diversion of clean water around mining operations to prevent contamination by mining activities;
- reducing the discharge of pollutants from the mine to the environment;
- minimising adverse effects on the surface water systems including the Goulburn River and Ulan Creek (i.e. hydraulic and water quality impacts);
- managing approved water discharges to meet license conditions; and
- segregating mine impacted water from better quality water to minimise the volume of mine impacted water that requires recycling and treatment.

3.1.3 Baseline Data

The Project Approval requires the SWMP to provide baseline data on surface water quality and flows in watercourses that could be affected by the operation of the Ulan Mine Complex (refer to **Section 3.1**). The baseline data is also used in determining appropriate trigger values against which to compare the results of ongoing water quality monitoring (refer to **Section 3.2.1**).

3.1.3.1 Water Quality

Surface water quality monitoring has been undertaken in the surrounding catchments at locations upstream and downstream from the Ulan Mine Complex. Historical data is available for two locations on the Goulburn River, one location downstream of the Ulan Mine Complex boundary on Spring Gully and on the Talbragar River.

Surface Water monitoring locations (for Water Quality and Flow) have been established in Spring Gully (within the Ulan Mine Complex boundary), Bobadeen Creek, Mona Creek, Cockabutta Creek and Curra Creek based on the commitments included in the Project Approval. At the time of preparation of this program, historical data was not available for these locations, however, baseline data is currently being collected and will be included once there is sufficient data available (nominally at least 24 samples of flowing water). The surface water monitoring period of record for each monitoring location is presented in **Table 3.2** and the monitoring locations are shown on **Figure 3.1**. **Appendix C** summarises Surface Water Qualities of Ulan Creek, Bobadeen Creek, Curra Creek, Mona Creek, and Cockabutta Creek.

Table 3.2 Period of Record for Surface Water Quality Monitoring in Watercourses

Location Codes	Monitoring Locations	River System	Period of Record
SW01	Goulburn River Upstream (EPL Point 33)	Goulburn River	May 2006 to present
SW02	Goulburn River Downstream (EPL Point 18)	Goulburn River	May 2006 to present
SW03	Ulan Creek upstream of Bobadeen Discharge (Upstream of EPL Point 6)	Goulburn River	February 2012 to present
SW04	Ulan Creek at Old Ulan	Goulburn River	February 2012 to present
SW05	Ulan Creek at Pleuger Road	Goulburn River	November 2010 to present
SW06	Spring Gully	Goulburn River	November 2010 to present
SW07	Bobadeen Creek	Goulburn River	February 2012 to present
SW08	Curra Creek	Goulburn River	February 2012 to present
SW09	Talbragar River	Talbragar River	Sept 2008 to present*
SW10	Mona Creek	Talbragar River	February 2012 to present
SW11	Cockabutta Creek	Talbragar River	February 2012 to present
SW12	Basin 3:1	Goulburn River	August 2012 to present
SW13	Clean Water Diversion Outlet (EPL Point 23)	Goulburn River	April 2015 to present
SW14	Ulan West Boxcut Clean Water Diverson Outlet	Goulburn River	April 2015 to present
SW15	Peanut Dam	Goulburn River	April 2015 to present

Note: * intermittent monitoring undertaken due to low flow conditions in the Talbragar River.

Goulburn River

The UCMPL surface water monitoring program for the Goulburn River comprises monitoring at locations SW01 and SW02 (refer to **Figure 3.1**). Baseline data for the Goulburn River is available for the period May 2006 to November 2010 and is sourced from both continuous data loggers and opportunistic grab samples. Minimum, 80th percentile and maximum values for the water quality in the Goulburn River are tabulated in **Table 3.3**. The trends in these water quality variables are illustrated

graphically in **Appendix B**. Breaks in the graphical data sets represent dry periods where samples could not be obtained or missing data due to equipment failure/technical issues.

It should be noted that water quality results for SW02 (i.e. Goulburn River Downstream) since December 2007 include discharges from EPL Point 6 and later EPL Point 19.

Table 3.3 Water Quality Monitoring for Goulburn River (May 2006 to Nov 2010)

Water Quality Variable	Minimum	80th Percentile	Maximum
Goulburn River Upstream (SW01)			
pH	6.2	7.7	8.0
Electrical Conductivity (EC) (µS/cm)	38	680	1053
Total Suspended Solids (TSS) (mg/L)	9	111	176
Goulburn River Downstream (SW02) (including discharges from EPL Point 6 and 19)			
pH	6.4	7.9	8.1
Electrical Conductivity (EC) (µS/cm)	12	854	1235
Total Suspended Solids (TSS) (mg/L)	4	53	163

Spring Gully

The baseline water quality data for Spring Gully comprises intermittent monitoring data between February 2002 and May 2011 at a location approximately 1.5 kilometres downstream of the Ulan Mine Complex colliery boundary. The water quality data for this location is intermittent as Spring Gully is ephemeral and has had no flow for long periods of time. As such out of 145 sampling periods only 17 water quality samples were able to be collected. Collection of baseline data (Quality and Flow) continues through the use of flow gauging and automated sampling.

Minimum, 80th percentile and maximum values for the water quality in Spring Gully are tabulated in **Table 3.4**. Breaks in the graphical data sets represent dry periods where samples could not be obtained.

Table 3.4 Water Quality Monitoring for Spring Gully (Feb 2002 to May 2011)

Water Quality Variable	Minimum	80th Percentile	Maximum
pH	5.4	6.6	7.9
Electrical Conductivity (EC) (µS/cm)	110	240	620
Total Suspended Solids (TSS) (mg/L)	2	20	43

Talbragar River

The baseline water quality data for the Talbragar River comprises monitoring data between September 2008 and May 2011. The water quality data for this location is in two periods as the Talbragar River had no consistent flows the period from January 2009 to January 2010. As such there are currently only 13 water quality records available for the Talbragar River at the sampling location. Collection of baseline data (Quality and Flow) continues through the use of flow gauging and automated sampling.

Minimum, 80th percentile and maximum values for the water quality in the Talbragar River are tabulated in **Table 3.5**. Breaks in the graphical data sets represent dry periods where samples could not be obtained.

Table 3.5 Water Quality Monitoring for Talbragar River (Sep 2008 to May 2011)

Water Quality Variable	Minimum	80th Percentile	Maximum
pH	7.6	8.5	8.6
Electrical Conductivity (EC) (µS/cm)	415	843	860

Total Suspended Solids (TSS) (mg/L)	9	66	87

3.1.3.2 Flows

Historical flow gauging data is available for three flow gauges in the Goulburn River catchment near to or within the Ulan Mine Complex:

- SW01 located upstream of the Ulan Mine Complex on the Goulburn River in a similar location to the discontinued DPI Water flow gauging station, The upstream gauge was recommissioned in August 2018. ;
- SW02 located downstream of the Ulan Mine Complex on the Goulburn River approximately 1 kilometres upstream of Ulan Road (gauging data available from November 2006 to date); and
- SW03 located immediately upstream of the Bobadeen Water Treatment Facility discharge location on Ulan Creek (gauging data available from 6/6/2011 to date).

Flow monitoring at these locations is undertaken continuously via data logger.

The results of the baseline surface water monitoring program are outlined in **Section3.1.3.1**.

Future monitoring to collect baseline data for the ephemeral creeks and the Talbragar River is discussed in **Section 3.1.3.1.**

3.1.3.3 Stream Health and Aquatic Ecology

An aquatic assessment was undertaken as a component of the Ecological Assessment for the EA (Umwelt, 2009). The aquatic assessment included an assessment of aquatic habitats and riparian vegetation, as well as macroinvertebrates, vertebrates and threatened aquatic species and communities. The aquatic assessment included sites on Cockabutta Creek, Mona Creek, Talbragar River, Bobadeen Creek, Ulan Creek, Spring Gully and the Goulburn River.

Surveys of aquatic habitats were completed within targeted parts of the Ulan Mine Complex, where subsidence modelling has highlighted potential impacts on aquatic features. All major drainage lines within the Ulan Mine Complex were considered as part of the aquatic assessment. The location of each aquatic assessment site was selected based on a number of factors, however were largely positioned in parts of the drainage lines where sufficient water was present to enable aquatic macroinvertebrate sampling.

Umwelt completed aquatic surveys at 11 sites within the Ulan Mine Complex, 5 of which were subject to macroinvertebrate sampling. The aim of these assessments was to record the aquatic habitat components present at each site, including details on stream geomorphology, riparian and in-stream vegetation, water quality (qualitative parameters only) and substrate material. Australian River Assessment System (AUSRIVAS), a nationally recognised prediction system, was used to assess the condition of waterways on site. The system is based on using the macroinvertebrate community within a river as a surrogate for river health. AUSRIVAS macroinvertebrate predictive models have been developed for each state and territory and for the main habitat types found in all Australian river systems.

The results of the aquatic assessment are available in the Ecological Assessment (Umwelt, 2009) and summarised below.

AUSRIVAS macroinvertebrate sampling will generally occur at sites that has been sampled previously by Umwelt (Umwelt 2009) (refer to **Figure 3.3**). The results of the aquatic assessment (Umwelt, 2009) will be reviewed annually against ongoing monitoring results **refer to Section** 4.1.4).

- Mona Creek, an ephemeral waterway that contains some semi-permanent pools of water, where no fish species have been previously observed or recorded. Previous assessment has indicated a moderately low stream condition, and overhanging riparian vegetation dominated by Blakely's red gum (Eucalyptus blakelyi) and in-stream emergent plants.
- Cockabutta Creek is mostly outside the Project Area and an ephemeral waterway. One site near to the edge of the Project Area (refer to **Figure 3.3**) had AUSRIVAS macroinvertebrate sampling. A billabong along the creek channel that had a low stream condition, although in places the creek had approximately 50 per cent cover of riparian vegetation and well vegetated banks.
- Bobadeen Creek lies within the north east corner of the Project Area and feeds into Spring Gully (refer to **Figure 3.3**). The majority of Bobadeen Creek and its floodplains have been cleared and used for cattle grazing and the main channel of Bobadeen Creek has been incised through

erosion. AUSRIVAS macroinvertebrate sampling will occur in the site that has been sampled previously (Umwelt 2009).

- Ulan Creek runs south through the centre of the Project Area, before bending towards the east and joining with the Goulburn River at the far east boundary (refer to **Figure 3.3**). Ulan Creek has ephemeral flow only, and was not holding any water flow at the time of the EA survey in 2009 (Umwelt 2009). Bank erosion and slumping is evident in places and is particularly severe on the south bank. AUSRIVAS macroinvertebrate sampling will occur in eight sites that have been sampled previously (Umwelt 2009, Mount King 2008).
- The headwaters of the Goulburn River are situated to the south and south-east of the Project Area, where it flows in an easterly direction away from the site, through Goulburn River National Park. The reaches are highly modified, having been diverted in 1982 in accordance with a previous approval. AUSRIVAS macroinvertebrate sampling and fish trapping will occur in three sites that have been sampled previously (Mount King 2008) to monitoring any changes to river condition resulting from the rehabilitation efforts (refer to **Figure 3.3**). Two further sites will continue to be monitored to document downstream conditions, as is currently occurring (Mount King 2008).
- The Talbragar River is situated approximately 3 kilometres north of the Project Area, and is the discharge point for the pipeline. At this reach of the Talbragar River, the channel is broad (up to 5 metres), with almost continuous pools of water up to approximately 1 metre in depth. Significant bank undercutting is evident in several locations along the river and the riparian and in-stream vegetation was heavily disturbed, having been cleared and grazed for decades. AUSRIVAS macroinvertebrate sampling and fish trapping will occur in two sites (one upstream and one downstream of the discharge point) (refer to **Figure 3.3**) that have been sampled on previous occasions (Umwelt 2009).

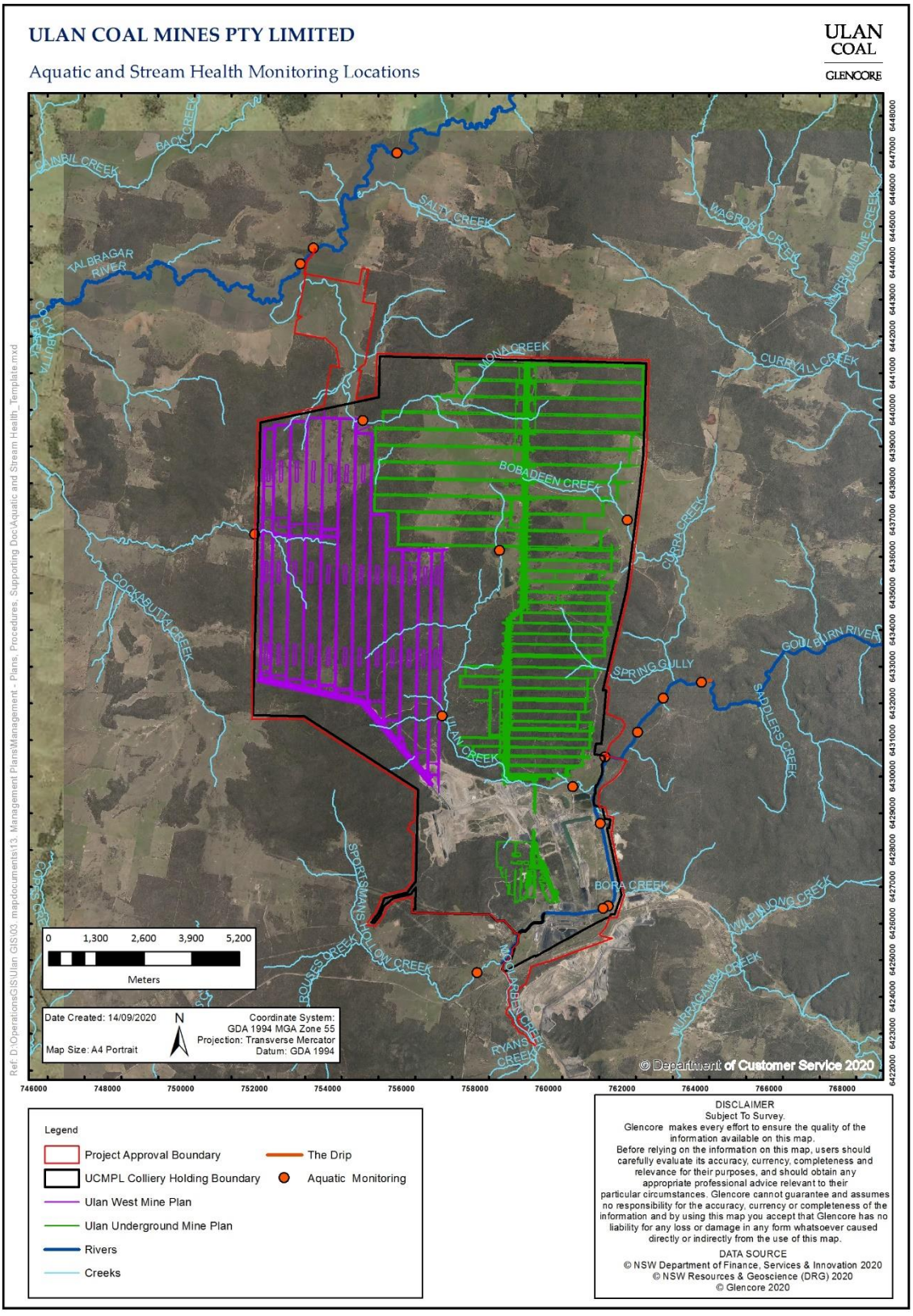

Figure 3.3 Stream Health Monitoring Locations

3.2 Surface Water Trigger Levels

The Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2000) published by the Australian and New Zealand Environment Conservation Council (ANZECC) provide a framework

for the assessment of water quality in fresh water environments. These guidelines form the central technical reference of the National Water Quality Management Strategy, which the federal government and all state and territory governments have adopted for managing water quality. These guidelines apply to both surface waters and groundwaters.

The ANZECC (2000) guidelines recommend that trigger values be used as a yardstick against which to compare the results of water quality monitoring and suggest that when monitoring results fall outside the trigger range there is a possible risk to environmental value and further action should be taken to investigate or address the cause.

Section 3.2.1 outlines the methodology used to determine appropriate water quality trigger values for the Ulan Mine Complex. These trigger values are based on baseline data, as discussed in **Section 3.1.3. Section 3.2.2** presents the trigger values that have been adopted for assessing and responding to changes in stream health within the Ulan Mine Complex.

3.2.1 Methodology for Trigger Value Determination

Water quality trigger values are indicator values that are used as a yardstick against which to compare the results of water quality monitoring. Water quality trigger values (except for those relating to discharges) provide an early warning on water quality data. The ANZECC (2000) guidelines note that when monitoring results fall within the trigger range there is low risk to environmental value. When monitoring results fall outside the trigger range there is a possible risk to environmental value and further action is required to investigate or address the cause. The trigger values are not exceedance criteria but are used to initiate investigations into the surface water quality as reported by the monitoring program. Setting appropriate trigger values is a key issue in managing water quality.

The ANZECC (2000) guidelines recommend that wherever possible site-specific data is used to define trigger values for physical and chemical factors which can adversely impact the environment. However, the guidelines provide default trigger values that can be used where there is insufficient site-specific data available.

The approach recommended by ANZECC (2000) for developing site-specific trigger values is to formulate trigger values based on the 80th percentile of the site-specific baseline monitoring data. The objective of this approach is to develop conservative site-specific trigger values as a means to improve water quality in disturbed ecosystems.

However, this approach to defining site-specific trigger values does not allow for water quality variability caused by climatic conditions and the ephemeral nature of the creek systems present at and downstream of the Ulan Mine Complex. It is therefore considered that an 80th percentile trigger value may not adequately reflect the water quality dynamics for highly disturbed ecosystems with ephemeral creek systems.

A summary of the baseline monitoring data and discussion is presented in **Section 3.1.3.**

In the event that a suitable site-specific trigger value cannot be determined for a given water quality parameter at the Ulan Mine Complex, the default trigger value defined by ANZECC (2000) is used.

This approach of formulating trigger values of the 80th percentile of site-specific baseline monitoring data has been used in determining appropriate trigger levels for the Goulburn River (refer to **Table 3.7**).

Analysis of the baseline data for the Goulburn River provides an 80th percentile value for pH, EC and TSS. Where the 80th percentile value is higher than the ANZECC (2000) guidelines, the 80th percentile value is adopted since it better represents the existing water quality in the creek systems surrounding the Ulan Mine Complex. Where the 80th percentile value is lower than the ANZECC (2000) guidelines, the ANZECC (2000) default trigger value is adopted.

Analysis of the baseline data for Spring Gully indicates that although the pH ranges within the ANZECC (2000) guideline values for upland rivers in NSW, the maximum EC recorded is significantly higher than the default trigger value (ANZECC, 2000) for upland rivers in NSW (this is only for one sample), the 80th percentile value is within the ANZECC (2000) guidelines for upload rivers in NSW. As there are limited water quality records for creek systems within the Ulan Mine Complex there is not sufficient baseline data to develop site-specific water quality triggers. As such the interim trigger values selected for the watercourses draining the Goulburn River and Talbragar River have been selected as the default ANZECC triggers values for upland rivers in NSW.

Analysis of the baseline data for the Talbragar River indicates that the pH ranges are similar to the ANZECC (2000) guideline values for lowland rivers in NSW. The maximum EC recorded is significantly

higher than the default trigger value (ANZECC, 2000) for upland rivers in NSW but within the default trigger value for lowland rivers in NSW. As there are only 13 water quality records for the Talbragar River there is not sufficient baseline data to develop site-specific water quality triggers. As such the interim trigger values selected for the Talbragar River has been selected as the default ANZECC triggers values for lowland rivers in NSW.

3.2.2 Assessment Criteria and Adopted Trigger Values

EPL 394 outlines a number of concentration limits for water that is discharged from the Ulan Mine Complex via licensed discharge points. In addition to the statutory requirements outlined in EPL 394, UCMPL has adopted interim trigger levels for other surface water monitoring locations to assist in the management of water quality both within and surrounding the Ulan Mine Complex. The process for developing these trigger levels is outlined in **Section 3.2.1**.

Trigger values for Ulan Creek are based on the concentration limits specified in EPL 394 for discharges to Ulan Creek from Rowans Dam (EPL Point 3), Bobadeen Water Treatment Facility (EPL Point 6) and North West Sediment Dam (EPL Point 19) (refer to **Table 3.6**).

Table 3.6 EPL 394 Concentration Limits for Licensed Discharge Points

EPL Point	Location Name	Pollutant	Unit of Measure	50th Percentile Concentration Limit	100th Percentile Concentration Limit
1	Effluent Storage Dam*	Electrical Conductivity	µS/cm	N/A	810
		pH	pH	N/A	6.5 to 8.5
2	Millers Dam	Electrical Conductivity	µS/cm	N/A	900
		Iron	mg/L	N/A	5
		Oil and Grease	mg/L	N/A	10
		pH	pH	N/A	6.5 to 8.5
		Total Suspended Solids	mg/L	N/A	50
		Zinc	mg/L	N/A	5
3	Outlet from Rowans Dam to Ulan Creek	Electrical Conductivity	µS/cm	800	900
		Iron	mg/L	N/A	5
		Oil and Grease	mg/L	N/A	10
		pH	pH	N/A	6.5 to 8.5
		Total Suspended Solids	mg/L	N/A	50
		Zinc	mg/L	N/A	5
4	Drainage Outlet from Truckfill Dam to unnamed watercourse	Electrical Conductivity	µS/cm	N/A	900
		Iron	mg/L	N/A	5
		Oil and Grease	mg/L	N/A	10
		pH	pH	N/A	6.5 to 8.5
		Total Suspended Solids	mg/L	N/A	50
		Zinc	mg/L	N/A	5
6	Discharge to Ulan Creek from Bobadeen WTF (LDP 6)	Electrical Conductivity	µS/cm	800	900
		pH	pH	N/A	6.5 to 8.5
		Total Suspended Solids	mg/L	N/A	50

19	Discharge to Ulan Creek from NWSD (LDP 19)	Electrical Conductivity	µS/cm	800	900
		pH	pH	N/A	6.5 to 8.5
		Total Suspended Solids	mg/L	N/A	50

*EPL Point 1 discharges to land

Water quality monitoring will continue to be undertaken in order to obtain baseline data for development of appropriate site-specific trigger levels for the remaining creeks within or downstream of the Ulan Mine Complex. Until these site-specific trigger values are available, the ANZECC default trigger levels will be used for these creeks (refer to **Table 3.7**).

Table 3.7 Adopted Trigger Values for Key Water Quality Parameters

Water Quality Variable	pH	EC (µS/cm)	TSS (mg/L)
Goulburn River Upstream (SW01)	6.5 – 8.0[1]	680[2]	111[2]
Goulburn River Downstream m (SW02)[4]	6.4 – 8.1[3]	854[2]	53[2]
Ulan Creek Upstream of LDP6(SW03)	6.5 – 7.9[9]	1126[9]	64[9]
Ulan Creek at Old Ulan (SW04)	6.5 – 8.5[8]	900[8]	83[10]
Ulan Creek at Pleuger Road(SW05)	6.5 – 8.5[8]	900[8]	50[7]
Talbragar River (SW09)	6.5 – 8.5[5]	125 –2200[5]	50[7]
Watercourses flowing to Goulburn River (SW06, SW07, SW08)	6.5 – 8.0[6]	30 – 350[6]	50[7]
Watercourses flowing to Talbragar River (SW09, SW10, SW11)	6.5 – 8.0[5]	30 – 350[5]	50[7]
Clean Water Diversion/System (SW12. SW13 (EPL 23), SW14, SW15)	6.5 – 8.0[6]	30 – 350[6]	50[7]

Notes:
[1] ANZECC (2000) default trigger value range for lowland east flowing coastal rivers in NSW
[2] 80th percentile based on historical data for the Goulburn River
[3] Range within Historical data for Goulburn River Downstream
[4] SW02 is downstream of the Ulan Mine Complex and as such water quality at this location can be influenced by other developments in the catchment outside of UCMPL influence.
[5] Interim trigger values based on ANZECC (2000) default trigger values for lowland rivers in NSW. Site-specific trigger values will be developed as monitoring data becomes available.
[6] Interim trigger values based on ANZECC (2000) default trigger values for upland rivers in NSW. Site-specific trigger values will be developed as monitoring data becomes available.
[7] Interim trigger values based on Volume 1 of Managing Urban Stormwater: Soils and Construction (Landcom, 2004).
[8] Trigger level reflects upstream discharge limit approved under EPL394
[9] 80th percentile of SW03 baseline (31 samples taken between February 2012 and September 2017)
[10] 80th percentile of SW04 baseline (24 samples taken between February 2012 and November 2017)

3.2.2.1 EPL Limits - Volume

EPL 394 outlines the concentration limits for EPL points 1, 2, 3, 4, 6 and 19. Water discharged from these licensed discharge points must not exceed the concentration limits specified in **Table 3.6**.

In addition to the pollutant concentration limits specified in **Table 3.6** EPL 394 also specifies volume and mass limits for the discharge of water via the licensed discharge points. These volume limits are provided in **Table 3.8.**

Table 3.8 EPL 394 Discharge Volume Limits

EPL Points	Locations	Volume Limit
1	Effluent Storage Dam	85 KL/day
2	Millers Dam	600 KL/day
3	Outlet from Rowans Dam* to Ulan Creek	10ML/day^
4	Drainage Outlet from Truckfill Dam to unnamed watercourse	2ML/day
6	Discharge to Ulan Creek from Bobadeen RO Plant	15ML/day^
19	Discharge to Ulan Creek from North West Sediment Dam	30 ML/day^

Note: *Rowans Dam is not currently being used for discharge, however it can be reinstated if required.
^The combined daily discharge from LDP 3, 6 and 19 must not exceed 30 megalitres per/day.

3.2.2.2 EPL Monitoring Requirements

EPL 394 outlines outlines the monitoring frequency and sampling method for points 1, 2, 3, 4, 6, 19, 18, 23 and 33. Sample collection must be undertaken as per the requirements specified in **Table 3.9.**

EPL Point	Location Name	Pollutant	Unit of Measure	Frequency	Sampling Method
1	Effluent Storage Dam*	Biochemical Oxygen Demand	mg/L	Monthly during Discharge	Grab Sample
		Electrical Conductivity	µS/cm	Monthly during Discharge	Grab Sample
		Nitrogen	mg/L	Monthly during Discharge	Grab Sample
		Oil and Grease	mg/L	Monthly during Discharge	Grab Sample
		pH	pH Unit	Monthly during Discharge	Probe
		Phosphorus	mg/L	Monthly during Discharge	Grab Sample
		Total Suspended Solids	mg/L	Monthly during Discharge	Grab Sample
2	Millers Dam	Electrical Conductivity	µS/cm	Daily during Discharge	Grab Sample
		Iron	mg/L	Daily during Discharge	Grab Sample
		Oil and Grease	mg/L	Daily during Discharge	Grab Sample
		pH	pH	Daily during Discharge	Grab Sample
		Total Suspended Solids	mg/L	Daily during Discharge	Grab Sample
		Zinc	mg/L	Daily during Discharge	Grab Sample
3	Outlet from Rowans Dam to Ulan Creek	Electrical Conductivity	µS/cm	Daily during Discharge	Grab Sample
		Iron	mg/L	Daily during Discharge	Grab Sample
		Oil and Grease	mg/L	Daily during Discharge	Grab Sample
		pH	pH	Daily during Discharge	Grab Sample
		Total Suspended Solids	mg/L	Daily during Discharge	Grab Sample
		Zinc	mg/L	Daily during Discharge	Grab Sample
4	Drainage Outlet from	Electrical Conductivity	µS/cm	Daily during Discharge	Grab Sample

EPL Point	Location Name	Pollutant	Unit of Measure	Frequency	Sampling Method
	Truckfill Dam to unnamed watercourse	Iron	mg/L	Daily during Discharge	Grab Sample
		Oil and Grease	mg/L	Daily during Discharge	Grab Sample
		pH	pH	Daily during Discharge	Grab Sample
		Total Suspended Solids	mg/L	Daily during Discharge	Grab Sample
		Zinc	mg/L	Daily during Discharge	Grab Sample
6	Discharge to Ulan Creek from Bobadeen WTF (LDP 6)	Electrical Conductivity	µS/cm	Continuous during Discharge	Continuously
		pH	pH	Continuous during Discharge	Continuously
		Total Suspended Solids	mg/L	Weekly*	Grab Sample
		Turbidity	Nephelometric turbidity units	Continuous during Discharge	Continuously
19	Discharge to Ulan Creek from Bobadeen WTF (LDP 6)	Electrical Conductivity	µS/cm	Continuous during Discharge	Continuously
		pH	pH	Continuous during Discharge	Continuously
		Total Suspended Solids	mg/L	Weekly*	Grab Sample
		Turbidity	Nephelometric turbidity units	Continuous during Discharge	Continuously
18	Downstream Goulburn River (SW02)	Electrical Conductivity	µS/cm	Continuous during Discharge	Continuously
		pH	pH	Continuous during Discharge	Continuously
23	UWO Clean Water Diversion (SW13)	Electrical Conductivity	µS/cm	Daily during Discharge	Grab Sample
		pH	pH	Daily during Discharge	Grab Sample
		Total Suspended Solids	mg/L	Daily during Discharge	Grab Sample
33	Upstream Goulburn River (SW01)	Electrical Conductivity	µS/cm	Continuous during Discharge	Grab Sample

3.2.2.3 Stream Health and Aquatic Ecology

The stream health and aquatic ecology monitoring (Section 4.1.6 SWMP) includes assessment of channel stability, riparian vegetation condition and macroinvertebrate populations (refer to **Figure 3.3**). The monitoring results are assessed annually against background trends to identify variations in the data that may indicate a degradation in stream health and aquatic ecology. This assessment is undertaken by a suitably qualified ecologist.

3.2.2.4 Water Quality

The trigger values adopted for surface water quality monitoring for the Ulan Mine Complex are presented in **Table 3.7**.

3.3 Training

Effective implementation and maintenance of this plan depends on the competency of the UCMPL workforce and its contractors. General awareness training is provided to all new employees and contractors as part of the Ulan Site Specific Induction program in accordance with the *Training and Competency Management (ULNUG-849165555-5762, ULWUG-729531900-105, and ULNOC-1105874907-1747)*.

Additional training will be provided to employees and contractors based on the Training Needs Analysis detailed in Appendix 3 of the *EMS (ULNCX-111515275-870)*. This training will be targeted to provide employees and contractors specific skills and knowledge to enable them to manage surface water monitoring in accordance with this management plan.

For more information on training refer to Section 3 of the *EMS (ULNCX-111515275-870)*.

4 Measurement and Evaluation

4.1 Surface Water Monitoring

4.1.1 Monitoring Standards

Surface water monitoring is undertaken in accordance with relevant Australian Standards, legislation and the EPA approved methods for sampling, including (but not limited to):

- Approved Methods for the Sampling and Analysis of Water pollutants in NSW (DEC, 2004); and
- AS/NZS 5667.1:1998 Water Quality – Sampling – Guidance on the Design of Sampling Programs, Sampling Techniques and the Preservation and Handling of Samples.

Monitoring frequency and quality will be as defined in the SWGWRP.

4.1.2 Monitoring Components

This program includes monitoring of the following elements of the water management system and surrounding creeks:

- surface water quality and flows in upstream and downstream watercourses;
- baseflow in the Goulburn and Talbragar Rivers;
- channel stability in upstream and downstream watercourses;
- stream health conditions in upstream and downstream watercourses;
- on-site water management; and
- water quality and volume for off-site discharges.

A description of the monitoring locations, frequency and parameters measured for each of these components of the monitoring program is provided in the following sections.

4.1.3 Surface Water Quality Monitoring

Surface water monitoring is undertaken in accordance PA08_0184 and EPL 394. A summary of the key surface water monitoring requirements are outlined in the sections below.

4.1.3.1 Statutory Requirements

EPL 394 requires surface water monitoring to be undertaken at EPL points 1, 2, 3, 4, 6, 18 19, 23 and 33 (refer to **Figure 3.1**). The parameters required to be monitored include parameters for which concentration limits are specified (refer to **Table 3.6**) and a number of additional parameters. The surface water monitoring requirements under the Project Approval and the EPL are presented in **Table 2.1** and **Table 2.2** respectively.

4.1.3.2 On Site Water Storage

Surface water quality has been monitored at the on-site water storages including water supply dams, mine voids, irrigation water storages, clean water drains and sediment dams. The key on-site water storages are shown on **Figure 3.1**.

Water monitoring within on-site water storages is undertaken to provide data for the management of water within the mine water management system including the management of water quality of discharges.

4.1.4 Flow Monitoring

Stream flow is monitored both qualitatively and quantitatively. Qualitative flow monitoring is undertaken during water quality monitoring at surface water monitoring locations (refer to **Figure 3.1**).

The locations of existing flow gauges re shown on **Figure 3.1** and **Table 4.1**.

Table 4.1 Surface Water Flow Monitoring Program

Location Code	Monitoring Locations	River System	Period of Record
SW01[1]	Goulburn River Upstream	Goulburn River	May 2006 to present[1]
SW02	Goulburn River Downstream	Goulburn River	May 2006 to present
SW03	Ulan Creek at Bobadeen Discharge	Goulburn River	June 2011 to present
SW04	Ulan Creek at Old Ulan*	Goulburn River	September 2015 - present
SW05	Ulan Creek at Pleuger Road*	Goulburn River	September 2015 - present
SW06	Spring Gully	Goulburn River	September 2015 - present
SW07	Bobadeen Creek	Goulburn River	September 2015 - present
SW08	Curra Creek	Goulburn River	September 2015 - present
SW09	Talbragar River	Talbragar River	September 2015 - present
SW10	Mona Creek	Talbragar River	September 2015 - present
SW11	Cockabutta Creek	Talbragar River	September 2015 - present

Note [1]: Gauging data to date is incomplete due to difficulties in ascertaining a robust ratings curve. The gauging station was recommissioned in August 2018.

*These flows are augmented by discharge from LDP 6 and are therefore not accurate.

Flow monitoring data is analysed in conjunction with the surface water quality monitoring results to provide a holistic view of stream health and is used where possible to assess potential impacts of the mining operations at on hardrock baseflows (refer to *GWMP (ULNCX-111515275-1643)*).

The flow gauging locations (refer to **Table 4.1** and **Figure3.1**) are all, with the exception of SW09, currently located either within the mine lease boundary or on UCMPL property. SW09, located on the Talbragar River, is located on a private property. UCMPL have an agreement with the property owner regarding this monitoring location.

Flow gauging data is reviewed on an annual basis considering response of the catchment areas to storm events, including peak flows and volume of runoff, and comparison/comment on results from previous reporting periods.

4.1.5 Channel Stability Monitoring

Channel stability monitoring is undertaken annually for the Goulburn River, Talbragar River, Ulan Creek, Spring Gully, Bobadeen Creek, Curra Creek, Mona Creek and Cockabutta Creek, including an unnamed second order tributary of Cockabutta Creek which is predicted to be impacted by subsidence with the extension of Longwall panels as approved on MOD 3 of the project approval to assess the condition of the watercourses. This annual monitoring is targeted at specific reaches of the above mentioned creeks proposed to be undermined in the next 12 months and reaches of those creeks that have been undermined in the previous 24 months. The monitoring will involve an observational survey of each stream that is to include:

- documenting locations and dimensions of significant erosive or depositional features so that any subsequent changes can be evaluated quantitatively;
- photographic monitoring points at representative locations to enable a comparison over time of channel stability; and
- written descriptions of the stream at each of the photographic points focusing on evidence of erosion and exposed soils.

Channel stability surveys will also be undertaken at regular intervals along the Goulburn River diversion to monitor the stability of the diversion profile. Baseline channel stability surveys were undertaken prior to remediation works to enable a comparison following the completion of remediation and stabilisation works. Specific monitoring details for the Goulburn River Diversion are provided in the *Goulburn River Diversion Remediation Plan (GRDRP) (ULNCX-111515275-1641)*.

4.1.6 Stream Health Monitoring

Stream health monitoring is to be undertaken for the Goulburn River, Talbragar River, Ulan Creek, Bobadeen Creek, Mona Creek and Cockabutta Creek at locations shown in **Figure 3.3.** The monitoring and is undertaken annually in spring by a qualified ecologist and include the monitoring of macroinvertebrate assemblages and riparian vegetation. As detailed in the *Biodiversity Management Plan (ULNCX- 111515275- 225)*, the stream health monitoring will include the following methodologies:

- aquatic macroinvertebrate sampling (using the AUSRIVAS or SIGNAL methodology) at all sites where possible (given the ephemeral nature of some sites);
- water quality monitoring (such as water temperature, conductivity, dissolved oxygen, turbidity, pH, alkalinity) at all sites where possible using a calibrated water probe;
- a geomorphic assessment of substrate type, in-stream features and presence of erosion and/or deposition;
- targeted aquatic vertebrate sampling at the Goulburn River and the Talbragar River (6 sites in) where suitable fish habitat is present; and
- riparian and in-stream aquatic vegetation sampling.

Further details regarding the methodologies outlined above are provided in the *Biodiversity Management Plan (ULNCX- 111515275- 225)*.

4.1.7 On-Site Water Monitoring

Surface water monitoring that is undertaken at the Ulan Mine Complex to meet operational requirements includes the following:

- daily rainfall, as recorded from the on-site weather station;
- daily water level monitoring of the main water storage dams;
- weekly water level monitoring of Millers, Moolarben and Rowans Dams;
- monthly sampling of Bobadeen, NWSD, Rowans and Millers Dam;
- monthly monitoring of dams from which off-site discharge can occur, for the following water quality parameters:
    - pH;

- electrical conductivity (µS/cm);
- TDS (mg/L); and
- TSS (mg/L).

- daily volume of water imported onto the site from off-site;
- Quarterly inspections of other dams including assessing potential seepage points, erosion, uncontrolled discharge and geochemical (spills within/around the water body and staining/discolouration within water body/embankments) (and post rainfall events of greater than 30mm in 24 hours where required or as stipulated in the *Erosion and Sediment Control Plan (ULNCX-111515275-224);*
- inspections of all sediment and erosion controls as per GDP conditions (refer to *Erosion and Sediment Control Plan (ULNCX-111515275-224)* as well as during and after storm events (i.e. rainfall events of greater than 30 millimetres in 24 hours).

As detailed in the *WMP (ULNCX-111515275-99)*, a protocol has been developed that aims to minimise the potential for discharge off site (where practical) and provide that water quality is suitable if discharge off site is required.

4.2 Assessment and Response

4.2.1 Stream Health and Impacts

4.2.1.1 Water Quality and Flows

The Environment and Community Manager or delegate is responsible for the monthly review of the monitoring results and associated trends in water quality. In the event that any water quality measurement is found to deviate from background trends and/or is outside the adopted trigger values presented in **Table 3.7** or discharge limits defined in **Tables 3.6** and **3.8**, site-specific investigations are initiated.

Section 3.3.2.3 of the ANZECC (2000) guidelines suggests that if an adopted trigger value is exceeded, the aim of site-specific investigations is to assess if a 'potential risk' or an actual problem exists. The site-specific investigation will be initiated in accordance with the *SWGWRP (ULNCX-111515275-1644)* and the UCMPL *EMS (ULNCX-111515275-870)*.

When a water quality measurement is investigated, the findings of the investigation are reported in the Annual Review report for the Ulan Mine Complex.

Monitoring data is retained in an appropriate format on site and is used to review the effectiveness of the water management system on an ongoing basis.

4.2.1.2 Baseflows in Watercourses

Flow in watercourses is considered to comprise of two main components based on the timing of the response in a watercourse after a rainfall event. Water that enters a watercourse rapidly is called "quickflow" and is a result of direct rainfall onto a watercourse surface and rainfall-runoff across the land surface. Water that takes longer to reach a watercourse is called "baseflow" and is primarily a result of groundwater discharge into the watercourse (AR&R, 2009). In addition, watercourses can vary, being gaining, i.e. receipt of groundwater inflow, and losing, i.e. discharge to groundwater system, over both time and space.

Baseflows, i.e. flows in a watercourse sourced from groundwater aquifers, require the source groundwater aquifer to have a groundwater hydrostatic pressure higher than the watercourse hydrostatic pressure, be regularly recharged and have suitable local materials to enable the storage and transmission of baseflows into the watercourse (Smakhtin, 2001). In addition, baseflow regimes may be influenced by other factors, such as groundwater influences, flow regulation or diversion structures (e.g. weirs, dams, diversion channels, etc.), urbanisation, returns flows from treatment plants or industry, and evaporation and evapotranspiration.

At the Ulan Mine Complex, the mechanisms which contribute to baseflow within a watercourse include seepage from:

- shallow regolith;
- soil zone;
- unconsolidated alluvium adjacent to and within a watercourse;
- weathered and fractured rocks; and
- seepage from the regional deep hardrock systems.

As discussed in the EA, groundwater modelling by Mackie Environmental Research (MER) (2009), indicated that depressurisation of groundwater aquifers associated with the Ulan Mine Complex will result in the loss of hardrock derived baseflows to the Goulburn River and Talbragar River systems.

Monitoring of losses to hardrock baseflows is addressed in the *GWMP (ULNCX-111515275-1643)*.

In the event losses to hardrock baseflows are identified, the Environment and Community Manager will be responsible for implementing response mechanisms in accordance with the *SWGWRP (ULNCX-111515275-1642)*.

4.2.1.3 Stream Health Conditions and Channel Stability

The Environment and Community Manager will be responsible for the completion of the annual assessment of channel stability and the annual stream health assessment for the Goulburn River, Talbragar River, Ulan Creek, Spring Gully, Bobadeen Creek, Curra Creek, Mona Creek and Cockabutta Creek in accordance with **Sections 4.1.5 and 4.1.6**.

The assessment of stream health and channel stability will include a review of the current monitoring results against historical monitoring results (including the baseline data from the Ecological Assessment, refer to **Section 3.1.3**) to identify any potential deterioration or improvement in stream health. In the event deterioration in stream health is identified, the Environment and Community Manager will be responsible for implementing response mechanisms in accordance with the *SWGWRP (ULNCX-111515275-1642)*.

5 Reporting

For details of water reporting requirements refer to Section 4.5 of the WMP (Table 4.1).

The following will be reported in the Annual Review:

- Non-compliances with EPL 394 and Project Approval;
- Exceedances of surface water and groundwater trigger levels;
- Identified impacts on stream health and/or channel stability, including losses to base flow;
- Impact on water supply to privately owned land;
- Community complaints; and
- Any actions taken in response to these impacts (where applicable and the effectiveness of the actions in preventing a re-occurrence of the impact.

5.1 Community Complaints

Community complaints received by UCMPL are managed in accordance with ULNCX-111515275-3376 Complaints Procedure which requires recording complaints, complaint investigation and follow up actions. A 24 hour, 7 day a week community and employee information telephone line 1800 647 630 and email address ulancommunity@glencore.com.au are available to receive comments and complaints from the community.

6 Review and Improvement

The Environment and Community Manager (or delegate) will review this monitoring program in accordance with the PA 08_0184 Schedule 5 Condition 4 which states:

On an annual basis and after submission of the Annual Review report, UCMPL shall review, and if necessary revise, the strategies, plans, and programs required under Project Approval 08_0184 to the satisfaction of the Director-General within 3 months of:

a) *the submission of an annual review under …;*

b) *the submission of an incident report under …;*

c) *the submission of an audit report under …; and*

d) *any modification to the conditions of this approval, (unless the conditions require otherwise).*

The Proponent must review and if necessary revise the strategies, plans and programs required under this approval to the satisfaction of the Secretary. Where this review leads to revisions in any such document, them within 4 weeks of the review, unless the Secretary agrees otherwise, the revised document must be submitted to the Secretary for approval.

Changes in environmental requirements, technology and operational procedures may be included in the review. Changes are recorded in the revision history (**Section 8.3**) Updated versions of the approved monitoring program are publicly available on UCMPL's website at www.ulancoal.com.au

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7 Accountabilities

Role	Accountabilities for this document
Operations Manager	Approve appropriate resources for the effective implementation of the Surface Water Monitoring Program. • Ensure the effective implementation of strategies designed to reduce surface water impacts from the operation. • Ensure any potential or actual surface water issue is reported in accordance with legal requirements and the corporate standard. • Authorise internal and external reporting requirements of the Surface Water Monitoring Program. • Approve subsequent revisions of the Surface Water Monitoring Program.

Role	Accountabilities for this document
Environment and Community Manager	• Provide that sufficient resources are allocated for the implementation of the Surface Water Monitoring Program. • Ensure appropriate resources are budgeted for to enable appropriate monitoring of surface water. • Ensure that surface water considerations are undertaken in the installation of all new infrastructure to be installed at the operation, where applicable. • Ensure that surface water management controls are implemented in accordance with the Surface Water Monitoring Program. • Ensure that the results of monitoring are evaluated and reported to senior management and to relevant personnel for consideration as part of ongoing mine planning. • Ensure any potential or actual surface water issue is reported in accordance with legal requirements and the corporate standard. • Provide visible and proactive leadership in relation to the surface water management. • Ensure all internal and external reporting requirements are met, including incident reporting in accordance with EMS. • Ensure all reporting complies with internal and external monitoring standards, protocols and regulations. • Proactively engage government and community as required. • Coordinate the ongoing review of the Surface Water Monitoring Program. • Review and approve external reports e.g. Annual Review Report, prior to final approval by the Operations Manager. • Contact point for Community Complaints in accordance with ULNCX-111515275-3376– Complaints Procedure. • Ensure effective management of all community complaints.
Water Manager	• Manage and maintain UCMPL's water management infrastructure, including monitoring equipment (where applicable). • Ensure all water management infrastructure is operated in a proper and efficient manner to meet UCMPL's corporate and regulatory responsibilities. • Monitor the pumping of water from the open cut pit and underground workings and maintaining the associated pumping and monitoring system. • Implement and manage changes to UCMPL's water management system through UCMPL's Change Management process.

Role	Accountabilities for this document
Environment & Community Officer	• Ensure that all monitoring records are effectively maintained on site in accordance with the EMS • Coordinate the collation and evaluation of monitoring data. • Ensure any potential or actual water management issue, including incidents and non-conformances is reported to the ECM • Coordinate incident investigation processes including associated reporting requirements, in accordance with the EMS. • Coordinate the implementation of corrective actions and evaluate their effectiveness. • Provide visible and proactive leadership in relation to water management. • Participate in the ongoing review of the Surface Water Monitoring Program. • Update monitoring data on the UCMPL internet site. • Regularly report environmental performance to ECM. • Prepare internal and external reports for review by ECM. • Ensure that all monitoring records are effectively maintained on site in accordance with the EMS. • Coordinate the collation and evaluation of monitoring data.

Role	Accountabilities for this document
Environment & Community Coordinator	• Upload copies of updated management plans to the UCMPL website. • Conduct periodic environmental inspections of UCMPL's buffer lands to identify any water management issues. • Ensure any potential or actual water management issue, including incidents and non-conformances is reported to the ECM. • Manage access and lease agreements for ongoing management of water management system. • Proactively engage government and community as required. • Manage and maintain the water monitoring programs in accordance with this Program • Ensure monitoring equipment is operated in accordance with relevant industry standards and protocols. • Conduct periodic environmental inspections in accordance with the EMS • Coordinate incident investigation processes including associated reporting requirements, in accordance with the EMS. • Provide visible and proactive leadership in relation to water management. • Participate in the ongoing review of the Surface Water Monitoring Program. • Organise the channel stability and stream health assessments.

Role	Accountabilities for this document
Project Manager	• Provide that sufficient resources are allocated for the implementation of the Surface Water Monitoring Program, as required. • Ensure adequate resources are budgeted for in relation to water monitoring or erosion and sediment control for their task/project. • Implement and manage changes to UCMPL's water management system through UCMPL's Change Management process. • Ensure the any work requiring ground disturbance is approved prior to disturbance in accordance with EMS (where relevant). • Ensure that operational changes consider the potential impacts on surface water in the surrounding environment and adjacent private landholders. • Monitor that team members and contractors carry out work appropriate monitoring and maintenance tasks. • Ensure any potential or actual water management issue is controlled, or otherwise isolated. • Ensure any potential or actual water management issues, including environmental incidents, are reported to the ECM. • Conduct environmental inspections including monitoring of erosion and sediment control structures prior to and following high rainfall events. • Provide input to management on the adequacy and effectiveness of the Surface Water Monitoring Program. • Complete maintenance and repair work on equipment, including erosion and sediment control structures as identified in field inspections. • Provide visible and proactive leadership in relation to water management. • Ensure personnel working at the operation are aware of any water monitoring obligations for their task/project.

Role	Accountabilities for this document
All Supervisors	• Provide that sufficient resources are allocated for the implementation of the Surface Water Monitoring Program, as required. • Ensure adequate resources are budgeted for in relation to water monitoring or erosion and sediment control for their task/project. • Implement and manage changes to UCMPL's water management system through UCMPL's Change Management process. • Ensure the any work requiring ground disturbance is approved prior to disturbance in accordance with EMS (where relevant). • Ensure that operational changes consider the potential impacts on surface water in the surrounding environment and adjacent private landholders. • Monitor that team members and contractors carry out work appropriate monitoring and maintenance tasks. • Ensure any potential or actual water management issue is controlled, or otherwise isolated. • Ensure any potential or actual water management issues, including environmental incidents, are reported to the ECM. • Conduct environmental inspections including monitoring of erosion and sediment control structures prior to and following high rainfall events. • Provide input to management on the adequacy and effectiveness of the Surface Water Monitoring Program. • Complete maintenance and repair work on equipment, including erosion and sediment control structures as identified in field inspections. • Provide visible and proactive leadership in relation to water management. • Ensure personnel working at the operation are aware of any water monitoring obligations for their task/project.

Role	Accountabilities for this document
Surface Projects Coordinator	• Provide that sufficient resources are allocated for the implementation of the Surface Water Monitoring Program, as required. • Ensure adequate resources are budgeted for in relation to water monitoring or erosion and sediment control for their task/project. • Implement and manage changes to UCMPL's water management system through UCMPL's Change Management process. • Ensure the any work requiring ground disturbance is approved prior to disturbance in accordance with EMS (where relevant). • Ensure that operational changes consider the potential impacts on surface water in the surrounding environment and adjacent private landholders. • Monitor that team members and contractors carry out work appropriate monitoring and maintenance tasks. • Ensure any potential or actual water management issue is controlled, or otherwise isolated. • Ensure any potential or actual water management issues, including environmental incidents, are reported to the ECM. • Conduct environmental inspections including monitoring of erosion and sediment control structures prior to and following high rainfall events. • Provide input to management on the adequacy and effectiveness of the Surface Water Monitoring Program. • Complete maintenance and repair work on equipment, including erosion and sediment control structures as identified in field inspections. • Provide visible and proactive leadership in relation to water management. • Ensure personnel working at the operation are aware of any water monitoring obligations for their task/project.
All Employees & Contractors	• Ensure the effective implementation of this plan with respect to their work area. • Ensure any potential or actual water management issues, including environmental incidents, are reported to the Project Manager, Supervisor or Task Coordinator. • Seek approval from the Project Manager, Supervisor or Task Coordinator prior to making changes to the water management system.

8 Document Information

Relevant legislation, standards and other reference information must be regularly reviewed and monitored for updates and should be included in the site management system. Related documents and reference information in this section provides the linkage and source to develop and maintain site compliance information.

8.1 Definitions

Table 8.1 Definitions

Term	Definition
ANZECC	Australian and New Zealand Environment Conservation Council
BIS	Bobadeen Irrigation Scheme
CMA	Catchment Management Authority
DOI – Water	Department of Industry – Water
DPIE	NSW Department of Planning, Industry and Environment (DPIE);
DPI	Department of Primary Industries
DTIRIS	Department of Trade and Investment, Regional Infrastructure and Services
EA	Environmental Assessment
EC	Electrical Conductivity
EMS	Environmental Management Strategy
EPA	Environment Protection Authority
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPL	Environment Protection License 394
(G)CAA	(Glencore) Coal Assets Australia
GWMP	Groundwater Management Plan
LGA	Local Government Area
MWRC	Mid Western Regional Council
OEH	Office of Environment and Heritage
LW	Longwall
Mtpa	Million tonnes per annum
P	Phosphorous
PA	Project Approval 08_0184
pH	A measure of acidity
POEO Act	*Protection of the Environment Operations Act 1997* – NSW legislation administered by EPA that regulates discharges to land, air and water
Potable water	Water which is free from impurities that may cause disease or harmful physiological effects, and is considered safe for human consumption.
SD	Sustainable Development
SMP	Subsidence Management Plan
SWGWRP	Surface Water and Groundwater Response Plan
SWMP	Surface Water Monitoring Program
Tailings	Fine residual waste material separated in the coal preparation process.

TDS	Total Dissolved Solids
TSS	Total Suspended Solids
UCMPL	Ulan Coal Mines Proprietary Limited
WMP	Water Management Plan

8.2 Reference Information

Reference information, listed in **Table 8.2** below, is information that is directly related to the development of this document or referenced from within this document.

Table 8.2 Reference information

Reference	Title
Legislation	*Protection of the Environment Operations Act 1997*
	Water Management Act 2000
	Water Act 1912
	Environmental Planning and Assessment Act 1979
Australian Standards	AS/NZS 5667.1:1998. Water Quality – Sampling – Guidance on the Design of Sampling Programs, Sampling Techniques and the Preservation and Handling of Samples.
	AS/NZS 5667.10:1998 Water Quality – Sampling – Guidance on Sampling of Waste Waters.
UCMPL	Environmental Management Strategy (ULNCX-111515275-870)
	Water Management Plan (ULNCX-111515275-99)
	Goulburn River Diversion Remediation Plan (ULNCX-111515275-1641)
	Erosion and Sediment Control Plan (ULNCX- 111515275- 224)
	Groundwater Monitoring Program (ULNCX- 111515275- 1643)
	Surface Water and Groundwater Response Plan (ULNCX- 111515275- 1644)
	Biodiversity Management Plan (ULNCX- 111515275- 225)
	Complaints Procedure (ULNCX-111515275-3376)
	Integrated Mining Operations Plan 2017 to 2024 (ULNCX- 111515275- 3548)
External	AGE (2018) Ulan Coal Mine Limited Groundwater Impact Assessment for s75W Modification (MOD4). Report prepared for Ulan Coal.
	ANZECC/ARMCANZ, 2000. National Water Quality Management Strategy: Australian Guidelines for Fresh and Marine Water Quality.
	Department of Environment and Conservation (DEC), 2004. Approved Methods for the Sampling and Analysis of Water Pollutants in NSW.
	Landcom, 2004. Managing Urban Stormwater – Soils and Construction, Volume 1.
	Department of Environment and Climate Change (DECC), 2008. Managing Urban Stormwater – Soils and Construction, Volume 2A Installation of services.
	Department of Environment and Climate Change (DECC), 2008. Managing Urban Stormwater – Soils and Construction, Volume 2C Unsealed Roads.
	Department of Environment and Climate Change (DECC), 2008. Managing Urban Stormwater – Soils and Construction, Volume 2D Main Road Construction.
	Department of Environment and Climate Change (DECC), 2008. Managing Urban Stormwater – Soils and Construction, Volume 2E Mines and Quarries.

Reference	Title
	Department of Infrastructure, Planning and Natural Resources (DIPNR), 2005. DIPNR Guidelines for Management of Stream/Aquifer Systems in Coal Mining Developments – Hunter Region.
	Eco Logical (2018) Ulan Continued Operations Project – Modification 4 Longwall Optimisation Project Environmental Assessment. Report prepared for Ulan Coal.
	Engeny Water Management (2018) Ulan Coal Mines Limited Modification 4 Surface Water Impact Assessment. Report prepared for Ulan Coal.
	Engineers Australia, 2009, Australian Rainfall and Runoff: Project 7 – Baseflow for Catchment Simulation.
	Smakhtin, 2001, Low-flow Hydrology: A review, Journal of Hydrology, Vol. 240, 147-186.
	Umwelt (Australia) Pty Ltd, 2009a. Ulan Coal – Continued Operations Ecological Assessment. Prepared for Ulan Coal Mines Limited.
	Umwelt (Australia) Pty Ltd, 2009b. Ulan Coal – Continued Operations Environmental Assessment. Prepared for Ulan Coal Mines Limited.
	Umwelt (2011) Ulan Coal Continued Operations North 1 Underground Mining Area, Minor Modification to Ulan No.3 & Ulan West Mine Plans & Proposed Concrete Batching Plant
	Umwelt (May 2012) Environmental Assessment Modification to Ulan Coal Continued Operations, Ulan West Mine Plan (Approved Panels 1 – 4) and Construction Blasting

8.3 Change Information

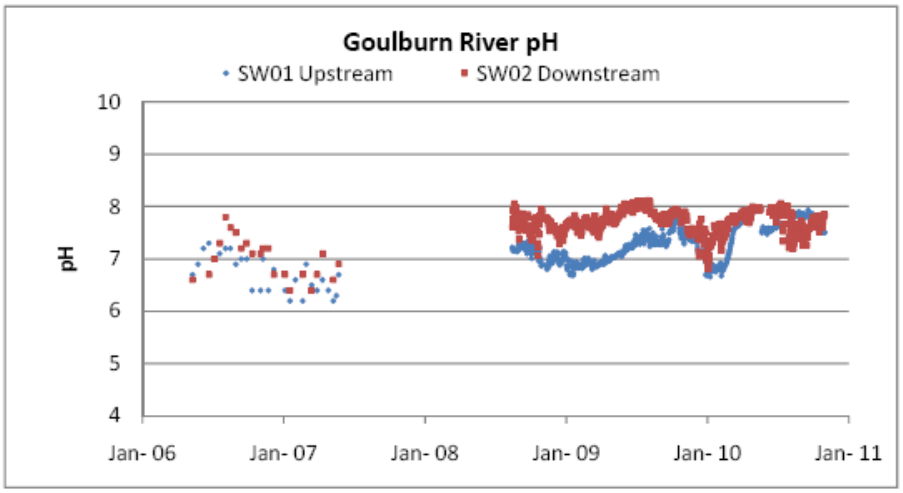
Full details of the document history are recorded in the document control register, by version. A summary of the current change is provided in **Table 8.3** below.

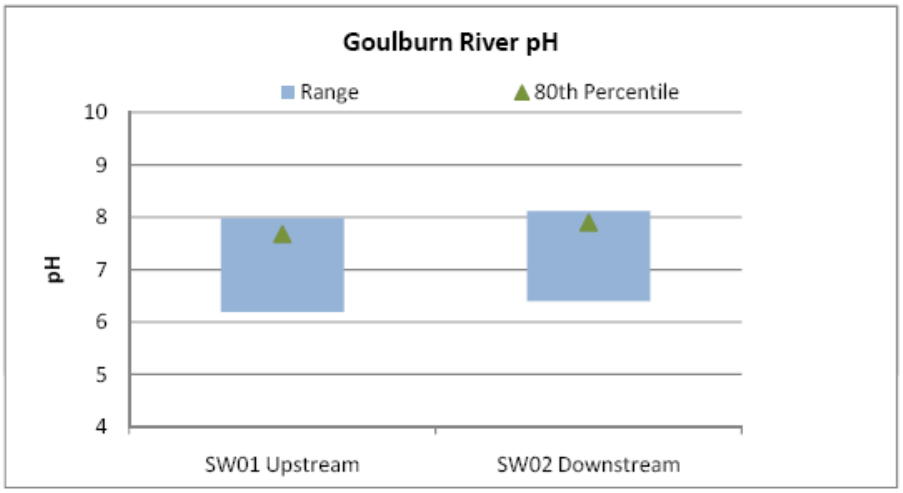
Table 8.3 Change information

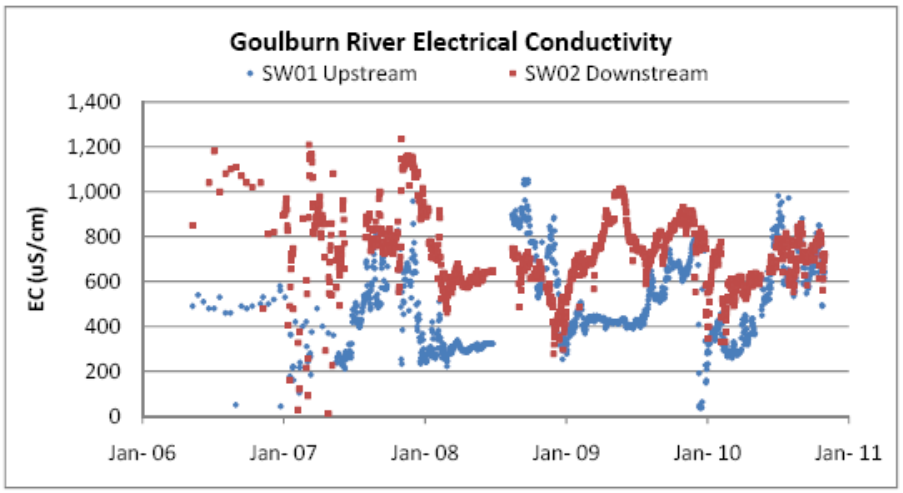
Version	Date	Review team (consultation)	Change Summary
1	31 March 2011	Cheryl Henriques, Jamie Lees, Susan Shields (Umwelt)	New management plan to address requirements of PA 08_0184.
2	1 April 2011	Cheryl Henriques	Formatting – no change to content
3	19 July 2011	Susan Shield (Umwelt), Cheryl Henriques, Jamie Lees	Update to program following DP&I comments
4	21 July 2011	Cheryl Henriques	Formatting – no change to content
4.1	15 June 2012	Robyn Stoney, Ian Flood, Susan Shield (Umwelt), Rachel Murray	Annual Review & updated based on MOD 1 & EPL 394 variation
5	22 June 2015	Steve Shoesmith, Eliza LeBrocq, Neville Buckley	Updated into new Glencore Template, removed any reference to Xstrata documents
5.1	30 May 2016	Angela van der Kroft	Commenced review in response to MOD3
5.2	2 June 2016	Tom Frankham	Update in response to Modification 3
6.0	5 December 2016	Tara Stokes	Published Version 5.2 approved by DPIE 2/12/2016
6.5	May 2017	Tara Stokes	update to Table 3.7 adopted trigger values
6.8	June 2017	Josh Frappell	Update to:

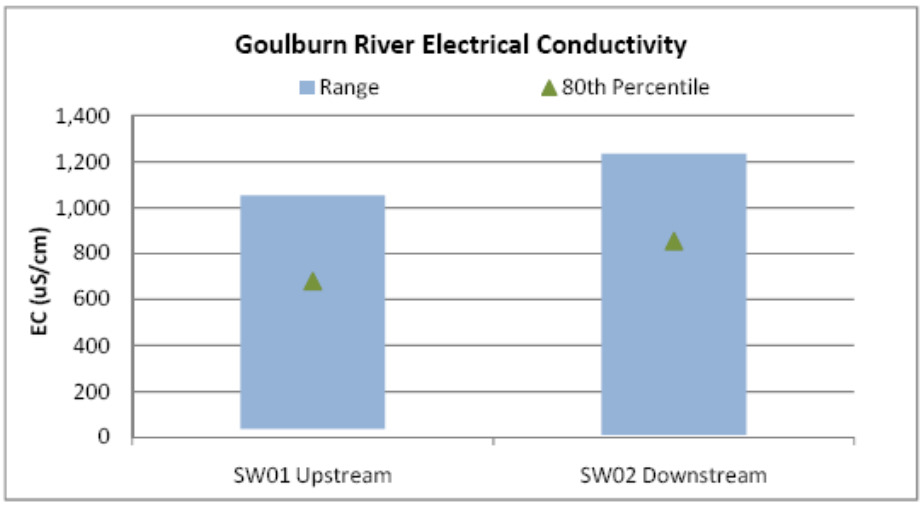
			• Monitoring locations. • Section 3.2.2 • Dam monitoring regimes, • Figures 1.1, 1.2, 3.1 and 3.2 • Appendix A included
6.9	July 2018	Kristy Bennetts	Administrative Update Updates to Subsidence SMP /EP approvals
6.17	Feb 2019	Lucy Stuart	Administrative Update Updates to Figure and Dam monitoring regimes
7.0	April 2019	Lucy Stuart Robbie Mills	Minor revisions following DPIE feedback, version approved 6/06/2019.
7.1	September 2019	Lucy Stuart and EMM	Minor revisions based on the approval of MOD 4 such as Figure updates.
7.2	June 2020	Patrick Curtis	Minor administrative updates.
7.3	August 2020	Jake Hawkins	Updated Department of Planning and Environment (DP&E) to Department of Planning, Industry and Environment (DPIE) as advised by the EPA (5 August 2020).
7.4	September 2020	Jake Hawkins	MOD 5 administrative changes, inclusion of MOD5 approval and updated operations plan layout.

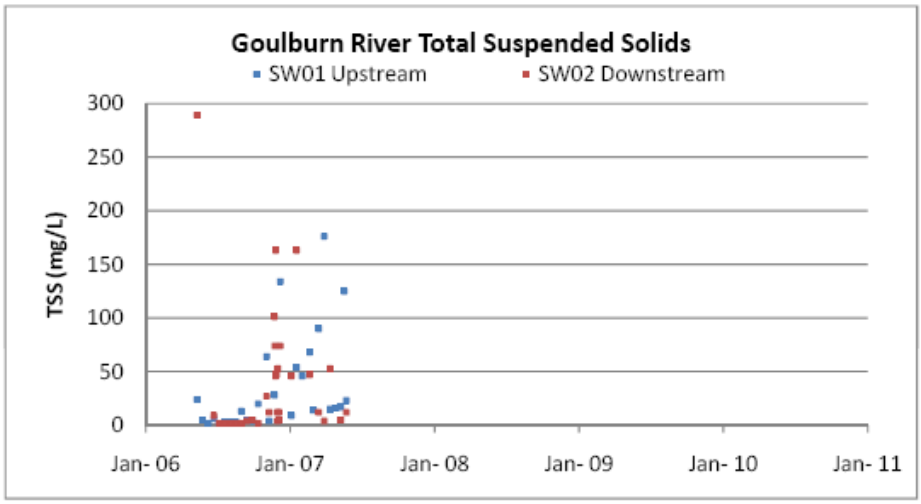
Appendix A Graphical Summary of Baseline Data

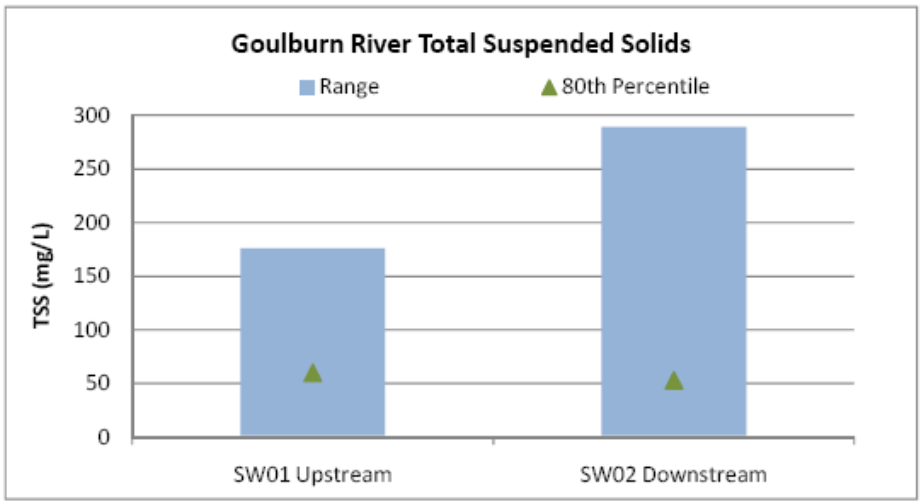












Appendix B Summary of Surface Water Qualities

Year	SW Sites	SW Site Description	pH			EC (µS/cm)			TSS (mg/L)		
			Min	Max	Ave	Min	Max	Ave	Min	Max	Ave
2010-2011	SW04	Ulan Creek at Old Ulan	8.2	8.2	8.2	380	**1100**	**787.5**	16	16	16
	SW05	Ulan Creek at Pleuger Road	**6**	**8.1**	7.4	70	320	196	2	82	14.5
	SW07	Bobadeen Creek	**6.8**	6.8	6.8	^	^	^	**106**	**106**	**106**
	SW08	Curra Creek	^	^	^	545	865	743	^	^	^
	SW10	Mona Creek	8	8	8	^	^	^	**188**	**188**	**188**
	SW11	Cockabutta Creek	^	^	^	120.5	1000.5	524.7	^	^	^
2012	SW04	Ulan Creek at Old Ulan	6.5	8.4	7.9	95	**1080**	502.1	2	**132**	35.6
	SW05	Ulan Creek at Pleuger Road	6.5	**8.4**	7.5	45	235	150	2	**324**	**44.4**
	SW07	Bobadeen Creek	6.5	7.1	6.9	10	80	36.7	10	150	76.5
	SW08	Curra Creek	**4.9**	6.1	5.5	**375**	**980**	**682.6**	2	52	28
	SW10	Mona Creek	**6.1**	7.5	7	80	130	100	2	**182**	**61.8**
	SW11	Cockabutta Creek	**6.1**	7.1	6.5	303	1000	621.8	10	45	29
2013	SW04	Ulan Creek at Old Ulan	6.7	**8.5**	7.8	280	**835**	645	2	58	15.3
	SW05	Ulan Creek at Pleuger Road	**3.2**	7.9	6.7	330	**2510**	**990**	1	**108**	**21.6**
	SW07	Bobadeen Creek	**6.2**	7.2	6.7	^	^	^	120	180	150
	SW08	Curra Creek	^	^	^	240	**1720**	**899**	^	^	^
	SW10	Mona Creek	**6.2**	6.2	6.2	^	^	^	39	39	39
	SW11	Cockabutta Creek	^	^	^	289	878	627	^	^	^
2014	SW04	Ulan Creek at Old Ulan	7.2	8.4	8	686	**796**	742.9	2	7	4.8
	SW05	Ulan Creek at Pleuger Road	7.1	7.9	7.6	585	**908**	741.1	2	4	2.8
	SW07	Bobadeen Creek	**6.4**	7.3	6.9	107	210	146.8	28	**254**	**139.6**
	SW08	Curra Creek	^	^	^	^	^	^	^	^	^
	SW10	Mona Creek	^	^	^	^	^	^	^	^	^
	SW11	Cockabutta Creek	^	^	^	^	^	^	^	^	^
2015	SW04	Ulan Creek at Old Ulan	7.4	**8.5**	8.1	633	**803**	729	3	**88**	29
	SW05	Ulan Creek at Pleuger Road	7.3	7.7	7.5	657	807	735	<1	10	4
	SW07	Bobadeen Creek	6.8	7.4	7.2	163	274	207	**82**	**178**	**119**
	SW08	Curra Creek	^	^	^	^	^	^	^	^	^
	SW10	Mona Creek	^	^	^	^	^	^	^	^	^
	SW11	Cockabutta Creek	^	^	^	^	^	^	^	^	^

2016	SW04	Ulan Creek at Old Ulan	7.8	**8.7**	8.1	414	**793**	652	6	**307**	64.5
	SW05	Ulan Creek at Pleuger Road	7.1	8	7.6	238	737	612	<1	**54**	11
	SW07	Bobadeen Creek	7.3	**7.8**	7.5	154	207	189	10	41	31
	SW08	Curra Creek	**6.1**	6.1	6.1	126	126	126	4	4	4
	SW10	Mona Creek	7.5	7.6	7.6	273	413	323	12	46	35
	SW11	Cockabutta Creek	**6**	6.1	6.1	113	143	128	19	28	24

^indicates no results obtained in the reporting period due to no flows in the creek at the time of sampling

Bold – results are outside adopted trigger values as per **Table 3.7**