Hunter Power Project

Water Management Plan

Final Amended

28 January 2022

Hunter Power Project

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Final	20 December 2021	Final	K Byrnes J Vernon G Sheppard	K Collings A Horan	M Luger	K Ivanusic
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Glossary of terms

Term	Definition
ANZG (2018) Water Quality Guidelines	Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2018 update)
Discharge criteria	Discharge concentration limits outlined in Project EPL
Mitigation	Action to reduce the severity of an impact
Program	Surface and groundwater monitoring program
Project	The Hunter Power Project; formerly referred to as the Kurri Kurri Power Station Project
Project Site	The area of land that is directly impacted on by the development, including access roads, and areas used to store construction materials
Proponent	Snowy Hydro Limited
Secretary	Planning Secretary under the EP&A Act, or nominee
Sensitive Receptor	A location where people are likely to work or reside; this may include a dwelling, school, hospital, office or public recreational area (EPA 2016)
Significant	Greater than 20% concentration value difference between impact site and reference site
Study Area	The Project Site and any other areas surveyed and assessed for surface water and groundwater values which may be subject to indirect impacts.
"The Blue Book"	Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom, 2004)

Abbreviations

Abbreviation	Definition
AHD	Australian Height Datum
ASS	Acid Sulfate Soils
ASSMAC	Acid Sulfate Soil Management Advisory Committee
ANZECC/ARMCANZ	Australian and New Zealand Environment and Conservation Council / Agriculture and Resource Management Council of Australia and New Zealand
ANZG	Australian and New Zealand Guidelines
bgl	Below ground level
BMP	Biodiversity Management Plan
cm	Centimetre
CEMS	Construction Environmental Management Strategy
DEC	Department of Conservation
DECCW	Department of Environment, Climate Change and Water (former)
DPIE	Department of Planning, Industry and Environment (NSW)
DPI	Department of Primary Industries (NSW)
DGV	Default Guideline Value
EIS	Environmental Impact Statement
EPA	Environment Protection Authority (NSW)
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
EPBC Act	*Environmental Protection and Biodiversity Conservation Act 1999* (Federal)
EPL	Environment Protection Licence
ESCP	Erosion and Sediment Control Plan
EWMS	Environmental Work Method Statement
km	Kilometre
POEO Act	*Protection of the Environment Operations Act 1997* (NSW)
ppm	Parts per million
m	Metre
m/d	Metres per day
mm	Millimetre
mg/L	Milligrams per litre
m/s	Metres per second
MW	Monitoring Well
NATA	National Association of Testing Authorities
NHMRC	National Health and Medical Research Council
NTU	Nephelometric Turbidity Units

Abbreviation	Definition
QA/QC	Quality Assurance and Quality Control
"The Blue Book"	Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom, 2004)
TSS	Total Suspended Solids
WM Act	*Water Management Act 2000*
WMP	Water Management Plan
WQC	Water Quality Control
µS/cm	Micro siemens per centimetre
% saturation	Per cent saturation

1. Introduction

1.1 Background and purpose

Snowy Hydro Limited (Snowy Hydro) (Proponent) proposes to develop a gas fired power station near Kurri Kurri, NSW ('Project') - see Figure 1-1. The Project involves the construction and operation of an open cycle gas turbine power station and electrical switchyard, together with other associated infrastructure.

The major supporting infrastructure that is part of the Project would be a 132 kilovolt (kV) electrical switchyard located within the Project Site – see Figure 1-2 and Figure 1-2. Other supporting infrastructure elements of the Project include:

- Storage tanks and other water management infrastructure
- Fire water storage and firefighting equipment such as hydrants and pumps
- Maintenance laydown areas
- Diesel fuel storage tank(s) and truck unloading facilities
- Site access roads and car parking
- Office/administration, amenities, workshop/storage areas
- A provisional stormwater basin.

Construction activities are anticipated to commence in early 2022 and the Project is intended to be operational by the end of 2023.

This Water Management Plan (WMP) forms part of the Construction Environmental Management Strategy (CEMS) for the Project. The WMP has been prepared to manage the Project impacts during construction on local surface water and groundwater environments. The plan outlines potential impacts on local surface and groundwater environments and details the management strategies, actions and controls to be used to manage these impacts.

A WMP is a requirement of the Infrastructure Approval Condition B40 and has been prepared in consultation with NSW Environment Protection Authority (EPA), Department of Planning, Industry and Environment (DPIE) Water, Hunter Water Corporation and Cessnock City Council (Council).

The WMP must be approved by the Secretary prior to the commencement of construction. The WMP will be implemented.

This WMP addresses management associated with construction only. As per Infrastructure Approval Condition C21 – staged plans, Snowy Hydro will develop an operational WMP for approval by the Secretary prior to commencing operations.

1.2 Construction activities

The Project construction activities include the following:

Table 1-1: Construction stages and activities

Construction stage	Construction activity per program	Activity details
Pre-construction/site establishment	Site access, civil works, and road construction to establish site	• Installation of environmental controls, which may include: temporary sheds, amenities, fencing, erosion and sediment controls, laydown/stockpiling areas, site surveys and, initial internal road building • Construction of reinforced concrete pavement to support heavy vehicles (up to B-double size) • Internal road layout design to account for turning paths of large vehicles, cranes, and articulated vehicles, so that movements in and out can be made in a forward direction • Roadworks and hardstand areas to be constructed for car parking, delivery/laydown areas • Where required, bunded areas for delivery, handling, and storage of fuel and other hazardous material would be constructed
Construction	Switchyard Site Preparation	• Clearing of vegetation
Site Establishment and Construction	Earthworks to prepare the Project site and construction areas	• Initial site clearing and grading works. Earthworks may involve small amounts of cut and fill to achieve the necessary design levels across the site • Trenching for underground utilities and services would be installed such as stormwater, water and sewer reticulation, electrical cables, and (internal) gas pipes between the gas receiving station and the gas turbine locations • Preparation and construction of foundations. Deep piling is expected to support the heaviest infrastructure such as the gas turbines, generator and the main step-up transformers while shallower piling or pad type foundations would underpin the foundations where the proposed surface loads are less (e.g. site office/administration buildings, car park). Final numbers and depth of foundation piles will be subject to detailed design, as is the piling method (i.e. bored; driven; vibration piling) • Reinforced concrete slabs would be constructed in certain pavement areas, with other areas being surfaced with crushed rock or other suitable materials

Construction stage	Construction activity per program	Activity details
Construction	Balance of Plant, Switchyard Construction, & Turbine Installation	• Installation of major plant items associated with the gas turbines including all above ground civil, mechanical, electrical plant equipment • Installation of electrical switchyard
Commissioning	Commissioning and testing (excluded from construction scope)	• Program of testing and certification of all Project components, systems, and processes to demonstrate the Project can operate to the required standards before commencing operation
Post-construction/demobilisation	Demobilisation	• Removal of construction equipment, site fencing and construction compounds • Installation and establishment of landscaping

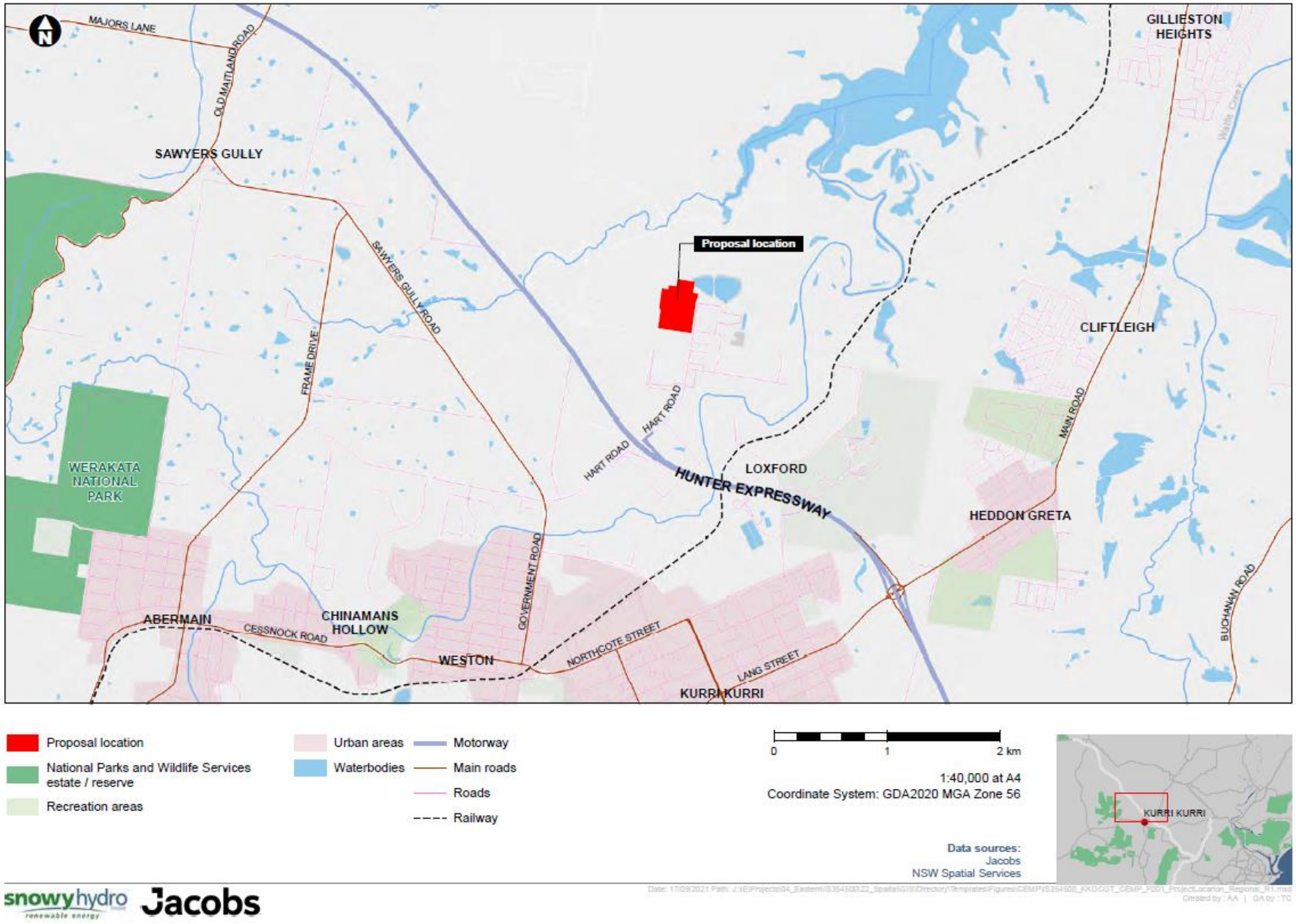

Figure 1-1: Project location (regional)

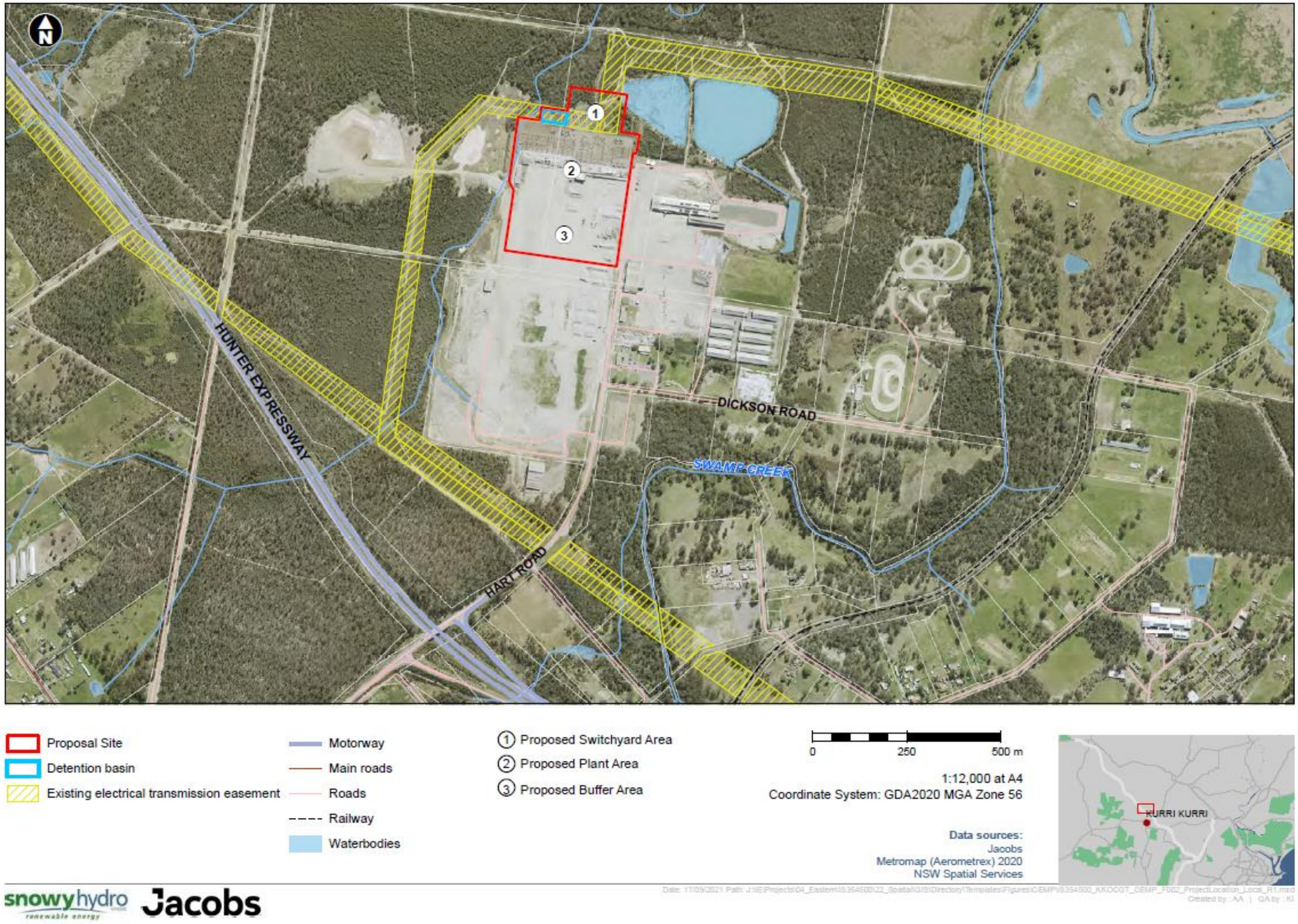

Figure 1-2: Project location (local)

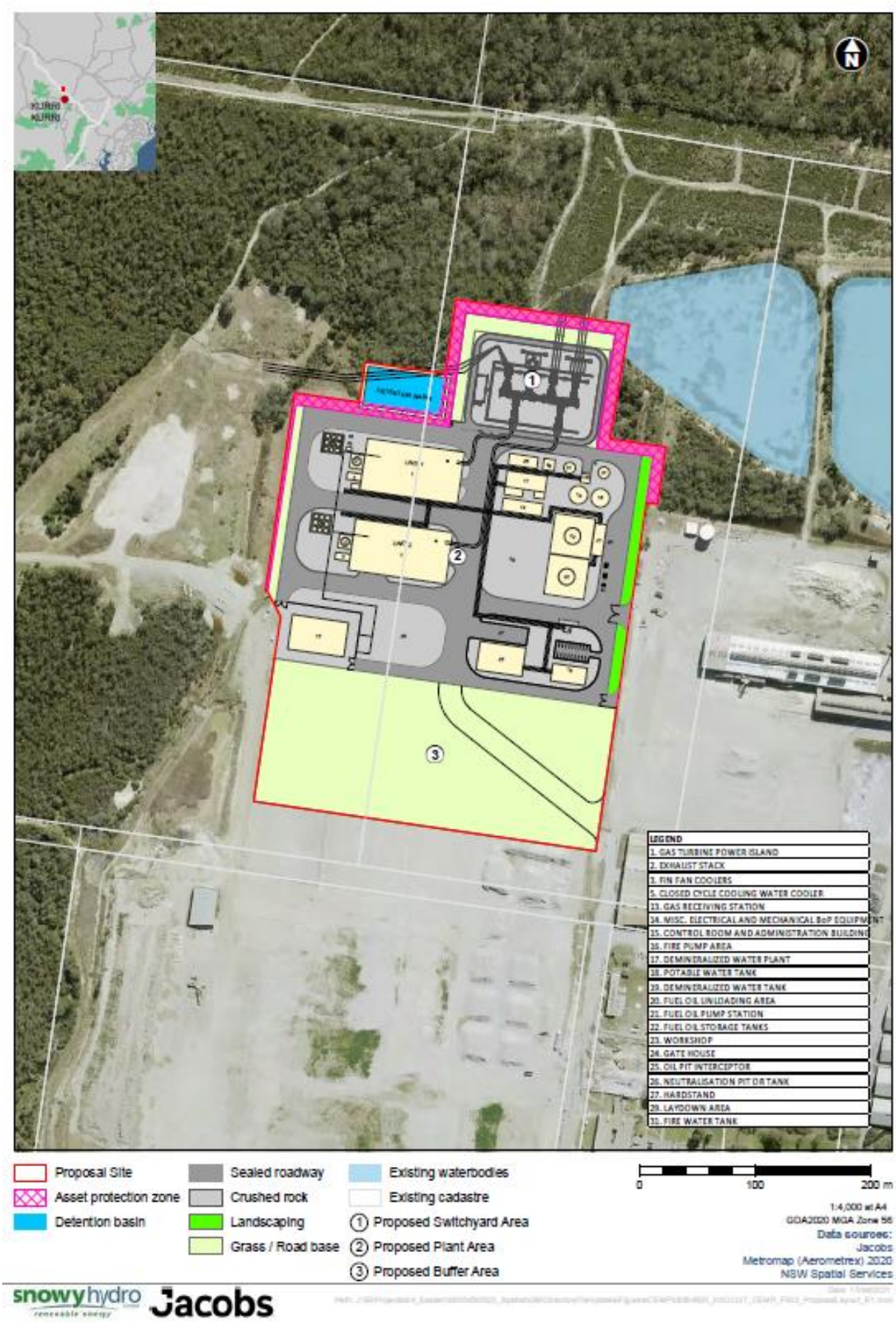

Figure 1-3: Site layout

In addition to the construction activities outlined in Table 1-1, the pre-construction and site earthworks stages are largely associated with vegetation clearance, site preparation and establishment of site erosion and sediment controls. These are further discussed in this WMP in Section 5. Tasks specific to these stages would include:

- Installation of exclusion fencing, noting that that the fencing would be equal to or smaller than the Project Site
- Cutting/ tree removal and brush cutting of vegetation
- Chipping of woody material and stockpiling for reuse or removal off the Project Site
- Stripping of topsoil, where required within the northern areas of the Project Site and stockpiling for reuse
- Earthworks to grade the site towards the north west corner of the Project Site
- As part of the earthworks, the Principal Contractor may also excavate the provisional sediment/ stormwater basin and associated discharge/overflow to the creek with suitable scour protection. This would require an Environmental Work Method Statement (EWMS) to be compiled by the Principal Contractor.

1.3 Objectives

The objective of this WMP is to manage and monitor impacts associated with construction on surface water and groundwater within and surrounding the Project Site through:

- Identifying surface water and groundwater impacts that require control measures
- Developing strategies to manage surface water and groundwater impacts
- Establishing a surface water and groundwater monitoring program and define management measures
- Assigning responsibilities for monitoring and management
- Providing information to assist with auditing implementation of the WMP.

Surface water and groundwater impacts during construction would be managed in accordance with the CEMS and this management plan, to maximise workers' awareness of surface water and groundwater values and the need to avoid or minimise potential impacts to downstream receivers.

1.4 Associated management plans

Other plans that provide associated information relevant to environmental management of surface water and groundwater impacts include:

- CEMS – demonstrates systems and procedures to ensure that controls are established and maintained to manage potential environmental impacts, compliance and performance throughout construction of the Project in accordance with applicable legislative requirements, and the Infrastructure Approval conditions. This plan uses information gathered during planning through to the operation to allow information continuity and transfer between the Proponent, Principal Contractor, and all teams working on each phase of the Project. Legislation and regulations related to the Project are also referenced within the CEMS.
- Biodiversity Management Plan (BMP) – includes mitigation measures to minimise impact to biodiversity values, including vegetation clearance impacts and aquatic habitat impacts.

1.5 Infrastructure Approval conditions

The water management requirements identified in the Infrastructure Approval conditions are listed in Table 1-2, while the requirements for this WMP are listed in Table 1-3. A cross reference is also included to indicate where the conditions and requirements are addressed in this WMP. Note that operational aspects of the Infrastructure Approval conditions have not been included in these tables.

Table 1-2: Infrastructure Approval conditions – Water Management Requirements

Condition	Requirement(s)	Where addressed
B35	▪ The Proponent must ensure it has sufficient water for the development; and if necessary, adjust the scale of development on site to match its available water supply.	Section 4.1 and 4.2
B36	▪ The Proponent must ensure that all surface discharges from the site comply with all relevant provisions of the POEO Act, including any discharge limits (both volume and quality) set for the development in any EPL.	Section 4.4.2
B38	▪ Prior to the commencement of any construction the Proponent must install and maintain suitable sediment and erosion controls onsite, in accordance with the relevant requirements of *Managing Urban Stormwater: Soils and Construction – Volume 2A Installation of Services* (DECC 2008).	Section 5.1

Table 1-3: Infrastructure Approval conditions – Water Management Plan

Condition	Requirement(s)	Where addressed
B40	Prior to the commencement of construction, unless the Secretary agrees otherwise, the Proponent must prepare a Water Management Plan for the development to the satisfaction of the Secretary. This plan must:	This WMP
B40(a)	▪ be prepared by a suitably qualified and experienced person/s whose appointment has been endorsed by the Secretary;	Document history
B40(b)	▪ be prepared in consultation with EPA, DPIE Water, Hunter Water Corporation and Council;	Section 1.6
B40(c)	(i) include a **Site Water Balance** that includes details of: a) predicted annual inflows to and outflows from the site;	Operational requirement. Note that the operational measures are not included in this WMP
	b) sources and security of water supply, including reasonable and feasible measures to minimise potable water demand through detailed design and operations;	
	c) water and wastewater storage capacity;	
	d) water use and management on site including demineralisation water treatment and wastewater transfer; and	
	e) reporting procedure;	
	(ii) include a **Water Management Plan** that includes: a) baseline data on surface water flows and quality of watercourses and/or water bodies potentially impacted by the development	Section 3

Condition	Requirement(s)	Where addressed
	b) detailed description of the surface water management system; including ▪ measures and pollution control measures which do not require an open basin excavated below the water table where practicable; and ▪ measures to manage spills, off site flood impacts and stream erosion flows;	Section 5.1 Note that the operational measures are not included in this WMP
	c) a program to monitor and evaluate: ▪ disturbance of acid sulphate soils; ▪ surface water discharges, stormwater and storage volumes; ▪ rainfall and flooding events; and ▪ the effectiveness of the surface water management systems to minimise erosion and sediment impacts;	CEMS Section 8.3 (acid sulphate soils) Section 6.2 Note that the operational measures are not included in this WMP
	d) reporting procedures for the results of the monitoring program; and	Section 6.5 Note that the operational measures are not included in this WMP
	e) a plan to mitigate any adverse surface water impacts of the development;	Section 5.2
	(iii) include **Groundwater Management Plan** that includes: a) detailed baseline data of hydrogeology and groundwater levels and quantity of groundwater resources potentially impacted by the development	Section 3.3 Note that the operational measures are not included in this WMP
	b) water licencing requirements	Section 2 Note that the operational measures are not included in this WMP
	c) a detailed description of the groundwater management and monitoring system, including measures to reduce potential for contamination or take of groundwater and estimated groundwater take, if the base of the pollution and surface water management basin is located less than 1 m above the water table;	Section 5.3 Note that the operational measures are not included in this WMP
	d) a program to monitor and evaluate groundwater flows, groundwater quality and the effectiveness of the groundwater management systems, including	Section 5.3 Note that the operational measures are not included in this WMP

Condition	Requirement(s)	Where addressed
	e) reporting procedures for the results of the monitoring program;	Section 6.2 Note that the operational measures are not included in this WMP
	f) a plan to respond to any probable or actual exceedances of the groundwater performance criteria and repair, mitigate and/or offset any adverse groundwater impacts of the development.	Section 0 Note that the operational measures are not included in this WMP

1.6 Consultation with agencies

Condition B40(b) of the Infrastructure Approval requires that the WMP is prepared in consultation with the NSW EPA, DPIE Water, Hunter Water Corporation and Cessnock City Council. Snowy Hydro and Jacobs met with the EPA and Council and discussed the project and consultation requirements, and offered meetings with DPIE Water.

While Hunter Water Corporation has more interest in operational matters and this WMP applies to construction related matters only, a summary of consultation is included for completeness.

The following table outlines the feedback and Snowy Hydro's response that was undertaken during the plan's development.

Table 1-4: Consultation feedback and response

Agency	Feedback	Response & Section reference
NSW EPA	EPA responded they "encourage the development of [management plans] to ensure that proponents and licensees have determined how they will meet their statutory obligations and designed environmental objectives. Being a regulatory authority, the EPA's role is to administer and regulate the statues for environmental management and protection. As such the EPA does not directly get involved in the development of strategies to achieve those objectives and does not review or comment on such plans."	Noted.
DPIE Water	DPIE consulted with the hydrogeologists within the Department and "are experiencing an exceptionally high demand for assessment of pre-approval and post approval state significant development projects. Due to the high number of pending requests the department will not be commenting on preliminary draft WMP documents and will provide formal advice on the final document submitted for determination".	Noted.
Cessnock City Council	Council consulted with the Council's development engineers and replied they have "no comments on the plans (Transport and Water)".	Noted.

Agency	Feedback	Response & Section reference
Hunter Water Corporation	Snowy Hydro has been consulting with Hunter Water throughout the year with respect to the potable water, sewer, trade waste requirements and associated connections for the Hunter Power Project. This has informed the operational water strategy and water management for the project. The development of water and sewer connection requirements has been in the context of the Interim Servicing Strategy from the industrial precinct developer 'Regrowth', and the overall Precinct Strategy. The interim strategy to be in place while the power station is operating and before the majority of the precinct is developed. Consequently, the consultation with Hunter Water is often also with Regrowth in order to coordinate each parties requirements. Additionally, Snowy Hydro, Regrowth and Hunter Water have been meeting frequently to discuss the Service Strategy for operations and for water during construction. Hunter Water Corporation provided their Preliminary Service Advice on 25 February 2021, following provision by Jacobs, on behalf of Snowy Hydro, of a site water balance and instantaneous potable water demand required by the power station. Subsequent consultation and meetings have been held through October and November with Hunter Water. Issues addressed have included review of trade waste characteristics and criteria for the project, the nature of sewer main extensions for construction office space as well as permanent power station offices, hydraulic assessments and sewer main capability, Throughout November and December, the Interim Servicing Strategy has been revised to incorporate various infrastructure required for both pumped and gravity sewer systems. This revised strategy was submitted to the Major Developments division, along with a connection application to reconnect the administration building which will be occupied by Snowy Hydro. Snowy Hydro has also been in detailed discussions most recently with the Hunter Water Technical Services Division to develop a hydraulic assessment for the precinct in which the project site is located. The consultation has focused on how to utilise existing infrastructure to sustainably provide the construction site with potable water during mobilisation and throughout the project. The process of connecting to the network is managed by Hunter Water and will involve the engagement of an accredited plumbing and earthworks contractor to facilitate this scope of work. Snowy Hydro has engaged the designer AECOM for the water and sewer connection design work, who have applied for and been accredited by Hunter Water. The formal aspect of the consultation process is the lodging of connection applications and connection designs by Snowy Hydro to	Noted.

Agency	Feedback	Response & Section reference
	Hunter Water for approval. Hunter Water will also be invited to comment on the operational WMP.	

2. Legislation and policy framework

2.1 Legislation and policy

Key legislation relevant to surface water and groundwater management includes:

- *Environmental Planning and Assessment Act 1979* (EP&A Act)
- *Protection of the Environment Operations Act 1997* (POEO Act)
- *Water Management Act 2000* (WM Act)
- *Water Management (General) Regulation 2018*
- NSW Aquifer Interference Policy.

Refer to the CEMS for details of the relevant legislation and policy.

Draft Environment Protection Licence (EPL) 21627 issued under the POEO Act for the Project includes a number of conditions relevant to surface and groundwater management. The POEO Act defines waters as the whole or any part of:

- *Any river, stream, lake, lagoon, swamp, wetlands, unconfined surface water, natural or artificial watercourse, dam, or tidal waters (including the sea), or*
- *Any water stored in artificial works, any water in water mains, water pipes or water channels, or any underground or artesian water.*

Section 120 of the POEO Act states that it is illegal to pollute waters. Under the Act, 'water pollution' includes introducing litter, sediment, oil, grease, wash water, debris, and flammable liquids (such as paint) into waters or placing such material where it is likely to be washed or blown into water or the stormwater system or percolate into groundwater. All practicable steps will be taken to minimise the risk of pollution of waters.

2.2 Guidelines

Guidelines and standards relating to the management of surface and groundwater that are applicable to the Project include:

- Managing Urban Stormwater: Soils and Construction (Volume 1) (Landcom, 2004)
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2018 update) (ANZG, 2018), referred to herein as the ANZG (2018) Water Quality Guidelines
- Australian and New Zealand Guidelines for Water Quality Monitoring and Reporting (ANZECC/ARMCANZ, 2000)
- Approved Methods for Sampling and Analysis of Water Pollutants in NSW (DEC, 2004)
- NSW Water Quality and River Flow Objectives (DECCW, 2006)
- Pollution Incident Response Management Plans Guidelines (NSW EPA, 2020)
- Acid Sulfate Soil Manual (ASSMAC, 1998).

The above-mentioned guidelines have been described in the Surface Water Quality and Aquatic Ecology Impact Assessment Report (Appendix I of the EIS) and Groundwater Impact Assessment Report (Appendix H of the EIS).

3. Existing environment

3.1 Soils and geology

A geotechnical review and intrusive investigation indicated deep alluvial soils across the Project Site, with siltstone bedrock at approximately 14 m to 18 m depth. Laboratory testing undertaken on near surface soils indicated that they are sodic and hence have the potential to be dispersive in nature.

Acid Sulfate Soils (ASS) are unlikely at the Project Site according to probability mapping (DPIE, 2021). However, laboratory testing results from preliminary geotechnical investigations indicate localised areas within the alluvial soils mainly at depth are ASS. On-site ASS management is outlined in the CEMS and construction activities will be undertaken in accordance with the Acid Sulphate Soil Manual.

3.2 Surface water

3.2.1 Water features

The Project Site is located in proximity to two waterways, these include:

- An unnamed tributary of Black Waterholes Creek, which is an ephemeral waterway that flows generally south west to north east immediately adjacent to the Project Site on the western boundary
- Black Waterholes Creek, which is a perennial waterway located downstream of the tributary and subsequently flows into Swamp Creek about 1.5 km downstream.

Both waterways eventually converge to Swamp Creek which continues flowing north and drains a large network of low lying, floodplain environments known as Wentworth Swamp. Swamp Creek ultimately flows into Wallis Creek about 10 kilometres (km) downstream of the Project Site and Wallis Creek joins to the Hunter River a further seven km downstream.

Other important water features within proximity of the Project Site are two large artificial stormwater retention ponds referred to as the North Dam (both approximately one metre deep) associated with the stormwater management system of the former Kurri Kurri aluminium smelter. Following closure of the Kurri Kurri aluminium smelter, the ponds still receive site runoff, including from a small portion of the Project Site. Hydro Aluminium is licenced (under their EPL) to discharge to an irrigation area on an adjacent vegetated property north of the ponds. The ponds currently have a combined capacity of approximately 130,000 m^3.

Figure 3-1 shows water features within proximity of the Project Site.

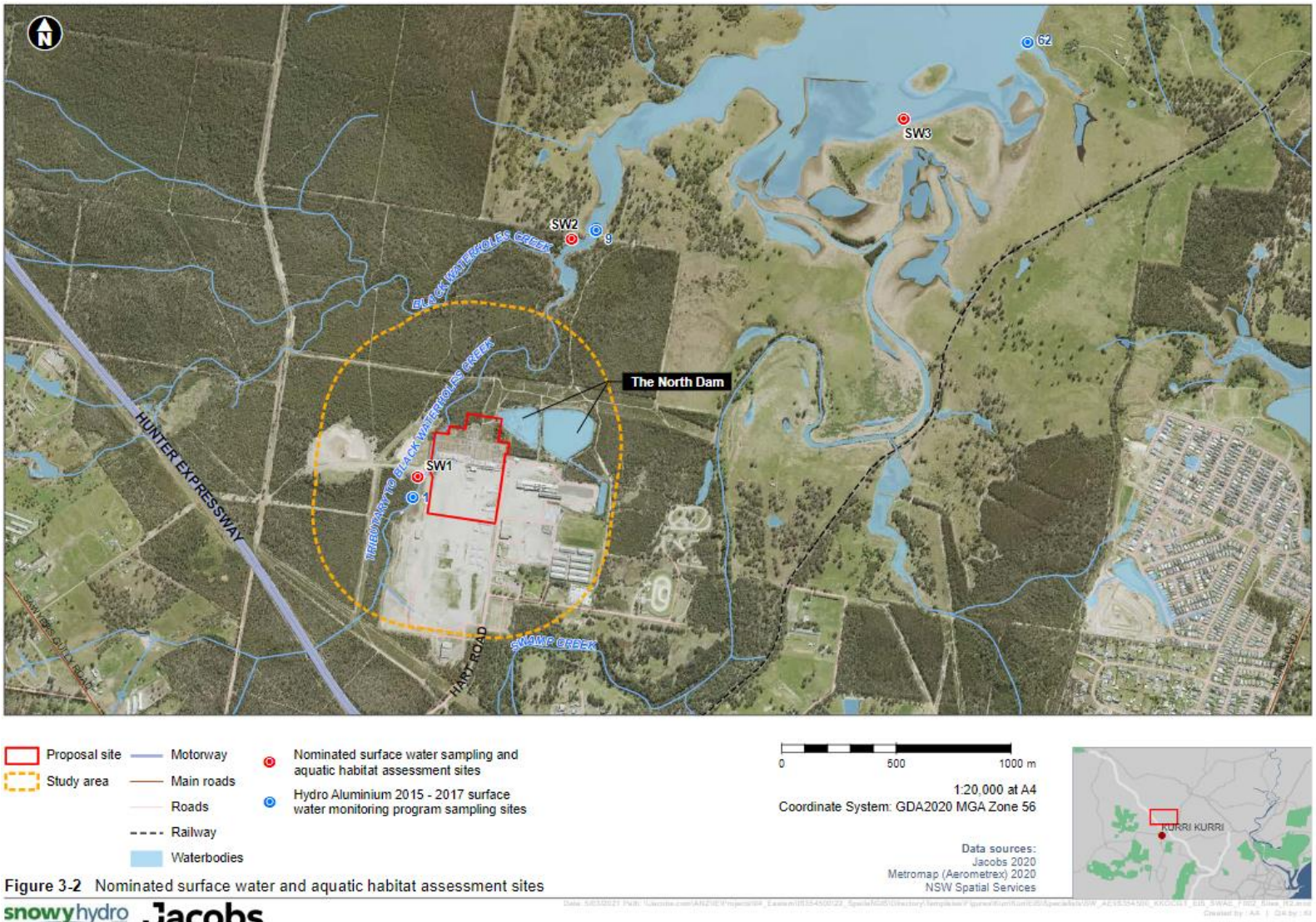

Figure 3-2 Nominated surface water and aquatic habitat assessment sites

Figure 3-1: Surface water features in proximity of the Project Site

3.2.2 Site topography and drainage

The current surface water hydrology over the Project Site comprises approximately 50 per cent of stormwater runoff (untreated) draining west to Black Waterholes Creek, and the remaining approximately 50 per cent being diverted to the stormwater retention ponds located to the north-east of the Project Site via an existing stormwater drainage system.

3.2.3 Water quality

As per the Project EIS, existing baseline water quality data for waterways in proximity of the Project Site is limited to three years of monthly monitoring data collected by Hydro Aluminium between 2015 and 2017, and three additional grab samples collected in November 2020 (sites shown on Figure 3-1). As outlined in the Project EIS, construction activities are not expected to result in downstream impacts to water quality. In fact, modelling suggests that proposed water quality controls are likely to improve water quality reaching downstream due to treatment provided by the provisional stormwater basin/ treatment train. Discharge methodology and discharge criteria is outlined in Section 4.4.

The existing water quality data has been compared to the ANZG (2018) Water Quality Guideline default guideline values (DGVs) for the protection of aquatic ecosystems for slightly to moderately disturbed lowland rivers (95% species protection). Where there are no guideline values available for toxicants and stressors for the protection of aquatic ecosystems, other guideline values (irrigation water supply and livestock water supply) have been adopted. Table 3-1 provides results of the water quality analysis. Results outside the ANZG (2018) Water Quality Guideline recommended DGVs are shown in bold.

Table 3-1: Median water quality data (Source: Hydro Aluminium, 2015-2017)

Parameter	Unit	DGV for 95% species protection (ANZG, 2018)	Tributary of Black Waterholes Creek		Black Waterholes Creek		Swamp Creek	
			Site 1[1]	SW1[2]	Site 9[1]	SW2[2]	Site 62[1]	SW3[2]
pH		6.5 – 8.5	7.4	6.7	6.7	5.9	7.6	6.7
Turbidity	NTU	6-50	-	18.0	-	38.6	-	**370**
Dissolved Oxygen	% saturation	85-110	-	**76.9**	-	**37.6**	-	**79.4**
Electrical conductivity	µS/cm	125-2200	1600	790	1500	1313	1250	858
Total Nitrogen	mg/L	0.35	-	**1.3**		**2.4**		**2.4**
Total Phosphorus	mg/L	0.025	-	0.2	-	**0.28**	-	**0.49**
Filterable Reactive Phosphorus	mg/L	0.020	-	**0.06**	-	<0.01	-	<0.01
Calcium	mg/L	1000[3]	-	16	-	10	-	19
Fluoride	mg/L	1.5[4]	**4.2**	**1.7**	**1.9**	**2.1**	0.85	0.8
Chloride	mg/L	250		191		**422**		148
Aluminium	mg/L	0.055		0.001		**0.34**		**0.27**
Arsenic	mg/L	0.024	-	<0.0001	-	<0.0001	-	<0.0001

Parameter	Unit	DGV for 95% species protection (ANZG, 2018)	Tributary of Black Waterholes Creek		Black Waterholes Creek		Swamp Creek	
			Site 1[1]	SW1[2]	Site 9[1]	SW2[2]	Site 62[1]	SW3[2]
Boron	mg/L	0.37	-	<0.05	-	<0.05	-	<0.05
Cadmium	mg/L	0.00006	-	<0.001	-	<0.001	-	<0.001
Chromium	mg/L	0.001	-	<0.001	-	<0.001	-	<0.001
Copper	mg/L	0.0014	-	<0.001	-	<0.001	-	<0.001
Lead	mg/L	0.0034	-	**0.004**	-	<0.001	-	<0.001
Mercury	mg/L	0.00006	-	<0.0001	-	<0.0001	-	<0.0001
Nickel	mg/L	0.011	-	0.008	-	0.009	-	0.009
Zinc	mg/L	0.008	-	<0.005	-	**0.01**	-	<0.005
Free cyanide	mg/L	0.007	-	<0.004	-	<0.004	<0.005	<0.004

Note:
[1] Sample sites from the Hydro Aluminium surface water monitoring program (2015 – 2017). [2] EIS grab sample sites collected by Jacobs in November 2020. [3] DGVs for primary industry (livestock drinking water) (ANZECC/ARMCANZ, 2000). [4] DVGs for recreational water quality (NMHRC, 2008)

3.3 Groundwater

3.3.1 Aquifer characterisation

3.3.1.1 Alluvial aquifer

The water table aquifer is hosted in the alluvium and is unconfined. Several bores have intersected a clay layer within the alluvium, which may be laterally extensive and may create a multi-level aquifer body. It has been suggested that the alluvium may comprise an upper and lower aquifer, with the lower aquifer having sub-artesian pressures. However, the uncertainty around the condition of the clay layer is high and it is unlikely to represent a regional aquitard. The nature of the alluvium is variable, and yield is uncertain.

Hydraulic testing has been undertaken on a number of monitoring bores and the formations tested interpreted to have a hydraulic conductivity of between $2x10^{-5}$ m/s and $8x10^{-6}$ m/s (1.7 m/d to 0.7 m/d), which is representative of sand and silty sand.

3.3.1.2 Bedrock aquifer

The bedrock aquifer is considered a minor aquifer due to the fact it is comprised predominantly of siltstone. More permeable zones are likely to be located where weathered sandstone is found or in the fractures and jointing of the rock units.

3.3.2 Groundwater levels and flow

The former Kurri Kurri aluminium smelter infrastructure has locally influenced the water table at the Project Site. Impermeable surfaces and stormwater drains have potentially lowered the water table in certain areas, while groundwater mounds have been identified near the existing stormwater retention ponds outside of the Project Site. The existing stormwater retention ponds and groundwater mounds are considered to be a potential source of groundwater recharge, and potentially groundwater contamination.

Indicative groundwater elevation contours based on limited observed groundwater levels are presented in Figure 3-2.

While regionally the dominant groundwater flow direction is anticipated to be to the north and north-east toward sensitive receptors such as Black Waterholes Creek and Wentworth Swamp, the plotted water level contours indicate that locally, shallow groundwater flow is controlled by topography. The unnamed tributary of Black Waterholes Creek along the western boundary and to the north of the Project Site and Swamp Creek approximately 1 km to the east of the Project Site represent local controls on groundwater elevation.

Beneath the Project Site, groundwater flow is inferred to be predominantly west-north-west toward the unnamed tributary of Black Waterholes Creek along the western and northern boundary.

Groundwater elevations beneath the Project Site are inferred to range from approximately 12 m Australian Height Datum (AHD) at the eastern boundary in the vicinity of borehole MW20 to approximately 9 m AHD at the western boundary, adjacent to the unnamed drainage line. This equates to a depth to water of approximately 1.2 m below ground level (bgl) along the eastern boundary, increasing up to approximately 4.0 m bgl along the western boundary of the Project Site.

East of the Project Site there is a general easterly groundwater flow direction.

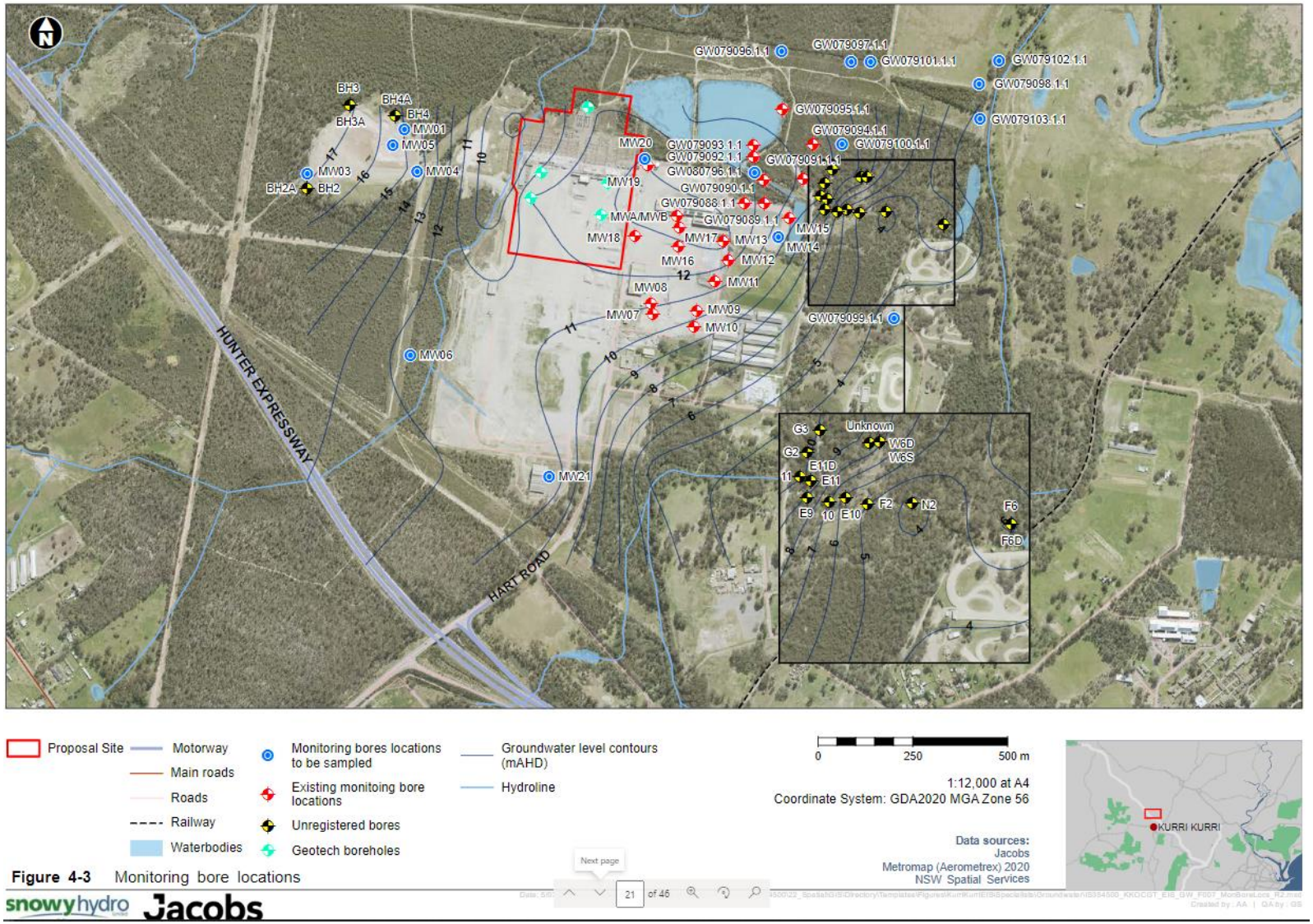

Figure 3-2: Groundwater features in proximity of the Project Site

3.3.3 Groundwater surface water interaction

The alluvial aquifer is considered to be connected to surface water features such as Swamp Creek and Black Waterholes Creek that lead to the Wentworth Swamp wetlands based on the direction of groundwater flow and the groundwater depth. The local drainage lines are considered to provide a control on groundwater levels and as such are likely a point of ephemeral groundwater discharge or evapotranspiration.

3.3.4 Groundwater quality

Previous industrial activities at the former Kurri Kurri aluminium smelter have impacted groundwater quality, primarily via the stormwater ponds and waste storage areas, which are adjacent the Project Site.

Basic groundwater quality (major anions, pH, electrical conductivity) was analysed from samples collected at five selected monitoring bore locations (MW06, MW13, MW20, MW21, GW079099) around the Project Site in November 2020. Field measurements and laboratory analytical results are provided in the Groundwater Impact Assessment Report (Appendix H of the EIS).

Analysis of the results are provided in Table 3-2. Water quality as represented by MW13 and MW20 are likely to be indicative of any shallow groundwater intersected by site excavations.

Table 3-2: Water Quality Summary

Monitoring Bore	Salinity (µS/cm)	pH
MW6	20,700	6.65
MW13	1,610	4.84
MW20	1,219[1]	6.76
MW21	19,900	7.08
GW079099	14,100	5.65

Note:
[1] field reading

4. Potential impacts

4.1 Site Water Balance - construction

Key water demands during construction of the Project would include:

- Earthworks – conditioning of bulk fill materials and pavement foundations
- Dust suppression – access tracks and work areas
- Concrete curing
- Irrigation for revegetation and landscaping
- Potable water for use at site offices, crib rooms and ablutions.

Water demand at site has been minimised through the most efficient option, including batching concrete off site for pre-manufactured concrete sections and large concrete components used in the development, which will result in very low consumption on site for concrete manufacture.

Indicative water demands are summarised in Table 4-1 and are based on preliminary estimates of construction material quantities.

Over the duration of construction (anticipated to be approximately two years), approximately 8.5 ML of water is estimated to be required, nominally 4.25 ML per year. This is equivalent to an average daily demand of approximately 11.6 kL per working day.

Water demands would be supplied by Hunter Water via their existing potable water network, with a connection available in the vicinity of the Hart Road and Dickson Road junction. Reuse of water from a proposed sediment basin cannot be guaranteed as there is an environmental requirement to empty the basin within five days after a storm event. However, water from the sediment basin will be used for dust suppression and fill conditioning when availability of the water allows.

Table 4-1: Estimate of total construction water demands

Water Use	Requirement (ML)	Assumption
Earthworks	0.10	Allowance to increase antecedent soil moisture content by 5% to reach optimum moisture content. ▪ 2,000 m^3 fill requirement
Dust suppression	3.65	Allowance of two 10,000 L tankers per day for summer months for duration of construction (assumed 2 years)
Concrete batching	Nil	▪ Assume procured offsite and imported
Concrete curing	0.25	▪ Allowance of 5% of concrete volume (20 L per tonne) ▪ 12,000 tonnes of concrete (approx. 5,000m^3) assumed
Irrigation	0.12	▪ Allowance 2,000 L per day for last two months of construction
Potable	4.38	▪ Allowance of 50 L per day per person for duration of construction ▪ Estimated average workforce per day of 120 personnel
Total	**8.5**	Over the two year construction period

Snowy Hydro have been engaging with Hunter Water Corporation for over a year on a water servicing strategy. The construction water demand will increase slowly over a number of months as more building work and

construction personnel start working on the site. It is anticipated that approximately 2.19 ML of wastewater per year will be discharged to Hunter Water's sewer system during construction.

Measures to minimise potable water demand during construction will be achieved by re-using captured stormwater runoff for dust suppression and by using off site concrete batching and pre-manufacturing, therefore it is anticipated that there will be zero consumption on site for concrete manufacture. A suite of water efficiency measures are also contained in the construction documentation and will be implemented by the contractor.

No water or wastewater storage is proposed during construction, other than in the potential stormwater / erosion sediment control basin.

No demineralisation or water or wastewater treatment is proposed during construction.

4.2 Operational Water Demand

Key water demands during the operation of the Project include:

- Input to the demineralised water treatment plant for the production of demineralised water for wet compression/fogging and NOx emission control when operating on diesel
- Inlet air / evaporative cooling for the gas turbines
- Supply to workshops, amenities and administration buildings, including kitchens, safety showers, eyewash facilities, etc.
- Make-up supply for the firefighting and emergency facilities
- Plant wash down.

The operational water demands will vary depending on the type of fuel used, with natural gas having a significantly lower water consumption than when needing to operate on diesel fuel. Significant variation in annual water usage is also dependent on ambient temperature and the utilisation rate of evaporative coolers and wet compression fogging.

Indicative water demands based on the largest expected F Class gas turbine are summarised in Table 4-2 and Table 4-3. Water tanks on site will buffer instantaneous water demand. Water demand will be dependent on the eventual gas turbine selected for the Proposal and would be refined during the detailed design process.

The estimated potable water demand, emanating from the potable water tank, for the Project is expected to be up to approximately 133 kL/hr. This does not correspond to the instantaneous water demand on the Hunter Water supply connection due to the presence of the potable and demineralised water tanks on site which help buffer out the instantaneous demands.

Nitrous oxide (NO_x) emission control inflates the demand for demineralised water when a dual-fuel turbine is operating on diesel fuel. Demineralised water would be produced on site via a demineralisation water plant which would be fed from the potable water supply.

The indicative total annual water demand for operation of the Project is approximately 80 ML based on a 10 per cent capacity factor on gas and 2 per cent capacity factor on diesel (total of 1,051 hours per year, comprising approximately 876 hours on gas and 175 hours on diesel fuel).

All operational water demands can be supplied to the Project by Hunter Water via a new connection to their existing potable water network.

Table 4-2: Estimated water demand for main components when operating on natural gas

Component	Units	Water Demand for 2 x Units
Potable water: Total	**kL/h**	**133.1**

Component	Units	Water Demand for 2 x Units
Evaporative cooler make-up	kL/h	67.7
Demineralised Plant Supply	kL/h	65.3
Domestic Use	kL/h	0.075
Demineralised water: Total	**kL/h**	**64.8**
Wet compression / fogging	kL/h	57.6
NOx emission control	kL/h	0.0
Compressor washing (as required)	kL/h	7.2

Table 4-3: Estimated water demand for main components when operating on diesel fuel

Component	Units	Water Demand for 2 x Units
Potable water: Total	kL/h	133.1
Evaporative cooler make-up	kL/h	67.7
Demineralised Plant Supply	kL/h	65.3
Domestic Use	kL/h	0.075
Demineralised water: Total	kL/h	151.2
Wet compression / fogging	kL/h	0.0
NOx emission control	kL/h	144.0
Compressor washing (as required)	kL/h	7.2

Hunter Water has confirmed that "The proposed development is located in Coalfields Water Supply System. The nominal water connection is the existing 200mm CICL in Dickson Road. Hunter Water's assessment indicates there is a sufficient capacity in the local network to provide the proposed development with the required operational demand". Hunter Water has also confirmed that they are currently working with Regrowth and Snowy Hydro to confirm the interim and final servicing needs for this proposal.

4.3 Construction activity impacts

The activities outlined in Table 4-4 provide additional detail on specific actions during construction that may result in an impact on surface and groundwater.

Table 4-4: Construction stage and activity summary

Construction activity	Detailed construction activities
Pre-construction/ site establishment	▪ Pre-construction preparatory activities including dilapidation studies, surveys, investigations, access. ▪ Installation of exclusion fencing ▪ Cutting/knocking over trees and brush cutting of vegetation ▪ Chipping of woody material and stockpiling for reuse or removal off site ▪ Stripping of topsoil and stockpiling for reuse ▪ Earthworks to grade the site and stockpiling of material ▪ Excavation of the provisional sediment/stormwater basin and stockpiling of material

	▪ Associated discharge/overflow to the creek with suitable scour protection
Construction	▪ Site earthworks including cut and fill, and stockpiling of material ▪ Pile foundations ▪ Trenching and installing underground services ▪ Balance of plant ▪ Switchyard – electrical ▪ Primary installation of gas turbine and generator ▪ HV electrical installation ▪ Site surfacing ▪ Provisional sediment basin discharge/overflow to the creek with suitable scour protection
Post-construction/ demobilisation	▪ Installation and establishment of landscaping ▪ Removal of construction equipment, site fencing and construction compounds ▪ Planting around perimeter of the eastern boundary of site for aesthetic reasons, without compromising safety or operational requirements

The key aspects of the project with potential to result in impacts to surface water and groundwater (without mitigation measures) are outlined in Table 4-5.

The mitigation and management measures described in Section 5 have been developed taking into consideration the potential environmental impacts to receivers as detailed below.

Table 4-5: Construction activity summary and potential impacts to surface and groundwater

Construction activity	Description	Potential impacts	Potential receivers
Site establishment	▪ Installation of site infrastructure and environmental controls, which may include: temporary sheds, amenities, fencing, temporary erosion and sediment controls, laydown/stockpiling areas, site surveys, initial internal road building	▪ Sediment laden runoff entering downstream receiving waterway ▪ Accidental spills and leaks from vehicles and construction machinery required for site establishment works	▪ Direct impact to unnamed tributary of Black Waterholes Creek ▪ Indirect impact to downstream Black Waterholes Creek and Swamp Creek
Site preparation – Switchyard	▪ Clearing of vegetation ▪ Stockpiling of material	▪ Sediment laden runoff entering downstream receiving waterway ▪ Accidental spills and leaks from vehicles and machinery required for vegetation clearing works	▪ Direct impact to unnamed tributary of Black Waterholes Creek ▪ Indirect impact to downstream Black Waterholes Creek and Swamp Creek

Construction activity	Description	Potential impacts	Potential receivers
Earthworks to prepare the Project site and construction areas	▪ Initial site clearing and grading works. Earthworks to achieve the necessary design levels across the site ▪ Stockpiling of material ▪ Trenching for underground utilities and services would be installed such as stormwater, water and sewer reticulation, electrical cables, and (internal) gas pipes between the gas receiving station and the gas turbine locations ▪ Preparation and construction of foundations for the entire site. Deep piling is expected to support the heaviest infrastructure such as the gas turbines, generator, and the main step-up transformers while shallower piling or pad type foundations would underpin the foundations of the site where the proposed surface loads are less (e.g., site office, car park) ▪ Deeper excavations may be required for the gas turbine foundations and installation of the oil water separator and neutralising tanks ▪ Reinforced concrete slabs would be constructed in certain pavement areas, with other areas being surfaced with crushed rock or other suitable materials	▪ Sediment laden runoff entering downstream receiving waterway ▪ Accidental spills and leaks from vehicles and machinery required for earth works ▪ Contaminated runoff from concrete wastewater entering downstream receiving waterway ▪ Groundwater level drawdown due to dewatering for deep excavations ▪ Dewatering discharge entering downstream receiving waterway	▪ Direct impact to unnamed tributary of Black Waterholes Creek ▪ Indirect impact to downstream Black Waterholes Creek and Swamp Creek
Construction of internal roads	▪ Construction of reinforced concrete pavement to support heavy vehicles (up to B-double size) ▪ Internal road layout design to account for turning paths of large vehicles, cranes, and articulated vehicles, so that movements in and out can be made in a forward direction ▪ Roadworks and hardstand areas to be constructed for permanent staff parking, delivery/laydown areas ▪ Where required, bunded areas for delivery, handling, and storage of fuel and other hazardous material would be constructed	▪ Sediment laden runoff entering downstream receiving waterway ▪ Accidental spills and leaks from vehicles and machinery required for works ▪ Contaminated runoff from concrete wastewater entering downstream receiving waterway	▪ Direct impact to unnamed tributary of Black Waterholes Creek ▪ Indirect impact to downstream Black Waterholes Creek and Swamp Creek

Construction activity	Description	Potential impacts	Potential receivers
Installation of above ground civil, mechanical, electrical plant equipment, and electrical switchyard	▪ Installation of major plant items associated with the gas turbines and switchyard – details of key Project elements can be found in the CEMS	▪ Sediment laden runoff entering downstream receiving waterway ▪ Accidental spills and leaks from vehicles and machinery required for works ▪ Contaminated runoff from concrete wastewater entering downstream receiving waterway	▪ Direct impact to unnamed tributary of Black Waterholes Creek ▪ Indirect impact to downstream Black Waterholes Creek and Swamp Creek
Commissioning and testing	▪ Program of testing and certification of all Project components, systems, and processes to demonstrate the Project can operate to the required standards before commencing operation	▪ Accidental spills and leaks from vehicles and works	▪ Direct impact to unnamed tributary of Black Waterholes Creek ▪ Indirect impact to downstream Black Waterholes Creek and Swamp Creek
Demobilisation and rehabilitation	▪ Installation and establishment of landscaping ▪ Removal of construction equipment, site fencing and construction compounds	▪ Sediment laden runoff entering downstream receiving waterway ▪ Accidental spills and leaks from vehicles and machinery required for works	▪ Direct impact to unnamed tributary of Black Waterholes Creek ▪ Indirect impact to downstream Black Waterholes Creek and Swamp Creek

4.4 Sediment basin discharges

4.4.1 Discharge methodology

Testing, treatment and discharge of construction water collected in the provisional stormwater and/other sediment basin/s will be undertaken in accordance with guidance outlined Section 6 of the Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom, 2004), commonly known as "the Blue Book".

4.4.2 Discharge criteria

Water quality will be sampled prior to any controlled discharges from sediment basin/s to confirm that the discharge criteria as detailed in Table 4-6 are met prior to controlled discharge. Water discharges will comply with all relevant provisions of the POEO Act, including any discharge limits (both volume and quality) set for the development in the EPL.

Table 4-6: Discharge criteria for controlled construction discharges

Parameter	Measurement and assessment			Discharge criteria
	Percentile concentration limit	Sample method and frequency	Units	
pH	100 (up to and including 31mm of rain in any 5-day period)	Probe/grab sample Prior to discharge	pH	6.5 – 8.5
Total Suspended Solids (TSS)	100 (up to and including 31mm of rain in any 5-day period)	Probe/grab sample Prior to discharge	mg/L	<50
Turbidity	100 (up to and including 31mm of rain in any 5-day period)	Probe/grab sample Prior to discharge	NTU	At a value calibrated to achieve <50 mg/L TSS
Oil and grease	100 (up to and including 31mm of rain in any 5-day period)	Visual Prior to discharge	None visible	None visible

4.4.3 Overflow events

Based on a 5-day, 85th percentile rainfall depth (Landcom, 2004), should rainfall received within a 5-day period exceed 31mm, it is expected that the sediment basin/s may discharge without an opportunity to confirm that the discharge criteria are met. It should also be noted that other types of sediment controls may be overwhelmed during such an event and repair work must be undertaken when it has been determined by the Principal Contractor that it is safe to do so. An overflow event will be reported as an 'incident' and be managed in accordance with the CEMS.

4.4.4 TSS and NTU correlation

TSS is a dry weight measurement of particulate matter in the water column. Measuring TSS directly can take up to 24 hours and must be conducted under laboratory conditions with specialised equipment. TSS is often used as a measurement of water quality as it provides a good correlation with environmental impact caused by soil entering the water column on a range of different sites with different soil types. However, the delay in obtaining results means the application of the required mitigation is also delayed, potentially resulting in adverse environmental outcomes.

An alternative measure of water quality is turbidity, measured in Nephelometric Turbidity Units (NTU). Turbidity when compared to TSS does not always provide good correlation with environmental impact as it is affected by individual soil type, dissolved substances (e.g. tannins) and is especially affected by dispersible soils. In contrast to TSS, NTU readings can be taken in the field in only 2-3 minutes making it a preferential method of testing in a dynamic construction environment.

Laboratory testing will be undertaken in conjunction with field testing initially prior to the first controlled discharge to establish a correlation between TSS and turbidity (NTU). Once the statistical correlation is established, NTU measurement will be undertaken to demonstrate TSS is below the site discharge criteria. To ensure the ongoing accuracy of the correlation between NTU and TSS, water samples will be collected quarterly containing sediment which displays the typical soil characteristics of the sediment basin. The samples will be tested at a NATA accredited laboratory for both NTU and TSS under laboratory conditions.

4.5 Groundwater dewatering

Testing and treatment of water produced through excavation dewatering will be undertaken against the discharge criteria as detailed in Table 4-6, with the additional criteria of an upper limit for electrical conductivity 2,250 µS/cm (ANZG, 2018).

Where groundwater salinity does not meet the discharge criteria, then other management options such as offsite disposal may need to be considered.

A Dewatering Management Plan will be prepared by the Principal Contractor that outlines:

- Excavations requiring dewatering and anticipated dewatering volumes
- Details of any required Water Access Licences and Water Use Approval or applicable exemptions
- Anticipated groundwater quality
- Dewatering methodology
- Dewatering discharge treatment and disposal options
- Monitoring of dewatering discharge groundwater quality
- Monitoring of groundwater level response to dewatering.

5. Mitigation and management measures

Water impacts during construction would be managed in accordance with the CEMS, which includes water management objectives to maximise workers' awareness of water values and the need to avoid or minimise potential impacts to downstream receivers.

As outlined in Section 4, construction activities have potential to cause impacts to surface and groundwater if not properly managed. Mitigation and management measures to prevent these impacts will be undertaken during the pre-construction, construction and demobilisation phases. The key aspects of the surface water and groundwater management strategy include:

- Erosion and sediment controls, outlined in the Section 5.1
- Water quality control measures, outlined in Section 5.2
- Groundwater level monitoring, outlined in Section 5.3.

5.1 Concept erosion and sediment control plan

The concept erosion and sediment control plan (ESCP) described below will be used as a guide by the Principal Contractor in developing and implementing the site-specific ESCP. The site-specific ESCP will be developed by the Principal Contractor in accordance with Section 2 of the Blue Book. Erosion and sediment controls onsite will be installed and maintained in accordance with the Blue Book.

The objective of the ESCP is to minimise the amount of sediment leaving the Project Site directly or via the site's drainage system during construction. Before construction commences, geotextile sediment barrier fence will be placed around the site perimeter where construction is to occur. Specific care will be taken on the north-western corner of the site to ensure that sediment is collected and does not enter the watercourse.

At a minimum, the following general practices will apply to early-stage earthworks:

- Site entry areas will be designed and have suitable sized crushed rock (40mm+ aggregate in a 200 mm deep layer) to limit transportation of site soils offsite via vehicle wheels. This area will be graded to divert water towards sedimentation fence by means of raised area on the Project Site boundary. Additionally, a washdown area may be considered by the Principal Contractor
- All soil stockpiles will be surrounded on the downhill side by a sediment control fence. The uphill side will require a small earthen bank to direct flow away from the stockpile
- When trenching excavation is occurring for services, the excavated soil will be placed on the uphill side of the trench to limit sediment runoff from this temporary stockpile, or the soil will be removed to a stockpile in the Project Site. Check dams will be placed in the base of the trench if rain is expected whilst the trench remains open.

Aside from the general practices above and dependent on the Principal Contractor's staging, the following sediment control measures will be adopted:

- Each of the various hardstands and road surface levels are completed to the top of subgrade at which stage the kerbs and drainage pits and pipes will be in place.
- On long slopes, temporary level spreaders will be formed using contour drains, diversion banks, or sediment control fences to reduce the erosive power of the runoff
- Directly behind the kerb on each hardstand, a sediment control will be placed
- The grate and inlet areas of sag pits will be surrounded with sandbags or aggregate bags to trap sediment before it enters the drainage network
- A sand bag or aggregate bag will also be placed in the kerb channel at regular intervals to form check dams that reduce sediment load at each inlet pit

- Sediment control fences will be placed on the hardstands immediately upstream of the inlet pits to reduce sedimentation entering the drainage network.

At the north-western side of the site, the collection of all stormwater will occur where the pipe outlets to the site's discharge point. During construction, a temporary basin may be placed before the final discharge point to collect any sediment in the stormwater. Suitably sized energy dissipation structures will be located at the outlet of this basin to control and reduce the risk of an erosion event. No additional flood mitigation measures are proposed as the site is above the required flood levels and will not result in any increase in downstream flooding.

5.1.1 Sediment basin

A sediment basin is provisionally identified in Figure 1-4 as proposed in the EIS. Where the Principal Contractor can demonstrate equivalent water quality management in their ESCP, the basin may not be required. The design and construction of the sediment basin(s) or other controls will be undertaken in accordance with the Blue Book Volume 1 (Landcom, 2004).

The basin will be located more than 1 m above the water table. This will minimise the risk of groundwater contamination.

5.1.2 Erosion and sediment control strategy

The erosion and sediment control strategy for the construction works includes, but not be limited to, measures outlined in Table 5-1.

Table 5-1: Erosion and sediment controls

Aspect	Reference number	Measures/techniques	Timing and duration	Responsibility
Off-site (clean) water	ESC1	▪ Clean water approaching site from the external catchment beyond the Project Site will be managed via clean water drains and diversion berms to minimise run-on into the Project Site boundary ▪ All channels along the Project Site boundary carrying clean water away from site areas are to drain onto surrounding lands or into existing drainage (i.e. unnamed tributary of Black Waterholes Creek) ▪ Physical controls will be inspected weekly to ensure no obstructions/build-up of sediment	Prior to clearing, construction	Principal Contractor
On-site (dirty) water	ESC2	▪ Sediment fencing / bunding and diversion drains will be established around the entire Project Site boundary to prevent water from leaving the site ▪ Construction runoff will be directed to the sediment basin ▪ Physical controls will be inspected weekly to ensure no obstructions / build up of sediment	Prior to clearing, construction	Principal Contractor
Sediment basin and other physical water quality control structures	ESC3	▪ Runoff collected in the sediment basin will be tested (and treated if necessary) before controlled discharge via the basin outlet ▪ Controlled discharges from the sediment basin will be carried out within 5-days following a rainfall event (following suitable settlement time) ▪ Sediment collected from the sediment basin or other traps will be transported to nominated stockpile sites or removed offsite as required ▪ Compostable or reusable temporary erosion control devices will be used where practicable	Construction	Principal Contractor

Aspect	Reference number	Measures/techniques	Timing and duration	Responsibility
Flow velocity	ESC4	▪ Stormwater flow velocities through work areas will be controlled using temporary berms, or other physical controls ▪ Any discharge to the unnamed tributary of Black Waterhole Creek will be carried out at a low flow velocity and will include appropriate scour protection/ dissipation	Construction	Principal Contractor
Vegetation	ESC5	▪ Erosion and sediment controls will be established prior to any vegetation clearance ▪ Vegetation removed as part of the works will be mulched and reused on-site for erosion and sediment control purposes where feasible	Prior to clearing, construction	Principal Contractor
Stockpiles	ESC6	▪ All exposed stockpiles will have sediment fencing around their lower edge and be provided with adequate temporary cover if they will remain for more than 10 days	Construction	Principal Contractor
Exposed soils / high risk erosion areas	ESC7	▪ The spatial extent of exposed soil areas will be minimised where practicable, with no-go (exclusion) areas clearly marked on ESCP, delineated and signposted ▪ Temporary ground cover (eg. Geo-fabric, soil binder/stabiliser, hydro-mulch, other suitable products, or other ground covers.) will be used to lock-down high-risk areas when significant rain is imminent	Construction	Principal Contractor
Rainfall	ESC8	▪ Rainfall forecasts will be actively monitored and used to trigger sediment basin discharges, inspection and, where required, implementation of additional measures such as application of soil binder ▪ Should significant rainfall be forecast, and a site closure anticipated/ planned, the sediment basin will be emptied immediately prior to site closure	Construction	Principal Contractor
Erosion and sediment controls inspection	ESC9	▪ All erosion and sediment controls will be inspected at least weekly, before a site closure of two days or more, and after rainfall exceeding 20 mm in 24 hours. Maintenance will be carried out as required prior to next forecast rainfall event	Construction	Principal Contractor

5.2 Water quality controls

In addition to erosion and sedimentation, water contamination by construction activities must be managed through specific water quality control measures. Additional water quality controls include those outlined in Table 5-2 .

Table 5-2: Water quality controls

Aspect	Reference number	Measures/techniques	Timing and duration	Responsibility
Accidental spills and leaks	WQC1	▪ An emergency spill response will be employed in the event of an accidental spill. Refer to the CEMS for details ▪ Spill kits will be available on site	Construction	Principal Contractor
Vehicle and machinery maintenance	WQC2	▪ Maintenance areas will be established for vehicles, equipment and machinery, including for refuelling and repair areas, and wash down bays ▪ Maintenance areas will be fully bunded and runoff will be directed via on-site diversion drains to the sediment basin	Construction	Principal Contractor
Fuels, chemicals and liquid storage	WQC3	▪ All fuels, chemicals and liquids would be stored on level ground at least 20 metres away from waterways (including existing stormwater drainage systems) and would be stored in a sealed bunded area within the Project Site	Construction	Principal Contractor
Litter	WQC4	▪ Designated waste bins will be available on site ▪ Temporary gross pollutant traps will be incorporated into the drainage design for the construction site	Prior to clearing, construction	Principal Contractor
Concrete	WQC5	▪ Concrete washout will be confined to designated concrete washout bays or using a Concrete Waste Separation Unit (CWSU), which allows for recycling of concrete waste and treatment of wastewater ▪ Dust suppression techniques will be implemented to minimise mobilisation of concrete dust	Construction	Principal Contractor
Groundwater dewatering	WQC6	▪ Anticipated groundwater dewatering for excavations and management approaches will be detailed in the Dewatering Management Plan	Construction	Principal Contractor
Acid Sulfate Soils	WQC7	▪ ASS treatment procedures will be implemented in accordance with ASS guidelines. Refer to the CEMS for details	Construction	Principal Contractor

5.3 Groundwater drawdown monitoring

The focus of the WMP with respect to groundwater impacts is to ensure that temporary groundwater drawdown as a result of dewatering of excavations is within that predicted in the Project EIS and that no undue impacts to groundwater dependent ecosystems occur.

Two groundwater monitoring wells and water level monitoring capability are to be installed by the Principal Contractor, and groundwater level will be monitored at the notional groundwater monitoring locations provided on Table 5-3 during dewatering activities. The final monitoring locations will be confirmed in the Dewatering Management Plan to be developed by the Principal Contractor.

Table 5-3 Groundwater monitoring locations

Monitoring site	Monitoring location number	Description	Frequency
Downgradient of dewatering operations	MB-01	▪ Potential impact site, assessment of drawdown propagation. Located within 50m downgradient of deepest excavation locations	▪ Water level – hourly via water level data logger during active dewatering and until water levels start recovering ▪ Minimum two-weekly manual measurement for calibration and verification of logger data
East of dewatering operations	MB-02	▪ Potential impact site, assessment of drawdown propagation. Located along northern end of eastern Project Site boundary (MW20)	▪ Water level – hourly via water level data logger during active dewatering and until water levels start recovering ▪ Minimum two-weekly manual measurement for calibration and verification of logger data

The Principal Contractor will develop a plan to respond to any groundwater level drawdowns in excess of that assessed in the EIS. Measures that will be considered include stopping dewatering until water levels recover, reducing the rate of dewatering, reducing the amount of work below the groundwater table, adopting different construction techniques, installing groundwater barriers or managing inflows. This will be detailed in the dewatering management plan to be prepared by the Principal Contractor and will meet the groundwater exemption or any licence requirements.

5.4 Incident Reporting

Water quality discharges and site operations outside of the mitigation measures identified in this Plan will be considered an incident. Water quality and incident reporting will occur as outlined in the CEMS and as per the Infrastructure Approval conditions, and in the case of significant pollution incidents the site Environment Protection Licence.

6. Compliance management

6.1 Roles and responsibilities

6.1.1 Project team

The Project team's organisational structure and overall roles and responsibilities are outlined the CEMS.

6.1.2 Specialist consultants

Specific responsibilities for specialist consultants related to the development and implementation of surface and groundwater management measures are detailed below in Table 6-1.

Table 6-1: Specialist consultant requirements

Specialist	Responsibility
Environmental specialist	▪ Provide input for the development and implementation of PIRMP.
Groundwater specialist	▪ Provide input for the development and implementation of the Dewatering Management Plan.

6.2 Monitoring, inspection and reporting

In addition to the requirements outlined in the CEMS, Table 6-2 below summarises the monitoring and reporting to be undertaken during pre-construction, construction and demobilisation phases of the project to meet the requirements of this plan.

Table 6-2: WMP monitoring and reporting requirements

Monitoring and reporting requirements	Responsibility
Pre-construction: ▪ Environmental monitoring checklist, including: - Erosion and sediment control inspection - Water quality controls inspection	Principal Contractor
Construction: ▪ Environmental monitoring checklist, including: - Erosion and sediment control inspection - Water quality controls inspection - Dewatering management inspection ▪ Groundwater level monitoring ▪ Controlled discharge monitoring ▪ Acid sulphate soils monitoring (as per CEMS)	Principal Contractor
Regular auditing and review of the Principal Contractor environmental management systems throughout the duration of works.	Snowy Hydro

The Principal Contractor's records management procedure will detail the requirements for the retention and management of records. All records are to remain legible and be available to the relevant authorities when requested.

Documents and records in relation to environmental management, monitoring, and reporting must be retained for the duration identified in the Infrastructure Approval, Environment Protection Licence, and as per applicable regulations. The Principal Contractor's EMS Document Control procedure will outline retention durations.

6.3 Training

All employees and contractors working on site will undergo site induction training relating to surface water and groundwater management issues. The induction training will address elements related to water management including:

- Requirements of this WMP
- Relevant legislation
- Water protection requirements
- Stockpile locations, laydown areas and management measures.

Further to this, targeted training in the form of toolbox talks or specific training will also be delivered to personnel with a key role in water management. Examples of training topics include:

- Erosion and sediment control procedures
- Sediment basin discharge procedures
- Water quality control procedures
- Dewatering management procedures.

6.4 Auditing

The Principal Contractor will conduct internal environmental audits monthly (at minimum) throughout construction to ensure the ongoing adequacy and effectiveness of the CEMS, and all management plans. Internal audits will verify compliance with:

- The CEMS and management plans
- Infrastructure Approval conditions
- Other relevant requirements (licences, permits, regulations).

Environmental audits are planned and scheduled with all other project audits. An audit checklist will be developed and amended as necessary by the Principal Contractor to reflect changes to the CEMS, subsequent approvals, and changes to Acts, regulations, or guidelines.

Independent audits will be conducted as outlined in Section 7.6.3 of the CEMS with the conditions of approval (C15 to C19) relevant to the Independent Environmental Audit reproduced in Appendix D.

6.5 Incidents and complaints

Complaints and enquiries will be managed in accordance with the process outlined in Section 6.3 of the CEMS. Incidents will be reported in accordance with the process outlined in Section 7.4 of the CEMS.

Audits will be undertaken to assess the effectiveness of environmental management measures and compliance with the Water Management Plan and all regulatory requirements. The auditing procedure are be detailed in the CEMS.

6.6 Incident notification

The Principal Contractor will notify Snowy Hydro upon becoming aware of an incident, and Snowy Hydro will then notify the Secretary in writing via the Major Projects website immediately.

The key aspects the notification will address are:

(a) the development and application number (12590060);

(b) details of the incident (date, time, location, a brief description of what occurred and why it is classified as an incident);

(c) how the incident was detected;

(d) when the Proponent became aware of the incident;

(e) any actual or potential non-compliance with conditions of approval;

(f) what immediate steps were taken in relation to the incident;

(g) further action(s) that will be taken in relation to the incident; and

(h) a development contact for further communication regarding the incident. Unless otherwise stated in the incident notification, this is the Snowy Hydro Approvals Manager on 0409 840 165.

6.7 Incident reporting

Within 30 days of the date on which the incident occurred or as otherwise agreed to by the Secretary, the Proponent must provide the Secretary and any relevant public authorities (as determined by the Secretary) with a detailed report on the incident addressing all requirements below, and such further reports as may be requested.

The Incident Report will include:

(a) a summary of the incident;

(b) outcomes of an incident investigation, including identification of the cause of the incident;

(c) details of the corrective and preventative actions that have been, or will be, implemented to address the incident and prevent recurrence; and

(d) details of any communication with other stakeholders regarding the incident

6.8 Non-compliance notification

In the instance of a non-compliance, the Secretary will be notified in writing via the Major Projects website within seven days after the Proponent becomes aware of any non-compliance. Snowy Hydro will lodge the notification.

The Principal Contractor must notify Snowy Hydro whenever it is aware of a non-compliance.

The key aspects a non-compliance notification will address are:

(a) the development and application number (12590060);

(b) the condition of approval that the development is non-compliant with;

(c) the way in which the development does not comply;

(d) the reasons for the non-compliance (if known); and

(e) the corrective and preventative actions undertaken to address the non-compliance.

For clarity, a non-compliance which has already been notified as an incident does not need to also be notified as a noncompliance to the Major Projects website.

6.9 Compliance reporting

Compliance Reports of the development will be carried out by Snowy Hydro with the support of the Principal Contractor, and also upon the advice of the Environmental Representative where applicable. Reporting is to be in accordance with, and upon the timing set out in, the *Compliance Reporting Post Approval Requirements (2020)* or subsequent version.

Snowy Hydro must make each Compliance Report publicly available within 60 days of submitting it to the Secretary.

There is an opportunity to request and agree an alternative reporting method and timing with the Secretary to those identified in this section. If sought, this is to be done by Snowy Hydro in consultation with the Department.

6.10 Complaints and enquiry management

An enquiry is defined as a question or request for information.

A complaint is defined as a statement that describes Project related activities as unsatisfactory or unacceptable. Complaints may also be accompanied by threats to contact the media, local MP, or some other authority.

Complaints and enquiries may be received by any method. The CRM will acknowledge and respond to enquiries and complaints about the Project, as per the process and timeframes shown in the table below. Where the complaint rises to the level of a dispute it shall be manged in accordance with the steps outlined in section 6.3 in the Construction Environmental Management Strategy.

Table 6-3: Complaints and enquiries management

Complaints and enquiries management	
Responding to complaints received during standard work hours	▪ Investigate and determine source of complaint immediately ▪ Provide an oral response acknowledging receipt of complaint to complainant as soon as possible. Every effort will be made to respond within 24 hours for emails, or one week for letters ▪ Investigate the potential environmental impacts and consequences of the complaint ▪ Record details of complaint received, how it was managed and the actions required to close out the complaint ▪ Provide an update of the complaints register to the ER for any complaints received on the day they are received.
Responding to enquiries received during standard work hours	▪ Record details of enquiry received ▪ Provide a response to enquirer on the next business day.
Responding to enquiries and complaints out of hours	▪ Stakeholders will be provided with the Project phone number for specific complaints and enquiries related to works out of

	hours. This number will be monitored by the CRM on a 24-hour basis ▪ The CRM will triage complaints and enquiries and liaise directly with the Principal Contractor to respond. Non-urgent enquiries and complaints will be dealt with on the next business day ▪ All details of the enquiry or complaint will be recorded in the Project consultation complaint register by the CRM. ▪ Provide an update of the complaints register to the ER for any complaints received on the day they are received.

7. Review and improvement

7.1 Continuous improvement

Continuous improvement of the Water Management Plan will be carried out through the continued evaluation of mitigation and management measures against environmental policies, objectives and targets and identifying where opportunities exist for improvement.

The continuous improvement process will include:

- Identifying opportunities to improve environmental management measures and performance
- Identify the causes of any non-compliances with the relevant criteria
- Develop an effective plan to address any identified non-compliances
- Determine the effectiveness of applied mitigation measures
- Document any changes to work procedures undertaken to control non-compliances and/or improve efficiencies
- Compare work process results with the relevant objectives and targets.

7.2 Staging and Review of Management Plans

The Department's approval for the staging of management plans into construction and operation phases was provided on 22 of December 2021 as required under C13.

Regular reviews of management documentation will also occur and after certain events. The triggers for further review of this Management Plan include:

(a) the submission of an incident report under condition C6;

(b) the submission of an audit report under conditions C15 to C19;

(c) the approval of any modification to the conditions of this approval;

(d) a direction of the Secretary (Department of Planning Industry and Environment) under condition A2 of Schedule 2;

(e) as initiated by the Principal Contractor or Snowy Hydro; or

(f) upon the advice of the Environmental Representative.

Where revisions are made, then within 4 weeks of the review the revised document will be submitted to the Secretary for approval, unless otherwise agreed with the Secretary, or within the scope of the Environmental Representative role as set out in condition A23.

7.3 Update and amendment

Where necessary, the Water Management Plan will be required to be updated. Document and records management for the Project is described in Section 7.7 of the CEMS.

As required by condition C20, prior to the commencement of construction the required information will be publicly available on the project website.

8. References

ASSMAC, 1998, Acid Sulfate Soil Manual, NSW Acid Sulfate Soil Management Advisory Committee, August 1998.

ANZECC/ARMCANZ, 2000a, *National Water Quality Management Strategy Australian and New Zealand Guidelines for Fresh and Marine Water Quality*. Australian and New Zealand Environment and Conservation Council, Agriculture and Resource Management Council of Australia and New Zealand.

ANZECC, 2000b, *Australian and New Zealand Guidelines for Water Quality Monitoring and Reporting*, Australian and New Zealand Environment and Conservation Council, Agriculture and Resource Management Council of Australia and New Zealand.

ANZG, 2018, *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*. Australian and New Zealand Governments and Australian state and territory governments. Canberra ACT, Australia, 2018. Available at www.waterquality.gov.au/anz-guidelines.

DEC, 2004, Approved Methods or Sampling and Analysis of Water Pollutants in NSW. Department of Environment and Conservation (NSW), March 2004.

DPIE, 2021, *Acid Sulfate Soils probability mapping - eSPADE v2.0 interactive NSW Soil and Land Information mapping*. Available at: https://www.environment.nsw.gov.au/eSpade2Webapp Accessed October 2021.

Landcom, 2004. Managing Urban Stormwater – Soils and Construction, Volume 1.

NHMRC, *Guidelines for Managing Risks in Recreational Water*, Australian Government, 2008.

NSW EPA, *2020. Guideline: Pollution Incident Response Management Plans*. NSW Environment Protection Authority. https://www.epa.nsw.gov.au/licensing-and-regulation/licensing/environment-protection-licences/pollution-incident-response-management-plans.

The Guideline: Pollution Incident Response Management Plans (PIRMP Guideline)

Appendix A. Environmental monitoring checklist

The following checklist provides an example pro-forma that can be used for monitoring compliance with the procedures outlined in this WMP. Copies of the pro-forma are to be used as required for inspections by the Principal Contractor. The pro-forma provided is an example only and is to be used as a guide in the absence of the Principal Contractor's or Snowy Hydros' own environmental compliance sheets.

Completed compliance sheets are to be filed in an Environmental Log Folder. An Environmental Improvement Notice is to be completed for all Non-Conformances or rectification requirement.

Table 8-1: Environmental Monitoring Checklist template

Hunter Power Project Water Management Plan Monitoring Checklist					
Inspection No:			**Inspection Date:**		
Completed by:					
Item No.	**Control Measure**	**Ref. Section in plan**	**COMPLETED**		**Comments / Corrective Action for Follow-up**
			YES	**NO**	

Appendix B. Water testing and sampling methodology

B.1 Scope

This procedure is applicable to all surface water and groundwater sampling conducted by personnel during the Project.

B.2 In-situ/field testing

In-situ water quality testing is to be carried out where sufficient water is present. In-situ water quality parameters to be measured include:

- pH
- Temperature (°C)
- Electrical conductivity (µS/cm)
- Salinity (ppm)
- Turbidity (NTU)
- Dissolved oxygen (% saturation and mg/L)
- Redox potential (mV).

Measurements will be collected at the edge of the waterway (so as to not disturb the streambed) between 15 and 30 cm below the surface of the water. Sampling depth is to be recorded in the field.

For each parameter measured in situ, three replicate measurements will be recorded about 10 metres apart. Each parameter will then be recorded as the average (arithmetic mean) of the three measures.

B.3 Sample collection

All surface water sample collection will be carried out in accordance with methods outlined in the *Australian Guidelines for water quality monitoring and reporting* (ANZECC/ARMCANZ, 2000b) and with reference to procedures outlined in the *Approved Methods or Sampling and Analysis of Water Pollutants in NSW* (DEC, 2004).

Grab samples will be collected manually from the sampling locations identified by the Principal Contractor. The volume of sample collected will be of sufficient volume for the required analyses, including any repeat analyses and will be collected into sampling bottles and jars provided by the NATA accredited testing laboratory.

B.4 Sample labelling and preservation

All samples will be clearly labelled with unique sampling identification nomenclature consisting of the sample date, location, and sampler initials.

All samples will be kept cool by being placed in an insulated cool box (or equivalent) with ice to be kept ≤6°C for preservation prior to dispatch to the NATA accredited testing laboratory under chain of custody procedures.

B.5 Decontamination and calibration

Generally, sampling equipment will not require specific cleaning apart from rinsing the equipment well on return to the lab at the end of each sampling trip. However, if a sample site is particularly dirty (i.e. there is an algal bloom, or the site smells strongly of hydrocarbons, hydrogen sulphide or other), equipment will need to be cleaned thoroughly before being introduced to another site.

In addition, the water quality probe must be calibrated prior to each sampling event and must be maintained by a regular service regime using an accredited repairer. A log for the water quality probe that details service history, repairs, calibration and other relevant information will be maintained.

B.6 Quality control samples

Duplicate water quality samples will be taken every 10 water samples to verify laboratory QA and QC. Further to this, internal laboratory QA/QC is conducted on a batch basis, as per standard laboratory practice, and therefore may not be specific to samples. In the event that laboratory QA/QC is conducted on Project samples, this information will be compared.

B.7 Induction / training

Personnel involved in any aspect of water sampling activities will be trained in the requirements of this procedure. Training will include inductions, toolbox talks, pre-starts and targeted training as required.

Appendix C. DPE endorsement of qualifications and experience of report preparers

Planning, Industry & Environment

Ian Smith
Project Manager
Snowy Hydro Limited
Monaro Highway
COOMA New South Wales 2630

24/01/2022

Dear Mr. Smith

Hunter Power Project - (SSI-12590060)
Experts Approval to prepare Water Management Plan

I refer to your request (SSI-12590060-PA-23) and letter dated 17 January 2022 for the Secretary's approval of suitably qualified persons to prepare the Water Management for the Hunter Power Project – (SSI-12590060-PA-23).

The Department has reviewed the nominations and information you have provided and is satisfied that these experts are suitably qualified and experienced.

Consequently, I can advise that the Secretary endorses the appointments of Greg Sheppard, Jorja Vernon and Kate Byrnes of Jacobs to prepare the Water Management Plan.

If you wish to discuss the matter further, please contact Charissa Pillay on 02 99955944

Yours sincerely

Stephen O'Donoghue
Director Resource Assessments

As nominee of the Secretary

Appendix D. Independent Environmental Audit Approval condition

"INDEPENDENT ENVIRONMENTAL AUDIT

C15. Independent Audits of the development must be conducted and carried out in accordance with the Independent Audit Post Approval Requirements (2020) or its latest version.

C16. Proposed independent auditors must be agreed to in writing by the Secretary prior to the commencement of an Independent Audit.

C17. The Secretary may require the initial and subsequent Independent Audits to be undertaken at different times to those specified in the Independent Audit Post Approval Requirements (2020) or its latest version, upon giving at least 4 weeks' notice (or timing) to the Proponent of the date upon which the audit must be commenced.

C18. Independent Audit Reports and the Proponent's response to audit findings must be submitted to the Secretary within 2 months of undertaking the independent audit site inspection, as outlined in the Independent Audit Post Approvals Requirements (2020) or its latest version, unless otherwise agreed by the Secretary.

C19. Notwithstanding the requirements of the Independent Audit Post Approvals Requirements (2020) or its latest version, the Secretary may approve a request for ongoing independent operational audits to be ceased, where it has been demonstrated to the Secretary's satisfaction that independent operational audits have demonstrated operational compliance."