Prepared for
AGL Macquarie Pty Ltd
ABN: 18 167 859 494

Bayswater Power Station Ravensworth Ash Line

Water Management Plan - Construction

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			Name/Position	Signature
0	06-Jul-2022	Final	Neil Standen Team Lead - Impact Assessment and Permitting	
1	11-Aug-2022	Final - revised to address DPE comments	Neil Standen Team Lead - Impact Assessment and Permitting	
2	25-Nov-2022	Update to include revised water quality limits	James McNamara – AGL Senior Environment Advisor	

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1.0 Introduction

1.1 Background

Bayswater Power Station is a coal-powered thermal power station operated by AGL Macquarie (AGLM). The power station is located on the New England Highway approximately 15km south of Muswellbrook township, in the upper Hunter Valley of NSW.

On 18 February 2022, AGLM was granted Development Consent (SSD-9697) by the Department of Planning and Environment (DPE) for the Bayswater Power Station Upgrade Project, a State Significant Development (SSD) encompassing a series of upgrades to the power station. These upgrades aim to deliver water and wastewater infrastructure and site improvements at Bayswater Power Station to ensure its continued operational and environmental performance. Potential impacts of the upgrade works were assessed within the Environmental Impact Statement (EIS) (Jacobs, 2020) prepared to accompany the development application. This included a Surface Water, Groundwater and Flooding Technical Paper as Appendix D (the 'Surface Water Assessment').

1.2 Ravensworth Ash Line Project

The Ravensworth Ash Line component of the upgrade works will include the construction of a new coal ash pipeline from the Bayswater Fly Ash Plant to Ravensworth Void No. 3 for ash emplacement. Specifically, this will consist of upgrading existing sections and installing new sections of an approximately 9.5km long pipeline for the purpose of transferring and disposing of ash waste to the Ravensworth Void No. 3.

The existing Ravensworth Ash Line is over 20 years old and requires replacement to reduce the risk of failure over the remaining operational life of the Bayswater Power Station. The replacement of the pipeline is required under EPL 779.

The majority of the new Ravensworth Ash Line will be above ground, with several sections running underground to avoid existing infrastructure corridors (including New England Highway, Pikes Creek, Liddell Station Road and other infrastructure corridors). The upgrade and construction of the Ravensworth Ash Line will include the following works:

- repositioning of underground pipelines to above ground;
- replacement or upgrading of ageing sections of the pipeline;
- vegetation clearing associated with existing infrastructure;
- vegetation clearance along pipeline alignments with opportunities to minimise clearance where practical;
- construction of concrete plinths to support above ground pipelines;
- trenching or underboring of sections where the pipeline will run below ground, with potential shoring and benching required depending on the depth of trenching; and
- disposal of any unused pipelines construction material such as pipe segments, concrete and steel as required.

1.3 Scope of the Water Management Plan

This Water Management Plan (WMP) has been prepared for the construction phase of the Ravensworth Ash Line component of SSD 9697. The scope of this WMP includes the pipeline corridor for the Ravensworth Ash Line and associated surface water monitoring network and does not include the entire Bayswater Power Station site.

This WMP excludes the management of groundwater, which is relevant to other elements of the Bayswater Power Station Upgrade Project (such as the Borrow Pits, Slat Cake Landfill and Bayswater Ash Dam Augmentation). Boreholes within the vicinity of the Ravensworth Ash Line were drilled up to

10 m below ground level and did not encounter groundwater. Potential impacts to groundwater during construction of the Ravensworth Ash Line would be managed through the Construction Environmental Management Plan (CEMP) prepared for the project.

1.4 Objectives of the WMP

The objectives of the WMP are to:

- ensure compliance with the relevant conditions of SSD 9697 as applicable to the construction phase of the Ravensworth Ash Line project (**Section 1.5**);
- detail all relevant statutory requirements associated with surface water management during construction of the Ravensworth Ash Line project (**Section 1.5** and **3.0**);
- describe water management measures to be implemented during construction to divert clean surface water away from operational areas (**Section 6.0**);
- detail the monitoring program to be implemented during construction (**Section 7.0**);
- provide surface water assessment criteria, including trigger levels for investigating any potential adverse surface water impacts (**Section 8.0**);
- provide protocols for the investigation and response to exceedances of the surface water assessment criteria (**Section 9.0**).

1.5 Project Approval Requirements

In accordance with condition A10 of SSD 9697, AGLM has obtained approval from DPE (correspondence from DPE dated 5 August 2020) to prepare and submit the WMP in a staged process, with Stage 1 comprising the Ravensworth Ash Line component of works. This WMP covers the construction phase of the Ravensworth Ash Line component of the project, as agreed by DPE.

This WMP has been prepared in accordance with condition B7 of SSD 9697, where applicable to the construction phase of the Ravensworth Ash Line component of the project. DPE has endorsed the AECOM project team as suitably qualified and experienced to prepare the WMP (correspondence from DPE dated 5 August 2020). Consultation with the Environment Protection Authority (EPA) and NSW Department of Natural Resources Access Regulator (NRAR) has been undertaken during preparation of this WMP to obtain comments from these agencies.

The requirements of condition B7 of SSD 9697 are shown in **Table 1** with cross reference to sections within the WMP where the requirements have been addressed. In accordance with condition A12 of SSD 9697 and as agreed by DPE, this WMP only addresses the conditions that are applicable to Stage 1 of the development.

Table 1 Requirements of Condition B7 of SSD 9697

Condition Requirement	Comment / WMP Section
B7. Prior to the commencement of construction, or as otherwise agreed by the Planning Secretary the Applicant must prepare a WMP for the development to the satisfaction of the Planning Secretary. The WMP must:	This document
a. be prepared by a suitably qualified and experienced person(s) whose appointment has been endorsed by the Planning Secretary;	Quality Information and **Section 1.5**
b. be prepared in consultation with the EPA and NRAR	**Section 1.5**
c. detail the management of wastewater streams on-site;	**Section 6.0**

d. detail the water licence requirements and water licences held for the development under the Water Management Act 2000;	Not applicable to this WMP – no additional water licences required.
Condition Requirement	**Comment / WMP Section**
e. a comprehensive water balance;	Not applicable to this WMP – this is relevant to other components of the project.
f. contain a Groundwater Management Plan;	Not applicable to this WMP – this is relevant to other components of the project (refer to **Section 1.3**).
g. contain a Surface Water Management Plan, including:	
- (i) detailed baseline data of surface water resources potentially impacted by the development	Not applicable to this WMP this is relevant to other components of the project. AGLM conduct a site-wide monitoring program. Relevant baseline data for the Stage 1 construction works has been sought from the Environmental Assessment for SSD 9697, as detailed in Section 5.5.1. , Potential impacts during construction of the Ravensworth Ash Line would be monitored as per item (iii) below.
- (ii) a comprehensive program to monitor surface water flows and quality, surface water storage and use and sediment basin operation	Not applicable to this WMP – this is relevant to other components of the project. Potential impacts during construction of the Ravensworth Ash Line would be monitored as per item (iii) below.
- (iii) a surface water monitoring program, including a program for routine inspection and monitoring of the Ravensworth ash line;	**Section 7.0**
- (iv) measures to divert clean surface waterways from operational areas;	**Section 6.0**
- (v) surface water impact assessment criteria, including trigger levels for investigating any potential adverse surface water impacts;	**Section 8.0**
- (vi) a protocol for the investigation and mitigation of identified exceedances of the surface water impact assessment criteria; and	**Section 9.0**

- (vii) a trigger action response plan to respond to any exceedances of the surface water performance criteria, and repair, mitigate and/or offset any adverse groundwater impacts of the development.	**Section 9.0**

Other conditions of SSD 9697 that relate to surface water management are shown in **Table 2** along with a discussion of their relevance to the construction of the Ravensworth Ash Line component of the project.

Table 2 Other conditions of SSD 9697 relating to surface water management

Condition Requirement	Comment / WMP Section
Water Licences B1. The Applicant must obtain all necessary water licences for the development, including during construction, under the *Water Act 1912* and/or the *Water Management Act 2000* prior to the take of water occurring.	Water requirements would be drawn from existing entitlements, no new water licences would be required for the project.
Water Quality B2. The Applicant must ensure that all surface discharges from the site comply with all relevant provisions of the *Protection of the Environment Operations Act 1997* (POEO Act), including any discharge limits (both volume and quality) set for the development in any EPL.	**Section 5.5.1**
B3. All process operational wastewater generated by the activity must: (a) be captured and stored at the premises and must only be disposed of by tanker transport to a licensed wastewater facility; or (b)discharge in accordance with conditions B2; or (c) managed via an existing site wastewater system.	Existing process water management systems would continue to be implemented during construction of the Ravensworth Ash Line
B4. Prior to the commencement of any construction or other surface disturbance the Applicant must install and maintain suitable sediment and erosion controls onsite, in accordance with the relevant requirements of *Managing Urban Stormwater: Soils and Construction – Volume 1* (the Blue Book) (Landcom, 2004).	**Section 6.0**
Acid Sulphate Soils B5. The Applicant must ensure that any construction activities in identified areas of acid sulphate soil risk are undertaken in accordance with the *Acid Sulphate Soil Manual* (Acid Sulphate Soil Management Advisory Committee, 1998).	Not applicable to this WMP acid sulphate soils are not anticipated within the project area (Jacobs, 2020).
Water Management Performance Measures B6. The Applicant must ensure that the development does not cause any exceedance of the performance measures in Table 1 of SSD 9697, to the satisfaction of the Planning Secretary.	Relevant performance measures are discussed in **Section 8.1**.

1.6 Related Reports and Plans

This WMP forms one component of the environmental management framework established at Bayswater Power Station. An Environmental Management Strategy (EMS) (Jacobs, 2022) has been prepared for the Bayswater Power Station Upgrade Project (also referred to as the Water and Other Associated Operations Works (WOAOW) project). This overarching EMS provides an environmental management framework for all development stages, including the Ravensworth Ash Line component.

This WMP should be read in conjunction with the following documents (or the version in force at the time of reading):

- AGLM Environment Policy;
- AGLM Health, Safety and Environment Policy;
- *Bayswater WOAOW Environmental Management Strategy* (Jacobs, 2022);
- *Bayswater Fly Ash Plant Upgrade: Ravensworth Ash Line Construction Environmental Management Plan AGLM-CPG-049-RPT-009* (GHD, 2021);
- *Biodiversity Management Plan (BMP) Ravensworth – Bayswater Ash Line Upgrade* (Kleinfelder, 2022); and
- Erosion and Sediment Control Plan (ESCP).

2.0 Site Identification Details

The Site identification details are summarised in **Table 3**.

Table 3 Site Identification Details

Item	Description
Owner	The owner of the Bayswater Power Station Site is AGLM. The total area of AGLM landholding is approximately 10,000 hectares, including Liddell Power Station, the Ravensworth rehabilitation area, Lake Liddell and surrounding buffer lands. The Project is predominantly located on land owned by AGLM, although some parts of the pipeline crosses road reserves owned by Transport for NSW (TfNSW), Singleton Council and a small area of Crown Land.
Site Address	Bayswater Power Station is located off the New England Highway, approximately 15 km south-east of Muswellbrook and 25 km northwest of Singleton. The Ravensworth Ash Line will extend from the Bayswater Fly Ash Plant to Ravensworth Void No. 3 (as shown on **Figure 1**). Access to the Ravensworth Ash Line would be by Pikes Gully Road and Hebden Road.
Title Identification relevant for Ravensworth Ash Line	Lot 6 DP 247943 Lot 601 DP 1019325 Lot 2 DP 619383 Lot 2012 DP 1151790 Lot 1 DP 1142103 Lot 13 DP 247945 Lot 15 DP 247945 Lot 10 DP 1204457
Current Land Use Zoning	The Site is on land zoned SP2 – Infrastructure and RU1 – Primary Production.
Surrounding land use	The landscape local to the Site is heavily influenced by mining and power generation activities. Local land use is dominated by largescale infrastructure associated with Bayswater and Liddell power stations, and open cut mining activities at Ravensworth Mine Complex, Mount Arthur Coal, Hunter Valley Operations, Liddell Coal Mine and the former Drayton Mine. The New England Highway runs parallel to the pipeline route. The closest residential area is the Antiene subdivision, which is located behind a ridge line approximately 5 km north of the Project.

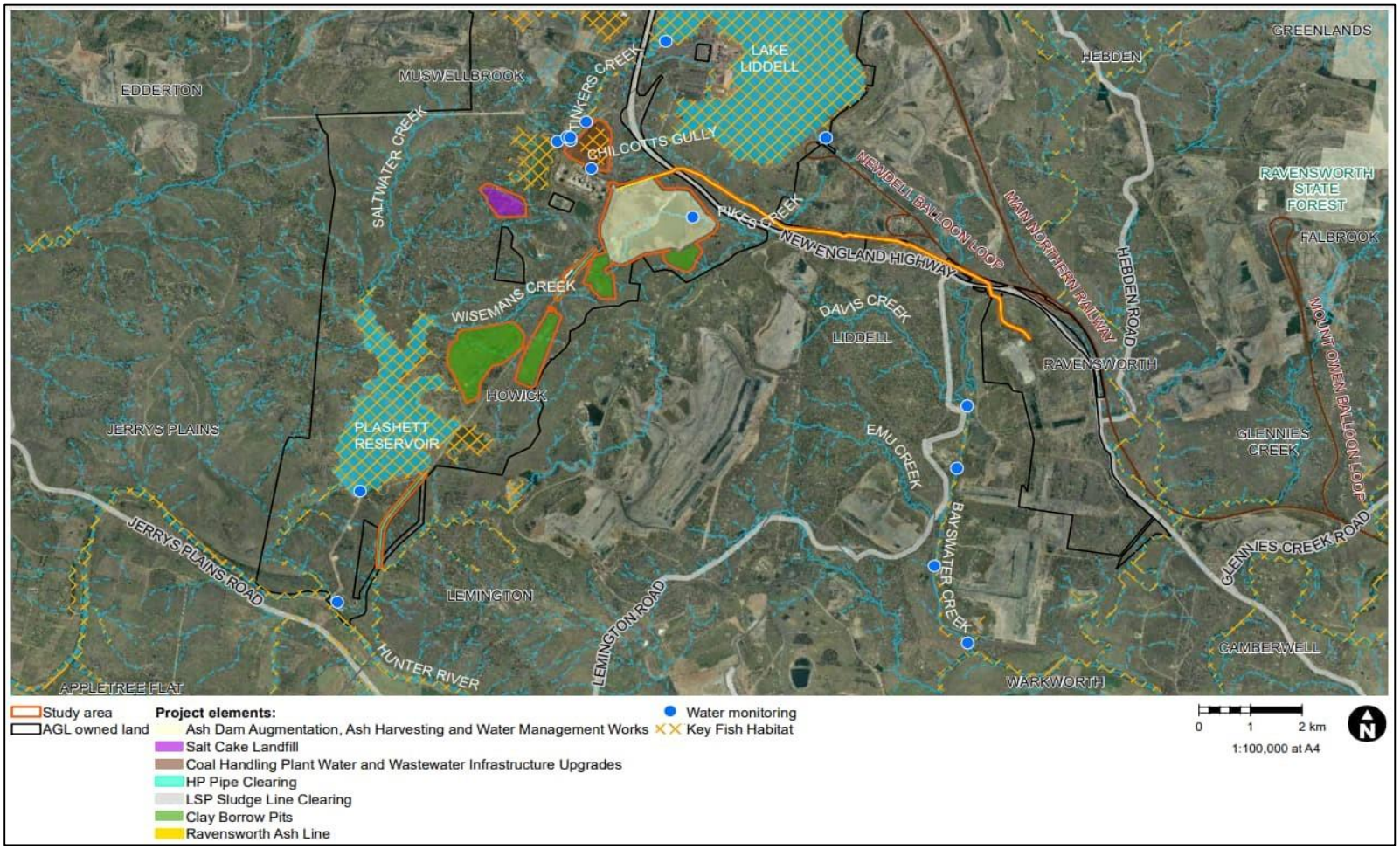

Figure 1 Site context of the Ravensworth Ash Line (Source: Jacobs, 2020).

3.0 Legislation and Guidelines

This WMP considers a range of legislation, policy and guidelines, as outlined below.

3.1 NSW Legislation

3.1.1 Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (EP&A Act) provides the framework for development assessment in NSW. The EP&A Act and its regulations include provisions to ensure that the potential environmental impacts of a development are considered in the decision-making process prior to approval being granted.

The Bayswater Power Station Upgrade Project has been declared to be SSD and Development Consent (SSD 9697) was granted on 18 February 2022. AGLM will need to undertake construction of the Ravensworth Ash Line component of the project in accordance with the relevant conditions of SSD 9697 (refer to **Section 1.5**).

3.1.2 Protection of the Environment Operations Act 1997

The POEO Act is administered by the EPA and prohibits the pollution of water, land or air. The POEO Act provides for the licensing of specific activities. Bayswater Power Station operates under Environmental Protection License (EPL) No. 779. The EPL sets emission and operational limits and includes water monitoring requirements at a range of sites at Bayswater Power Station.

Under the POEO Act, there is a legal responsibility to ensure that runoff leaving a site meets an agreed water quality standard, including water being discharged from sedimentation ponds after storm events. Part 5.7 of the POEO Act includes a duty to notify relevant authorities of pollution incidents.

3.1.3 Water Act 1912 and Water Management Act 2000

The *Water Act 1912* and the *Water Management Act 2000* (WM Act) are the two key pieces of legislation for the management of water in NSW and contain provisions for the licensing of water access and use. The Water Sharing Plan for the Hunter Regulated River Water Source 2016 provides for the efficient use of this water source.

Construction of the Ravensworth Ash Line would not alter AGLMs overall water requirements with all necessary water to be drawn from within existing entitlements. No new water access licences would be required for the project.

As the project is SSD, a water use approval under section 89, a water management work approval under section 90, or an activity approval under section 91 of the WM Act are not required.

3.1.4 Pipelines Act 1967 NSW

The *Pipelines Act 1967 NSW* serves the purpose of providing a system of approvals for the construction and operation of pipelines, including licencing requirements. Under Part 3, the Ravensworth Ash Line project is exempt, and a licence is not required to construct, alter or operate the pipeline.

3.2 Policies and Guidelines

3.2.2 NSW Water Quality and River Flow Objectives (DECCW, 2006)

The *NSW Water Quality and River Flow Objectives* (DECCW, 2006) are a set of high-level water quality objectives which entail the agreed environmental values and long-term goals for NSW's surface waters. They include the community values and uses for a range of water bodies, and a range of water quality indicators to assess whether the current condition of the waterway supports these values and uses.

Waterways within the Project area have been classified as 'uncontrolled streams'. The nominated environmental values for uncontrolled streams include:

- Protection of aquatic ecosystems;
- Visual amenity;

- Secondary contact recreation;
- Primary contact recreation; Livestock water supply; and Irrigation water supply.

3.2.3 Managing Urban Stormwater - Soils and Construction

The *Managing Urban Stormwater – Soils and construction, Volume 1* (Landcom, 2004) (also referred to as the Blue Book) outlines the basic principles for stormwater management during construction. It provides guidance on design and construction of sediment and erosion control measures to protect downstream water quality, thereby improving the health, ecology and amenity of rivers and streams.

This guideline shaped the mitigation measures which are to be implemented for the water management during the Ravensworth Ash Line construction.

3.2.4 Guidelines for Managing Risks in Recreational Waters (NHMRC, 2008)

The *Guidelines for Managing Risks in Recreational Waters* (NHMRC, 2008) aim to protect human health from threats posed by the recreational use of coastal, estuarine and fresh waters. The guidelines provide recommended values for indicators that may pose a risk to human health. The indicators are relevant for waterways that are being used for recreation but have the potential to be polluted.

4.0 Roles and Responsibilities

The relevant roles and responsibilities associated with this WMP are outlined in **Table 4**.

Table 4 Roles and Responsibilities

Role	Responsibility
Environment Advisor (AGLM)	• Ensure overall implementation of this WMP • Ensure works are conducted in accordance with regulatory requirements • Manage relationships with Construction Contractor as required • Review monthly reports provided by Construction Contractor • Track and report on environmental performance against the management actions identified in this WMP • Notify incidents or non-compliances to relevant authorities as per **Section 10.2** • Investigate incidents or non-compliances and ensure corrective actions are implemented to prevent a reoccurrence.
Project Manager (Construction Contractor)	• Ensure adequate resources are available for implementation of this WMP • Administer all contracts related to supply of services • Overall construction methodology and execution of the works • Risk assessment and management of the Project site • Monitor performance trends and implement corrective actions via the Site Superintendent • Monthly reporting to AGLM
Site Superintendent (Construction Contractor)	• Manage relationships with AGLM representative as required • Carry out all work in a safe and efficient manner and report all hazards, incidents and accidents promptly • Daily site coordination and management meetings across disciplines • Complete worksite inspections and investigations and complete accurate and timely reporting • Ensure that accurate information reporting as requested by Project Manager is delivered
HSE Advisor (Construction Contractor)	• Ensure this WMP is effectively implemented • Advise employees and Supervisors regarding surface water management • Direct routine and additional monitoring where required • Review surface water monitoring data to determine compliance with this WMP • Coordinate an investigation of non-compliances, incidents and complaints • Implement corrective actions and evaluate their effectiveness • Ensure internal and external reporting requirements are met, including incident reporting to relevant authorities • Ensure monitoring records are maintained onsite
Supervisors (Construction Contractor)	• Manage subcontractors to ensure appropriate controls are implemented and monitoring activities are carried out • Ensure all staff members are inducted onto the site and have an appropriate level of training as required for their activities • Ensure that environmental controls, such as erosion and sediment controls, are maintained and working effectively • Monitor the effectiveness of the controls implemented

Role	Responsibility
	• Report incidents in accordance with the requirements of this WMP • Assist the HSE Advisor in investigating non-compliances or incidents and implementing corrective actions
All staff and contractors	• Comply with the requirements of this WMP • Complete induction prior to commencing work • Maintain competencies relevant to your activities • Understand risks associated with your activities • Stop work immediately if a particular activity is carried out in an unsatisfactory manner • Undertake activities in accordance with this WMP and specific instructions issued by your supervisor • Report environmental incidents to your supervisor

5.0 Environmental Setting

5.1 Geology and Soils

The surface geology along the Ravensworth Ash Line route is mapped as Mulbring Siltstone, Vane Subgroup and Jerry Plans Subgroup of the Whittingham Coal Measures and Quaternary Alluvium associated with Bayswater Creek. These are primarily sub-horizontal sedimentary strata characteristic of coal seams, clay stones, tuffs, siltstones, sand stones and conglomerates.

Soil landscape mapping indicates that shallow soils comprising residual and colluvial loams and sands would be present on ridgelines, with brown solodic soils on the lower slopes. Sandy earths and possible siliceous sands may be observed within drainage lines on the lower slopes (Jacobs, 2020).

The EIS (Jacobs, 2020) identified that the project area was mapped as a “low probability of occurrence” for Acid Sulfate Soils (ASS) and given the site elevations, ASS is not anticipated.

5.2 Topography, Drainage and Flooding

The local topography is characterised by low hills with elevations ranging from 100 m Australian Height Datum (AHD) up to 220 m AHD. The natural land comprises maximum slopes of approximately 25% to 30% (Jacobs, 2020). The majority of the Ravensworth Ash Line is located on the northern side of the New England Highway, south of Lake Liddell (**Figure 1**).

The Site is not located on land mapped under the *Singleton Local Environmental Plan 2013* as being susceptible to flooding. The probable maximum flood level is estimated to be at Relative Level (RL) 173.3 m across Pikes Gully. Flood behaviour in Pikes Gully downstream of the Bayswater Ash Dam is not influenced by the dam (Jacobs, 2020).

5.3 Surrounding Waterbodies

The Site is located in the Upper Hunter Valley Catchment area, which is the largest coastal catchment in NSW. The Hunter River flows to the west and then around the south of the study area. The Hunter River is located approximately 8km from the Site (Jacobs, 2020).

Within the Project area is the Bayswater Creek sub catchment, which has been substantially disturbed by mining activities. The watercourses and artificial water bodies within the surrounding landscape are shown in **Figure 1** and include:

- **Lake Liddell** – located approximately 800m north of the Project Site, this dam was constructed in the 1960s to provide cooling water to the Liddell Power Station. A dam wall was constructed across Bayswater Creek to create the dam, which collects runoff from the upper portion of Bayswater Creek. The dam receives flows from licensed discharges from Bayswater and Liddell power stations. Flows from Lake Liddell are intermittently released to Bayswater Creek and are monitored at licensed discharge point “LDP08”. The water quality released into Bayswater Creek is regulated by the Hunter River Salinity Trading Scheme (HRSTS) and water quality limits set out in EPL 779.
- **Bayswater Creek** – intersecting the Project Site in the eastern end of the pipeline route, this creek is a fifth order waterway which was dammed to create the Lake Liddell reservoir and has been heavily modified downstream of the lake. While discharges from Lake Liddell are the primary source of flow into Bayswater Creek, a number of other tributaries flow into Bayswater Creek. This creek acts as a transfer channel between Lake Liddell and the Hunter River, with discharges to Hunter River regulated by the HRSTS.
- **Pikes Creek** – intersecting the Project Site about mid-way along the pipeline route, this creek is a third order stream which flows in a north-easterly direction through the site and under the New England Highway. Pikes Creek receives flow from a number of small tributaries downstream of the Bayswater Ash Dam.
- **Chilcotts Creek** – intersecting the Project Site in the western end of the pipeline route, this creek is an ephemeral, first order stream. Chilcotts Creek flows in a north-easterly direction toward Lake

Liddell and crosses under the New England Highway. Two small drainage lines flow into the creek however the creek receives the majority of its flow from direct seepage from the Bayswater Ash Dam and runoff during wet periods.

The pipeline would be located underground at Pikes Creek and would be raised above ground for crossings at Bayswater Creek and Chilcotts Creek.

5.4 Sensitive Receiving Environments

Lake Liddell and Bayswater Creek have been mapped as Key Fish Habitat. However, no threatened species are predicted to occur, and only minimal suitable aquatic habitat features appear to be present along the banks of the waterways. Bayswater Creek has been highly modified downstream including the construction of a diversion channel and a drop structure near the confluence of Bayswater Creek and the Hunter River which prevents the migration of fish upstream. As such, these waterways have been classified as Type 3 minimal Key Fish Habitat.

Commercial fishing is prohibited in the waterways within the Project area and no waterways are part of the drinking water catchments for any surrounding townships. Overall, no waterways within the Project area are considered to be sensitive receiving environments.

5.5 Water Quality

Waterways within the wider Hunter River catchment area are affected by high salinity. Sources of salt within waterways in the catchment include rainfall and weathering products which enter streams via surface runoff pathways and groundwater sources.

The EIS included an analysis of monitoring records from various sources collected within the study area. Generally, water sampling data indicated that discharge water quality was within the range specified in EPL 779 (Jacobs, 2020).

When considering water quality in relation to recommended guidelines for protection of aquatic ecosystems or primary industry (ANZG, 2018), there were instances of some parameters exceeding the recommended guidelines. In particular, electrical conductivity was found to be outside the recommended range of 125 – 2250 µS/cm in Lake Liddell and Pikes Creek. However, median electrical conductivities are suggested to exceed 5500 µS/cm in water sources within the Hunter River catchment. Therefore, the values recorded are considered consistent with regional water quality issues.

5.5.2 Surface Water Assessment

The Surface Water Assessment found the following:

Chilcotts Creek:

The creek receives the majority of its flow from direct seepage from the Bayswater Ash Dam – Saddle Dam wall and from runoff during wet periods. There is currently no formal collection point for this seepage volume and no available water quality data for this creek.

Pikes Creek:

Summary statistics detailed in Table 4-19 of the Surface Water Assessment are presented below:

Indicator	Minimum	20th percentile	Median	80th percentile	Maximum
pH	7.9	8.1	8.3	8.5	8.7
Electrical Conductivity (µS/cm)	4460	5010.6	5322	5438.2	5490

Bayswater Creek:

Summary statistics detailed in Table 4-13 of the Surface Water Assessment in 4 sampling locations along Bayswater Creek are presented below:

Parameter	BC1	BC2	BC3	BC4
Electrical conductivity (µS/cm)	2,864	3,452	3,130	2,907
pH	8.13	7.82	8.12	7.91

5.5.1 EPL Concentration Limits

The quality of water discharged from the Bayswater Power Station to receiving environments is subject to regulation by the HRSTS and water quality concentration limits implemented under AGLM's EPL 779. The water concentration limits for AGLM's licensed discharge points are shown in **Table 5**.

Table 5 Water concentration limits as defined by EPL 779

Pollutant	Unit of measure	100 percentile concentration limit
EPL Point 19 (discharge from cooling towers to Tinkers Creek)		
Conductivity	µS/cm	4500
Oil and grease	mg/L	10
pH	pH	6.5 – 9.0
EPL Point 20 (discharge from oil and water separator holding basin to Tinkers Creek)		
Oil and grease	mg/L	10
Total suspended solids	mg/L	30
EPL Point 23 (discharge of saline waters under HRSTS from Lake Liddell dam wall)		
pH	pH	6.5 – 8.5
Total suspended solids	mg/L	30
EPL Point 24 (discharge of saline waters under HRSTS from Void 4 pump system)		
Boron	mg/L	0.81
Cadmium	mg/L	0.0003
Copper	mg/L	0.001
Iron	mg/L	0.27
Molybdenum	mg/L	0.29
Nickel	mg/L	0.019
pH	pH	6.5 – 9.5
Silver	mg/L	0.0005
Total suspended solids	mg/L	30

6.0 Water Management Measures

During construction, water will be required for activities such as dust suppression, drilling, concrete works and revegetation. Water will be sourced from existing onsite sources in accordance with existing AGLM water access licences and no additional water access licences will be required for construction of the Ravensworth Ash Line.

Potential impacts to water quality and hydrology may occur through the following construction activities:

- removal of vegetation, general earthworks, topsoil stripping and excavation;
- stockpiling of topsoil and vegetation;
- transportation of cut and/or fill materials and the movement of heavy vehicles across exposed earth;
- potential for spills and leaks;
- horizontal directional drilling/thrust boring;
- piling;
- drainage and culvert works;
- concreting works; and instream works.

Table 6 outlines the water management measures to minimise potential impacts to surface water and hydrology during construction of the Ravensworth Ash Line.

Table 6 Water management measures

Measure	Timing	Responsibility
Erosion and sediment control measures will be installed prior to construction work commencing and will be implemented in accordance with the ESCP prepared for the Project and Landcom's *Managing Urban Stormwater: Soil and Construction*.	Prior to and during construction	Project Manager Supervisors
Controls for receiving environments will be implemented in accordance with the ESCP and will include: • designation of "no go" zones for construction plant and equipment; • creation of catch/diversion drains and sediment fences at the downstream boundary of construction activities where practicable to ensure containment of sediment-laden runoff and diversion toward sediment sump treatment areas (not sediment basins) to prevent flow of runoff to nearby waterways.	Prior to and during construction	Project Manager HSE Advisor
Any water collected from the construction worksites will be treated and discharged as appropriate and in accordance with relevant discharge criteria (refer to **Section 8.2**) to avoid potential contamination of waterways.	During construction	Project Manager HSE Advisor
Water will be sourced from existing onsite sources in accordance with existing water licences. Recycled water will be used where feasible and water use records will be reviewed to identify opportunities to minimise the use of potable water.	During construction	Supervisors HSE Advisor

Measure	Timing	Responsibility
Stockpiles will be managed to minimise the potential for mobilisation and transport of dust, sediment and leachate in runoff, including: • the number and size of stockpiles will be minimised; • stockpiles will be located away from drainage lines, waterways and areas of high wind erosion; • stockpiles will be stabilised in accordance with the ESCP, with appropriate erosion and sediment controls established; dust suppression techniques will be used as required.	During construction	Project Manager Supervisors
Implement surface water monitoring as outlined in **Section 7.0** to identify potential changes in water quality and if changes in downstream water quality are observed, implement the procedures outlined in **Section 9.0**.	Prior to and during construction	Project Manager HSE Advisor
Construction works in proximity to waterways will be undertaken with the aim of minimising disturbance of banks. Where impacts can't be avoided, bank stabilisation practices will be implemented to stabilise the banks as soon as possible.	During construction	Project Manager Supervisors
Flood risks will be considered throughout construction. In the event that a temporary departure from the design is required (e.g. temporary diversions or crossings of waterways), flood impacts will be assessed before finalising the required approach.	During construction	Project Manager HSE Advisor
If temporary crossings on waterways are required, these will be constructed to minimise the disturbance of banks. Following completion of construction, the temporary crossings will be removed and the area rehabilitated.	During construction	Project Manager HSE Advisor
Clean up spills that may occur using spill kits appropriate for the type of spill.	During construction	Project Manager Supervisors

7.0 Monitoring Program

7.1 Environmental Inspections

Environmental inspections during construction of the Ravensworth Ash Line will be undertaken by the Construction Contractor in accordance with the CEMP developed for the Project. This will include:

- Weekly environmental inspections of the Site;
- Inspection of erosion and sediment control devices prior to and following significant rainfall; and

  Monthly environmental audits of the Site.

If site conditions are considered unsafe for driving or walking to the relevant inspection location or if heavy rainfall has made the locations inaccessible, then inspections would be undertaken at the soonest available opportunity when the risks are appropriately managed.

Site inspection reports and audit reports will be prepared to document the findings of these environmental inspections and will be retained on site with Project documentation.

7.2 Surface Water Monitoring

7.2.1 Locations

For construction of the Ravensworth Ash Line, water quality monitoring of Pikes Creek, Baywater Creek, and Chilcotts Creek will be undertaken by the Construction Contractor at suitable and safely accessible locations upstream and downstream from the construction works.

7.2.2 Sampling Parameters

The following field parameters will be analysed by sampling with a calibrated, handheld water quality meter and by visual inspection:

- pH;
- Electrical conductivity;
- Turbidity; and
- Visual assessment for the presence of oil and grease.

7.2.3 Monitoring Frequency

Water quality monitoring for construction of the Ravensworth Ash Line will be undertaken as follows, if there is water present in the creeks at the time of the required sampling and if it safe to do so:

- prior to commencement of construction;
- monthly during construction works;
- prior to, during and following construction of creek crossings (instream works or underboring); and
- prior to and following significant rainfall events (greater than 20mm predicted in 24 hours).

If heavy rainfall has made monitoring locations inaccessible and attempting to access the location could result in unacceptable risks to the safety of people or property, then water monitoring would be undertaken at the soonest available opportunity and when the risks are appropriately manageable.

7.3 Water Monitoring Records

Field observations and measurements will be documented in quality-controlled field sheets. All field notes will be retained on site with Project documentation. The following records must be kept in respect of any samples required to be collected for the water quality monitoring:

- the date and time at which the sample was collected;
- the location at which the sample was taken;
- the name of the person who collected the sample; and

- observations of the sampled water (e.g colour, turbidity, odour, sheen).

7.4 Pipeline Leak Detection System

AGLM operates a pipeline leak detection system for the existing Ravensworth Ash Line, which includes routine daily inspections for evidence of leaks and computer monitoring systems to detect leaks and flow discrepancies. This pipeline leak detection system will continue to be implemented during operation of the new Ravensworth Ash Line.

Routine daily inspections involve physical inspection of relevant pumps, valves and the pipeline to identify potential defects or leaks. The results of the routine daily inspections are documented on the daily inspection checklist and any identified defects are reported to their supervisor. All inspection checklists will be retained on site with Project documentation.

Computer monitoring systems include automated alarms which activate if a pipeline leak or flow discrepancy is detected. When an alarm is activated, the following actions will take place:

- Investigate the difference in flow
- Check the discharge flow meter trends
- Check the pipeline for leaks
- Calibrate the discharge flow transmitters

In the event of leak detection, slurry pumping will be shut down until the leak is rectified. A flow discrepancy alarm would automatically reset once the condition is clear. A leak detection alarm will be reset manually once the condition is clear.

8.0 Assessment Criteria

8.1 Performance Measures

Condition B6 of SSD 9697 states that the Project must not cause an exceedance of the performance measures provided in Table 1 of SSD 9697. Some of the features and performance measures are applicable to other components of the overall upgrade project and are not relevant to this WMP.

The features that are relevant to the construction of the Ravensworth Ash Line are reproduced in **Table 7**. The effectiveness of the water management actions implemented during construction can be assessed based on the key performance indicators (KPI) set for each performance measure.

Table 7 Relevant performance measures from condition B6 of SSD 9697

Feature	Performance Measure	KPI
Water Management General	• Minimise the use of clean and potable water on the site • Maximise water recycling, reuse and sharing opportunities • Minimise the use of make-up water from external sources • Design, install, operate and maintain water management systems in a proper and efficient manner • Minimise risks to the receiving environment and downstream water users	Water use records are reviewed to minimise potable water use and to maximise water recycling opportunities Erosion and sediment controls are installed and maintained in accordance with ESCP Monitoring program is implemented to identify potential water quality issues
Erosion and sediment control works	• Establishment of erosion and sediment controls in accordance with *Managing Urban Stormwater: Soils and construction - Volume 1* (the Blue Book) (Landcom, 2004) • Design, install and maintain any new infrastructure within 40 metres of watercourses in accordance with the guidance series for *Controlled Activities on Waterfront Land* (NRAR 2018)	Erosion and sediment controls are installed as per ESCP and maintained in good working order Pipeline is constructed within approved disturbance footprint to minimise impact to riparian zones
Ravensworth ash pipeline	• Design and install the new section of pipeline to minimise potential for groundwater ingress • Design, install and operate a pipeline leak detection monitoring and response system	Groundwater management measures are implemented as per CEMP Existing pipeline leak detection system is implemented during construction and operation
Chemical and hydrocarbon storage	• Chemical and hydrocarbon products to be stored in bunded areas in accordance with the relevant Australian Standards	All spills cleaned up and reported to AGLM Environment Advisor during construction of the pipeline. CEMP controls reviewed for effectiveness and re-established. Spill kits replenished.
Aquatic and riparian ecosystems	• Comply with all relevant provisions of the POEO Act, including any discharge limits (both volume and quality) set for the development in any EPL	Monitoring program is implemented to identify water quality impacts or exceedances

8.2 Surface Water Impact Assessment Criteria

The potential water quality impacts associated with the construction of the Ravensworth Ash Line will relate primarily to increased turbidity and suspended solids as a result of increased erosion. Surface water impact assessment criteria have been developed based on the data presented in the Surface Water Assessment.

Table 8 provides the surface water impact assessment criteria which will be used as trigger values for assessing surface water impacts during construction of the Ravensworth Ash Line project.

Table 8 Surface water impact assessment criteria

Pollutant	Unit of measure	Concentration limit
pH	pH	6.5-8.5
Turbidity	NTU	6-50
Pikes Creek / Chilcotts Creek- Salinity (electrical conductivity)	µS/cm	125 - 5438
Bayswater Creek – Salinity (electrical conductivity)	µS/cm	125-3,450

As discussed in **Section 5.5.1**, AGLM discharges water from Bayswater Power Station in accordance with the HRSTS and the water concentration limits set out in EPL 779. The electrical conductivity limit for water discharged from EPL Point 19 is 4500 µS/cm, which exceeds the assessment criteria provided in **Table 8** for Bayswater Creek. In the event that water monitoring for construction of the Ravensworth Ash Line exceeds the assessment criteria set out in **Table 8**, an investigation will need to consider whether any controlled discharges undertaken in accordance with the HRSTS and EPL 779 may have impacted the results.

9.0 Trigger Action Response Plan

The Trigger Action Response Plan (TARP) for the construction of the Ravensworth Ash Line is provided in **Table 9**. The objective of the TARP is to present a set of procedures to be followed and actions to be implemented should an exceedance of the performance measures (**Section 8.1**) or assessment criteria (**Section 8.2**) be identified. The TARP outlines different levels of notification (i.e., internal or external) and actions required to mitigate, repair or offset adverse water quality impacts that may occur as a result of the construction works.

Table 9 Surface Water Trigger Action Response Plan for Construction of the Ravensworth Ash Line

Trigger	Action	Response	Plan
Forecasts of significant rain (greater than 20mm predicted over a 24 hour period)	• Ensure erosion and sediment controls are installed correctly and maintained before event • Conduct surface water monitoring prior to and following rainfall event when safe to do so • Review results of pre- and postrainfall water quality monitoring, for upstream and downstream locations	• Inadequacies in erosion and sediment control measures are to be rectified as soon as possible • If monitoring results are elevated downstream or indicate an exceedance, complete the relevant actions identified within this TARP	• Monitoring results to be retained • onsite with Project documentation Site inspection checklist to be used to document inspections of erosion and sediment controls and action undertaken
Water monitoring indicates: • turbidity is greater at the downstream location compared to the sampling result at the upstream location; or • sediment or oil and grease are visible at the downstream location	• Notify Site Supervisor • Initiate an investigation to review erosion and sediment control measures • Identify corrective actions or additional control measures to be implemented where relevant to mitigate potential water quality impacts	• If required, implement corrective actions or install additional erosion and sediment control measures where required	• A summary of monitoring results, investigations and corrective actions to be retained onsite with Project documentation

Water monitoring indicates exceedance of surface water impact assessment criteria specified in **Section 8.2**	• Construction Contractor to notify AGLM Environment Advisor (as per **Section 10.2**) • Initiate investigation to determine the cause of the exceedance • AGLM to notify the EPA and DPE of the exceedance if investigation finds it is a result of this construction project (as per **Section 10.2**) • Conduct additional monitoring to confirm water quality parameters • Identify corrective actions where relevant • AGLM to report monitoring results and results of investigations as detailed in **Section 10.1**.	• Implement corrective actions or additional mitigation measures • Continue water quality monitoring to assess the effectiveness of corrective actions	• A summary of monitoring • results, investigations, corrective actions and notification to regulatory authorities to be retained onsite with Project documentation If required, amend the WMP, ESCP and CEMP to reflect changes to construction methodology

10.0 Compliance and Reporting

10.1 Reporting of Monitoring Results

Surface water monitoring during construction of the Ravensworth Ash Line will be carried out by suitably trained and experienced staff or contractors. Monitoring will be undertaken in accordance with the surface water monitoring program detailed in **Section 7.0**.

Monitoring results for the calendar month will be provided to DPE by the 15th day of the following month. This report will include the results of any investigation into exceedances of criteria in Table 8, if relevant. If exceedances are found to be due to activities associated with the construction of the Ravensworth Ash Line then they will be reported as detailed in Section 10.2.

10.2 Incident and Non-Compliance Reporting

All environmental incidents will be reported in accordance with procedures documented in the CEMP prepared for construction of the Project.

Environmental incidents relating to water management may include:

- spills of hydrocarbons, chemicals, liquid waste;
- non-compliance of licence or approval conditions;
- harm or damage to flora and fauna or aquatic habitat;
- incidental discharge (e.g. contaminated water in stormwater system);
- uncontrolled release of contaminants (e.g. stockpiled contaminated materials).

In accordance with condition D4 of SSD 9697 and condition R2 of the EPL 779, notification to the EPA and DPE must occur **immediately after becoming aware of an incident** causing or threatening material harm to the environment. DPE must be notified immediately in writing via the Major Projects website and the EPA must be notified immediately by telephone on 131 555. Written details of the incident notification must be provided to the EPA and DPE **within seven days**, as per condition R2.2 of EPL 779 and Appendix 4 of SSD 9697.

In accordance with condition D5 of SSD 9697, DPE must be notified in writing via the Major Projects website **within seven days** of becoming aware of a non-compliance against the conditions of consent. Exceedances of concentration limits included in the conditions of EPL 779 must be reported to the EPA **within five days** of becoming aware of the exceedance, as per condition R4.1 of EPL 779. Further details of the exceedance must be provided to the EPA **within 20 days** of the initial notification and must include the information set out in condition R4.2 of EPL 779.

10.3 Audit and Compliance Reporting

10.3.1 Internal Project Audits

Monthly internal audits will be conducted during construction of the Project in accordance with the CEMP prepared for the Project. In relation to water management, internal audits will review:

- procedures and controls implemented as part of water management measures;
- completion and maintenance of records relating to site inspections and monitoring;
- results of water monitoring programs;
- the effectiveness of erosion and sediment control measures; compliance against regulatory requirements.

An audit report will be prepared and retained on site along with Project documentation.

10.3.2 Independent Environmental Audits

Independent Environmental Audits will be prepared and submitted to DPE in accordance with conditions D12 to D17 of SSD 9697 and the requirements of DPE's *Independent Audit Post Approval Requirements* (DPE, 2020).

Unless otherwise agreed by DPE, an Independent Environmental Audit will be conducted within 12 weeks of the commencement of construction and then at intervals of no greater than 26 weeks throughout the construction phase. Each report must be submitted to DPE with AGLM's response to the audit findings, within two months of the audit date.

Each Independent Environmental Audit, including AGLM's response to the audit report, will be made publicly available within 60 days of submission to the DPE, in accordance with condition D15(c) of SSD 9697.

10.3.3 Compliance Reports

Conditions D8 to D11 of SSD 9697 require Compliance Reports to be prepared and submitted to DPE in accordance with the *Compliance Reporting Post Approval Requirements* (DPE, 2020). The Compliance Reports outline the compliance status of the Project in relation to the conditions of SSD 9697.

Compliance Reports are not required to be submitted during the construction phase of the Project. Unless otherwise agreed by DPE, an Operational Compliance Report will be prepared and submitted at intervals no greater than 52 weeks from the date of commencement of operation.

Each Compliance Report will be made publicly available within 60 days of submitting it to DPE, in accordance with condition D10 of SSD 9697.

11.0 WMP Review

The WMP will be reviewed and updated as necessary during construction to allow new or changing environmental risks relating to the construction works to be addressed. The construction contractor will ensue that feedback systems will be in place for the duration of construction.

In accordance with condition D3 of SSD 9697, the WMP will be reviewed within three months of:

- the submission of an incident report required under condition D4 of SSD 9697;
- the submission of an audit report required under condition D12 of SSD 9697;
- the approval or modification to the conditions of SSD 9697; or as directed by the DPE under condition A3 of Schedule 2.

Where this review leads to a revision of the WMP, the revised document will be submitted to DPE for approval within four weeks of the review. Other triggers for WMP review may include:

- major change in the construction methodology;
- findings and recommendations of site inspections; and
- changes in environmental legislation and/or policies.

12.0 References

DECCW (2006) *NSW Water Quality and River Flow Objectives*, Department of Environment, Climate Change and Water, NSW Government, Sydney

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GHD (2021) *Bayswater Fly Ash Plant Upgrade: Ravensworth Ash Line Construction Environmental Management Plan AGLM-CPG-049-RPT-009* (Draft), GHD Pty Ltd, Orange, 11 May 2021.

Jacobs (2022) *Bayswater WOAOW Environmental Management Strategy Rev D,* Jacobs Group (Australia) Pty Ltd, Newcastle West, 9 May 2022.

Jacobs (2020) *Bayswater Water and Other Associated Operational Works Project: Environmental Impact Statement*, Jacobs Group (Australia) Pty Ltd, North Sydney, 4 June 2020).

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Landcom (2004) *Managing Urban Stormwater: Soils and Construction – Volume 1* (also known as the Blue Book), Landcom, Sydney.

NHMRC (2008) *Guidelines for Managing Risks in Recreational Water,* National Health and Medical Research Council, Australian Government, Canberra.