Appendix F

Surface Water Impact Assessment

Kentbruck Green Power Hub

Prepared for
Neoen Australia Pty Ltd
ABN: 57 160 905 706

AECOM

Surface Water Impact Assessment

Kentbruck Green Power Hub EES Technical Report

29-Jan-2024

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Surface Water Impact Assessment

Kentbruck Green Power Hub EES Technical Report

Client: Neoen Australia Pty Ltd

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Executive Summary

Overview

The Kentbruck Green Power Hub (the project) is a proposed wind farm located near the town of Nelson in south western Victoria. The project will comprise of up to 105 wind turbines that will be up to 270 m in height. The project will also include a transmission line to export energy to the existing network.

On 25 August 2019, the Minister for Planning determined that an Environment Effects Statement (EES) is required for the Project pursuant to the *Environment Effects Act 1978 (Vic)* ('EE Act'), due to the potential for significant environmental effects. An EES enables decision makers and stakeholders to understand the likely environmental impacts of the project and how they are proposed to be managed.

The project is also being assessed under the bilateral agreement between the Commonwealth and Victorian Governments, which allows the project and potential impacts on Matters of National Environmental Significance (MNES) to be assessed under the Victorian EES process.

This report specifically assesses the potential impacts to the surface water environment that may occur during the construction and operational phases of the project.

The assessment methodology consisted of a desktop assessment that was supported by a field visit to ground truth assessment findings and assumptions. This desktop assessment included a review of publicly available surface water information including:

- A review of publicly available surface water information, databases and reports that are relevant to the Project site and associated catchments.
- Land Subject to Inundation Overlays (LSIO) from relevant planning schemes.
- Local topographical data.

The desktop assessment also included consultation with Neoen to clarify details for the project delivery and operation.

Existing Environment

The project area is located within the Glenelg Basin and Portland Coast Basin regions. The proposed wind farm site is bounded by the Glenelg Estuary and Discovery Bay Ramsar site from along the north western and southern borders.

Waterbodies interfacing with the proposed project area mostly consist of farm dams and minor ephemeral wetlands and waterways. Some of these minor waterways converge to form Johnstone Creek beyond the site boundary which eventually drains to the Glenelg Estuary and Discovery Bay Ramsar site.

The proposed underground transmission route starts from east of the proposed wind farm site and extends along Boiler Swamp Road within the Cobboboonee National Park boundary. Surrey River and Mount Kincaid Creek are two major waterways that intersect with the proposed transmission line through this section. The proposed transmission line then continues underground as it traverses up to 9 km of freehold agricultural land before its connection with the Heywood Terminal Station.

Potential Impacts

Potential impacts on surface water were identified by considering the proposed construction methods and identifying the potential threats to the environmental values of the receiving waterways or aquatic environments. The impacts identified include:

Construction Impacts

- Dewatering of groundwater and/or rainwater from the turbine foundations, trenches and excavations results in contaminated water entering waterways and the receiving environment.
- Stormwater runoff from construction sites and work activities pollute receiving waterways and downstream environment.

- Trenching across waterways mobilises sediment and causes pollution in the waterways and downstream environment.
- Frac-out from Horizontal Directional Drilling (HDD) returns drilling fluids to surface causing discharge to surface water.
- A spill of hazardous materials during construction results in contaminated discharge to surface water.
- Construction activities change the flood risk and flood characteristics.
- Construction activities potentially block or divert low flow pathways leading to changes in flow regime and environmental values.

Operational impacts

- Operational or permanent infrastructure potentially change the hydrological conditions leading to increased flood levels or flooding of adjacent property.
- Operational or permanent infrastructure potentially blocking or diverting low flow pathways leading to changes in flow regime and environmental values.
- A spill of hazardous materials at the operational facilities results in contaminated discharge to surface water.
- Contaminated stormwater runoff from operational facilities pollutes receiving waterways and environment.

Operational impacts associated with the transmission line were deemed to be minimal due to the small footprint of any above ground infrastructure and the proposed reinstatement of underground transmission line trenches to pre-development conditions.

Mitigation and contingency measures

A broad range of mitigation measures have been developed to reduce potential surface water impacts through the construction and operational phases of the project. These measures were developed using current construction guidelines and best management practices.

For many waterway crossings, such those with an ephemeral flow regime, open trenching is proposed to be undertaken. These works would be carried out through timely excavation and reinstatement of waterways that would mitigate the impacts to the receiving environment. All trenching activities would be planned and executed in accordance with the relevant regulatory requirements and industry best practice guidelines such as the IECA Best Practice Erosion and Sediment Control Appendix P; *Land Based Pipeline Construction Guidelines* (2015) and EPA Publication 1896: *Working within or adjacent to waterways* (2020).

Crossings of larger waterways that feature a more perennial flow regime (e.g. Surrey River) should be completed using horizontal directional drilling (HDD) techniques that do not disturb the surface at the waterway. In these applications, the electricity cable is tunnelled beneath the bed of the watercourse. Management of potential environmental impacts away from waterways predominantly would be managed by applying the EPA Victoria (2020) Publication 1834; *Civil Construction, Building and Demolition Guide* and EPA Victoria (2020) Publication 1896: *Working within or adjacent to waterways*, using key techniques such as:

- minimising the volume and area of stockpiled material and removing excavated material
- minimising the time during which materials are stockpiled at the surface and disturbed areas are exposed
- reinstating and vegetating disturbed surfaces as quickly as possible
- preventing the flow from external catchments over disturbed surfaces
- bunding or providing silt fences around stockpiled material and disturbed areas
- directing runoff from stockpiled material to a temporary sediment basin where necessary

- adequately managing existing overland flow paths using standard design procedures.

Dewatering of trenches and other excavations following rain events may cause turbid water to enter waterways. Water collected from excavated areas would be recycled and reused for construction activities such as dust suppression. Where discharge to waterbodies is inevitable, water would be collected and treated to EPA requirements prior to discharge.

Working on floodplains or near overland drainage pathways can impact the flow of water as it moves through the catchment. The placement of stockpiled material and the provision of gaps would be considered to help reduce the potential risks associated with flooding during construction. It is recommended that discussions relating to the temporary placement of material within the floodplain be held with the Glenelg Hopkins Catchment Management Authority (GHCMA) prior to construction.

Construction of access roads, wind turbine foundations and buildings within the site can permanently change the existing flow regime. This can occur though increased runoff from new impervious areas, loss of floodplain storage and permanent structures that block or change existing flow pathways.

To manage these risks, stormwater produced from operation and maintenance (O&M) facilities and any new access roads may be recycled and reused for internal use. Detailed flood modelling and drainage investigations may also be required during the design phase to ensure that the proposed infrastructure within the wind farm does not impact the exiting 1% Annual exceedance probability (AEP) flood level, flood velocity and floodplain storage.

In the event of an exceedance or failure of a mitigation measure, contingency measures will be applied to minimise impacts caused by changes in surface water quality or flow. These measures will be outlined in the Sediment, Erosion and Water Quality Management Plan (SEWQMP) and aligned with industry best practice guidelines such as *EPA Publication 1834; Civil Construction, Building and Demolition Guide* and include the following where relevant:

- methods to prevent water entering excavations
- controls to be implemented when a storm event is forecast
- measures to ensure that waterways and floodplains retain sufficient flood detention capacity to moderate peak water flows
- a flood warning system
- clean up procedures, including disposal of excess water
- notification of relevant authorities if unplanned incidents occur that could pose a risk to the environment

The study has concluded that the project is consistent with the EES evaluation objective in the Scoping Requirements with appropriate mitigation measures in place.

Abbreviations

Abbreviation	Definition
AECOM	AECOM Australia Pty Ltd
AEP	Annual exceedance probability
CEMP	Construction Environmental Management Plan
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DEECA	Department of Energy, Environment and Catchment Planning
DELWP	Department of Environment, Land, Water and Planning
DTP	Department of Transport and Planning
EES	Environment Effects Statement
EMF	Environmental Management Framework
EPA	Environment Protection Authority
EP Act	Environment Protection Act 2017
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
ERR	Earth Resources Regulation
ERS	Environment Reference Standard
GDE	Groundwater dependent ecosystem
GHCMA	Glenelg Hopkins Catchment Management Authority
Ha	Hectare
HDD	Horizontal Directional Drilling
ISO	International Standards Organisation
LNG	Liquefied Natural Gas
LSIO	Land Subject to Inundation Overlay
LSF	Land Subject to Flooding
MNES	Matters of national environmental significance
Neoen	Neoen Australia Pty Ltd
O&M	Operation and Management
PFI	Persistent Feature Identifier
SWMP	Surface Water Management Plan
UFI	Unique Feature Identifier

Glossary of terms

Term	Definition
1% AEP Flood Event	A design flood that has a 1% probability of occurring every year. This is also known as the 100-year average recurrence interval (ARI) flood event.
Annual exceedance probability (AEP)	The probability of a particular sized event being exceeded in any given year.
Construction Environmental Management Plan (CEMP)	Document that identifies and manages construction activities that may impact the environment
Designated waterway	A waterway declared under the *Water Act 1989 (Vic)* that is managed and controlled by the specified authority. Nearly all key waterways in the project area are designated waterways, controlled by the GHCMA.
Ephemeral waterway	A waterway which flows only after rain and has no baseflow component
Environmental Management Framework (EMF)	Provides an integrated governance framework to manage environmental aspects as described in the EES
Land Subject to Inundation Overlay (LSIO)	Applies to land in either rural or urban areas that is subject to inundation from mainstream flooding but is not part of the primary floodway. This extent usually represents the 1% Annual Exceedance Probability (AEP) flood extent from open channels. These overlays require a planning permit for buildings and works
Perennial waterway	Waterways that feature permanent, year-round baseflows or standing water (e.g. river, wetland or swamp)
Receptor	A natural or manmade attribute or component of an asset that could be measurably impacted by a change in water quantity or quality.

1.0 Introduction

1.1 Purpose of this report

The purpose of Kentbruck Surface Water Impact Assessment Report ('this report') is to assess the potential surface water impacts associated with the Kentbruck Green Power Hub ('the project') to inform the preparation of an Environment Effects Statement (EES) required for the project.

On 25 August 2019, the Minister issued a decision confirming that an EES is required for the project due to the potential for significant environmental effects.

The project was also referred to the Commonwealth Government, on 7 November 2019, and declared a 'controlled action', requiring assessment and approval under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The project is proposed to be comprised of wind turbines, associated infrastructure, transmission lines, a quarry and groundwater supply. This report provides a surface water impact assessment for the EES and proposes mitigation measures for potential impacts. This report assesses the potential for adverse effects to surface water and surface water receptors during construction and operation of the project.

This will inform the development of an Environmental Management Framework (EMF) for the project. The mitigation measures listed in the EMF would be implemented in the approvals and management plans for the project.

2.0 Project Description

The following section provides a high level summary of The Kentbruck Green Power Hub project description. A more detailed project description is presented in Chapter 3 of the EES (Project Description).

2.1 Project Overview

Neoen is proposing a renewable energy development, known as the Kentbruck Green Power Hub, comprising a wind energy facility (wind farm) with associated infrastructure. The Project would be mostly located in an actively managed and harvested pine plantation in southwest Victoria, between Portland and Nelson, in the Glenelg LGA.

The Project would involve two main components:

- A wind farm of up to 600 MW comprising up to 105 wind turbines and associated permanent and temporary infrastructure.
- A new 275 kV underground transmission line, which would connect the Project to the existing AusNet electricity transmission network. The transmission line would extend from the eastern boundary of the wind farm site to the existing 275/500 kV Heywood Terminal Station and would be up to 26.6 km in length.

2.1.1 Wind Farm

Permanent infrastructure to be constructed as part of the Project would include:

- Up to 105 wind turbines
- Access roads, including:
    - Public roads for site access. Existing site access routes into the commercial forestry operation would be utilised to minimise the need for new site entrances. Some public roads and intersections would need to be upgraded to facilitate delivery of Project components, particularly wind turbine blades.
    - Internal access roads. Existing access tracks within the commercial forestry operation and on land currently used for agricultural purposes would be used where possible. Some of these roads and intersections may need to be upgraded.
- Up to eight meteorological monitoring masts within the wind farm site
- Permanent hardstand areas at each turbine location, with a footprint of approximately 0.4 ha, subject to refinement based on the dimensions of the final wind turbine model selected
- Three collector substations
- Underground powerlines connecting the wind turbines to the collector substations
- A main wind farm substation to which all the collector substations would be connected. The main substation would connect the wind farm to the existing electricity transmission network via a new transmission line.
- A high voltage powerline connecting the collector substations to the main substation, which would be a combination of overhead and underground cabling
- Transition stations at which the high voltage powerline would transition from overhead to underground or vice versa (if needed; see below)
- Up to two permanent site compounds, including 30 carparking spaces at each location.

Temporary infrastructure associated with construction of the wind farm would include:

- Up to three concrete batching plants.
- Laydown areas with a footprint of approximately 0.6 ha located at each turbine.

- Up to six construction compounds, each containing a site office, carparking, storage, amenities, and a workshop.

2.1.2 Onsite quarry

A new limestone quarry is also proposed to be established in the wind farm site adjacent to the existing quarry operated by Green Triangle Forest Products (GTFP), on North Livingston Road. The cemented “cap rock” quarry would operate during both construction and operation, with the extracted material to be used for hardstands and for upgrades to existing access roads or construction of new access roads.

The quarry would have a maximum footprint of 9 ha and be up to 15 m deep, with actual dimensions to be determined following a comprehensive drilling, sampling and testing program during detailed design of the Project. The total extracted volume is estimated to be up to 300,000 cubic metres (m3), with material to be extracted progressively during construction. The quarry would also be used throughout the Project’s lifetime for road maintenance and would be made safe and rehabilitated at the end of its use for the Project to a suitable landform.

2.1.3 Electrical reticulation

The Project would require new electrical reticulation that involves the construction of underground and overhead cabling throughout the wind farm site and electrical substations. A new transmission line to connect the Project to the existing transmission network is also proposed.

2.1.4 Main substation

A main electrical substation would be constructed in the wind farm site to facilitate connection of the Project to the existing electricity network. This substation would be located near the eastern boundary of the wind farm site to minimise the distance between the substation and the connection point to the transmission network (at the Heywood Terminal Station).

The main substation would have a footprint of up to 3.3 ha with a maximum height of approximately 40 m. It would contain protection equipment and a control room with communications equipment, with tanks for storing water and oil for maintenance of the collector and main substation equipment. The substation would be constructed on a hardstand, with appropriate contamination/stormwater controls used around the oil tanks such as bunding and concrete slabs. The substation would be fully enclosed in security fencing with sufficient space for a fire break and screening around the perimeter.

2.1.5 Collector substations

Up to three collector substations would be constructed within the wind farm site to facilitate collection and distribution of electricity generated from the wind turbines into the existing electricity network.

The collector substations would have a footprint of up to 1 ha with a maximum height of approximately 35 m. Each substation would contain a range of electrical equipment including step-up transformers, protection equipment (including lightning protection), and a high voltage bus bar connecting to the high voltage overhead powerline. The collector substations would be constructed on hardstands, with the transformers mounted on concrete slabs. The collector substations would be fully enclosed in security fencing.

2.1.6 Onsite wind farm powerlines

The Project would involve the installation of up to 190 km of underground powerlines (33 kV or 66 kV) connecting the wind turbines to the collector substations, and up to 27.8 km of high voltage powerline connecting the collector substations to the main wind farm substation.

The high voltage powerline would likely be 275 kV (subject to detailed design) and would run overhead along Portland-Nelson Road from the western collector substation to the eastern collector substation.

From the Portland-Nelson Road / Sandy Hill Road intersection it would pass beneath Portland-Nelson Road then continue underground to the main wind farm substation.

The underground route through the GTFP plantation is the preferred option for a range of reasons, including minimising impacts on native vegetation, minimising bird and bat collision risks, and minimising traffic disruption along Portland-Nelson Road. However, part of the underground route is located within land zoned Public Park and Recreation Zone (PPRZ), which recognises areas for public recreation and open space and provides for appropriate commercial uses. GSC considers this PPRZ area to be an anomaly in the Glenelg Planning Scheme (the Planning Scheme) as it is under private ownership (timber plantation), and is seeking to rezone it to Farming Zone.

Although a wind energy facility (including infrastructure such as powerlines) is not prohibited in the PPRZ, the decision was made to remove all Project infrastructure from within the zone to be consistent with its public recreation objectives. The preferred underground route for the 275 kV powerline would therefore only be progressed if GSC's Planning Scheme amendment is successful, or if Neoen seeks permission from the land manager for the infrastructure to be located within the PPRZ. Only one of the options would ultimately be constructed.

2.1.7 Transmission line

The Project would require a new 275 kV transmission line to connect the Project to the existing transmission network. The proposed transmission line route measures approximately 26.6 km in length and would extend underground from the main wind farm substation near the eastern boundary of the wind farm site to the existing Heywood Terminal Station. The transmission line would bisect Cobboboonee National Park and Cobboboonee Forest Park for approximately 17.6 km, where it would be buried beneath an existing road (Boiler Swamp Road).

After exiting Cobboboonee Forest Park the underground line would continue for 1.2 km through freehold agricultural land and two options have been identified for this section of the transmission line. The slightly shorter southern route is the preferred option, but due to its proximity to a swampy area adjacent to the Surrey River it may not be feasible for underground construction. The viability of this option will be determined in response to geotechnical investigations undertaken during detailed design and only one option would ultimately be constructed. After crossing the Surrey River, the transmission line would continue underground until its connection point into the Heywood Terminal Station.

The underground route through Cobboboonee National Park / Forest Park has been delineated into a 6.5 m wide construction footprint to minimise impacts on native vegetation within the Boiler Swamp Road corridor. The cabling would be buried using a specialised machine that excavates, lays the cable and backfills the trench in a single pass, minimising the associated construction footprint through small trench widths and minimal spoil generation. Once the transmission line exits Cobboboonee Forest Park, the construction footprint would be approximately 9 m wide as it continues through freehold land until it reaches Heywood Terminal Station. Traditional open-cut trenching methods would be used for this section of the underground transmission line.

All transmission line options that have been considered for the Project, including those which are no longer being pursued by Neoen, are discussed in Chapter 4 of the EES and detailed in the options assessment report prepared by Umwelt (2023). Appendix B of this report provides a summary of the impacts associated with three alternative transmission line options considered by Neoen to date, including a combined overhead-underground option to the Heywood Terminal Station, and overhead and underground options through freehold land southeast of the wind farm site. These options are referred to as Options 1A, 2A and 2B, respectively

3.0 EES Scoping Requirements

3.1 EES Scoping Objectives

The Scoping Requirements for the project were issued by the Victorian Minister for Planning in February 2020 (dated January 2020). These set out the specific matters to be investigated and documented in the EES, in accordance with the *Ministerial guidelines for assessment of environmental effects* under the *Environment Effects Act 1978*.

The evaluation objective relating to catchment values and hydrology, as provided in the project's EES Scoping Requirements, is relevant to surface water and identifies the desired outcomes in the context of potential project effects. The evaluation objectives in the Scoping Requirements provide a framework to guide integrated assessment of the environmental effects of the project.

The following Evaluation objective for catchment values and hydrology is relevant to the surface water assessment:

To maintain the functions and values of aquatic environments, surface water and groundwater quality and stream flows and prevent adverse effects on protected beneficial uses.

It should be noted that 'beneficial uses' have been replaced with 'environmental values' under the *EP Act* enacted 1st July 2021. This is described further in Section 4.1.

3.2 EES Scoping Requirements

The aspects from the scoping requirements relevant to the evaluation objective are shown in Table 1 as well as the location where these items have been addressed in this report.

Table 1 Scoping requirements relevant to surface water

Aspect	Scoping requirement	Section addressed
Key issues	Potential for the project to have significant impact on wetland systems, including, but not limited to, Glenelg Estuary and Discovery Bay Ramsar site and its associated aquatic environments, and the ability for wetland systems to support habitat for protected flora and fauna species.	Section 6.2 describes the surface water context, including the Glenelg Estuary and Discovery Bay Ramsar site and the DEECA mapped current wetlands. Section 8.0 outlines the key risks that the project may have on these receiving wetlands. The residual risk of the project impacting wetland systems was determined as low.
	The potential for adverse effects on nearby and downstream water environments (including Glenelg Estuary and Discovery Bay Ramsar site and listed Nationally Important Wetlands) due to changed water quality, flow regimes, impacts on groundwater or waterway conditions during construction.	Section 6.2 describes the surface water context for the project area, including consideration of water quality and flow regime. Section 8.1 outlines the key risks that the project may have on these waterways and wetlands during the construction phase. The residual risk of the project impacting downstream water environments was determined as low.
	The potential for adverse effects on the functions and environmental values of surface water due to the project's activities, including water extraction, interception or diversion of flows, discharges or seepage from quarrying areas, turbine foundations and other operational areas or saline water intrusion.	Section 6.2 describes the surface water context for the project area, including consideration of hydrology. Section 8.2 outlines the key risks that the project may have on the existing flow regime during the operational phase. The residual risk of the project having adverse effects on the functions and environmental values of surface water was determined as low.

Aspect	Scoping requirement	Section addressed
	Potential for the project to have a significant effect on hydrology and affect existing sedimentation and erosion processes leading to land and aquatic habitat degradation	Section 6.2 describes the surface water context for the project area, including consideration of hydrology. Section 8.2 outlines the key risks that the project may have on the existing flow regime during the operational phase. The residual risk of the project having a significant effect on hydrology was determined as low.
	Potential for disturbance of contaminated or acid sulfate soils.	Section 8.1 outlines the key risks associated with the potential disturbance of acid sulfate soils during construction. EES Technical Report: *Environmental Site Investigation* also details potential sources of contamination and acid sulfate soils in the project area
Existing environment	Characterise the groundwater (including depth, quality and availability to licence/use) and surface water environments and drainage features intersecting with the project area and its environs.	Section 6.1 describes the regional surface water context and Section 6.2 describes the local surface water context for the project area and connected catchments. Section 7 of EES Technical Report: *Groundwater Impact Assessment* - details the interaction between groundwater and surface water and potential impacts of the project on groundwater flow
	Characterise the wetland systems in the project area and its environs including the extent, types and condition of wetlands that could be impacted by the project, having regard to terrestrial and aquatic habitat, including as habitat corridors or linkages.	Section 6.2 describes the local surface water context for the project area and connected catchments. This includes the characterisation of wetlands. EES Technical Report: *Flora and Fauna Existing Conditions and Impact Assessment* details potential impacts of the project on flora and fauna within and near the project area.
	Characterise hydrological requirements for wetlands in the project area and its environs and their acceptable limits for change.	Sections 6.2 describes the local surface water context for the project area and connected catchments. This includes the characterisation of wetlands. Sections 6.2 and 4.4 also define the limits of acceptable change for wetlands.
Likely effects	Assess the potential effects of the project on surface water and groundwater environments and associated environmental values, including on permanent and ephemeral wetland systems in the project area and its environs and downstream, considering appropriate climate change scenarios.	Section 8.1 outlines the potential impacts that the project may have on the existing surface water environments during Construction. Section 8.2 outlines the key impact that the project may have on the existing surface water environments during the operational phase. EES Technical Report: *Groundwater impact assessment* details the potential impacts of the project on groundwater flow. EES Technical Report: *Groundwater Dependent Ecosystem Impact Assessment* details the potential impacts

Aspect	Scoping requirement	Section addressed
		of the project on GDEs, including the Glenelg Estuary and Discovery Bay Ramsar site.
	Assess the potential effects on Glenelg Estuary and Discovery Bay Ramsar site, due for example to changed water quality, flow regimes, impacts on groundwater or waterway conditions during construction considering appropriate climate change scenarios.	Section 8.1 outlines the potential impacts that the project may have on the Glenelg Estuary and Discovery Bay Ramsar site during Construction. Section 8.2 outlines the key impact that the project may have on the Glenelg Estuary and Discovery Bay Ramsar site during the operational phase.
	Identify and assess potential effects of the project on soil stability, erosion and the exposure and disposal of contaminants or hazardous soils (e.g. acid sulfate soils).	Section 8.1 outlines the potential impacts that the project may have on changes to flow regime and associated soil stability and erosion during construction. Section 8.2 outlines the potential impacts on changes to flow regime and associated soil stability and erosion during the operational phase. EES Technical Report: *Environmental Site Investigation* assesses the potential impacts of contamination and acid sulfate soils in the project area.
Mitigation measures	Identify proposed measures to mitigate any potential effects, including any relevant design features or preventative techniques to be employed during construction and operation.	Section 9.0 sets out the proposed measures that are considered necessary to mitigate the potential impacts during the construction and operation phases.
Performance Objectives	Describe proposed measures to manage and monitor effects on catchment values and identify likely residual effects.	Section 9.0 describes the monitoring objectives for the operational phase. Section 9.0 also sets out the proposed monitoring measures for the construction and operation phases.
	Describe contingency measures for responding to unexpected but foreseeable impacts such as disturbance of acid sulfate soils.	Section 9.0 sets out the proposed contingency measures that are considered necessary to mitigate the potential impacts during the construction and operation phases. EES Technical Report: *Environmental Site Investigation* describes the contingency measures related to the impacts of contamination from acid sulfate soils in the project area.

4.0 Evaluation Framework

The assessment considered the legislation, policy and standards that are relevant to surface water, as well as specific assessment criteria that have been derived for the purposes of the study.

4.1 Legislation, policy and guidelines

Table 2 summarises the relevant environmental legislation that applies to the project in the context of this surface water impact assessment, as well as the implications and required approvals.

Table 2 Primary environmental legislation and associated information

Legislation/ policy	Key policies/strategies	Implications for the project	Approvals required
Commonwealth			
Environment Protection and Biodiversity Act 1999 (*EPBC* Act)	The EPBC Act commenced in July 2000 and is the Australian Government's key piece of environmental legislation. The EPBC Act has a broad range of objectives including the protection environment, particularly 'matters of national environmental significance'.	The project has the potential to impact the Glenelg Estuary and Discovery Bay Ramsar site. This Ramsar site is considered a matter of national environmental significance.	Project is a controlled action and will require approval under the EPBC Act. Threatened species and ecological communities protected under the EPBC Act which may rely on surface water in the Project Area, are considered in the biodiversity reports prepared by Biosis and summarised in the Matters of National Environmental Significance Report prepared by Umwelt.
National Water Quality Management Strategy (NWQMS) - Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG 2018 Water Quality Guidelines)	The guidelines provide authoritative guidance on the water quality objectives required to sustain current environmental values for natural or semi-natural water resources in Australia and New Zealand. The guidelines identify limits to acceptable change in water quality that would continue to protect the associated environmental value.	These guidelines are not mandatory, however, meeting the guidelines would provide a level of certainty that there would be no significant impact on waterways or environmental values.	No approvals required
Victorian Government			

Legislation/ policy	Key policies/strategies	Implications for the project	Approvals required
Water Act 1989	The *Water Act 1989 (Vic)* ('Water Act') sets the legal framework for managing and protecting water resources across the State. It seeks the integrated management of all elements of the water cycle and maximises community involvement in the implementation of arrangements relevant to the use, conservation and management of water resources. The Act also establishes the responsible authority for the control and management of waterways. Waterway.	Approval is required from Glenelg Hopkins Catchment Management Authority (GHCMA) for any works on, over or under a designated waterway.	Approval from GHCMA prior to commencing construction. Consent for minor waterway work will be required for each crossing.
Marine and Coastal Act 2018 *Siting and Design guidelines for structures on the Victorian Coast*	Indicates that a person must not use or develop or undertake works on marine and coastal Crown land without consent.	The project should assess whether elements of this Act impact the design of the proposed works.	No approvals required
Marine and Coastal Policy (2020)	The strategy establishes sea level rise planning benchmarks.	The project should assess whether elements of this policy impact the design of the proposed works	No approvals required
Environment Protection Act 2017 (Vic)	Amendments to the *Environment Protection Amendment Act 2017 (Vic)* were incorporated on 01 July 2021. The EP Act includes a new approach to tackling environmental issues, focusing on preventing waste and pollution impacts rather than managing those impacts after they have occurred. The legislation will improve the protection of Victoria's environment and human health through a more proportionate, risk-based environment protection framework. Central to the EP Act is the general environmental duty which requires that any person who is engaging in an activity that may give rise to risk of harm to	Any discharge into a waterway or groundwater during the construction of the project must be in accordance with the requirements of the *Environment Protection Act 2017 (Vic)* and subordinate legislation. The general environmental duty has been applied to this surface water impact assessment for the project as shown in the outcomes of the risk assessment process described in this technical report. It should be noted that GED is evolving over time and the requirements of the GED as relevant at	No approvals required

Legislation/ policy	Key policies/strategies	Implications for the project	Approvals required
	human health or the environment from pollution or waste to minimise those risks so far as reasonably practicable.	the appropriate time will need to be reflected in the CEMP and OEMP for the project.	
Environment Reference Standard (ERS) 2021.	Many of the components of the former SEPP (Waters) were adopted by the ERS. The ERS identifies the environmental values to be protected or maintained, as well as outlining the necessary indicators and objectives to achieve compliance with the EP Act 2017.	Meeting the environmental quality objectives as set out in Part 5 (Water) of the ERS will help the project minimise the potential for adverse impacts on surface water quality and ensure that existing environmental values are protected.	No approvals required
Planning and Environment Act 1987	This Act establishes a framework for planning the use, development and protection of land in Victoria.	Works that have the potential to alter the flow of water across property boundaries could be a trigger for a planning permit.	A planning permit may be required if the proposed works have the potential to alter the flow of water across a property boundary.
Guidelines			
Managing the Floodplain: A guide to best practice in flood risk management in Australia (Australian Emergency Management Handbook Series - Handbook 7). (2017)	These technical guidelines were established by the Australian Emergency Management Program and provides best practice advice on how to understand and manage flood risk. This includes guidance on flood mitigation, land use planning and emergency management.	Adhering to the process and recommendations presented in this handbook will reduce the risks and impacts associated with flooding.	No approvals required
Technical Flood Risk Management Guideline: Flood Hazard. (Australian Institute for Disaster Resilience Guideline 7-3). (2017)	Part of the flood related 'Handbook 7' series, Handbook 7-3 provides specific guidance on the quantification of flood hazard. Flood hazard considers the relationship between flood depth and flow velocity and is particularly important in land development projects.	Adhering to the process and recommendations presented in these guidelines will ensure flood hazard is considered and mitigated for all aspects of the project.	No approvals required

Legislation/ policy	Key policies/strategies	Implications for the project	Approvals required
Best Practice Erosion and Sediment Control – Appendix P: Land based Pipeline Construction (IECA 2015)	Whilst primarily aimed at the construction of pipelines, these guidelines are applicable for similar ‘strip’ or ‘linear’ construction projects including the construction of cable conduits. The appendix provides specific guidance on the application of best practice erosion and sediment control to the construction of land-based pipelines, and pipeline crossings of waterways. Its purpose is to describe the various temporary drainage, erosion and sediment control measures that are available for use during the construction of land-based pipelines, and where possible, outline the circumstances in which their use is likely to be warranted.	Adopting the methodology and mitigation presented in this guideline will reduce the risks and impacts associated with erosion and sedimentation during construction and decommissioning works.	No approvals required
EPA Victoria Publication: 1834: Civil Construction, Building and Demolition Guide	This guide was released in November 2020 and replaces a number of best practice guidelines including EPA Publication 480: Environmental Guidelines for Major Construction Sites. This new guide covers a broad range of environmental issues associated with land development, construction and decommissioning activities and outlines the recommended and mandatory risk management measures.	Adopting the management framework and mitigation measures presented in these guidelines will reduce the risks of environmental impacts during construction and decommissioning works.	No approvals required
EPA Victoria (2021) Publication 1823.1; Mining and Quarrying – Guide to preventing harm to people and the environment.	This guide presents the key environmental risks of quarrying and mining operations, as well as providing examples of how to mitigate these risks.	Adopting the principles presented in these guidelines will reduce the risk of waterway pollution from the proposed quarrying operations.	Approval from Earth Resources Regulation (ERR) will be required for the proposed quarry.
EPA Victoria (2020) Publication 1896; Working Within of	This guide highlights the risks of working in and around waterways with specific focus on how to eliminate the or reduce	Adopting the principles presented in these guidelines will reduce the risk of waterway pollution from activities that cross	No approvals required

Legislation/ policy	Key policies/strategies	Implications for the project	Approvals required
Adjacent to Waterways.	the risk of harm from erosion, sediment and dust.	or occur adjacent to waterways.	
Liquid storage and handling guidelines. EPA 2018	This guide outlines the principles for preventing harm to the environment and human health when storing and handling liquid substances. This guide refers to bulk storage as well as smaller containers or packaged storage of liquid substances, and to liquids that are considered raw materials, product or waste.	Compliance with this guide will reduce the likelihood of pollution caused by the release liquids.	No approvals required
EPA Victoria (2021) Publication 1739; Urban Stormwater Management Guidance.	This guide highlights the risks of uncontrolled stormwater runoff on waterways and provides general objectives and information to support risk assessment and minimisation.	Adopting the principles presented in these guidelines will reduce the risk of stormwater pollution from any additional, permanent areas of impervious catchment.	No approvals required
Code of Practice: The storage and handling of dangerous goods	The code of practice provides practical guidance on how to comply with the obligations of Victoria’s occupational health and safety legislation for the safe storage and handling of dangerous goods.	Compliance with the code of practice will reduce the likelihood of pollution caused by the release of dangerous goods.	No approvals required

4.2 Environment Protection and Biodiversity Act 1999 (*EPBC* Act)

The project is considered a 'controlled action' under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (Cth) ('EPBC Act'). The Project is being assessed under the bilateral agreement between the Commonwealth and Victorian Governments, which allows the Project and potential impacts on MNES to be assessed under the Victorian EES process.

4.3 Environment Protection Act 2017 (Vic)

In Victoria, the EP Act came into effect in 2021 and is designed to prevent harm to human health and the environment from pollution and waste. At the centre of the EP Act is the general environmental duty (GED).

4.3.1 General environmental duty

The GED requires that:

any person who is engaging in an activity that may give rise to risks of harm to human health or the environment from pollution or waste must minimise those risks, so far as reasonably practicable.

The GED applies at all times, during construction and operation of the project, for any activities posing a risk of harm to human health and the environment. Meeting regulatory requirements does not mean that the GED has been met.

The following sections of the EP Act apply to the GED:

- Section 25(1) of the EP Act states that a person who is engaging in an activity that may give rise to risks of harm to human health or the environment from pollution (including noise, which includes sound and vibration) must minimise those risks so far as reasonable and practicable.
- Section 6 of the EP Act states that minimising risks of harm to human health and the environment requires the duty holder to eliminate risks of harm to human health and the environment so far as reasonably practicable and, if it is not reasonably practicable to eliminate those risks, then reduce those risks as far as reasonably practicable.
- Section 6(2) of the EP Act states factors to give regard to when determining what is reasonably practicable in relation to the minimising of risks to harm to human health and the environment.

4.3.2 Reasonably practicable

EPA Victoria Publication 1856: Reasonably Practicable provides guidance as to the factors to consider when defining proportionate controls to minimise harm, as follows:

- Eliminate first: Can you eliminate the risk?
- Likelihood: What's the chance that harm would occur?
- Degree (consequence): How severe could the harm be on human health or the environment?
- Your knowledge about the risks: What do you know, or what can you find out, about the risks your activities pose?
- Availability and suitability: What technology, processes or equipment are available to control the risk? What controls are suitable for use in your circumstances?
- Cost: How much does the control cost to put in place compared to how effective it would be in reducing the risk?

The items above have been considered when assessing the suitability of mitigation measures for the project. This is evidenced in the Waterway and Wetlands Crossing assessment in Section 6.2.7 where potential mitigation measures were not adopted because they were not seen as reasonably practicable. For example, using HDD waterway crossing methodologies for all waterways not considered to be reasonably practicable and therefore open cut trenching techniques were adopted for most of the crossings.

4.4 Assessment criteria

The assessment criteria considered in this surface water assessment are outlined below.

4.4.1 Water quality:

Runoff from the proposed construction works, operational phase and decommissioning activities would aim to meet the water quality indicators and objectives for the downstream receiving waterways, as defined in the Environment Reference Standard (ERS) (2021).

The project is located within the 'Lowlands of Glenelg, Hopkins, Portland and Corangamite and Millicent Coast Basins' segment of the Murray and Western Plains. The ERS (2021) outlines the water quality indicators and objectives for this segment. These are presented in Table 3.

Table 3 Water quality indicators and objectives for the receiving waterways of the Lowlands of Glenelg, Hopkins, Portland and Corangamite and Millicent Coast Basins segment, as defined in the ERS (2021).

Total Phosphorus (µg/L)	Total Nitrogen (µg/L)	Dissolved Oxygen (% saturation)		Turbidity (NTU)	Electrical Conductivity (µS/cm@ 25°C)	pH (pH units)		Toxicants (Water)
75th Percentile	75th Percentile	25th Percentile	Maximum	75th Percentile	75th Percentile	25th Percentile	75th Percentile	% Protection
≤55	≤1,100	≥65	130	≤20	≤2,000	≥7.0	≤8.0	95

Surface water quality monitoring during construction will be carried out to ensure runoff from the proposed work sites do not impact the receiving waterways and wetlands. The water quality monitoring framework will be documented in the CEMP and site-specific sampling details provided in the SWMP.

Permanent infrastructure should be designed to meet the water quality requirements of the Urban Stormwater Best Practice Environmental Management (BPEM) Guidelines (1999) and EPA Publication 1739.1: Urban Stormwater Management Guidance (2021). This includes the following pollutant reduction objectives:

- Suspended solids: 80 per cent reduction in mean annual load.
- Total phosphorus: 45 per cent reduction in mean annual load.
- Total nitrogen: 45 per cent reduction in mean annual load.
- Litter: 70 per cent reduction of mean annual load.

4.4.2 Flood risk:

The proposed construction works, operational and decommissioning activities would aim to achieve the requirements of the following guidelines:

- Managing the Floodplain: A guide to best practice in flood risk management in Australia (Australian Emergency Management Handbook Series - Handbook 7).
- Technical Flood Risk Management Guideline: Flood Hazard. (Australian Institute for Disaster Resilience Guideline 7-3).

Where required, flood modelling will be undertaken during the detailed design phase and additional input sought from the GHCMA (e.g. to obtain flooding and floodplain and advice for the project).

5.0 Methodology

A systematic risk-based approach has been applied to understand the existing environment, the potential impacts of the project and how to avoid, minimise or manage the risk of impact. This approach has also been guided by the evaluation framework presented in Section 4.0.

The following sections outline the method for the surface water impact assessment.

5.1 Existing conditions assessment

This work was carried out as a desktop assessment and supported by a field visit to ground truth the assessment findings and confirm specific assumptions. The existing conditions assessment was prepared following a review of previous investigations, publicly available surface water data, management strategies and reports. Major waterways were investigated using aerial photography, DEECA GIS Layers and a site visit.

5.2 Risk assessment method

A system-based risk approach was adopted to examine the potential risks, impacts and mitigation measures for surface water and catchment values intersecting with the wind farm, transmission line and quarry. A risk assessment was carried out using an approach that is consistent with Australian/New Zealand Standard AS/NZS ISO 31000:2018 *Risk Management Process*.

The risk assessment process provides a method for:

- identifying key project risks to inform where detailed investigations are required
- ensuring the level of investigation is proportionate to the relative environmental risk
- assessing the effectiveness of proposed mitigation measures and whether additional measures may be required.

Risks to the project were defined as a combination of:

- the magnitude of potential consequences of an event
- the likelihood of the event occurring.

The risk assessment process developed for the project involved the assignment of consequence and likelihood ratings which combined to give an overall risk level for each identified risk.

The initial findings of the impact assessment were used to identify and describe cause-and-effect pathways for the project to determine links between project activities and their subsequent environmental consequences (known as risk pathways). These risk pathways were identified considering the assets, values and uses requiring protection identified during the existing conditions assessment.

5.2.1 Assigning consequence of risks

In this risk assessment, the consequences of a risk occurring were assigned using a consequence guide. Specific consequence categories were developed considering existing conditions in the study area. The consequence rating criteria used in the risk assessment specifically for risks relating to surface water is shown in Table 4.

Table 4 Surface water consequence rating criteria

Level	Qualitative description
Negligible	Applicable water quality standards met across the region. Negligible or very minor change to waterway and flow regime.
Minor	Isolated, minor and temporary exceedance of applicable water quality standards that is short lived. Some change to waterway or flow regime with minor implications.
Moderate	Localised exceedance of applicable water quality standards. Changes to waterway or floodplain function with moderate implications.
Major	Major exceedance of water quality standards in a local area. Waterway, floodplain levels that impact project or river health significantly compromised.
Severe	Regional and prolonged exceedance of applicable water quality standards. Extensive impact to waterway, floodplain function or flow regime with irreversible disturbance to river health or flood levels.

5.2.2 Assigning likelihood of risks

A likelihood rating for each identified risk pathway was assigned using the guide in Table 5. The likelihood criteria in the risk assessment range across a scale from ‘almost certain’ where ‘the event is expected to occur in most circumstances or is planned to occur’ to ‘rare’ where ‘the event may occur only in exceptional circumstances.’

Table 5 Likelihood guide

Level	Description
Rare	The event may occur only in exceptional circumstances
Unlikely	The event could occur but is not expected
Possible	The event could occur
Likely	The event will probably occur in most circumstances
Almost certain	The event is expected to occur in most circumstances or is planned to occur

5.2.3 Risk assessment matrix and risk rating

Together, the consequence and likelihood were combined to arrive at a risk rating, using the matrix shown in Table 6.

Table 6 Risk assessment matrix

		Consequence ratings				
		Negligible	Minor	Moderate	Major	Severe
Likelihood rating	Rare	Very low	Very low	Low	Medium	Medium
	Unlikely	Very low	Low	Low	Medium	High
	Possible	Low	Low	Medium	High	High
	Likely	Low	Medium	Medium	High	Very high
	Almost certain	Low	Medium	High	Very high	Very high

5.2.4 Application of mitigation measures

An initial set of mitigation measures were developed as part of this impact assessment. These mitigation measures were based on the need to comply with the legislation and standard requirements that are typically incorporated into the delivery of infrastructure projects of similar type, scale and complexity.

As the project design, construction methodology and operation strategies were well progressed at the commencement of this impact assessment, mitigating measures that were already incorporated in the project design have been included as initial mitigation measures.

Initial risk ratings were applied to each identified risk pathway assuming that these initial mitigation measures were in place. Additional mitigation measures were developed where the initial risk ratings were categorised as medium or higher. Recommended mitigation measures are presented in Section 9.0 of this assessment report.

5.3 Impact assessment method

A change to baseline conditions caused by project activities in any of the project phases may give rise to impacts. The impact assessment involved identifying the severity, extent and duration of any impacts, positive or negative, that the project may have on the existing environment.

The surface water impact assessment was conducted based on publicly available information and supported by further field-based observations. No flood modelling, or water quality sampling was carried out as part of this impact assessment. The assessment focused on the impact of the project on waterways intersecting with the project and the Glenelg Estuary and Discovery Bay Ramsar site.

5.3.1 Construction

Potential impacts to surface water were identified by assessing the proposed construction phase activities that could impact environmental values of downstream water courses or receiving waters, including the Glenelg Estuary and Discovery Bay Ramsar site.

The impact assessment adopted a risk management hierarchy that prioritised the avoidance of surface water impacts above minimisation or treatment. This also considered the need to comply with industry specific legislation, best practice guidelines and standards.

One of the greatest risks to surface waters is the waterway crossings for the cable transmission alignment. The least intrusive method for waterway crossing is HDD that provides a negligible impact on the waterway and minimal ground disturbance. Trenching across waterways could create a greater disturbance but sediment deposition in the downstream waterway can still be minimised if controls are implemented, such as undertaking the works in dry periods and immediately reinstating the affected area. For trench works outside of the waterway, controls such as methods to dewater to disperse flows would be required to manage risks.

HDD has been adopted for waterway crossings where risks such as sedimentation of downstream waterways or damage to riparian zones or levees cannot be adequately mitigated by controls if trenching was adopted. Trenching has been proposed for other waterways and drainage lines where construction risks can be managed and other impacts, such as dewatering and reinstating bell holes required to accommodate boring machines, can be avoided. Locations of proposed HDD crossings are presented in **Figure 5 of Appendix A**.

Observations taken during the field visit on 20 April 2023, combined with publicly available data from DEECA and Geoscience Australia, were used in assessing the suitability of the proposed construction method for crossing each waterway and the following factors were considered:

- Whether the waterway was natural or had been significantly modified from its original form (constructed).
- Whether vegetation was intact or cleared including the extent of vegetation and ability to re-establish, based on surrounding land use.
- A combination of upstream catchment area and channel width, which provides an indication of whether the trench could be excavated and reinstated with certainty before rain is forecast so that sediment accumulating in the downstream waterway could be prevented.
- Waterway size also provides an indication of how easily the channel can be reinstated to match its existing form.
- Whether the waterway was ephemeral.

5.3.2 Operation

The wind turbine footings, access roads, and buildings for operations and maintenance may increase impervious areas and reduce existing flood storage at this site. Therefore, stormwater generated as a result of this development should be managed by on-site storage and conveyance structures where required (e.g. ditches to manage runoff from access roads, rainwater harvesting on the control room).

This assessment methodology considers the potential impacts of any permanent infrastructure on the existing flow regime and water quality. The assessment also considers whether more detailed studies, such as flood modelling, are required to inform the project on specific flooding issues and any necessary flood controls that may be required due to permanent infrastructure. Detailed flood assessments may also be required to inform the location, elevation and design of critical infrastructure in relation to the 1% AEP flood level. Setbacks from waterways and elevation of infrastructure above flood levels may also be required by Glenelg Hopkins Catchment Management Authority and Glenelg Shire Council.

5.4 Assumptions and limitations

Assumptions and limitations relating to this impact assessment are provided below:

- The surface water impact assessment is based on publicly available information and visual site-based observations. It does not consider additional field-based measurements, flood modelling, or water quality sampling.
- The assessment focuses on the impact of the project on all waterways intersecting with the Project with a focus on those flowing into the Glenelg Estuary and Discovery Bay Ramsar site.
- The flood extents in this report are derived from the current available overlays and zones. In this area limited investigations have been undertaken to determine flood extents. Therefore, areas that are at risk of flooding may not have planning overlays.
- Incorporating climate change scenarios, including rainfall intensity increases may change the standard for flood protection, road assets and other properties which are not assessed in this Report. The GHCMA Climate Change Strategy considers a 15% rainfall increase for

year 2090 climate change projection. This would be reviewed and, if still considered current, would be incorporated into the flood modelling investigation recommended for the project. GHCMA would be consulted during the detailed design phase of the project to ensure that any proposed flood modelling investigations adopt appropriate and acceptable allowances for climate change.

- The proposed project infrastructure sites will be located at elevations that vary between 20m and 140m AHD (approx.). These sites are also separated from water levels in the Glenelg Estuary and Discovery Bay Ramsar site and it has been assumed that sea level rise would not directly impact the project.
- The transmission line connecting the wind farm to the electricity network will be underground. It is assumed that any ground disturbance caused by these transmission line assets will be reinstated to the existing surface with no permanent obstructions to overland flow or waterways.
- The proposed project infrastructure will include minor roads and the use of some crushed rock and concrete at the facilities. However, it is assumed there would be no material change to the existing proportion of impervious surfaces associated with the electricity cabling routes.
- There are no proposed works to permanently alter the existing cross section of waterways or alter existing levees or flood controls.

This Report must be read in the context of limitations and assumptions mentioned above and the purpose for which it was intended. The limitations and assumptions referred to throughout the Report and other relevant issues outside of the Report scopes are solely for the purpose of this assessment.

5.5 Stakeholder engagement

A program of stakeholder and community engagement will be undertaken to assist with Project development (refer to the EES Chapter 26 EES community and Stakeholder engagement chapter).

Specific stakeholder engagement undertaken as part of the surface water impact assessment is summarised in Table 5. In addition, consultation with the community has identified the following concerns relating to surface water:

- contaminated water spilling into the Glenelg Estuary and Discovery Bay Ramsar sites Ramsar and affecting impacting marine life, flora and fauna and birds
- potential for noise, air and acid sulfate soils pollution causing impact to soil, waterways and groundwater.

Engagement to date:

- The Mayor and CEO of Glenelg Shire Council
- The Executive Officer and Chair of Portland Committee
- Met with proposed host landowners
- Undertaken stakeholder identification and analysis.
- Neighbouring property owners
- Indigenous groups
- Confirm Community Drop-in Sessions
- Develop feedback form

Table 5 Stakeholder engagement undertaken as part of the surface water impact assessment

Stakeholder	Key issues discussed	Engagement outcome
DEECA	Refer to Section 3.4 of the Flora and Fauna Impact Assessment at Appendix C of the EES. DEECA was notably consulted by Neoen Project team within onsite transmission route surveys of the waterway crossings and culverts. A workshop was held in 2020 with TRG representatives from DEECA, the CMA, DTP IAU, and Southern Rural Water to discuss the initial findings of surface water and groundwater characterisation studies for the Project.	Onsite meetings attended by DEECA allowed to gather on-the-ground knowledge about flooding events, road management etc. The workshop discussed potential next steps for the surveys, and made recommendations in relation to which other stakeholders might be able to provide additional information.
Host landowners	Considerable consultation has been conducted with host landowners, including GTFP. Drainage installed by farmers / owners around paddock perimeter to drain excess surface, to allow for livestock and cropping. New access tracks to have appropriate drainage to ensure current status of surface water in paddocks to remain the same.	GTFP was involved from the early stages of the project constraints mapping and provided their on-the-ground perspective on water related issues such as the locations of wetlands, waterways, depressions, as well as insight on potential flooding risks. Host landowners happy to share knowledge of known water runoff, during detailed design. Design requirements for culverts relating to access tracks were included in contracts where conversations were had with landowners.
Neighbouring property owners	Refer to Sections 3.3.3 and 4.1.5 of the Brolga Impact Assessment at Appendix E of the EES for details about discussions with landowners in relation to wetlands.	Refer to Sections 3.3.3 and 4.1.5 of the Brolga Impact Assessment at Appendix E of the EES for details about discussions with landowners in relation to wetlands.
Indigenous groups	Cultural heritage surveys have been undertaken to ensure the wind farm's design protects local cultural artefacts and values.	The Cultural Heritage Assessment has identified denser Aboriginal cultural heritage presence towards the coastline. Artefact scatters are becoming more dispersed farther inland away from main water sources.

Stakeholder	Key issues discussed	Engagement outcome
	Distance from non-coastal water were used as the base layers in constructing the predictive model for the Cultural Heritage Assessment. Neoen is working with the Gunditj Mirring Traditional Owner Aborigina Corporation (GMTOAC) to undertake an extensive cultural values assessment to ensure the project has a positive legacy for the Gunditjmara community.	Aboriginal occupation on the Study Area was often centred around waterways and areas adjacent to water sources, including swamps. These swamp lands and watercourses would have provided Aboriginal people with freshwater as well as an abundant source of animal and plant resources. Areas considered to have the highest likelihood of containing Aboriginal cultural heritage were located in the vicinity of the southern boundary of Kentbruck Plantation, predominantly within 500 m of waterbodies. A CHMP will be finalised with the GMTOAC for the Project.

5.6 Linkage to other EES technical reports

The surface water impact assessment should be read in conjunction with other relevant technical reports forming part of the EES. Other potential impacts relating to groundwater, GDEs, biodiversity and contamination have been considered in detail in other technical reports:

- EES Technical Report: *Groundwater impact assessment* - details the interaction between groundwater and surface water and potential impacts of the project on groundwater flow
- EES Technical Report: *Environmental Site Investigation* - details potential sources of contamination and acid sulfate soils in the project area
- EES Technical Report: *Flora and Fauna Existing Conditions and Impact Assessment* - details potential impacts of the project on flora and fauna within and near the project area
- EES Technical Report: *Groundwater Dependent Ecosystem Impact Assessment* – details potential impacts of the project on GDEs, including the Glenelg Estuary and Discovery Bay Ramsar site.

6.0 Existing conditions

Awareness of the existing catchment hydrology and current water quality is required in order to understand the pre-development conditions of the catchment including waterway condition, floodplain characteristics and the associated environmental values. The findings of the existing conditions study informed the impact assessment documented in this report.

The existing conditions assessment considers the following elements:

- Regional Catchment Context
- Local Surface Water Context
  - Topography and Land Use
  - Hydrology
  - Flooding
  - Waterway Condition
  - Glenelg Estuary and Discovery Bay Ramsar Site
  - Environmental Values
  - Water Supply
  - Water for Construction.

6.1 Regional Catchment Context

The Glenelg Hopkins catchment with a drainage area of almost 2.7 million hectares is located in western Victoria and encompasses the four river basins of Glenelg, Hopkins, Portland Coast and Millicent Coast (**Figure 1 – Appendix A**). The GHCMA is responsible for river health and is accountable for regulation of works on waterways and floodplains, rural drainage and waterway and floodplain management

Major cities and towns within the catchment include Warrnambool, Hamilton, Portland, part of Ballarat, Ararat, Casterton, Port Fairy and Beaufort with a population of approximately 130,000 people. The region's main economic drivers are agriculture, fisheries, retail, manufacturing, health and community services, education and construction, while agriculture, forestry and fishing are the major employers.

The Glenelg Hopkins catchment covers a diverse range of landscapes including mountain ranges, coastal areas and agricultural land. The region also features significant natural reserves such as the Glenelg Estuary and Discovery Bay Ramsar site, and national parks with high conservation values including the Grampians National Park, Port Fairy and Warrnambool, Yambuk and the Discovery Bay Coastal Park (GHCMA annual report 2018-2019).

The largest waterway within the Glenelg Hopkins Catchment is the Glenelg River which is located to the north of the proposed wind farm site (GHCMA, 2019).

Waterways in the Glenelg Hopkins region have high environmental, social, economic and cultural value (environmental values) including:

a. the supply of water for industrial, agricultural and domestic use

b. recreational pursuits such as bird watching, kayaking and fishing

c. strong cultural connections to waterways across the region with links to the Gunditj Mirring Traditional Owners Aboriginal Corporation (GMTOAC) for the proposed footprint area, and Barengi Gadjin Land Council (BGLC) for the connecting northern GHCMA area (GHCMA Annual Report 2018-2019).

Flooding is a natural hazard in the Glenelg-Hopkins catchment, mainly caused by high rainfall and coastal storm surges. There is a history of flooding along the Glenelg River, Wannon River, Portland, Fitzroy River, Condah Drain, Darlot Creek, Heywood, Port Fairy and Merri rivers in addition to flash flooding of urban centres. Major regional floods (1946, 2011 and 2016) occurred in the Portland Coast and Hopkins River basins respectively (GHCMA Flood Strategy 2017, DELWP 2018).

Wetlands feature extensively in the region, numbering over 5,400 and covering 73,000 hectares or 3% of the catchment area (GHCMA Waterway Strategy, 2014-2022). Based on the Index of Wetland Condition (IWC 2009), wetlands in the catchment have been assessed to be mostly in good condition, with 64% of wetlands in good to excellent condition.

A key feature of the Glenelg Hopkins Catchment is the Glenelg Estuary and Discovery Bay wetlands. These wetlands are recognised for their outstanding values, features and diversity of habitats and are listed under Ramsar Convention on Wetlands of International Importance (**Figure 1 – Appendix A**). Management of the Ramsar site is coordinated by the Victorian Government through DEECA (Glenelg Estuary and Discovery Bay Ramsar Site Management Plan, 2017). The project area is adjacent to the Glenelg Estuary and Discovery Bay Ramsar site.

6.1.1 Glenelg River Basin

The Glenelg Basin is located in the west of the Glenelg Hopkins region and contains the Glenelg River which is classified as a heritage river under the *Heritage River Act 1992*. Major tributaries of the Glenelg River include the Crawford, Stokes and Wannon rivers.

The Glenelg basin contains the Rocklands reservoir in the north of the region, upstream from the Glenelg River. The basin is diverse as it contains many national parks, a Ramsar site and threatened ecological communities. Based on the Index of Stream Condition (ISC 2010) benchmarking, just over two-thirds (68%) of the stream length draining to the Glenelg River was in moderate condition. Of the remainder, 10% was in good condition, 16% was in poor condition and 6% very poor condition (GHCMA Annual Report 2018-2019).

6.1.2 Portland Coast Basin

The Portland Coast basin is located in the south of the Glenelg Hopkins region and is characterised by the relatively short rivers that into the Southern Ocean. Sub-catchments within the basin include the Moyne, Surrey, Darlot Creek-Fitzroy River system and Eumerella-Shaw system. Based on ISC 2010, 84% of the stream length of these waterways within this basin was in moderate condition, 15% in poor condition and 0.4% in very poor condition (GHCMA Annual Report 2018-2019).

6.1.3 **Hopkins Basin**

The Hopkins Basin is located in the east of the Glenelg Hopkins region and contains a number of tributary systems that feed into Hopkins River. These include the Mount Emu, Salt and Fiery creeks. The catchments and waterways of the Hopkins basin have been significantly modified through agricultural land use. Based on the ISC 2010, just 6% of stream lengths were in moderate condition, with poor and very poor conditions being at 38% and 56% respectively (GHCMA Annual Report 2018-2019). The Project Area does not intersect the Hopkins Basin.

6.2 Local Surface Water Context

The proposed wind farm site and transmission line route are located within the Glenelg Basin and Portland Coast Basin catchment regions **(Figure 1 – Appendix A).**

The proposed wind farm is located mostly in the southside of Glenelg River basin with a small portion of land (less than 10%) in the Portland Coast basin **(Figure 2 – Appendix A)**. The proposed site is bound by the Glenelg Estuary and Discovery Bay Ramsar site along the northern and southern borders. Land uses include commercial forest plantations of radiata pine with agricultural grazing at the western and eastern ends of the site.

6.2.1 Topography and Land Use

The general topography of the wind farm site is graded towards the Glenelg Estuary and Discovery Bay Ramsar site with highpoints across Portland-Nelson Road at the north of the site. The north-west corner of the site is divided by Portland-Nelson Road. Topography on the south side of the Portland-Nelson Road follows a local ridgeline that connects a local highpoint to the mountain range running north south, beginning at Mount Richmond, through the Lower Glenelg and Cobboboonee National Parks.

The commercial forestry land (Kentbruck Plantation) is highly modified and includes logging roads to manage forest operations. There are five farm dams on the south of the plantation (Geoscience Australia, 2019) as shown in **Figure 3 – Appendix A.** The operational status and design of these dams is not known.

The proposed transmission line route stretches approximately 26.6 km through the south-western region of the Portland Coast basin. Surrey River and Mt Kincaid Creek are two major waterways that intersect with the proposed underground route (**Figure 5 – Appendix A**) as it crosses through Cobboboonee National Park and open farmland to the existing Heywood Terminal Substation (**Figure 5 – Appendix A**).

6.2.2 Climate

Rainfall varies across the region and is typically higher along the coast than rainfall experienced further inland. Average annual rainfall totals for the site are generally around 800 millimetres a year compared to 670 millimetres a year recorded at Coleriane (BOM Station ID 090024), approximately 70 kilometres north-west of the site.

The nearest rain gauge to the site is located at Mount Richmond (BOM Station ID 90197), however, this site only opened in 2021 and is yet to record a full year of data.

The nearest stations with an extensive annual rainfall record are Cape Bridgewater (opened in 1905), Nelson (opened in 1884), and Drik Drik (opened in 1907). The mean monthly and annual rainfall totals for these gauging stations are presented in Table 7. These records show that rainfall totals are typically higher during July and August (shown dark green) and lower around February (shown light green).

Table 7 Mean monthly and annual rainfall totals in millimetres for Cape Bridgewater, Nelson and Drik Drik (Source: BOM 2022)

Station	Location	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
90013	Cape Bridgewater	34	33	41	63	87	99	114	106	81	65	52	47	822
90059	Nelson	30	29	38	60	81	96	107	99	75	61	46	41	763
90036	Drik Drik	32	29	42	63	86	96	110	114	87	71	56	45	831

In the months preceding the 20 April 2023 site visit, the region had experienced significantly higher than average rainfall. Table 8 Provides a summary of the total recorded rainfall at Mount Richmond (BOM Station ID 90197) from April 2022 to April 2023. These higher-than-average rainfall totals were associated with the complex La Niña climatic pattern that had occurred consecutively since 2020 and brought cooler, wetter conditions to much of south-eastern Australia.

Table 8 Recorded higher than average monthly total rainfall for Mount Richmond in the months preceding the 20 April 2023 site visit.

		2022									2023			
Station	Location	Apr	may	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	April
90013	Mount Richmond (Blacks Rd)	93.6	94	131	114	159	104	143	125	60	20	64	79	105

6.2.3 Hydrology

There are three river gauging stations within the local and adjacent catchments. One inactive station located on Moleside creek (active 1973 - 1985), approximately 7 kilometres north east of the wind farm site, and two active station located on Surrey River at Heathmere (active 1975 – present), and Fitzroy River close to Heywood (active 1963 – present). Neither of these gauging stations are located inside the site boundary, however, they do illustrate the most probable seasonal variation within the broader catchment.

Table 9 presents a comparative summary of mean daily stream flows for each month at the Moleside Creek, Fitzroy River and Surrey River gauging stations. These records show that stream flows are at their highest during August and September (shown dark green) and lowest around February and March (shown light green).

Table 9 Mean daily stream flow for each month at the Surrey River, Moleside Creek and Fiztroy River surface water sites (Mega litres / day) (Source: Bureau of Meteorology, 2021).

Station	Location	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
237207	**Surrey River**	4.0	1.8	2.2	2.4	6.7	46.8	190.9	282.4	200.7	117.0	36.9	10.5
238233	**Moleside Creek**	14.1	9.9	9.6	9.9	10.9	16.3	34.9	63.0	68.1	47.8	29.5	17.6
237202	**Fitzroy River**	8.7	1.9	2.0	3.3	14.5	45.5	140.1	251.5	201.3	46.7	15.8	73.0

Surface water runoff from the western and central areas of the proposed wind farm site generally flows toward the Discovery Bay Ramsar site, however, the vegetated plantation and sandy soils ensure much of the rainfall occurring across these areas infiltrate into the ground. This potential reduction in runoff was evident during the site visit of 20 April 2023 where drainage channels and waterways were less prominent in the vicinity of the proposed quarry location (Figure 1)

Figure 1 The volume of surface water runoff appears to be lower in the vicinity of the proposed quarry site in comparison with sites located in the south eastern of the Project area.

Where runoff does occur, it is primarily conveyed through minor, ephemeral waterways and drainage pathways. These minor ephemeral waterways include the waterways that cross the area of agricultural land between Portland-Nelson Road and the eastern boundary. The majority of these waterways, to the west of Mount Kincaid, merge with Johnstone Creek and Mcphails Creek outside of the site boundary and eventually drain to the Discovery Bay Ramsar site. Figure 2 shows the ephemeral waterway of Johnstone Creek in the vicinity of the proposed substation.

Figure 2 The ephemeral waterway channel of Johnstone Creek, looking south towards the proposed substation area.

Waterways to the east of Mount Kincaid, such as Mount Kincaid Creek, drain eastward toward the southern boundary of the Cobboboonee Forest Park and into the Surrey River system.

There are also several farm dams in this area although the operational status or design of these dams is not known. (Geoscience Australia, 2019) (**Figure 4 – Appendix A)**.

6.2.4 Flooding

According to available flood information (DELWP, 2022), the proposed wind farm site is not located within a 1% Annual Exceedance Probability (1% AEP) flood extent. However, based on information available from DELWP (2022), there are several areas that are identified as low lying areas that may be subject to periodic inundation or waterlogging as presented in (**Figure 3 – Appendix A**). These areas include the waterways and current wetlands that occupy the cleared land in the south east area of the proposed wind farm site. Some areas of potential waterlogging may also occur adjacent to the east corner of the Discovery Bay Coastal Park (**Figure 4 – Appendix A**).

Part of the proposed underground transmission line is located in the 1% AEP flood extent for the Surrey River (DELWP, 2018) (**Figure 5 – Appendix A**).

The existing floodplains and major waterways that require consideration with respect to the proposed project include:

- Johnstone Creek
- Mcphails Creek
- Surrey River

- Wild Dog Creek
- Mount Kincaid Creek

6.2.5 Waterway condition

The Third Index of Stream Condition report (DELWP 2010) is a benchmarking process to determine the environmental condition of major rivers and streams across the state of Victoria. In the ISC report, each major river and stream was assessed over 5 categories. These were Hydrology, Physical Form, Streamside Zone, Water Quality and Aquatic Life.

For each reach of an assessed waterway, an overall ISC score of between 0-50 is given and subsequently assigned a rating of excellent, good, moderate, poor or very poor. Table 10 provides a summary of the of the sub-indices and metrics that were used to form the ratings in the ISC Report.

Surrey River was categorised as a major river or stream in the DELWP (2010) report. According to the ISC Report, Surrey River is in an overall moderate condition, with good to excellent physical form and vegetation levels, and low levels of aquatic life. Table 11 (DELWP 2010). No other waterways that interface with the project area were assessed in the ISC Report.

Table 10 Third Index of Stream Condition Assessment sub indices and metrics

Hydrology	Physical Form	Streamside zone	Water Quality	Aquatic life
Sub-Indices				
Hydrology refers to the amount of water that is within the river channel at a particular point in time at a particular location. A minimum of 15 years of monthly flow data is used.	Physical form takes into account the river bank condition as well as instream habitat (logs or 'snags') and major barriers to fish migration, such as dams and artificial weirs.	Streamside zone measures characteristics of the woody vegetation within 40 metres of the river's edge.	Water quality is the quality of water in the river.	Aquatic life is based on the number and type of aquatic macroinvertebrates found within the river.
Metrics				
Low flows High flows Zero flows Seasonality Variability	Bank condition Artificial barriers Instream woody habitat	Width Fragmentation Overhang Cover of trees and shrubs Structure Large Trees Weeds	Total Phosphorus Turbidity Salinity (EC) pH	AUSRIVAS SIGNAL EPT Number of Families

Table 11 Index of Stream Conditions of crossing waterways (DELWP 2010)

Basin	Reach	Reach Length (km)	River	Hydrology	Physical Form	Streamside Zone	Water Quality	Aquatic Life	ISC Score	Condition
37	3	0.8	Surrey River	5	10	6	9	5	30	Moderate

Basin	Reach	Reach Length (km)	River	Hydrology	Physical Form	Streamside Zone	Water Quality	Aquatic Life	ISC Score	Condition
37	4	16	Surrey River	5	8	6		7	31	Moderate
37	5	29	Surrey River	5	10	9		3	28	Moderate
37	203	7.2	Surrey River	5	10	3		5	24	Moderate

6.2.6 Wetlands

Publicly available data shows the presence of seven current wetlands located in the agricultural south-eastern portion of the proposed wind farm site. (DEECA Mapshare Vic 2023). These wetlands vary in size with two of the largest wetlands (Wetland ID 20522 and 20532) extending into the adjacent Kentbruck Heath located within the Lower Glenelg National Park, just beyond the site boundary and agricultural areas **(Figure 4 – Appendix A)**. All of the current wetlands that interface with the project are categorised by DEECA as ephemeral, temporary features that are subject to periods of inundation. Table 12 provides further details on DEECA mapped wetlands.

The Flora and Fauna Existing Conditions and Impact Assessment Draft Report (Biosis 2023) suggested that the DEECA current wetlands were only mapped approximately because numerous smaller depressions were located outside the boundaries of these wetlands.

The Report (Biosis 2023) also drew parallels between the depressions found within Kentbruck Heath and those found on the cleared agricultural land. Thereby concluding it was likely the cleared agricultural land would have once supported wetland mosaics that were similar to those currently found within the National Park. These wetlands were identified as Wet Heathland and Heathy Woodland.

The primary source of water for these wetlands is groundwater and the Groundwater Dependent Ecosystems Impact Assessment Report (CDM Smith 2023) presented additional areas, beyond the current wetland boundaries, that have high potential for groundwater interaction.

The proposed cable alignment interfaces with the two large wetlands along the northern boundary of the project area (Wetland ID 20522 and 20532). The project boundary and proposed cable alignment also marks a change in the landscape between Kentbruck Heath and the cleared agricultural land. Figure 4 and Figure 5 show the two large current wetlands that would be crossed by the proposed cable alignment at the edge of the northern project boundary.

A key feature of northern boundary is a farm access track that runs from east to west between Portland-Nelson Road, and the farm access tracks that join Mount Kinkaid Road. Observations during the site visit on 20 April 2023 found that the access track had been constructed above the natural ground surface in some locations, including the wetland crossing sites.

This landform appeared to block the potential flow of surface water across the site boundary and areas of ponding were visible on the northern side of the track and boundary, towards Kentbruck Heath (Figure 6). Whereas the farm access track at this location, and proposed cable alignment route, appeared to be relatively dry and trafficable by four wheel drive vehicle.

During the site visit of 20 April 2023, the two large wetlands located on the cleared agricultural land were largely dry with only small, isolated depressions found to contain surface water. This was following several months of higher-than-average rainfall, as discussed in section 6.2.2 of this report.

In addition to these current mapped wetlands, the Brolga Impact Assessment Report (Biosis 2022) identified other small waterbodies that could support Brolga (breeding and non-breeding sites) across the project area. These included freshwater marshes along the Surrey River floodplain transmission corridor, and freshwater meadow within the two large mapped wetlands and the open agricultural land near mount Kincaid. The Report (Biosis 2022) also referenced the potential impacts that dewatering from the project can have on these existing wetlands, however, it concluded that these impacts would be short term and temporary in nature.

The proposed underground cable transmission alignment will interface with a small number of the additional wetlands that were identified in the Brolga Impact Assessment Report (Biosis 2022). These locations include identified areas within the two large mapped wetlands (Wetland ID 20522 and 20532), and additional wetlands in the open farmland on the Surrey River Floodplain. One of the proposed access roads also interfaces with a small wetland identified in the Brolga Impact Assessment Report (Biosis 2022).

Figure 3 An isolated depression with standing water, close to the proposed cable alignment (Wetland ID 20522).

Figure 4 Current wetland located at the northern boundary of the site looking west toward Portland-Nelson Road. (Wetland ID 20522)

Figure 5 Current wetland located at the northern boundary of the site looking east toward Mount Kinkaid (Wetland ID 20532)

Figure 6 Visible ponding of the north side of the farm access track and project boundary.

Table 12 DEECA mapped wetlands located inside the proposed wind farm site (DEECA mapped current wetlands 2023).

Wetland ID	Area (ha)	Wetland Type	Aquatic System	Origin	Water regime	Salinity Regime
20522	251.77	Unknown	Palustrine or Lacustrine (unknown specifics)	Naturally occurring	Periodically inundated – episodic	Fresh
20529	2.00	Unknown	Palustrine or Lacustrine (unknown specifics)	Naturally occurring	Periodically inundated – episodic	Fresh
20530	2.77	Temporary freshwater lakes	Lacustrine	Naturally occurring	Periodically inundated – episodic	Fresh
20532	271.56	Unknown	Palustrine or Lacustrine (unknown specifics)	Naturally occurring	Periodically inundated – episodic	Fresh
20531	3.81	Temporary freshwater lakes	Lacustrine	Naturally occurring	Periodically inundated – episodic	Fresh
20534	4.57	Unknown	Palustrine or Lacustrine (unknown specifics)	Naturally occurring	Periodically inundated – episodic	Fresh
20535	3.62	Unknown	Palustrine or Lacustrine (unknown specifics)	Naturally occurring	Periodically inundated – episodic	Fresh

6.2.7 Waterway and wetland crossings

Observations taken during the field visit on 20 April 2023, combined with publicly available data from DEECA and Geoscience Australia were used to inform the proposed construction methodology for waterway and wetland crossings. The two construction methodologies considered in this assessment were trenching (dry open cut) and horizontal directional drilling (HDD). Typical construction tasks for each of these methodologies are described in more detail below.

6.2.7.1 Dry Open Cut Trenching

Dry open cut trenching (trenching) is often used to cross minor waterways and ditches, particularly those that have low flow, shallow channel profiles or are ephemeral. Managing the flow of water during trenching can include damming, bypass pumping, or temporary pipes laid in the bed of the watercourse.

The key management objective of good trenching methodology is to isolate potentially polluting activities from the flow pathway. This can include stormwater management measures such as berms and sediment traps to prevent contaminated runoff from entering the waterway.

Narrow, shallow waterways can typically be crossed with construction equipment operating from the banks. However, wider waterways will require access inside the channel and a vehicle access track may be required across the channel bed. Access tracks over ephemeral or low flow waterways can be constructed using clean hard rock and culverts in the base to maintain flow along the waterway channel bed.

Site preparation begins by stripping topsoil from the banks and areas near to the river crossing point. This topsoil is stockpiled away from the works area and can be used for reinstatement if the materials are deemed suitable. Additional sediment control measures can also be placed in the waterway where necessary.

If damming or over pumping is required, sandbags or coffer dams would be used to create sumps that can accommodate pumps. During pumping, erosion and sediment controls would be adopted to minimise any downstream impacts. For some sites, this may require offline treatment before returning clean water to the channel.

Excavating the cable trench across the waterway should only occur once all plant access and stormwater management measures have been completed. This could happen in one complete operation for minor waterways, or staged for wider waterways by retaining flow on one side of the channel.

The cable conduit would then be laid at the base of the trench and checked to ensure there is enough cover between the true base of the waterway channel and the top of the conduit. For some sites, greater depth or additional protection (e.g. a thick concrete slab) may be required.

The conduit would be encased in thermally stable backfill (TSB) material before being covered by the previously excavated subsoil and river bed materials to complete backfilling. Once backfilling has been completed, the banks will be reinstated to match the original channel profile and, where necessary, protected to prevent erosion.

Typically, minor waterway crossings take up to three days to complete the works inside the waterway channel. Further detail on construction methodologies for trenched waterway crossings can be found in *IECA Best Practice Erosion and Sediment Control Appendix P; Land Based Pipeline Construction Guidelines*

6.2.7.2 Horizontal Directional Drilling

Waterway crossings using HDD rely on subsurface conduits being drilled in a parabolic borehole beneath the bed of the waterway.

Each HDD approach has a minimum feasible drilling length and maximum bore depth that will be considered in the design of each waterway crossing.

The drilling worksites will consist of an entry site, that typically includes a pipe fabrication area, and an exit site.

The first stage is to drill the pilot hole between the two sites. Once drilled, the pilot hole is enlarged using reamers that gradually cut the bore to the desired size. During drilling, cutting fluids are circulated through the bore to remove cuttings from the drill head and support the bore profile. The most common cutting fluids are bentonite based, due to their efficiency in transporting coarse cuttings. However, alternative cutting fluids can be used in potentially sensitive sites.

Once the hole has been cut, the conduit pipe is pulled through the bore into its final position. This pulling process displaces the drilling fluids where they are recovered from the worksite for recycling or disposal.

6.2.7.3 Waterway and wetland crossing assessment

The waterway and wetland crossing assessment considered the following factors in the decision making process:

- Whether the waterway or wetland was ephemeral or perennial.
- A combination of upstream catchment area and channel width, which provides an indication of whether the trench could be excavated and reinstated with certainty during dry of low flow conditions.
- Whether the waterway or wetland was natural, or had been significantly modified from its original form (constructed).

Horizontal directional drilling (HDD) construction techniques were selected for major, perennial waterways that featured large upstream catchments and natural channel form.

Other waterways, such as those that featured smaller catchments, ephemeral flow conditions and less defined channels or were considered appropriate for trenched crossings.

Table 13 and Table 14 provides a summary of each waterway that interfaces with the proposed wind farm site and underground transmission route respectively and the proposed crossing construction methodology. Wetlands that interface with the proposed infrastructure of the wind farm site are summarised in Table 15.

The largest waterway to be crossed by the underground transmission route is Surrey River. This waterway has an upstream catchment area of approximately 6,300 ha at the upstream crossing site, 12,500 ha at the central crossing site, and 20,500 ha at the downstream crossing site. Data provided by DEECA classifies Surrey River as a non-ephemeral (perennial) waterway. During the site visit of 20 April 2023, no flow was observed in Surrey River, despite the region experiencing higher than average rainfall totals in the weeks prior to the visit. Figure 7 shows the dry Surrey River channel and culvert crossing of boiler swamp road.

This lack of year-round flow could potentially identify Surrey River as a suitable waterway for trenched crossings. However, the wide channel profile, extensive upstream catchment area and natural setting presented a higher risk of flooding and could potentially be more difficult to reinstate. Subsequently, HDD was proposed for this waterway.

Figure 7 Dry riverbed in Surrey River at Boiler Swamp Road (central crossing site) on 20 April 2023

The other minor ephemeral waterways and drainage lines that cross Boiler Swamp Road are considered suitable for trenched waterway crossings (Figure 8).

The two largest wetlands that interface with the proposed infrastructure are ephemeral and have been modified at their point of interface (**Figure 4 – Appendix A)**. This was confirmed during the site visit on 20 April 2023 where a farm access track and vegetation clearing had potentially changed the natural hydrology of the site.

Subsequently, these sites may be suitable for trenching of cables and the construction of roads, providing the mitigation measures presented in the Flora and Fauna Existing Conditions Impact Assessment, Groundwater Dependent Ecosystems Impact Assessment and Groundwater Impact

Assessment reports are adopted. The locations of the proposed waterway crossings construction method, including the HDD locations are presented in **Figure 5 – Appendix A**.

Figure 8 One of the many minor drainage lines that cross Boiler Swamp Road and is considered suitable for open cut, trenched crossing construction methodology (white culvert markers).

The final construction methodology for each waterway and wetland crossing will be determined and developed further through the detailed design phase of the project. Where changes to the construction methodology are proposed, the relevant land manager and DEECA will be consulted. Once agreed, all changes will be reflected in the project CEMP and any SEWQMP that is developed under the CEMP. The final CEMP will also be prepared to the satisfaction of the relevant authority.

All of these crossing works will also be carried out in accordance with industry best practice guidelines (e.g. IECA Best Practice Erosion and Sediment Control) and subject to approval by the GHCMA and the requirements of the Works On Waterway Licence application process.

It should be noted that HDD can also be recommended as the preferred construction methodology to reduce non-surface water related impacts, such as protecting terrestrial habitat, crossing existing constructed assets or to overcome constructability challenges. For example, HDD has been proposed for the Wild Dog Creek crossing because of potential constructability constraints.

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Table 13 Waterway assessment summary - Waterways intersecting with the proposed wind farm site

Name (Or Persistent Feature Identifier No.)	Catchment Area (ha)	Hierarchy (DEECA)	Ephemeral	Natural or Constructed	Interface	Construction Method	Reasoning for construction method
Unnamed Waterway (PFI 8808530)	360	Minor	Yes	Constructed	Cable Access roads	Trench	Narrow, ephemeral waterway where crossing and reinstatement can be planned for dry weather and completed quickly
Unnamed Tributary of Johnstone Creek (PFI: 8808864)	470	Minor	Yes	Constructed	Cable Access roads	Trench	Narrow, ephemeral waterway where crossing and reinstatement can be planned for dry weather and completed quickly

Table 14 Waterway assessment summary - Waterways intersecting with the proposed underground transmission line route

Name	Catchment Area (ha)	Hierarchy (DEECA)	Ephemeral	Natural or Constructed	Construction Method	Reasoning for construction method
Unnamed Tributary of Johnstone Creek (PFI 8809411)	1,340	Minor	Yes	Constructed	Trench	Narrow, ephemeral waterway where crossing and reinstatement works can be planned for dry weather and completed quickly
Unnamed Tributary of Mount Kincaid Creek (PFI 8809519)	80	Minor	Yes	Constructed	Trench	Narrow, ephemeral waterway where crossing and reinstatement works can be planned for dry weather and completed quickly
Unnamed Tributary of Mount Kincaid Creek (PFI 8809477)	101	Minor	Yes	Constructed	Trench	Narrow, ephemeral waterway where crossing and reinstatement works can be planned for dry weather and completed quickly
Unnamed Waterway (PFI 8809732)	120	Minor	Yes	Natural	Trench	Narrow, ephemeral waterway where crossing and reinstatement works can be planned for dry weather and completed quickly

Name	Catchment Area (ha)	Hierarchy (DEECA)	Ephemeral	Natural or Constructed	Construction Method	Reasoning for construction method
Unnamed Tributary of Mount Kincaid Creek (PFI 8810426)	550	Minor	Yes	Natural	Trench	Narrow, ephemeral waterway where crossing and reinstatement works can be planned for dry weather and completed quickly
Surrey River (PFI 18735895)	6,300	Major	No	Natural	HDD	Major perennial waterway with natural form and large upstream catchment
Surrey River (PFI 18735897)	12,050	Major	No	Natural	HDD	Major perennial waterway with natural form and large upstream catchment
Unnamed Tributary of Surrey River (PFI 18735888)	50	Minor	Yes	Natural	Trench	Narrow, ephemeral waterway where crossing and reinstatement works can be planned for dry weather and completed quickly
Wild Dog Creek (PFI 18735879)	800	Minor	Yes	Natural	HDD	Narrow, ephemeral waterway with natural form
Surrey River (PFI 18736259)	20,500	Major	No	Natural	HDD	Major perennial waterway with natural form and large upstream catchment
Unnamed Tributary of Surrey River (PFI 8809471)	50	Minor	Yes	Natural	Trench	Minor, ephemeral waterway where crossing and reinstatement works can be planned for dry weather and completed quickly
Unnamed Tributary of Surrey River (PFI 18735829)	80	Minor	Yes	Natural	Trench	Minor, ephemeral waterway where crossing and reinstatement works can be planned for dry weather and completed quickly
Unnamed Tributary of Surrey River (PFI 8809289)	55	Minor	Yes	Constructed	Trench	Minor, ephemeral waterway where crossing and reinstatement works can be planned for dry weather and completed quickly
Unnamed Tributary of Surrey River (PFI 8809280)	25	Minor	Yes	Constructed	Trench	Minor, ephemeral waterway where crossing and reinstatement works can be planned for dry weather and completed quickly

Name	Catchment Area (ha)	Hierarchy (DEECA)	Ephemeral	Natural or Constructed	Construction Method	Reasoning for construction method
Unnamed Tributary of Surrey River (PFI 18735819)	2,700	Major	No	Constructed	Trench	Aerial imagery indicates this waterway is likely to be ephemeral at the crossing location. Crossing and reinstatement works can be planned for dry weather and completed quickly
Unnamed Tributary of Surrey River (PFI 18735849)	850	Minor	Yes	Constructed	Trench	Minor, ephemeral waterway where crossing and reinstatement works can be planned for dry weather and completed quickly
Unnamed Tributary of Surrey River (PFI 18735845)	850	Minor	Yes	Constructed	Trench	Minor, ephemeral waterway where crossing and reinstatement works can be planned for dry weather and completed quickly
Unnamed Tributary of Surrey River (PFI 18735867)	30	Minor	Yes	Natural	Trench	Minor, ephemeral waterway where crossing and reinstatement works can be planned for dry weather and completed quickly

Table 15 Waterway assessment summary – Mapped wetlands (DEECA) intersecting with the proposed infrastructure

Wetland No. (DEECA)	Area (Ha)	Ephemeral	Natural or Constructed	Infrastructure interface	Construction Method	Reasoning for construction method
20522	251.77	Yes	Naturally occurring	Cables Access Roads	Trench / surface	Ephemeral wetland where crossing and reinstatement works can be planned for dry weather and completed quickly
20532	271.56	Yes	Naturally occurring	Cables Access Roads	Trench / surface	Ephemeral wetland where crossing and reinstatement works can be planned for dry weather and completed quickly

6.2.8 Glenelg Estuary and Discovery Bay Ramsar Site

The Glenelg Estuary and Discovery Bay Ramsar site is located in the southern region of the Glenelg River Basin, adjacent to the Victorian-South Australian border, and covers an area of approximately 22,289 ha (**Figure 6 – Appendix A**).

The Glenelg Estuary and Discovery Bay Ramsar site is internationally recognised for the important habitat it provides for waterbird species such as the globally endangered Australasian bittern. It also provides food, spawning grounds and nurseries for a wide range of fish including the globally vulnerable eastern little galaxias.

Major land uses adjacent to the Ramsar site include forestry (primarily pine plantations) and grazing pastures. Both the Lower Glenelg National Park and Discovery Bay Coastal Park are managed by Parks Victoria in partnership with local stakeholders and DEECA for areas inside the Ramsar site.

The site's boundaries exclude the portions of the Glenelg Estuary that lie within South Australia, as well as 600 metres of the estuary channel adjacent to the town of Nelson. The Glenelg Estuary and Discovery Bay Ramsar site is divided into northern and southern sites by Nelson Township and the Green Triangle Forest Products (GTFP) and Kentbruck plantations.

The Glenelg Estuary Ramsar site (the northern site) covers the western part of Lower Glenelg National Park from the South Australian border to the Nelson - Winnap Road. The Glenelg River and Moleside Creek enter the Ramsar site from the west, merging together and meandering within the Ramsar site. Neither Glenelg River nor Moleside Creek pass through the project area (**Figure 6 – Appendix A**).

The southern region of the Ramsar site forms most of the Discovery Bay Coastal Park and the Nelson Streamside Reserve. Key waterways of this area include the Glenelg River estuary at Nelson, and Johnstone Creek. Johnstone Creek has an approximate catchment area of 1,200 ha and discharges to Swan Lake in the southern Ramsar site (**Figure 3 – Appendix A**). Swan Lake is contained by the coastal dune system with no open discharge into the ocean (Figure 9). However, anecdotal information from a landowner suggests that the lake does occasionally discharge into the ocean during years when the water level is high enough.

Figure 9 Swan Lake in the Johnstone Creek catchment

The Glenelg River Estuary and Discovery Bay wetland complex comprises a network of interconnected wetlands including freshwater permanent wetlands, intermittently inundated marshes, estuarine waters and intertidal sandy beaches that are in excellent condition. The hydrology system includes a complex interaction of surface and groundwater flows and local rainfall-runoff. The surface hydrology and geohydrology systems are crucial to the estuary functioning, and to the freshwater wetlands (DELWP 2017). Critical hydrological Limits of Acceptable Change (LACs) for these sites are:

- Bridgewater Lakes, Lake Mombeong, Swan Lake, Malseed Lake and Cain Flat Swamp will not become dry
- The Glenelg Estuary mouth will not remain closed for three consecutive years or open for more than five years.

The Glenelg Estuary mouth is seasonally closed by periods that average around 40 days. Sometimes, the estuary mouth can remain closed for a year. Permanent changes, such as permanently open or closed would represent a significant change in the character of the wetland type and extent.

Understanding groundwater-surface water interactions across the Glenelg Estuary and Discovery Bay Ramsar site, and the impact of the Kanawinka Fault on the local hydrology, are knowledge gaps for the Ramsar site and subject to further investigations (DELWP 2017).

Risk assessments provided by Parks Victoria (2015), the GHCMA (2018-2019) and DELWP (2017) considered increased stormwater runoff and sediment to the Ramsar site as a medium to high threat. Stormwater runoff from the catchment containing elevated sediment and nutrient concentrations can cause an increase in algal growth, reduce dissolved oxygen levels and subsequently impact fish diversity and aquatic vegetation used in fish reproduction and waterbird feeding. In addition, increased stormwater may adversely impact beach erosion (DELWP 2017).

6.2.9 Environmental Values

The term ‘environmental values’ relates to the importance placed on a specific environmental aspect because of the service, or use, that environmental aspect provides. Examples of environmental values, that relate to surface water, include clean water for drinking and healthy waterways that support recreation.

A summary of environmental values within or adjacent to the project area is provided in Table 16. It should be noted that there are no designated water supply catchments within the proposed wind farm site or transmission line corridor.

Table 16 Environmental values within or adjacent to the project area

Water aspect	Environmental Values
Glenelg River Estuaries and Inlets.	Marine and estuarine waters – aquatic ecosystems: • Slightly modified Environmental Values / Water uses • Recreation • Aesthetic enjoyment • Traditional owner cultural values • Cultural and spiritual values • Aquaculture • GDEs • Habitat values
Glenelg Estuary and Discovery Bay Ramsar site.	Marine and estuarine waters – aquatic ecosystems: • Largely unmodified Environmental Values / Water uses • Aquaculture • Aesthetic enjoyment

<table>
<tr><th>Water aspect</th><th>Environmental Values</th></tr>
<tr><td></td><td>• Traditional owner cultural values
• Cultural and spiritual values
• GDEs
• Habitat values</td></tr>
<tr><td>Waterways including Surrey River, Mount Kinkaid Creek, Johnstone Creek, Mcphails Creek, Wild Dog Creek, their connected tributaries and unnamed waterways.</td><td>Aquatic ecosystems:
• Slightly to moderately modified
Environmental Values / Water uses:
• Secondary contact recreation
• Aesthetic enjoyment
• Traditional owner cultural values
• Cultural and spiritual values
• Agriculture and irrigation
• Industrial and commercial use
• Habitat values.</td></tr>
<tr><td>Current Wetlands.</td><td>Aquatic ecosystems:
• Unmodified to moderately modified
Environmental Values / Water uses
• Traditional owner cultural values
• Cultural and spiritual values
• Agriculture
• Habitat values.</td></tr>
</table>

6.2.10 Water supply

Three main agencies collaboratively manage water resources within the Glenelg River Basin. These are; Southern Rural Water, Wannon Water, and the GHCMA. Each authority has a different role and provides their customers with a range of different services. Additionally, an overlap agreement exists between these agencies for catchments that occupy areas beyond the Victorian border.

Southern Rural Water

- Assesses license applications for the construction of new farm dams and bores
- Manages and monitors new and existing groundwater and surface water licenses
- Assesses and manages temporary and permanent water transfers.

Wannon Water

- Manages the collection and storage of potable water
- Filtration and/or disinfection and delivery of water
- The collection and treatment of wastewater.

Glenelg Hopkins CMA

- Implements the regional catchment strategies
- Monitors and reports on the health of the catchment
- Promotes community awareness of catchment issues
- Provides advice and recommendations to the Victorian Government and Local Government organisations.
- Regulates works in, on, over, under or in close proximity to designated waterways.

Referring to the data available from Wannon Water, most of the water supplies for the region are sourced from Rocklands Reservoir, Tullich Borefield, Konongwootong Reservoir and Dilwyn Aquifer (Wannon Water, 2019).

6.2.11 Water for construction

Water is required during the construction phase for dust suppression, road-base construction, and concrete for the turbine foundations.

Water to be used during construction would be sourced from a combination of on-site storages, on-site bores or from potential off-site locations. Current water supply requirements for construction are estimated to be 255 megalitres over a 24-month construction period and the preferred source of water supply for this supply is groundwater from a bore (or bores) within the wind farm site.

Other sources, such as onsite rainfall storages and tanks, offsite groundwater or trucking/carting water could be used if necessary. These sources would be confirmed during the detailed design phase and subject to approvals from the relevant authorities.

Further details on the use of groundwater during construction can be found in Section 3 of the Groundwater Impact Assessment Report (AECOM 2022).

7.0 Risk assessment

An assessment of surface water risks posed by the project was undertaken in accordance with the method described in Section 5.2 of this report.

The risk assessment has been used as a screening tool to prioritise the focus of the impact assessments and development of mitigation measures. The risk pathways link project activities (causes) to their potential effects on the environmental assets, values or uses that are considered in more detail in the impact assessment. Risks were assessed for the construction and operation phases of the project. This process addresses the GED requirements as the risk-based approach prompts exploration of potential mitigation and control measures to minimise any impacts and risk of harm identified.

These mitigation measures are typically incorporated into the delivery of infrastructure projects of similar type, scale and complexity. As the project design progresses at the commencement of this impact assessment, mitigating measures would be identified in the detailed design phase, such as HDD for crossing major watercourses.

Risk ratings were applied to each of the identified risk pathways assuming these initial mitigation measures were included. Where the initial risk ratings were categorised as medium or higher, additional mitigation measures were developed.

The identified risks and associated residual risk ratings for the construction and operational phase are listed in Table 17. Risk pathways associated with decommissioning activities are generally considered similar in nature to those identified for the construction phase and therefore, have not been presented separately in this assessment.

All future decommissioning works would be carried out in accordance with the relevant industry standard best practice guidelines at the time of decommissioning to mitigate any potential impacts.

Table 18 to Table 25 of this assessment report provides further detail to support the residual risk assessment ratings provided in Table 17.

Table 17 Surface water risks and associated residual risk ratings

Risk ID	Potential threat and effects on the environment	Residual risk rating
Construction		
SW01	Dewatering of groundwater and/or rainwater from the turbine foundations, trenches and excavations results in contaminated water entering waterways and the receiving environment.	Low
SW02	Stormwater runoff from construction sites and work activities pollute receiving waterways and downstream environment.	Low
SW03	Trenching across waterways mobilises sediment and causes pollution in the waterways and downstream environment.	Low
SW04	Frac-out from Horizontal Directional Drilling (HDD) returns drilling fluids to surface causing discharge to surface water.	Low
SW05	A spill of hazardous materials during construction results in contaminated discharge to surface water.	Low
SW06	Construction activities change the flood risk and flood characteristics.	Low

Risk ID	Potential threat and effects on the environment	Residual risk rating
SW07	Construction activities potentially block or divert low flow pathways leading to changes in flow regime and environmental values.	Low
Operation		
SW08	Operational or permanent infrastructure potentially change the hydrological conditions leading to increased flood levels or flooding of adjacent property.	Low
SW09	Operational or permanent infrastructure potentially blocking or diverting low flow pathways leading to changes in flow regime and environmental values.	Low
SW10	A spill of hazardous materials at the operational facilities results in contaminated discharge to surface water.	Low
SW11	Contaminated stormwater runoff from operational facilities pollutes receiving waterways and environment.	Low

Table 18 SW01 – Risk associated with dewatering of excavations

Risk ID	Works area	Risk name	Risk pathway	Initial mitigation measure	Initial Risk			Additional mitigation measure	Residual Risk		
					C	L	Risk		C	L	Risk
Construction											
SW01	Wind Farm Site Transmission Line Works Quarry	**Dewatering**	Dewatering of groundwater and/or rainwater from the turbine foundations, trenches and excavations results in contaminated water entering waterways and the receiving environment.	**MM-SW01 Dewatering** a. Dewatering activities would be managed in accordance with the Dewatering Plan in the CEMP. The plan would adopt a management hierarchy that prioritises the prevention of discharges into surface waters as far as is reasonably practicable. The relevant suggested measures outlined in EPA Victoria Publication: 1834: Civil Construction, Building and Demolition Guide (2020) should also be incorporated into the CEMP. b. Water resulting from dewatering activities should be tested for potential contaminants. c. Groundwater that is contaminated by acid sulfate soils should be tested and discharged or disposed in accordance with protocols outlined in the Environmental Site Investigation EES Technical Report. d. Ponded stormwater and rainwater collected in excavations may be suitable for onsite treatment, reuse or discharge, subject to water quality testing results. e. Water recycled for reuse onsite will be used for construction activities such as dust suppression. f. Where deemed suitable, discharge of collected water to land should be to areas of low gradient to avoid soil erosion or sedimentation of land or water. Discharges to land should also avoid areas that are saturated or at risk of becoming inundated. g. Water from excavated areas should not be discharged into or within 50 m of a watercourse, drainage pathway or wetland without prior treatment. h. Sediment control devices should be used where required, to remove suspended soils and dissipate flow. These devices include sediment fences or basins.	Minor	Unlikely	Low	No additional mitigation measures identified.	Minor	Unlikely	Low

C: Consequence; L: Likelihood

Table 19 SW02 –Risk associated with contaminated stormwater runoff

Risk ID	Works area	Risk name	Risk pathway	Initial mitigation measure	Initial Risk			Additional mitigation measure	Residual Risk		
					C	L	Risk		C	L	Risk
Construction											
SW02	Wind Farm Site Transmission Line Works Quarry	**Stormwater runoff quality**	Stormwater runoff from construction sites and work activities pollute receiving waterways and downstream environment.	**MM-SW02 Surface water runoff** a. A water quality monitoring and adaptive management program will be implemented to ensure the effectiveness of controls that are implemented to mitigate potential risks to surface waters, and detail additional and/or improved measures that would be implemented should those controls fail or are not effective to eliminate or minimise risks of harm to surface waters. b. Monitoring of surface waters will be conducted upstream and downstream of works areas prior to construction, during construction and post-construction at the appropriate frequency (i.e., weekly during watercourse crossings works) to understand any changes to environmental values in line with EPA publication 1896: Working within or adjacent to waterways. c. All construction works will be carried out in accordance with industry best practice guidelines including the IECA Best Practice Erosion, Sediment Control Guidelines and EPA Publication 1834 Civil Construction, Building and Demolition Guide, EPA Publication 1894: Managing Soil Disturbance, and EPA Publication 1895: Managing stockpiles. d. A Project-wide CEMP will be developed and implemented, incorporating a Sediment, Erosion and Water Quality Management Plan (SEWQMP) for all work areas. The SEWQMP will outline the erosion and sediment mitigation measures to be implemented for each work area. Erosion and sediment control measures will include: - Sediment control devices such as bunding or silt fences around stockpiled material, earthworks and disturbed areas. - Clean water diversion around disturbed or unvegetated areas. The SEWQMP will be developed in consultation with GHCMA and EPA Victoria. The SEWQMP must also have regard to relevant controls to be set out in the Acid Sulfate Soils Management Plan (MM-CA03).	Minor	Possible	Low	No additional mitigation measures identified	Minor	Possible	Low

C: Consequence
L: Likelihood

Table 20 SW03 – Risk associated with trenching across waterways

Risk ID	Works area	Risk name	Risk pathway	Initial mitigation measure	Initial Risk			Additional mitigation measure	Residual Risk		
					C	L	Risk		C	L	Risk
Construction											
SW03	Wind Farm Site Transmission Line Works	**Trenching across waterways**	Trenching across waterways mobilises sediment and causes pollution in the waterways and downstream environment.	**MM-SW03 Trenching Across Waterways** a. All trenched waterway crossings will be carried out in accordance with industry best practice guidelines including the IECA Best Practice Erosion and Sediment Control Guidelines and EPA Publications 1834 Civil Construction, Building and Demolition Guide and 1896 Working within or adjacent to waterways. b. Waterway crossing works and reinstatement will be carried out in consultation with the GHCMA. c. Trench crossing works will be programmed for dry or low flow conditions, such that works are preferentially scheduled for drier months of the year and lowest flow of the waterway and works are avoided when high rainfall events are expected. d. Cabling will be assembled and prepared so that it can be installed as quickly as practicable once trenching over a watercourse has been completed. e. The exposed trench within a watercourse and riparian zones will be reinstated immediately following the installation of the cable, including providing suitable compaction and revegetation. f. Waterway reinstatement will be designed to avoid future erosion. This may include the use of riprap made of stones to stabilise the waterway. If necessary, a geofabric will be provided to prevent erosion and scour until the vegetation has established. g. Visual monitoring for changes in turbidity will be undertaken downstream of the trench during flow events, if the trench has not been reinstated. h. For 12 months after completion of trenching works, trenched waterways will be visually inspected following significant rainfall/flow events. If during these visual inspections waterway reinstatement works are observed to be not performing appropriately (ie erosion is occurring), rectification measures will be developed and implemented in a timely manner. i. Temporary diversions will be provided if there is permanent or tidal flow in the waterway in accordance with the IECA Best Practice Erosion and Sediment Control Guidelines. **j.** Sediment control devices such as silt fences will be used to remove suspended solids and dissipate flow where required.	Minor	Unlikely	Low	No additional mitigation measures identified	Minor	Unlikely	Low

C: Consequence
L: Likelihood

Table 21 SW04 Risk associated with HDD

Risk ID	Works area	Risk name	Risk pathway	Initial mitigation measure	Initial Risk			Additional mitigation measure	Residual Risk		
					C	L	Risk		C	L	Risk
Construction											
SW04	Transmission Line Works	**Horizontal Directional Drilling**	Frac-out from Horizontal Directional Drilling (HDD) returns drilling fluids to surface causing discharge to surface water.	**MM-SW04 HDD waterway crossings** a. The proposed HDD profile design and the work method statement shall be submitted to the GHCMA and approved prior to the commencement of works at the Surrey River crossings. b. Risk of frac-out should be assessed in accordance with industry best practice guidelines to determine likelihood of occurrence (e.g. modelling). c. Drilling profiles should be adjusted where the risk of frac-out is considered likely. d. Drilling fluid properties should be monitored during HDD operations to reduce the risk of frac-outs (e.g. mud weight, viscosity, pressure). e. Drilling equipment and configuration should be appropriate for the proposed HDD operation to prevent frac-out. f. Pollution prevention strategies should be in accordance with EPA Publication 1834; Civil Construction, Building and Demolition Guide, IECA Best Practice Erosion and Sediment Control Appendix P; Land Based Pipeline Construction Guidelines and EPA Publication 1896: Working within or adjacent to waterways. g. Sediment control devices such as silt fences should be put used to remove suspended solids and dissipate flow where required. h. Earth bunds/or and drainage channels should be placed around the upper edges of drill sites and work areas to divert natural runoff around and away from the site and prevent mixing with drilling compound runoff. i. Sump pits should be constructed at the bottom of the drill site. The sump pit would be positioned to capture runoff from the drilling compound. Materials collected in the sump pit will be assessed and managed in accordance with industry best practice guidelines for HDD operations. j. An earth bund or silt fence would be placed around the sump pit to contain any spillage. k. All facilities utilised in the surface mud handling (mixing, cleaning and pumping) during the HDD activities should be bunded.	Minor	Unlikely	Low	No additional mitigation measures identified	Minor	Unlikely	Low

C: Consequence / L: Likelihood

Table 22 SW05- Risk associated with spill of hazardous materials.

Risk ID	Works area	Risk name	Risk pathway	Initial mitigation measure	Initial Risk			Additional mitigation measure	Residual Risk		
					C	L	Risk		C	L	Risk
Construction											
SW05	Wind Farm Site Transmission Line Works Quarry	**Spills**	A spill of hazardous materials during construction results in contaminated discharge to surface water.	**MM-SW05 Fuel and chemical spills** a. The storage of fuels and chemicals would comply with the requirements of the Dangerous Goods (Storage and Handling) Regulations (2022), EPA Guideline 1698; Liquid Storage and Handling Guidelines and EPA Publication 1834; Civil Construction, Building and Demolition Guide. b. Fuels and chemicals stored on site should be minimised. c. Fuels should not be stored in areas that are subject to inundation (e.g. floodplains), and at least 50m from sensitive receptors, such as waterways, wetlands and drainage pathways. d. Fuel storage facilities should be bunded. e. Spill kits shall be available at locations where machinery/plant are operating and at refuelling points and fuel and chemical storage locations. f. Spills of hazardous materials should be rendered safe, and where required, collected and transported by licenced contractors for disposal at appropriately licenced facilities, including cleaning materials, absorbents and contaminated soils. g. Staff training should include spills management procedures. h. Emergency response plans for spills should be developed as per safety, hazard and risk assessments. i. Refuelling of vehicles, plant and equipment (excluding handheld machines) should be undertaken in a designated refuelling area with appropriate measures to contain spills j. Refuelling of vehicles, plant and equipment should not occur within 50m of a watercourse, drainage pathway or wetland. **MM-SW04 HDD waterway crossings** a. The proposed HDD profile design and the work method statement shall be submitted to the GHCMA and approved prior to the commencement of works at the Surrey River crossings. b. Risk of frac-out should be assessed in accordance with industry best practice guidelines to determine likelihood of occurrence (e.g. modelling). c. Drilling profiles should be adjusted where the risk of frac-out is considered likely. d. Drilling fluid properties should be monitored during HDD operations to reduce the risk of frac-outs (e.g. mud weight, viscosity, pressure). e. Drilling equipment and configuration should be appropriate for the proposed HDD operation to prevent frac-out. f. Pollution prevention strategies should be in accordance with EPA Publication 1834; Civil Construction, Building and Demolition Guide, IECA Best Practice Erosion and Sediment Control Appendix P; Land Based Pipeline Construction Guidelines and EPA Publication 1896: Working within or adjacent to waterways. g. Sediment control devices such as silt fences should be put used to remove suspended solids and dissipate flow where required. h. Earth bunds/or and drainage channels should be placed around the upper edges of drill sites and work areas to divert natural runoff around and away from the site and prevent mixing with drilling compound runoff.	Minor	Unlikely	Low	No additional mitigation measures identified	Minor	Unlikely	Low

				i. Sump pits should be constructed at the bottom of the drill site. The sump pit would be positioned to capture runoff from the drilling compound. Materials collected in the sump pit will be assessed and managed in accordance with industry best practice guidelines for HDD operations. j. An earth bund or silt fence would be placed around the sump pit to contain any spillage. k. All facilities utilised in the surface mud handling (mixing, cleaning and pumping) during the HDD activities should be bunded.							

C: Consequence / L: Likelihood

Table 23 SW06- Risk associated with changes to flood risk

Risk ID	Works area	Risk name	Risk pathway	Initial mitigation measure	Initial Risk			Additional mitigation measure	Residual Risk		
					C	L	Risk		C	L	Risk
Construction											
SW06	Wind Farm Site Transmission Line Works	**Changes to flood risk**	Construction activities change the flood risk and flood characteristics.	**MM-SW06 Changes to flow regime during construction** a. A project wide CEMP would be developed and implemented, incorporating a SEWQMPfor all sites. The SEWQMPwill outline the flood risk management measures for each site. b. Construction compounds, drilling compounds, laydown areas and material storage areas should be located outside of the floodplain or areas that are subject to inundation. Where this is not considered feasible, site design optimisation would minimise the extent of works and storage in the floodplain. c. Stockpiling of excavation material, topsoil and trench spoil in areas that are flood prone should be avoided. d. Site activities, facilities, infrastructure and materials should be set back from drainage pathways and waterways to the satisfaction of the GHCMA and, in the absence of regulatory requirements, in accordance with IECA Best Practice Erosion and Sediment Control guidelines.	Minor	Possible	Low	No additional mitigation measures identified	Minor	Possible	Low

Table 24 SW07- Risk associated with changes to low flow regime

Risk ID	Works area	Risk name	Risk pathway	Initial mitigation measure	Initial Risk			Additional mitigation measure	Residual Risk		
					C	L	Risk		C	L	Risk
Construction											
SW07	Wind Farm Site Transmission Line Works Quarry	**Changes to low flow regime**	Construction activities potentially blocking or diverting low flow pathways leading to changes in flow regime and environmental values.	**MM-SW06 Changes to flow regime during construction** a. A project wide CEMP would be developed and implemented, incorporating a SEWQMPfor all sites. The SEWQMPwill outline the flood risk management measures for each site. b. Construction compounds, drilling compounds, laydown areas and material storage areas should be located outside of the floodplain or areas that are subject to inundation. Where this is not considered feasible, site design optimisation would minimise the extent of works and storage in the floodplain. c. Stockpiling of excavation material, topsoil and trench spoil in areas that are flood prone should be avoided. d. Site activities, facilities, infrastructure and materials should be set back from drainage pathways and waterways to the satisfaction of the GHCMA and, in the absence of regulatory requirements, in accordance with IECA Best Practice Erosion and Sediment Control guidelines.	Minor	Possible	Low	No additional mitigation measures identified	Minor	Possible	Low

Table 25 The Project Permanent Impacts

Risk ID	Works area	Risk name	Risk pathway	Initial mitigation measure	Initial Risk			Additional mitigation measure	Residual Risk		
					C	L	Risk		C	L	Risk
Design and Operation											
SW08	Wind Farm Site	**Changes to flood risk**	Operational or permanent infrastructure potentially change the hydrological conditions leading to increased flood levels or flooding of adjacent property.	**MM-SW07 Changes to flow regime during operation** a. Proposed infrastructure should be designed to maintain existing levels of flood protection associated with overland flow paths (considering flood levels, flows and velocities) through compliance with GHCMA requirements for flooding and overland flows. b. Permanent surface structures should be designed to allow a set back from waterways and drainage pathways and maintain existing flow regime. c. Modifications to existing flow pathways (e.g. drainage diversion) would be carried out to the satisfaction of the GHCMA and Glenelg Shire Council.	Minor	Unlikely	Low	No additional mitigation measures identified	Minor	Unlikely	Low
SW09	Transmission Lines Works	**Changes to low flow regime**	Operational or permanent infrastructure potentially block or divert low flow pathways leading to changes in flow regime and environmental values.	**MM-SW07 Changes to flow regime during operation** a. Proposed infrastructure should be designed to maintain existing levels of flood protection associated with overland flow paths (considering flood levels, flows and velocities) through compliance with GHCMA requirements for flooding and overland flows. b. Permanent surface structures should be designed to allow a set back from waterways and drainage pathways and maintain existing flow regime. c. Stormwater drainage systems, for all permanent operational infrastructure will be designed to the satisfaction of Glenelg Shire Council (e.g. in accordence with the requirements of the Infrastructure Design Manual (IDM)). d. Modifications to existing flow pathways (e.g. drainage diversion) would be carried out to the satisfaction of the GHCMA and Glenelg Shire Council.	Minor	Unlikely	low	No additional mitigation measures identified	Minor	Unlikely	low

Risk ID	Works area	Risk name	Risk pathway	Initial mitigation measure	Initial Risk			Additional mitigation measure	Residual Risk		
					C	L	Risk		C	L	Risk
SW10	Wind Farm Site Transmission Line Works	**Spills**	A spill of hazardous materials at the operational facilities results in contaminated discharge to surface water.	**MM-SW05 Fuel and chemical spills** a. The storage of fuels and chemicals would comply with the requirements of the Dangerous Goods (Storage and Handling) Regulations (2022), EPA Guideline 1698; Liquid Storage and Handling Guidelines and EPA Publication 1834; Civil Construction, Building and Demolition Guide. b. Fuels and chemicals stored on site should be minimised. c. Fuels should not be stored in areas that are subject to inundation (e.g. floodplains), and at least 50m from sensitive receptors, such as waterways, wetlands and drainage pathways. d. Fuel storage facilities should be bunded. e. Spill kits shall be available at locations where machinery/plant are operating and at refuelling points and fuel and chemical storage locations. f. Spills of hazardous materials should be rendered safe, and where required, collected and transported by licenced contractors for disposal at appropriately licenced facilities, including cleaning materials, absorbents and contaminated soils. g. Staff training should include spills management procedures. h. Emergency response plans for spills should be developed as per safety, hazard and risk assessments. i. Refuelling of vehicles, plant and equipment (excluding handheld machines) should be undertaken in a designated refuelling area with appropriate measures to contain spills. j. Refuelling of vehicles, plant and equipment should not occur within 50 m of a watercourse, drainage pathway or wetland.	Minor	Possible	Low	No additional mitigation measures identified	Minor	Possible	Low
SW11	Wind Farm Site Transmission Line Works	**Stormwater runoff quality**	Contaminated stormwater runoff from operational facilities pollutes receiving waterways and environment.	**MM-SW08 Stormwater management of operational facilities and roads** a. Stormwater produced from operation & management (O&M) facilities and access roads shall be attenuated within the site and reused for internal use as much as possible. b. Implement a water collection and treatment system to ensure that stormwater discharges comply with the ERS. c. Stormwater treatments should be incorporated into the site design for the site facilities and access road to capture surface runoff and reduce pollutants in accordance with the Best Practice Environmental Management Guidelines (CSIRO 1999). d. Surface water discharges to designated waterways shall be designed in consultation with GHCMA to ensure there is no adverse impact on the capacity, quality and integrity of the receiving waterway.	Minor	Unlikely	Low	No additional mitigation measures identified	Minor	Unlikely	Low

C: Consequence
L: Likelihood

8.0 Impact assessment

This section discusses the potential surface water impacts of the project as a result of the construction activities and the operational phase infrastructure. This section also presents the associated mitigation measures that aim to reduce impacts to as low a level as possible and protect the environmental values of surface water outlined in section 6.0. Mitigation measures referred to are summarised in Section 9.0.

As discussed in section 7.0, risks and potential impacts associated with future decommissioning works are similar in nature to those identified for the construction phase and are not presented separately in this assessment report.

8.1 Construction

Construction activities can impact surface water quality through a number of mechanisms including mobilisation of sediment, dewatering of excavations, runoff from disturbed ground and pollution from spills.

Risks to the existing flow regime and flooding can also occur through the excavation of turbine foundations, trenching, and the stockpiling of soils and other materials on the floodplain.

The following sections outline these construction impacts in more detail.

8.1.1 Site dewatering (Risk ID SW01)

During the construction phase, it may be necessary to pump out groundwater or rainwater that has collected in open excavations such as the turbine foundations, transmission cable trenches and quarry. This water may contain sediments and other pollutants. If not managed appropriately, there is a risk that contaminated stormwater is discharged to receiving waterways and the Glenelg Estuary and Discovery Bay Ramsar site.

Dewatering will be managed through the application of the CEMP. This may include the development of a specific Dewatering Plan to manage impacts associated with dewatering from open excavations. The CEMP will adopt a management hierarchy that priorities the prevention of discharges into surface waters as far as is reasonably practicable. Any groundwater that is released to surface waters should meet the water quality objectives as defined in 4.0 of this assessment. Groundwater that does not meet these objectivities should be collected and treated to the required water quality standard, prior to discharging.

Water from excavated areas should not be discharged into or within 50 m of a watercourse, drainage pathway or wetland. Discharge of collected water should be to areas of low gradient to avoid soil erosion or sedimentation of land or water. Sediment control devices should be used where required, to remove suspended soils and dissipate flow. These devices include sediment fences or basins.

Water in excavations that may be contaminated by acid sulfate soils should be tested and discharged or disposed in accordance with protocols outlined in *Environmental Site Investigation* EES Technical Report*.*

Pollutants associated with contaminated soils and groundwater are discussed in the *Environmental Site Investigation* EES Technical Report.

Full implementation of the mitigation measures presented above and in Table 18 will address the water quality impacts associated with site dewatering and would make the residual impact unlikely to occur. Where unexpected incidents associated with site dewatering do occur, the impacts are considered to be minor and very localised following implementation of these measures. The residual risk rating for this impact is low.

8.1.2 Stormwater runoff quality (Risk ID SW02)

Exposed construction surfaces are suspectable to soil and sediment loss. These surfaces typically include unvegetated or disturbed ground, haul roads, laydown areas, site compounds, topsoil windrows and trench spoil.

Sediment runoff from these surfaces can be easily transported in drainage pathways and receiving waterways causing changes in downstream water quality and receiving environment.

The project CEMP will incorporate a Sediment, Erosion and Water Quality Management Plan (SEWQMP) that outlines the necessary mitigation measures and how they should be applied across the site to ensure surface water runoff does not contaminate receiving waterways.

These mitigation strategies will include erosion and sediment control measures that are described in multiple best practice guidelines including *EPA Publication 1834; Civil Construction, Building and Demolition Guide.*

These erosion and sediment control measures would typically include clean water catch drains, sediment basins, sediment fencing and vegetated buffer areas.

The project CEMP will also outline the surface water quality monitoring framework, with the more detailed, site specific monitoring measures documented in the SWMP. Surface water quality monitoring will typically include daily or real time monitoring of turbidity in surface water runoff. It also includes background monitoring in the potential receiving environment, such as sampling upstream and downstream of an identified discharge point.

Whilst the release of contaminated surface water runoff from construction activities is considered possible, full implementation of the mitigation measures defined above and in Section Table 19 would reduce the consequence of waterway pollution to minor with localised, short term impacts. The residual risk rating for this impact is low.

8.1.3 Trenching across waterways (Risk ID SW03)

Excavating across waterways and drainage flow pathways can mobilise contaminants and is a significant risk for the receiving waterways.

The proposed waterway crossing methodology is to use standard ‘open cut’ trenching, which involves in-stream excavation of a trench. For many waterways, open cut trenching is considered an appropriate crossing methodology due to a broad range of factors that can include ephemeral flow regime, small upstream catchments, poorly defined channels, lack of riparian vegetation or constructed channels. Further details on the decision-making process for open trench crossings are set out in Table 13 and Table 14**.**

To manage the risks associated with open cut trenching across waterways, surface water flows should not interface with the construction work areas. Additionally, waterway crossings should be conducted during times of low flow or when the waterways are dry and when weather forecasts indicate the low likelihood of rain.

Mitigation measures for waterway crossings should be constructed and managed in accordance with the relevant regulatory requirements and industry best practice guidelines. These include the *IECA Best Practice Erosion and Sediment Control Appendix P; Land Based Pipeline Construction Guidelines* and *EPA Publication 1896: Working within or adjacent to waterways*. These mitigation measures would also include compliance with the Project CEMP.

Waterways that feature large upstream catchments, perennial flow regimes, wide, natural channels and valuable riverine habitat are generally considered appropriate for HDD crossings. Using HDD would potentially avoid disturbance of the riparian habitat and reduce the likelihood of sediment entering waterways.

HDD and horizontal boring are proposed at waterway crossings of the main Surrey River and adjacent major tributaries including Wild Dog Creek. All of these crossings are subject to further detailed geotechnical investigations.

While HDD is less intrusive to surface features than open trenching, the technique has other environmental constraints associated with managing drilling muds and runoff from the drilling sites and from laydown areas.

Surface water quality monitoring will be carried out during all waterway crossings, as detailed in the project CEMP and SWMP.

Full implementation of the mitigation measures defined above and in Section Table 20 would make waterway pollution from trenching activities unlikely. Where the release of contaminated materials do occur (e.g. sediment) the impacts are considered to be minor and localised. The residual risk rating for this impact is low.

8.1.4 Horizonal Directional Drilling (Risk ID SW04)

Horizontal directional drilling (HDD) presents a risk of stormwater contamination and impacts to the receiving waterways. This can occur through the mobilisation of contaminants from drilling compounds (e.g. sediment from disturbed ground and excavations) or from drilling fluids returning to surface during the drilling operation, known as ‘frac-out’.

Managing excavation water, runoff and spills associated with HDD operations (e.g. from the drilling compounds) are addressed in sections 8.1.1, 8.1.2 and 8.1.5 of this report. This section specifically relates to the risks associated with frac-out during HDD operations.

Frac-out is generally happens when HDD pressure exceeds the overburden pressure, causing the drilling fluids to migrate through the overlying material and discharge to the surface. This can happen if the overburden is shallow or made of loose material.

In most instances of frac-out, drilling fluid can be recovered and managed to prevent it from entering the stormwater pathway. However, frac-out that occurs beneath a waterway channel may cause drilling fluids to discharge directly into water, causing downstream contamination.

Preventing frac-out can be achieved by a number of mitigation measures that include site specific risk assessments (e.g. pressure calculations), adjustment of drilling profiles to suit existing conditions, appropriate drill configuration (e.g. bit size, hole assemblies) and monitoring of drilling fluids during the drilling.

Full implementation of the mitigation measures defined above and in Section Table 20 would make waterway pollution from HDD operations unlikely. Additionally, should frac-out occur during a waterway crossing, the impacts are considered to be minor and localised. The residual risk rating for this impact is low.

8.1.5 Spills (Risk ID SW05)

There is potential for spills of fuels or other liquid contaminants to flow into local waterbodies or drainage lines during construction of the project. Potential spills are most likely to be associated with refuelling and liquids used in the HDD drilling process. The primary concern with this potential impact is the possibility of hazardous materials entering waterways and the Glenelg Estuary and Discovery Bay Ramsar site.

As indicated in the risk assessment, impacts associated with spills of fuels during construction of the project are considered a low risk with the application of industry standard mitigation measures during construction.

Managing the risks of fuel or chemical spills can be achieved by adhering to standards and industry best practice guidelines. These measures should include minimising storage of chemicals at the work site, bunding storage areas, use of spill kits and appropriate training of personnel.

Full implementation of the mitigation measures defined above and in Table 22 would make waterway pollution from spills unlikely. Any spills that could occur are considered to be minor and can be managed locally without entering surface waters. The residual risk rating for this impact is low.

8.1.6 Changes to flood risk (Risk ID SW06)

Project construction activities around waterways and on floodplains can increase flood risk across the project area and on neighbouring properties. The mechanisms for increased flood risk are varied and can include loss of flood storage and changes flood flow characteristics brought about by changes to the surface of a floodplain or existing flow pathway.

Stockpiling of excavation material, topsoil and trench spoil presents one of the key risks to changing flood levels.

The project would implement measures to ensure that spoil material placed alongside excavations, such as trenches and turbine foundations, does not completely impede the flow of flood waters. Other measures such as avoiding the placement of soil stockpiles in flood prone areas and providing up-slope diversions to convey flow around the areas at risk should also be implemented where required.

Overall, the potential impact on flood levels is likely to be moderate for the wind farm site and can be further minimised by implementation of industry standard mitigation measures.

In the event that a stockpile has to be located in an area which may be at risk of flooding, it is possible to carry out a flood modelling assessment to quantify the potential impacts and inform the mitigation measures or confirm that another location is required.

Whilst changes to flood risk from construction activities are considered possible, the full implementation of the mitigation measures defined above and in Table 23 would reduce the consequence of these changes to minor with localised, short term impacts. The residual risk rating for this impact is low.

8.1.7 Changes to low flow regime (Risk ID SW07)

Construction activities, including construction of haul roads, compounds and stockpiling can change local drainage characteristics and low flow pathways. These changes can impact existing uses such as agricultural water supplies or cut off environmental flows to important areas of habitat.

To mitigate these impacts, all construction site infrastructure (e.g. compounds and laydown areas) and storage areas should be located outside of the floodplain or areas that are subject to inundation, where possible.

Where this cannot be achieved, site activities and infrastructure should be set back from drainage pathways and the site layout optimised to reduce the amount of non-essential materials being stored on the floodplain.

Access tracks, haul roads and lay down areas should be appropriately designed to ensure the existing flow pathways are maintained. This would include the construction of waterway crossings in accordance with the requirements of GHCMA.

Details of the site-specific engineering controls and management strategies that are required to maintain the existing flow regime would be documented in the SEWQMP developed as part of the project wide CEMP.

Whilst changes to the low flow regime during the construction phase is considered possible, the full implementation of the mitigation measures defined above and in

Table 24 would reduce the consequence of these changes to minor with localised, short-term impacts. The residual risk rating for this impact is low.

8.2 Operation

This section presents the potential surface water impacts that may occur through the operational phase of the project. Key considerations for this phase include increases in the impervious areas at the above ground facilities, the potential for spills and storm water runoff from the site.

8.2.1 Changes to flood risk (Risk ID SW08)

Above ground infrastructure to be constructed within the project sites include platforms and buildings for operations and maintenance, power collector stations, masts, a terminal substation and the formation of new access roads.

Construction of this above ground infrastructure can increase the impervious area of the catchment which can potentially change runoff characteristics and flow regime. Increases in runoff generated as a result of this development can be managed by standard design practices that include considerations of runoff volume, discharge rates, discharge locations, overland flow paths and climate change impacts.

As an initial mitigation measure for managing flood levels during operation of the project, the proposed facilities and access roads should be designed to limit impacts to surface water conveyance. Appropriate flood mitigation measures should be implemented at the site to avoid any adverse (upstream or downstream) conveyance impacts to the existing flood storages, flood levels and flood velocities, as well as maintaining the exiting overland flow pathways. Flood and drainage infrastructure should be designed in a way that preserves the pre-development hydrology of the catchment.

Typically, the design of permanent infrastructure within the sites should be built above the predicted 1% AEP flood level, with additional freeboard, as required by the Shire of Glenelg and the Glenelg Hopkins CMA. These predicted flood levels should include allowances for the impacts of climate change over the proposed project horizon. These structures should also be placed outside of any local, overland flow drainage paths where possible.

Overall, the likelihood of adverse impacts from flooding as a result of the project operation and the potential consequence associated with any flood impacts are considered to be low for the wind farm site and very low for the transmission line.

On completion of the transmission line, the pre-development landform would be restored to match the existing surface grade and reinstated with groundcover vegetation. Thus, the project transmission lines would generally not result in any permanent change to the existing surface landform or create a permanent obstruction to overland flow or flow within waterways.

Additionally, the project would not permanently modify the existing cross section of waterways or alter existing levees or flood controls within the transmission lines route. Furthermore, while there will be minor roads and the use of some crushed rock and concrete at the facilities, there would be no material change to the existing proportion of impervious surfaces associated with the electricity cabling routes.

With the full implementation of the measures described above, and those presented Table 25, the potential impacts on flood risk were considered unlikely to occur and with only minor consequences. The residual risk rating for this impact is low.

8.2.2 Changes to low flow regime (Risk ID SW09)

Operational and permanent wind farm infrastructure can change or block the existing low flow pathways. This can occur through the construction of wind turbine foundations, new access roads or by changes to the ground surface following reinstatement of excavations.

Modifying the existing flow regime can have significant impacts on the uses of water as well as areas of habitat that have established around specific hydrological conditions.

To mitigate these impacts, all operational and permanent infrastructure would be located outside of the predicted, future floodplain extent or areas that are subject to inundation. This includes consideration of climate change impacts.

Where this not considered feasible, the design of all permanent and operational infrastructure will consider setbacks from drainage pathways and waterways.

In some instances, waterway crossings and diversion of existing flow pathways around the proposed infrastructure may be necessary to maintain existing hydrological conditions. The design for any drainage diversion would be carried out to the satisfaction of the GHCMA.

Stormwater drainage systems, for all permanent operational infrastructure will be designed to the satisfaction of Glenelg Shire Council (e.g. in accordance with the requirements of the Infrastructure Design Manual (IDM)). This will ensure runoff from new impervious areas is managed to reduce the impacts on the existing flow regime.

With the full implementation of the measures described above, and those presented Table 25, the potential impacts on flow regime were considered unlikely to occur and with only minor consequences. The residual risk rating for this impact is low.

8.2.3 Spills (Risk ID SW10)

There is potential for spills of fuels or other hazardous substances, which may flow into local waterbodies, to occur during the project operation phase. Potential spills are most likely to be associated with the refuelling of plant or management of materials during maintenance.

The potential impacts of a spill at these facilities are considered to be minor as the facilities would be designed in accordance with regulatory requirements for storage of chemicals and fuels. Additionally, any spill would be localised and managed within the site boundaries.

The sites should be designed so that areas used to store fuels and chemicals are located outside of overland flow paths to ensure that the risks of a spill entering waterways or the Glenelg Estuary and Discovery Bay Ramsar site are minimal.

With the full implementation of the measures described above, and those presented Table 25, the potential impacts on flood risk were considered unlikely to occur and with only minor consequences. The residual risk rating for this impact is low.

Whilst a spill of fuel or chemicals was considered possible during the operation phase, full implementation of the mitigation measures defined above and in Table 25 would reduce the consequence of waterway pollution to minor with localised, short term impacts. The residual risk rating for this impact is low.

8.2.4 Stormwater runoff quality (Risk ID SW11)

The increase in impervious surfaces associated with the permanent facilities associated the project facility and access roads has the potential to result in increased sediment and nutrients in stormwater runoff. The potential impact has been rated minor as it is intended that the wind farm site and proposed transmission line routes would be designed to meet the pollutant reduction targets specified in the *Best Practice Environmental Management Guidelines* (CSIRO 1999), EPA Publication 1739.1: Urban Stormwater Management Guidance and the Infrastructure Design Manual, as adopted by Glenelg Shire Council.

Stormwater management strategies are designed to remove pollutants from stormwater runoff, retain water on site and reduce the frequency off runoff discharging from the site during storm events. Achieving the best practice performance objectives for nutrients and sediment would also help the project achieve the water quality objectives as defined in the ERS (2021). All stormwater management and treatment measures will be sized to allow for the impacts of climate change over the proposed project horizon.

With the full implementation of the measures described above, and those presented Table 25, the potential impacts on stormwater quality during the operational phase were considered unlikely and with only minor, localised consequences. The residual risk rating for this impact is low.

9.0 Recommended mitigation measures

This section outlines the recommended mitigation measures for surface water management that were identified as a result of the risk and impact assessment.

The recommended mitigation measures are applicable to the construction and operation phases of the project and, when implemented, would ensure the project minimises adverse effects on water quantity and quality within the project area and downstream waterbodies including the Glenelg Estuary and Discovery Bay Ramsar site. These are presented in Table 26.

In the course of finalising this technical report, consultation was undertaken with Neoen and other members of the wider proponent team (designers, contractors and other specialists) so that the recommended mitigation measures would be achievable and compatible with those proposed by other specialists.

The recommended mitigation measures have been refined as a result of these discussions and should be incorporated into the *Environmental Management Framework* (EMF) and *Construction Environmental Management Plan* (CEMP), which would be implemented to effectively manage the environmental performance of the project.

The CEMP would be developed prior to construction and include a site-specific *Surface Water Management Plan* (SWMP) that provides details on the recommended mitigation measures presented in Table 26.

These mitigation measures would be developed in accordance with industry best practice guidelines including *EPA Victoria Publication: 1834: Civil Construction, Building and Demolition Guide (2020), EPA Publication 1896: Working within or adjacent to waterways (2020)* and *IECA Best Practice Erosion and Sediment Control Appendix P; Land Based Pipeline Construction Guidelines (2015).*

The SEWQMP will also outline the surface water monitoring and contingency plan for the construction phase. This contingency plan will be aligned with industry best practice guidelines and will consider a broad range of measures that should be adopted during the event of an exceedance or failure of a mitigation measure. Aspects of the contingency plan would consider the following (EPA Vic 2020):

- methods to prevent water entering excavations.
- controls to be implemented when a storm event is forecast.
- measures to ensure that waterways and floodplains retain sufficient flood detention capacity to moderate peak water flows.
- a flood warning system.
- clean up procedures, including disposal of excess water.
- notification of relevant authorities if unplanned incidents occur that could pose a risk to the environment.

All construction phase stormwater management measures should be designed using the appropriate design rainfall for that site. Furthermore, all proposed surface water management measures and mitigation strategies for the operational phase would consider the impacts of climate change in the design. This should include allowances for increasing rainfall intensity.

It should be noted that any future risks associated with decommissioning activities would be mitigated by conducting future works in accordance with the relevant industry standards and best practice guidelines at the time of decommissioning.

Table 26 Recommended mitigation measures.

Mitigation measure ID	Mitigation measure	Works area	Phase
MM-SW01	**Dewatering** a. Dewatering activities would be managed in accordance with the Dewatering Plan in the CEMP. The plan would adopt a management hierarchy that prioritises the prevention of discharges into surface waters as far as is reasonably practicable. The relevant suggested measures outlined in EPA Victoria Publication: 1834: Civil Construction, Building and Demolition Guide (2020) should also be incorporated into the CEMP. b. Water resulting from dewatering activities should be tested for potential contaminants. c. Groundwater that is contaminated by acid sulfate soils should be tested and discharged or disposed in accordance with protocols outlined in the Environmental Site Investigation EES Technical Report. d. Ponded stormwater and rainwater collected in excavations may be suitable for onsite treatment, reuse or discharge, subject to water quality testing results. e. Water recycled for reuse onsite will be used for construction activities such as dust suppression. f. Where deemed suitable, discharge of collected water to land should be to areas of low gradient to avoid soil erosion or sedimentation of land or water. Discharges to land should also avoid areas that are saturated or at risk of becoming inundated. g. Water from excavated areas should not be discharged into or within 50 m of a watercourse, drainage pathway or wetland without prior treatment. h. Sediment control devices should be used where required, to remove suspended soils and dissipate flow. These devices include sediment fences or basins.	Wind farm site Transmission line route Quarry	Construction
MM-SW02	**Surface water runoff** a. A water quality monitoring and adaptive management program will be implemented to ensure the effectiveness of controls that are implemented to mitigate potential risks to surface waters, and detail additional and/or improved measures that would be implemented should those controls fail or are not effective to eliminate or minimise risks of harm to surface waters. b. Monitoring of surface waters will be conducted upstream and downstream of works areas prior to	Wind farm site Transmission line route Quarry	Construction

Mitigation measure ID	Mitigation measure	Works area	Phase
	construction, during construction and post-construction at the appropriate frequency (i.e., weekly during watercourse crossings works) to understand any changes to environmental values in line with EPA publication 1896: Working within or adjacent to waterways. c. All construction works will be carried out in accordance with industry best practice guidelines including the IECA Best Practice Erosion, Sediment Control Guidelines and EPA Publication 1834 Civil Construction, Building and Demolition Guide, EPA Publication 1894: Managing Soil Disturbance, and EPA Publication 1895: Managing stockpiles. d. A Project-wide CEMP will be developed and implemented, incorporating a Sediment, Erosion and Water Quality Management Plan (SEWQMP) for all work areas. The SEWQMP will outline the erosion and sediment mitigation measures to be implemented for each work area. Erosion and sediment control measures will include: - Sediment control devices such as bunding or silt fences around stockpiled material, earthworks and disturbed areas. - Clean water diversion around disturbed or unvegetated areas. The SEWQMP will be developed in consultation with GHCMA and EPA Victoria. The SEWQMP must also have regard to relevant controls to be set out in the Acid Sulfate Soils Management Plan (MM-CA03).		

Mitigation measure ID	Mitigation measure	Works area	Phase
MM-SW03	**Trenching Across Waterways** a. All trenched waterway crossings will be carried out in accordance with industry best practice guidelines including the IECA Best Practice Erosion and Sediment Control Guidelines and EPA Publications 1834 Civil Construction, Building and Demolition Guide and 1896 Working within or adjacent to waterways. b. Waterway crossing works and reinstatement will be carried out in consultation with the GHCMA. c. Trench crossing works will be programmed for dry or low flow conditions, such that works are preferentially scheduled for drier months of the year and lowest flow of the waterway and works are avoided when high rainfall events are expected. d. Cabling will be assembled and prepared so that it can be installed as quickly as practicable once trenching over a watercourse has been completed. e. The exposed trench within a watercourse and riparian zones will be reinstated immediately following the installation of the cable, including providing suitable compaction and revegetation. f. Waterway reinstatement will be designed to avoid future erosion. This may include the use of riprap made of stones to stabilise the waterway. If necessary, a geofabric will be provided to prevent erosion and scour until the vegetation has established. g. Visual monitoring for changes in turbidity will be undertaken downstream of the trench during flow events, if the trench has not been reinstated. h. For 12 months after completion of trenching works, trenched waterways will be visually inspected following significant rainfall/flow events. If during these visual inspections waterway reinstatement works are observed to be not performing appropriately (ie erosion is occurring), rectification measures will be developed and implemented in a timely manner. i. Temporary diversions will be provided if there is permanent or tidal flow in the waterway in accordance with the IECA Best Practice Erosion and Sediment Control Guidelines. j. Sediment control devices such as silt fences will be used to remove suspended solids and dissipate flow where required.	Wind farm site Transmission line route	Construction

Mitigation measure ID	Mitigation measure	Works area	Phase
MM-SW04	**HDD waterway crossings** a. The proposed HDD profile design and the work method statement shall be submitted to the GHCMA and approved prior to the commencement of works at the Surrey River crossings. b. Risk of frac-out should be assessed in accordance with industry best practice guidelines to determine likelihood of occurrence (e.g. modelling). c. Drilling profiles should be adjusted where the risk of frac-out is considered likely. d. Drilling fluid properties should be monitored during HDD operations to reduce the risk of frac-outs (e.g. mud weight, viscosity, pressure). e. Drilling equipment and configuration should be appropriate for the proposed HDD operation to prevent frac-out. f. Pollution prevention strategies should be in accordance with EPA Publication 1834; Civil Construction, Building and Demolition Guide, IECA Best Practice Erosion and Sediment Control Appendix P; Land Based Pipeline Construction Guidelines and EPA Publication 1896: Working within or adjacent to waterways. g. Sediment control devices such as silt fences should be put used to remove suspended solids and dissipate flow where required. h. Earth bunds/or and drainage channels should be placed around the upper edges of drill sites and work areas to divert natural runoff around and away from the site and prevent mixing with drilling compound runoff. i. Sump pits should be constructed at the bottom of the drill site. The sump pit would be positioned to capture runoff from the drilling compound. Materials collected in the sump pit will be assessed and managed in accordance with industry best practice guidelines for HDD operations. j. An earth bund or silt fence would be placed around the sump pit to contain any spillage. k. All facilities utilised in the surface mud handling (mixing, cleaning and pumping) during the HDD activities should be bunded.	Transmission line route	Construction
MM-SW05	**Fuel and chemical spills** a. The storage of fuels and chemicals would comply with the requirements of the Dangerous Goods (Storage and Handling) Regulations (2022), EPA Guideline 1698; Liquid Storage and Handling	Wind farm site Transmission line route Quarry	Construction and Operation

Mitigation measure ID	Mitigation measure	Works area	Phase
	Guidelines and EPA Publication 1834; Civil Construction, Building and Demolition Guide. b. Fuels and chemicals stored on site should be minimised. c. Fuels should not be stored in areas that are subject to inundation (e.g. floodplains), and at least 50m from sensitive receptors, such as waterways, wetlands and drainage pathways. d. Fuel storage facilities should be bunded. e. Spill kits shall be available at locations where machinery/plant are operating and at refuelling points and fuel and chemical storage locations. f. Spills of hazardous materials should be rendered safe, and where required, collected and transported by licenced contractors for disposal at appropriately licenced facilities, including cleaning materials, absorbents and contaminated soils. g. Staff training should include spills management procedures. h. Emergency response plans for spills should be developed as per safety, hazard and risk assessments. i. Refuelling of vehicles, plant and equipment (excluding handheld machines) should be undertaken in a designated refuelling area with appropriate measures to contain spills j. Refuelling of vehicles, plant and equipment should not occur within 50m of a watercourse, drainage pathway or wetland.		
MM-SW06	**Changes to flow regime during construction** a. A project wide CEMP would be developed and implemented, incorporating a SEWQMP for all sites. The SEWQMP will outline the flood risk management measures for each site. b. Construction compounds, drilling compounds, laydown areas and material storage areas should be located outside of the floodplain or areas that are subject to inundation. Where this is not considered feasible, site design optimisation would minimise the extent of works and storage in the floodplain. c. Stockpiling of excavation material, topsoil and trench spoil in areas that are flood prone should be avoided. d. Site activities, facilities, infrastructure and materials should be set back from drainage pathways and waterways to the satisfaction of the GHCMA and, in the absence of regulatory requirements, in accordance with IECA Best Practice Erosion and Sediment Control guidelines.	Wind farm site Transmission line route Quarry	Construction

Mitigation measure ID	Mitigation measure	Works area	Phase
MM-SW07	**Changes to flow regime during operation** a. Proposed infrastructure should be designed to maintain existing levels of flood protection associated with overland flow paths (considering flood levels, flows and velocities) through compliance with GHCMA requirements for flooding and overland flows. b. Permanent surface structures should be designed to allow a set back from waterways and drainage pathways and maintain existing flow regime. c. Modifications to existing flow pathways (e.g. drainage diversion) would be carried out to the satisfaction of the GHCMA and Glenelg Shire Council.	Wind farm site	Operation
MM-SW08	**Stormwater management of operational facilities and roads** a. Stormwater produced from operation & maintenance (O&M) facilities and access roads shall be attenuated within the site and reused for internal use as much as possible. b. Implement a water collection and treatment system to ensure that stormwater discharges comply with the ERS. c. Stormwater treatments should be incorporated into the site design for the site facilities and access road to capture surface runoff and reduce pollutants in accordance with the Best Practice Environmental Management Guidelines (CSIRO 1999). d. Surface water discharges shall be designed in consultation with GHCMA to ensure there is no adverse impact on the capacity, quality and integrity of the receiving waterway.	Wind farm site	Operation

10.0 Conclusion

10.1 Assessment objective

The purpose of this report is to assess the potential surface water impacts associated with the Kentbruck Green Power Hub to inform the preparation of the EES that is required for the project.

The assessment was carried out using desktop studies and a field visit to determine the potential impacts of the project on surface water movement and quality (including waterways and wetlands). The assessment also identified the appropriate management and mitigation strategies that could address these potential impacts and meet the GED requirements of the *Environment Protection Act 2017* (EP Act).

10.2 Key Assets and environmental values.

The proposed wind farm site lies to the east of the Glenelg Estuary and Discovery Bay Ramsar site. This site is recognised internationally for the habitat it provides for waterbird species including the globally endangered Australasian bittern. It also provides food, spawning grounds and nurseries for a wide range of fish such as the globally vulnerable eastern little galaxias. The location of the windfarm site introduces a potential pathway between the proposed site activities and the Ramsar site via a small tributary that connects to Johnstone Creek.

The proposed cable transmission alignment will also interface with a number of surface water features that include ephemeral waterways, agricultural drainage channels, ephemeral wetlands and a major river (Surrey River). Whilst these surface water features have varied hydrological characteristics and geomorphology, they all sustain important aquatic habitat in the Glenelg and Portland Basins as well as providing important agricultural, cultural and recreational values.

10.3 Key surface water Impacts

The assessment identified a number of activities that could impact the receiving waterways or the Glenelg Estuary and Discovery Bay Ramsar site. These included trenching across waterways, runoff from active construction areas and dewatering of excavations.

Waterway crossings in particular place construction activities directly in the waterway channel and if not managed effectively, these works can release sediment and other contaminants into the aquatic environment.

Similarly, disturbed ground or unvegetated ground caused by construction works can also interface with overland flow pathways and minor drainage lines that carry sediment and pollutants towards sensitive surface water receptors.

These pollutants become difficult to manage once they have entered drainage pathways and waterways. Downstream impacts of construction site pollution include sedimentation, loss of fish spawning areas, fish kills, litter, as well as impacts to cultural and social values.

In addition to changes in water quality, the construction and operational phase activities could change the flow regime of the local waterway or catchment. Construction of access roads, turbine foundations and buildings within the wind farm can decrease flood storage and increase the volume of local runoff from the site.

Additionally, construction compounds, hardstands, stockpiles, the quarry, access roads and permanent infrastructure can change the low flow characteristics. These changes can cut off important water supplies for aquatic ecosystems and impact anthropological uses such as supplying farm dams or providing local drainage services.

10.4 Recommended mitigation measures

Many of the potential surface water impacts identified in Section 8.0 of this assessment would be managed through the adoption of the mitigation measures presented in Section 9.0. This includes compliance with the project’s EMF, CEMP and SEWQMP, and by adopting the controls presented in various best practice guidance for construction and environmental management. These guidelines include the IECA Best Practice Erosion and Sediment Control Guidelines, EPA Publication 1834; Civil Construction, Building and Demolition Guide and EPA Publication 1896: Working within or adjacent to waterways.

The mitigation strategies and controls presented in these guidelines are varied and cover a wide range of techniques that aim to manage surface water flows in and around the site, and avoid the generation of contaminated water before it can travel to a waterway. Such strategies include water quality monitoring, upstream diversion of clean water, programming works for dry seasons or during dry weather, limiting disturbed areas, using appropriate materials storage methodologies, and optimising site layout around floodplains or drainage pathways. These guidelines also provide direction on the collection, treatment and discharge of contaminated stormwater.

Adopting the guidelines and the mitigation measures presented in of this assessment, such as using HDD for identified water crossings, will mitigate the significant surface water impacts associated with the Kentbruck Green Power Hub project.

11.0 References

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Appendix A

Figures

NEOEN BOUNDLESS ENERGY

AECOM

DATUM GDA94 VICGRID94

0 10 20 Kilometers

1:600,000 (when printed at A3)

Legend

- Transmission Line - Underground
- 275 kV Powerline - Overhead
- 275 kV Powerline - Underground
- Wind Farm Site Boundary
- Glenelg Estuary and Discovery Bay Ramsar Site

Basin

- DARLING RIVER
- GLENELG RIVER
- HOPKINS RIVER
- MILLICENT COAST
- OTWAY COAST
- PORTLAND COAST

Data Sources:
1. Locality, Railway, Drainage Line, Streets, Features © StreetPro 2014
2. State Controlled Roads © (VICMAP) 2018
3. Essential Habitat © (VICMAP) 2018
4. Conservation Areas © (VICMAP) 2018
5. Protected Area © (VICMAP) 2018
6. Regional Ecosystems v8 © (VICMAP) 2018
7. Protected Plants Flore Survey Trigger © (VICMAP) 2018
8. Waterway Barrier Works© (VICMAP) 2018

Preliminary Hydrology Assessment
Kentbruck Green Power Hub

BASINS

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Figure F1

A3 size

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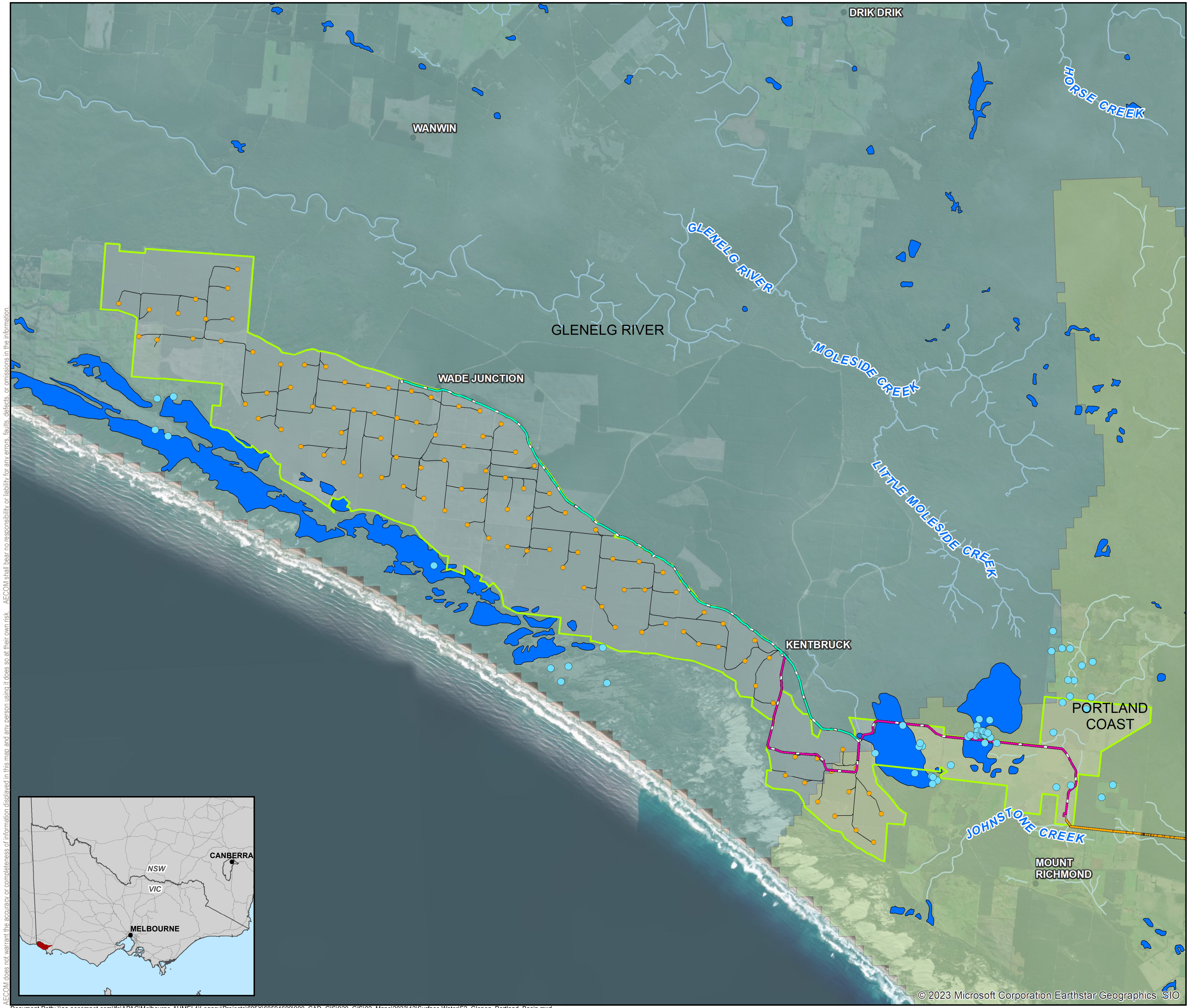

NEOEN BOUNDLESS ENERGY

AECOM

DATUM GDA94 VICGRID94

0 1.5 3

Kilometers

1:98,019 (when printed at A3)

Legend

- Turbine location
- Internal access roads
- Transmission Line - Underground
- 275 kV Powerline - Overhead
- 275 kV Powerline - Underground
- Wind Farm Site Boundary

Drainage Basins

Basin

- GLENELG RIVER
- PORTLAND COAST
- Watercourse
- DELWP Mapped Current Wetlands
- Farm Dams

Data Sources:

1. Locality, Railway, Drainage Line, Streets, Features © StreetPro 2014
2. State Controlled Roads © (VICMAP) 2018
3. Essential Habitat © (VICMAP) 2018
4. Conservation Areas © (VICMAP) 2018
5. Protected Area © (VICMAP) 2018
6. Regional Ecosystems v8 © (VICMAP) 2018
7. Protected Plants Flore Survey Trigger © (VICMAP) 2018
8. Waterway Barrier Works© (VICMAP) 2018

Preliminary Hydrology Assessment

Kentbruck Green Power Hub

GLENELG AND PORTLAND COAST BASINS

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Figure F2

A3 size

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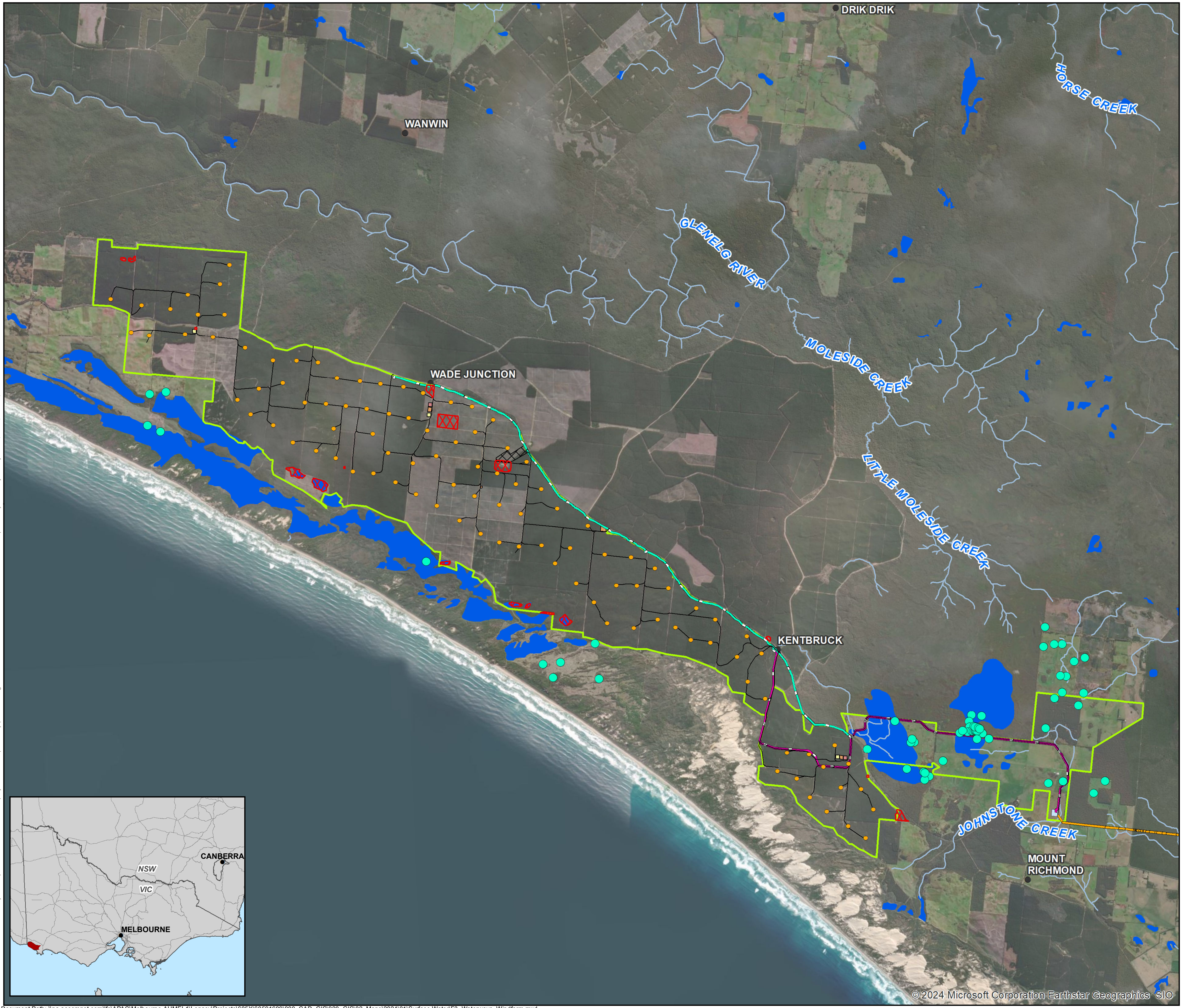

NEOEN BOUNDLESS ENERGY

AECOM

DATUM GDA94 VICGRID94

0 1.5 3 Kilometers

1:98,019 (when printed at A3)

Legend

- Turbine location
- Internal access roads
- Transmission Line - Underground
- 275 kV Powerline - Overhead
- 275 kV Powerline - Underground
- Wind Farm Site Boundary
- Concrete Batch Plant
- Construction Compounds
- Laydown Areas
- Watercourse
- DELWP Mapped Current Wetlands
- Farm Dams
- GTFP Excluded Areas
- Quarry - Work Authority Boundary

Data Sources:
1. Locality, Railway, Drainage Line, Streets, Features © StreetPro 2014
2. State Controlled Roads © (VICMAP) 2018
3. Essential Habitat © (VICMAP) 2018
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Preliminary Hydrology Assessment

Kentbruck Green Power Hub

WATERWAYS - WINDFARM SITE

PROJECT #: 60578607
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VERSION: 1

Figure F3

A3 size

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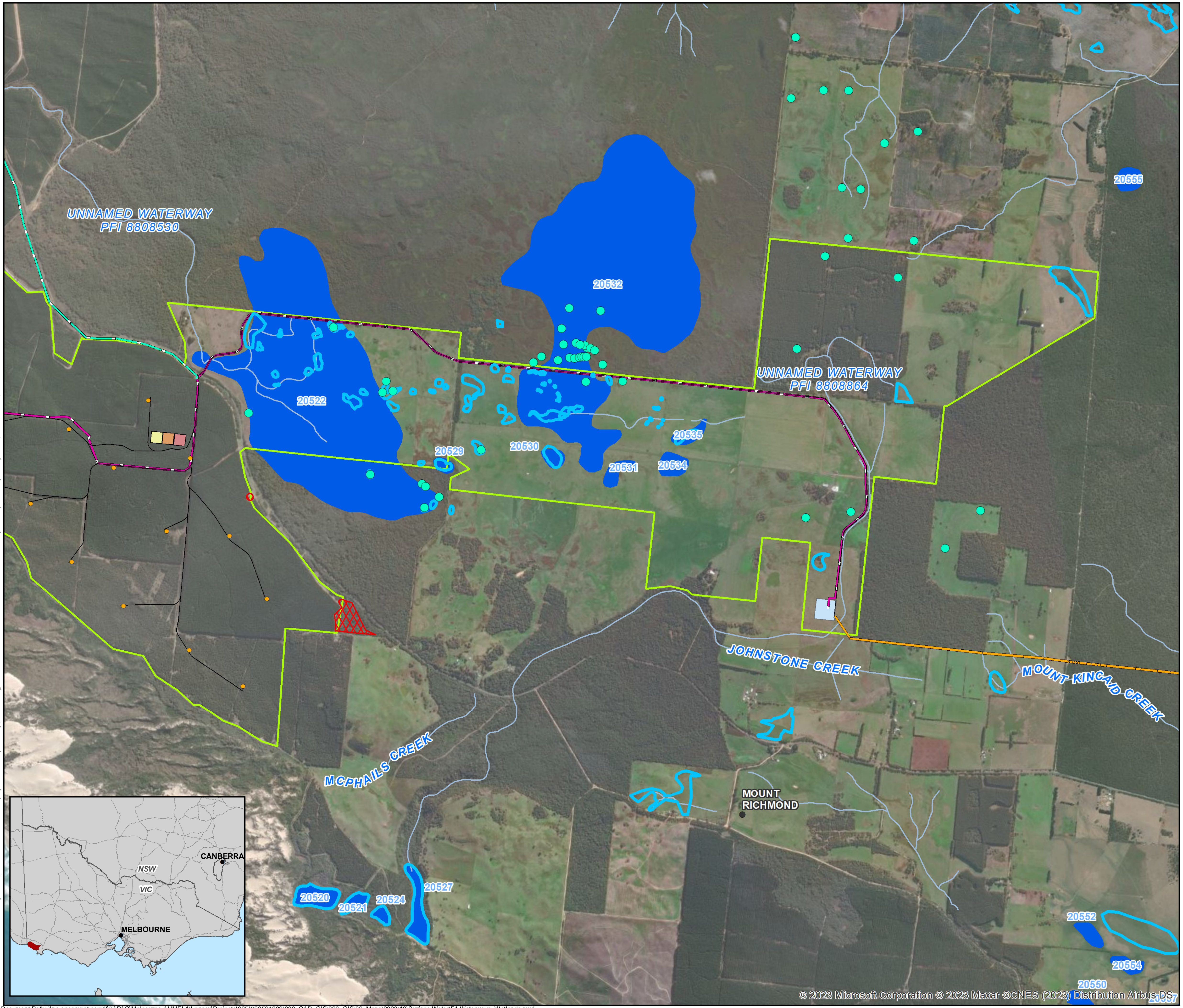

NEOEN BOUNDLESS ENERGY

AECOM

DATUM GDA94 VICGRID94

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Kilometers

1:31,834 (when printed at A3)

Legend

- Turbine location
- Internal access roads
- Transmission Line - Underground
- 275 kV Powerline - Overhead
- 275 kV Powerline - Underground
- Wind Farm Site Boundary
- Main Substation
- Construction Compounds
- Concrete Batch Plant
- Laydown Areas
- Watercourse
- DELWP Mapped Current Wetlands
- Farm Dams
- GTFP Excluded Areas
- Wetlands (Biosis 2023)

Data Sources:
1. Locality, Railway, Drainage Line, Streets, Features © StreetPro 2014
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Preliminary Hydrology Assessment
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WATERWAYS AND WETLANDS - WINDFARM SITE

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Figure F4

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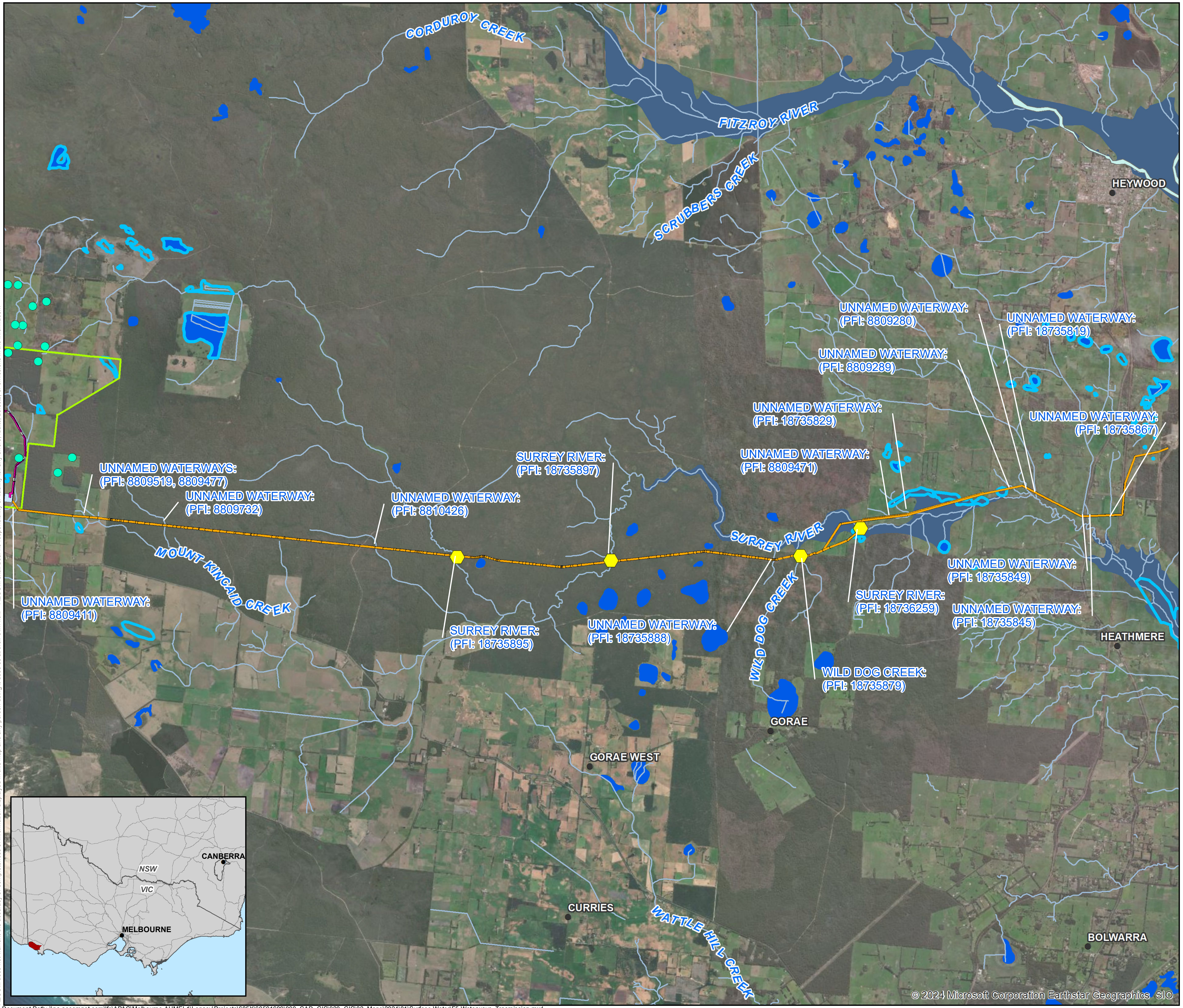

NEOEN Boundless Energy | AECOM

DATUM GDA94 VICGRID94

0 1 2 Kilometers

1:77,500 (when printed at A3)

Legend

- Internal access roads
- Transmission Line - Underground
- 275 kV Powerline - Underground
- Wind Farm Site Boundary
- HDD Crossing Location
- Watercourse
- DELWP Mapped Current Wetlands
- Farm Dams
- Wetlands (Biosis 2023)

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WATERWAYS & WETLANDS - TRANSMISSION

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VERSION:	1

Figure F5

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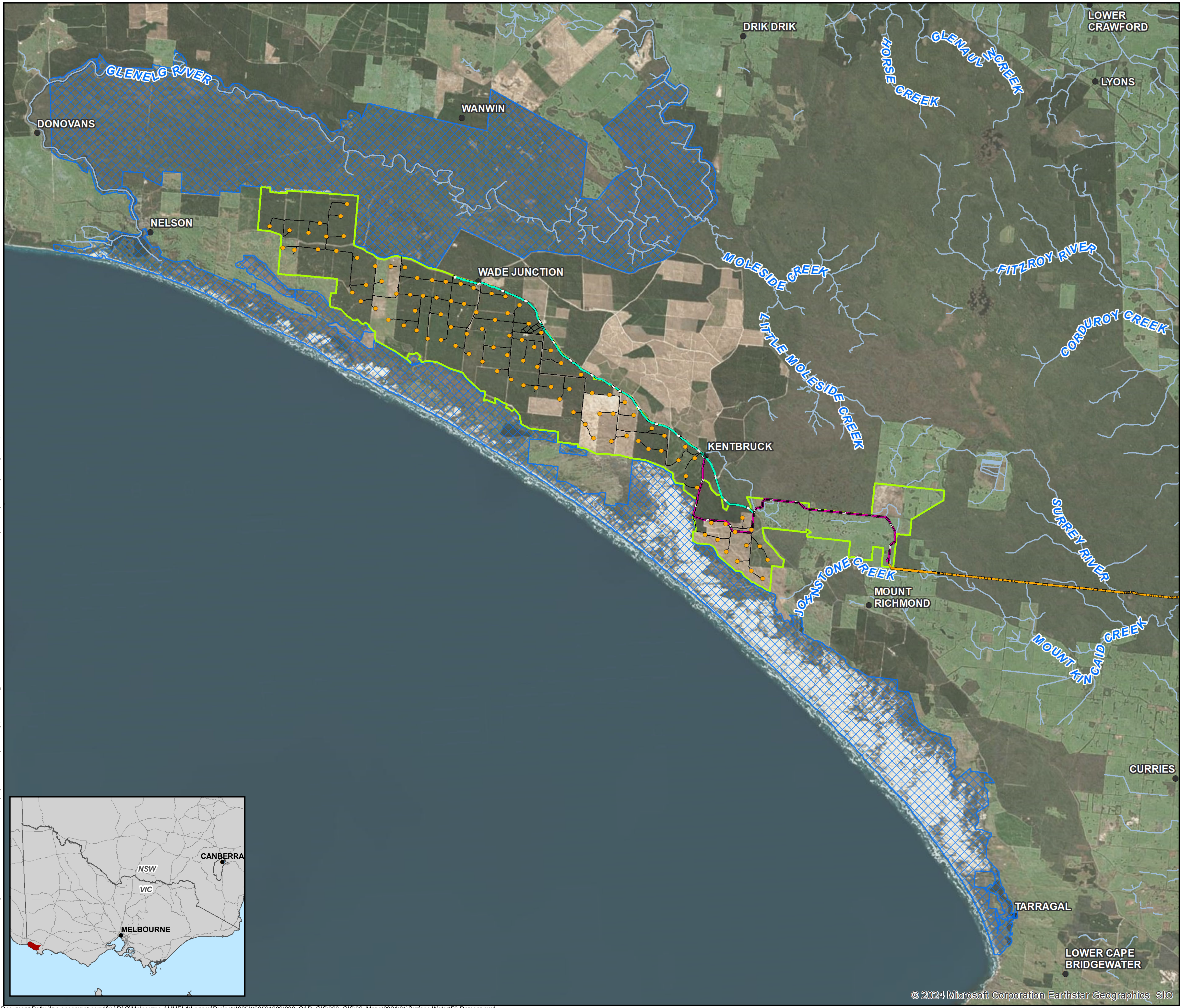

NEOEN BOUNDLESS ENERGY   AECOM

DATUM GDA94 VICGRID94
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Kilometers
1:150,000 (when printed at A3)

Legend

- Turbine location
- Internal access roads
- Transmission Line - Underground
- 275 kV Powerline - Overhead
- 275 kV Powerline - Underground
- Wind Farm Site Boundary
- Watercourse
- Glenelg Estuary & Discovery Bay Ramsar Site
- Quarry - Work Authority Boundary

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GLENELG ESTUARY AND DISCOVERY BAY RAMSAR SITE

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Figure F6

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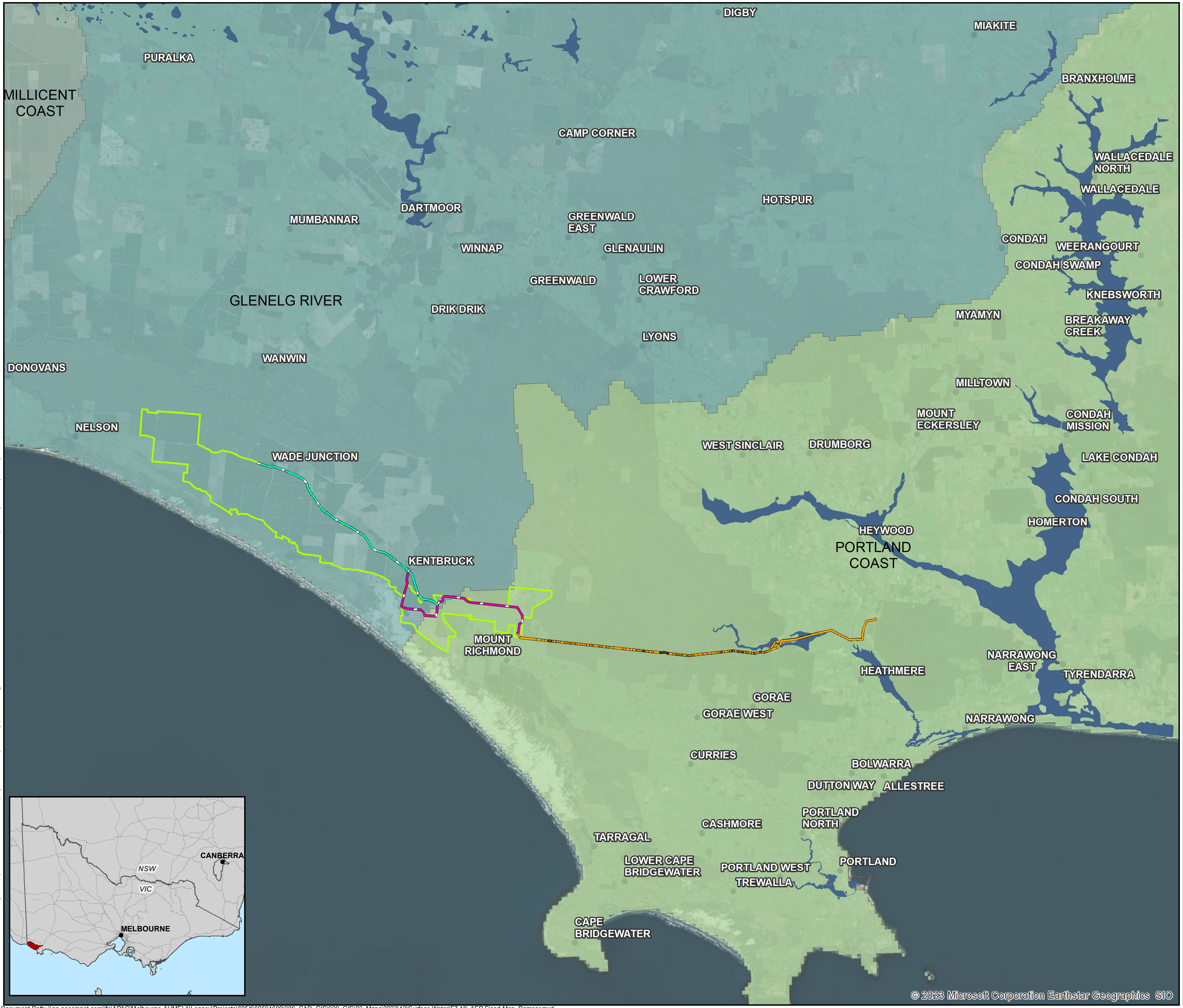

NEOEN BOUNDLESS ENERGY

AECOM

Legend

- Transmission Line - Underground
- 275 kV Powerline - Overhead
- 275 kV Powerline - Underground
- Wind Farm Site Boundary
- 1% AEP Flood Extent

NCBLevel2DrainageBasin...

Basin

- GLENELG RIVER
- MILLICENT COAST
- PORTLAND COAST

Data Sources:
1. Locality, Railway, Drainage Line, Streets, Features © StreetPro 2014
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1% AEP FLOOD EXTENT

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VERSION:	1

Figure F7

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A3 size

Appendix B

Surface Water Impact Assessment - Alternative Alignment Assessment

Prepared for
Neoen Australia Pty Ltd
ABN: 57 160 905 706

AECOM

Surface Water Impact Assessment

Alternative Alignment Assessment

29-Jan-24
Kentbruck Green Power Hub
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Delivering a better world

Surface Water Impact Assessment

Alternative Alignment Assessment

Client: Neoen Australia Pty Ltd

ABN: 57 160 905 706

Prepared by

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29-Jan-24

Job No.: 60591699

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Quality Information

Document	Surface Water Impact Assessment
Ref	60591699
Date	29-Jan-2024
Originator	Tony Barrett
Checker/s	Peter Meyers
Verifier/s	Peter Meyers

Revision History

Rev	Revision Date	Details	Approved	
			Name/Position	Signature
1	08-Dec-2023	Revised following project updates	Peter Meyers Technical Director Water Resources	
2	29-Jan-2024	Revised following Neoen comments	Peter Meyers Technical Director Water Resources	

Table of Contents

1.0 Background

Section 3.4 of the Scoping Requirements for Kentbruck Green Power Hub Environment Effects Statement requires that the Project's EES document the likely environmental effects of the Project's feasible alternatives, including routes and configurations for the transmission line. The depth of investigation should be proportionate to the potential of the alternatives to minimise potentially significant adverse effects and to meet the Project objectives.

This appendix describes the feasible transmission line alternatives that have been considered by Neoen for this Project, and the potential surface water effects of each alternative. The preferred option for the Project, referred to as "Option 1B", has been assessed in detail in this report, so is not subject to any further assessment in this appendix. Instead, this appendix considers the potential environmental effects of the following transmission line alternatives:

- Option 1A ("Heywood Underground-Overhead Combined": Follows the same route as Option 1B (the preferred option) through Cobboboonee National Park / Forest Park however it then transitions to an overhead transmission line for the remainder of the alignment to the Heywood Terminal Station.
- Option 2A ("Portland Overhead"): A wholly overhead option that connects to the existing Heywood-Portland 500 kV line north of Portland. Runs southeast from the wind farm site through rural landholdings. No final route was determined for this option as landowner agreements were unable to be secured for the entire length of transmission line. This option therefor includes several route options.
- Option 2B ("Portland Underground"): Follows the same route as Option 2A but is wholly underground.

1.1 Transmission line Project objectives

The fundamental objective of the Project is to provide a source of clean, renewable energy to help power homes and businesses in Victoria and throughout eastern Australia which are connected to the National Electricity Market (NEM).

Neoen's environmental and social objectives for the Project, as described in Section 2.2 of the EES, stem from the need to develop the Project in accordance with the principles of ecologically sustainable development. Neoen's objectives relating specifically to the transmission line component of the Project are to:

- Deliver renewable electricity from the Project to the NEM.
- Seek opportunities to co-locate infrastructure with existing compatible land uses such as existing easements and transport routes.
- Avoid or minimise potential adverse impacts on the natural environment.
- Avoid or minimise potential adverse impacts on Aboriginal and historical heritage.
- Avoid or minimise potential adverse impacts on nearby residents associated with visual amenity, noise, traffic, and air quality
- Avoid impacts to business and commercial operations.
- Avoid or minimise potential impacts on productive agricultural land.
- Avoid or minimise the risk of bushfire.
- Ensure an appropriate land use outcome by avoiding areas of sensitivity and potential land use conflicts.
- Be able to obtain necessary agreements with landowners and land managers to install and operate infrastructure.
- Be able to obtain planning and environmental approvals from all necessary authorities.

- Provide a constructable and cost effective grid connection.

Umwelt (2023) has prepared a Transmission Line Options Assessment which describes all the transmission line options considered by Neoen to date, including those which were not found to be viable and were removed from the Project before the EES process commenced or very early in the EES process. The Options Assessment uses an objective, criteria-based approach to assessing each option. The assessment criteria and scoring metrics were developed in accordance with the transmission line objectives provided above.

This appendix describes the potential surface water impacts of the feasible transmission line options identified in the options assessment report, providing information for use by Umwelt in the options assessment in relation to the surface water related criteria.

2.0 Description of the alternative transmission line options

The Project being pursued by Neoen, and subject to full impact assessment in this report, comprises a preferred transmission line route and configuration as described in the Surface Water Impact Assessment EES Report (underground through Cobboboonee National Park and Forest Park, and farmland to the Heywood Terminal Station – Option 1B). An alternative configuration to this option has also been considered by Neoen, which follows the same route as Option 1B however it involves an overhead section between Cobboboonee Forest Park and the Heywood Terminal Station.

Two other options which were identified as feasible in the Transmission Line Options Assessment, but are no longer being pursued by the Project due to a lack of landowner and community support, are Options 2A and 2B which run southeast from the wind farm site and connect to the Heywood-Portland 500 kV line north of Portland. Option 2A is wholly overhead, while Option 2B is wholly underground.

The three transmission line options are described as follows:

- Option 1A: The underground transmission line would extend east from the main wind farm substation and traverse Cobboboonee National Park and Forest Park beneath an existing road. From there, the transmission line would transition to an overhead line as it travels through freehold land to reach Heywood Terminal Station
- Option 2A: The overhead transmission line would extend southeast from the main wind farm substation and traverse several freehold rural landholdings used primarily for grazing. This option would require development and construction of a new terminal station adjacent to the existing Heywood-Portland 500 kV line north of Portland.
- Option 2B: The underground transmission line would extend southeast from the main wind farm substation and traverse several freehold rural landholdings used primarily for grazing. This option would require development and construction of a new terminal station adjacent to the existing Heywood-Portland 500 kV line north of Portland.

3.0 Summary of the assessment methodology

The assessment methodology adopted for the alternative transmission line options utilised the same systematic, risk-based approach that was applied during the assessment of the preferred transmission line option in the Surface Water Impact Assessment EES Report.

This approach considered the existing environment, the potential impacts of the project and how to avoid, minimise or manage the risk of these impacts. The following sections provide a high-level overview of the assessment methodology including key assumptions and limitations. Further details of the methodology can be found in Section 5.0 of the Surface Water Impact Assessment EES Report.

3.1 Existing Conditions

Existing conditions were determined through desktop assessment of publicly available data and information provided by Neoen. These data sources included previous investigations, areal imagery and Victorian Government data portals (e.g. DEECA's Mapshare site). No field investigations were carried during the alternative transmission line assessment.

3.2 Risk assessment

Potential risks, impacts and mitigation measures for surface water and catchment values were examined using the same approach carried out for the preferred transmission line assessment methodology in the Surface Water Impact Assessment EES Report. This was consistent with the Australian/New Zealand Standard AS/NZS ISO 31000:2018 *Risk Management Process* and consequence and likelihood ratings were assigned to give an overall risk level for each identified risk.

3.3 Impact assessment

Impacts occur when project activities cause changes to existing conditions. The impact assessment identified the severity, extent, and duration of any impacts the project may have on the existing surface water environment and environmental values. These impacts include typical hydrological and water quality changes that could occur during the construction and operational phases.

Key focus areas of the alternative transmission line options impact assessment were the waterways and wetlands that interface with the project.

The impact assessment was desktop based only and did not include any flood modelling or water quality sampling.

3.4 Waterway Crossing Assessment

The construction of waterway crossings presents one of the more critical risks to existing conditions and the associated environmental values of water. The waterway crossing assessment reviewed a broad range of characteristics for each waterway that could be crossed by the alternative transmission line alignments and made recommendations on the preferred crossing methodology.

4.0 Existing conditions

The existing conditions assessment of the catchments, waterways and wetlands that could be impacted by the project provided the basis for the impact assessment.

The Surface Water Impact Assessment EES Report considered a broad range of aspects for existing conditions at the regional catchment scale and local surface water scale. Several of these aspects documented in the main report remain relevant to this alternative transmission line options assessment and should be referred to in support of this assessment. These aspects include the Regional Catchment Context (Section 6.1), Climate (Section 6.2.2), Glenelg Estuary and Discovery Bay Ramsar Site (Section 6.2.8), Water Supply (Section 6.2.10) and Water for Construction (Section 6.2.11).

The existing conditions that were considered for this alternative transmission line options assessment related to the local surface water context only and included the following aspects;

- Topography and Land Use
- Hydrology
- Wetlands
- Flooding
- Waterway Condition
- Environmental Values

4.1 Topography and Land Use

The Option 1A alignment would construct a combined an underground-overhead transmission line between the main wind farm substation in the west, and the Heywood Terminal Station to the east.

The western section of this alignment option traverses Cobboboonee National Park along an existing road. This park has an area of around 18,500 ha and features lowland forests, heathlands and wetlands.

Moving east, beyond the National Park boundary, the alignment crosses open agricultural land before reaching the Heywood Terminal Station.

The topography of the Option 1A alignment varies greatly and includes the lower slopes of Mount Kinkaid in the west, gentle undulations through Cobboboonee National Park, and relatively flat terrain across the agricultural land towards the Heywood Terminal Station. At just 30 mAHD, the area of agricultural land along the Surrey River floodplain represents the lowest elevation of the proposed project area.

The Option 2A and Option 2B transmission line alignment would extend in a south easterly direction from the main wind farm site across open agricultural land that is predominantly used for grazing. All of this land has been categorised as ‘Farming Zone - Schedule One’ in the planning scheme.

The alignment originates in the north west at Mount Kinkaid, close to the Cobboboonee National Park and adjacent timber plantations. As the alignment moves south, it runs close to the boundary of the Mount Richmond National Park. This national park is managed by Parks Victoria and has an area of around 1,730 hectares.

Contour data indicates this alignment occupies an extensive plain that is gently graded to the east and southeast. The highest elevation along this alignment occurs on the slopes of Mount Kincaid at around 150 mAHD. As the transmission line moves away from Mount Kincaid, the hill slope becomes less defined and the terrain flattens out through the central area of the alignment. Typical elevations through the alignment vary between 120 mAHD near Portland-Nelson Road, to around 50 mAHD, approximately 20km to the southeast, close it to the existing Heywood-Portland 500 kV line.

4.2 Hydrology

The Surface Water Impact Assessment EES Report identified three gauging stations that were in the local and adjacent catchments. These were Moleside creek (active 1973 - 1985), Surrey River at Heathmere (active 1975 – present), and Fitzroy River close to Heywood (active 1963 – present).

None of these gauging stations are located inside the project boundary or in upstream catchments that interface with the potential alternative transmission line alignment options. Only the Surrey River gauging station at Heathmere is in a catchment that is potentially impacted by the project. This gauging station is located in the lower reaches of the Surrey River system at the southern tip of the Narrawong Flora Reserve, approximately 7.5km downstream of the Option 1A transmission line alignment.

Table 1 presents the mean daily stream flows for each month at the Surrey River gauging station near Heathmere. These records show that stream flows are significantly higher during August (shown dark green) and lowest around February (shown light green).

Table 1 Mean daily stream flow for each month at the Surrey River surface water site (Mega litres / day) (Source: Bureau of Meteorology, 2023).

Station	Location	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
237207	**Surrey River**	4.0	1.8	2.2	2.4	6.7	46.8	190.9	282.4	200.7	117.0	36.9	10.5

Mount Kincaid forms the natural catchment boundary between the Glenelg River and Surrey River Systems. All of the alternative transmission line options are on the eastern side of Mount Kinkaid and outside of the Glenelg River system.

The Surface Water Impact Assessment EES Report provides a summary of the waterways and hydrology of the Option 1B transmission line alignment. This alignment is the same as the proposed Option 1A transmission line alignment and is presented in Figure F5 of the Surface Water Impact Assessment EES Report.

The Option 1A transmission line alignment falls entirely within the Surrey River catchment and interfaces with a number of small tributaries before crossing the Surrey River floodplain. These tributaries include the Mount Kinkaid Creek and Wild Dog Creek. Further details on the Surrey River system and associated tributaries can be found in the Surface Water Impact Assessment EES Report.

The alternative alignments for Options 2A and 2B also start in the upper reaches of the Surrey River catchment. However, the route enters the Wattle Hill Creek catchment as the alignment moves east of Mount Richmond National Park. Figure F1A provides the hydrological context for the Option 2A and 2B alignment

Wattle Hill Creek receives runoff from the agricultural land situated between Mount Richmond National Park in the west, and the southern extent of Cobboboonee Forest Park to the east. The upper reaches of Wattle Hill Creek feature a large number of drainage channels and farm dams across the agricultural land. As the Creek flows towards Portland, the course becomes more defined with natural meanders and fewer channel modifications.

The lower reaches of Wattle Hill Creek discharge into Fawthrop Lagoon, a natural, estuarine wetland located in the suburbs of Portland. Fawthrop Lagoon has also been modified as a stormwater retarding basin to protect downstream communities.

The outflow channel from Fawthrop Lagoon connects to a highly modified and straightened waterway that was potentially constructed as a canal. The final discharge point for the Wattle Hill Creek system is into Portland harbour, adjacent to the Trawler Warfe.

4.3 Wetlands

The Surface Water Impact Assessment EES Report provides a summary of the wetlands that are on, or adjacent to the Option 1A transmission line alignment. The location of these wetlands is also shown in Figure 5 of the Surface Water Impact Assessment EES Report.

The alternative transmission line route for Options 2A and 2B passes close to five current wetlands in the upper reaches of Mount Kincaid Creek. These wetlands have all been categorised as ephemeral, temporary features that are subject to periods of inundation. Three of these wetlands have also been described as temporary freshwater marshes and meadows (DEECA).

As the alignment moves south east of these current wetlands, it crosses close to the northern boundary of Mount Richmond National Park. The alignment through this area crosses the upper reaches of several minor tributaries that feed into the Surrey River System, including Mount Kincaid Creek. The terrain through this area is relatively flat and aerial imagery indicates that some of these areas may feature temporary freshwater meadows caused by the low relief and proximity to drainage pathways. Similar drainage conditions and wetlands may also exist to the south east as the alignment nears Heath Road and Amors Road.

4.4 Flooding

None of the alternative transmission line route options are in areas that are impacted by a Land Subject to Inundation Overlay (LSIO) or Floodway Overlay (FO) as categorised by the local planning scheme.

The nearest areas affected by LSIO and FO are on the Fiztroy River at Heywood, which is outside of the project catchment, and Wattle Hill Creek, south of Bridgewater Road.

Whilst there are no areas of LSIO or FO near the alternative transmission line route options, flooding is still likely to occur in some of the waterways that interface with these alignments.

The Option 1A transmission line alignment crosses Surrey River at two locations in the Cobboboonee National Park. East of the park, the alignment enters the Surrey River floodplain and crosses the River for third time, as well as crossing a number of major tributaries that feed into Surrey River from the north.

Mapping data from the Department of Energy, Environment and Climate Action (DEECA) indicates that the Surrey River floodplain is subject to significant flooding along this alignment. The estimated flood extent for the 1% annual exceedance probability (AEP) flood event is shown in Figure 5 of the Surface Water Impact Assessment EES Report.

There are no mapped flood extents available for the waterways that cross the alternative alignment route Options 2A and 2B. Many of these waterways are minor tributaries and the crossings would occur in the upper reaches of the catchment suggesting that the risk of riverine flooding could be low. However, the topography of the land through this alignment is relatively flat and the presence of wetlands, particularly in the upper reaches of Mount Kincaid Creek, suggest that some areas could experience periodic inundation or waterlogging.

Further downstream of these alignment options, flooding is well documented with records of flooding at Narrawong on the Surrey River and at Fawthrop Lagoon on Wattle Hill Creek in Portland.

4.5 Waterway Condition

Section 6.2.5 of the Surface Water Impact Assessment EES Report provides a summary of waterway condition for the Surrey River. This was based on the Third Index of Stream Condition report (DELWP 2010).

The Third Index of Stream Condition (ISC) report assessed the environmental condition of major rivers and streams across the state of Victoria. Subsequently, the ISC report does not include the minor waterways that interface with the alternative transmission line Options 2A and 2B.

Areal imagery indicates that many of the waterways along the route of the alternative transmission line Options 2A and 2B have been heavily modified for agricultural use. These modifications include changes to the physical form through channel straightening, changes to hydrology from the construction of farm dams, and impacts to streamside zone from the loss of riparian and streamside vegetation.

There is no publicly available water quality monitoring data for the upper reaches of the Mount Kincaid Creek and Wattle Hill Creek through the alternative transmission line alignment Options 2A and 2B.

4.6 Environmental Values

The Surface Water Impact Assessment EES Report defines the environmental values of water that are in or adjacent to the project area. Environmental values are associated with the importance placed on a specific environmental aspect because of the service or use that aspect provides.

Many of the environmental values associated with the waterways and wetlands that interface with the alternative transmission line options remain unchanged from the Surface Water Impact Assessment EES Report. Table 2 provides A summary of environmental values for water that are within or adjacent to the alternative alignment options 2A and 2B.

Table 2 Environmental values within or adjacent to the alternative transmission line Options 2A and 2B

Water aspect	Environmental Values / Water Uses
Waterways including Surrey River, Mount Kinkaid Creek, Wattle Hill Creek, their connected tributaries and unnamed waterways.	• Recreation. • Aesthetic enjoyment. • Traditional owner cultural values. • Cultural and spiritual values. • Agriculture and irrigation. • Industrial and commercial use. • Habitat values.

Water aspect	Environmental Values / Water Uses
Current Mapped Wetlands and other non-categorised wetlands	• Traditional owner cultural values. • Cultural and spiritual values. • Agriculture. • Habitat values. • Recreation. • Flood storage.

5.0 Identification of impact pathways

Section 8.0 of the Surface Water Impact Assessment EES Report discusses the potential surface water impacts of the project that could occur during the construction and operational phases.

Impacts from the construction phase can occur through a broad range of mechanisms including mobilisation of sediment, dewatering of excavations, runoff from disturbed ground and pollution from spills.

Operational phase impacts can occur where the proposed infrastructure or final landform changes the existing hydrology or water quality in the receiving aquatic environment. Mechanisms for these impacts can include blockage of flow pathways or increased volume of stormwater runoff from new impervious surfaces (e.g. access tracks).

Many of the impact pathways that were developed during Surface Water Impact Assessment EES Report remain relevant to the alternative transmission line options. Subsequently, the same Risk Identification numbers have been applied to this assessment. These risk pathways are summarised in Table 3.

Table 3 Surface water risk pathways for the alternative transmission line options

Risk ID	Potential threat and effects on the environment
Construction	
SW01	Dewatering of groundwater and/or rainwater from the trenches and excavations results in contaminated water entering waterways and the receiving environment.
SW02	Stormwater runoff from construction sites and work activities pollute receiving waterways and downstream environment.
SW03	Trenching across waterways mobilises sediment and causes pollution in the waterways and downstream environment.
SW04	Frac-out from Horizontal Directional Drilling (HDD) returns drilling fluids to surface causing discharge to surface water.
SW05	A spill of hazardous materials during construction results in contaminated discharge to surface water.
SW06	Construction activities change the flood risk and flood characteristics.
SW07	Construction activities potentially block or divert low flow pathways leading to changes in flow regime and environmental values.
Operation	
SW08	Operational or permanent infrastructure potentially change the hydrological conditions leading to increased flood levels or flooding of adjacent property.

Risk ID	Potential threat and effects on the environment
SW09	Operational or permanent infrastructure potentially blocking or diverting low flow pathways leading to changes in flow regime and environmental values.
SW11	Contaminated stormwater runoff from operational facilities pollutes receiving waterways and environment.

6.0 Impact assessment

The Impact Assessment considers the impacts listed in Section 5.0 of this report and the effect they could have on the existing conditions listed in Section 4.0.

The Impact Assessment also provides a high level summary of the mitigation measures that aim to reduce these impacts to as low a level as possible to preserve these existing conditions and their associated environmental values.

6.1 Waterway Crossing Assessment

Waterway crossings present one of the more significant risks to existing conditions and this impact assessment includes a waterway crossing assessment that will help inform decisions on the crossing construction methodology for each of the alternative transmission alignment options (i.e. overhead, open cut trenching or horizontal directional drilling).

The waterway crossing assessment carried out for this study was desktop based and used a range of publicly available data to make assumptions on waterway condition and characteristics. Criteria considered in the waterway crossing assessment included the following:

- Whether the waterway or wetland was ephemeral or perennial.
- Upstream catchment area and waterway hierarchy (i.e. using DEECA hierarchy).
- Whether the waterway or wetland was natural or had been significantly modified from its original form (constructed).

Major, perennial waterways that featured large upstream catchments and natural channel form were considered appropriate for horizontal directional drilling (HDD) construction techniques.

Waterways with smaller catchments, ephemeral flow conditions, less defined or constructed channels were considered appropriate for trenched (open cut) waterways crossings.

A waterway crossing assessment has previously been carried out for the Option 1B transmission line alignment. This alignment follows the same route as Option 1A and recommendations were made for HDD crossings beneath the Surrey River. These findings are directly applicable to the section of the 1A alignment that runs through the Cobboboonee National Park between Mount Kincaid and the Surrey River floodplain.

The waterway crossing assessment summary provided in Table 4 is for the overhead section of the Option 1A transmission line between the Cobboboonee National Park and Heywood Terminal Station. These waterways are presented in Figure F5 of the Surface Water Impact Assessment EES Report. The waterway crossings presented in Table 5 are for the Option 2A and 2B transmission line alignments.

Table 4 Waterway crossings of the proposed 1A Option(overhead) transmission alignment

Name	Catchment Area (ha)	Hierarchy (DEECA)	Ephemeral	Natural or Constructed
Unnamed Tributary of Surrey River (PFI 8809471)	50	Minor	Yes	Natural
Unnamed Tributary of Surrey River (PFI 18735829)	80	Minor	Yes	Natural
Unnamed Tributary of Surrey River (PFI 8809289)	55	Minor	Yes	Constructed
Unnamed Tributary of Surrey River (PFI 8809280)	25	Minor	Yes	Constructed
Unnamed Tributary of Surrey River (PFI 18735819)	2,700	Major	No	Constructed
Unnamed Tributary of Surrey River (PFI 18735849	850	Minor	Yes	Constructed
Unnamed Tributary of Surrey River (PFI 18735845	850	Minor	Yes	Constructed
Unnamed Tributary of Surrey River (PFI 18735867)	30	Minor	Yes	Constructed

Table 5 Waterway crossings of the 2A and 2B Option transmission line alignment

Name	Catchment Area (ha)	Hierarchy (DEECA)	Ephemeral	Natural or Constructed	Construction Method	Reasoning for construction method
Unnamed Tributary of Mt Kinkaid Creek (PFI 8810262)	400	Minor	Yes	Constructed	Trench	Minor, ephemeral waterway where crossing and reinstatement works can be planned for dry weather and completed quickly
Unnamed Tributary of Wattle Hill Creek (PFI 8813193)	380	Minor	Yes	Constructed	Trench	Minor, ephemeral waterway (drainage channel) where crossing and reinstatement works can be planned for dry weather and completed quickly

Name	Catchment Area (ha)	Hierarchy (DEECA)	Ephemeral	Natural or Constructed	Construction Method	Reasoning for construction method
Unnamed Tributary of Wattle Hill Creek (PFI 8813535)	30	Minor	Yes	Constructed	Trench	Minor, ephemeral waterway where crossing and reinstatement works can be planned for dry weather and completed quickly
Unnamed Tributary of Wattle Hill Creek (PFI 8814044)	420	Minor	Yes	Constructed	Trench	Minor, ephemeral waterway where crossing and reinstatement works can be planned for dry weather and completed quickly
Unnamed Tributary of Wattle Hill Creek (PFI 8814055)	280	Minor	Yes	Constructed	Trench	Minor, ephemeral waterway where crossing and reinstatement works can be planned for dry weather and completed quickly
Unnamed Tributary of Wattle Hill Creek (PFI 18735949)	1,600	Minor	Yes	Constructed	Trench	Minor, ephemeral waterway where crossing and reinstatement works can be planned for dry weather and completed quickly

6.2 Impact Assessment

The resultant risk ratings for all risk pathways assessed were deemed low and a subsequent residual impact assessment has not been carried out. Table 6 provides a summary of the impact assessment, including key mitigation measures and risk ratings. More detailed descriptions of the impacts and mitigation measures can be found in Sections 8 and 9 of the Surface Water Impact Assessment EES Report.

Table 6 Impact assessment with key risk pathways, mitigation measures and risk ratings

Risk ID	Risk Pathway	Mitigation Measure	Risk Rating		
			C	L	Risk
SW01	Dewatering of groundwater and/or rainwater from the turbine foundations, trenches and excavations results in contaminated water entering waterways and the receiving environment.	• Dewatering activities would be managed in accordance with the Dewatering Plan in the CEMP. • Water from excavated areas should not be discharged into or within 50 m of a watercourse, drainage pathway or wetland. • Where discharge to waterbodies is inevitable, water should be collected and treated to the requirements of the relevant Authorities.	Minor	Unlikely	Low

SW02	Stormwater runoff from construction sites and work activities pollute receiving waterways and downstream environment.	• A water quality monitoring and adaptive management program will be implemented to ensure the effectiveness of controls that are implemented to mitigate potential risks to surface waters, and detail additional and/or improved measures that would be implemented should those controls fail or are not effective to eliminate or minimise risks of harm to surface waters. • Monitoring of surface waters will be conducted upstream and downstream of works areas prior to construction, during construction and post-construction at the appropriate frequency (i.e., weekly during watercourse crossings works) to understand any changes to environmental values in line with EPA publication 1896: Working within or adjacent to waterways. • All construction works will be carried out in accordance with industry best practice guidelines including the IECA Best Practice Erosion, Sediment Control Guidelines and EPA Publication 1834 Civil Construction, Building and Demolition Guide, EPA Publication 1894: Managing Soil Disturbance, and EPA Publication 1895: Managing stockpiles. • A Project-wide CEMP will be developed and implemented, incorporating a Sediment, Erosion and Water Quality Management Plan (SEWQMP) for all work areas. The SEWQMP will outline the erosion and sediment mitigation measures to be implemented for each work area.	Minor	Possible	Low

SW03	Trenching across waterways mobilises sediment and causes pollution in the waterways and downstream environment.	• All trenched waterway crossings will be carried out in accordance with industry best practice guidelines including the IECA Best Practice Erosion and Sediment Control Guidelines and EPA Publications 1834 Civil Construction, Building and Demolition Guide and 1896 Working within or adjacent to waterways. • Waterway crossing works and reinstatement will be carried out in consultation with the GHCMA. • Trench crossing works will be programmed for dry or low flow conditions, such that works are preferentially scheduled for drier months of the year and lowest flow of the waterway and works are avoided when high rainfall events are expected. • The exposed trench within a watercourse and riparian zones will be reinstated immediately following the installation of the cable, including providing suitable compaction and revegetation. • Waterway reinstatement will be designed to avoid future erosion. This may include the use of riprap made of stones to stabilise the waterway. If necessary, a geofabric will be provided to prevent erosion and scour until the vegetation has established. • For 12 months after completion of trenching works, trenched waterways will be visually inspected following significant rainfall/flow events. If during these visual inspections waterway reinstatement works are observed to be not performing appropriately (ie erosion is occurring), rectification measures will be developed and implemented in a timely manner. • Temporary diversions will be provided if there is permanent or tidal flow in the waterway in accordance with the IECA Best Practice Erosion and Sediment Control Guidelines.	Minor	Unlikely	Low
SW04	Frac-out from Horizontal Directional Drilling (HDD) returns drilling fluids to surface causing discharge to surface water.	• The proposed HDD profile design and the work method statement shall be submitted to the GHCMA and approved prior to the commencement of HDD works • Risk of frac-out should be assessed in accordance with industry best practice guidelines to determine likelihood of occurrence (e.g. modelling).	Minor	Unlikely	Low

SW05	A spill of hazardous materials during construction results in contaminated discharge to surface water.	• The storage of fuels and chemicals would comply with industry best practice guidelines and the requirements of the relevant authorities. • Fuels and chemicals stored on site should be minimised. • Fuels should not be stored in areas that are subject to inundation (e.g. floodplains), close to waterways and/or wetlands.	Minor	Unlikely	Low
SW06	Construction activities change the flood risk and flood characteristics.	• A project wide CEMP would be developed and implemented, incorporating a SWMP for all sites. The SWMP will outline the flood risk management measures for each site. • Construction compounds, drilling compounds, laydown areas and material storage areas should be located outside of the floodplain or areas that are subject to inundation. • Stockpiling of excavation material, topsoil and trench spoil in areas that are flood prone should be avoided. • Site activities, facilities, infrastructure and materials should be set back from drainage pathways and waterways.	Minor	Possible	Low
SW07	Construction activities potentially block or divert low flow pathways leading to changes in flow regime and environmental values.	• A project wide CEMP would be developed and implemented, incorporating a SWMP for all sites. The SWMP will outline the flood risk management measures for each site. • Construction compounds, drilling compounds, laydown areas and material storage areas should be located outside of the floodplain or areas that are subject to inundation. • Stockpiling of excavation material, topsoil and trench spoil in areas that are flood prone should be avoided. • Site activities, facilities, infrastructure and materials should be set back from drainage pathways and waterways.	Minor	Possible	Low
SW08	Operational or permanent infrastructure potentially change the hydrological conditions leading to increased flood levels or flooding of adjacent property.	• Proposed infrastructure should be designed to maintain existing levels of flood protection. • Permanent surface structures should be designed to allow a set back from waterways and drainage pathways and maintain existing flow regime. • Modifications to existing flow pathways (e.g. drainage diversion) would be carried out to the satisfaction of the GHCMA and Glenelg Shire Council.	Minor	Unlikely	Low

SW09	Operational or permanent infrastructure potentially blocking or diverting low flow pathways leading to changes in flow regime and environmental values.	• Proposed infrastructure should be designed to maintain existing levels of flood protection. • Permanent surface structures should be designed to allow a set back from waterways and drainage pathways and maintain existing flow regime. • Modifications to existing flow pathways (e.g. drainage diversion) would be carried out to the satisfaction of the GHCMA and Glenelg Shire Council.	Minor	Unlikely	Low
SW11	Contaminated stormwater runoff from operational facilities pollutes receiving waterways and environment.	• Stormwater produced from operation & management (O&M) facilities and access roads shall be attenuated within the site and reused for internal use as much as possible. • Stormwater treatments should be incorporated into the site design for the site facilities and access road to capture surface runoff and reduce pollutants in accordance with the Best Practice Environmental Management Guidelines (CSIRO 1999). • Surface water discharges to designated waterways shall be designed in consultation with GHCMA	Minor	Unlikely	Low