YANCOAL
兖煤澳大利亚有限公司

2024

Stratford Renewable Energy Hub Environmental Impact Statement

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1 INTRODUCTION

Yancoal Australia Limited (Yancoal) has been investigating diversification opportunities, including development of renewable energy projects on its existing landholdings. One of these more advanced opportunities is establishing a renewable energy hub on land associated with the Stratford Mining Complex (SMC).

The proposed Stratford Renewable Energy Hub (SREH) would comprise a Pumped Hydro Energy Storage (PHES) with an indicative generation capacity of 3.6 gigawatt-hours (GWh) (i.e. 300 megawatts [MW] over 12 hours), alongside a complementary photovoltaic (PV) solar farm facility (Solar Farm). The Solar Farm would have an indicative capacity of approximately 320 MW alternating current (AC) (equivalent to 375 MW direct current [DC]), to supply a portion of required energy to 'charge' the PHES.

Collectively, the PHES, the Solar Farm and associated infrastructure are referred to as 'the Project'.

Subject to network capacity, the Project is capable of producing 400 MW over 9 hours, however, the capacity in this Environmental Impact Statement (EIS) is generally stated to be 300 MW over 12 hours.

The Project would be capable of providing 'Long Duration Storage' (LDS). LDS is defined by the New South Wales (NSW) Government in the NSW *Electricity Infrastructure Investment Act 2020* (EII Act) as infrastructure that *"consists of storage units with a registered capacity that can be dispatched for at least 8 hours".* LDS provides a source of reliable and dispatchable energy during periods when solar/wind is not available, assisting with the stability of the NSW electricity grid as coal-fired power is phased out.

The Project would be situated on land associated with the existing SMC, located in the Gloucester Valley, approximately 95 kilometres (km) north of Newcastle, NSW (Figures 1-1 and 1-2). The SMC is an open cut coal mining operation that is owned and operated by Stratford Coal Pty Ltd (SCPL), a wholly owned subsidiary of Yancoal. Mining operations at the SMC are scheduled to be completed in 2024.

The site provides topographic variations suitable for a PHES, with elevated topography being located in close proximity to the existing Stratford East Dam.

The location of the Project at the SMC has a number of strategic advantages as the Project can reuse and repurpose existing SMC disturbance areas, infrastructure, and water stored in mine voids (Figures 1-3a and 1-3b). In addition, the Project is strategically located in close proximity to existing transmission infrastructure and established transport routes (Figure 1-1). This significantly reduces environmental impacts compared to alternative large-scale renewable energy projects located in remote locations.

The Project is wholly located within the MidCoast Council Local Government Area (LGA). All freehold land required for the Project is owned by Yancoal or its subsidiaries (Figure 1-4).

This document is an EIS for the Project, which has been prepared in accordance with the Planning Secretary's Environmental Assessment Requirements (SEARs) issued on 16 July 2024.

This EIS has also been prepared in accordance with the Commonwealth's assessment requirements issued in April 2024 (Attachment 1), and with regard to the *State Significant Infrastructure Guidelines* (NSW Department of Planning, Housing and Infrastructure [DPHI], 2024a) and the *Large-Scale Solar Energy Guideline* (Department of Planning and Environment [DPE], 2022a).

1.1 CRITICAL STATE SIGNIFICANT INFRASTRUCTURE

On 19 June 2024, the Project was declared to be Critical State Significant Infrastructure (CSSI) on the basis that the Project "*will help maintain the state's critical energy security and continue the essential energy supply to homes and businesses during peak-demand periods as coal-fire sources close.*"

The Project has been declared 'critical' by the NSW Government. It would provide a source of reliable, renewable and dispatchable energy during periods when solar/wind is not available, assisting with the stability of the NSW electricity grid as coal-fired power is phased out.

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LEGEND
- 132 kV Transmission Network
- 330 kV Transmission Network
- 500 kV Transmission Network
- State and Regional Roads
- Potential Transgrid Electricity Transmission Line Upgrade (Not Part of the Project)

Source: NSW Spatial Services (2023)

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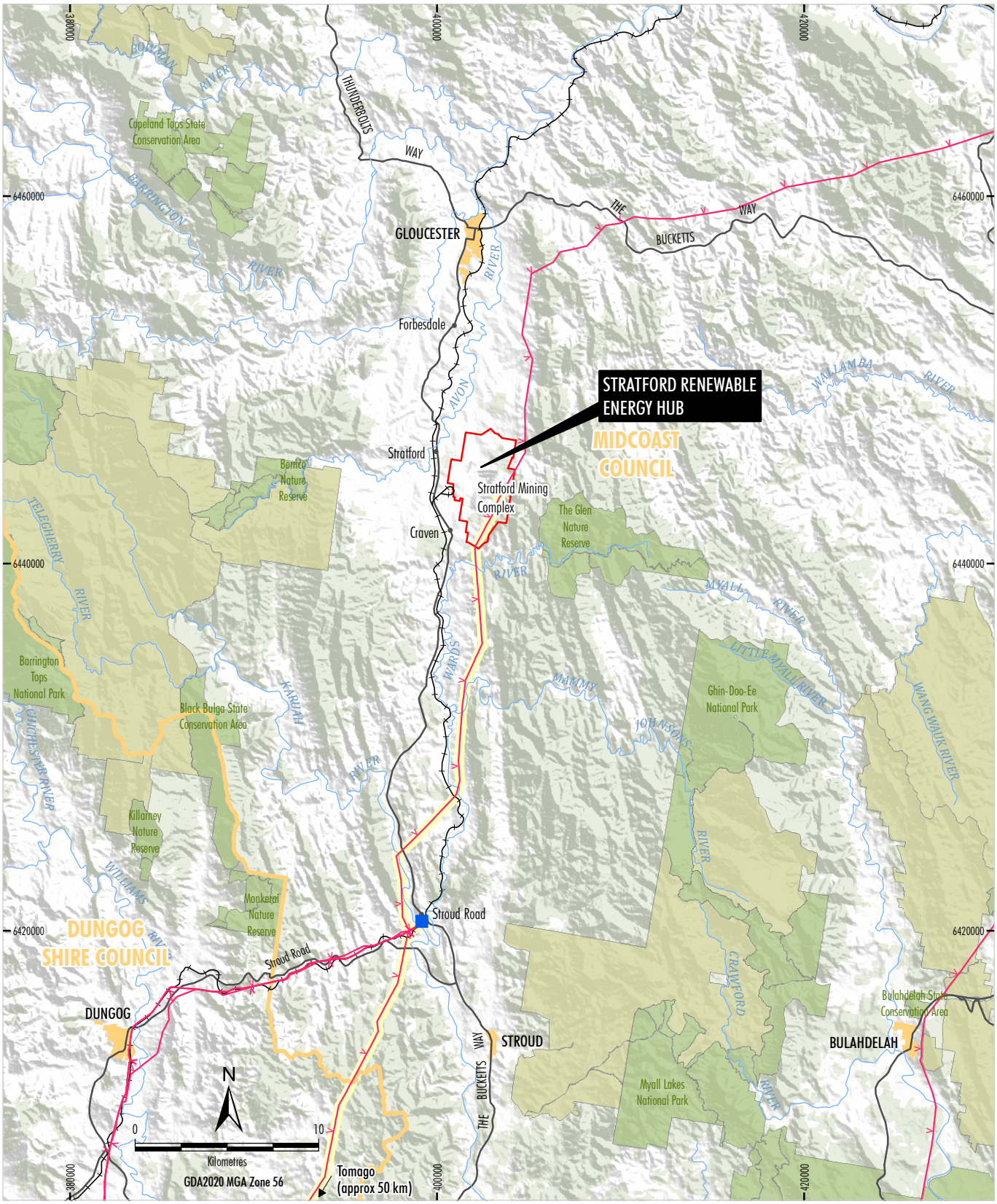
Regional Location

Figure 1-1



LEGEND
- Mining Tenure
- State Forest
- NPWS Estates
- Local Government Area Boundary
- Transmission Substation
- 132 kV Transmission Network
- Potential Transgrid ETL Upgrade (Not Part of the Project)

Source: Geoscience Australia (2006); Yancoal (2023); NSW Spatial Services (2023)

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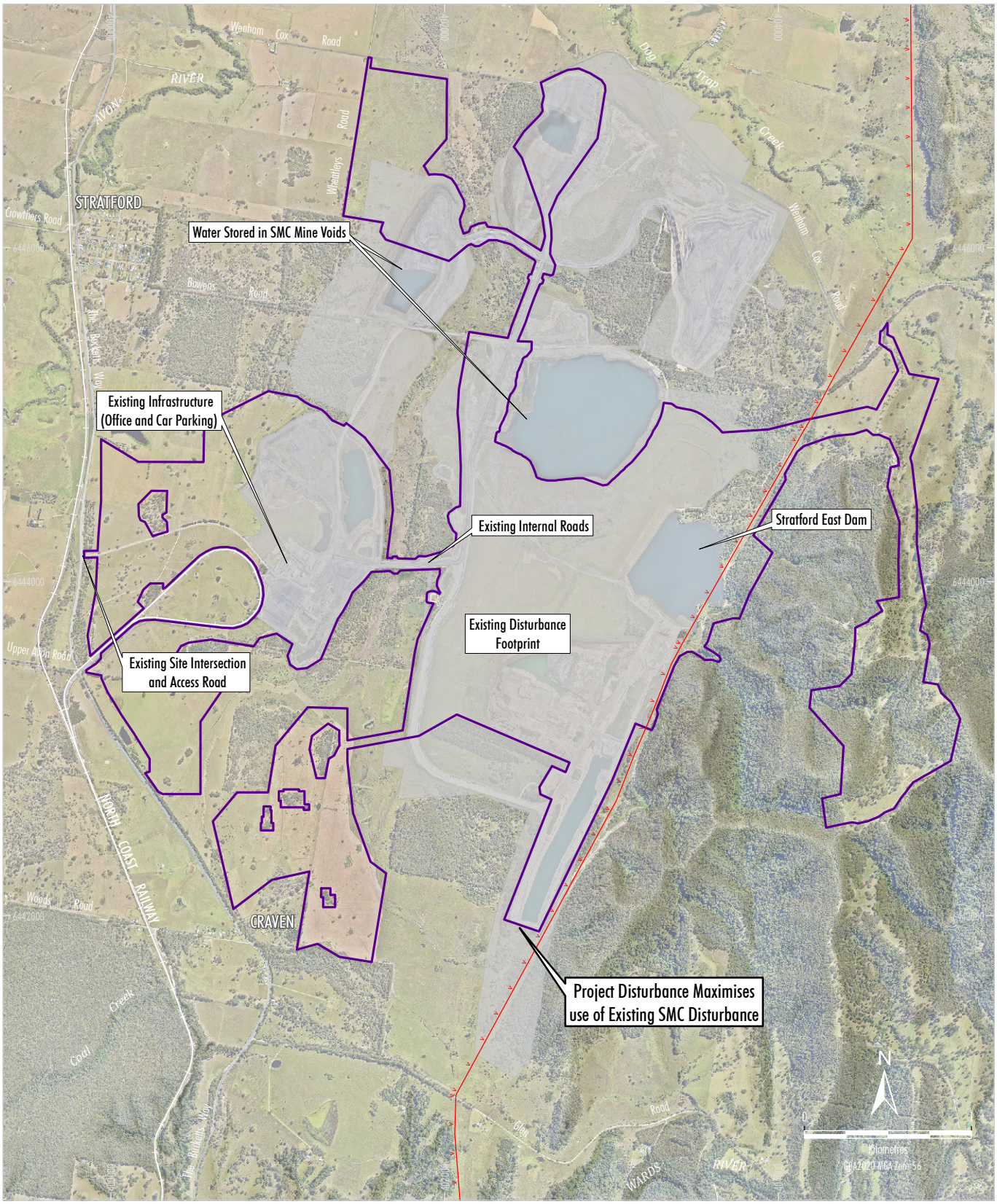
Project Locality

Figure 1-2

YAN-22-45 SREH EIS Sect1_202B



YAN-22-45 SREH EIS Sect1_204A

LEGEND

- 132 kV Electricity Transmission Line
- Approximate Extent of SMC Existing/Approved Surface Development
- Project Disturbance Footprint

Source: NSW Spatial Services (2023); Yancoal (2023)

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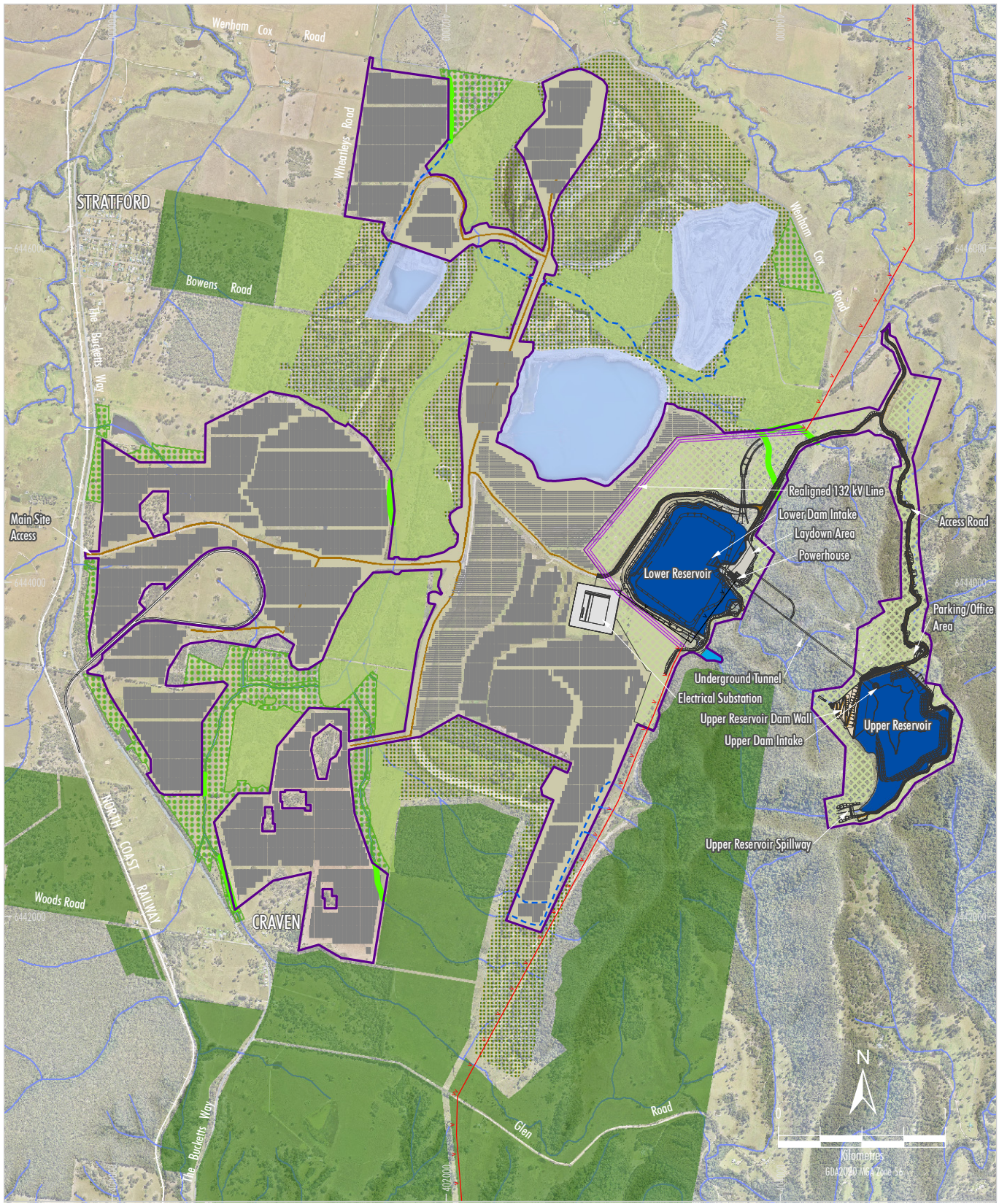
Existing SMC and Indicative Project Disturbance Fooprint

Figure 1-3a



LEGEND

Project Components

- Project Disturbance Footprint
- Indicative Solar Photovoltaic Array Layout
- Internal Access Road
- Riparian Corridor Protection Zone
- Area Available to be Rehabilitated or Repurposed During Operations
- Potential Areas to Achieve Project Rehabilitation Obligation Associated with the SMC
- Realigned 132kV Transmission Line

SMC Development Consent SSD-4966 Components

- Biodiversity Offset Area
- Indicative Reconfigured Biodiversity Enhancement Area
- SCPL Rehabilitation
- Native Vegetation
- Final Void
- SCPL Retained Water Infrastructure

Source: NSW Spatial Services (2023); Yancoal (2023)

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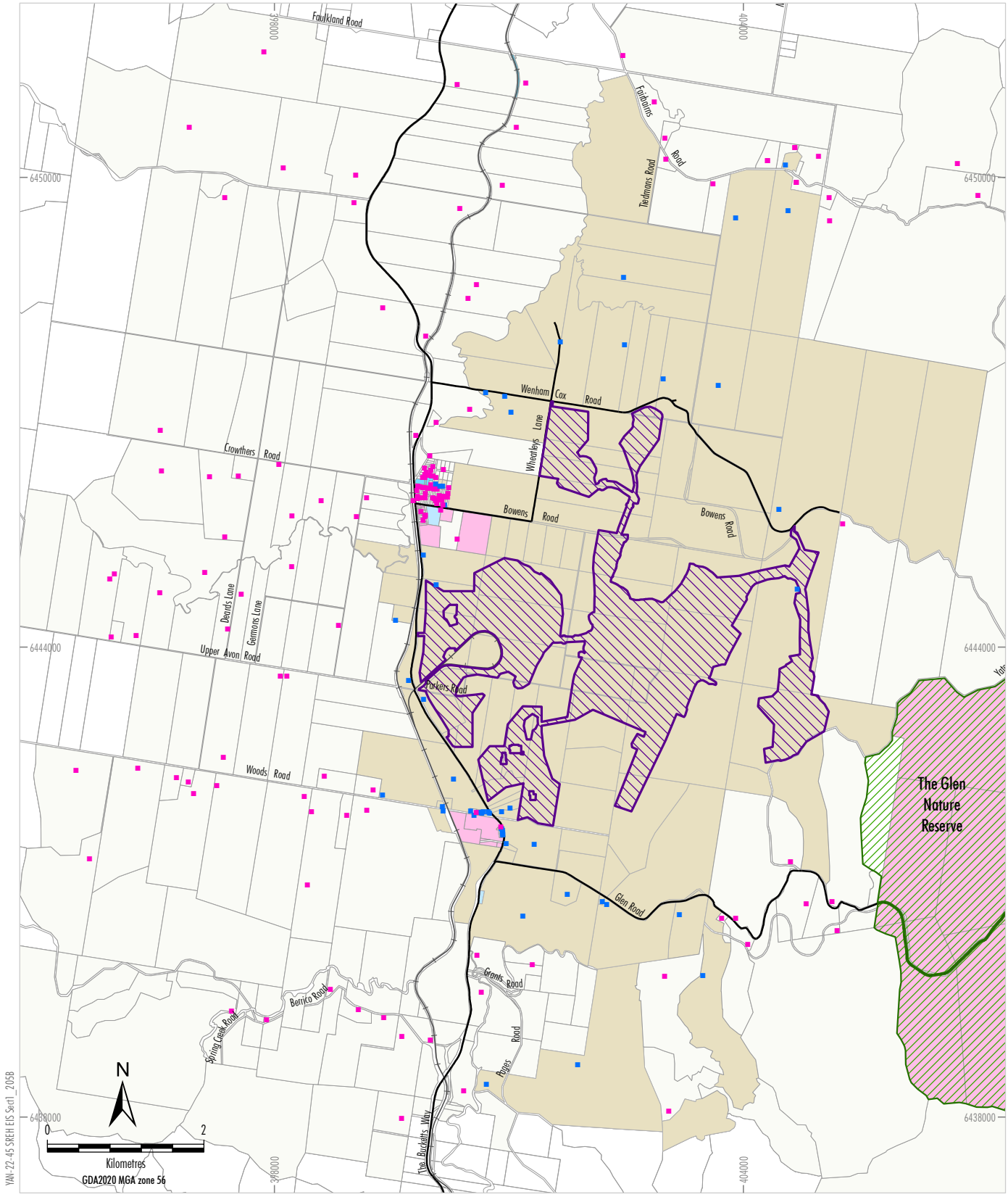
Indicative Operational General Arrangement

Figure 1-3b



LEGEND

- National Park, Nature Reserve or State Conservation Area
- Crown
- State Government
- Local Government
- Privately Owned
- Yancoal (or Subsidiary) Owned
- Privately Owned Dwelling
- Yancoal (or Subsidiary) Owned Dwelling
- Project Disturbance Footprint

Source: NSW Spatial Services (2023); Yancoal (2023)

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Land Ownership

Figure 1-4

1.2 APPLICANT DETAILS AND SCHEDULE OF LANDS

Consistent with section 190(1)(b) of the NSW *Environmental Planning and Assessment Regulation 2021* (EP&A Regulation), Gloucester Coal Pty Ltd (ACN 008 881 712), a wholly owned subsidiary of Yancoal, is the entity 'responsible' (i.e. the applicant) for the Project. Contact details for Gloucester Coal Pty Ltd are:

Gloucester Coal Pty Ltd
Level 18, Darling Park Tower 2
201 Sussex Street, Sydney NSW 2000
(+61) 2 8583 5300

A dedicated website for the Project can be viewed at:

www.stratfordcoal.com.au/page/SREH/

The Project is located at 3364 The Bucketts Way, Stratford, NSW 2422. Attachment 7 presents the Project Infrastructure Application Area and Real Property Descriptions.

1.3 PROJECT OVERVIEW

1.3.1 Purpose of the Document

This EIS has been prepared to accompany an Infrastructure Application made for the Project, in accordance with Part 5 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

This EIS considers the potential environmental impacts of the Project in accordance with sections 190 to 192 of the EP&A Regulation and the SEARs issued by the DPHI.

The proposed action for the Project (the Action) was referred to the Commonwealth Minister for Environment and Water (Commonwealth Minister) in February 2024 (EPBC 2023/09733). A delegate of the Commonwealth Minister determined on 11 April 2024 that the Action is a "controlled action" and, therefore, the Action also requires approval under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The Project is to be assessed pursuant to the Assessment Bilateral Agreement with the NSW Government. Therefore, this EIS provides an assessment of potential impacts on the following controlling provisions under the EPBC Act considered by the Commonwealth Minister (or delegate) to be relevant to the Action:

- threatened species and communities (sections 18 and 18A); and
- migratory species (sections 20 and 20A).

On 19 April 2024, the Commonwealth Minister provided its assessment requirements to the NSW Government.

A reconciliation of where the SEARs and the Commonwealth's assessment requirements are addressed in this EIS is provided in Attachment 1.

1.3.2 Project Objectives

Section 192(1)(b) of the EP&A Regulation requires that an EIS must include a statement of the objectives of the development.

The key Project objectives can be summarised as follows:

1. Provide a commercially attractive post-mining land use (PMLU) opportunity that comprises LDS.
2. Repurpose mine infrastructure and beneficially use previously disturbed areas, where possible, to minimise environmental impacts.
3. Optimise the location and size of the PHES to maximise both power generation and energy storage.
4. Produce at least 300 MW AC solar energy to maximise generation of on-site renewable energy to charge the PHES.

1.3.3 Project Summary

The Project would include the following activities:

- construction and operation of the PHES, including the upper reservoir, lower reservoir, tunnelled waterways and powerhouse, with a capacity of approximately 3.6 GWh (indicatively 300 MW over 12 hours);
- construction and operation of the Solar Farm to supply approximately 320 MW AC (375 MW DC) electricity to charge the PHES, with optionality to export electricity to the grid in times of surplus solar generation (noting electricity will also need to be imported from the grid);
- construction and operation of an on-site electrical substation, to connect the PHES and the Solar Farm to the electricity transmission line (ETL) network;
- realignment of the existing Transgrid 132 kilovolt (kV) ETL that currently traverses the Stratford East Dam to the west of the lower reservoir to enable safe construction of the powerhouse;
- use (and upgrades as necessary) of existing SMC internal access tracks/roads, access off The Bucketts Way, and other existing SMC infrastructure;
- use of water stored in existing SMC mine voids for initial fill, and as backup water supplies to the PHES during the operation; and
- other associated infrastructure, construction and operational activities as may be required to support the Project.

Further detail on the Project components is provided in Section 3 of this EIS.

1.4 BACKGROUND

1.4.1 History of the Stratford Mining Complex

The SMC is an open cut coal mining operation. The SMC operates under Development Consent SSD-4966. Mining operations commenced in 1995 and are approved until 31 December 2025.

As part of its diversification strategy, Yancoal is investigating several diversification opportunities, including the development of renewable energy projects across its landholdings. The Project is the most advanced of these opportunities.

The SMC is scheduled to complete mining in 2024. This timing presents an opportunity to integrate closure/rehabilitation activities with construction of the Project, allowing the site to be efficiently transitioned for beneficial use (subject to timely approvals).

The SMC is in close proximity to existing electricity transmission infrastructure, provides suitable topographic variations for a pumped hydro project (i.e. change in elevation over a short distance), and has access to water stored in mine voids.

These factors make the Project a commercially attractive PMLU opportunity that would provide ongoing economic and social benefits to the local Gloucester community and contribute to decarbonisation of the NSW electricity grid in the near-term.

The SMC will complete mining in 2024. The SMC is not reliant on the Project to meet its closure and rehabilitation obligations, however this timing presents an opportunity to integrate closure/rehabilitation activities with construction of the Project.

1.4.2 Avoidance, Minimisation and Offset Strategies

The Project has been designed to avoid and minimise environmental impacts.

In particular, the Project would maximise the use of existing SMC infrastructure for construction and operation (e.g. carparks, offices, workshops, laydown areas, services and utilities) to avoid and/or minimise additional disturbance required for the Project.

For residual impacts, the Project would include the implementation of a biodiversity offset strategy as per the NSW *Biodiversity Conservation Act 2016* (BC Act).

Further detail regarding the strategic advantages of the site is provided in Section 2.

Details of avoidance, minimisation and offset strategies are provided in Sections 2 and 6 and Attachment 3 of this EIS.

The Project site has significant advantages. The Project can maximise the use of land previously disturbed for the SMC, and land previously cleared for agricultural activities.

In addition, the Project can repurpose the existing SMC, beneficially use water stored in mine voids and has access to the ETL network, transport routes and population centres.

1.5 RELATED DEVELOPMENT

1.5.1 Existing Development – Stratford Mining Complex

A large portion of the land for the Project is currently used for the SMC (both mining areas and buffer lands) (Figures 1-3a and 1-3b).

Rehabilitation and closure obligations related to the SMC are outlined in Development Consent SSD-4966 and various mining leases and exploration licences held by SCPL under the NSW *Mining Act 1992*. SCPL will undertake rehabilitation and closure activities for the SMC in parallel with the potential approval and construction of the Project. The SMC is not reliant on the Project to meet its closure and rehabilitation obligations.

Yancoal is seeking a new Infrastructure Approval for the Project. The proposed relationship between the Project and Development Consent SSD-4966 can be summarised as follows:

- If the Project is approved, its approval would overlap with Development Consent SSD-4966 with respect to some land, and until such time as SCPL surrenders Development Consent SSD-4966.
- In areas where the Project and SMC overlap, land uses and ongoing use of existing infrastructure approved for the Project would take precedence over the approved final land uses for the SMC (subject to commercial agreement).
- In areas where the Project and SMC do not overlap, or in the event that the Project does not proceed, SCPL would continue to rehabilitate the SMC in accordance with Development Consent SSD-4966.

In addition, existing mine voids would be used to store excess rock material from construction of the Project, where possible. Water contained within the existing mine voids would be used to supply the initial fill water for the PHES and 'top-up' the PHES if required during operations.

Subject to approval of the Project, a modification to Development Consent SSD-4966 may be required to reflect the Project, and the associated interactions with the SMC (e.g. changes in final landform and PMLU).

Attachment 6 provides an overview of how the Project would interact with the rehabilitation and closure of the SMC.

Should the Project be approved, separate 'harmonisation' approvals for the SMC may be required.

1.5.2 Development Required for the Project – Subject to Separate Assessment

The existing Transgrid 132 kV ETL would require upgrades to facilitate the import and export of power between the Project and the grid.

Yancoal has commenced consultation with Transgrid and Energy Corporation of NSW (EnergyCo) in relation to ETL upgrades. It is expected the following upgrades to the existing network would be required:

- Realignment of a small portion of the existing 132 kV ETL around the lower reservoir to enable safe construction of the Project (e.g. the powerhouse) (Figure 1-3b). This activity forms part of the Project, however it is expected the realigned ETL would be owned/managed by Transgrid. It is noted the SMC has approval to realign the ETL in a similar (but longer) route (this approved realignment will not occur).
- Construction of a new on-site substation connecting to the realigned 132 kV ETL (Figure 1-3b). As above, while this construction forms part of the Project, it is expected this asset would be owned/managed by Transgrid.

- Upgrade of the existing 132 kV ETL to a double circuit line from the Project to the Stroud Road substation (Figure 1-2), and further potential upgrades between the Stroud Road substation and Tomago (Figure 1-1). If the Project is approved and the Potential ETL Upgrade is required to support the Project, it is anticipated that Transgrid would refine the environmental controls for the ETL in an environmental management plan in liaison with relevant stakeholders. These upgrades would be the subject of a detailed feasibility study by Transgrid.

An Environmental Assessment of the potential ETL upgrades is provided as Attachment 5.

Upgrades to the existing Transgrid ETL network would likely be required for the Project to achieve its full capacity. The broader network upgrades do not form part of the Project.

1.6 PROJECT CONSULTANTS

This EIS was prepared on behalf of Yancoal by Resource Strategies Pty Ltd with specialist input provided by the following organisations:

- GHD Pty Ltd (GHD) (Feasibility Study design work, Biodiversity Development Assessment Report [BDAR], Aquatic Ecology Impact Assessment, and Landscape and Visual Impact Assessment [LVIA]);
- Niche Environment and Heritage Pty Ltd (Niche) (Aboriginal Cultural Heritage Assessment [ACHA], and Historic Heritage Assessment [HHA]);
- HydroBalance (Surface Water Assessment);
- SLR Consulting Pty Ltd (SLR) (Groundwater Impact Assessment, and Noise and Vibration Impact Assessment);
- Minesoils Pty Ltd (Minesoils) (Soils, Land and Agricultural Impact Assessment);
- The Transport Planning Partnership Pty Ltd (TTPP) (Road Transport Assessment);
- Airen Consulting (Airen) (Air Quality and Greenhouse Gas Assessment);
- CK Consultants Pty Ltd (CK Consultants) (Environmental Risk Assessment [ERA]);
- Peterson Bushfire (Bushfire Assessment);
- Aigis Group (Social Impact Assessment [SIA]);
- AnalytEcon Pty Ltd (Economic Assessment); and
- Goeldner Consulting (Estimated Development Cost [EDC] Report).

In addition, a peer review was undertaken by HydroAlgorithmics Pty Ltd for the Groundwater Impact Assessment.

1.7 STRUCTURE OF THIS DOCUMENT

The remainder of this EIS comprises a main text component and supporting studies, which includes Appendices A through to P. An overview of the main text is presented below:

Section 2	Outlines the strategic context for the Project.
Section 3	Describes the various components and stages of the Project.
Section 4	Outlines the statutory provisions relevant to the Project.
Section 5	Describes the consultation and engagement undertaken in relation to this EIS and ongoing community involvement.
Section 6	Details the environmental assessment of the Project, including a description of the existing environment, an assessment of potential impacts and a description of the measures that would be implemented to avoid, minimise, mitigate, offset, manage and/or monitor the potential impacts of the Project.
Section 7	Describes how the Project (when compared with other alternatives) is in the public interest and balances impacts, strategic needs and benefits.
Section 8	Lists the documents referenced in Sections 1 to 7 of this EIS.
Section 9	Defines abbreviations and acronyms used in Sections 1 to 7 of this EIS.

Attachments to the main text are also provided as follows:

Attachment 1	SEARs, including cross-reference to Assessment Requirements Relevant to the EPBC Act.
Attachment 2	Community Engagement Information.
Attachment 3	Summary of Mitigation Measures.
Attachment 4	EDC Report.
Attachment 5	ETL Environmental Assessment.
Attachment 6	Rehabilitation Review.
Attachment 7	Infrastructure Application Area and Real Property Descriptions.

Appendices A to P contain supporting information, including a number of specialist reports:

Appendix A	Soils, Land and Agricultural Impact Assessment.
Appendix B	Surface Water Assessment.
Appendix C	Groundwater Impact Assessment.
Appendix D	BDAR.
Appendix E	Aquatic Ecology Impact Assessment.
Appendix F	ACHA.
Appendix G	HHA.
Appendix H	Road Transport Assessment.
Appendix I	LVIA.
Appendix J	Noise and Vibration Impact Assessment.
Appendix K	Air Quality and Greenhouse Gas Assessment.
Appendix L	SIA.
Appendix M	Economic Assessment.
Appendix N	ERA.
Appendix O	Preliminary Hazard Analysis (PHA).
Appendix P	Bushfire Assessment.

2 STRATEGIC CONTEXT

This section outlines the strategic context for the Project.

It should be noted the strategic importance of the Project has been recognised via its declaration as CSSI. In declaring the Project CSSI, the NSW Government stated that the Project is "*essential to NSW for economic, social and environmental reasons"* as it *"will help maintain the state's critical energy security and continue the essential energy supply to homes and businesses during peak-demand periods as coal-fire sources close."* (Minister for Planning and Public Spaces, 2024).

The Project would supply enough electricity to power approximately 140,000 to 180,000 households, and would avoid between 320,000 and 550,000 tonnes of carbon dioxide equivalent per year (t CO_2-e/year), if this electricity was alternatively produced by gas-fired power generation.

In addition, unlike other proposed pumped hydro projects, the Project is a combined solar generation and storage model, which provides additional supply of renewable energy for the PHES, reducing the reliance on electricity imported from the grid.

This section has been structured to describe the following:

- **National and State legislation and policies outlining greenhouse gas emission reduction targets and investment in renewable energy:** The need for the Project derives from legislation and policies targeting decarbonisation of the electricity grid and investment in replacement energy from renewable energy projects.
- **The need for LDS:** Due to the scheduled closure of coal-fired power stations, LDS projects, like the Project, have been identified as being critical to complement variable renewable energy (VRE) (e.g. solar and wind), and address forecast exceedances of electricity reliability standards.
- **The benefits of pumped hydro as LDS:** Pumped hydro is recognised as the most established and cost-effective technology to deliver LDS.
- **Beneficial PMLU:** The Project is consistent with State and regional policies encouraging the beneficial use and repurposing of mining land.
- **Strategic advantages of the site:** Compared to other pumped hydro projects, the Project site has significant advantages that minimise its environmental impacts, such as the ability to use and repurpose SMC disturbance areas, infrastructure and water stored in mine voids, and proximity to existing transmission and transport routes.
- **Other strategic matters suggested to be addressed by the *State Significant Infrastructure Guidelines*:** Consideration of cumulative impacts, key hazards, and potential third-party agreements.
- **Consideration of alternatives:** Justification for the Project, as proposed in this EIS, when considering a "no Project" scenario, and Project alternatives.

Additional justification for the Project is provided in Section 7.

2.1 NATIONAL AND STATE GREENHOUSE GAS EMISSION REDUCTION TARGETS

2.1.1 Paris Agreement and Climate Change Act 2022

The *Paris Agreement* is an international treaty on climate change. It was adopted by 196 Parties at the United Nations Climate Change Conference in Paris, France, on 12 December 2015. It entered into force on 4 November 2016 (United Nations Framework Convention on Climate Change, 2024).

Australia is a signatory to the *Paris Agreement* and has adopted a Nationally Determined Contribution of a 43 percent (%) reduction in greenhouse gas emissions below 2005 levels by 2030 (Commonwealth of Australia, 2022a).

The Commonwealth *Climate Change Act 2022* legislates Australia's emission reduction targets under the *Paris Agreement*, and net zero by 2050.

2.1.2 NSW Policy Framework

The NSW Government has endorsed Australia's commitments to the *Paris Agreement* and states it will take actions consistent with the level of effort required to achieve them (Office of Environment and Heritage [OEH], 2016).

The *NSW Climate Change Policy Framework* (OEH, 2016) outlines a long-term objective of achieving net zero emissions by 2050. The NSW Government has introduced a suite of policies and legislation to achieve this objective.

The *Net Zero Plan Stage 1: 2020-2030* (Department of Planning, Industry and Environment [DPIE], 2020a) provides the framework for NSW to reach net zero emissions by 2050. The NSW *Climate Change (Net Zero Future) Act 2023* legislates actions to deliver on the net zero emissions by the 2050 target.

The NSW Government is aligning its 2030 emissions reduction objectives to the projections reported in the *Net Zero Plan Stage 1: 2020-30 Implementation Update* (DPIE, 2021a). These objectives aim to reduce emissions by 50% below 2005 levels by 2030. In addition, the *Net Zero Plan Implementation Update 2022* (Office of Energy and Climate Change, 2022) describes the aim to reduce emissions by 70% below 2005 levels by 2035.

2.2 NATIONAL AND STATE RENEWABLE ENERGY INVESTMENT POLICIES

Stationary energy is the sector with the largest contribution to Australian and NSW greenhouse gas emission inventories (NSW Environment Protection Authority [EPA], 2024a).

As part of strategies to meet emission reduction targets (Section 2.1), policies at the Commonwealth and State level have been developed to decarbonise the stationary energy sector via investment in new renewable energy projects.

2.2.1 Australian Renewable Energy Target

The Australian Government's Renewable Energy Target Scheme was developed under the Commonwealth *Renewable Energy (Electricity) Act 2000* (Renewable Energy Act) and is designed to reduce greenhouse gas emissions in the electricity sector by encouraging renewable energy generation under the Large-scale Renewable Energy Target and Small-scale Renewable Energy Scheme.

The Large-scale Renewable Energy Target encourages investment in renewable power stations, including solar and hydro-electric, to achieve 33,000 GWh of additional renewable electricity each year until 2030.

2.2.2 NSW Electricity Infrastructure Roadmap and Electricity Infrastructure Investment Act 2020

The *NSW Electricity Infrastructure Roadmap* (DPIE, 2020b) and the EII Act outline the regulatory framework to coordinate investment in the transmission, generation, storage and firming infrastructure required to maintain reliability while decarbonising the NSW electricity grid.

Part 3 of the EII Act defines an Energy Security Target, which aims to achieve reliable electricity supply over the medium and long-term for NSW electricity consumers.

Part 6 of the EII Act applies to LDS infrastructure for storage of electricity that "*consists of storage units with a registered capacity that can be dispatched for at least 8 hours, and is scheduled by AEMO in the central dispatch process under the National Electricity Rules*". This part sets out the NSW Government's minimum investment objectives for LDS for the period ending 31 December 2029, being the establishment of 12 gigawatts (GW) of additional renewable energy generation, and an additional 2 GW of LDS capacity.

The need for the Project derives from legislation and policies targeting decarbonisation of the electricity grid and investment in replacement energy from renewable energy projects.

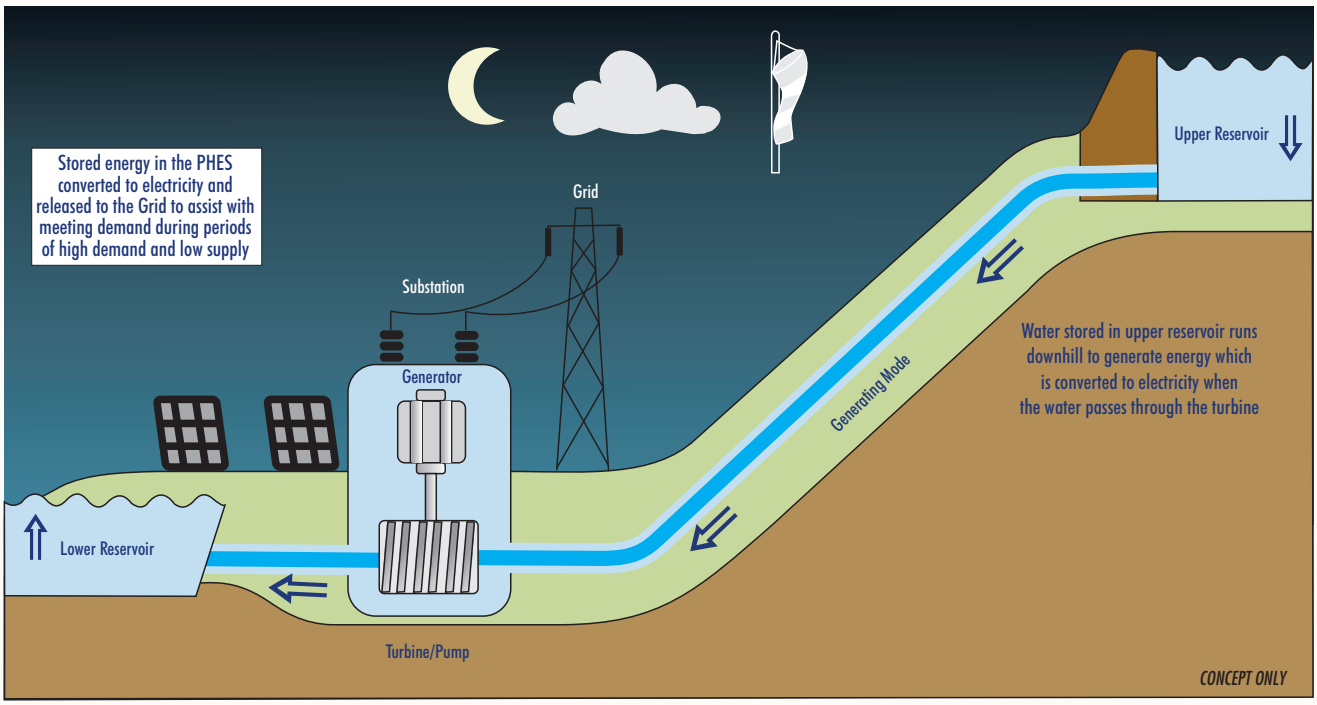
2.3 STRATEGIC REQUIREMENT FOR LONG DURATION STORAGE

Due to the scheduled closure of coal-fired power stations, and replacement with VRE (e.g. solar and wind), the *2023 Electricity Statement of Opportunities* (Australian Energy Market Operator [AEMO], 2023a) identified reliability gaps would be expected in NSW from 2025 to 2026 and onwards.

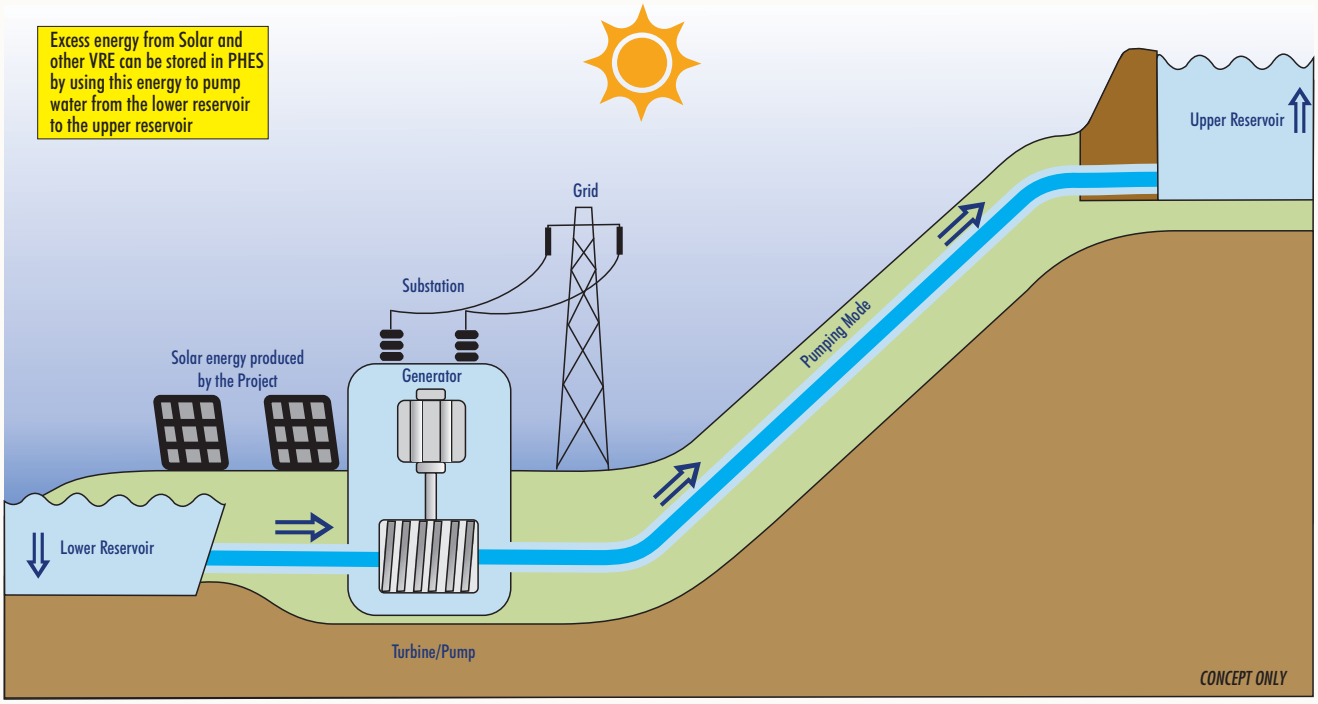
AEMO (2023b) highlights the need for more energy storage to prevent reliability shortages.

LDS is able to produce energy on demand and assist with the redistribution of VRE (Figure 2-1).

GENERATING MODE



PUMPING MODE



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Conceptual Illustrations of Pumped Hydro

Figure 2-1

That is, during periods when the sun is shining and the wind is blowing, excess solar and wind energy can be generated and stored by LDS projects. This stored energy can then be redistributed to the grid when VRE is not sufficient to produce enough electricity, particularly during 6.00 pm to 8.00 pm and/or 6.00 am to 8.00 am when the peak electricity demand typically occurs in the grid, and solar energy is not abundant (Figure 2-1).

The Project would be capable of producing up to 300 MW for 12 hours, which exceeds the threshold for LDS under the EII Act.

If approved, the Project could contribute to the additional 2 GW of LDS, legislated under the EII Act to be in place prior to 2030, and could assist in addressing the anticipated electricity reliability shortages, which are projected to occur in the near future by the NSW Government and AEMO.

Due to the scheduled closure of coal-fired power stations, LDS projects, like the Project, have been identified as being critical to complement VRE (e.g. solar and wind), and address forecast electricity reliability shortfalls.

2.4 STRATEGIC REQUIREMENT FOR PUMPED HYDRO PROJECTS

The NSW Government has identified pumped hydro as the most established form of LDS, stating (DPIE, 2021b) (emphasis added):

> ***Pumped hydro is recognised as the most established form of long duration storage.*** *It provides large amounts of reliable electricity on demand by storing surplus renewable energy and releasing it into the grid when demand exceeds supply.*

Figure 2-1 provides a general illustration of the key components and workings of PHES, including an indication of when power from pumped hydro is likely to be of most benefit to the grid.

Pumped hydro plants provide several essential ancillary services to the electricity grid, which help to maintain stability, reliability, and efficiency. Some of the key ancillary services provided by pumped hydro plants are:

- **Load balancing**: Pumped hydro plants can store excess electricity during periods of low demand by pumping water from a lower reservoir to an upper reservoir. During peak demand, the water is released back to the lower reservoir, generating electricity. This load balancing helps to manage fluctuations in electricity demand and supply, ensuring grid stability.
- **Frequency regulation**: Pumped hydro plants can respond quickly to changes in grid frequency by adjusting their generation or pumping capacity. This rapid response helps to maintain the grid's frequency within the required range, ensuring system stability and preventing potential blackouts.
- **Voltage regulation**: Pumped hydro plants can help to maintain voltage levels within the grid by adjusting their reactive power output. This voltage regulation is essential for the stable operation of transmission and distribution networks, reducing the risk of equipment damage and service interruptions.
- **Spinning reserve**: Pumped hydro plants can be kept in standby mode, ready to generate electricity at short notice if there is a sudden loss of power from other sources. This spinning reserve capability contributes to the grid's resilience and reliability in case of unexpected events or generator outages.
- **Black start capability**: Pumped hydro plants can often start without relying on the electricity grid, enabling them to provide critical support to restart the grid in the event of a complete system blackout.
- **Renewable energy integration**: Pumped hydro plants can help to integrate intermittent renewable energy sources, such as solar and wind, by storing excess generation during periods of high renewable output and releasing it when renewable generation is low. This storage capability allows for better utilisation of renewable resources and reduces the need for fossil fuel-based backup generation.

2.5 PUMPED HYDRO AGAINST ALTERNATIVE FORMS OF LDS

Batteries can be an alternative form of LDS (DPIE, 2019), and have advantages compared to pumped hydro in that their location is more flexible.

Modelling presented in the AEMO *New South Wales Development Pathways Report* (AEMO, 2021) investigated feasibility of Battery Energy Storage System (BESS) technology as an alternative to pumped hydro. The AEMO found (emphasis added):

> ***In the modelling outcomes, pumped hydro generation was preferred over eight-hour battery storage considering the assumed levelised cost of each technology.*** *Despite having a higher outright capital cost, pumped hydro's longer technical and economic life (40 years compared to 20 years for battery storage) means pumped hydro is expected to have lower levelised cost and therefore require less additional revenue through LTES* [Long-term Electricity Supply] *Agreements.*

This aligns with the findings of the *GenCost 2023-24: Consultation draft* prepared by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) in collaboration with AEMO, which identifies pumped hydro as having a relatively lower capital cost on a per unit of energy (e.g. kilowatt-hour) basis than battery storage (Graham et al., 2023).

Pumped hydro is recognised as the most established and cost-effective technology to deliver LDS in consideration of current BESS technology limitations. PHES can generally provide larger and longer storage than a BESS.

2.6 BENEFICIAL POST-MINING LAND USE

The NSW Government has outlined its intention to promote and facilitate economic development in regional NSW via alternative PMLUs in various policy documents.

Key actions in the NSW Government's *Strategic Statement on Coal Exploration and Mining in NSW* (Department of Regional NSW, 2020) include:

- facilitating the beneficial uses of coal mining land once mining has ended; and
- supporting the diversification of coal-reliant regional economies, including developing and implementing location-specific plans to diversify the regional economies that are heavily dependent on coal mining.

In June 2023, the NSW Government released the *Practical guide: Post mining land use* (Department of Regional NSW, 2023), designed to "*assist and encourage mining lease holders to explore opportunities for alternative and innovate PMLUs for mine sites"*. The *Practical guide: Post mining land use* (Department of Regional NSW, 2023) identifies energy generation as a key opportunity for alternative PMLUs.

Similarly, the *Hunter Regional Plan 2041* (DPE, 2022b) outlines a key planning priority in the Barrington District (which is relevant to the Project location) being to "*Plan for alternative land uses for former power stations and mining sites*". More specifically, the *Hunter Regional Plan 2041* (DPE, 2022b) states (emphasis added):

> *The Stratford and Duralie mines near Gloucester provide potential re-use opportunities over the 20-year period of this plan. Existing hard stand areas, vehicular access and transmission lines* ***could support renewable energy*** *and batteries.*

The *Hunter Regional Plan 2041* (DPE, 2022b) identified the opportunity for the existing SMC and Duralie Coal Mine to be repurposed to support the transition to renewable energy. In this regard, the development of the Project is aligned with this strategy, being able to continue attracting investment in the region after the closure of the SMC and Duralie Coal Mine.

In general, the Project is entirely consistent with the intent of the *Strategic Statement on Coal Exploration and Mining in NSW* (Department of Regional NSW, 2020), the *Practical guide: Post mining land use* (Department of Regional NSW, 2023) and the *Hunter Regional Plan 2041* (DPE, 2022b) in regard to the beneficial use of the SMC land. Associated economic opportunities from the Project would continue to be provided to the region after the completion of mining operations.

The Project aligns with the NSW Government intentions to facilitate beneficial use of mining land to attract investment in new industries following the completion of mining operations.

If approved, the Project would be a model of beneficial PMLU.

2.7 STRATEGIC ADVANTAGES OF THE PROJECT SITE

2.7.1 Existing Land Use

The most prevalent land uses in the area surrounding the Project are mining (including existing disturbance areas and active rehabilitation), agricultural production (including grazing for beef production and dairy) and remnant vegetation generally located along ridgelines and watercourses, and in isolated patches within the cleared landscape.

Rural residential areas located in the vicinity of the Project include Stratford and Craven.

The closest reserved areas to the Project are The Glen Nature Reserve, Barrington Tops National Park and Berrico Nature Reserve, located approximately 1 km, 7 km and 40 km away, respectively.

New infrastructure proposed for the Project is located on land zoned under the *Gloucester Local Environmental Plan 2010* (Gloucester LEP) as RU1 (Primary Production) and E5 (Heavy Industrial) (noting the Gloucester LEP is not applicable to the Project due to its CSSI declaration). Figure 2-2 shows the local land zoning around the Project site.

The MidCoast Council has developed a draft MidCoast Local Environmental Plan (MidCoast LEP) which, once finalised, will supersede the Gloucester LEP. The draft MidCoast LEP includes updated land zones, in which the existing SMC Biodiversity Offset Areas would be zoned as C2 (Environmental Conservation). New infrastructure proposed for the Project would remain on land zoned as RU1 (Primary Production) and E5 (Heavy Industrial) (noting that LEPs are not applicable to the Project due to its CSSI declaration).

Yancoal (or its subsidiaries) owns all freehold land required to develop the Project. The land ownership around the Project site is presented as Figure 1-4.

2.7.2 Use of SMC Disturbance and Infrastructure

Maximising the Use of Previously Disturbed SMC Land

The Project has been designed to maximise the use of previously disturbed areas associated with the SMC to minimise new disturbance.

In particular, the footprint of the Solar Farm has targeted areas previously disturbed by the SMC, including on the Stratford Waste Emplacement, infrastructure areas, Western Co-disposal Area, and the Stratford East Open Cut and Bowens Road North Open Cut (once backfilled).

The extent of existing SMC disturbance is provided on Figure 2-3.

Overall, approximately 60% of the Solar Farm is located on SMC disturbed land.

Maximising the Use of Existing SMC Infrastructure

In addition to the use of land disturbed by the SMC, the Project would maximise the use of existing SMC infrastructure (e.g. carparks, offices, workshops, laydown areas, services and utilities) to avoid and/or minimise additional disturbance required for the Project, primarily during the construction period.

The Project would also involve the upgrade of the existing Stratford East Dam for the lower reservoir.

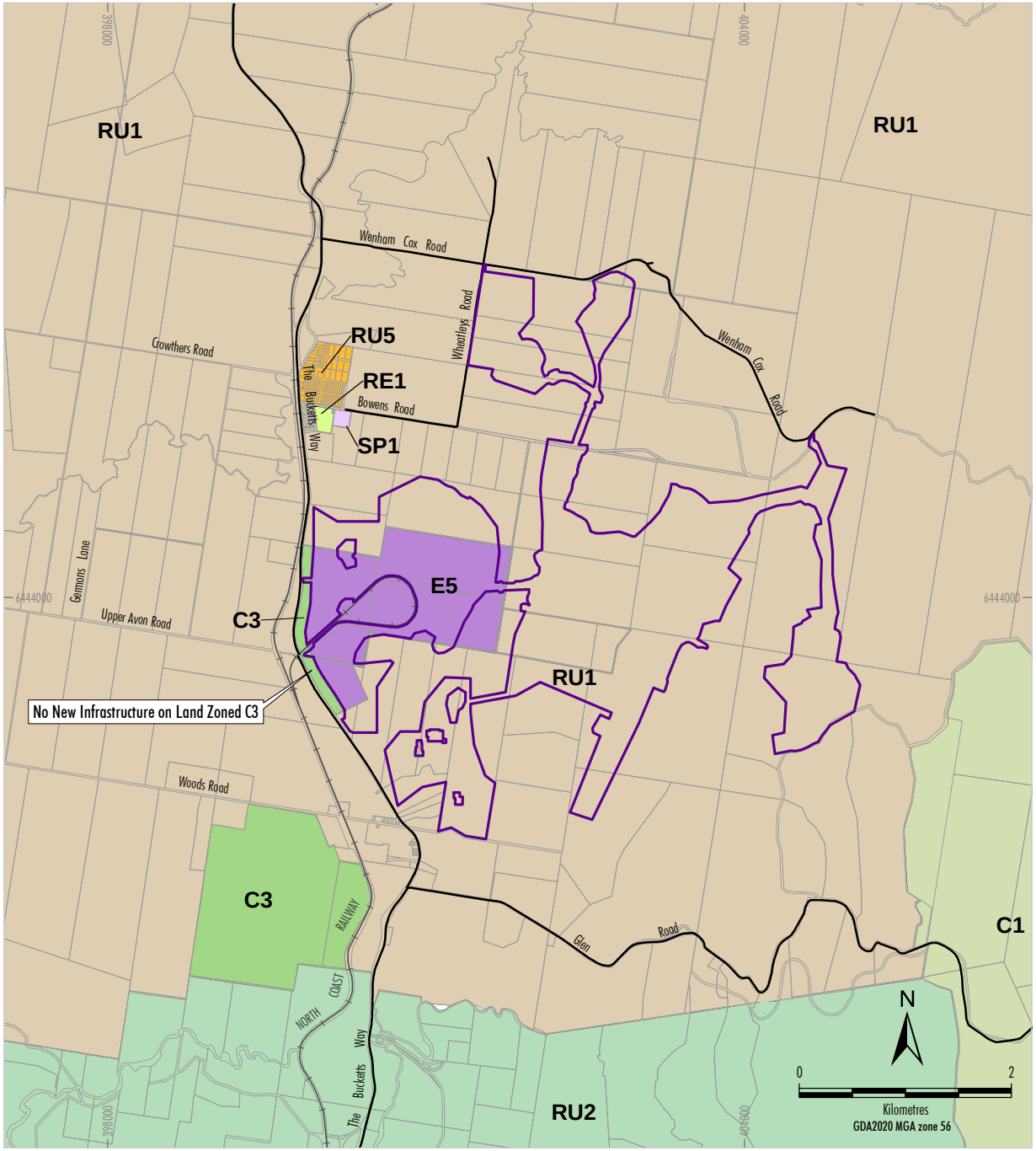
The key SMC infrastructure that would be used by the Project is provided on Figure 2-3.

Beneficial Use of Water Stored in Mine Voids

In relation to the SMC mine voids, SMC Development Consent SSD-4966 requires the following:

- The size and depth is minimised so far as is reasonable and feasible.
- The drainage catchment is minimised so far as is reasonable and feasible.
- The highwall instability risk is minimised so far as is reasonable and feasible.
- The size and depth is designed having regard to their function as long-term groundwater sinks, to maximise groundwater flows across backfilled pits to the void and to not be a source of saline groundwater for aquifers and streams.
- Designed and constructed to ensure adequate freeboard to ensure no spillage under any foreseeable conditions.
- The risk of flood interaction for all flood events up to and including the Probable Maximum Flood (PMF) event is minimised.

The SMC mine voids are predicted to permanently hold water, with no current beneficial use.



The Project would develop new infrastructure on land zoned RU1 (Primary Production) and E5 (Heavy Industrial).

The Project has been designed to avoid new infrastructure on land zoned as C3 (Environmental Management) under the Gloucester LEP, noting the Gloucester LEP is not applicable to the Project due to its CSSI declaration.

LEGEND

Project Disturbance Footprint

Gloucester LEP Land Zoning

E5	Heavy Industrial
RUI	Primary Production
SP1	Special Activities
C1	National Parks and Nature Reserve
C3	Environmental Management
RE1	Public Recreation
RU2	Rural Landscape
RU5	Village

Source: NSW Spatial Services (2023); State Government of NSW and Department of Planning and Environment (2023)

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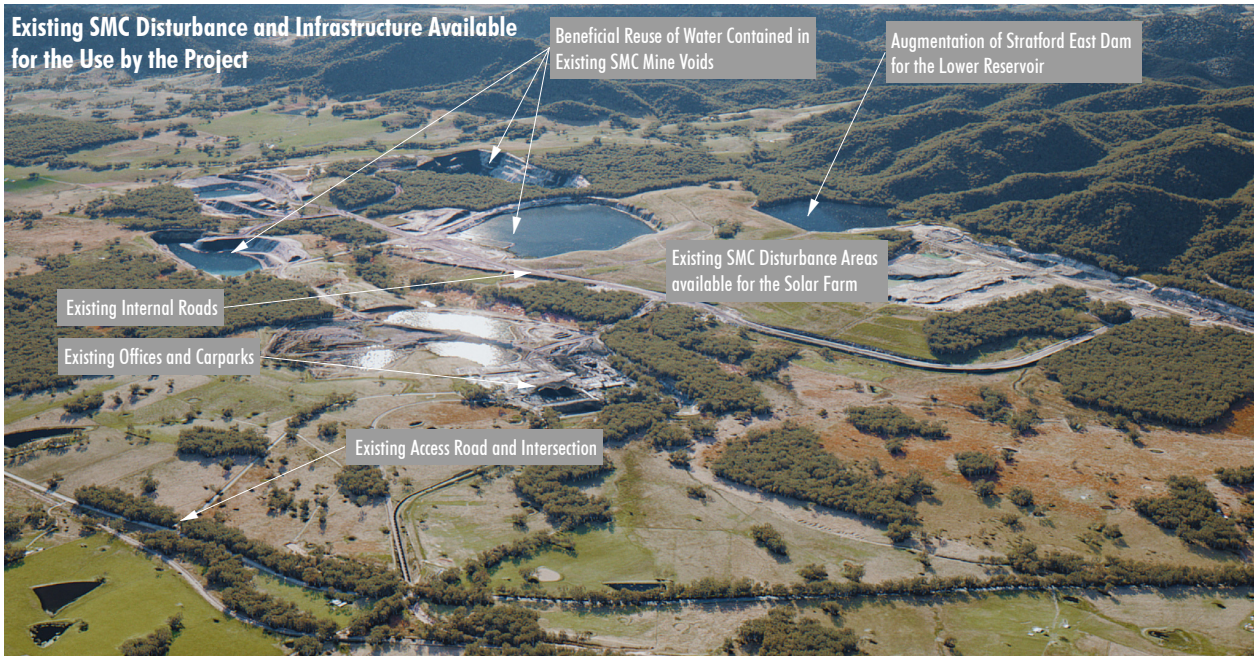
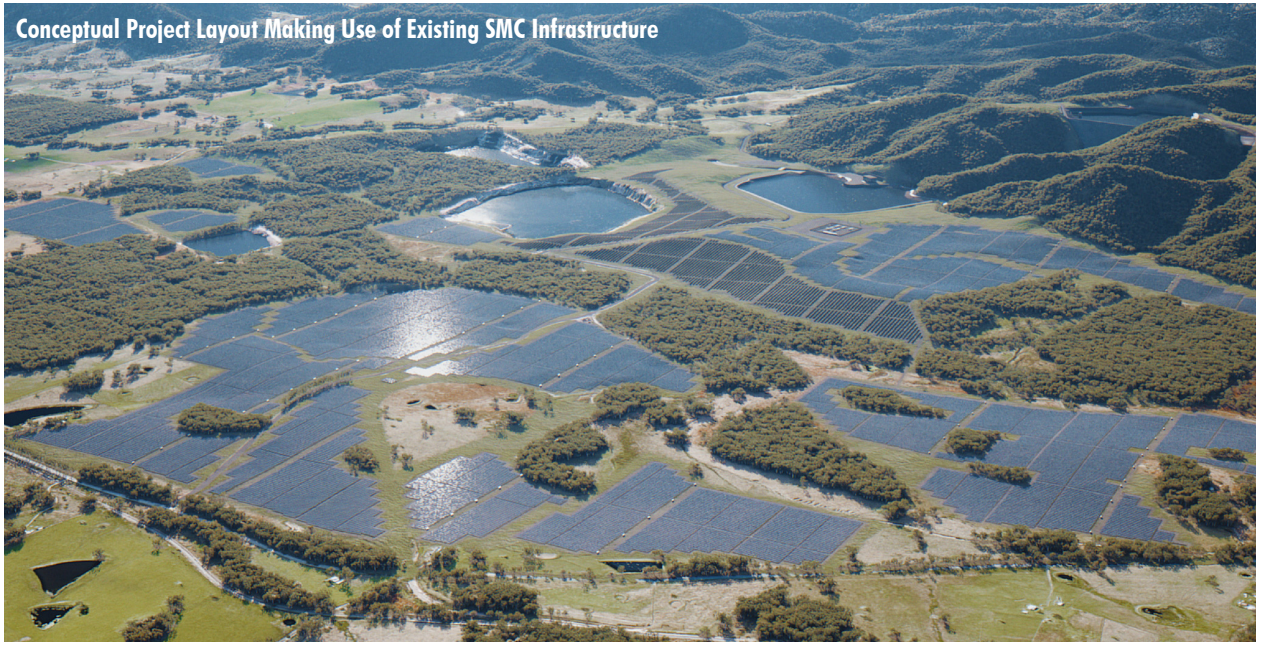
Local Land Zoning

Figure 2-2





The Project has been designed to maximise the use of previously disturbed areas associated with the SMC to minimise new disturbance associated with the Project.

In particular, the footprint of the Solar Farm has targeted areas previously disturbed by the SMC. The Project would also maximise the use of existing SMC infrastructure for construction and operation (e.g. carparks, laydown areas, roads) to avoid and minimise additional disturbance required for the Project.

The existing Stratford East Dam would be upgraded and used for the lower reservoir.

The PHES provides an opportunity for water contained within the SMC mine voids to be beneficially reused for the PHES. This would avoid reliance on natural water sources for the PHES.

Source: GHD (2024)

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Reuse of SMC Disturbance and Infrastructure

Figure 2-3

The PHES provides an opportunity for water contained within the SMC mine voids to be beneficially used to initially fill the PHES and top-up the PHES if required during operations. This would avoid reliance on natural water sources to fill and maintain water levels in the PHES.

2.7.3 Topography

Elevation differences between the upper and lower reservoirs of a pumped hydro development are fundamental to its feasibility.

The upper and lower reservoirs proposed as part of the Project would be located in areas with elevation approximately between 160 metres Australian Height Datum (m AHD) and 400 m AHD. This natural variation in elevation between the two reservoirs (over 200 metres [m] difference in vertical elevation) is sufficient to support a commercially viable PHES (Figure 2-4).

The upper reservoir for the PHES must be located in an area that provides an elevation difference between the upper and lower reservoirs. The upper reservoir, therefore, is constrained by topography and cannot be located in any other position.

The Solar Farm component of the Project would be typically located in lower gradient areas, with elevation ranging from approximately 90 m AHD to 180 m AHD. Elevation is not a key constraint to the development of the Solar Farm.

The topography of the Project Disturbance Footprint and surrounds is provided on Figure 2-4, which illustrates that there are no alternative locations on Yancoal-owned land at similar elevation to locate the upper reservoir.

2.8 CONSTRAINTS AND AVOIDANCE

The Project has been designed in consideration of key restrictions and constraints, including:

- All proposed development would be located on freehold land owned by Yancoal or its subsidiaries.
- Existing biodiversity offset properties secured via covenant on title for the SMC.
- New infrastructure on land zoned C3 under the Gloucester LEP has been avoided (noting there is existing SMC infrastructure, such as the main access road within land zoned C3, which would be used by the Project).
- As per the second Project objective, the Project has targeted the beneficial use of the SMC infrastructure and previously disturbed land to minimise additional disturbance.

These key restrictions and constraints are discussed further below.

2.8.1 Key Project Constraints

Yancoal Landholdings

Yancoal, or its subsidiaries, owns freehold land associated with the SMC, including buffer land.

The Project has been designed to remain within the extent of Yancoal landholdings (Figure 2-5).

Biodiversity Offset Properties

In accordance with Condition 36, Schedule 3 of the SMC Development Consent SSD-4966, SCPL has made suitable arrangements to protect the SMC Biodiversity Offset Areas in perpetuity, via Public Positive Covenants and Restrictions on the Use of Land for the Biodiversity Offsets, registered on title with NSW Land and Property Information.

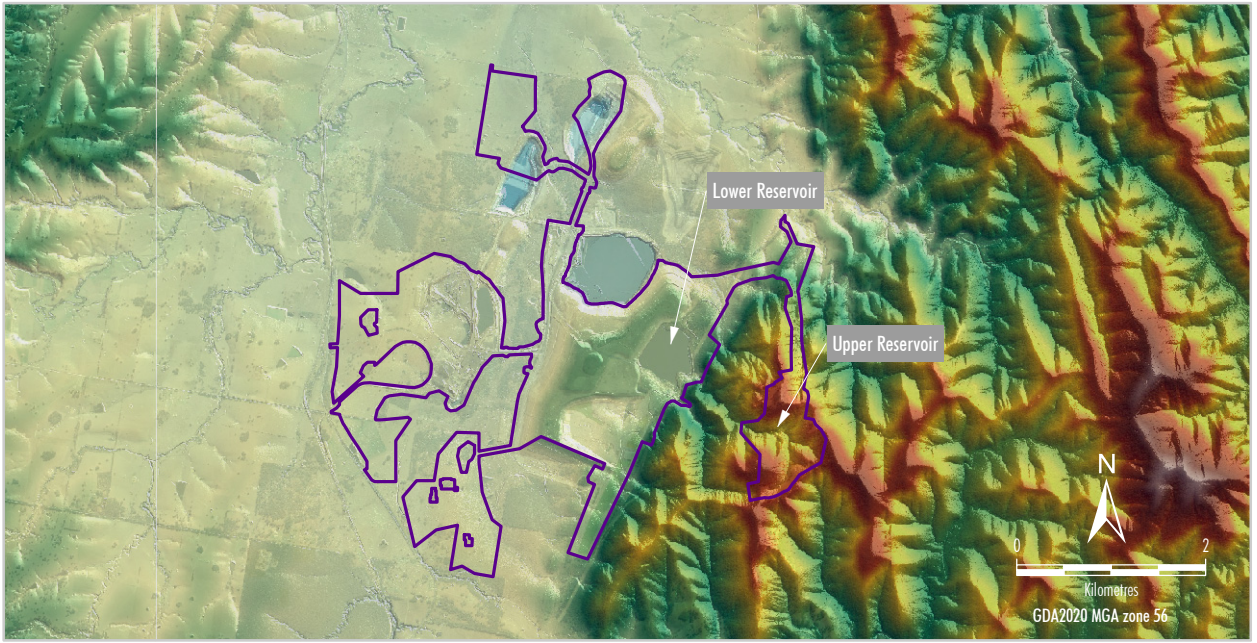
The Project has been designed around the SMC Biodiversity Offset Areas, which are shown on Figure 2-5.

Land Zoned C3

The Project is located wholly within the MidCoast Council LGA, and in an area regulated under the Gloucester LEP.

While the Project, as CSSI, is not required to adhere to the Gloucester LEP, it has been designed to avoid new infrastructure on land zoned as C3 (Environmental Management) under the Gloucester LEP, which exists on Yancoal-owned land that runs parallel to The Bucketts Way. It is noted that existing SMC infrastructure within land zoned C3, such as the main access road, would be used by the Project.

Areas zoned as C3 under the Gloucester LEP are shown on Figures 2-2 and 2-5.



The upper reservoir for the PHES must be located in an area that provides an elevation difference between the upper and lower reservoirs. The location of the upper reservoir, therefore, is constrained by topography, and cannot be located in any other position.

Topography of the existing valley provides a natural basin suitable for the design and storage capacity of an upper reservoir.

The topography of the Project Disturbance Footprint and surrounds illustrates that there are no alternative locations on Yancoal land at similar elevations to locate the upper reservoir.

LEGEND
Project Disturbance Footprint

Source: NSW Spatial Services (2023)
Orthophoto: Google CNES/Airbus (2023)

30 125 250 375 500 625 650
Elevetation (m AHD)

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Topography

Figure 2-4

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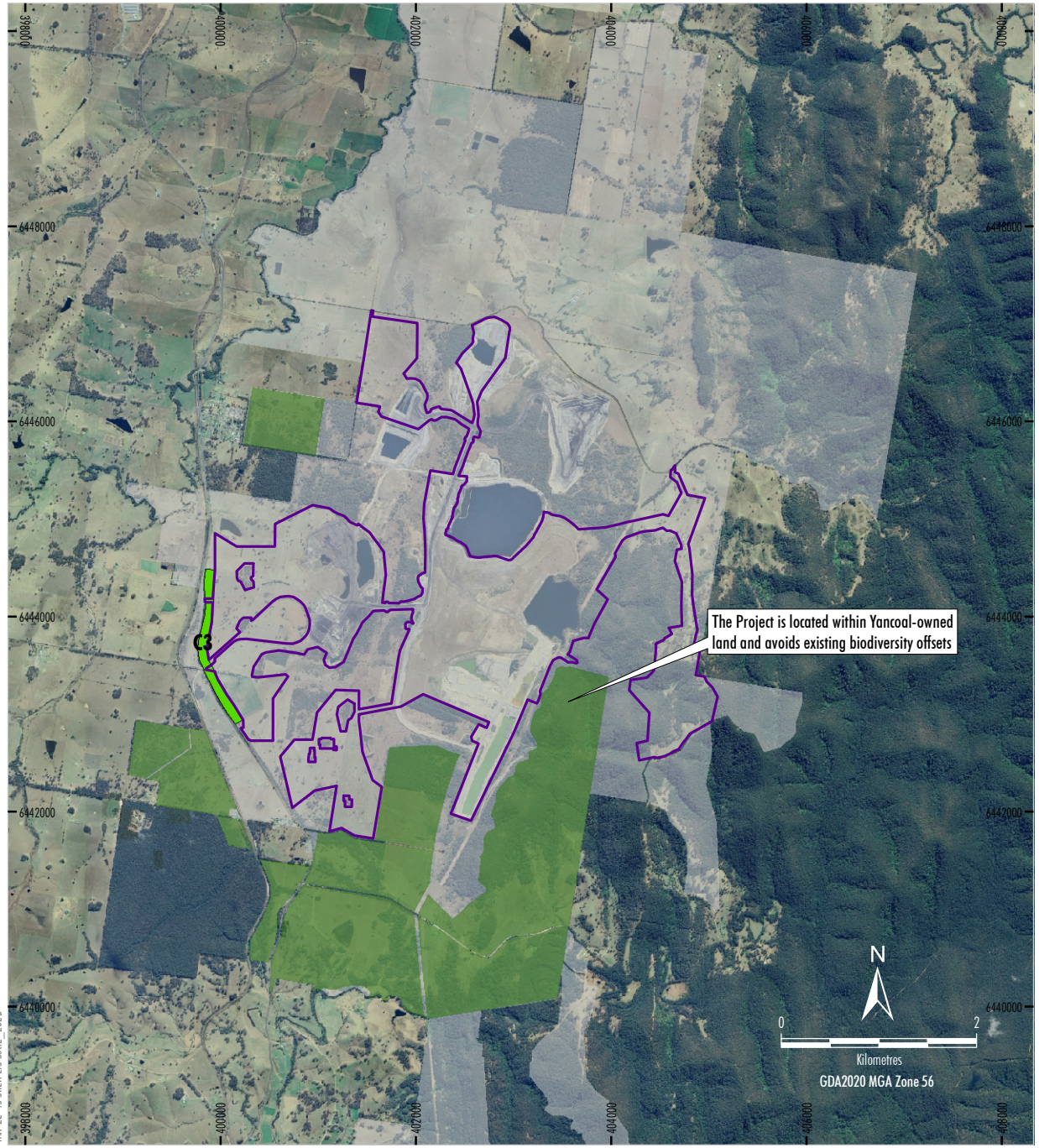

The Project has been designed to remain within the extent of Yancoal landholdings.

In addition, the Project has been designed to completely avoid the SMC Biodiversity Offset Areas, which are protected in perpetuity via Covenants.

The Project has also been designed to avoid new infrastructure on land zoned as C3 (Environmental Management) under the Gloucester LEP, noting the Gloucester LEP is not applicable to the Project due to its CSSI declaration.

LEGEND
- Yancoal Owned Land
- Project Disturbance Footprint
- SMC Biodiversity Offset Area
- Environmental Management Land Zoning on Yancoal Owned Land

Source: NSW Spatial Services (2023)
Orthophoto: Google CNES/Airbus (2023)

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Yancoal Landholdings, SMC Biodiversity Offset Areas and LEP Land Zoning

Figure 2-5

YAN-22-45 SREH EIS Sect2_202B

2.8.2 Project Design Avoidance and Mitigation

The Project design incorporates a number of avoidance and mitigation measures, as described below.

Maximising Areas Previously Cleared for Agriculture

For portions of the Solar Farm not proposed on land disturbed for the SMC, the Project has maximised areas previously cleared for agriculture and dominated by non-native vegetation.

Approximately 184 hectares (ha) (36%) of the Solar Farm facility is mapped as non-native vegetation. The extent of non-native vegetation is provided on Figure 2-6.

Patches of Remnant Vegetation

Where possible, and through iterative review of the Project layout and baseline environmental survey data, larger patches of vegetation have been avoided to reduce impacts of the Project on areas of higher quality biodiversity value.

These areas are shown on Figure 2-6.

Avoidance of Aboriginal Cultural Heritage Sites

The Project layout has been refined to avoid key Aboriginal cultural heritage sites, including (Appendix F):

- SREH-PAD-1, a potential archaeological deposit (PAD).
- CTS-1, a potentially culturally significant site.

Tunnelled Waterway

The PHES component of the Project has been designed to use a tunnelled waterway, rather than above-ground pipes, to minimise surface disturbance and visual impacts.

The location of the tunnelled waterway is provided on Figure 2-6.

Avoiding Higher-visibility Areas

The design of the Solar Farm component of the Project has been revised (compared to the layout presented in the Scoping Report) to avoid higher visibility areas on land adjacent to The Bucketts Way, particularly land on the western side of The Bucketts Way.

In response to community feedback, areas immediately adjacent to The Bucketts Way are no longer proposed for solar, due to community concern regarding visual impacts (refer to Section 5 for further detail on community feedback).

The areas no longer proposed for the Solar Farm are provided on Figure 2-6.

Vegetative Screening

Where the Solar Farm component of the Project is proposed in closest proximity to The Bucketts Way, implementation of vegetative screening is proposed to minimise visual impacts of the Solar Farm to users of The Bucketts Way.

The proposed area for vegetative screening along The Bucketts Way is provided on Figure 2-6.

The length of the Solar Farm proposed along The Bucketts Way would be wholly screened by vegetation when considering the existing vegetative screening on the land zoned as C3 (Environmental Management) and the additional area proposed for vegetative screening (Figure 2-6).

Minimising Disturbance to Aquatic Habitat

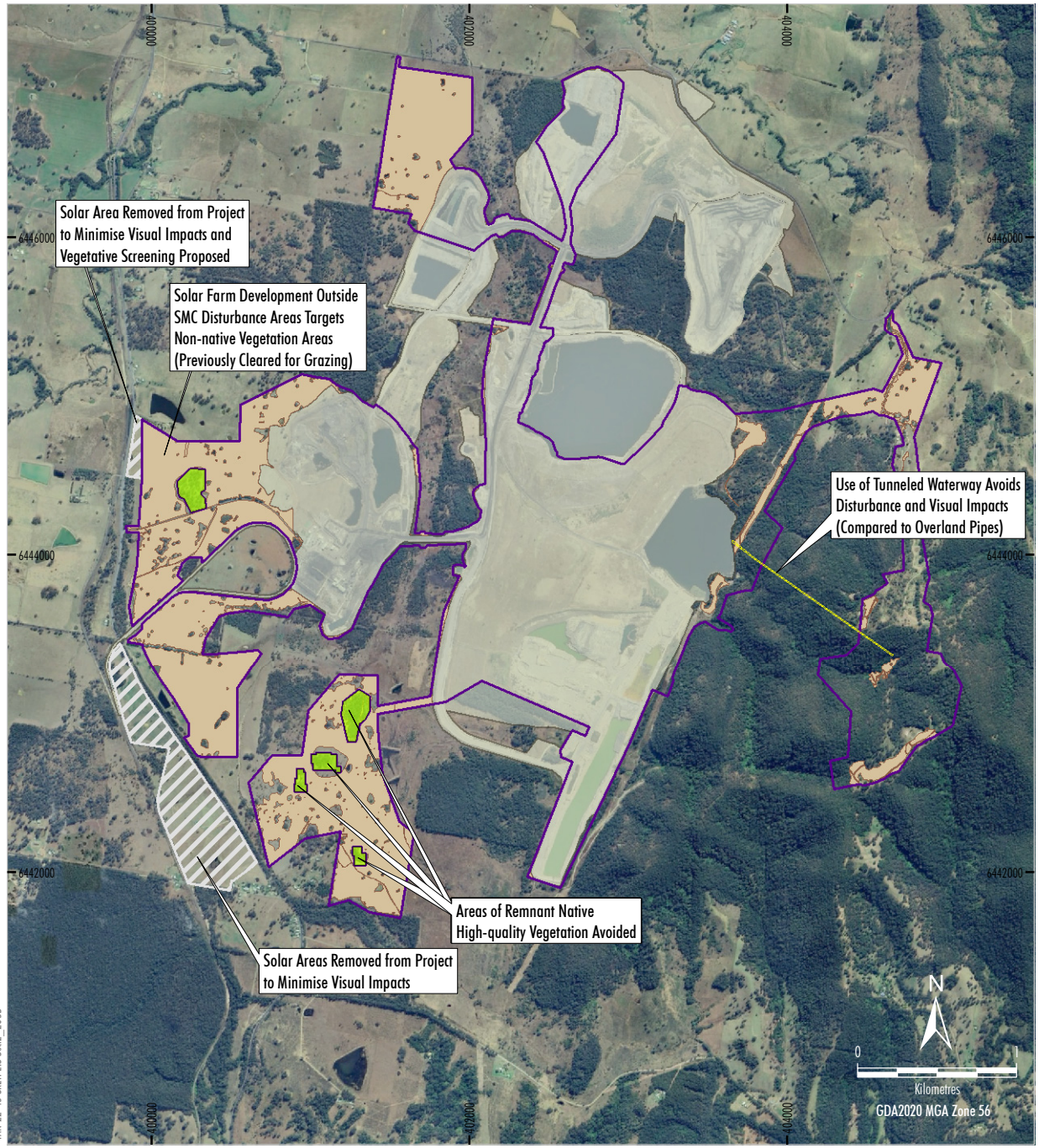
The Project layout has been designed to set back the Solar Farm from existing creek lines such as Avondale Creek to maintain riparian corridors.

2.8.3 Proximity to Existing 132 Kilovolt Electricity Transmission Line

The proximity of the existing Transgrid 132 kV ETL provides an opportunity for the Project to directly connect to the grid.

By comparison, other projects that are more remote from the existing network will require the development of new transmission easements to connect to the grid, resulting in new disturbance and associated impacts.

While Transgrid has identified that upgrades to the existing transmission network between the Project and Stroud Road substation, and further potential upgrades between the Stroud Road substation and Tomago (Figures 1-1 and 1-2), would likely be required to support the Project, these upgrades would be to an existing ETL, and could use existing easements.



For portions of the Solar Farm not proposed on land disturbed for the SMC, the Project has maximised areas previously cleared for agriculture and dominated by non-native vegetation.

Former grazing land is Land and Soil Capability Class 4 and above, limiting potential impact on agricultural land.

Where possible, areas of native vegetation have been avoided to reduce impacts of the Project on areas of higher quality biodiversity value.

The PHES component of the Project has been designed to use a tunnelled waterway, rather than above-ground pipes, to minimise surface disturbance and visual impacts.

The Solar Farm has been revised to avoid higher visibility areas on land adjacent to The Bucketts Way, particularly land on the western side of The Bucketts Way.

Where the Solar Farm component of the Project is proposed in close proximity to The Bucketts Way, implementation of vegetative screening is proposed to minimise visual impacts of the Solar Farm to users of The Bucketts Way.

LEGEND
- Project Disturbance Footprint
- Tunnelled Waterway
- Area No Longer Proposed for Solar
- Solar Farm Avoidance of High-quality Native Vegetation
- Approximate Extent of SMC Existing Surface Development
- Non-native Vegetation

Source: NSW Spatial Services (2023)
Orthophoto: Google CNES/Airbus (2023)

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Project Design Avoidance and Mitigation

Figure 2-6

YAN-22-45 SREH EIS Sect2_205B

2.8.4 Proximity to Regional Transport Routes and Populations

The Project is located approximately 200 km north of Sydney, 95 km north of Newcastle and 10 km south of Gloucester.

Access to the Project site would be primarily from the south via the established M1 (Pacific Highway) and The Bucketts Way, a regional road that connects Gloucester to the Pacific Highway.

It is of benefit that the Project could be accessed via current State and regional road networks, with no new public road construction or upgrades required prior for the Project.

In addition, the proximity of multiple regional towns and cities indicates that the construction workforce could likely be sourced within the broader region, which would benefit the local and regional communities by providing employment opportunities.

Compared to other pumped hydro projects, the Project site has significant advantages that minimise its environmental impacts, such as the ability to use and repurpose SMC disturbance areas, infrastructure and water stored in mine voids, and proximity to existing transmission and transport routes.

2.9 OTHER STRATEGIC MATTERS

A preliminary assessment of environmentally sensitive areas of State significance was undertaken as per Chapter 2 of the NSW *State Environmental Planning Policy (Planning Systems) 2021* (Planning Systems SEPP). It identified that the Project is **not** associated with:

- Coastal wetlands or littoral rainforest within the meaning of the NSW *State Environmental Planning Policy (Resilience and Hazards) 2021* (Resilience and Hazards SEPP).
- Coastal waters of the State.
- Land reserved as an aquatic reserve under the NSW *Fisheries Management Act 1994* (FM Act) or as a marine park under the NSW *Marine Parks Act 1997*.
- Land declared as a Ramsar wetland within the meaning of the EPBC Act.
- Land declared a World Heritage property within the meaning of the EPBC Act.
- Land identified in an environmental planning instrument (EPI) as being of high Aboriginal cultural significance or high biodiversity significance.
- Land reserved as a State conservation area under the NSW *National Parks and Wildlife Act 1974* (NPW Act).
- Land, places, buildings or structures listed on the State Heritage Register under the NSW *Heritage Act 1977*.
- Land reserved or dedicated under the NSW *Crown Land Management Act 2016* for the preservation of flora, fauna, geological formations or for other environmental protection purposes.
- Land identified as being critical habitat under the NSW *Threatened Species Conservation Act 1995* or Part 7A of the FM Act.

2.10 KEY RISKS AND HAZARDS

Key risks and hazards of the Project are identified, and sections where these risks and hazards are addressed in this EIS are provided below:

- land contamination (Section 6.2.5);
- flooding (Section 6.3);
- dam safety (Section 6.17);
- electromagnetic fields radiation (Section 6.17); and
- bushfire (Section 6.18).

2.11 CUMULATIVE IMPACTS

Potential interactions between the Project and other existing and proposed major developments have been considered consistent with the NSW *Cumulative Impact Assessment Guidelines for State Significant Projects* (DPE, 2022c).

The SMC (and Duralie Coal Mine) will be undergoing closure works in parallel with the construction and operation of the Project. This will involve decommissioning of the existing mining infrastructure (where not required for the Project, if approved), shaping of final landforms and rehabilitation activities including revegetation. A small fleet of mining/construction equipment will be required to implement the closure works, however, the overall intensity of activity during the SMC rehabilitation phase would be significantly less than what has occurred during mining.

The impact of closure works has been considered cumulatively with the Project, particularly during the Project construction phase.

A review of the impacts of the Project to the rehabilitation of the SMC is presented as Attachment 6.

Upgrades to the existing Transgrid 132 kV ETL are also considered cumulatively with the Project in Attachment 5.

A review of 'Major Projects' was presented in the Scoping Report for the Project (Attachment A of the Scoping Report). No material interactions were anticipated with the closest Major Projects, given their distance from the Project (at least 37 km away). Notwithstanding, cumulative traffic impacts from other relevant proposed developments have been considered in the Road Transport Assessment (Appendix H).

2.12 THIRD-PARTY AGREEMENTS

It is expected that, should the Project be approved and developed, the Project would seek to enter into a third-party agreement with SCPL regarding a water sharing agreement for transfer of water stored in the existing SMC mine voids to/from the PHES. Similar agreements would also be entered into with SCPL to allow shared infrastructure, Project interactions, landform handover criteria, and ensuring clear division of responsibilities for the management and operation of the SMC and Project independently.

Further, should the Project be approved, the Project would seek to enter into a third-party agreement with the following:

- Transgrid: Agreement to facilitate access to its transmission network.
- MidCoast Council: Planning Agreement.

2.13 CONSIDERATION OF ALTERNATIVES

Section 192(1)(c) of the EP&A Regulation requires that an EIS must include:

> *(c) an analysis of feasible alternatives to the carrying out of the development, activity or infrastructure, considering its objectives, including the consequences of not carrying out the development, activity or infrastructure*

In addition, the *State Significant Infrastructure Guidelines* (DPHI, 2024a) and SEARs for the Project require consideration of feasible alternatives.

The key feasible alternatives to the Project that were considered and not adopted are as follows:

- Not proceeding with the Project.
- Alternatives to PHES location and power output.
- Alternatives to Solar Farm arrangement.

2.13.1 "No Project" Scenario

The consequences of not proceeding with the Project include:

- The Project would not contribute to the decarbonisation of NSW's electricity network and would not contribute positively to National or State greenhouse gas emission reduction targets.
- The Project would not be available to provide LDS, particularly during periods when VREs are not sufficient to meet consumer demands.
- The requirement to satisfy LDS requirements identified by the NSW Government and AEMO would need to be met by large-scale batteries and/or alternative pumped hydro projects in more remote locations, with greater potential environmental impacts.
- The economic and social benefits of further investment in the Gloucester Valley would not be realised.
- The potential impacts of the Project along with the Project management measures and offsets, would not occur.
- The SMC would be rehabilitated to final land uses (native vegetation and pasture) with lower economic benefits.

2.13.2 Alternatives to PHES Location and Power Output

There is limited flexibility in the location of the PHES, given its location is determined and constrained by topography. Similarly, the designed energy output of the PHES (3.6 GWh) is limited by the available water storage capacity of the upper reservoir, which is constrained by the topography of the upper reservoir area (Figure 2-4).

A PHES comprising the use of an existing mine void as the lower reservoir and the augmented Stratford East Dam as the upper reservoir was considered. However, there is insufficient elevation difference between the existing mine void and the Stratford East Dam.

The Project is able to make use of the existing Stratford East Dam for the lower reservoir, and so use of an existing mine void as the lower reservoir was not considered further.

There are no feasible alternatives to the location of the upper reservoir.

2.13.3 Alternatives to Solar Farm Arrangement

The Solar Farm has been designed to produce more than 300 MW power to maximise the locally generated renewable energy required to pump water from the lower reservoir to the upper reservoir.

The Solar Farm has maximised the use of land previously disturbed for the SMC operations to minimise new disturbance.

The remaining Solar Farm areas have been designed around the SMC Biodiversity Offset Areas, and designed to maximise the use of areas previously cleared for agriculture (currently mapped as non-native grassland) and minimise impacts to larger patches of native vegetation.

Key changes to the Solar Farm layout have been made during the environmental assessment review, including (Figure 2-6):

- removal of an area of the Solar Farm from the western side of The Bucketts Way due to community feedback regarding visual impacts;
- setting back the Solar Farm from The Bucketts Way to enable vegetative screening to be planted and reduce visual impacts;
- avoidance of higher biodiversity value patches of native vegetation;
- avoidance of a PAD identified during Aboriginal cultural heritage surveys undertaken for the Project ACHA; and
- setting back the Solar Farm from existing creek lines such as Avondale Creek to maintain riparian corridors.

Alternative designs to reduce the indicative capacity of approximately 320 MW AC were considered. However, any solar not developed as part of the Project would lead to the additional input of energy via the grid, and would require development of renewable generation in other areas (which may result in additional impacts compared to those proposed for the Project).

In addition, increasing the power demand from off-site energy development may also result in the need for additional associated transmission line upgrades, resulting in additional impacts.

Overall, in consideration of the Project objectives and above alternatives, Yancoal considers the current Project design as the most beneficial from an environment, social and economic perspective.

3 PROJECT DESCRIPTION

This section describes the proposed Project, including construction and operational details, based on the current feasibility designs.

3.1 PROJECT OVERVIEW

The Project would include the following activities:

- construction and operation of the PHES (with an indicative generation capacity of 300 MW over 12 hours), including:
  - construction and operation of a new upper reservoir;
  - augmentation of the existing Stratford East Dam to serve as the lower reservoir;
  - construction and operation of a tunnelled waterway, which comprises a vertical shaft and inclined headrace tunnel between the upper reservoir and powerhouse, and a tailrace tunnel connecting the powerhouse to the lower reservoir;
  - construction and operation of an access tunnel, which would be used for the waterway construction;
  - construction and operation of an underground powerhouse, which would contain two reversible pumps/turbines (approximately 150 MW to 200 MW each); and
  - construction and operation of an assembly bay, which would be used for the powerhouse construction, and to service the powerhouse following construction;
- construction and operation of the Solar Farm to supply approximately 320 MW AC (375 MW DC) electricity to charge the PHES, with optionality to export electricity to the grid in times of surplus solar generation (noting electricity will also need to be imported from the grid);
- construction and operation of an on-site electrical substation, to connect the PHES and the Solar Farm to the ETL network;
- realignment of the existing Transgrid 132 kV ETL that currently traverses the Stratford East Dam to the west of the lower reservoir to enable safe construction of the powerhouse;
- use (and upgrades as necessary) of existing SMC internal access tracks/roads, access off The Bucketts Way, and other existing SMC infrastructure;
- use of water stored in existing SMC mine voids for initial fill, and as backup water supplies to the PHES during the operation; and
- other associated infrastructure, construction and operational activities as may be required to support the Project.

Subject to network capacity, the Project is capable of producing 400 MW over 9 hours, however, the capacity in this EIS is generally stated to be 300 MW over 12 hours.

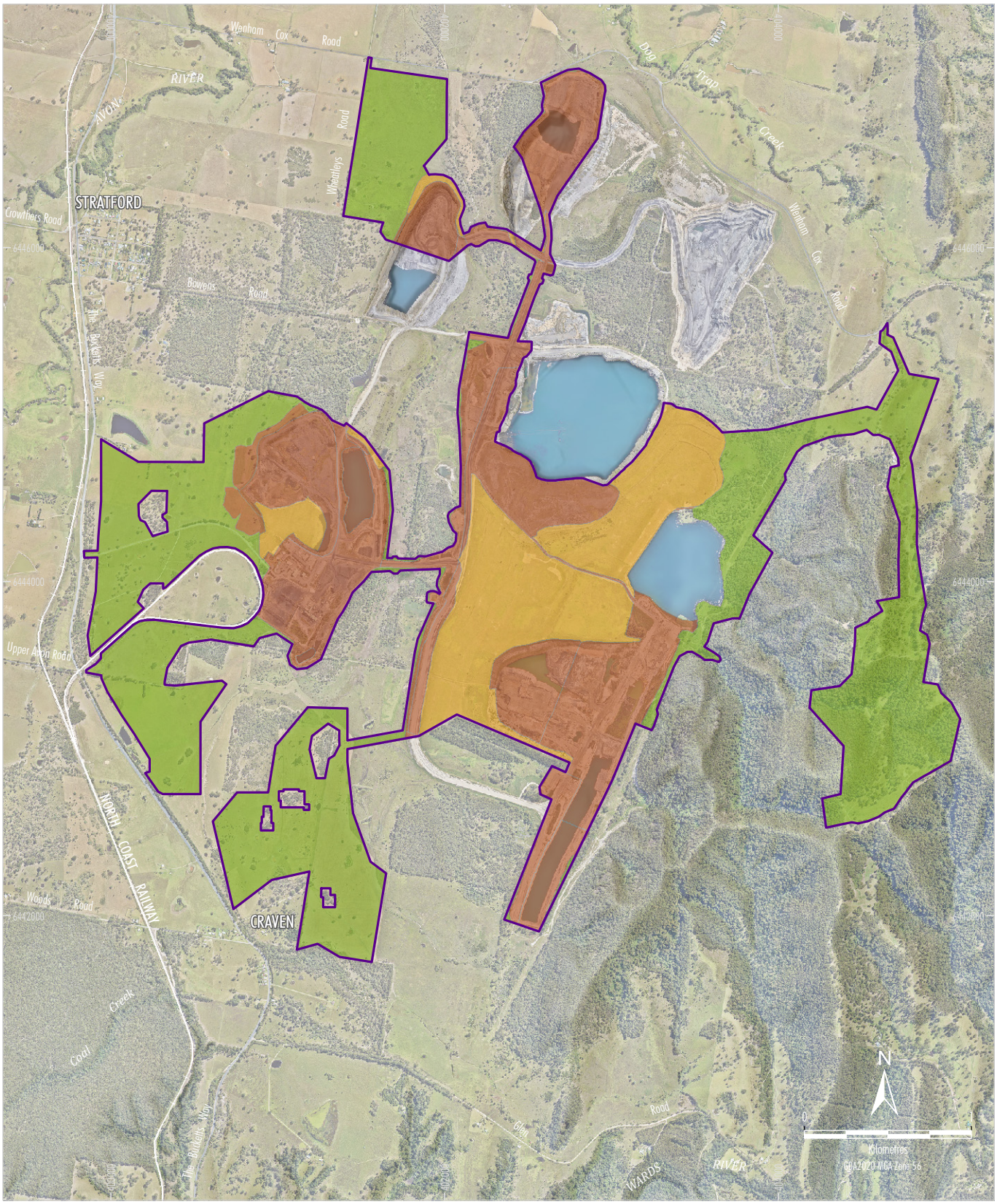
3.2 EXISTING SITE AND PROJECT AREAS

The Project is wholly located within the MidCoast Council LGA. The Project would be located within and adjacent to land associated with the existing SMC. Yancoal (or its subsidiaries) owns all freehold land required to develop the Project.

The schedule of lands for the Project is provided as Attachment 7 of this EIS.

The Project area overlies the existing SMC site, which comprises existing mining disturbance areas and areas of active rehabilitation. Rehabilitation of the SMC will continue to occur in parallel with Project construction, however does not form part of the Project.

The current status of the landforms within the Project area (including, where relevant, the current rehabilitation status of SMC landforms) is shown on Figure 3-1.



YAN-22-45 SREH EIS Sect3_204B

LEGEND

- Project Disturbance Footprint
- Areas Outside SMC – Immediately Available for SREH Development
- SMC Areas where SCPL has Completed Landform Establishment* – Immediately Available for SREH Development
- SMC Areas where Rehabilitation and Landform Establishment is NOT Complete – SREH Development is Contingent on SCPL Rehabilitation

** As per SMC 2023 Annual Rehabilitation Report*

Source: NSW Spatial Services (2023); Yancoal (2023)

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Indicative Development Availability Status of Project Site Landforms

Figure 3-1

The overall Project area includes the surface disturbance area and the underground development area:

- The proposed surface disturbance area comprises:
    - some existing SMC infrastructure that would be shared and repurposed for the Project, including the SMC main access road (Plate 3-1) and internal roads (Plate 3-2) (with necessary upgrades as required for the Project), and use of existing utilities (Sections 3.3.9 and 3.4.13 and Attachment 6) (Plate 3-3);
    - SMC land that has (Plate 3-4) or will be (Plate 3-5) rehabilitated to a safe and stable state and would be used for the Project (e.g. for construction of the Solar Farm);
    - the Stratford East Dam, which would be augmented for the lower reservoir (Plate 3-6); and
    - new disturbance areas outside the currently disturbed SMC land for the upper reservoir, portion of the Solar Farm and other infrastructure.
- The proposed underground development area comprises the tunnelled waterways connecting the upper and lower reservoirs.

In addition, the Project may use other existing infrastructure and utilities that is outside the surface disturbance area, such as SMC water pipelines, existing 33 kV/11 kV power supply and existing roads, as necessary.

The existing SMC mine voids do not form part of the Project, however, would be used to permanently store excavated material and groundwater inflows generated from construction activities (subject to amending relevant SMC approvals). The initial filling of the PHES (and top-up during the operation if required) would also source water stored in mine voids (Plate 3-7).

Plate 3-1 SMC Main Site Access Road and Intersection with The Bucketts Way Available for Use for the Project

Plate 3-2 SMC Internal Road Available for Use for the Project

Plate 3-3 SMC Office and Carpark Area Available for Use for the Project

Plate 3-4 Stratford Waste Emplacement – Rehabilitated Agricultural Area

Plate 3-5 Bowens Road North Open Cut to be Rehabilitated Prior to Solar Establishment in this Area

Plate 3-6 Stratford East Dam to be Augmented for the Lower Reservoir

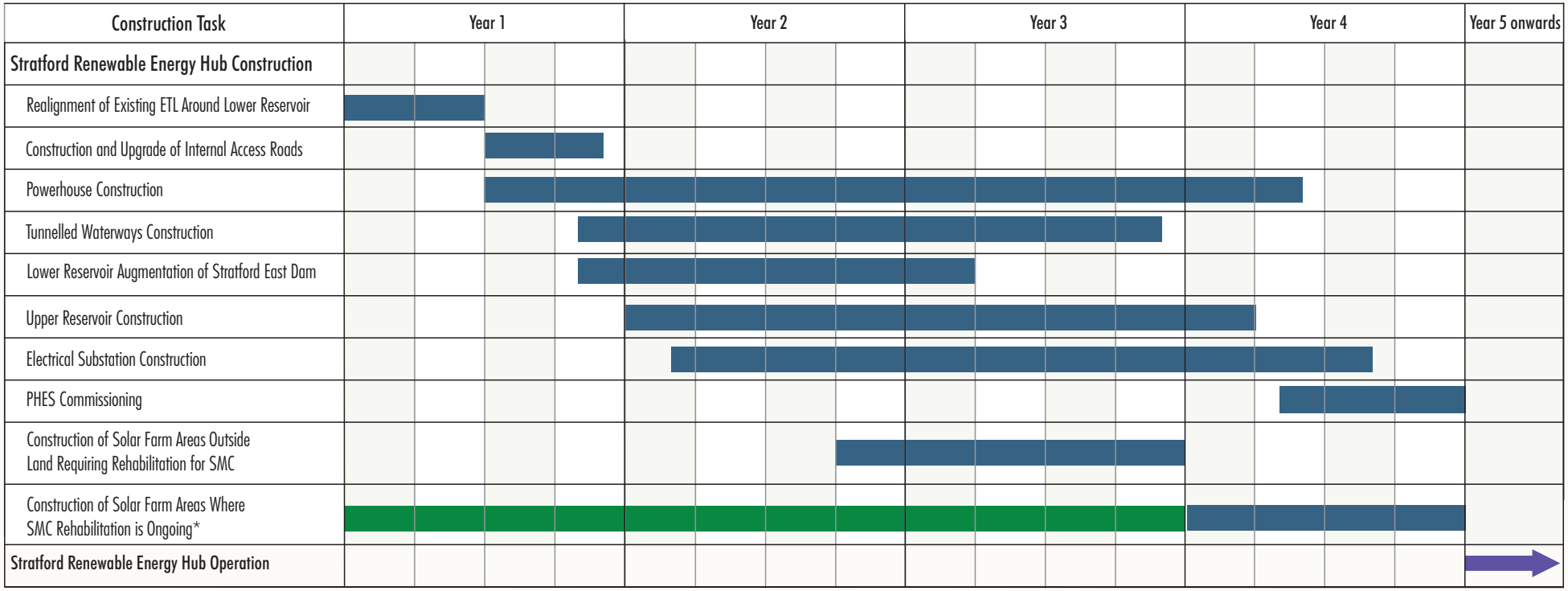
Plate 3-7 Water Stored in the SMC Mine Voids (such as Main Pit) would be Used to Initially Fill the PHES

General stages of the Project can be summarised as:

- **Construction**: the construction of the Project is anticipated to take approximately 4 years. An indicative Project construction schedule is provided as Figure 3-2, which includes indicative interactions with the ongoing SMC rehabilitation activities.
- **Operation**: the operation of the Project would generally continue for as long as there is commercially viable demand for electricity produced by the Project (expected to be greater than 50 years).
- **Decommissioning/rehabilitation**: following the closure of the Project, infrastructure would be decommissioned and associated rehabilitation activities would occur across the Project site.

The indicative layouts of Project construction stages and an indicative Project operational general arrangement are shown on Figures 3-3 to 3-6. Conceptual visualisations of the Project are provided in Figures 3-7a and 3-7b.

Table 3-1 provides a summary of key characteristics of the Project.



**Timing of construction dependent on completion of SMC rehabilitation in these areas. Figure 3-1 illustrates areas where future rehabilitation works are required prior to solar development.*

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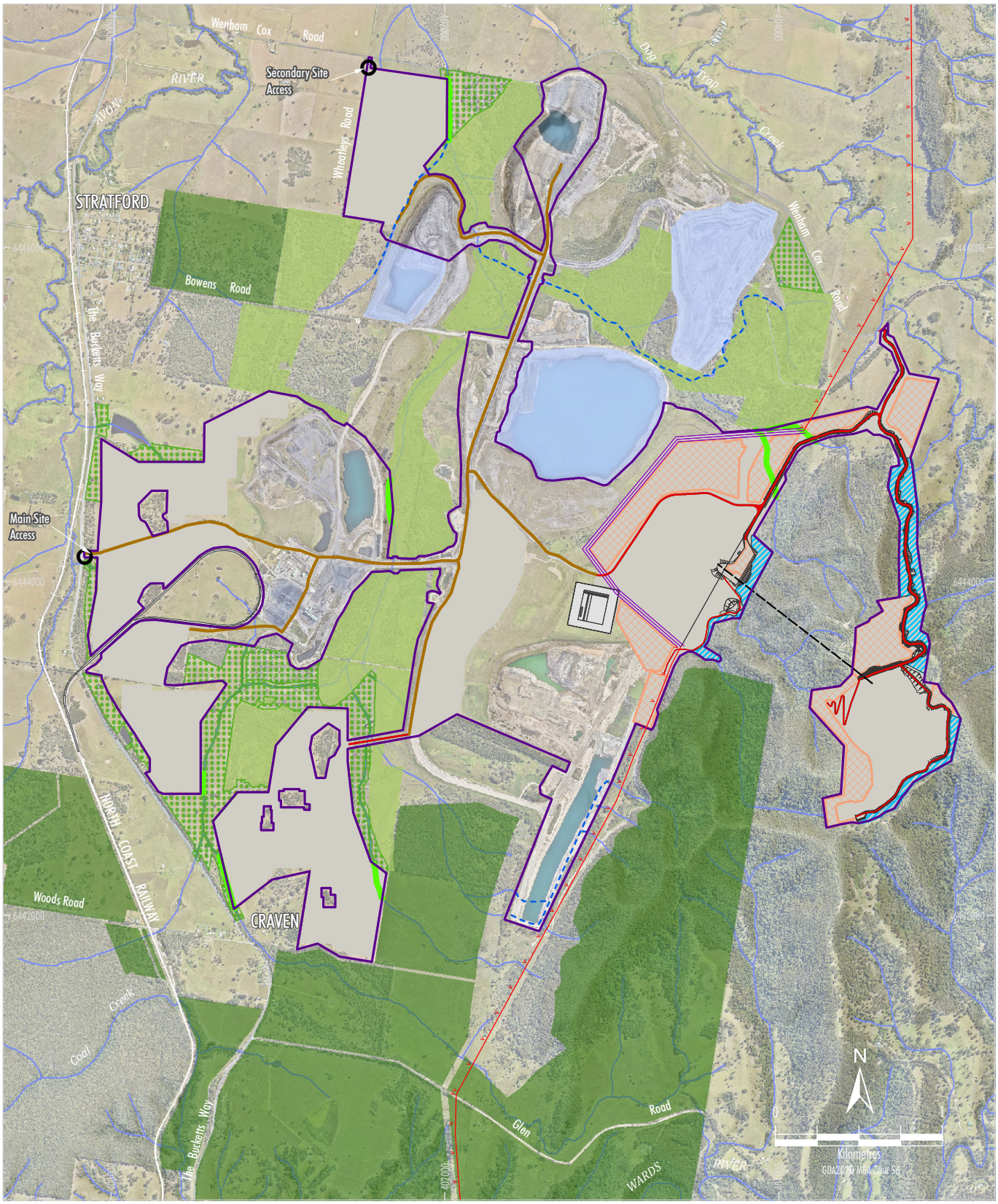
Indicative Project Construction Schedule

Figure 3-2



YAN-22-45 SREH EIS Sect3_207B

LEGEND

Project Components

- Project Disturbance Footprint
- Existing Internal Access Roads
- New Internal Access Roads
- Construction Disturbance Extent
- Riparian Corridor Protection Zone
- Laydown/Construction Area
- Area Available for Erosion and Sediment Control
- Potential Areas to Achieve Project Rehabilitation Obligation Associated with the SMC
- Site Access Point
- Indicative Underground Tunnel
- Realigned 132kV Transmission Line

SMC Development Consent SSD-4966 Components

- Biodiversity Offset Area
- Indicative Reconfigured Biodiversity Enhancement Area
- Final Void
- SCPL Retained Water Infrastructure

Source: NSW Spatial Services (2023); Yancoal (2023)

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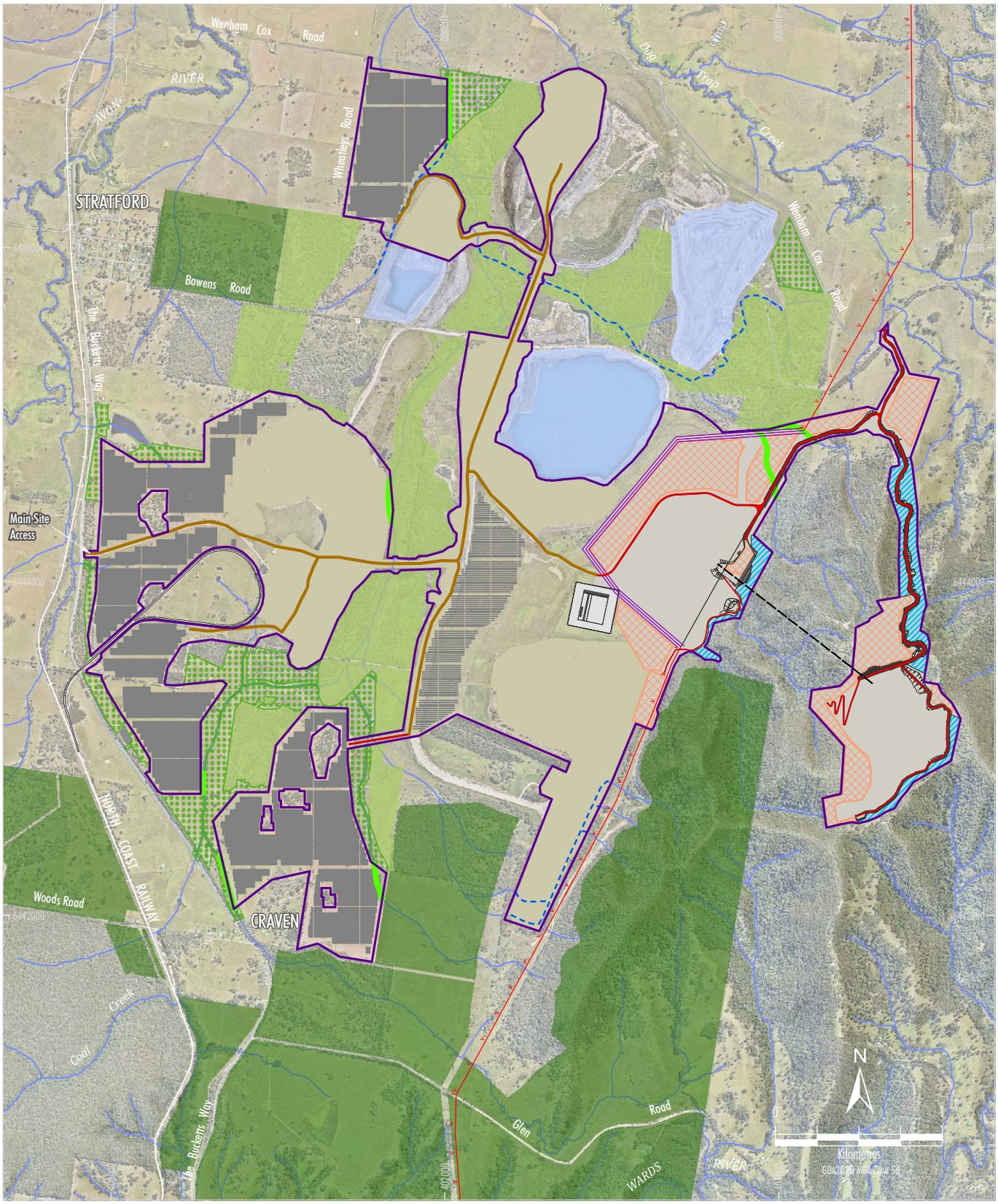
Indicative Construction Plan – Year 2

Figure 3-3



YAN-22-45 SREH EIS Sec3_208A

LEGEND

Project Components

- Project Disturbance Footprint
- Indicative Solar Photovoltaic Array Layout
- Existing Internal Access Roads
- New Internal Access Roads
- Construction Disturbance Extent
- Riparian Corridor Protection Zone
- Laydown/Construction Area
- Area Available for Erosion and Sediment Control
- Potential Areas to Achieve Project Rehabilitation Obligation Associated with the SMC
- Indicative Underground Tunnel
- Realigned 132kV Transmission Line

SMC Development Consent SSD-4966 Components

- Biodiversity Offset Area
- Indicative Reconfigured Biodiversity Enhancement Area
- SMC Rehabilitation (Once Completed Available for Solar Development)
- Final Void
- SCPL Retained Water Infrastructure

Source: NSW Spatial Services (2023); Yancoal (2023)

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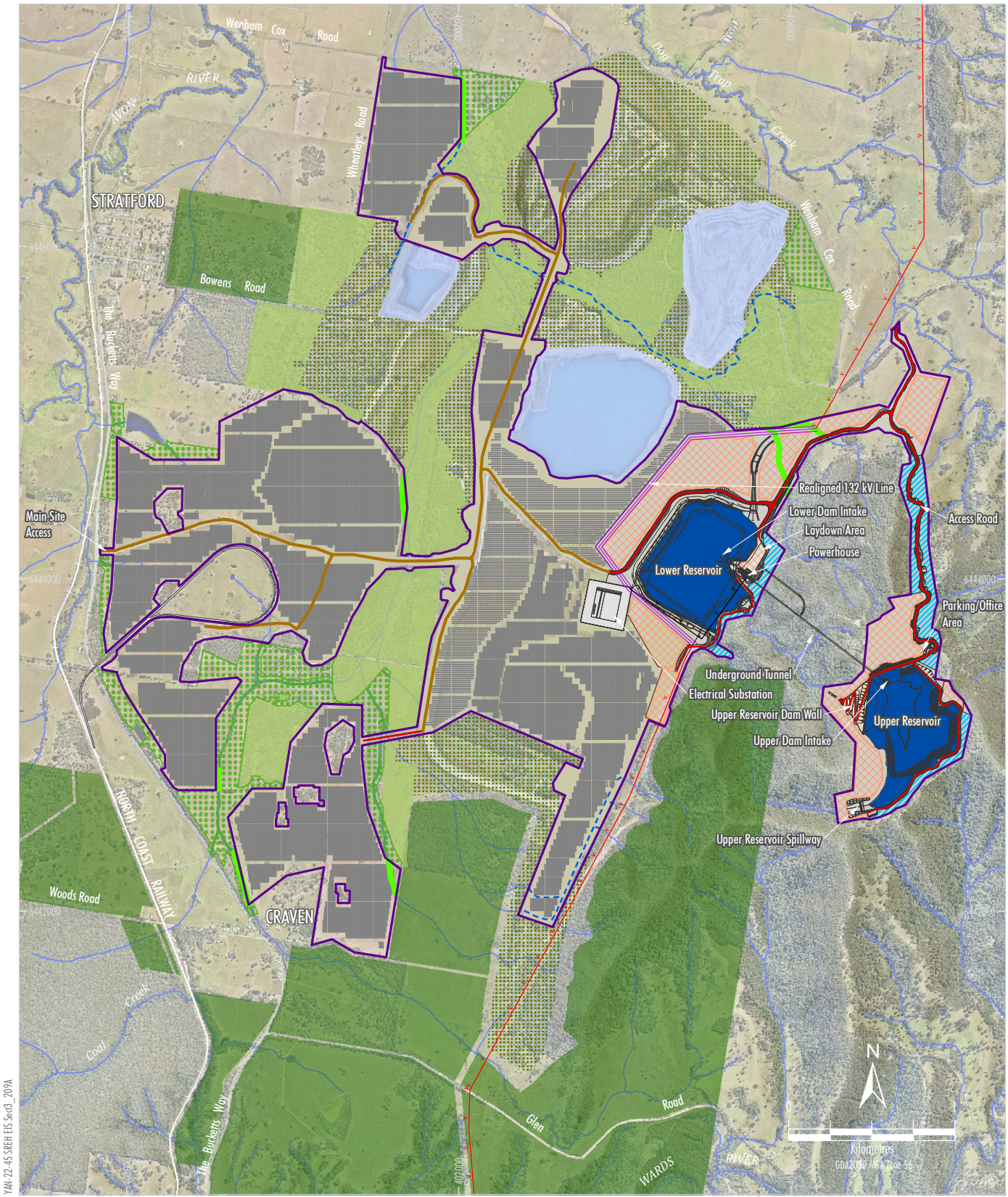
Indicative Construction Plan – Year 4

Figure 3-4



YAN-22-45 SREH EIS Sect3_209A

LEGEND

Project Components

- Project Disturbance Footprint
- Indicative Solar Photovoltaic Array Layout
- Internal Access Roads
- New Internal Access Roads
- Riparian Corridor Protection Zone
- Laydown/Construction Area
- Area Available for Erosion and Sediment Control
- Potential Areas to Achieve Project Rehabilitation Obligation Associated with the SMC
- Realigned 132kV Transmission Line

SMC Development Consent SSD-4966 Components

- Biodiversity Offset Area
- Indicative Reconfigured Biodiversity Enhancement Area
- SMC Rehabilitation
- Native Vegetation
- Final Void
- SCPL Retained Water Infrastructure

Source: NSW Spatial Services (2023); Yancoal (2023)

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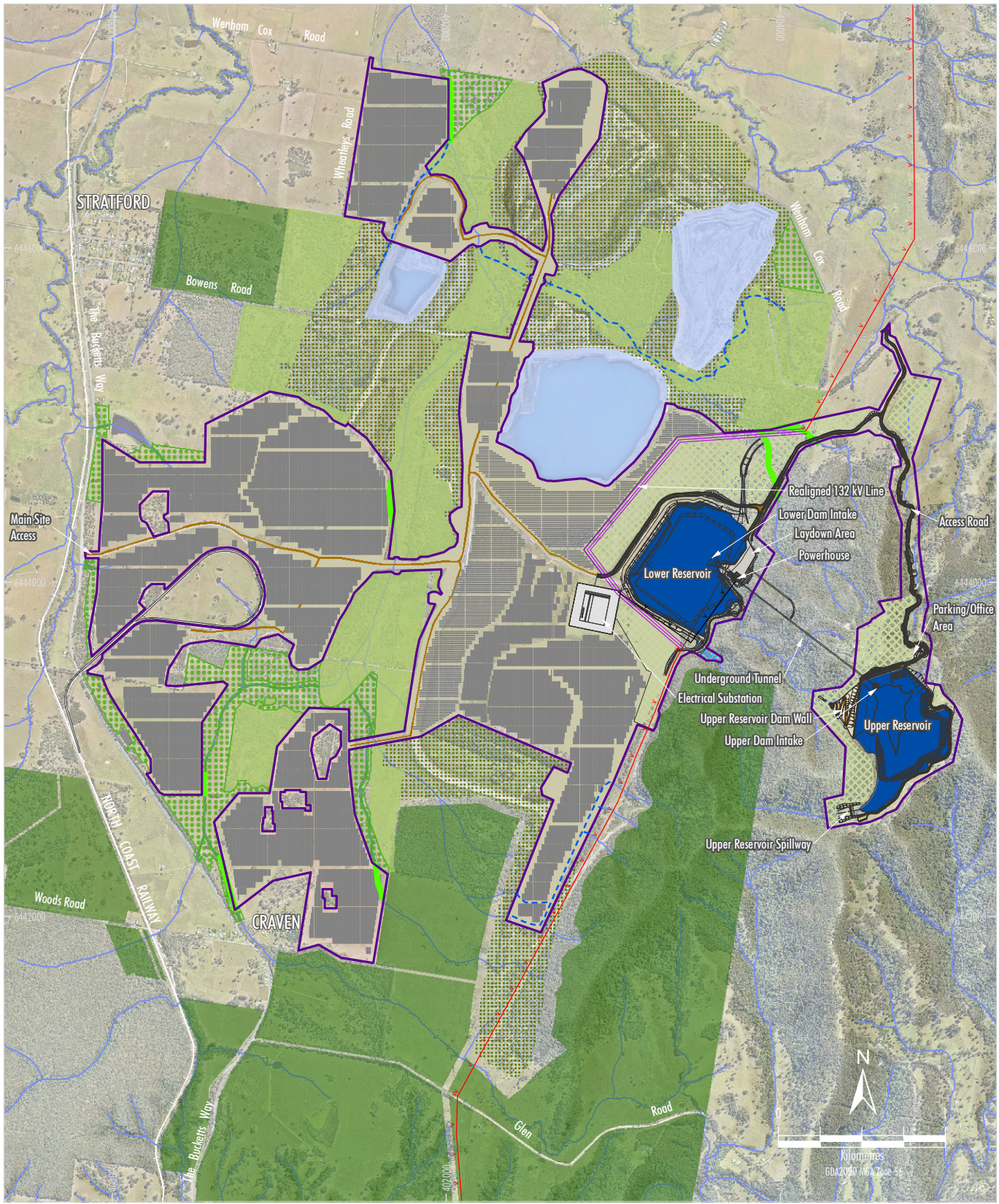
Indicative Construction Plan
End of Construction

Figure 3-5



LEGEND

Project Components

- Project Disturbance Footprint
- Indicative Solar Photovoltaic Array Layout
- Internal Access Road
- Riparian Corridor Protection Zone
- Area Available to be Rehabilitated or Repurposed During Operations
- Area Available for Erosion and Sediment Control
- Potential Areas to Achieve Project Rehabilitation Obligation Associated with the SMC
- Realigned 132kV Transmission Line

SMC Development Consent SSD-4966 Components

- Biodiversity Offset Area
- Indicative Reconfigured Biodiversity Enhancement Area
- SCPL Rehabilitation
- Native Vegetation
- Final Void
- SCPL Retained Water Infrastructure

Source: NSW Spatial Services (2023); Yancoal (2023)

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Indicative Operational General Arrangement

Figure 3-6

YAN-22-45 SREH EIS Sect3_002A

LEGEND
Indicative Single-Axis Tracking Solar Panels
Indicative Fixed Tilt Solar Panels

Source: GHD (2024)

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Conceptual Project Visualisation
Looking North

Figure 3-7a

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LEGEND
Indicative Single-Axis Tracking Solar Panels
Indicative Fixed Tilt Solar Panels

Source: GHD (2024)

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Conceptual Project Visualisation
Looking East

Figure 3-7b

Table 3-1
Overview of the Project

Project Characteristics	Description	
Project Locality		
Project Disturbance Footprint	• The Project Disturbance Footprint would be approximately 870 ha (Figure 3-1). • Of the 870 ha, approximately 468 ha is land already disturbed by the SMC, and approximately 402 ha of land is new disturbance (of which, approximately 145 ha is native vegetation clearance, with the remainder non-native vegetation).	
Project Location	• The Project is within and adjacent to land associated with the SMC, located in the Gloucester Valley, approximately 95 km north of Newcastle in the MidCoast Council LGA. • All freehold land required to develop the Project is owned by Yancoal (or its subsidiaries).	
Land Zoning and Land Use	• New infrastructure for the Project would be located on land which is zoned under the Gloucester LEP as: – RU1 (Primary Production); and – E5 (Heavy Industrial). • There is existing SMC infrastructure, such as the main access road within land zoned C3 (Environmental Management), which would be used by the Project. • It is noted the Gloucester LEP is not applicable to the Project due to its CSSI declaration.	
Project Components		
Project Capacity	• The capacity of the PHES would be approximately 300 MW over a 12-hour period (i.e. 3.6 GWh in total) (or 400 MW over 9 hours). • The Solar Farm would have the capacity of approximately 320 MW AC (375 MW DC).	
Project Life	• Solar panels have a life expectancy of approximately 25 years, and would be replaced as required throughout the operation of the Project. • The PHES does not have a set lifespan, and would continue for as long as there is commercially viable demand for electricity produced by the PHES. • Refurbishments of the PHES infrastructure, such as the pumps/turbines, would be required at various stages of the Project life.	
Project Infrastructure	**Upper Reservoir**	• Full supply level (FSL) at approximately 390.0 m AHD. • Minimum operating level at approximately 359.5 m AHD. • Freeboard height of approximately 0.9 m, leading to spillway level at approximately 390.9 m AHD. • Crest level at approximately 391.5 m AHD, and parapet wall at approximately 392.9 m AHD. • Total storage volume of approximately 8.2 gigalitres (GL), with active storage volume (i.e. volume of water transferred between the upper and lower reservoirs) of approximately 6.95 GL. • Low level outlet constructed to meet dam safety requirements. • Spillway constructed to meet dam safety requirements.

Table 3-1 (Continued)
Overview of the Project

Project Characteristics		Description
Project Components		
Project Infrastructure	**Lower Reservoir**	• FSL at approximately 171.0 m AHD. • Minimum operating level at approximately 147.0 m AHD. • Freeboard height of approximately 0.9 m. • Crest level at approximately 174.0 m AHD. • Total storage volume of approximately 7.1 GL, with active storage volume of approximately 6.95 GL. • Spillway constructed to meet dam safety requirements.
	Tunnelled Waterways	• Construction would be via drill and blast. • Concrete-lined vertical shaft connecting the upper reservoir intake to the headrace tunnel, with a shaft depth of approximately 100 m and diameter of approximately 6.5 m. • Headrace tunnel connecting the vertical shaft and the powerhouse, comprising: – concrete-lined section of tunnel with a length of approximately 650 m and diameter of approximately 6.5 m; – steel-lined section of tunnel with a length of approximately 350 m and diameter of approximately 5.2 m; and – steel bifurcate which would split water flow to each pump/turbine. • Tailrace tunnel connecting the powerhouse and the lower reservoir, comprising: – concrete-lined tunnel with a length of approximately 100 m and diameter of approximately 7.0 m; and – two steel draft tubes connecting the pump/turbine and the tailrace tunnel. • Temporary access tunnel from northern end of the powerhouse silo area to the headrace tunnel, with a length of approximately 900 m and diameter of approximately 6.5 m.
	Powerhouse and Assembly Bay	• Contains two 150 MW to 200 MW reversible pump/turbine units. • Powerhouse silo structure of the powerhouse at a depth of approximately 100 m, with a diameter of approximately 32 m. • A building over the powerhouse silo with overhead crane for equipment installation and maintenance, office facilities and control room. • An electrical substation with step-up transformers. Each pump/turbine unit would require one transformer with a rating of approximately 200 megavolt-amperes (MVA), transforming voltage from approximately 13.8 kV (output of the turbine) to 132 kV (the electricity grid voltage).

Table 3-1 (Continued)
Overview of the Project

Project Characteristics		Description
Project Components		
Project Infrastructure	**Solar Farm**	• Power output of approximately 320 MW AC (375 MW DC). • Approximately 625,000 PV solar panel modules and 9,000 mounting structures. • Single-axis tracking (SAT) and fixed tilt PV module mounting structures. • DC combiner boxes. • Inverter power conversion units. • 33 kV underground cabling connecting the power conversion units to the electrical substation. • Weather stations to assist in measuring solar performance. • Fencing around the Solar Farm for public safety and asset protection purposes.
	Electrical Substation	• Located proximal to the lower reservoir. • A switchyard would be required for electricity generated by the Solar Farm and for the PHES. A separate (but co-located) switchyard would be required to connect the Project to the Transgrid ETL. • Two 200 MVA transformers for the Solar Farm to transform voltage from 33 kV (output from the Solar Farm) to 132 kV (the electricity grid voltage). • Outdoor 33 kV busbars. • 33 kV switchrooms for the Solar Farm. • A control room for the operation of the electrical substation. • Lighting masts and lighting poles.
	Transmission Infrastructure	• Section of the existing Transgrid 132 kV ETL that traverses the Stratford East Dam would be realigned to the west of the lower reservoir to enable safe construction of the powerhouse. • The Project electrical substation would connect to the realigned section of the 132 kV ETL. • Overhead powerlines connecting the PHES substation to the Project electrical substation. • Underground cables connecting the Solar Farm to the Project electrical substation.
	Access Tracks	• Main site access would be via the existing SMC access road and intersection with The Bucketts Way. • Internal SMC roads (with upgrades as necessary) would provide access for Project traffic, where possible. • Existing tracks between the lower reservoir and the upper reservoir would be upgraded to provide two-way road access to the upper reservoir. • Internal access/maintenance roads throughout the solar array for maintenance of the Solar Farm during the operation. • Newly established access tracks constructed, where necessary within the Project Disturbance Footprint.

Table 3-1 (Continued)
Overview of the Project

Project Characteristics	Description
Construction and Operation Details	
Construction Material Management	• Construction materials for the upper and lower reservoir dam walls would preferentially be sourced from on-site borrow pits, along with excavated materials from the headrace and tailrace. • An on-site concrete batching plant and crushing station would be used to provide concrete for the construction works. • Importation of some construction materials would be needed. • Excess excavated material generated from the Project construction (e.g. from the tunnel and powerhouse excavations) would generally be transported to and emplaced in the SMC mine voids. • Temporary stockpiles and laydown areas established within the Project Disturbance Footprint as required.
Construction Access	• The majority of construction traffic would use the existing SMC access road and intersection with The Bucketts Way. • A small portion of the construction traffic would make use of Wenham Cox Road during the construction of the northern area of the Solar Farm, and to access the upper reservoir.
Traffic Movements	• Construction: The peak construction workforce would generate approximately 350 light vehicle (720 vehicle movements) and 30 heavy vehicle (60 vehicle movements) to and from the Project site in a typical day. • Operation: The normal operation of the Project would generate approximately 10 light vehicles (20 vehicle movements) in a typical day. During scheduled maintenance, traffic numbers would increase, however this increase would be temporary.
Water Management	• An up-catchment diversion system to prevent upslope runoff reporting to the lower reservoir would be constructed to the east of the lower reservoir. • Initial fill for the PHES would be sourced from water stored in the SMC mine voids. • PHES designed to operate as a closed system, with opportunistic transfer of water between the PHES and the existing SMC mine voids, subject to a water sharing agreement with SCPL.
Workforce	• Construction: An average of 300 Full-Time Equivalent (FTE) workers would be required over a period of around 48 months, with a peak of approximately 350 FTE workers. • Operation: Approximately 10 FTE workers would be required during normal operations. This would increase to approximately 30 FTE workers during periodic maintenance activities.
Hours of Operation	• Construction: Major earthworks would generally occur during daytime construction hours (7.00 am to 6.00 pm), 7 days per week. Tunnelling, construction of the vertical shaft and other associated activities would occur up to 24 hours per day, 7 days per week. • Operation: The Project would operate on a 24-hour basis over its operational life. The PHES would be optimised on a daily basis to maximise power supply (‘generation mode’) to the grid during periods of high electricity demand, and maximise power consumption (‘pumping mode’) from the Solar Farm and/or the grid during periods of low electricity demand and excess supply of VREs (Figure 2-1).
Estimated Development Cost	• The current EDC is approximately $1.8 billion (Attachment 4).

3.3 PROJECT GENERAL ARRANGEMENT

Key components of the Project include the following (Figure 3-6):

- upper reservoir;
- lower reservoir;
- underground powerhouse and associated assembly bay;
- tunnelled waterways;
- Solar Farm;
- electrical substation and switchyards;
- transmission infrastructure, including internal connection network from the powerhouse and the Solar Farm to the site electrical substation;
- upgraded internal access tracks; and
- other services as required.

3.3.1 Upper Reservoir

The upper reservoir dam wall involves construction of an outer rockfill wall, with a low permeability concrete slab on the upslope face of the dam. This type of dam wall is known as a 'concrete-faced rockfill dam' configuration.

The upper reservoir dam wall would have the following components (Figure 3-8):

- Rockfill dam wall.
- Concrete plinth and grout curtain at the upstream toe of the dam.
- Concrete lining of the upstream face.
- Parapet wall at the crest of the dam.
- Granular filter/transition and drainage layers underlaying the concrete lining.
- Low level outlet within the foundation of the dam.
- Vehicular access road within the downstream face of the dam to provide access to the low level outlet for operational inspections and monitoring of the dam downstream of the crest.
- Vehicular access road over dam crest for maintenance.

The upper reservoir would have a total volume of approximately 8.2 GL, with an active storage of approximately 6.95 GL. The upper reservoir has been designed with a 0.9 m freeboard above the FSL, to accommodate a PMF event.

An emergency spillway would be constructed at the southern end of the upper reservoir to comply with dam safety requirements. This spillway would only be required if the upper reservoir was completely full, the tunnelled waterway was not operational, and a flood event exceeding the design capacity occurred. In these extremely rare events, water overflowing the emergency spillway would be directed via a valve in the clean water diversion system to the lower reservoir.

The low level outlet could facilitate rapid drawdown of 30% to 45% of the water stored in the upper reservoir in emergency circumstances. Water released from the low level outlet during the emergency circumstances would be directed to the lower reservoir. Scheduled maintenance of the low level outlet would involve regular testing the outlet every 6 to 12 months. Approximately 1 megalitre (ML) of water would be released during these testing events, which would be directed to the lower reservoir via the clean water diversion system.

A small saddle dam would control the extent of inundation in a gully at the north-eastern corner of the upper reservoir. The saddle dam would incorporate a one-way valve and/or pumping system to drain any rainfall runoff reporting to the upslope side of the dam into the upper reservoir.

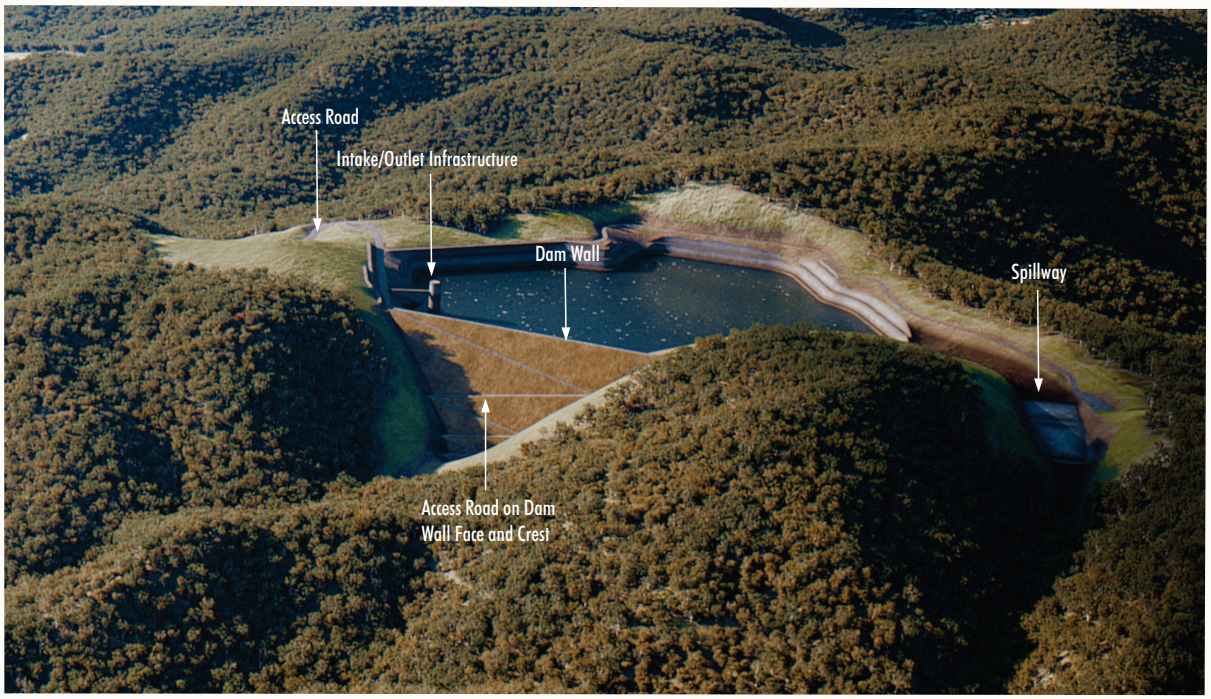
Vehicular access roads would be developed in the upper reservoir area during construction, and would be retained for monitoring and maintenance purposes during the Project operation.

3.3.2 Lower Reservoir

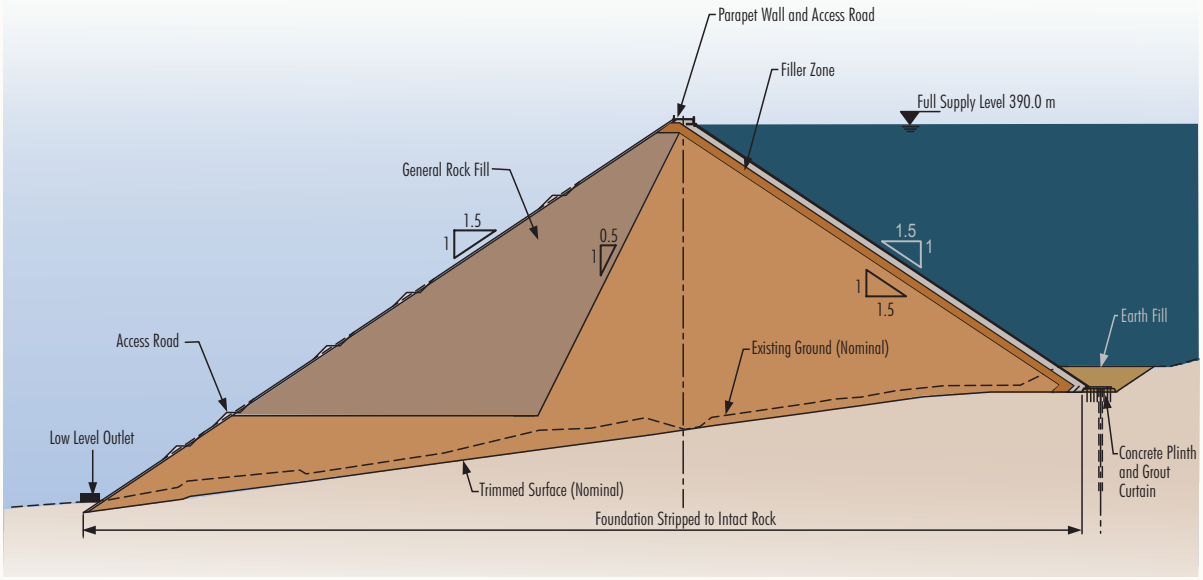
The lower reservoir dam wall would be a zoned embankment dam, that would be developed via augmentation of the existing Stratford East Dam (Figure 3-9).

The dam wall would comprise a zoned embankment consisting of:

- low permeability clay core;
- filter layers;
- rockfill layers; and
- riprap.



CONCEPTUAL VISUALISATION - UPPER RESERVOIR



TYPICAL CROSS SECTION -
UPPER RESERVOIR CONCRETE FACED ROCKFILL DAM WALL

YAN-22-45 SREH EIS Sect3_006A

Source: GHD (2024)

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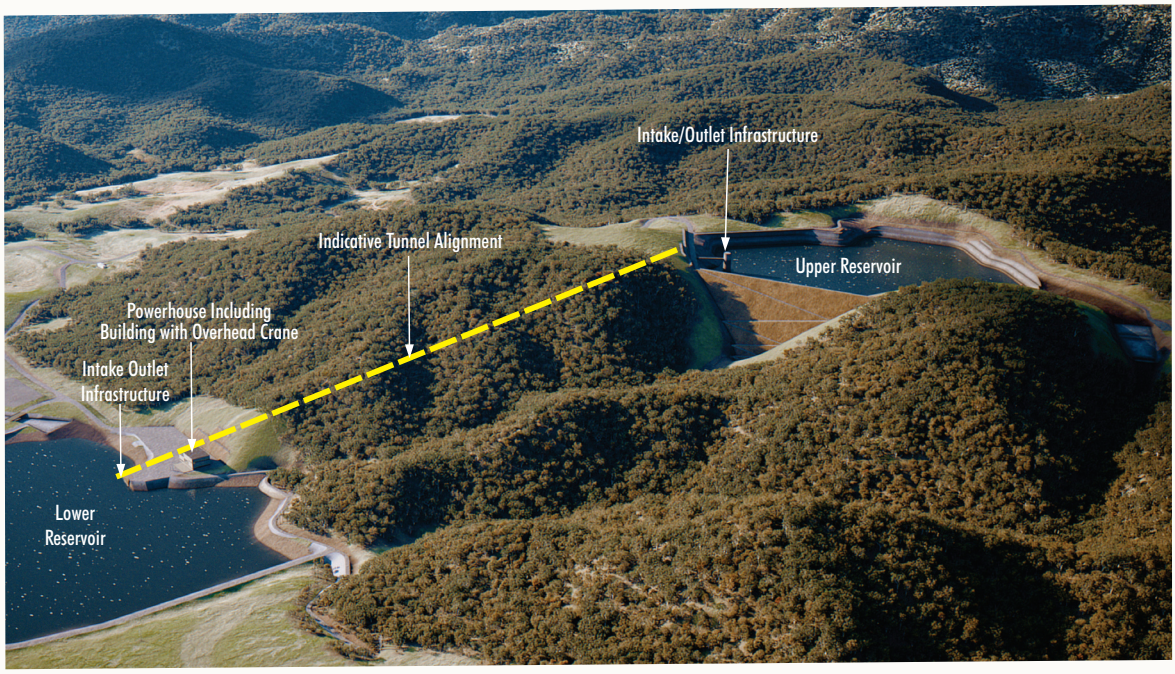
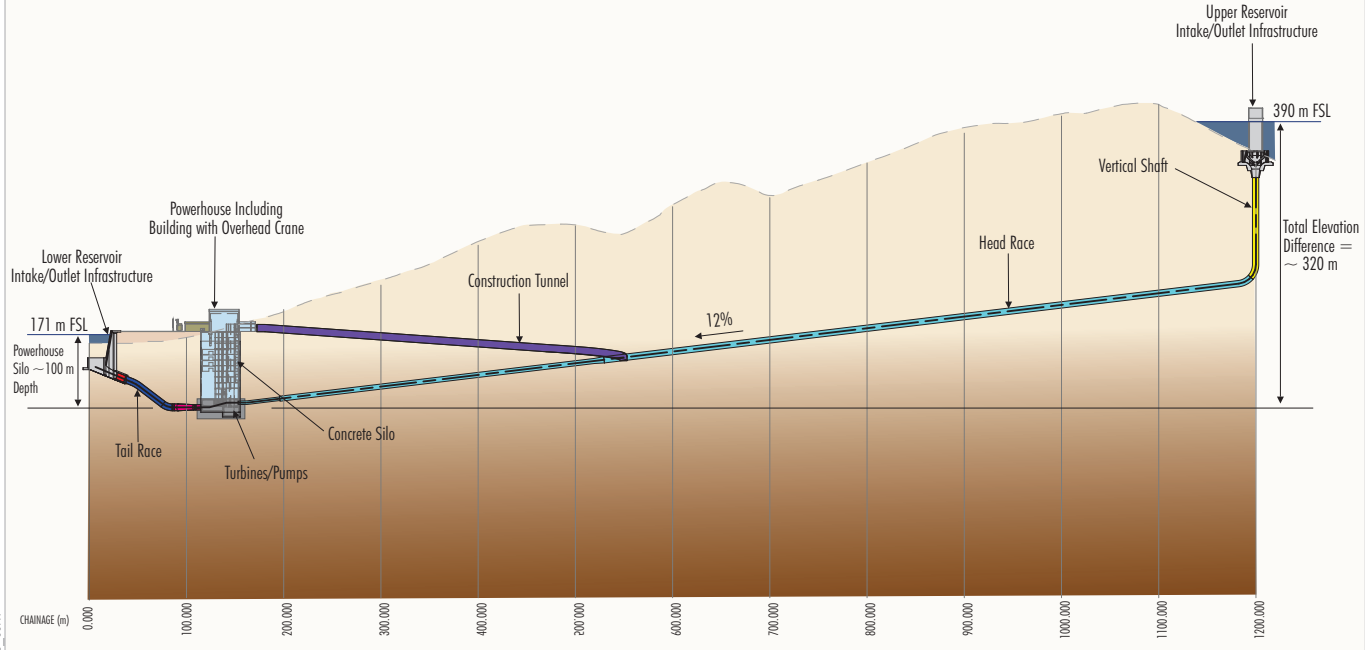
Conceptual Illustration of
Upper Reservoir and Dam Wall

Figure 3-8



CONCEPTUAL VISUALISATION - LOWER RESERVOIR,
POWERHOUSE AND UPPER RESERVOIR



CONCEPTUAL TUNNELLED WATERWAY,
POWERHOUSE AND CONSTRUCTION TUNNEL

YAN-22-45 SREH EIS Sect3 007A

Source: GHD (2024)

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Conceptual Illustration of Lower Reservoir,
Powerhouse and Tunnelled Waterways

Figure 3-9

The lower reservoir would have a total volume of approximately 7.1 GL, with an active storage of approximately 6.95 GL. The lower reservoir has been designed with a 0.9 m freeboard above the FSL, to accommodate a PMF event.

An emergency spillway would be constructed at the northern end of the lower reservoir, however, it would only be required if the lower reservoir was completely full, the tunnelled waterway was not operational, and a flood event exceeding the design capacity occurred.

Prior to the construction of the Project, a clean water diversion system would be constructed on the eastern side of the lower reservoir (Figure 3-9). The clean water diversion system would capture upslope catchment runoff between the upper and lower reservoirs, and direct this runoff to the north. It would comprise a combination of open channel and pipeline (particularly around the powerhouse). The clean water diversion would be designed with valves to enable water to be directed to the lower reservoir if required (e.g. during scheduled maintenance of the upper reservoir low level outlet).

Small saddle dams may be constructed to control the extent of the FSL footprint of the lower reservoir in small gullies upslope of the lower reservoir. Any such saddle dams would incorporate one-way valves and pumping systems to drain any rainfall runoff reporting to the lower reservoir.

3.3.3 Powerhouse and Assembly Bay

An underground powerhouse would be constructed to the east of the lower reservoir (Figure 3-9).

The powerhouse site would include the following components:

- concrete silo, with a diameter of approximately 32 m and depth of approximately 100 m;
- located at the deepest section of the powerhouse silo, there would be two pumps/turbines (used to generate energy when water is released from the upper reservoir to the lower reservoir and pump water from the lower reservoir to the upper reservoir), with each pump/turbine having a capacity of approximately 150 MW to 200 MW;
- buildings with an overhead crane positioned over the powerhouse silo for equipment installation and maintenance, site office facilities and control room; and
- PHES substation, with step-up transformers connected to the pumps/turbines.

3.3.4 Tunnelled Waterways

The tunnelled waterways would comprise the following components (Figure 3-9):

- Concrete-lined vertical shaft connecting the upper reservoir intake/outlet infrastructure to the headrace tunnel.
- Headrace tunnel connecting the vertical shaft and the powerhouse, including a concrete-lined section and a steel-lined section. A steel bifurcate would connect the headrace tunnel to the powerhouse, splitting water flow between the two turbines.
- Tailrace tunnel connecting the powerhouse and the lower reservoir, including a concrete-lined tunnel and two steel draft tubes (i.e. diffusers) to control the flow of water between the pumps/turbines and the tailrace tunnel.
- Construction access tunnel from the northern end of the powerhouse site to allow construction works to commence for the headrace tunnel excavation in parallel to construction of the powerhouse silo.

The tunnelled waterways would be sized to accommodate the maximum power output of the PHES, and are expected to be approximately 5 m to 8 m in diameter.

3.3.5 Solar Farm

The Solar Farm would cover a total area of approximately 520 ha.

The various areas of solar across the Project would be accessed via new or existing access roads, and would connect to the electrical substation, preferentially via underground cables.

The major components of the Solar Farm include:

- approximately 625,000 PV modules, with indicative solar panel dimensions of approximately 2.3 m × 1.1 m × 0.03 m (length × width × depth);
- SAT and fixed tilt PV module mounting structures (with fixed tilt generally located on steeper sections of the SMC landforms);
- DC combiner boxes;
- inverter power conversion units;
- 33 kV underground cabling from power conversion units to the electrical substation;

- weather stations to assist in measuring solar performance; and
- fencing around the Solar Farm for public safety and asset protection purposes, as required.

Table 3-2 provides a summary of the power expected to be generated by each Project solar area, as well as the indicative mounting structure (i.e. SAT versus fixed tilt). Figure 3-10 shows where each Solar Farm Area is located within the Project Disturbance Footprint.

Figure 3-11 provides a simplified electricity flow diagram for the Project showing how the Solar Farm would contribute electricity required for the PHES.

Table 3-2
Indicative Solar Farm Area Summary

Solar Area	Mounting Structure	AC Capacity (MW AC)	DC Capacity (MW DC)
1	SAT	16	19
2	SAT	28	33
3	SAT	8	9
4	SAT	44	52
5	SAT	16	18
6	SAT	26	30
7	SAT	57	66
8	SAT	14	17
9	SAT	49	57
10	SAT	6	7
11	SAT	8	9
12	SAT	9	10
13	Fixed Tilt	22	26
14	Fixed Tilt	19	23
Total		**322**	**376**

3.3.6 Electrical Substation

Electrical switchyards would be located proximal to the lower reservoir and the 132 kV ETL in the substation area shown on Figure 3-12. A switchyard would be required for electricity generated by the Solar Farm and the PHES. A separate (but co-located) switchyard would be required to connect the Project to the Transgrid ETL. Key components of the electrical substation area include:

- switchyards with bays;
- step-up transformers;
- outdoor busbars;
- switchrooms;
- security fencing;
- a control room; and
- lighting masts and lighting poles.

It is expected that the electrical substation and switchyard required to connect the Project to the Transgrid ETL would be transferred to Transgrid to own and operate.

3.3.7 Transmission Infrastructure

As part of the first stage of construction of the Project, a section of the existing Transgrid 132 kV ETL that currently traverses the Stratford East Dam would be realigned to the west of the lower reservoir to enable safe construction of the powerhouse (Figure 3-12).

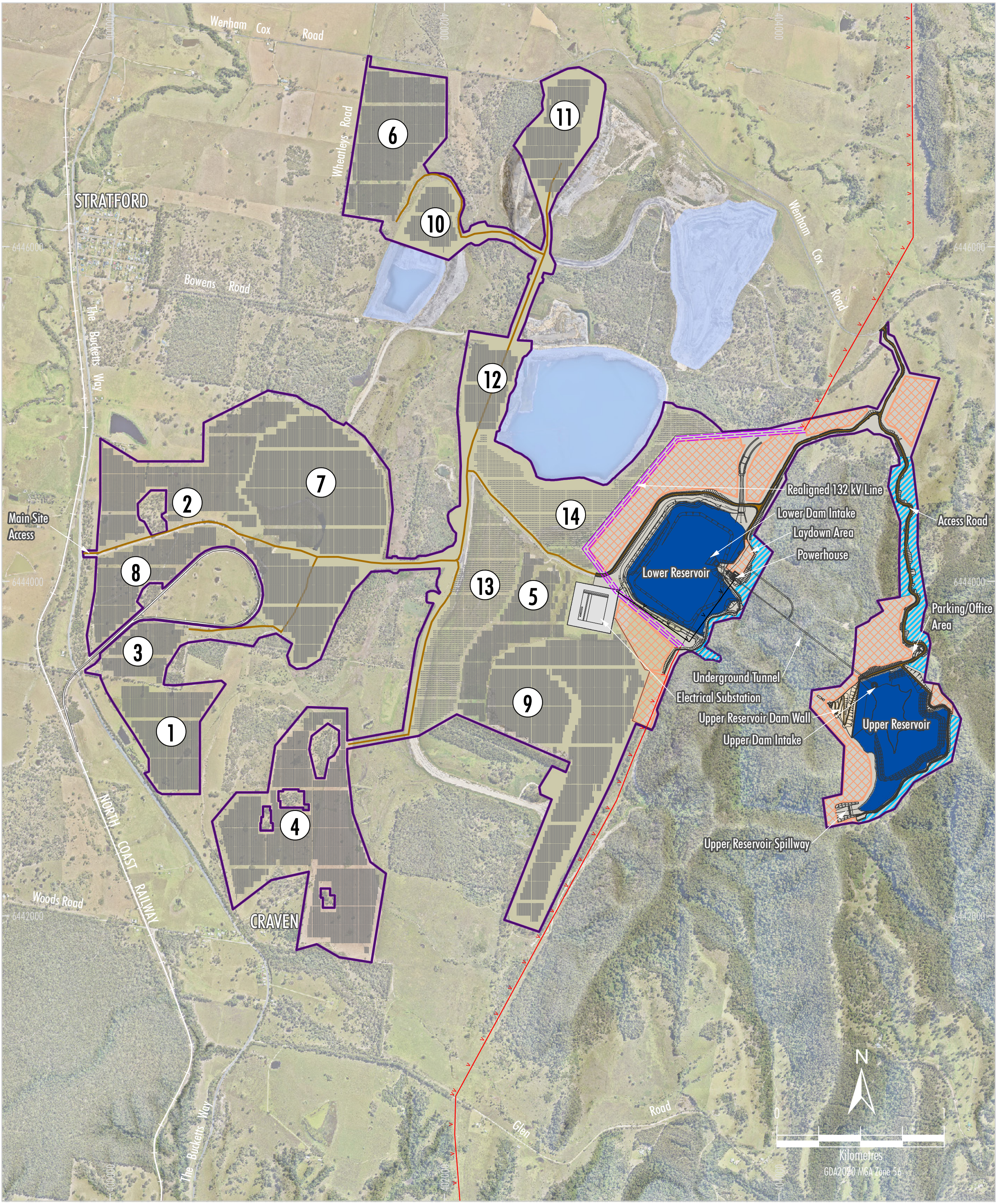
The Project electrical substation would connect to the realigned section of the 132 kV ETL (Figure 3-12). Other transmission infrastructure required for the Project would include overhead powerlines connecting the PHES substation to the Project electrical substation (Figure 3-12), and underground cables connecting the Solar Farm to the Project electrical substation.

The existing 33 kV/11 kV power supply to the SMC would continue to be used for the Project, and extended and/or realigned to provided auxiliary power to the powerhouse and upper reservoir.

3.3.8 Access Tracks

The main access to the Project site would be via the existing SMC access off The Bucketts Way (Figure 3-3 and Plate 3-1). Access during construction to the northern Solar Farm area immediately south of Wenham Cox Road would be via a new access point at Wenham Cox Road.

An existing access track to the upper reservoir would be upgraded for the Project to enable construction vehicles to safely access the upper reservoir, and prior to this, a new section of track would be established to connect to the lower reservoir construction area. Prior to upgrading the existing track to the upper reservoir, a small portion of construction traffic would use the existing track off Wenham Cox Road.



YAN-22-45 SREH EIS Sect3_201D

LEGEND

Final Void

Project Components

Project Disturbance Footprint

Indicative Solar Photovoltaic Array Layout

Laydown/Construction Area

Area Available for Erosion and Sediment Control

Internal Access Road

SMC Rehabilitation

Realigned 132 kV Transmission Line

Source: NSW Spatial Services (2023); Yancoal (2023)

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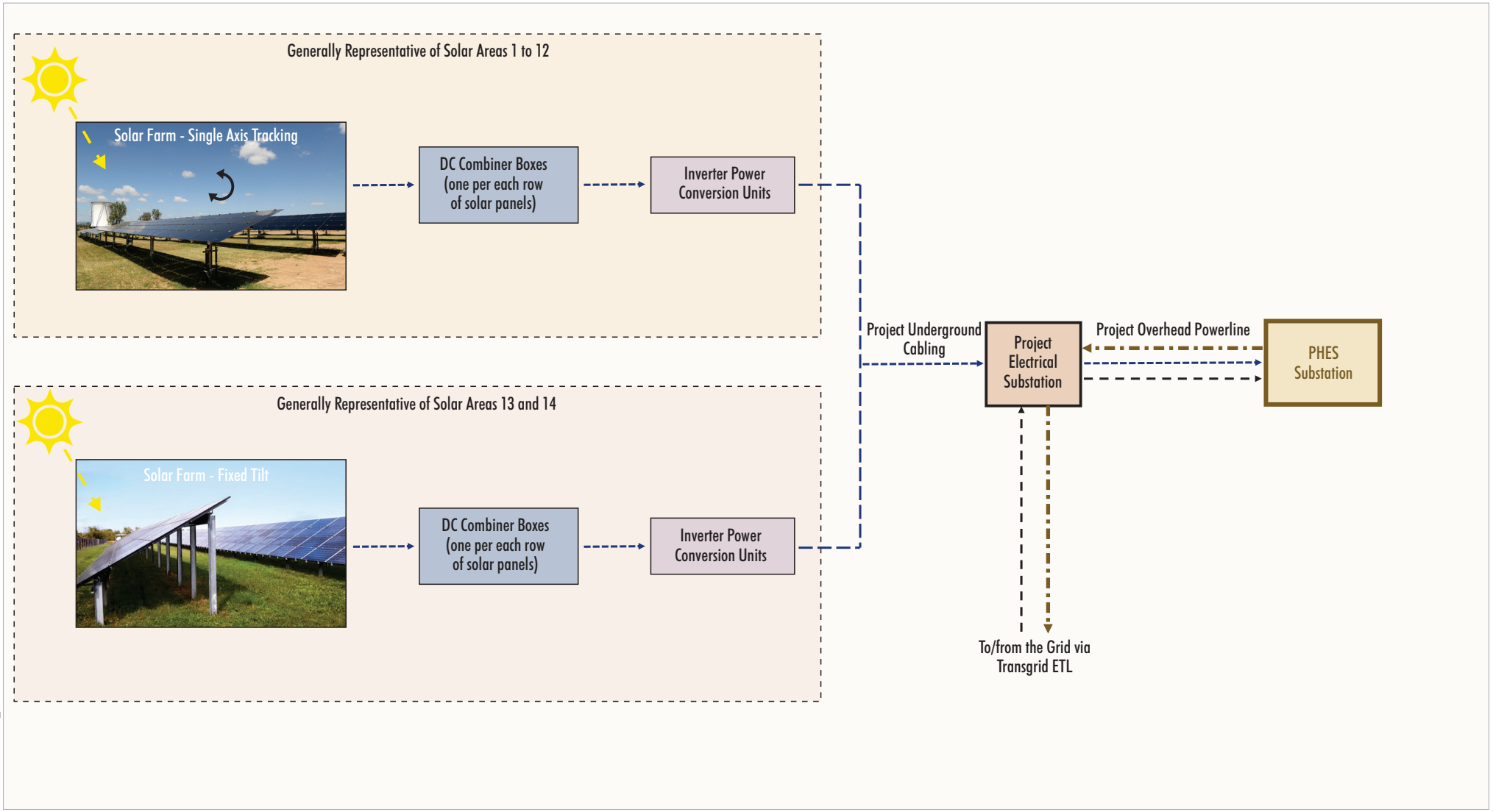
Indicative Solar Areas

Figure 3-10



YAN-22-45 SREH EIS Sect3_005B

LEGEND

- Electricity from Solar Farm
- Electricity from PHES
- Electricity from Grid

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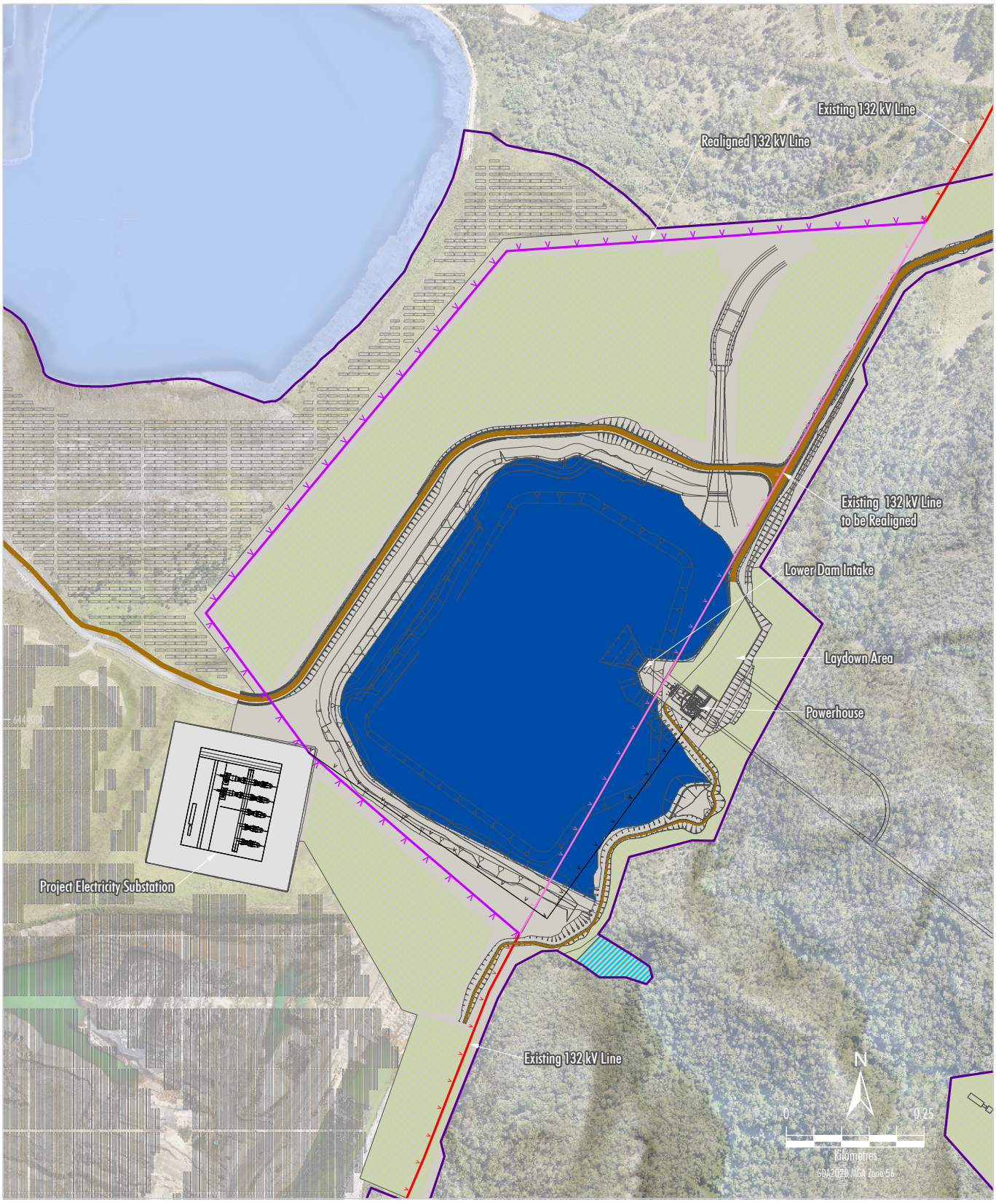
Project Simplified Electricity Flow Diagram

Source: University of Queensland (2024); Willowbrook Solar (2024)

Figure 3-11



YAN-22-45 SREH EIS Sect3_203B

LEGEND

Final Void

Project Components

- Project Disturbance Footprint
- Proposed Solar Photovoltaic Array Layout
- Area Available to be Rehabilitated or Repurposed During Operations
- Area Available for Erosion and Sediment Control
- Internal Access Road
- Existing TransGrid 132 kV Line
- Realigned 132 kV Transmission Line
- Internal ETL for the Project Phase
- Section of Existing TransGrid 132 kV Line to be Realigned

Source: NSW Spatial Services (2023); Yancoal (2023)

YANCOAL - STRATFORD RENEWABLE ENERGY HUB

Indicative General Arrangement of Electricity Transmission Lines

Figure 3-12

Existing SMC internal roads (Plate 3-2) would be used for the Project, where possible, with upgrades and maintenance as required. New access tracks would also be required to facilitate access to Project areas, as shown on Figure 3-3.

Other services (e.g. overhead powerlines, underground cables, water management infrastructure) would be located within disturbance corridors associated with the internal access roads.

3.3.9 Other Ancillary Infrastructure

Other associated ancillary infrastructure for the Project would include:

- new permanent carparks, site offices and other facilities at the upper reservoir and pumphouse (Figure 3-6);
- use (with upgrades as necessary) of existing SMC infrastructure (e.g. water management, carparks, offices, workshops, laydown areas, roads, power supply and communications infrastructure, services and utilities);
- water management infrastructure; and
- general lighting facilities in the construction areas during the Project construction, and around the site offices during the Project operation for safety purposes.

3.4 PROJECT CONSTRUCTION ACTIVITIES

It is expected the main Project construction activities would occur over an approximate four-year period, potentially commencing in 2025 (subject to timely approvals). An indicative construction schedule is provided in Figure 3-2. In some areas, site preparation works and construction activities for the Project are contingent on further rehabilitation of the landforms to be completed by SCPL.

The current status (with respect to SMC rehabilitation status) of the landforms within the Project area is shown on Figure 3-1.

Indicative layouts of Project construction stages are shown on Figures 3-3 to 3-5.

3.4.1 Construction Workforce and Hours

It is anticipated that an average of 300 FTE construction workers would be required over a period of approximately 48 months, with a peak of approximately 350 FTE workers.

Generally, construction activities would occur during daytime construction hours. However, due to the need for continuous activities for the tunnelled waterways (i.e. to manage construction schedule risk by allowing for a more efficient continuous operation and reduce safety risks), these activities are required to occur 24 hours per day, 7 days per week. Table 3-3 summarises the anticipated construction hours for the Project.

Other construction activities may occur 24 hours per day, 7 days per week, subject to compliance of out-of-hours construction noise criteria.

Table 3-3
Anticipated Project Construction Hours

Construction Activities	Hours
Majority of construction activities.	7.00 am to 6.00 pm, 7 days per week.
Tunnelling construction. Surface activities associated with the tunnelling construction. Other minor activities*.	24 hours per day, 7 days per week.

* Subject to compliance with out-of-hours construction noise criteria.

3.4.2 Realignment of the Existing Electricity Transmission Line

Part of the first stage of the Project construction would be the realignment of the existing ETL and its associated easement that currently traverses the Stratford East Dam to the west of the lower reservoir (Figure 3-12).

After the realignment, the existing infrastructure within the current easement would be decommissioned, where applicable. The current easement would then form part of the internal access track network for the Project.

3.4.3 General Site Preparation

Prior to the commencement of construction activities, general site preparation works would involve:

- vegetation clearance in previously undisturbed areas where Project construction activities would occur;
- installation of sediment and erosion controls;
- soil stripping and stockpiling; and
- geotechnical investigations across the Project construction area, as required to support detailed engineering design.

Site preparation would be undertaken progressively, ahead of specific construction areas in accordance with the final Project construction schedule.

Landform shaping (i.e. beyond SMC rehabilitation works) may be required for the Project in some areas to enable construction of solar and to improve drainage.

There would be limited site preparation work required to the rehabilitated SMC land (Plate 3-4) (e.g. land required for Project construction would be rehabilitated by SCPL to a state where it is safe and stable, but may not include revegetation if any such revegetation would need to be removed for the Project construction).

The current status (with respect to SMC rehabilitation status) of the landforms within the Project area is shown on Figure 3-1.

3.4.4 Upgrades of the Internal Access Tracks

Upper Reservoir

Access to the upper reservoir would be enabled by upgrading an existing access track to a two-way all-weather road, and constructing a new section of access track to connect to the existing SMC internal roads (Figure 3-3). Powerlines providing auxiliary power to the upper reservoir, and water pipelines for construction and firefighting water supply would be located within the upgraded road corridor as required.

An unsealed access road would also be constructed around the perimeter of the upper reservoir.

Lower Reservoir and Powerhouse

Existing SMC internal roads would be used to provide access to the powerhouse and the lower reservoir construction areas, with upgrades as necessary (Figure 3-3).

Solar Farm

Access to each Solar Farm area would be a combination of existing SMC internal roads (where possible) and newly constructed internal roads within the Project Disturbance Footprint (Figure 3-3).

3.4.5 Laydown Areas and Construction Pads

The main construction pad and laydown area for Project construction would be developed to the north of the lower reservoir. A smaller construction pad and laydown area would be developed adjacent to the upper reservoir area.

Concrete batching plants and rock crushers would be located at the upper and lower reservoir construction areas to provide materials for the Project construction (Figure 3-5).

Other smaller construction pads and laydown areas would be established within the extent of the Project Disturbance Footprint on an as needed basis.

3.4.6 Powerhouse Construction

The powerhouse silo excavation would be carried out top-down by drill and blast, with temporary support provided by rock belts and shotcrete as needed. The powerhouse silo would be concrete-lined and the pumps/turbines would be installed at the base of the powerhouse silo. A permanent sump required for drainage would also be located at the base of the powerhouse.

Rock excavated from the powerhouse silo would be screened, and suitable rocks for the Project construction would be collected and used. Excess excavated material would be transferred to and emplaced in the existing SMC mine voids.

Pre-grouting and post-grouting to mitigate groundwater inflows would be implemented as necessary. The groundwater inflows during the excavation process would be emplaced in the SMC mine voids.

Blasting activities would be designed and managed to comply with relevant ground vibration and overpressure criteria.

3.4.7 Tunnelled Waterways Construction

The waterways and associated access tunnels would be excavated using standard drill and blast techniques. A rock header may be used for excavation around the tunnel perimeter.

Groundwater inflows during excavation of the tunnelled waterways would be collected, used where possible (e.g. for dust suppression) and transferred to the SMC mine voids.

Rock excavated from the tunnelled waterways would be screened, and suitable rock for Project construction would be collected and used. Excess excavated material would be emplaced in the existing SMC mine voids, where possible.

Blasting activities would be designed and managed to comply with relevant ground vibration and overpressure criteria.

The tunnelled waterways would be concrete-lined in sections and steel lined in other sections to provide permanent stability and to prevent the ongoing inflow and outflow of water.

A temporary access tunnel from the northern end of the powerhouse site would be constructed to allow construction works to commence for the headrace tunnel in parallel to construction of the powerhouse silo.

3.4.8 Upper and Lower Reservoir Intake and Outlet Construction

The intake/outlet structures at the upper and lower reservoirs would comprise a diffuser at each end of the tunnelled waterways, to control the water flow into the reservoirs (Figure 3-9).

Both intake/outlet structures would be constructed after completion of lining of the tunnelled waterways.

3.4.9 Lower Reservoir Construction

The Stratford East Dam is classified as a ‘mine water dam’ with nil discharge to the environment in the SMC Environment Protection Licence (EPL) 5161.

To facilitate SMC closure (irrespective of the Project), the Stratford East Dam would be dewatered to enable and facilitate works to comply with the closure criteria for the dam. That is, emptying and augmentation of the Stratford East Dam would be required regardless of the Project. Water from the Stratford East Dam would be transferred to other water storages within the SMC.

The lower reservoir would be developed through augmentation of the existing Stratford East Dam. The existing Stratford East Dam wall would be stripped to expose the impervious zone. The overburden section above the original dam crest level would typically be stripped up to 1 m in preparation of construction of the upper clay core and filter section. The footprint of the empty Stratford East Dam would be de-silted via excavation of material down to competent rock.

Construction in the expanded area of the lower reservoir would involve soil stripping and vegetation clearance, followed by rock excavation. The excavation works are required to optimise the capacity of the lower reservoir. Suitable material extracted during these dam augmentation works would be used in dam wall construction.

The impervious clay zone of the dam wall for the raised section of the lower reservoir would be tied into the existing clay zone and the slopes would be modified to meet the required safety and stability requirements. An upstream layer of protection and filter would be constructed to protect and stabilise the upstream slope.

The lower reservoir would be compacted and/or grouted, where required, to minimise seepage.

If SCPL was unable to empty the Stratford East Dam prior to Project construction, the construction of the upper and lower reservoirs would be sequenced to accommodate this. This may include developing coffer dams within the existing Stratford East Dam footprint, temporary storages in the Project Disturbance Footprint and/or sequencing the overall construction of the PHES to accommodate transfer of water between the reservoirs progressively.

Borrow Pit(s)

Materials for the construction of the lower reservoir would preferentially be won within the reservoir footprints and/or, from potential borrow pit(s) across the site, subject to geotechnical investigations. Clay may be sourced from elsewhere on-site outside of the reservoir footprint, if available. The materials would be transported to rock crushing plants and material stockpile areas for handling and sizing.

Saddle Dams

Small saddle dams would be installed in natural gully lines on the upslope side of the lower reservoir to control the inundation area of the FSL of the lower reservoir, limiting the disturbance footprint and enabling the construction of the clean water diversion system.

Clean Water Diversion System

The existing clean water diversion structure around the Stratford East Dam would be decommissioned and replaced with a new clean water diversion to allow the increased capacity of the lower reservoir.

The new clean water diversion system would be constructed to capture upslope surface runoff between the lower reservoir and the upper reservoir, and divert this clean runoff to the north. The clean water diversion system would comprise a combination of open channel diversion system and pipelines (e.g. around the powerhouse). Runoff exceeding the design capacity of the diversion channel would be directed to the lower reservoir.

At the commencement of the pipeline section of the clean water diversion, a valve would be installed to enable diversion of water to the lower reservoir as required (e.g. for management of water released from the low level outlet during scheduled maintenance events).

Commissioning

During the commissioning of the PHES, water would be sourced from the existing SMC mine voids. Preference would be given to the water removed from the Stratford East Dam (prior to augmentation of the dam) with higher quality water within the voids used to top-up the system as far as possible.

Existing pipelines established as part of the SMC rehabilitation activities would be used to transfer water into the PHES system under a commercial arrangement with SCPL (or the future owner of the voids), noting significant volumes of water require transfer as part of SMC closure works (e.g. the existing Stratford East and Bowens Road North voids are to be dewatered and backfilled as part of closure activities).

Accordingly, SCPL would be responsible for transferring water to the lower reservoir, and the Project would receive this water for use in the PHES.

3.4.10 Upper Reservoir Construction

The upper reservoir would be a new structure constructed for the Project.

Vegetation within the upper reservoir footprint (including surrounding access track, dam wall and spillway areas) would be cleared and soil stripped and stockpiled. Both these resources would be used for rehabilitation of construction areas (when available) or transferred to the SMC for use on rehabilitation areas.

The base of the upper reservoir would be stripped to remove compressible or erodible material and excavated to expose a competent rock foundation.

The upper reservoir would be compacted and/or grouted, where required, to minimise seepage.

The dam wall of the upper reservoir would be constructed using rocks preferentially sourced from the floor of the upper reservoir, the lower reservoir or other on-site borrow areas where possible. The upstream face of the dam wall would be concrete-lined and connected to the concrete plinth.

The proposed reservoirs may be a “declared” dam under the NSW *Dams Safety Act 2015* as it is likely to meet the prescribed criteria in section 4(1)(1) of the NSW *Dams Safety Regulation 2019*. Construction of the proposed reservoirs would consider the relevant guidelines published by Dams Safety NSW.

Excavated Material

The excavated materials would be transported to the rock crushing plants and material stockpile areas for handling and sizing before use.

Surplus materials excavated from the upper reservoir area may also be used for access track upgrades or emplaced in SMC mine voids, where possible.

Borrow Pit(s)

Materials for the construction of the upper reservoir would preferentially be won from the reservoir footprints and/or from potential borrow pit(s) across the site, subject to geotechnical investigations.

Saddle Dam

A saddle dam on the northern perimeter of the upper reservoir would be constructed in a natural gully line to control the inundation footprint of the upper reservoir. Downstream erosion protection measures would be implemented within the Project Disturbance Footprint.

Spillway

An appropriately designed spillway would be constructed on the southern extent of the upper reservoir confining ridgeline. The area would be stripped and excavated to achieve the designed spillway capacity.

3.4.11 Electrical Substation

Construction works related to the electrical substation would include:

- Site preparation works.
- Construction of main facilities of the electrical substation and switchyards.
- Construction of other associated infrastructure (e.g. boundary fence around the switchyards).

3.4.12 Solar Farm

Activities for Solar Farm construction would include:

- Site preparation works such as vegetation clearance and access tracks development.
- Installation of module mounting structures, tracking structures and the solar panels.
- Construction of the inverter power conversion units (either on concrete or screw pile foundations).
- Installation of underground 33 kV cabling to connect the power conversion units to the Project electrical substation.

The Solar Farm would be constructed progressively (i.e. staged) in accordance with the progressive completion of the SMC rehabilitation activities required to make the landforms safe, stable and non-polluting, and suitable for solar construction. The need for each stage would also be reviewed at the time relative to sourcing electricity from the grid.

Fencing would be constructed, as required, around the solar areas.

Some areas required for temporary disturbance for construction (e.g. laydown areas) may be suitable for solar (or related development) once these areas are no longer required after construction. In consideration of this, the capacity of the Solar Farm is subject to change dependent on the final arrangement of solar panels within the approved disturbance footprint.

3.4.13 Use of Existing SMC Infrastructure

During Project construction, existing SMC infrastructure would be used, including:

- water pipelines, water management system, such as sediment and erosion controls;
- access roads;
- carpark and office facilities;
- services and utilities; and
- 33 kV/11 kV power supply and communications infrastructure.

Once construction is complete and the relevant infrastructure no longer needed (such as the existing SMC office), it would be decommissioned, demolished and the area rehabilitated where required to facilitate further development activities (such as additional solar).

3.4.14 Geotechnical Stability

The Project has several components with different geotechnical considerations, as discussed below.

Solar Farm – Outside SMC

Areas of the Solar Farm outside the SMC would be located on relatively flat land previously undisturbed by mining. Given the landform, and limited impact of solar construction, there are no material geotechnical issues relevant to this area.

Solar Farm – SMC Landforms

The Solar Farm would be constructed progressively (i.e. staged) in accordance with the progressive completion of the SMC rehabilitation activities required to make the landforms safe, stable and non-polluting, and suitable for solar construction.

As such, it will remain the responsibility of SCPL as part of its closure and relinquishment processes to provide SMC landforms that are geotechnically stable and suitable for construction of the Solar Farm (and other Project infrastructure).

SMC Final Voids

The SMC final voids provide the opportunity to beneficially reuse water stored in the voids to initially fill the PHES for the Project. The volume of water required to fill the PHES is relatively small compared to the overall water required to be transferred across the SMC as part of its closure processes. The voids themselves do not form part of the Project area. Accordingly, the geotechnical stability of the final voids would remain the responsibility of SCPL, and long-term stability of the voids will be demonstrated as part of closure and relinquishment processes.

PHES

Conceptual designs of the upper and lower reservoir have been completed to support Project feasibility studies and the Project description for this EIS. The reservoirs would subject to detailed design by suitably qualified dam engineers that would consider appropriate geotechnical factors of safety. It is expected the reservoirs would be considered "declared" under the *Dams Safety Act 2015,* and therefore, would be subject to further geotechnical review prior to construction in consultation with Dams Safety NSW, and safety reviews including studies of structural, hydraulic, hydrologic and geotechnical risks over the operational lives of the reservoirs.

Tunnelled Waterways

The tunnelled waterways are designed to be non-subsiding and geotechnically stable during construction. Following construction, the tunnelled waterways would be concrete and/or steel lined. The conceptual designs have been informed by exploration works, however further geotechnical investigations would be undertaken as part of detailed design (the completion of which may be subject to approval of the Project).

3.5 TRAFFIC MANAGEMENT

The majority of the Project traffic activities would occur during the construction stage. Traffic management during construction would include:

- The majority of construction traffic would access the site via the existing SMC main access, and the associated intersection with The Bucketts Way. This intersection with The Bucketts Way was purpose-built to manage heavy vehicles for the existing SMC operation. No additional intersection or public road upgrades would be required for the Project (Appendix H).
- During the construction of the northern Solar Farm area, the associated construction traffic would access this area via Wenham Cox Road. This portion of the construction traffic would be expected to access this area for approximately one month. Ongoing use of this access for operations would be limited.
- Oversize overmass (OSOM) and other heavy vehicles would typically access the Project site from the south, via The Bucketts Way and the Pacific Highway.

3.6 PROJECT OPERATIONS

3.6.1 Hours of Operation

The Project would operate 24 hours per day, 7 days per week over its operational life.

Pumping cycles of the PHES would be optimised on a daily basis to maximise power supply to the grid, and maximise power consumption from the Solar Farm. Power generation and pumping could each occur for up to approximately 12 hours over a 24-hour period, however shorter periods for both power generation and pumping are anticipated.

3.6.2 Activities

Operation of the Project would include the following (Figure 3-6):

- operation of the PHES, including:
  - releasing water from the upper reservoir to the lower reservoir to generate electricity during high electricity demand periods; and
  - pumping water from the lower reservoir to the upper reservoir to recharge the upper reservoir during low electricity demand periods;
- periodic scheduled maintenance of the PHES, including the upper and lower reservoirs, the waterways and the powerhouse;
- operation of the Solar Farm to supply electricity to the PHES (to recharge the upper reservoir), and export electricity to the grid in times of surplus solar generation;
- periodic scheduled maintenance of the Solar Farm, and ongoing cleaning of the solar panels; and
- replacement of solar panels when required, with associated deliveries and installation works (estimated to be every 20 to 30 years).

3.6.3 Workforce and Traffic Movement

Approximately 10 FTE workers would be required to operate the PHES and Solar Farm facility during normal operating hours. The operational workforce would increase to approximately 30 FTE workers during periodic maintenance activities.

The operational workforce would be expected to generate approximately 20 light vehicle movements per day. Approximately two heavy vehicle deliveries per day would be generated from operational activities.

During scheduled maintenance, the traffic number would increase, however this increase would be short-term (and be well below the initial construction phase).

The main operational site access would be via the existing SMC access road. Use of other existing roads may also be used by operational traffic, as required.

3.7 PROJECT REHABILITATION

Upon completion of Project construction, temporary landforms and works that are not required for Project operations (e.g. construction material stockpiles) would be decommissioned and rehabilitated, and typically revegetated with native vegetation.

Following completion of the Project, rehabilitation and decommissioning activities for the PHES would include:

- dewatering of the upper reservoir;
- the removal of the upper reservoir dam wall;
- subject to appropriate water quality, reconfiguration of the lower reservoir to a flow-through system (consistent with the closure concept for Stratford East Dam);
- removal of powerhouse equipment and filling of powerhouse silo;
- filling of the waterway tunnel and vertical shaft where required to mitigate future subsidence impacts;
- removal and revegetation of hardstand areas;
- revegetation of the upper reservoir; and
- ongoing controls to manage rehabilitation.

Rehabilitation and decommissioning works for the Solar Farm would include:

- removal of solar panels, tracking frames, structures and foundations, and other associated infrastructure;
- revegetation of the area; and
- ongoing controls to manage rehabilitation.

3.8 WATER MANAGEMENT

The key aspects of the Project water management system include the following:

- Erosion and sediment controls to manage sediment-laden runoff (e.g. from disturbed construction areas).
- Management of groundwater inflows during excavation and construction of the tunnelled waterways and the powerhouse silo.
- Clean water diversion system to minimise the capture of clean water runoff reporting to the lower reservoir.
- Initial filling of the PHES.

- Ongoing operation and management of the PHES water balance.
- Potable water supply during construction and operation.
- Sewage treatment systems for on-site toilet blocks.
- Fire-fighting water supply and on-site storage tanks.

3.8.1 Sediment and Erosion Control

Existing sediment and erosion controls in place for the SMC would be used by the Project where relevant, for example along existing internal roads that would be used by Project construction traffic.

Additional erosion and sediment controls for newly disturbed Project construction areas would be established in accordance with *Managing Urban Stormwater: Soils and Construction – Volume 2E Mines and quarries* ("Blue Book") (NSW Department of Environment and Climate Change [DECC], 2008a).

This would include diversion channels and drainage paths, additional sediment basins, sediment fences, and other controls. These measures would be confirmed as part of detailed design.

3.8.2 Management of Groundwater Inflows during Construction

Groundwater inflows during construction of the tunnelled waterways would be appropriately licensed. Collection systems and sumps would be used to capture groundwater inflows, where it would be used where possible (e.g. for watercarts during construction or stored in fire supply tanks) or transferred to the existing SMC.

3.8.3 Clean Water Diversion System

The clean water diversion system around the lower reservoir would capture upslope catchment runoff between the upper and lower reservoirs, and direct this runoff to the north.

The clean water diversion system would comprise a combination of open channel and pipeline (particularly around the powerhouse).

Clean water from the diversion system would be directed to the drainage line to the north of the lower reservoir. Releases from the clean water diversion system would be controlled via a diffuser prior to entering natural drainage lines.

3.8.4 Initial Filling of the Pumped Hydro Energy Storage

The commissioning of the lower reservoir, including initial fill, is described in Section 3.4.9.

The quantity of water stored in the SMC mine voids, which is already licensed, is already far in excess of the capacity requirements of the PHES. Hence, the filling of the PHES would not be dependent on climate conditions or obtaining water licences.

3.8.5 Pumped Hydro Energy Storage Operational Water Balance

The upper reservoir and lower reservoir are designed to operate as 'turkey's nest' dams, with minimal catchment beyond the footprint of the reservoirs (with the implementation of the clean water diversion system around the lower reservoir). This means the water balance of the PHES would be driven by rainfall and evaporation.

The maximum optimal amount of water stored in the PHES that would be transferred between the upper and lower reservoirs is approximately 6.95 GL.

The PHES has been designed to be able to operate as a 'closed' system after the initial fill. However, subject to commercial agreement with SCPL (or the future SMC land owner) there may be opportunities to source top-up water for the PHES from the voids, and/or transfer excess water back to the voids.

A water balance has been prepared for the PHES and provided as Appendix B. It shows:

- The combined capacity of the upper reservoir and lower reservoir is almost double the amount of water stored in the PHES at any given time as the PHES operates such that if one reservoir is almost full, the other reservoir is almost empty. As such, there is negligible risk of spill from the reservoirs, as water levels in the reservoir would be managed to avoid water levels exceeding the FSL. Notwithstanding, the reservoirs have been designed with freeboard of approximately 0.9 m and spillways to accommodate a PMF event.

- In the short-term, there would be fluctuations of a few percent around the optimal water level in the PHES due to rainfall and evaporation. This can be accommodated by the PHES, as it would only have a small impact on the maximum volume of water that is able to be transferred between the reservoirs.
- In the long-term, there is predicted to be a minor overall water deficit, which could be managed via top-up from the SMC mine voids (subject to commercial agreements).

3.8.6 Potable Water

Potable water is currently imported to the SMC. This would also be required for the Project for worker facilities and concrete batching.

3.8.7 On-site Sewage Treatment Systems

On-site toilet facilities are currently serviced by an on-site sewage treatment facility. Treated/grey water is sprayed onto grassy areas in accordance with *Environmental Guidelines: Use of Effluent by Irrigation* (NSW Department of Environment and Conservation [DEC], 2004).

The existing sewage treatment facilities (with upgrades as required) would continue to be used for the Project during construction, and additional treatment facilities may be located at new office locations for the Project at the pumphouse and upper reservoir.

Treated/grey water spray irrigation areas would continue to be operated for the Project in accordance with the *Environmental Guidelines: Use of Effluent by Irrigation* (DEC, 2004).

3.8.8 Fire-fighting Water Supply

Water tanks would be located along the access track to the upper reservoir and around the powerhouse and used to store water for emergency fire-fighting for the life of the Project. Pipelines along the access track would service these tanks. Water used to fill the tanks would be sourced on-site.

3.8.9 Temporary Storages

Temporary water storages would be constructed within the Project Disturbance Footprint (upper and lower reservoir footprints) which would be used to store construction water.

3.9 WASTE MANAGEMENT

The construction and operation of the Project would generate a range of waste streams that would require appropriate waste management.

The Project would use the general hierarchy of waste management and minimisation principles of avoid, reduce, use and recycle, to minimise the quantity of waste generated by the Project.

Classification of waste has been made consistent with the *Waste Classification Guidelines* (EPA, 2014).

3.9.1 Construction Waste

The construction phase of the Project may include the following waste components:

- excess excavated material from the excavation of the tunnelled waterways, powerhouse silo and reservoirs;
- vegetative waste from vegetation clearance;
- cardboard and plastic packaging waste (e.g. solar panel packaging, etc.);
- scrap metal and electrical/cabling waste;
- concrete waste; and
- general waste (food scraps, cans, glass bottles, plastic).

Excavated material won on-site would be used for construction, wherever possible, with excess to be temporarily stored in stockpiles in the construction sites, before being transported via truck and emplaced in the SMC mine voids.

Cleared vegetation would be mulched and used as part of rehabilitation activities, where it is feasible to do so. Any excess vegetation waste that could not be used on-site would be transported off-site to appropriately licensed local green waste facilities.

Other solid waste would be collected, separated and transported to off-site licensed waste facilities by licensed waste contractors.

The existing SMC sanitary facilities would be used during construction activities. Bio-waste from on-site sanitary facilities would be collected in tanks, and transported to off-site licensed disposal facilities by licensed waste contractors.

3.9.2 Operational Waste

Waste generated during the Project operation would be significantly less than Project construction, due to the decreased workforce at the site. Operational waste streams would be limited to those generated by operational and scheduled maintenance activities, and may include:

- solar panel packaging from the scheduled replacement of solar panels during the operation;
- replaced solar panels, following the end of their expected lifespan;
- replaced electrical and mechanical components from the scheduled maintenance;
- general office and workshop waste;
- general green waste from vegetation management; and
- bio-waste from on-site sanitary facilities.

These waste streams would be managed as described for the construction period. All waste requiring transport from the site would be carried out by appropriately licensed contractors.

During the operational life of the Project, recycling and use facilities for solar panels may advance in Australia. The future growth of solar panel recycling facilities would be considered throughout the life of the Project to inform potential recycling and use opportunities.

3.9.3 Liquid and Non-liquid Wastes

Existing wastewater treatment plants would be used for the Project to treat effluent on-site.

Waste hydrocarbons would be collected and stored on-site prior to being removed by licensed contractor(s).

Waste management practices during the construction phase of the Project would be further described in the Construction Environmental Management Plan (CEMP) that would be prepared for the Project.

A Waste Disposal Strategy would also be prepared for the end-of-life disposal of solar panels.

3.10 HANDLING DANGEROUS/ HAZARDOUS GOODS

Limited quantities of hazardous goods are proposed to be stored and handled on-site during both the construction and operational phases of the Project. Potentially hazardous goods to be used on-site include hydrocarbons (i.e. fuels), chemicals, explosives (for construction only), liquid and non-liquid wastes. Descriptions of potentially hazardous goods are provided below.

3.10.1 Hydrocarbons

Hydrocarbons used at the Project site during construction and operation would include fuels (diesel and petrol).

Diesel

Diesel is classified as a combustible liquid (Class C1) by Australian Standard (AS) 1940:2017 *The Storage and Handling of Flammable and Combustible Liquids* for the purpose of handling and storage, but is not classified as a dangerous good for transport purposes in accordance with the criteria of the *Australian Code for the Transport of Dangerous Goods by Road & Rail* (ADG Code) (National Transport Commission, 2022).

The risks associated with the Project would include handling, storage and use of diesel.

Where available, SMC diesel storage and handling equipment would be used and undertaken in accordance with current practices, including the use of appropriately bunded above-ground diesel tanks.

Petrol

Petrol is classified as a flammable liquid (Class 3) by AS 1940:2017 and as a dangerous good (Hazard Rating 3 – Flammable Liquid) according to the criteria of the ADG Code (National Transport Commission, 2022). On-site petrol usage would be minor and petrol engine vehicles would be fuelled offsite at local service stations.

3.10.2 Chemicals

Sulphur hexafluoride

Sulphur hexafluoride (SF_6) is classified as a non-flammable, non-toxic gas (i.e. an asphyxiant) (Hazard Rating 2.2) in accordance with the criteria of the ADG Code (National Transport Commission, 2022). On-site usage of SF_6 would be in minor quantities for operational and maintenance purposes associated with electrical switch gear.

Other Chemicals

It is noted that transformer oil is to be used on-site during the operations phase of the Project. Transformer oil is classed as a C2 combustible liquid, but is not classified as a dangerous good under the ADG Code (National Transport Commission, 2022).

3.10.3 Explosives

The waterways and powerhouse would be constructed using blasting. Explosive materials required for the Project would include initiating products and detonators, ammonium nitrate fuel oil and emulsion explosives.

Explosive storage would be conducted in accordance with the NSW *Explosives Act 2003* and *Explosives Regulation 2013*. The *Explosives Regulation 2013* details the requirements for the safe storage, transport, handling and disposal of explosive materials, with reference to AS 2187.2:2006 *Explosives – Storage and use – Use of explosives* for specific guidelines.

3.11 SUBDIVISION OF LAND

Relevant lots that would require potential subdivision may not be permissible under a local development application as they are smaller than the minimum lot size under the Gloucester LEP. Accordingly, approval is being sought under this application for potential future subdivision, given local planning controls do not apply to State Significant Projects.

Some of the lots within the Project Schedule of Lands (Attachment 7) would require subdivision to separate the different land uses between the SMC and the Project. This will assist with clarifying responsibilities between the Project and it will provide flexibility for the Project to be operated separate to the SMC.

3.12 PROJECT DESIGN SUBJECT TO FUTURE DETAILED DESIGN

This EIS Project Description has been based on a conceptual project design as available at the time of writing. As with any complex project like this Project, the final design is subject to change, and some flexibility is inherently required. Any such changes would be considered generally in accordance with this EIS Project Description where it can be demonstrated that the physical and environmental limits of any Infrastructure Approval for the Project, along with the environmental outcomes assessed in this EIS, will be achieved (in particular the Project Disturbance Footprint).

4 STATUTORY CONTEXT

The EP&A Act and EP&A Regulation set the framework for planning and environmental assessment in NSW. Approval for the Project is sought under the CSSI provisions (i.e. Division 5.2) under Part 5 of the EP&A Act. Consideration of the Project against the objects of the EP&A Act is provided in Section 7.

In accordance with the *State Significant Infrastructure Guidelines* (DPHI, 2024a), a statutory compliance table to identify relevant statutory requirements and where they have been addressed in the EIS is provided in Table 4-1.

This section provides:

Table 4-1 Project Statutory Compliance Summary

Table 4-2 Statutory Requirements for the Project

Table 4-3 Applicable Pre-conditions to Granting Approval

Table 4-4 Applicable Mandatory Matters for Consideration

Table 4-5 Content Requirements of an EIS – Section 190 of the EP&A Regulation

Table 4-6 Content Requirements of an EIS – Section 192 of the EP&A Regulation

Table 4-1
Project Statutory Compliance Summary

Relevant Legislation	Relevant EIS Reference
NSW Legislation	
EP&A Act	Sections 2 and 4
Roads Act 1993	Section 6.9, and Appendix H
BC Act	Table 4-3, Sections 6.5 and 6.6, and Appendices D and E
NSW *Protection of the Environment Operations Act 1997* (PoEO Act)	Sections 3, 6.9, 6.12 to 6.13, and Appendices H, J and K
NSW *Water Management Act 2000* (WM Act)	Table 4-2, Sections 6.3 and 6.4, and Appendices B and C
NSW *Dams Safety Act 2015*	Table 4-2, Sections 6.3 and 6.4, and Appendices B and C
NPW Act	Sections 6.7 and 6.8, and Appendices F and G
Heritage Act 1977	Sections 6.7 and 6.8, and Appendices F and G
Commonwealth Legislation	
EPBC Act	Table 4-2 and 4-3, Sections 6.3 to 6.6, and Appendices B to E
Native Title Act 1993	Table 4-2
Renewable Energy Act	Table 4-2

Table 4-2
Statutory Requirements for the Project

Category	Action Required
Power to Grant Approval	Under section 5.12 of the EP&A Act, any development, or class of development, may be declared as State Significant Infrastructure (SSI) by a State Environmental Planning Policy (SEPP). Clause 2.14 of the Planning Systems SEPP provides that a development is declared SSI for the purposes of the EP&A Act if it is specified in Schedule 4 of the Planning Systems SEPP. Under section 5.13 of the EP&A Act, any SSI project may also be declared to be CSSI if it is of a category that, in the opinion of the Minister, is essential for the State for economic, environmental or social reasons. Any such declaration may be made by the instrument that declared the development to be SSI (i.e. a SEPP) or by a subsequent such instrument. In June 2024, the NSW Minister for Planning and Public Spaces declared the Project to be CSSI. This declaration came into effect in July 2024 and is included in Schedule 5 of the Planning Systems SEPP. As the Project has been declared CSSI, section 5.22(1) of the EP&A Act provides that Part 4 does not apply. Thus the Project may be carried out without obtaining Development Consent, subject to the Project requiring assessment and approval under Part 5, Division 5.2 of the EP&A Act. Under section 5.14(1) of the EP&A Act, a person cannot carry out development that is SSI unless the Minister has approved of the carrying out of SSI under Division 5.2 of the EP&A Act. For CSSI, section 2.4(3b) of the EP&A Act prevents the Minister from delegating the function of determining an application under Division 5.2 of the EP&A Act for approval to carry out CSSI. Accordingly, the NSW Minister for Planning and Public Spaces has the power to grant approval and is the approval authority for this Project.
Permissibility	The Project area is located wholly within the MidCoast Council LGA, and in an area regulated under the Gloucester LEP. The Project's Infrastructure Application area is covered by the Gloucester LEP and includes land zoned under the Gloucester LEP as (Figure 2-2): • RU1 (Primary Production); • E5 (Heavy Industrial); and • C3 (Environmental Management). The Project has been designed to avoid new infrastructure in an area zoned as C3 (Environment Management) on Yancoal-owned land that runs parallel to The Bucketts Way. In the absence of the declaration of the Project as CSSI, electricity generation and storage would be prohibited under the Gloucester LEP. However, in accordance with section 5.22(2) of the EP&A Act, EPIs do not apply to SSI and CSSI, beyond the declaration of the Project as CSSI. Accordingly the Project is not prohibited under any EPIs, including the Gloucester LEP.
Other Approvals	***Approvals Not Required for SSI*** Section 5.23 of the EP&A Act prescribes the authorisations that are not required for approved SSI and CSSI authorised by an Infrastructure Approval under Division 5.2 of Part 5 of the EP&A Act. The following authorisations are not required for approved SSI under section 5.23(1): • A permit under section 201, 205 or 219 of the FM Act. • Approval under Part 4, or an excavation permit under section 139, of the NSW *Heritage Act 1977*. • An Aboriginal Heritage Impact Permit under section 90 of the NPW Act. • A bushfire safety authority under section 100B of the NSW *Rural Fires Act 1997*. • A water use approval under section 89, a water management work approval under section 90 or an activity approval (other than an aquifer interference approval) under section 91 of the WM Act. Additionally, section 5.23(2) of the EP&A Act provides that the following directions, orders or notices cannot be made or given so as to prevent or interfere with the carrying out of approved CSSI: • An interim protection order (within the meaning of the NPW Act). • An order under Division 1 (stop work orders) of Part 6A of the NPW Act or Division 7 (stop work orders) of Part 7A of the FM Act. • A remediation direction under Division 3 (Remediation directions) of Part 6A of the NPW Act.

Table 4-2 (Continued)
Statutory Requirements for the Project

Category	Action Required
Other Approvals (Continued)	• An order or direction under Part 11 (Regulatory compliance mechanisms) of the BC Act. • An environment protection notice under Chapter 4 of the PoEO Act. • An order under section 124 of the NSW *Local Government Act 1993*.
	Other Approvals or Legislation that Must be Applied Consistently for SSI Section 5.24 of the EP&A Act outlines the authorisations that cannot be refused if they are necessary for the carrying out of approved SSI under Division 5.2 and provides that those authorisations are to be substantially consistent with the Division 5.2 Infrastructure Approval. These authorisations are as follows: • An aquaculture permit under section 144 of the FM Act. • An approval under section 22 of the NSW *Coal Mine Subsidence Compensation Act 2017*. • A mining lease under the NSW *Mining Act 1992*. • A production lease under the NSW *Petroleum (Onshore) Act 1991*. • An EPL under Chapter 3 of the PoEO Act (for any purposes referred to in section 43 of the PoEO Act). • Consent under section 138 of the NSW *Roads Act 1993*. • A licence under the NSW *Pipelines Act 1967*. The Project would require a new EPL under the PoEO Act (i.e. for "electricity generation"), and therefore, an EPL cannot be refused if it is necessary for carrying out approved CSSI.
	Other Relevant Applicable State Statutory Approvals and Legislation – Not Expressly Integrated into the SSI Assessment The following approvals must be obtained before the Project may commence: • approval issued under Division 5.2 of the EP&A Act, and any relevant secondary approvals under the Infrastructure Approval conditions (e.g. management plans); • approval of the proposed Action (EPBC 2023/09733) under sections 130(1) and 133 of the EPBC Act, and any relevant secondary approvals under the approval conditions (e.g. management plans); and • construction and occupation certificates granted under Part 6 of the EP&A Act (refer to 188(3) of the EP&A Regulation). In addition to the legislation outlined above, the following NSW legislation (and associated regulations) may be applicable to the Project: • *Aboriginal Land Rights Act 1983*; • *Biosecurity Act 2015*; • *Contaminated Land Management Act 1997*; • *Crown Land Management Act 2016*; • *Dams Safety Act 2015*; • *Dangerous Goods (Road and Rail Transport) Act 2008*; • *Heritage Act 1977*; • *Native Title (New South Wales) Act 1994*; • WM Act; • *Water NSW Act 2014*; and • *Work Health and Safety Act 2011*. Relevant licences or approvals required under these Acts would be obtained for the Project where required.

Table 4-2 (Continued)
Statutory Requirements for the Project

Category	Action Required
Other Approvals (Continued)	Additional detail on the likely Project requirements under the WM Act and *Dams Safety Act 2015* are provided below. *Water Management Act 2000* Under section 5.23(1) of the EP&A Act, if the Project is approved as CSSI, water use approvals under section 89, water management work approvals under section 90, or activity approvals (excluding aquifer interference approvals) under section 91 of the WM Act would not be required for the Project. Appendices B and C and Sections 6.3 and 6.4 include consideration of the Project requirements under the WM Act and describe the water access licences (WALs) required for each relevant water source. Appropriate licences under the WM Act would be sought and obtained in consultation with NSW Department of Climate Change, Energy, the Environment and Water (NSW DCCEEW) (Water Group). *Dams Safety Act 2015* The *Dams Safety Act 2015* requires that Dams Safety NSW ensures that any risk that may arise in relation to dams (including any risks to public safety, the environment and economic assets) are of a level that is acceptable to the community. Under section 5 of the *Dams Safety Act 2015*, Dams Safety NSW may, by order published in the Gazette, declare a dam or proposed dam to be a declared dam for the purposes of the Act. The Project proposes the construction and operation of the upper and lower reservoirs. The proposed reservoirs may be "declared" dams under the *Dams Safety Act* 2015 as they may meet the prescribed criteria in section 4(1)(a) of the NSW *Dams Safety Regulation 2019*. If declared, the proposed design, construction, operation and monitoring of the upper an/or lower reservoir would be undertaken in consultation with Dams Safety NSW. ***Other Relevant Commonwealth Legislation*** *Native Title Act 1993* The Commonwealth *Native Title Act 1993* provides a legislative framework for the recognition and protection of Native Title rights in Australia. The *Native Title Act 1993* provides a mechanism to determine whether Native Title exists and identify the rights and interests that comprise that Native Title. The process is designated to ensure that Indigenous people have the opportunity to formally express an interest in a parcel of land, and to negotiate with the Government and the applicant about consent to access Native Title land. The National Native Title Tribunal was contacted on 29 June 2023, where it was confirmed that there are no native title determinations, registered native title claims, or land use agreements that exist within the Project area (Appendix F). *Renewable Energy (Electricity) Act 2000* The Australian Government's Renewable Energy Target Scheme was developed under the Renewable Energy Act and is designed to reduce greenhouse gas emissions in the electricity sector by encouraging renewable energy generation under the Large-scale Renewable Energy Target and Small-scale Renewable Energy Scheme. Section 17 of the Renewable Energy Act prescribes renewable energy sources eligible under the Renewable Energy Target; including solar and hydro energy. Certificates for the generation of electricity are issued using eligible renewable energy sources. The certificates are used to avoid or reduce the amount of renewable shortfall charge that liable entities who acquire electricity have to pay. Renewable energy certificates are classified as either large-scale generation certificates (which are created in relation to the generation of electricity by accredited power stations) or as small-scale technology certificates (which are created in relation to the installation of solar heaters and small generation units). The Project could be eligible as a Renewable Energy Generator to create Large-scale Renewable Energy Certificates.
Pre-conditions to Exercising the Power to Grant Approval	Relevant pre-conditions to the approval authority exercising its power to grant approval are presented in Table 4-3.

Table 4-2 (Continued)
Statutory Requirements for the Project

Category	Action Required
Mandatory Matters for Consideration	***Commonwealth Environment Protection and Biodiversity Conservation Act 1999*** Under the EPBC Act, proposed actions (i.e. activities or projects) with the potential to significantly impact matters protected by the EPBC Act must be referred to the Commonwealth Minister to determine whether they are "controlled actions" and require approval from the Minister. Section 67 of the EPBC Act defines "controlled actions" as actions that a person proposes to take if the taking of the action by a person without approval under Part 9 of the EPBC Act for the purposes of a provision of Part 3 of that Act would be prohibited by the provision. Such provisions are a "controlling provision" for the action. Part 3 of the EPBC Act sets out the requirements for obtaining an environmental approval in circumstances where an action may have a significant impact on a protected matter. Generally, the EPBC Act protects prescribed nationally significant animals, plants, habitats or places i.e. 'protected matters'. The Project was referred to the Commonwealth Minister in February 2024 (EPBC 2023/09733). A delegate of the Commonwealth Minister determined on 11 April 2024 that the Project is a "controlled action", the relevant controlling provisions being: • listed threatened species and communities (sections 18 and 18A); and • listed migratory species (sections 20 and 20A). Therefore, the Project also requires approval from the Minister under the EPBC Act and is to be assessed pursuant to the Assessment Bilateral Agreement with the NSW Government. As such, this EIS provides an assessment of potential impacts on the above controlling provisions under the EPBC Act. On 19 April 2024, the Commonwealth provided its assessment requirements for the Project. A reconciliation of where the SEARs and Commonwealth's assessment requirements are addressed in this EIS is provided in Attachment 1.
	Other Mandatory Matters Other matters that the approval authority is required to consider in deciding whether to grant approval for the Project are presented in Table 4-4.

Table 4-3
Applicable Pre-conditions to Granting Approval

Statutory Reference	Pre-condition	Relevance	Relevant Section of the EIS
EP&A Regulation			
Section 181(5)	Under section 181(5), consent of the owner of the land is not required for an application for CSSI. However, under section 181(6), the proponent of CSSI must: *(a) Arrange for the Minister to publish notice of the application on the NSW Planning Portal, and* *(b) Give notice of the application during the relevant period by –* *(i) Giving written notice to the owner of the land, or* *(ii) An advertisement published in a newspaper circulating in the area in which the infrastructure will be carried out.* Note: the relevant period under subsection (6)(b)(ii) is the period ending 14 days before the EIS is publicly exhibited.	Yancoal is the owner of private land required for the Project. Landowner consent for access to public land (e.g. Council land) is not required under section 181(5). Yancoal will satisfy relevant notification requirements under section 181(6)(b)(ii), 14 days before the EIS is on public exhibition.	N/A.
Section 190	Section 5.16 of the EP&A Act specifies that following an application for the Minister's approval of CSSI, the Planning Secretary is to prepare environmental assessment requirements, and these requirements must include an EIS prepared by, or on behalf of, the applicant, in the form prescribed by the regulations. Section 190 of the EP&A Regulation prescribes the required form of an EIS.	This EIS contains the relevant information including the address of relevant lands (Attachment 7). The name, address, professional qualifications and declaration of the person by whom the EIS has been prepared in consideration of the requirements of sections 190 of the EP&A Regulation has also been provided. Further, the person in preparation of this EIS has also had regard to the *State Significant Infrastructure Guidelines* (DPHI, 2024a). In accordance with section 190(1), the EIS includes the name and address of the responsible entity, a description of the development, and an assessment of the environmental impact of the development, as detailed in Table 4-5.	Table 4-5, Sections 1, 3, 4 and 6, Attachments 1 and 7. EIS Declaration.
Section 191	Section 191 of the EP&A Regulation states that the EIS must comply with the environmental assessment requirements notified under section 5.16(4) of the EP&A Act.	The Project SEARs that set out the environmental assessment requirements in accordance with the EP&A Regulation are provided in Attachment 1.	Attachment 1.
Section 192	Section 192 of the EP&A Regulation describes the required content of an EIS.	Table 4-6 provides a reconciliation of each requirement in subsection 192 (1) and the relevant section of this EIS where the information is provided. Subsection 192(2) of the EP&A Regulation indicates that the requirements set out in subsection 192(1) (Table 4-6) are subject to the environmental assessment requirements that relate to the EIS.	Table 4-6. This EIS.
BC Act			
Section 7.9(3)	The EIS that accompanies an Infrastructure Approval Application is to include a BDAR. A biodiversity assessment waiver is not requested.	A BDAR has been prepared and is included as Appendix D within this EIS.	Appendix D.

Table 4-4
Applicable Mandatory Matters for Consideration

Statutory Reference	Mandatory Consideration	Relevant Section of the EIS
Considerations under the EP&A Act		
Section 5.19	The Minister, when deciding whether to approve or disapprove the carrying out of SSI (including CSSI), is to consider the Planning Secretary's report on the infrastructure and the reports, advice and recommendations contained in the report, and any advice provided by the Minister with portfolio responsibility for the Proponent, and any findings or recommendations of the Independent Planning Commission following a review conducted in respect of the SSI proposal.	To be satisfied following submission of the EIS to DPHI.
Section 1.3	Relevant objects of the EP&A Act: • Promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources. • Facilitate ecologically sustainable development (ESD) by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment. • Promote the orderly and economic use and development of land. • Protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats. • Promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage). • Promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State. • Provide increased opportunity for community participation in environmental planning and assessment.	Section 7.
Section 5.22	As per section 5.22 of the EP&A Act, EPIs do not apply to CSSI.	Section 4.
Considerations under the EP&A Regulation		
Section 179	An application for approval of the Minister to carry out SSI must be in the form approved by the Planning Secretary, made available, and lodged on the NSW planning portal.	Project Application Form.
Considerations under the BC Act		
Section 7.14(2)	The Minister for Planning and Public Spaces is to take into consideration the likely impact of the proposed development on biodiversity values as assessed in the Project BDAR. The Minister may (but is not required to) further consider under the EP&A Act the likely impact of the Project on biodiversity values.	Sections 6.5 and 6.6, Appendices D and E.
Section 7.16(3)	If the Minister for Planning and Public Spaces is of the opinion that the Project is likely to pose serious and irreversible impacts on biodiversity values, the Minster is required to: • take those impacts into consideration; and • determine whether there are any additional and appropriate measures that will minimise those impacts if consent or approval is to be granted.	

Table 4-4 (Continued)
Applicable Mandatory Matters for Consideration

Statutory Reference	Mandatory Consideration	Relevant Section of the EIS
Considerations under the EPBC Act		
Section 136(1)	In deciding whether or not to approve the taking of an action, and what conditions to attach to an approval, the Commonwealth Minister must consider the following: • matters relevant to any matter that the Minister has decided is a controlling provision for the action; and • economic and social matters.	Section 7.
Section 136(2)	In considering the matters referred to in section 136(1), the Commonwealth Minister must take into account: • the principles of ESD; and • the assessment report (if any) relating to the action. In addition, section 136(2) (ca) to (g) specify the Commonwealth Minister must take into account, if applicable: • the finalised EIS; • the recommendation report relating to the action; • if a relevant inquiry was conducted, the report of the commissioners; • any other information the Commonwealth Minister has on the relevant impacts of the action; • any relevant comments given to the Commonwealth Minister; • relevant advice obtained by the Commonwealth Minister from the Independent Expert Scientific Committee; and • notices or relevant comments provided in accordance with the EPBC Act.	Sections 6 and 7, Appendices B, C, D, E, M and O.
Section 139(1)	In deciding whether or not to approve for the purposes of sections 18 and 18A the taking of an action with respect to threatened species and endangered communities, and what conditions to attach to such approval, the Commonwealth Minister must not act inconsistently with: • Australia's obligations under: – the Convention on Biological Diversity; or – the Convention on Conservation of Nature in the South Pacific; or – the Convention on International Trade in Endangered Species of Wild Fauna and Flora; or • a recovery plan or threat abatement plan.	Section 6.
Section 139(2)	If the Commonwealth Minister is considering whether to approve the taking of an action and the action has or will have, or is likely to have, a significant impact on a particular listed threatened species or a particular listed threatened ecological community the Commonwealth Minister must, in deciding whether to approve the taking of the action, have regard to any approved conservation advice for the species or community.	Sections 6.5 and 6.6, Appendices D and E.

Table 4-5
Content Requirements of an EIS – Section 190 of the EP&A Regulation

Summary of Section 190 of the EP&A Regulation	EIS Reference
The EIS must include:	
• The name, address and professional qualifications of the person who prepared the EIS.	Declaration Form
• The name and address of the 'responsible person' (i.e. the Applicant).	Section 1.2
• The address of the land to which the Project relates to or will be carried out.	Attachment 7
• A description of the Project.	Section 3
• An assessment of the environmental impact of the Project.	Section 6 and Appendices A to P

Table 4-6
Content Requirements of an EIS – Section 192 of the EP&A Regulation

Summary of Section 192 of the EP&A Regulation	EIS Reference
The EIS must include:	
• Summary of the EIS.	Executive Summary
• Objectives of the Project.	Section 1.3.2
• Analysis of any feasible alternatives to the Project, including the consequences of not carrying out the Project.	Section 2.12
• Description of the Project.	Section 3
• Description of the environment likely to be affected by the Project.	Section 6 and Appendices A to P
• The likely impacts on the environment of the Project.	
• Description of the measures proposed to mitigate any adverse effects of the Project on the environment.	Section 6 and Attachment 3
• A list of any approvals that must be obtained under any other Act or law before the Project may lawfully be carried out.	Section 4
• Compilation (in a single section of the EIS) of the measures proposed to mitigate any adverse effects of the Project on the environment.	Attachment 3
• The reasons justifying the carrying out of the development, activity or infrastructure in the manner proposed, having regard to the biophysical, economic and social considerations, including the principles of ESD.	Section 7

5 ENGAGEMENT

This section describes the engagement undertaken during the preparation of this EIS and how feedback has been considered.

Where relevant, references to the EIS sections and/or appendices where feedback has been considered and addressed is provided.

5.1 ENGAGEMENT APPROACH

The consultation undertaken during the preparation of this EIS is in accordance with the SEARs (Attachment 1) and *Undertaking Engagement Guidelines for State Significant Projects* (DPHI, 2024b).

The *Undertaking Engagement Guidelines for State Significant Projects* (DPHI, 2024b) includes a list of objectives for community participation in state significant projects like the Project.

The community participation objectives are detailed in Table 5-1, and these objectives have been considered and addressed during the EIS engagement.

Key objectives of the engagement undertaken for the Project were to:

- engage with key stakeholders about the Project;
- recognise and respond to local interests and concerns regarding the Project; and
- develop appropriate strategies to enhance positive impacts and minimise potential negative impacts.

Feedback obtained through engagement with key stakeholders has provided the opportunity to identify issues of concern or interest, and to consider these issues within the Project design and this EIS.

In particular, feedback received has resulted in changes to the Project Disturbance Footprint (relative to the Scoping Report) to minimise impacts, particularly to reduce visual impacts.

Yancoal would continue to engage with the community post-lodgement of this EIS, in consideration of the above objectives.

Table 5-1
Community Participation Objectives

Community Participation Objectives	Objective Included in EIS Engagement
• *identify the people or groups who are interested in or are likely to be affected by the project*	✓
• *use appropriate engagement techniques. This includes:* – *considering the accessibility of how information is delivered* – *the avoidance of technical language and jargon so information can be easily interpreted by the audience* – *the adoption of non-written forms of engagement, where needed.*	✓
• *ensure the community are provided with safe, respectful and inclusive opportunities to express their views*	✓
• *involve the community, councils and government agencies early in the development of the proposal, to enable their views to be considered in project planning and design*	✓
• *be innovative in their engagement approach and tailor engagement activities to suit the:* – *context (e.g. sensitivity of the site and surrounds)* – *scale and nature of the project and its impacts* – *level of interest in the project*	✓
• *provide clear and concise information about what is proposed and the likely impacts for the relevant people or group they are engaging with*	✓
• *clearly outline how and when the community can be involved in the process*	✓
• *make it easy for the community to access information and provide feedback*	✓
• *seek to understand issues of concern for all affected people and groups and respond appropriately to those concerns*	✓
• *provide feedback about how community and stakeholder views were used to shape the project or considered in making decisions*	✓
• *be able to demonstrate how the demography of the area affected has been considered in how and what engagement activities have been undertaken.*	✓

5.2 ENGAGEMENT CARRIED OUT

Yancoal has consulted with a range of stakeholders including Federal, State and local government agencies, infrastructure and service providers and the local community to obtain feedback on the proposed assessment approach, potential impacts and proposed mitigation and management measures for the Project.

5.2.1 Federal Government Agencies

Commonwealth Department of Climate Change, Energy, the Environment and Water

The proposed Action was referred to the Commonwealth Minister in February 2024 (EPBC 2023/09733). A delegate of the Commonwealth Minister determined on 11 April 2024 that the proposed Action is a "controlled action" and, therefore, the Action also requires approval under the EPBC Act.

On 19 April 2024, the Commonwealth provided its assessment requirements to the NSW Government.

Yancoal has consulted with the Commonwealth Department of Climate Change, Energy, the Environment and Water (Cth DCCEEW) during the preparation of the EPBC Referral and the EIS regarding the Project.

A reconciliation of where the Cth DCCEEW assessment requirements are addressed is provided in Attachment 1.

5.2.2 State Government Agencies

Input to the Project SEARs

The following agencies provided comments and specific input into the Project SEARs:

- Biodiversity and Conservation Division (BCD) within NSW DCCEEW;
- DPHI – Crown Lands;
- NSW Department of Primary Industries (DPI) – Agriculture;
- DPI – Fisheries;
- EPA;
- Fire and Rescue NSW;
- Heritage Council of NSW;
- Heritage NSW within NSW DCCEEW;
- NSW Resources (previously Mining, Exploration and Geoscience);
- National Parks and Wildlife Service;
- NSW Rural Fire Service;
- Transgrid;
- NSW DCCEEW (Water Group);
- WaterNSW; and
- Transport for NSW (TfNSW).

The assessment matters raised by the above agencies were considered in the SEARs for the Project.

A reconciliation of how the SEARs have been considered in this EIS is provided in Attachment 1.

Project Specific Consultation

Yancoal has consulted with the following State government agencies to provide a description of the Project, proposed scope of environmental assessment relevant to their respective areas of interest, and to offer a Project briefing:

- Department of Regional NSW;
- BCD;
- DPHI – Crown Lands;
- DPI – Agriculture;
- DPI – Fisheries;
- EPA;
- Fire and Rescue NSW;
- Heritage Council of NSW;
- Heritage NSW within NSW DCCEEW;
- NSW Resources;
- National Parks and Wildlife Service;
- NSW Rural Fire Service;
- NSW DCCEEW (Water Group);
- WaterNSW; and
- TfNSW.

A Project pre-lodgement briefing was offered to the above listed State government agencies on 10 and 11 June 2024.

In response to the briefing letters distributed to the above agencies, pre-lodgement briefings were held with NSW Resources and EPA, as well as DPHI in July 2024.

5.2.3 MidCoast Council

Yancoal has undertaken Project briefing meetings with the MidCoast Council throughout the preparation of the EIS to provide an overview of the proposed Project, its interaction with the existing SMC and the proposed assessment approach.

On 17 May 2024, Yancoal provided an offer for a Voluntary Planning Agreement (VPA) in relation to the Project to MidCoast Council.

The proposed terms of the VPA offer are based on two components: Community Contribution and Road Maintenance. The proposed payment terms are linked to the construction period, and would comprise an annual payment based on the average number of construction workers over the estimated four-year construction period (approximately 300 FTEs). The VPA contributions are proposed to be used for the provision of public infrastructure and services in the MidCoast Council LGA, and road maintenance on The Bucketts Way.

Yancoal will continue to consult with MidCoast Council throughout the EIS assessment process.

5.2.4 Infrastructure and Service Providers

Yancoal has consulted with Transgrid and EnergyCo in relation to capacity constraints in the ETL network (refer to Section 1.5.2 for a summary of likely ETL upgrades based on feedback from Transgrid and EnergyCo).

5.2.5 Public Consultation

Public consultation undertaken for the Project has included:

- ✓ **Preparation and distribution of Newsletter Fact Sheets**
- ✓ **Establishing a dedicated website and email address**
- ✓ **Establishing a Community Hotline**
- ✓ **Engaging with the SMC workforce**
- ✓ **Online survey**
- ✓ **Community information sessions**
- ✓ **One-on-one meetings with surrounding landowners**
- ✓ **One-on-one meetings with representative groups**
- ✓ **One-on-one meetings with institutional stakeholders**
- ✓ **SMC Community Consultative Committee briefings**

Community Newsletter

Yancoal prepared and distributed Newsletter Fact Sheets to inform the local community about the Project, provide updates on the progress of the EIS, and share contact information, and made them available on the Yancoal website in December 2022, April 2023, November 2023, March 2024 and July 2024.

In addition to being publicly available on the SREH website, the Fact Sheets were physically distributed to local residents.

A copy of each of the Project Fact Sheets is provided in Attachment 2.

Website, Email Address and Community Hotline

Yancoal maintains a website for the Project (https://www.stratfordcoal.com.au/page/SREH/) for the general public to keep up to date on the status of the Project.

In addition, Yancoal maintains a number of dedicated points of contact for the community to contact Yancoal with any questions or to provide feedback, including the SREH email address (SREH.feedback@yancoal.com.au) and Community Information Hotline (1300 658 239), as displayed in Project Newsletters (Attachment 2).

Community Information Sessions

Yancoal held in-person community information sessions on 25 and 26 March 2024 at the Stratford Hall and Gloucester Council Chambers, respectively, to provide an opportunity for local residents and other interested stakeholders to ask questions and provide feedback on the Project.

There were approximately 25 to 30 attendees over the two information sessions.

A key community concern noted from the information sessions was with regard to visibility of the solar areas proposed immediately adjacent to The Bucketts Way, particularly on the western side of The Bucketts Way.

Aboriginal Stakeholders

Aboriginal community consultation for the Project was undertaken in accordance with, but not limited to, section 60 of the *National Parks and Wildlife Regulation 2019* (NPW Regulation) and the *Aboriginal cultural heritage consultation requirements for proponents 2010* (Department of Environment, Climate Change and Water [DECCW], 2010a).

A total of 23 Aboriginal stakeholders (also referred to as Registered Aboriginal Parties [RAPs]), including organisations and individuals, registered an interest and were consulted in relation to the ACHA process for the Project (Appendix F).

Further detail on consultation with Aboriginal stakeholders, and how comments have been considered, is provided in Section 6.7 and the ACHA (Appendix F).

Additional consultation with Aboriginal elders has been undertaken to seek feedback on cultural values in the region (Appendix F).

SMC Staff and Contractors

The existing SMC workforce (employees and contractors) have been briefed on the Project during the development of the EIS.

SMC and Duralie Coal Mine Community Consultative Committees

The SMC and Duralie Coal Mine Community Consultative Committees (CCCs) provide a forum for consultation with the community on the operation of the mine developments. The CCCs are long-established, and comprise representatives from the community, Council and business groups.

The Duralie Coal Mine CCC was briefed on the Project in February and August 2023 and August 2024.

The SMC CCC was briefed in regard to the Project as a potential PMLU in February, May, August and November 2023, and February, May and August 2024.

Updates on the status of the Project and the proposed scope of environmental assessment have been provided to the CCCs at all meetings since August 2023.

Minutes of CCC meetings are publicly available on the SMC and Duralie Coal Mine websites.

Contractors and Suppliers

Yancoal has consulted with a number of local and regional contractors, suppliers and businesses with regard to the Project, likely timing, and potential opportunities for local businesses it would create, particularly during the construction phase of the Project.

One-on-One Meetings

One-on-one meetings were held with landowners, representative groups and institutional stakeholders to provide a Project update and inform the LVIA and SIA.

5.2.6 Social Impact Assessment

Aigis Group (2024) undertook consultation activities in support of the SIA for the Project (Appendix L), in addition to broader consultation activities conducted by Yancoal.

In addition to the above, consultation in support of the SIA included:

- Distribution of an online survey via QR code on both the Stratford newsletter (available on the SREH website and provided via letterbox drop to homes in Stratford and surrounds) and the local Gloucester Advocate newspaper, via link on the Gloucester Community Facebook page, and via hard copy at the community information sessions.
- One-on-one interviews and consultation with stakeholders, including:
  - SMC workforce;
  - Gloucester Worimi First Peoples Aboriginal Corporation;
  - Bucketts Way Neighbourhood Group;
  - Gloucester Business Chamber;
  - Advance Gloucester;
  - Gloucester Environment Group;
  - Gloucester Community Health Service;
  - MidCoast Council (Manager Economic and Destination Development);
  - Ambulance Service;
  - NSW Police (Gloucester Police Station);
  - National Parks and Wildlife Service;
  - Australian Wildlife Conservancy;
  - Visitor Information Centre; and
  - Hannaford Stock and Land Australia.

Further detail on the SIA is provided in Section 6.15 and Appendix L.

5.2.7 Affected Landowners

Landscape and Visual Impact Assessment

Yancoal made an offer to 29 landowners with potential views of the Project to have photo simulations taken from their properties.
15 landowners with potential views accepted Yancoal's offer for photo simulations.

The simulations that have been prepared from landowners with potential views were provided back to landowners and are depicted in the LVIA (Appendix I).

Noise and Vibration Impact Assessment

A landowner was briefed on impacts of the Project, including a description of the predicted construction noise exceedance under adverse meteorological conditions (Section 6.12).

5.3 STAKEHOLDER FEEDBACK

Feedback from the community was received during the community information sessions, engagement undertaken to inform the SIA (including an online survey), the dedicated Project email address and phone number, and one-on-one meetings. This feedback is summarised in Table 5-2, along with how the comments have been considered in the EIS.

5.4 ENGAGEMENT TO BE CARRIED OUT

Following the lodgement of the EIS and during the life of the Project, Yancoal will continue consultation with a range of stakeholders in consideration of *Undertaking Engagement Guidelines for State Significant Projects* (DPHI, 2024b).

Public exhibition of the EIS will allow the community and any interested stakeholders to provide a submission in support of the Project, commenting on aspects of the Project or objecting to the Project.

Potential opportunities for further community consultation, as well as consultation with government agencies, council and community groups, may include:

- ongoing consultation with landowners and the local community;
- community information sessions;
- distribution of community newsletters;
- distribution of Project overview video and simulation;
- Project-briefings with government agencies and the MidCoast Council;
- maintenance of the Yancoal website and community hotline; and
- ongoing public reporting requirements.

Yancoal would continue to monitor, review and adapt community engagement over the life of the Project to maintain effective community consultation and involvement.

5.4.1 Website, Email Address and Community Hotline

The dedicated website for the Project is available at:

www.stratfordcoal.com.au/page/SREH/

The website would continue to be maintained and provide information relevant to the Project, including:

- Project design, status and key documents (such as the EIS and relevant approval instruments);
- SREH community fact sheets;
- environmental monitoring, management plans and independent environmental audits; and
- contact details for further information.

Yancoal would also continue to maintain a number of dedicated points of contact for the community to contact Yancoal with any questions or to provide feedback (Section 5.2.5).

Table 5-2
Summary of Key Stakeholder Views and Concerns

Category	Key Stakeholder Views/Concerns	How Addressed
Project Justification	Support for renewable energy development.	• The Project has been designed to generate renewable energy, including: – 3.6 GWh from the PHES; and – approximately 320 MW AC from the Solar Farm.
	Use of a mine site is a positive component of the Project.	• The Project targets the beneficial use of the SMC infrastructure and previously disturbed land.
	Positive socio-economic benefits, including employment opportunities, career pathways, direct benefits for local businesses, keeping people in Gloucester, and providing ongoing investment in the region.	• Strategies to enhance positive socio-economic benefits are described in the SIA (Appendix L).
Economic, Environmental and Social Impacts	Visual amenity impacts, particularly the solar array in proximity to The Bucketts Way and views from private residences.	• In consideration of feedback, the design of the Solar Farm component of the Project has been refined to avoid higher visibility areas on land, including: – removal of the solar panels that had been proposed on the western side of The Bucketts Way (in totality); and – set back of the solar panels that had been proposed on the eastern side of The Bucketts Way, plus vegetative screening between the solar panels and The Bucketts Way. • Strategies to mitigate visual amenity impacts are addressed in the LVIA (Appendix I).
	Impacts on biodiversity.	• The Project has been designed to avoid areas of higher biodiversity value (where possible) and minimise impacts on biodiversity by maximising the use of: – previously disturbed areas associated with the SMC to minimise new disturbance; and – areas previously cleared for agriculture and dominated by non-native vegetation. • Strategies to mitigate impacts on biodiversity are addressed in the BDAR (Appendix D).
	Impacts on Aboriginal cultural heritage.	• The Project has been designed to: – avoid direct and indirect disturbance of SREH-PAD-1 (Appendix F); and – avoid direct disturbance to CTS-1 (plus a buffer zone) (Appendix F). • Strategies to avoid and mitigate impacts on Aboriginal cultural heritage are addressed in the ACHA (Appendix F).
	Construction workforce results in temporary impacts on housing and accommodation, and changes to demographic structure.	• Strategies to mitigate socio-economic impacts are described in the SIA (Appendix L).
	Recycling of solar panels.	• Waste from solar panels and recycling opportunities would be considered when the panels near the requirement for replacement.
	The noise generated by construction and operation of the Project.	• Strategies to minimise noise generated by construction and operation of the Project are addressed in the Noise and Vibration Impact Assessment (Appendix J).

Table 5-2 (Continued)
Summary of Key Stakeholder Views and Concerns

Category	Key Stakeholder Views/Concerns	How Addressed
Economic, Environmental and Social Impacts (continued)	Impacts to agriculture and SMC final landform. Perceptions that the Project is not consistent with the understanding of proposed use and Yancoal's intention with respect to operating the site. Stakeholders concerned about the change in PMLU and that Yancoal has changed its plans.	• Due to the scheduled closure of coal-fired power stations, alternate renewable energy projects have been identified as being critical to address forecast exceedances of electricity reliability standards. • Yancoal has investigated beneficial land use opportunities that would be sympathetic with the rehabilitated landforms and achieve the highest and best PMLU. • Yancoal has engaged with the community regarding the proposed change in final land use and their intention to develop the Project. • The *Hunter Regional Plan 2041* (DPE, 2022b) identified the opportunity for the existing SMC and Duralie Coal Mine to be repurposed to support the transition to renewable energy. In this regard, the development of the Project is aligned with this strategy, being able to continue attracting investment in the region after the closure of the SMC and Duralie Coal Mine. • Further consultation will be undertaken throughout the EIS assessment phase to ensure the community are well informed on the status of the Project.
Community Engagement	Request for ongoing stakeholder engagement, including additional community information sessions.	• Further consultation for the Project will include: – ongoing consultation with landowners and the local community; – community information sessions; – distribution of community newsletters; and – maintenance of the SREH website.

6 ENVIRONMENTAL IMPACT ASSESSMENT

6.1 INTRODUCTION

Section Overview

- This section provides an introduction to the environmental impact assessment summary for the EIS.
- The SMC is a key component of the environmental baseline.
- Further works will occur at the SMC for closure prior to commencement of the Project, meaning the 'baseline' also needs to consider these future changes as SMC closure works continue.
- For cumulative impacts, the SMC is the key project that requires consideration.
- An ERA (Appendix N) has been undertaken as required by the SEARs.

6.1.1 Stratford Mining Complex

The Project site is located at the SMC, which is an existing open cut coal mining operation, scheduled to complete mining in 2024.

The 'baseline' environment refers to the current environment within and surrounding the Project at the time of writing this EIS. The baseline environment includes the existing SMC and relevant disturbance and infrastructure (Figure 6-1).

Irrespective of the Project, the baseline environment will change (relative to the surveys undertaken for the EIS) to reflect progressive rehabilitation of SMC landforms. This includes rehabilitation of areas that overlap the Project as shown on Figure 6-2.

Should the Project be approved, the SMC final landform would be relatively unchanged, however final land uses would be updated to reflect the Project (Attachment 6).

The interaction between rehabilitation of the SMC and the Project, changes to SMC rehabilitation obligations as a consequence of the Project and rehabilitation and decommissioning of the Project is further described in Attachment 6.

6.1.2 Cumulative Impacts

Potential interactions between the Project and other existing and proposed major developments have been considered consistent with the NSW *Cumulative Impact Assessment Guidelines for State Significant Projects* (DPE, 2022c).

Potential impacts of the Project with other State Significant projects were considered in Table A-1 of the Scoping Report. Specifically, key State Significant projects surrounding the Project include the SMC (within and adjacent to the Project), Duralie Coal Mine (21 km south), Hillview Hard Rock Quarry (40 km south), Bobs Farm Sand Mine (37 km south) and Brandy Hill BESS (61 km south-west).

The key project with potential for cumulative impacts with the Project is SMC closure and rehabilitation works. This includes ongoing dust, noise, traffic and employment impacts. Potential cumulative impacts with the Project have been considered in relevant assessments including the road transport, noise and vibration, air quality and social impact assessments (Appendices H, J, K and L).

Since the Scoping Report, SEARs for the Hillview Hard Rock Quarry have been issued. Potential traffic cumulative impacts have been considered in the Road Transport Assessment (Appendix H), however no other cumulative impacts are considered likely.

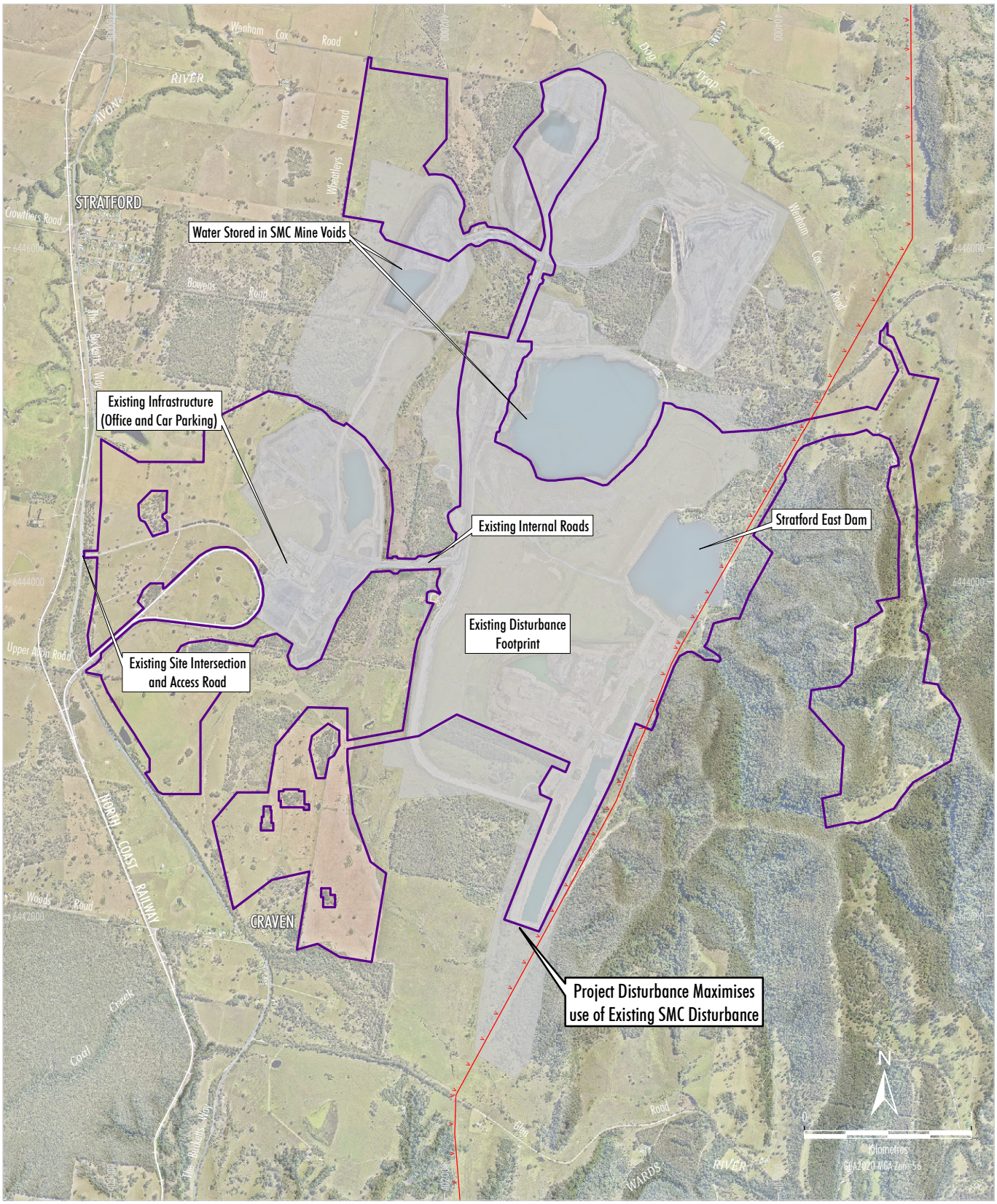
An environmental assessment of potential impacts of ETL upgrades is provided in Attachment 5.

6.1.3 Environmental Risk Assessment

Yancoal has undertaken a risk-based review of the potential environmental impacts of the Project to identify key potential environmental issues requiring assessment. An ERA has been prepared by CK Consultants (2024) and is presented as Appendix N.

The key potential environmental impacts of the Project are generally related to the below matters (Appendix N):

- Surface water impacts, including water quality and flooding.
- Groundwater impacts, including to potential Groundwater Dependent Ecosystems (GDEs).



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LEGEND

132 kV Electricity Transmission Line

Approximate Extent of SMC Existing/Approved Surface Development

Project Disturbance Footprint

Source: NSW Spatial Services (2023); Yancoal (2023)

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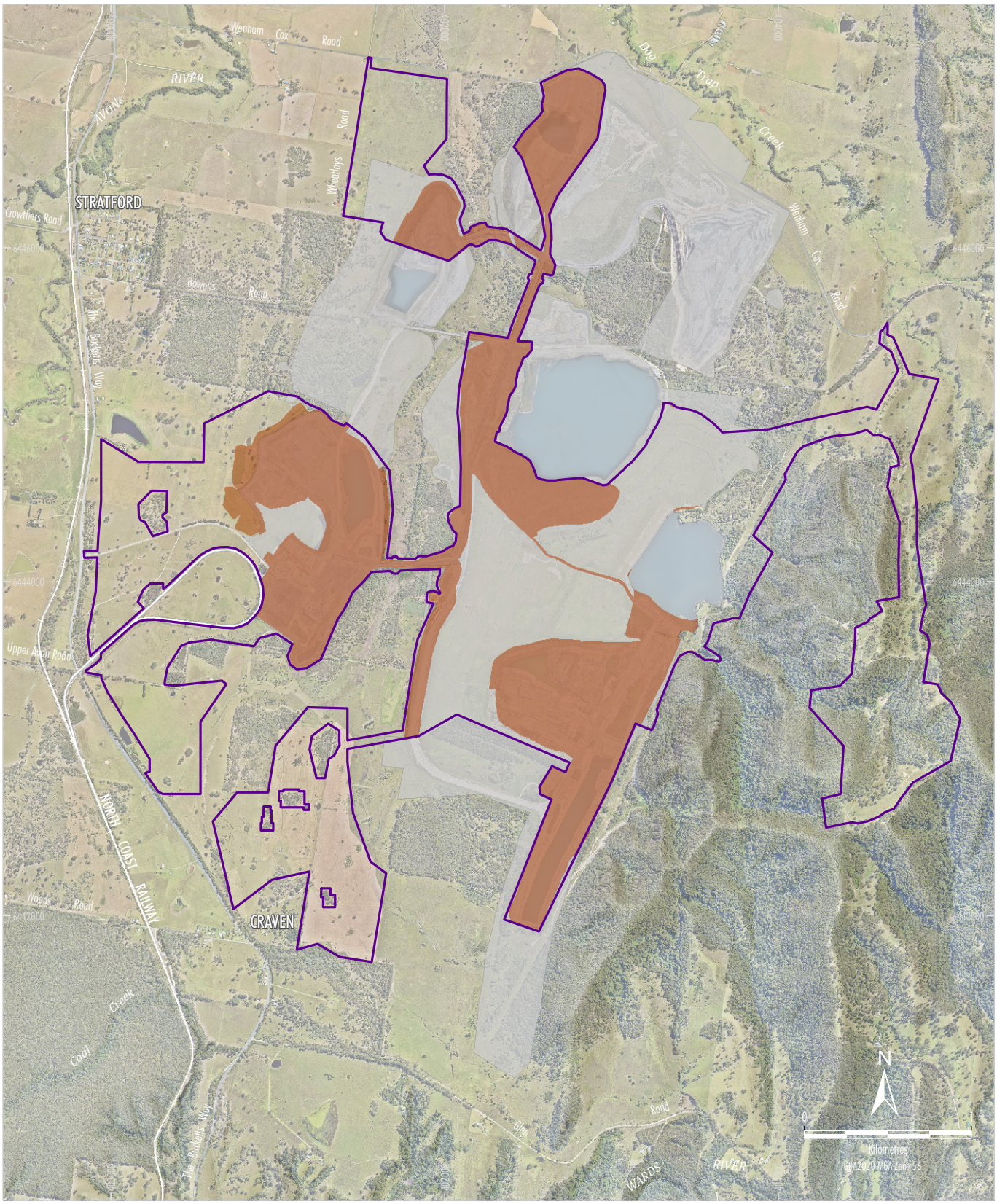
Project Baseline Environment

Figure 6-1



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LEGEND

- Project Disturbance Footprint
- Approximate Extent of SMC Existing/Approved Surface Development
- SMC Areas where Rehabilitation and Landform Establishment is Not Complete – SREH Development is Contingent on SCPL Rehabilitation

Source: NSW Spatial Services (2023); Yancoal (2023)

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Revised Baseline Environment

Figure 6-2

- Biodiversity, including aquatic ecology impacts.
- Impacts to Aboriginal cultural heritage and historic (non-Aboriginal) heritage sites.
- Traffic and road network impacts.
- Visual impacts.

These matters are addressed in this EIS section, as well as the specialist appendices to the EIS.

6.2 CLIMATE AND LAND RESOURCES

Section Overview

- This section summarises key aspects of the existing environment, such as climate, topography and land use.
- A Soils, Land and Agricultural Impact Assessment was prepared by Minesoils (2024) and is presented in Appendix A.
- The key guideline considered is the agricultural impact assessment requirements of the *Large-Scale Solar Energy Guideline*.
- There is no high value agricultural land (based on LSC class mapping) in the Project area, or mapped Biophysical Strategic Agricultural Land.
- There would be a loss of agricultural land due to the change in land use from low intensity grazing to renewable energy.
- The Glen Nature Reserve is more than 900 m away from the Project at its closest point, separated by topography, and is located in a separate surface water catchment. No direct impacts or significant amenity impacts are expected.
- Key mitigation, management and monitoring would be described in a *Revegetation, Rehabilitation and Decommissioning Management Plan* and *Erosion and Sediment Control Plan.*

6.2.1 Climate

Long-term meteorological data for the region are available from nearby Commonwealth Bureau of Meteorology (BoM) weather stations.

The BoM weather stations proximal to the Project include Waukivory, Cravan (Longview), Gloucester Post Office, Lostock Dam and Forster – Tuncury Marine Rescue weather stations. These weather stations measure a number of meteorological parameters, including rainfall and temperature.

SCPL operates three meteorological stations around the SMC, with one station (W3) specifically being operated to meet the meteorological monitoring requirements under Development Consent SSD-4966. Environmental monitoring sites, including SMC Site Weather Station W3 is shown on Figure 6-3.

Short-term local meteorological data (from 2018 onwards) are available from W3 and monitors a number of meteorological parameters, including temperature, humidity, rainfall, wind speed and wind direction.

A summary of meteorological data collected from these sources in the vicinity of the Project is provided in Tables 6-1 and 6-2 and discussed below.

Existing Environment

Rainfall

Table 6-1 provides a summary of long-term rainfall data from regional BoM weather stations. The long-term average annual rainfall ranges from approximately 986 to 1,176 millimetres (mm), with driest months being July to September and the wettest months typically being January to March.

Table 6-1 also provides a summary of rainfall data from SMC Site Weather Station W3. The average annual rainfall recorded on-site for the period January 2018 to December 2023 is approximately 1,041 mm.

Temperature

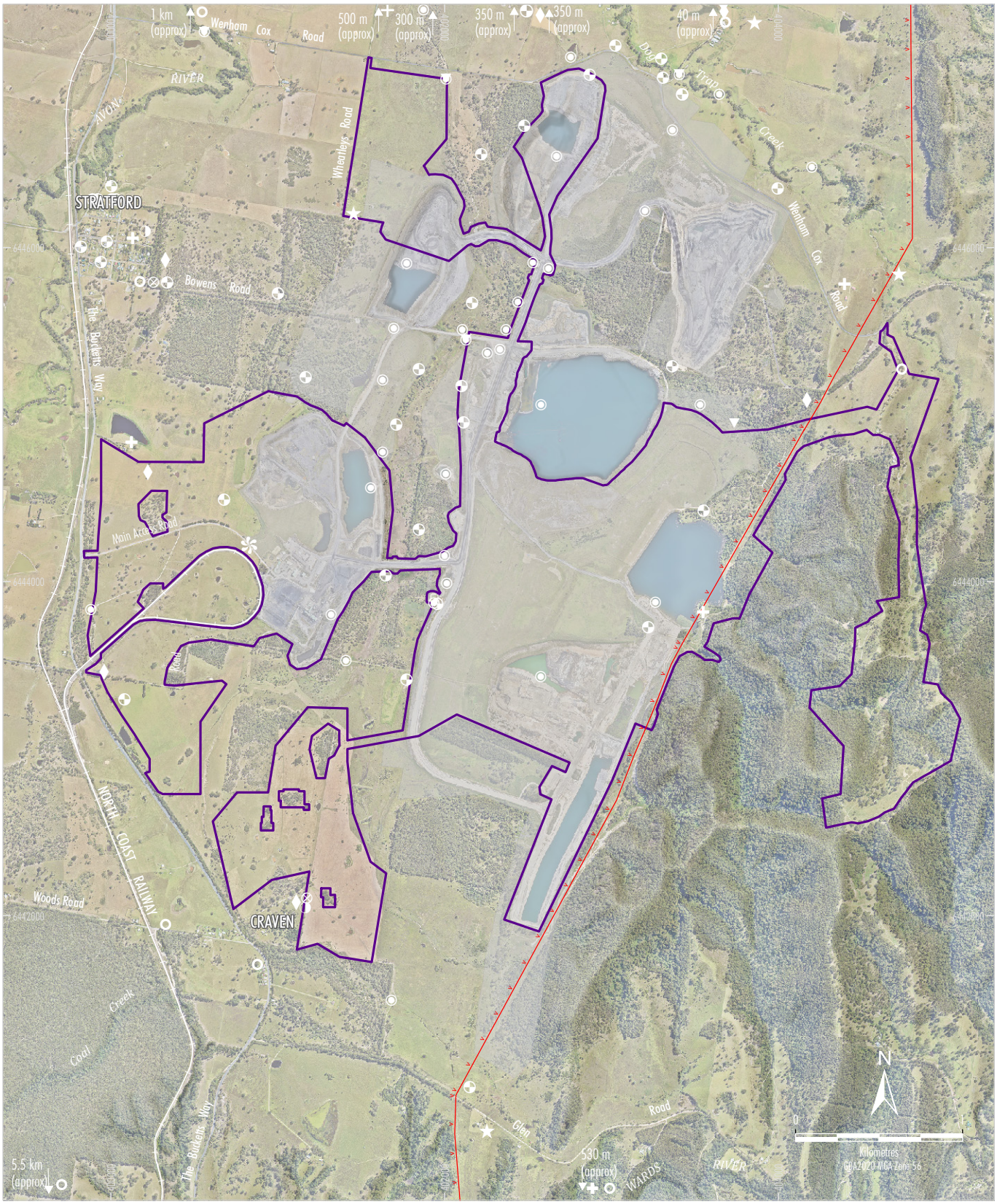
Table 6-2 provides long-term average temperature data from regional BoM weather stations. The long-term average monthly temperature ranges from a minimum of 6.4 degrees Celsius (°C) in July to a maximum of 29.8°C in January.

Evaporation

Appendix B presents long-term average evaporation data. The long-term average monthly evaporation rate ranges from 1.3 millimetres per day (mm/day) in June to 5.6 mm/day in December and January.

Wind Direction and Speed

As part of the Air Quality and Greenhouse Gas Assessment (Appendix K), windroses were developed using wind direction and wind speed data from SMC Site Weather Station W3.



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LEGEND

- Electricity Transmission Line
- Approximate Extent of SMC Existing/Approved Surface Development
- Project Disturbance Footprint

Monitoring Sites

- Groundwater Monitoring Site
- Surface Water Quality Monitoring Site
- Meteorological Station (W3)
- Static Dust Gauge
- High Volume Air Sampler
- Noise Monitoring Site
- Real-time Noise Monitoring Site
- Blast Monitoring Site
- TEOM Monitoring Site
- Macroinvertebrate Monitoring Site

Source: NSW Spatial Services (2023); Yancoal (2023)

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Existing SMC Environmental Monitoring Sites

Figure 6-3

Table 6-1
Meteorological Data Summary – Rainfall

Period of Record	Average Monthly Rainfall (mm)			
	Waukivory (060155)	Craven (Longview) (060042)	Gloucester Post Office (060015)	SMC Site Weather Station (W3)
	2008 to 2024	1961 to 2024	1888 to 2024	2018 to 2023
January	119.8	122.4	115.3	101.2
February	174.6	140.7	123.9	83.0
March	174.1	141.7	132.8	244.8
April	90.9	80.4	76.3	17.4
May	61.4	80.4	66.0	36.8
June	88.0	78.1	67.0	29.1
July	45.1	37.7	49.7	65.8
August	44.1	43.0	45.6	8.7
September	40.0	44.0	50.1	52.1
October	69.6	74.6	68.1	23.7
November	94.8	91.9	85.4	78.5
December	113.0	101.7	103.1	47.0
Annual Average	**1175.9 [1115.4]**	**1055.0 [1036.6]**	**985.5 [983.3]**	**1041.0**

Source: BoM (2024); SCPL (2018; 2019; 2020; 2021; 2022a; 2023)

[ ] Sum of average monthly records. Discrepancy with annual averages is based on BoM historical records.

Table 6-2
Meteorological Data Summary – Temperature and Humidity

Period of Record	Long-term Average Daily Temperature (°C)				Average Relative Humidity (%)			
	Lostock Dam (061288)		Forster – Tuncurry Marine Rescue (060013)		Lostock Dam (061288)		Forster – Tuncurry Marine Rescue (060013)	
	Minimum	Maximum	Minimum	Maximum	9.00 am	3.00 pm	9.00 am	3.00 pm
	1969 to 2024		1999 to 2020		1969 to 2024		1999 to 2020	
January	17.4	29.8	19.7	26.6	79	53	79	73
February	17.2	28.7	19.5	26.5	84	59	83	74
March	15.5	26.7	17.9	25.6	84	61	81	70
April	12.6	23.7	15.2	23.9	81	55	78	69
May	9.9	20.1	12.0	21.3	83	56	76	64
June	7.7	17.0	10.0	18.9	81	61	79	68
July	6.4	16.8	8.7	18.4	79	54	76	63
August	6.8	18.6	9.2	19.5	74	46	69	59
September	9.3	21.9	11.8	21.6	69	43	68	64
October	11.8	24.9	14.0	22.8	68	50	70	68
November	13.9	26.8	16.4	23.9	74	50	77	72
December	16.0	29.0	18.1	25.5	73	45	76	72
Annual Average	**12.0**	**23.7**	**14.4**	**22.9**	**78**	**53**	**76**	**68**

Source: BoM (2024); SCPL (2018; 2019; 2020; 2021; 2022a; 2023)

The most common annual and seasonal winds in the area are from the north to north-east and south to south-southwest (Appendix K).

Climate Change Projections

The Project is located within the East Coast South natural resource management sub cluster developed by CSIRO and the BoM (2015). Key climate change projections of relevance to the Project and how they have been addressed in specialist assessments are described below.

With regards to rainfall, climate variability is projected to increase in the next two decades. In the long term, modelling has predicted a minor decrease in average rainfall during winter, with an increase in extreme rainfall events. CSIRO and the BoM (2024) note that impact assessments in the region should consider the risk of both drier and wetter climates.

Evapotranspiration in the region is projected to increase throughout all seasons, consistent with projected increases in average temperature (CSIRO and BoM, 2024).

Rainfall and evapotranspiration projections are most relevant to the assessment of surface water and flooding impacts, as well as water balance modelling, which have been assessed in the Surface Water Assessment discussed in Section 6.3 and presented in Appendix B. The Surface Water Assessment has considered potential climate change impacts through sensitivity analysis of extreme rainfall events of varying intensity, including 1-in-500 year events for water balance modelling, and up to PMF events for flood impact assessment (Appendix B).

The intensity of bushfire weather is also predicted to increase over time (CSIRO and BoM, 2024). A Bushfire Assessment (Appendix P) has been undertaken for the Project, and is discussed in Section 6.18. The Bushfire Assessment details an investigation into factors influencing bushfire risk for the Project and surrounding areas, and recommends mitigation measures to address the risk of bushfire (Appendix P).

6.2.2 Topography

Existing Environment

The Project is located at elevations between approximately 160 to 400 m AHD.

Local topography in the vicinity of the Project area is characterised by a north-south oriented ridge to the east, transitioning to undulating lowlands and valley floor floodplains towards the west. The ridgeline to the east of the Project area rises to approximately 470 m AHD, and is moderately to steeply sloping and mostly timbered.

The regional topography proximal to the Project is shown on Figure 6-4.

The topography within the SMC footprint has been modified through open cut mining operations and associated waste rock emplacements.

Relevance to the Project

The variation in topography across the Project site is the key driver for the proposed PHES.

Elevation differences between the upper and lower reservoirs of a pumped hydro development are fundamental to its feasibility. The natural variation in vertical elevation between the upper and lower reservoirs at the Project site is greater than 200 m, which is sufficient to support a commercially viable PHES.

The topography of the proposed upper reservoir site also provides a natural basin suitable for the design and storage capacity of an upper reservoir.

There are no alternative locations on Yancoal-owned land that provides this unique topographic location.

Potential Impacts

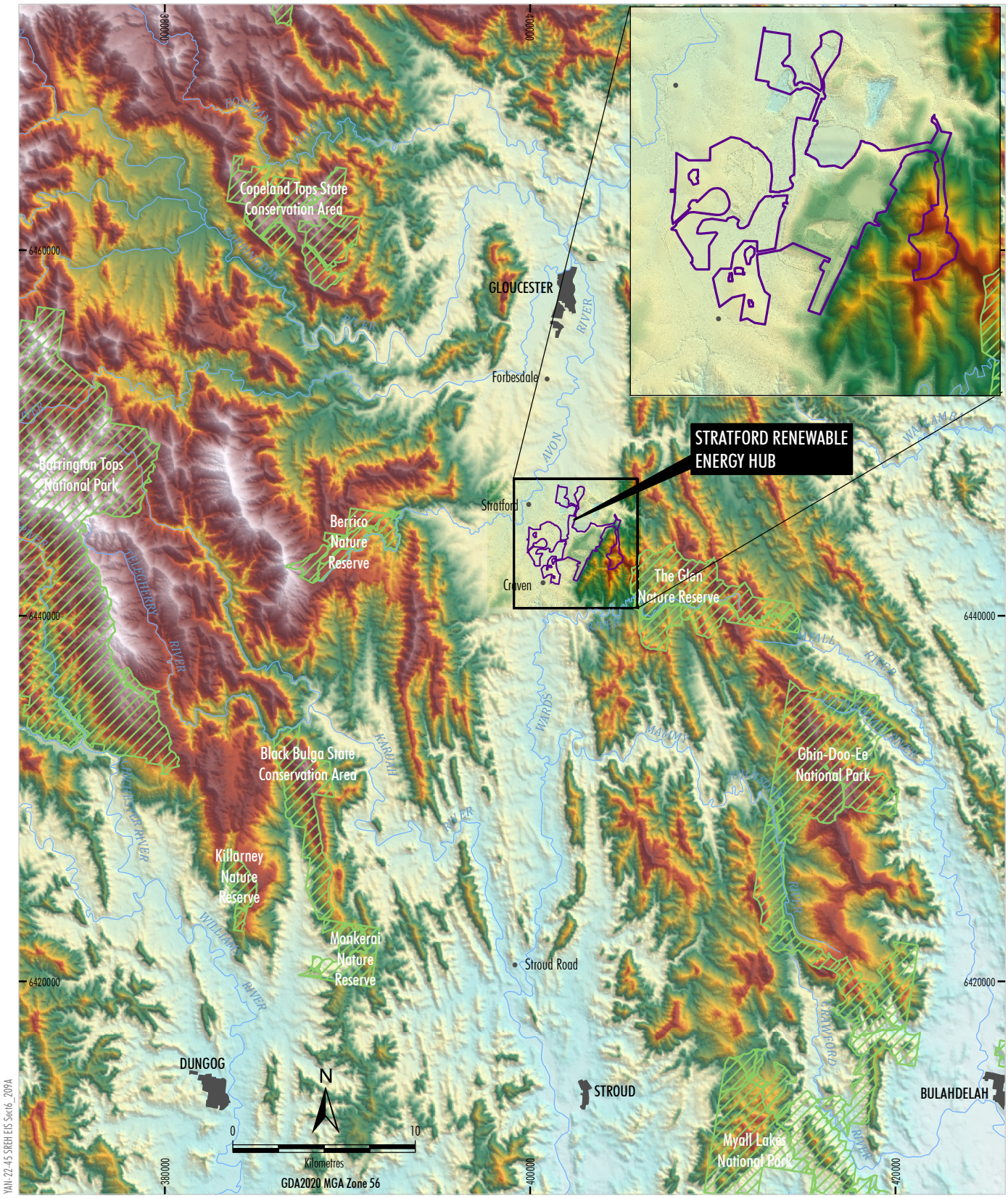
Construction of the upper reservoir would result in localised changes to the ridgeline topography. However, given the ridgeline continues to rise to the east, these changes would not change the overall horizon.

There would be no changes to existing topography as a result of the Solar Farm.

6.2.3 Land Use

Existing Environment

Land uses proximal to the Project currently comprise mining (including active disturbance areas and rehabilitation), low intensity agricultural production (primarily grazing for beef production) and remnant vegetation generally located along ridgelines and watercourses, and in isolated patches within the cleared landscape.



YAN-22-45 SREH EIS Sect6_209A

Source: Geoscience Australia (2006); Yancoal (2023); NSW Spatial Services (2023)

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Regional Topography

Figure 6-4

Villages located in the vicinity of the Project include Stratford and Craven. There are also a number of scattered rural residences in the vicinity of the Project. The locations of residences can be seen on Figure 1-4.

A number of reserved/protected areas are located in the general vicinity of the Project, including The Glen Nature Reserve (located approximately 1 km to the south-east), Barrington Tops National Park (approximately 7 km away) and Berrico Nature Reserve (approximately 40 km away) (Figure 6-4).

The Project is located on land zoned under the Gloucester LEP as RU1 (Primary Production) and IN3 (Heavy Industrial). Figure 2-2 shows the local land zoning within and surrounding the Project.

There are no Crown Lands within the Project Disturbance Footprint, or travelling stock routes.

The existing Transgrid 132 kV line and easement currently traverses through the Project site.

Yancoal (or its subsidiaries) owns all freehold land required to develop the Project. The land ownership within and surrounding the Project is presented in Figure 1-4.

Potential Impacts

The Project design maximises the use of previously industrialised land (the SMC) for solar and PHES.

The Project would result in changes to existing land use from bushland, agriculture and coal mining to renewable energy generating works and associated infrastructure. The Project would also change the approved SMC final land use, as described in Section 6.1.1 and Attachment 6.

A Land Use Risk Conflict Assessment (Minesoils, 2024) has been prepared for the Project prepared in accordance with the *Land Use Conflict Risk Assessment Guide* (DPI, 2011) as required by the *Large-Scale Solar Energy Guideline* (DPE, 2022a). The Land Use Risk Conflict Assessment is included in Appendix A of this EIS.

The Land Use Risk Conflict Assessment compares and contrasts the Project against surrounding land uses and activities for compatibility and conflict issues. Each potential conflict was assessed and given a risk ranking based on probability and consequence. With implementation of relevant risk reduction controls as outlined in Appendix A, all risks were scored low (Minesoils, 2024).

6.2.4 Soils and Agricultural Impact

A Soils, Land and Agricultural Impact Assessment was prepared by Minesoils (2024) in accordance with the Agricultural Impact Assessment requirements of the *Large-Scale Solar Energy Guideline* (DPE, 2022a). This assessment is presented as Appendix A.

Soils

Existing Environment

Following the soil survey undertaken by Minesoils (2024), the below soil units were mapped within the Project Disturbance Footprint (Figure 6-5):

- Kurosols.
- Sodosols.
- Tenosols.
- Dermosols.
- Anthroposols.

These soils are common to the Gloucester Valley and wider Sydney Basin.

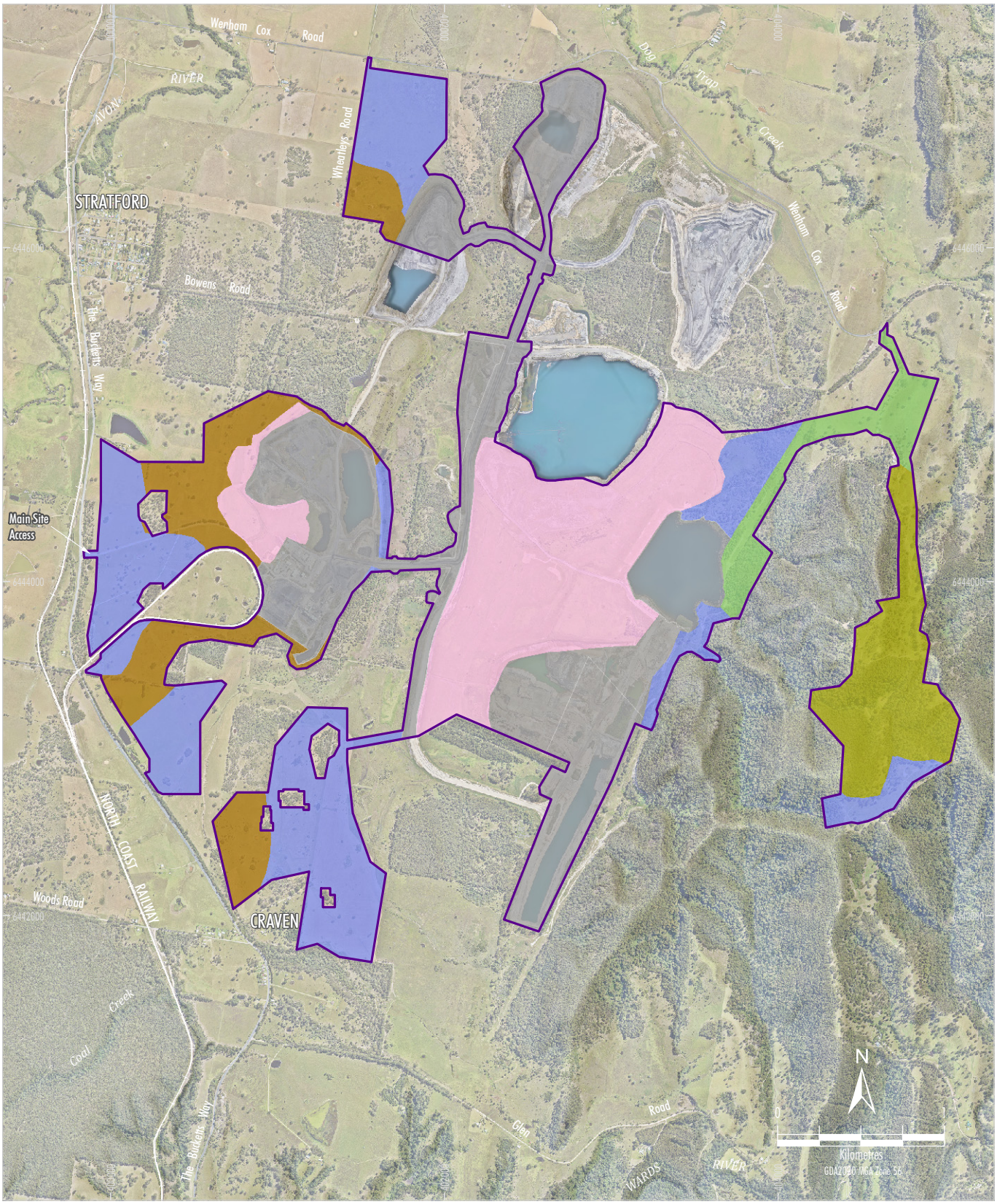
Remaining areas within the Project Disturbance Footprint contained no current soil resource due to SMC disturbance.

Potential Impacts

Construction of the upper and lower reservoirs would involve soil stripping. Stripped soil could be used for rehabilitation of temporary Project construction areas, or for SMC rehabilitation. It is not proposed that the stripped soil would be stockpiled and used for rehabilitation of Project operational infrastructure areas given operations could be greater than 50 years.

Soils over the majority of the Project Disturbance Footprint would be subject to minor disturbance as part of the construction or maintenance of solar arrays and electrical cabling trenches. In areas where earthworks are necessary for construction of the reservoirs, powerhouse and access tracks, soils would be subject to higher impact disturbance (Appendix A).

Overall, the impacts to the soils within the Project Disturbance Footprint are generally expected to be minimal and temporary (Appendix A).



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LEGEND

- Project Disturbance Footprint
- Soil Unit 1 - Kurosols
- Soil Unit 2 - Sodosols
- Soil Unit 3 - Tenosols
- Soil Unit 4 - Dermosols
- Soil Unit 5 - Anthroposols
- Disturbed Terrain / No Soil Resource

Source: NSW Spatial Services (2023); Yancoal (2023); Minesoils (2024)

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Soil Mapping Units

Figure 6-5

There would be no direct or indirect impacts to soil resources outside the Project Disturbance Footprint (Appendix A).

Land and Soil Capability

Existing Environment

Land and Soil Capability (LSC) describes the inherent physical capacity of the land to sustain a range of land uses and management practices in the long-term without degradation to soil, land, air and water resources. *The land and soil capability assessment scheme* (OEH, 2012) uses the biophysical features of the land and soil including landform position, slope gradient, drainage, climate, soil type and soil characteristics to derive detailed rating tables for a range of land and soil hazards.

Surveys conducted by Minesoils (2024) indicated that the Project site consists of the following LSC classes (Figure 6-6):

- LSC Class 4 – moderate capability land (approximately 34%).
- LSC Class 6 – low capability land (approximately 24%).
- LSC Class 7 – very low capability land (approximately 6%).
- LSC Class 8 – extremely low capability land (approximately 3%).
- Land not assessed due to existing mine disturbance (approximately 33%).

Class 4 land has moderate to high limitations for high impact land uses. Class 6 land has very high limitations for high impact land uses. Class 7 land has severe limitations that restrict most land uses, and Class 8 land has limitations so severe that it is not suitable for agriculture. The Project does not contain Class 1 to 3 land which is considered highly capable of sustaining most land uses.

Minesoils (2024) has mapped approximately 560 ha of potential agricultural land across the Project Disturbance Footprint, comprising approximately 260 ha outside the SMC disturbance footprint, and a further 300 ha on the SMC rehabilitated landform (noting some of this agricultural land is yet to be established as part of rehabilitation works required under Development Consent SSD-4966).

Potential Impacts

The Project would remove approximately 560 ha of potential agricultural land. Agrisolar (grazing within the Solar Farm) may be considered post-construction of the Project to reduce the loss of agricultural land.

Following Project decommissioning, it is anticipated that all existing agricultural land could be rehabilitated to an equivalent LSC Class, with the exception of 12 ha, which would be permanently removed from agricultural use as the electrical substation would be permanently retained, and the portion of the upper reservoir mapped as currently being available for agriculture would not be rehabilitated to agricultural use post-decommissioning.

The permanent reduction of 12 ha is negligible in the context of the land area subject to agriculture use in the MidCoast Council LGA (0.006%) (Appendix A).

Current agricultural land use immediate to the Project Disturbance Footprint, and in the broader Project locality would not change as a result of the Project, and there would be no fragmentation or displacement of existing agricultural industries as a result of the Project.

Strategic Agricultural Land

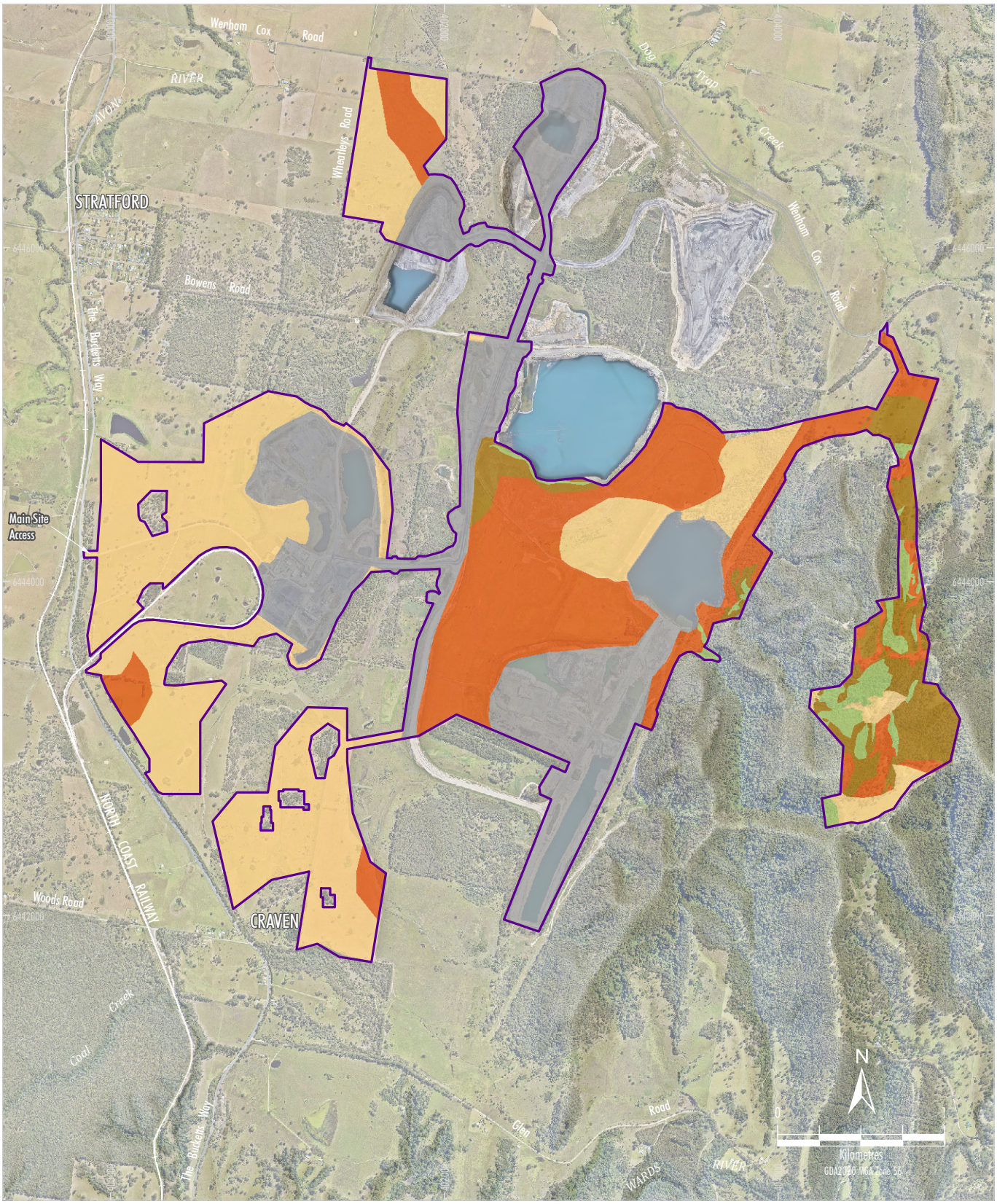
There is no mapped Biophysical Strategic Agricultural Land (BSAL) within the Project Disturbance Footprint. The nearest mapped BSAL is located approximately 1 km north-west and approximately 2 km south-west of the Project Disturbance Footprint in close association with the Avon River and Spring Creek.

The verification of BSAL is not required as per the *Large-Scale Solar Energy Guideline* (DPE, 2022a).

6.2.5 Land Contamination

Land contamination assessments have been undertaken for the Project site (GHD, 2024a).

With the implementation of proposed remediation (including as part of the SMC rehabilitation) prior to the commencement of construction activities, the land required for the Project would be suitable for the purpose for which the development is proposed to be carried out (i.e. renewable energy generating works and associated infrastructure).



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LEGEND

- Project Disturbance Footprint
- LSC Class 4 (Moderate Capability)
- LSC Class 6 (Low Capability)
- LSC Class 7 (Very Low Capability)
- LSC Class 8 (Extremely Low Capability)
- Disturbed Terrain (No LSC Classification)

Source: NSW Spatial Services (2023); Yancoal ; Minesoils (2024)

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Verified Land and Soil Capability Classes

Figure 6-6

6.2.6 The Glen Nature Reserve

The Glen Nature Reserve is the closest protected nature reserve to the Project, and is located approximately 1 km away to the south-east (Figure 1-2). The Glen Nature Reserve is administered by the NPWS.

The Glen Nature Reserve is separated from the Project by intervening topography and is located in a separate water catchment to the Project. While the Project is not 'adjacent' to The Glen Nature Reserve, potential impacts of the Project to The Glen Nature Reserve have been considered consistent with the requirements of the guidelines for *Development adjacent to National Parks and Wildlife Services lands* (DPIE, 2020c), as presented in Table 6-3.

The distance from the Project, screening vegetation and intervening topography would avoid and minimise any potential environmental impacts associated with the Project.

Table 6-3
Consideration of Potential Impacts to The Glen Nature Reserve

Environmental Aspect	Project Interaction
Erosion and sediment control	No interaction. Project is located in a separate water catchment.
Stormwater runoff	
Wastewater	
Management implications relating to pests, weeds and edge effects	No access required through the reserve. Access is provided from the west of the Project site.
Fire and the location of asset protection zones	Asset Protection Zones and other bushfire management measures to be in place for Project to minimise bushfire risk.
Boundary encroachments and access through NPWS lands	No interactions. No encroachment on The Glen Nature Reserve land or access.
Visual, odour, noise, vibration, air quality and amenity impacts	Compliance with EPA dust and noise criteria, meaning only minor potential amenity impacts.
Threats to ecological connectivity and GDEs	No disturbance of native vegetation within 1 km of The Glen Nature Reserve. No drawdown predicted at The Glen Nature Reserve.
Cultural heritage	Nil – no disturbance.
Road network design and its implications for continued access to the park	Nil – Project would not change existing park accesses.

6.3 SURFACE WATER

Section Overview

- This section summarises potential impacts to surface water.
- A *Surface Water Assessment* was prepared by HydroBalance (2024) and presented in Appendix B.
- Key legislation and guidelines considered were the WM Act, the "Blue Book" and *Guidelines for Controlled Activities on Waterfront Land.*
- Avoidance and minimisation of impacts includes designing the PHES to be a 'closed system', and using water from SMC storages to fill the PHES (avoiding reliance on natural waterways).
- The normal operation of the PHES would have no impact on local or regional water quality.
- There would be a reduction in flow days in the unnamed drainage line located between the upper and lower reservoirs, but limited change in surface flow downstream of the Project.
- Riparian Corridor Protection Zones would be implemented at key stream locations, including revegetation.
- Key mitigation, management and monitoring would be described in a *Surface Water Management Plan*.

6.3.1 Methodology

The Surface Water Assessment prepared by HydroBalance (2024) has been guided by the requirements of the SEARs for the Project, including agency advice, as well as relevant legislative requirements, including under the WM Act and PoEO Act.

The Surface Water Assessment has also been guided by the following guidelines and policies:

- *Guidelines for Controlled Activities on Waterfront Land* (DPI, 2018);
- *Managing Urban Stormwater: Soils and Construction Volume 1* (Landcom, 2004);
- *Managing Urban Stormwater: Soils and Construction Volume 2E Mines and Quarries* (DECC, 2008a);

- *Managing Urban Stormwater: Soils and Construction Volume 2A Installation of Services* (DECC, 2008b);
- *Managing Urban Stormwater: Soils and Construction Volume 2C Unsealed Roads* (DECC, 2008c);
- *Managing Urban Stormwater: Soils and Construction Volume 2D Main Road Construction* (DECC, 2008d);
- *Best Practice Erosion and Sediment Control (BPESC) Books 1–6* (International Erosion Control Association, 2008);
- *Storing and Handling Liquids: Environmental Protection: Participant's Manual* (DECC, 2007a);
- *NSW Water Quality and River Flow Objectives* (DECCW, 2006);
- *Flood risk management manual* (DPE, 2023a);
- *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (Australian and New Zealand Governments [ANZG], 2018);
- *Australian Drinking Water Guidelines* (National Health and Medical Research Council & National Resource Management Ministerial Council, 2011); and
- *Australian Rainfall and Runoff* (Ball et al., 2019).

The Surface Water Assessment has also considered the requirements of the *Water Sharing Plan for the Lower North Coast Unregulated and Alluvial Water Sources 2022* and *Water Management (General) Regulation 2018*.

6.3.2 Existing Environment

Regional Hydrology

The Project is within the Avon River sub-catchment of the Manning River catchment, as shown on Figure 6-7. The Manning River is considered a slightly to moderately disturbed watercourse which drains to the South Pacific Ocean near Harrington, 75 km north-east of the Project (HydroBalance, 2024).

Local Hydrology

In the immediate vicinity of the Project, the Avon River sub-catchment comprises the following local catchments (Figure 6-8) and drainage systems, which flow in a south-east to north-west direction towards the Avon River:

- Dog Trap Creek, located to the north-east of the Project;
- Avondale Creek (a sub-catchment of Dog Trap Creek), which flows through the Project site and existing SMC, before joining Dog Trap Creek; and
- an Unnamed Avon River tributary located to the west of the Project.

The above streams are shown on Figure 6-8 and detailed further below.

Dog Trap Creek

Dog Trap Creek is an ephemeral, tightly meandering channel that traverses north of the Project area and is classified as a fourth order stream at the confluence with Avondale Creek under the Strahler system. The catchment area is approximately 41 square kilometres (km^2) (which includes the Avondale Creek catchment area), with steep upper slopes ranging from 30-40% and the lower channel draining at a slope of about 1% (Appendix B).

Avondale Creek

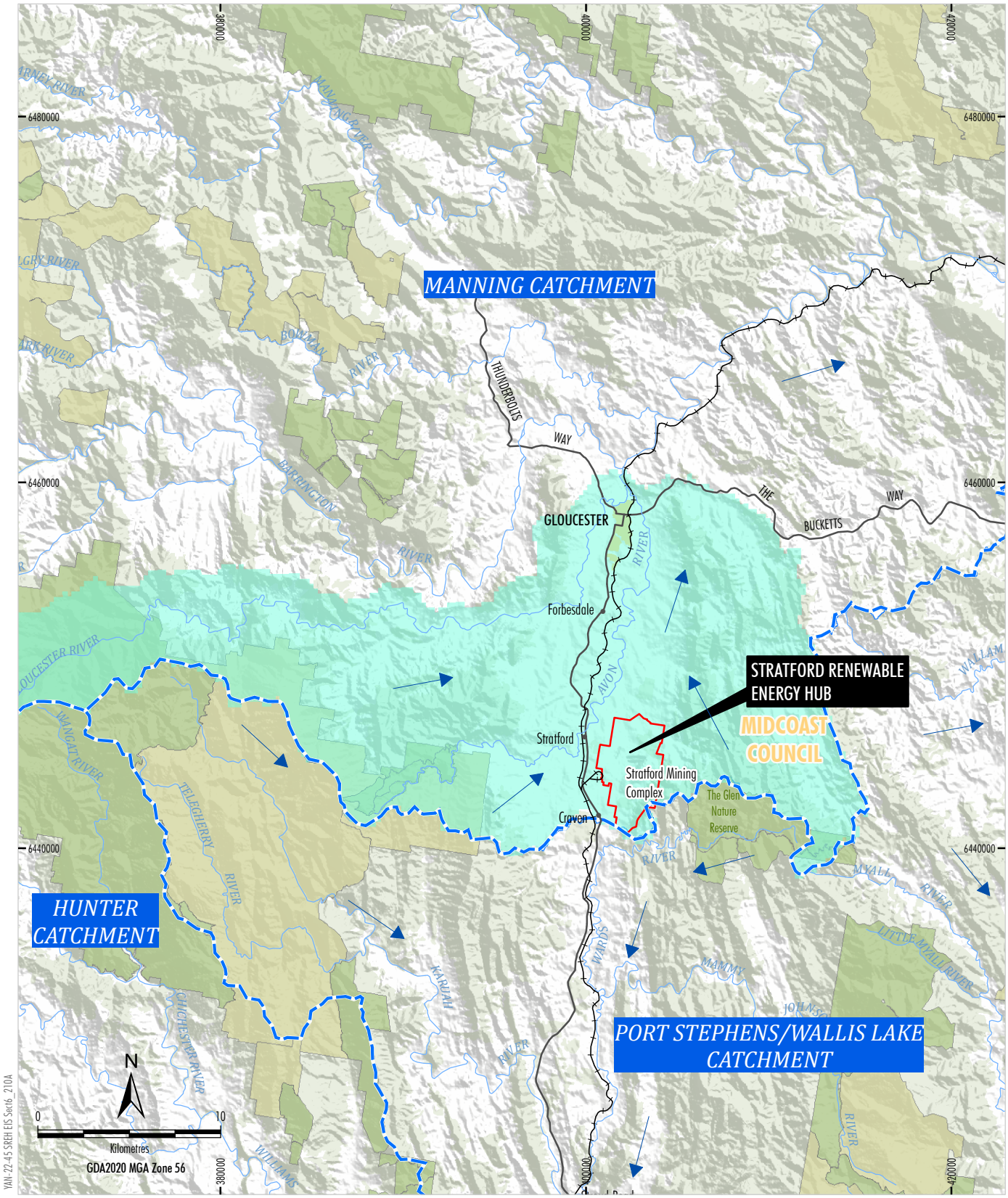
Avondale Creek is an ephemeral third order stream at the confluence with Dog Trap Creek that traverses through the existing SMC and proposed Solar Farm area of the Project, before joining Dog Trap Creek as a fourth order stream to the north of the Project. Avondale Creek's catchment area totals approximately 24 km^2 (Appendix B).

The catchment comprises a number of drainage lines (predominantly unnamed) which includes first/second order unnamed drainage lines that intermittently flow between the proposed upper and lower reservoirs.

Avondale Creek and some of its tributaries have been historically modified by the existing SMC and its water management system.

Unnamed Avon River Tributary

The Unnamed Avon River tributary is a minor (predominantly second order) ephemeral channel that flows from the west to the north of the Project, and has a 4 km^2 catchment area draining into the Avon River (Appendix B).



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LEGEND
- Mining Tenure
- State Forest
- NPWS Estates
- Regional Catchment Boundaries
- Avon River Sub-catchment
- Direction of Surface Water Flow

Source: Geoscience Australia (2006); Yancoal (2023); NSW Spatial Services (2023); HydroBalance (2024)

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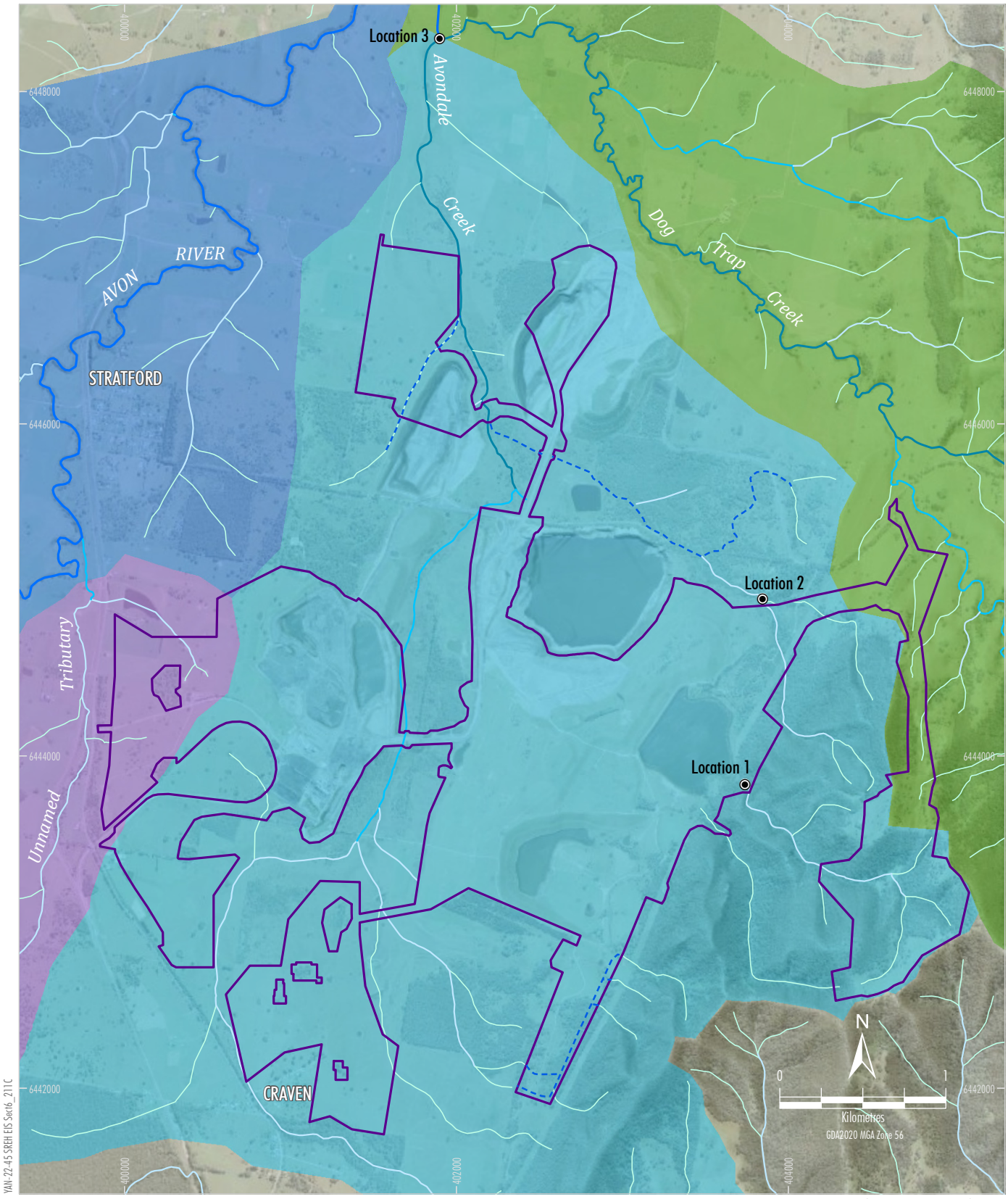
Regional Catchment

Figure 6-7



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Source: NSW Spatial Services (2023); Yancoal (2023); HydroBalance (2024)

LEGEND

Project Components

- Project Disturbance Footprint

Strahler Stream Order*

- 1st Order
- 2nd Order
- 3rd Order
- 4th Order
- 5th Order

Local Catchment

- Avon River Catchment
- Avondale Creek (Sub-catchment of Avon River and Dog Trap Creek)
- Dog Trap Creek (Sub-catchment of Avon River)
- Unnamed Tributary (Sub-catchment of Avon River)
- SCPL Retained Water Infrastructure

** Some drainage lines flow to existing SCPL water infrastructure and others been previously modified by the existing SMC*

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Local Sub-catchments of Avon River

Figure 6-8

Streamflow

The nearest streamflow gauge is located on the Avon River at the "Avon D/S Waukivory" station, which is operated by WaterNSW.

Historical flow and river height monitoring data at the Avon River gauge provides an indication of the flow regime in the downstream waterway.

Flow at the Avon River gauge is highest in the wetter months from January to April. The mean daily flow recorded at the Avon River gauge is 125 megalitres per day (ML/day) (Appendix B).

Surface Water Quality

Regional Water Quality

WaterNSW gauging station "Avon D/S Waukivory" has collected sub-daily electrical conductivity (EC) data since 2013. The gauging station is located approximately 10 km downstream of the Project, and is representative of water quality that drains past the site.

The *NSW Water Quality and River Flow Objectives* (DECCW, 2006) provide Water Quality Objectives (WQOs) for catchments throughout NSW.

EC data from the Avon D/S Waukivory gauging station shows that the river is generally above the high flow WQO for EC of 125 microsiemens per centimetre (µS/cm) (Appendix B). The EC data for instantaneous flows below 50 cubic metres per second (m^3/s) ranges up to 2,056 µS/cm, with many recorded values exceeding the low flow WQO for EC of 350 µS/cm (Appendix B).

Local Water Quality

The surface water and groundwater monitoring locations at the SMC are shown on Figure 6-3.

Water quality sampling has been undertaken in Avon River, Avondale Creek and the Dog Trap Creek since 1994. The data collected upstream of the existing SMC indicates that the baseline water quality exceeds the WQOs for a number of parameters, including turbidity and total iron concentration (Appendix B).

Flooding

The Surface Water Assessment (Appendix B) prepared for the Project includes flood modelling under existing conditions for a range of scenarios from 10% annual exceedance probability (AEP) to a PMF event.

Under the existing conditions, Avon River tailwater (backflow resulting from high Avon River water level) impacts approximately 400 m of the lower reaches of Dog Trap Creek, 1,500 m of Avondale Creek, and 600 m of the Unnamed tributary, leading to high depth, low velocity floodwaters in those areas (Appendix B).

Avondale Creek

Avondale Creek is generally well-defined in its upper reaches but loses definition as it passes through the existing SMC, exhibiting a 500 m wide floodplain during the majority of modelled events.

Under the existing conditions Avondale Creek has a typical depth less than 1.5 m for events up to and including 0.1% AEP. The 1% AEP and less frequent events also indicated ponding behind the site access road culverts and the reach impacted by Avon River tailwater (Appendix B).

Additionally, modelling showed that the 0.5% AEP and less frequent events would result in Avondale Creek overtopping sections of The Bucketts Way public road under existing conditions.

The creek main channel is less than 1 m deep in the vicinity of Wenham Cox Road, but would be overtopped by the 10% AEP and less frequent events as a result of Avon River tailwater impacts (Appendix B).

Surface Water Users

The Project is located within the *Water Sharing Plan for the Lower North Coast Unregulated and Alluvial Water Sources 2022.* Water in the Avon River is used for stock watering and irrigation purposes.

According to the NSW Water Register (WaterNSW), there are 34 surface water licences in the Avon River water source, with a total surface water licence volume of 1,791 megalitres per year (ML/year).

6.3.3 Potential Impacts

Project Design

The upper reservoir and lower reservoir would be constructed to operate as isolated systems (e.g. 'turkey's nest' dams), with the exception of transfers between the two reservoirs as part of operating the PHES.

As a result, direct interactions between the PHES and the surrounding surface water systems would generally be limited to interactions during construction.

Catchment Excision (Change in Water Quantity)

The existing Stratford East Dam would be augmented to form the lower reservoir. The impact of the lower reservoir on streamflow would not materially change relative to the existing Stratford East Dam due to the Project clean water diversion around the lower reservoir.

The construction of the upper reservoir would excise a portion of the existing surface water catchment. The total catchment area that would be excised by the construction of the upper reservoir is estimated to be approximately 52.1 ha. A breakdown of the catchment area excised for the locations shown on Figure 6-8, as a percentage of the pre-Project catchment area, is provided in Table 6-4.

The results show that the impact of the upper reservoir on streams would be greatest immediately downstream of the reservoir, as approximately 50% of the catchment to that point would be within the upper reservoir footprint (Appendix B). This is predicted to result in a reduction of minimum flow days from 19.7% to 13.3% of the days of the year.

Further downstream, there are reduced impacts to catchment size and a smaller reduction in minimum flow days (Table 6-4). The impact on the Avondale Creek catchment (which does not include contributions from Dog Trap Creek) would be negligible (Table 6-4) (Appendix B).

The outcomes of the assessment are shown visually on Charts 6-1 to 6-3.

Table 6-4
Catchment Area Excised by the Upper Reservoir

Location (Figure 6-8)	Pre-Project Catchment Area (ha)	Excised Area (ha)	Excised Catchment Area (%)	Minimum Flow Threshold# (ML/day)	Reduction in Minimum Flow Days (% of days per year)
Location 1 Unnamed tributary between the upper reservoir and lower reservoir*.	104.4	52.1	49.9	0.5	From 19.7 (existing) to 13.3 (Project)
Location 2 Unnamed tributary of Avondale Creek downstream of lower reservoir*.	285.9	52.1	18.2	1.0	From 22.9 (existing) to 20.8 (Project)
Location 3 Avondale Creek, downstream of the Project.	2,070.0	52.1	2.5	2.0	From 37.8 (existing) to 37.4 (Project)

Source: Appendix B

* Locations 1 and 2 are separate tributaries to the Unnamed tributary of Avon River as described in Section 6.3.2.

\# The minimum flow rate required for the stream to be considered 'flowing'.

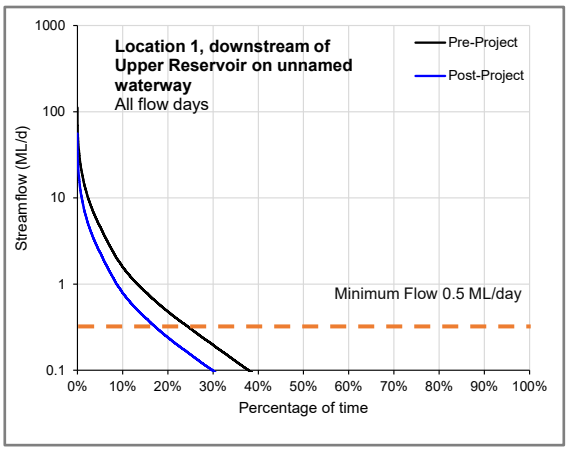


Chart 6-1 **Flow-duration Curve Comparison at Location 1**

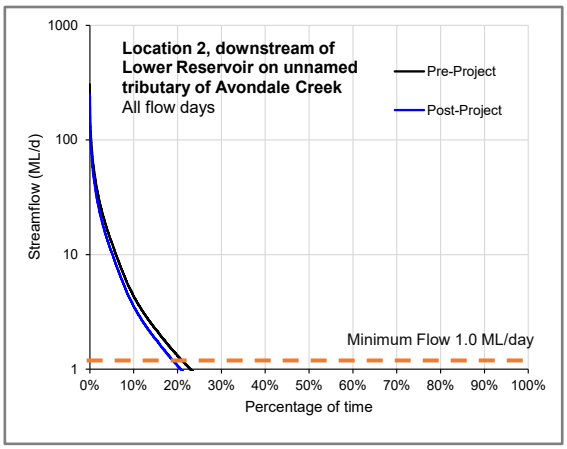


Chart 6-2 **Flow-duration Curve Comparison at Location 2**

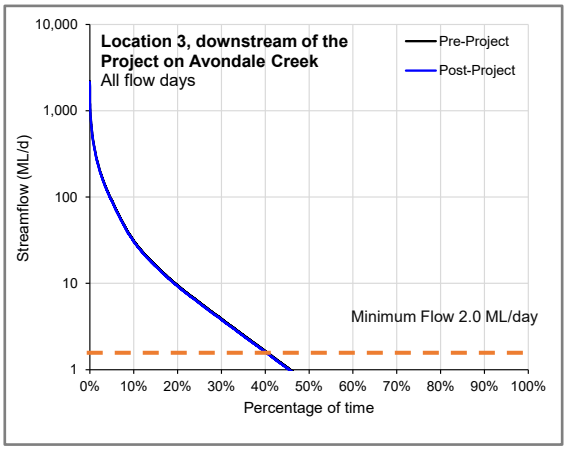


Chart 6-3 **Flow-duration Curve Comparison at Location 3**

Riparian Zones and Waterfront Land

The WM Act defines waterfront land as the bed of any river, lake or estuary and any land within 40 m of the river banks, lake shore or estuary mean high water mark. Works undertaken on waterfront land generally require a controlled activity approval, unless exemptions apply.

Guidelines for controlled activities have been prepared by NSW Department of Industry (now DPHI) which provide information on the design and construction of a controlled activity, and other ways to protect waterfront land.

As the Project is CSSI, a controlled activity approval to undertake work on waterfront land is not required.

Notwithstanding, the guidelines for controlled activities have been considered for any proposed works on waterfront land, including the *Guidelines for Controlled Activities on Waterfront Land* (DPI, 2018), *Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings* (DPI, 2003), and *Policy and guidelines for fish habitat conservation and management* (DPI, 2013a).

Figure 6-9 shows the interactions between the Project and local streams and drainage lines. Table 6-5 describes how the Project would interact with each of the streams and drainage lines within the Project Disturbance Footprint, and where Riparian Corridor Protection Zones would be implemented. Some of the Riparian Corridor Protection Zone areas are shown in the Project Disturbance Footprint, however no construction of infrastructure would occur in these areas.

Flooding

There are no impacts expected on flood levels and velocities in the Unnamed Avon River tributary or Dog Trap Creek, as the Project is outside of these floodplains.

The Project involves construction of the proposed Solar Farm within the Avondale Creek floodplain and its tributaries. There may be a minor reduction in floodplain conveyance capacity as a result of installation of the solar panel support structures.

Flood modelling predicts that there would be an increase in flood levels of less than 0.5 m (in floods up to a 1 in 100 year event) in some areas, including south of Wenham Cox Road and east of The Bucketts Way, as a result of the Project.

Flood velocity in these areas is modelled to increase by up to 0.8 metres per second (m/s) in some locations and decrease by 0.7 m/s in others under a 1 in 100 year flood event. As a result, during a significant flooding event the Project would result in floodwaters moving faster in some areas, and slower in others.

Greater impacts are modelled to occur in similar localised zones in flooding up to a 1 in 1,000 year event.

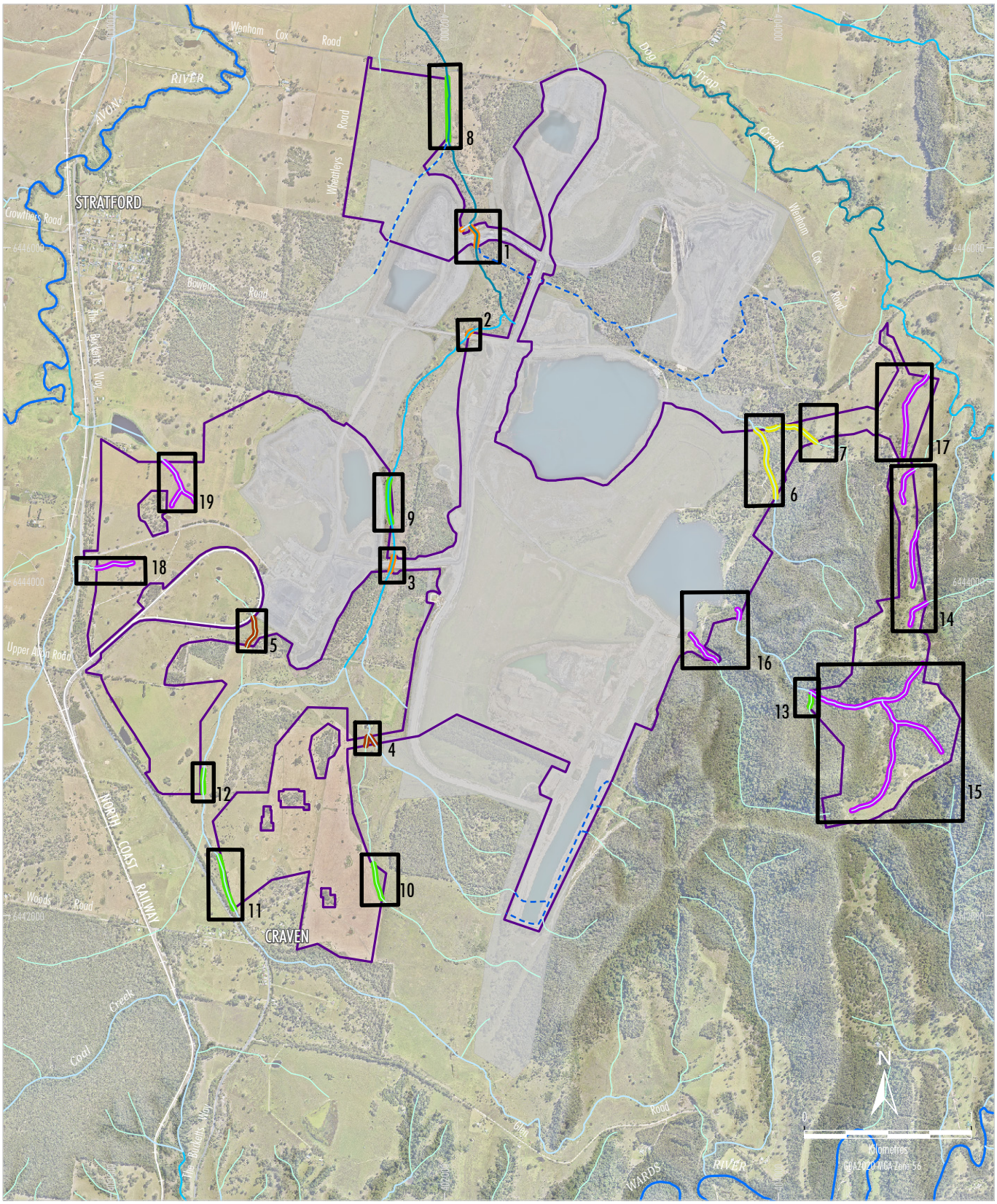
The trafficability of Wenham Cox Road and The Bucketts Way would not be negatively impacted by the modelled changes.

Discharge Requirements

Water balance modelling demonstrates that the upper reservoir and lower reservoir can be operated without the need to release to the environment, and with no predicted spills. This means the normal operation of the PHES would have no impact on local or regional water quality and environmental values (Appendix B).

A scheduled maintenance release of approximately 1 ML from the low level outlet of the upper reservoir would be required every 6 to 12 months to comply with dam safety requirements (ANCOLD, 2003). Water released from the low level outlet would be directed to the lower reservoir via infrastructure such as valve in the clean water diversion around the lower reservoir.

Maintenance releases are not expected to have any significant impact on downstream water quality and environmental values given the relatively small volume of water, and collection system to return this water to the lower reservoir (Appendix B).



LEGEND

- Approximate Extent of SMC Existing/Approved Surface Development
- Project Disturbance Footprint
- SCPL Retained Water Infrastructure

Strahler Stream Order

- 1st Order
- 2nd Order
- 3rd Order
- 4th Order
- 5th Order

Project Interaction

- Existing SMC Road Crossing
- Riparian Corridor Protection Zone
- Riparian Corridor Protection Zone and New Road Crossing
- New Road Crossing
- Disturbance

Source: NSW Spatial Services (2023); Yancoal (2023)

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Stream and Drainage Line Interaction with the Project

Figure 6-9

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Table 6-5
Summary of Project Interactions with Streams and Drainage Lines

Stream Reach Reference Location (Figure 6-9)	Stream Reach Name	Summary of Project Interaction	Stream Management Measure
Location 1 (fourth order stream)	Avondale Creek	Existing SMC Road Crossing.	• Existing culvert/bridge retained for Project construction and operational use.
Location 2 (third order stream)	Avondale Creek		
Location 3 (third order stream)	Avondale Creek		
Location 4 (first/second order stream)	Unnamed	New Road Crossing.	• "Any" road crossing allowed for first/second order streams under the *Guidelines for Controlled Activities on Waterfront Land*. • Considerations for the design and construction of watercourse crossings under the *Guidelines for Controlled Activities on Waterfront Land.*
Location 5 (first order stream)	Unnamed		
Location 6 (second order stream)	Unnamed		
Location 7 (second order stream)	Unnamed		
Location 6 (second order stream)	Unnamed	Riparian Corridor Protection Zones.	• Riparian corridors to be revegetated (i.e. no infrastructure to be constructed in riparian corridors, notwithstanding sections being within Project Disturbance Footprint). • Riparian Corridor Protection Zones for actual channel based on 10 m setback for first order, 20 m setback for second order, 30 m for third order and 40 m for fourth order streams. • Erosion and sediment controls implemented during construction for adjacent disturbance. • Riparian Corridor Protection Zones for lower reservoir spillway. • Riparian Corridor Protection Zones would be undertaken consistent with the recommended riparian corridor widths as per Table 1 of the *Guidelines for Controlled Activities on Waterfront Land.*
Location 7 (second order stream)	Unnamed		
Location 8 (fourth order stream)	Avondale Creek		
Location 9 (third order stream)	Avondale Creek		
Location 10 (first order stream)	Unnamed		
Location 11 (second order stream)	Unnamed		
Location 12 (second order stream)	Unnamed		
Location 13 (second order stream)	Unnamed		
Location 14 (second order stream)	Unnamed	Some disturbance in upper reaches may be required to implement erosion and sediment controls.	• Project disturbance (e.g. for sediment control works while existing track is being upgraded for the upper reservoir access road) to be refined to maintain 20 m setback. • Erosion and sediment controls implemented during construction to control downstream sedimentation.
Location 15 (first order stream)	Unnamed	Direct impact as a result of construction of the upper reservoir.	• Erosion and sediment controls implemented during construction to control downstream sedimentation.
Location 16 (first/second order stream)	Unnamed	Direct impact as a result of construction of the lower reservoir.	• Sections of stream would form part of lower reservoir clean water diversion (which will direct upstream flows to the north).
Location 17 (first order stream)	Unnamed	Direct impact during construction.	• Erosion and sediment controls implemented during construction to control downstream sedimentation. • Drainage paths would be re-established as part of construction. • Once stabilised (e.g. vegetation/grass cover) post-construction, erosion and sediment control measures to be removed when appropriate.
Location 18 (first order stream)	Unnamed		
Location 19 (second order stream)	Unnamed		

Estimated Water Use

Construction

The first fill of the reservoirs, and non-potable water, would be sourced from water stored within the existing SMC water management system and use of groundwater inflows collected during tunnel construction (Section 3.8). Potable water requirements (e.g. for worker facilities and concrete batching) would be purchased and imported from off-site, as per the existing SMC.

Operation

Any ongoing non-potable water requirements during the Project life (e.g. PHES system top-up) would be sourced from the SMC water management system, subject to commercial agreement (Section 3.8).

Predicted Licensing Requirement

There are no predicted surface water licensing requirements for the Project.

The upper reservoir and lower reservoir are proposed to be constructed and operated as isolated systems (i.e. 'turkey's nest' dams), with the exception of transfers between the two reservoirs, with no natural watercourses draining into the reservoirs.

Transfers between the upper reservoir and lower reservoir as part of the operation of a PHES are exempt from licensing in accordance with Schedule 4, clause 11A of the *Water Management (General) Regulation 2018.*

Where required, potable water for construction and operation would be sourced from external suppliers and does not require licensing.

The initial fill of the reservoirs would use water stored in SMC mine voids, which has already been licensed by SCPL.

Further detail on the expected groundwater licensing requirements is provided in Section 6.4.3.

6.3.4 Mitigation Measures and Monitoring

Mitigation and Management Measures

The Project has been designed to avoid and minimise potential impacts to surface water through the proposed construction and operation of the PHES as a closed system.

The Project has been designed to manage drainage lines as per the *Guidelines for Controlled Activities on Waterfront Land* (DPI, 2018), including setbacks from riparian corridors (Riparian Corridor Protection Zones) and construction of suitably designed road crossings. Revegetation of Riparian Corridor Protection Zones implemented for the Project would be revegetated following construction of the Project.

Surface Water Monitoring

SCPL currently undertakes surface water quality monitoring on and around the existing SMC. A subset of this program is proposed to continue for the Project, to monitor water quality upstream and downstream of the Project particularly during construction.

Construction Environmental Management Plan

A Surface Water Management Plan (including a Sediment and Erosion Control Plan) would be prepared as a sub-plan of a CEMP and Operations Environmental Management Plan (OEMP) for the Project.

The Surface Water Management Plan would be developed prior to the commencement of construction. The Surface Water Management Plan would include details of how erosion control and soil and water would be managed to minimise impacts to surface water, including management of sediment-laden runoff during construction.

6.4 GROUNDWATER

Section Overview

- This section summarises potential impacts to groundwater.
- A *Groundwater Impact Assessment* was prepared by SLR (2024a) and is presented in Appendix C.
- Key legislation and guidelines considered were the WM Act and *NSW Aquifer Interference Policy.*
- Avoidance and minimisation of impacts includes concrete lining underground tunnelled waterways and the powerhouse silo (to prevent groundwater inflows) and compacting/grouting at the reservoirs to minimise seepage.
- There would be groundwater inflows during construction of the tunnels/silo, with associated groundwater depressurisation, however groundwater levels are expected to recover following lining of the tunnels.
- Groundwater baseflow reductions are expected to be localised, and any temporary reduction in baseflow is unlikely to have a significant impact on stream flow.
- Groundwater seepage rates are predicted to be minor, in comparison to the overall groundwater flow.
- The Project is predicted to meet the Level 1 'Minimal Impact' criteria under the AIP.
- Groundwater inflow would be licensed.
- Key mitigation, management and monitoring would be described in a *Groundwater Management Plan*.

6.4.1 Methodology

Guidelines and Policy

The Groundwater Impact Assessment prepared by SLR (2024a) has been guided by the requirements of the SEARs for the Project, including agency advice, as well as relevant legislative requirements, including under the WM Act.

The Groundwater Impact Assessment has also been guided by the requirements of the following guidelines and policies:

- *Australian Groundwater Modelling Guidelines* (Barnett et al., 2012);
- *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZG, 2018);
- *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand [ANZECC & ARMCANZ], 2000);
- *Information Guidelines Explanatory Note: Assessing Groundwater-dependent Ecosystems* (Doody et al., 2019);
- *Guidelines for the Assessment and Management of Groundwater Contamination* (DEC, 2007);
- *Guidelines for Groundwater Protection in Australia* (Commonwealth of Australia, 2013);
- *National Water Quality Management Strategy* (Commonwealth of Australia, 2018);
- *NSW Aquifer Interference Policy* (NSW Government, 2012);
- *National Water Quality Management Strategy Guidelines for Groundwater Protection in Australia* (ANZECC & ARMCANZ, 1995);
- *Risk assessment guidelines for groundwater dependent ecosystems* (Serov et al., 2012);
- *Cumulative Groundwater Impact Assessment Approaches* (DPE, 2022d);
- *Groundwater assessment toolbox for major projects in NSW – Overview document* (DPE, 2022e);
- *Guidelines for Groundwater Documentation for SSD/SSI Projects. Technical guideline* (DPE, 2022f); and
- *Minimum Groundwater Modelling Requirements for SSD/SSI Projects* (DPE, 2022g).

Baseline Data and Investigations

The existing SMC has an extensive groundwater monitoring network which has been in use since 1996. Existing SMC groundwater monitoring sites are shown on Figure 6-3.

The Groundwater Impact Assessment has also been informed by results of exploration drilling with associated geotechnical and hydraulic testing in 2023 and 2024, at the locations shown on Figure 6-10.

In addition, a spring census was carried out in 2023 and 2024, where 15 sites in the vicinity of the Project identified through desktop assessment as being potential springs were assessed on the ground. At each spring census location water quality (where present) was sampled and an assessment of visible indications of a potential expression of groundwater was made. Out of the 15 sites, five were assessed to be a potential expression of groundwater at the time of inspection. These locations are shown on Figure 6-10.

Potential Impact Mechanisms

The Project includes the following key structures that have the potential for non-trivial interaction with groundwater (Appendix C):

- groundwater inflow (and associated drawdown) from construction of the tunnelled waterways and powerhouse silo; and
- seepage to groundwater from the upper and lower reservoirs.

The Project design incorporates measures to avoid and minimise potential impacts to groundwater, in particular:

- steel/concrete-lining of the tunnelled waterways and powerhouse silo, which would effectively limit seepage to the construction phase; and
- treatment of the upper and lower reservoir, to minimise seepage.

Modelling

To assess potential impacts to groundwater, SLR (2024a) completed a combination of analytical and numerical modelling of the Project components and surrounding hydrogeological units, informed by baseline data as detailed above.

6.4.2 Existing Environment

Geology

The Project is located within the Gloucester Basin (a small Permian sedimentary basin), with regional geology as shown on Figure 6-11.

The lower reservoir and powerhouse are located within rock of the lower Dewrang Group consisting of marine and lithic sandstone with coal seam layers and shale. The upper reservoir lies entirely within carboniferous rocks of the McInnes formation consisting mainly of sandstone with thinner beds of conglomerate and siltstone.

The tunnelled waterway would be excavated within the sandstone of the Dewrang group, the rhyolitic rock of the Alum Mountain volcanics and the rocks of the McInnes formation.

Hydrostratigraphy

Fractured Rock Groundwater System

A fractured rock groundwater system is the main groundwater system in the Project area, including shallow rock groundwater-bearing structures and the Gloucester Basin coal measures, Alum volcanics, and the carboniferous rocks of the McInnes formation.

Hydraulic Properties

Hydraulic conductivity data for the PHES area is available from packer testing undertaken in 2023 and 2024, and the results are summarised in Table 6-6.

Table 6-6
Hydraulic Conductivity of Hydrostratigraphic Units near the Upper Reservoir and Tunnel

Area	Minimum (m/s)	Maximum (m/s)
Upper Reservoir	3.5×10^{-10}	1.1×10^{-5}
Tunnel	3.6×10^{-12}	1.1×10^{-6}

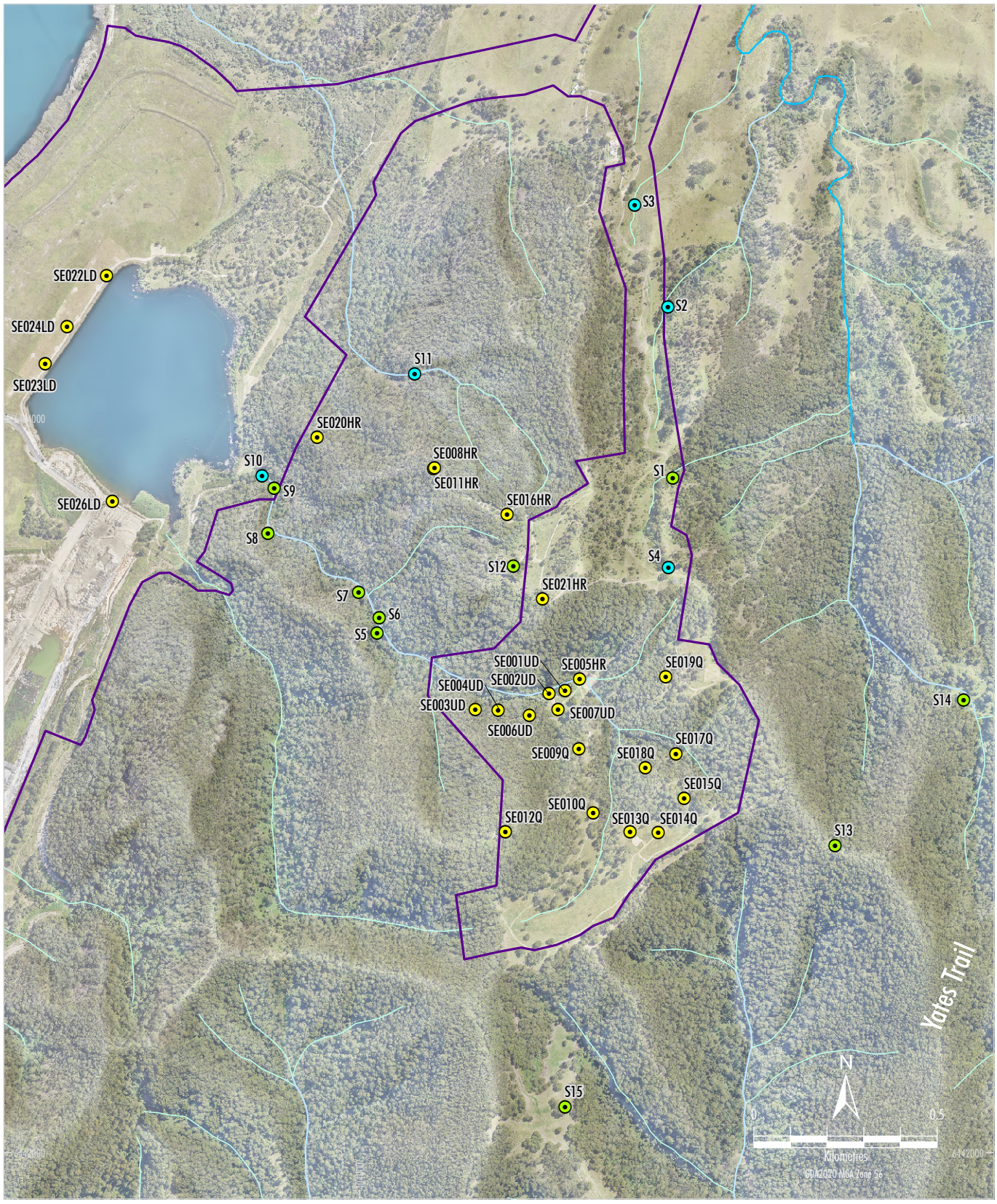
Source: Appendix C

Hydrogeological Conceptual Model

Cross-sections showing the hydrogeological conceptualisation of the proposed PHES area are shown on Figures 6-12 and 6-13.

Groundwater Levels and Flow Direction

Regionally, the direction of groundwater flow within the Gloucester Basin in the vicinity of SMC is from the south-east to the north-west, and the main groundwater discharge zones are Avondale Creek, Dog Trap Creek, and the Avon River (Appendix C).



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LEGEND

Project Components

Project Disturbance Footprint

Hydrogeological Exploration Bore Location

Exploration Bore

Spring Census Location

Potential Expression of Groundwater

No Expression of Groundwater

Strahler Stream Order

1st Order

2nd Order

3rd Order

Source: NSW Spatial Services (2023); Yancoal (2023); SLR (2024)

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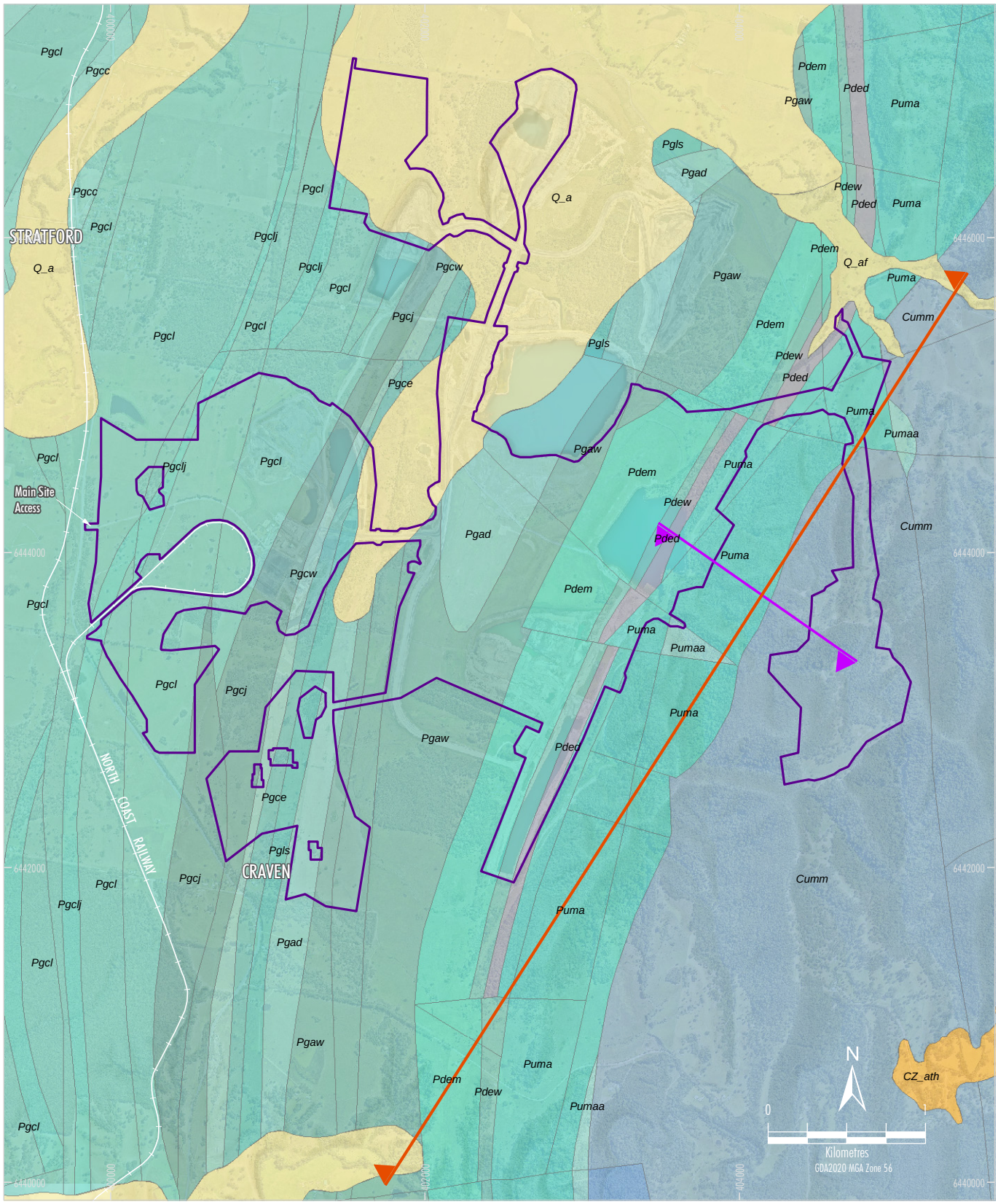
Exploration and Geotechnical Bore and Springs Census Locations

Figure 6-10



LEGEND

Project Components

- Project Disturbance Footprint

Formation

- Alluvium - Q_a
- Alluvial floodplain deposits - Q_af
- Alluvial terrace deposits - CZ_ath
- Alum Mountain Volcanics - Puma
- Alum Mountain Volcanics - Pumaa
- Crowthers Road Conglomerate - Pgcc
- Dog Trap Creek Formation - Pgad
- Durallie Road Formation - Pded
- Jilleon Formation - Pgcj
- Johnsons Creek Conglomerate - Cumj
- Leloma Formation - Pgcl
- Leloma Formation - Pgclj
- Mammy Johnsons Formation - Pdem
- McInnes Formation - Cumm
- Speldon Formation - Pgls
- Wards River Conglomerate - Pgcw
- Waukivory Creek Formation - Pgaw
- Weismantels Formation - Pdew
- Wenham Formation - Pgce

- Hydrogeological Long Section
- Hydrogeological Cross-Section

Source: NSW Spatial Services (2023); Yancoal (2023)

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Regional Geology

Figure 6-11

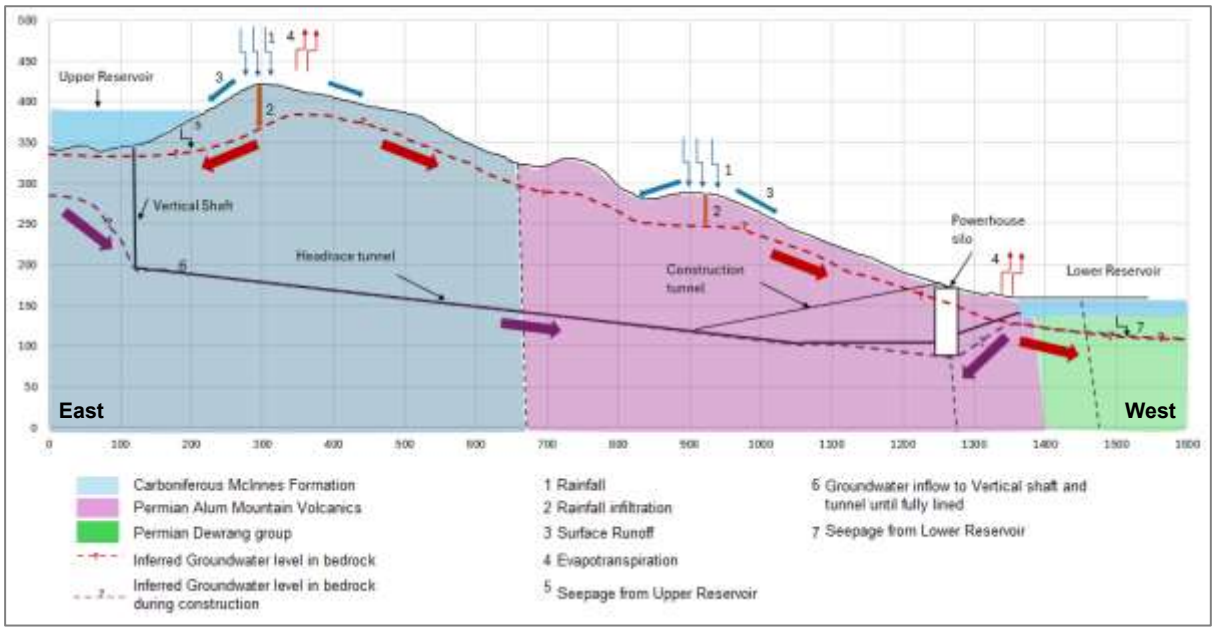


Figure 6-12 Hydrogeological Conceptual Model – Long Section (Along Tunnel Alignment)

Source: SLR, 2024a

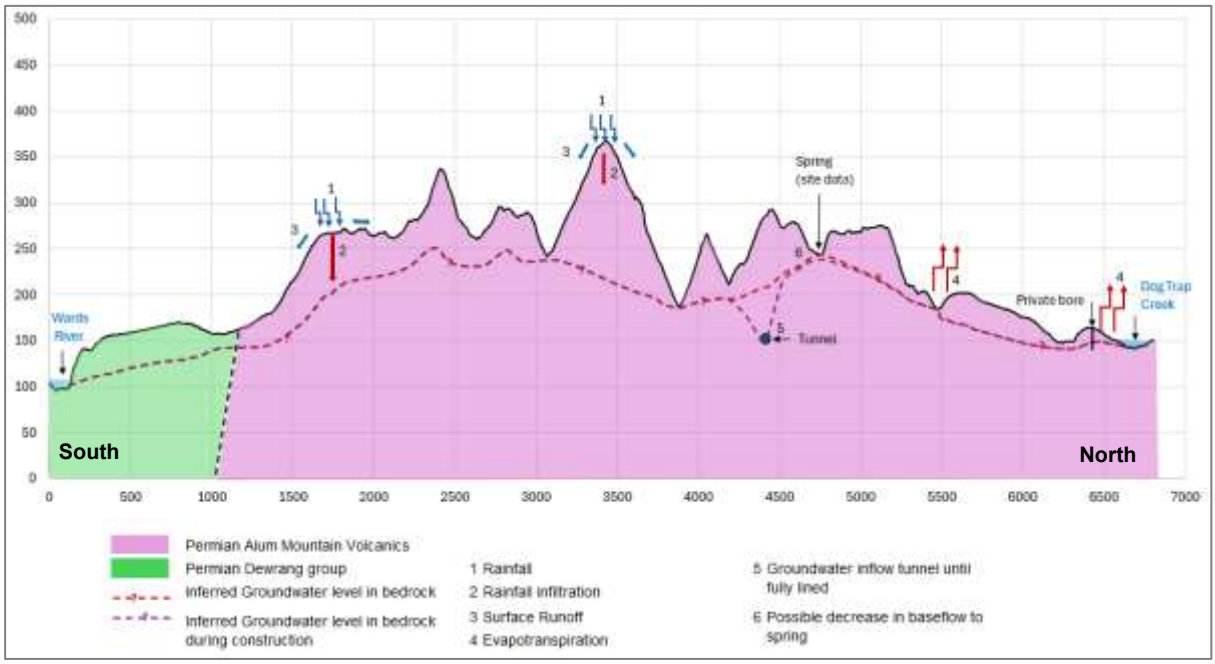


Figure 6-13 Hydrogeological Conceptual Model – Cross Section (Halfway Along Tunnel)

Source: SLR, 2024a

In the PHES area, groundwater levels in the fractured rock are a subdued reflection of topography and hydraulic gradients are strongly controlled by regional topography (Appendix C). Groundwater flows from the east to the west.

Groundwater level measurement obtained from locations within the footprint of the upper reservoir indicate that the water table is between 2 to 20 m below ground surface (Figures 6-12 and 6-13) (Appendix C).

Groundwater Recharge and Discharge

Recharge of the groundwater system near the PHES is dominated by rainfall infiltration and supplemented by inflow from streams during short-term events of high surface water flow (Appendix C).

Groundwater slowly discharges back into streams during periods of low surface flow at various locations such as those identified in the spring census (Figure 6-10).

Groundwater Quality

Groundwater quality information is available from the SMC monitoring network. Average values for EC are generally around 4,900 µS/cm in coal seams, 3,500 µS/cm in alluvium and regolith and 3,100 µS/cm in coal measures interburden (Appendix C).

Groundwater sampling in the upper reservoir footprint indicates that the groundwater is relatively fresh (EC of 800 to 1,050 µS/cm). The samples showed trace concentrations of total and dissolved metals (Appendix C).

Around the upper reservoir footprint, baseline groundwater quality is consistent with slightly to moderately disturbed aquatic freshwater ecosystems as defined by ANZECC & ARMCANZ (2000) except for total phosphorus and copper which exceeded the concentration for this environmental value at one sample site.

Groundwater quality around the lower reservoir footprint exceeds salinity levels for slightly to moderately disturbed aquatic freshwater ecosystems, but is consistent with quality suitable for livestock, selective irrigation and other general uses, and indicative of natural groundwater quality in the alluvium and regolith (Appendix C).

Anthropogenic Groundwater Users

Bores

Desktop survey identified a total of 128 registered bores within 5 km of the proposed PHES (Appendix C). The registered use categories for the bores identified were predominantly monitoring (94 bores).

The closest private bore to the proposed PHES is located adjacent to Dog Trap Creek, approximately 2 km from the tunnel on Yancoal-owned land. The registered use for this bore is domestic and stock purposes.

Water Sharing Plans

The following groundwater sources under the *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016* are relevant to the Project:

- New England Fold Belt Coast Groundwater Source; and
- Gloucester Basin Groundwater Source.

Within the New England Fold Belt Coast Groundwater Source, approximately 40,000 ML/year of the total long-term average annual extraction limit (LTAAEL) of 60,000 ML/year is unassigned.

Within the Gloucester Basin Groundwater Source, approximately 159 ML/year of the total LTAAEL of 2,030 ML/year is unassigned. SCPL holds water access licences (WALs) 41534 to 41538 in the Gloucester Basin Groundwater Source, with a combined entitlement of 1,431 ML/year.

Groundwater Dependent Ecosystems

Ecosystems that are dependent or partially dependent on groundwater, or that may be affected or impacted by change in groundwater quality and levels, are referred to as GDEs.

Broad mapping of GDE potential is available from the BoM GDE Atlas (BoM, 2023). The BoM GDE Atlas mapping shows low, moderate and high potential terrestrial GDEs within the Project Disturbance Footprint.

No High-Priority GDEs are identified within the vicinity of the Project under the *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016*.

6.4.3 Potential Impacts

Construction

Groundwater Inflow

During construction of the tunnelled waterway and other underground infrastructure, there would be a period of time where there would be no concrete or steel lining to limit the groundwater inflow from the surrounds.

Inflows to tunnelled waterways and underground infrastructure during construction have been estimated to peak at approximately 75 ML/year (Appendix C).

Following lining with concrete (and/or steel) and sealing of the construction access tunnel, groundwater inflows would be negligible (Appendix C).

Groundwater Depressurisation

Modelling predicts that groundwater depressurisation of approximately 2 m would extend up to approximately 1.1 km from the tunnelled waterways during construction, as a result of the groundwater inflow described above.

Such limited predicted groundwater depressurisation at the water table means that changes in water table levels are predicted to be limited (i.e. generally 1 m or less; Appendix C).

Drawdown is not expected at any privately-owned bores, and no stygofauna have been identified in the Project Disturbance Footprint (Appendix C).

Following lining of the tunnelled waterways and sealing of the construction access tunnel, groundwater pressure would recover.

Baseflow

Modelling indicates that drawdown could result in minor and temporary impacts to the contribution of groundwater baseflow to some first/second order unnamed drainage lines and tributaries within 500 m of the PHES (Appendix C).

Groundwater baseflow is expected to be localised, and a small component of the total stream flow. As such, any temporary reduction in baseflow is unlikely to have a significant impact on stream flow (Appendix C).

Operation

Groundwater Seepage

In order to mitigate the potential for significant impact, each reservoir would be compacted and/or grouted to minimise seepage (Appendix C).

Seepage analysis has been undertaken to assess the potential limits of seepage rates in the upper and lower reservoirs. A range of permeability scenarios using sensitivity analysis (to determine likely worst-case) were assessed.

For the upper reservoir, the median seepage of approximately 45 ML/year has been predicted. This is relatively low compared to the capacity of the upper reservoir (0.5% of the total capacity of 8.2 GL) (Appendix C).

Any seepage from the upper reservoir into the groundwater system would be small in comparison to the overall groundwater flows (Appendix C).

There are no nearby registered groundwater bores downgradient of the upper reservoir that would be impacted by seepage from the upper reservoir, and no stygofauna were identified in the area of the upper reservoir (Appendix C).

Any seepage discharge to the surrounding surface water environment, would be diluted by rainfall, which makes up a far greater portion of surface water stream flow (Appendix C).

For the lower reservoir, median seepage of approximately 15 ML/year has been predicted (0.2% of the total capacity of 7.1 GL).

In the area of the lower reservoir, there will be a groundwater gradient toward the SMC Main Pit, located 500 m north-west, and so any seepage is predicted to migrate towards the SMC Main Pit (Appendix C).

Groundwater Inflows and Depressurisation

Predicted inflows during the operational phase are estimated at 0.1 ML/year for the tunnelled waterways.

Operational tunnel inflows would have a negligible impact on groundwater depressurisation (Appendix C).

Groundwater Dependent Ecosystems

No High-Priority GDEs relevant to the Project have been identified in the *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016*, however low, moderate and high potential GDEs from the BoM GDE Atlas are located around the PHES (Figure 6-14).

Impacts on GDEs are unlikely, considering groundwater depressurisation during construction is predicted to have limited influence on the water table, operational drawdown is likely to be negligible and seepage from the reservoirs would be minimal (Appendix C).

Aquifer Interference Policy

An assessment of the construction of the tunnelled waterway and powerhouse silo for the Project against the *NSW Aquifer Interference Policy* (NSW Government, 2012) Minimal Impact Considerations for less porous and fractured groundwater sources was undertaken as part of the Groundwater Impact Assessment.

It was determined that the Level 1 'Minimal Impact' criteria would be met for both construction and operation (Appendix C).

Predicted Licensing Requirements

Estimated groundwater licensing requirements during construction are shown in Table 6-7. There are sufficient licences available to be held in these sources for the Project.

Table 6-7
Groundwater Source Licensing Requirements

New England Fold Belt Groundwater Source (ML/year)	Gloucester Basin Groundwater Source (ML/year)	Total (ML/year)
30	44	74

Source: Appendix C

Further details on the expected licensing requirements are provided in Table 6-8.

6.4.4 Mitigation Measures and Monitoring

Mitigation and Management Measures

Potential impacts to groundwater would be mitigated or avoided through the design of the Project.

The tunnelled waterways and powerhouse infrastructure would be concrete and/or steel lined, reducing inflow/outflow of water to a negligible level.

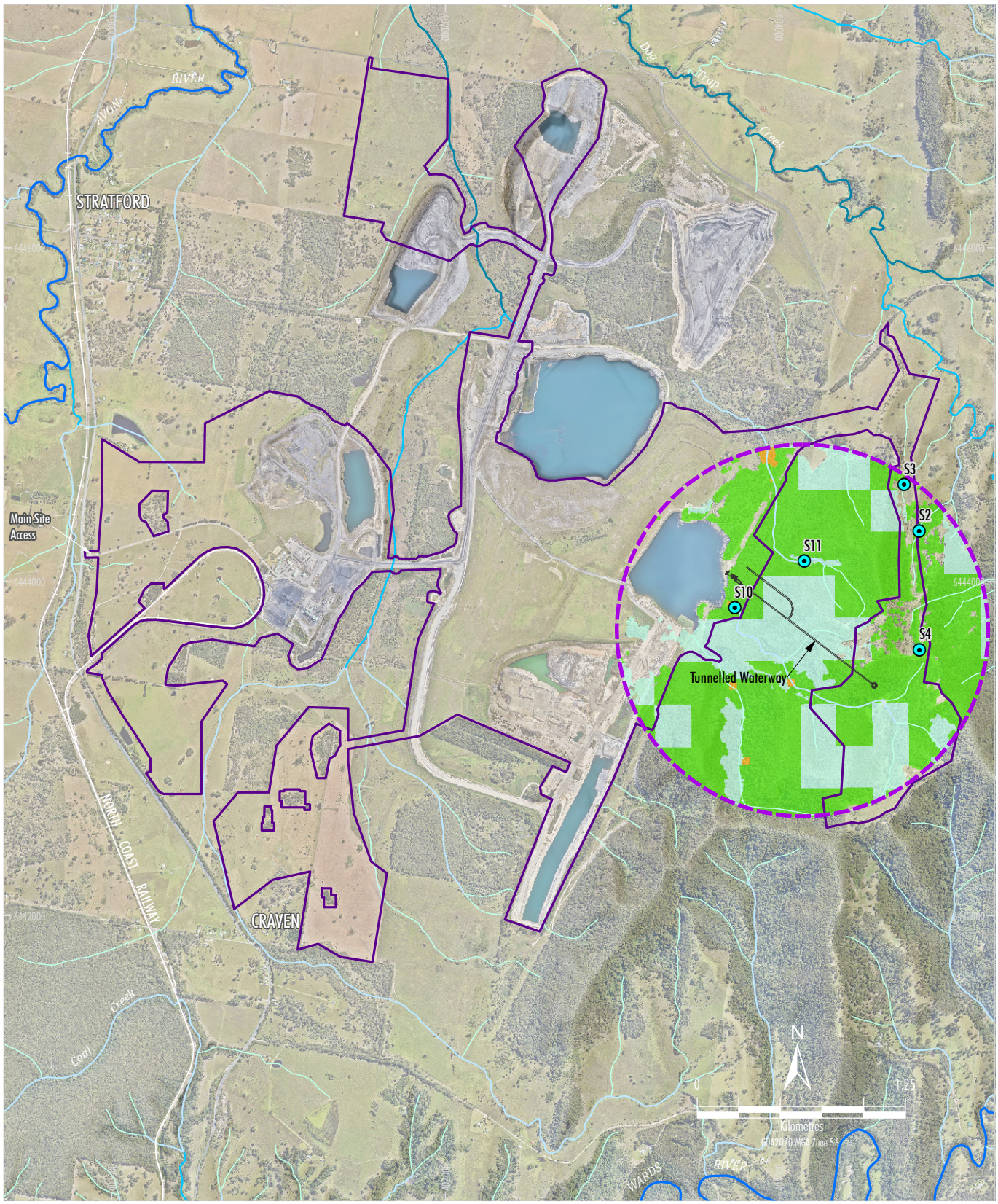
The upper and lower reservoirs would be treated (e.g. compacted and/or grouted) to minimise seepage.

Water Management Plans

Groundwater level monitoring would be undertaken during construction of the tunnelled waterway, vertical shaft and powerhouse silo to confirm the conclusions of modelling.

Baseline groundwater quality monitoring would be undertaken in shallow bores proximal to the drainage line downgradient from the upper reservoir. Groundwater quality monitoring would continue during construction and operations.

A Groundwater Management Plan would be prepared as a sub-plan of the CEMP and OEMP.



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LEGEND

Project Components

- Project Disturbance Footprint
- Estimated Extent of Groundwater Impact

GDE Mapping

- High Potential
- Medium Potential
- Low Potential

Spring Census Location

- Potential Expression of Groundwater

Strahler Stream Order

- 1st Order
- 2nd Order
- 3rd Order
- 4th Order
- 5th Order

Source: NSW Spatial Services (2023); Yancoal (2023)

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GDE Mapping and Estimated Extent of Potential Groundwater Impact

Figure 6-14

Table 6-8
Predicted Project Water Licensing Requirements

Phase	Water Type	Water Requirement	Water Sourced From	Water Source	Licensing Requirement
Construction	Surface Water	Potable (including concrete batching).	Imported (as per current SMC).	N/A – purchased water from licensed importer.	
		General construction (e.g. dust suppression).	Water stored in mine voids, and water management structures such as sediment dams.	N/A – no further licensing required as open pit take is licensed by SCPL, as reported in the SMC Annual Review.	
		Initial reservoir fill.	Water stored in mine voids.	N/A – no further licensing required as open pit take is licensed by SCPL, as reported in the SMC Annual Review.	
	Groundwater	Groundwater interception / extraction during tunnel / powerhouse excavation.	Groundwater in in-situ rock near the lower part of the tunnel.	Maximum of 44 ML/year from the *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016* ***Gloucester Basin Groundwater Source.***	SCPL holds WALs 41534 to 41538 in the ***Gloucester Basin Groundwater Source,*** with a combined entitlement of 1,431 ML. A total of 312.9 ML was required in 2023, indicating that more than sufficient excess would be available for the Project when required. Sufficient entitlements could be temporarily traded to the Project, subject to commercial arrangement.
			Groundwater in in-situ rock in the upper part of the tunnel.	Maximum of 30 ML/year from the *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016* ***New England Fold Belt Coast Groundwater Source.***	In the water year 2024/25, there are 646 WALs comprising approximately 16,909.9 share components (MLs) in the ***New England Fold Belt Coast Groundwater Source***. It is noted that the LTAAEL is 60,000 ML/year. The Project would source the relevant share components on the active market.
Operation	Surface Water	Transfer between upper and lower reservoirs as part of operation of the PHES.	Upper reservoir/lower reservoir (following initial fill).	N/A – Exempt in accordance with Schedule 4, clause 11A of the *Water Management (General) Regulation 2018.*	
		Upper reservoir.	N/A – the upper reservoir would operate as an isolated system (i.e. 'turkey's nest' dam). Due to the construction location at the highest point in the local topography, there is no upstream catchment that will drain into the upper reservoir.		
		Lower reservoir.	N/A – the lower reservoir would operate as a closed system (i.e. 'turkey's nest' dam). The clean water diversion system would divert 'clean' upstream runoff around the lower reservoir.		
		Operational water take (i.e. reservoir top-up, if required).	Water stored in mine voids.	N/A – no further licensing required as open pit take is licensed by SCPL, as reported in the SMC Annual Review.	
	Groundwater	Inflow to tunnels.	Minimal, however licences held during construction would be more than sufficient for any small residual inflow.		

6.5 TERRESTRIAL ECOLOGY

Section Overview

- This section summarises potential impacts to terrestrial ecology.
- A BDAR was prepared by GHD (2024b) and is presented in Appendix D.
- Key legislation and guidelines considered were the BC Act, EPBC Act and NSW *Biodiversity Assessment Method 2020*.
- Avoidance and minimisation of impacts includes maximising the use of land previously disturbed by the SMC and agriculture, avoidance of higher value patches of vegetation in the Solar Farm footprint and use of tunnelled waterway rather than overland pipes.
- The Project would disturb approximately 145 ha of native vegetation and associated species habitat, out of a total Project Disturbance Footprint of 870 ha.
- The main residual impacts are associated with construction of the upper reservoir, which cannot be relocated.
- There would be potential impacts to two TECs, two threatened flora species credit species and 18 threatened fauna species credit species.
- Three species are SAII entities: Scrub Turpentine, Sooty Owl and Stuttering Frog (the latter being assumed present). Specific management strategies are being developed for SAII entities (in addition to offsets).
- A Biodiversity Offset Strategy would be developed, targeting establishment of Biodiversity Stewardship Sites.
- Key mitigation, management and monitoring would be described in a *Biodiversity Management Plan*.

6.5.1 Methodology

Biodiversity Development Assessment Report

The BDAR was prepared in accordance with the SEARs as well as relevant State and Commonwealth requirements, legislative requirements under the BC Act and EPBC Act, and the NSW *Biodiversity Assessment Method* (BAM) (DPIE, 2020d).

The BDAR assesses the potential impacts of the Project on terrestrial ecology and provides an assessment of the impacts on Commonwealth threatened species and communities for EPBC 2023/09733.

Desktop Assessment

An initial desktop assessment was undertaken by GHD (2024b) to identify native vegetation, threatened ecological communities (TECs) and threatened species listed under the BC Act and EPBC Act that could be expected to occur in the locality, based on previous records, known distribution ranges, and habitats present.

Previous ecological surveys and assessments undertaken for the SMC have also been considered in the BDAR.

Native Flora Survey

Vegetation was assessed with reference to the BAM (DPIE, 2020d). The NSW State Vegetation Type Map (DPE, 2023b) was ground-truthed in the field to verify community types. Vegetation mapping was undertaken via walked transects across the Project Disturbance Footprint of likely vegetation types.

The condition of vegetation was assessed through observation and comparison against the Plant Community Type (PCT) condition benchmark data as well as using parameters such as species diversity, history of disturbance, weed invasion and canopy health (Appendix D).

To determine the most suitable PCT, the landscape position, soil type and other diagnostic features of the vegetation communities within the Project Disturbance Footprint were compared to the descriptions in the database to determine the most suitable PCT.

Native vegetation communities in the Project Disturbance Footprint were assigned to the closest equivalent PCT held in the *NSW BioNet Vegetation Classification Database* (NSW DCCEEW, 2024a).

TECs as defined in NSW and Commonwealth legislation were also identified based on diagnostic criteria in the listing documents for each candidate TEC.

The native vegetation in the Project Disturbance Footprint was then categorised into vegetation zones in accordance with the BAM (DPIE, 2020d). A vegetation zone is defined in the BAM (DPIE, 2020d) as a relatively similar area that is the same PCT and has the same broad condition state.

Justification for selected PCTs, condition classes, and further detail on survey methodology including vegetation integrity plots is provided in Appendix D.

Threatened Flora Survey

Targeted searches were undertaken for threatened flora species that were either predicted to occur within the Project Disturbance Footprint by the BAM Calculator (BAM-C) or identified during the desktop review as having potential to occur within the Project Disturbance Footprint given known distributions, previous records in the locality and habitat requirements for each species.

Flora surveys of the Project Disturbance Footprint were undertaken across multiple seasons (between November 2022 and April 2024) in accordance with the BAM (DPIE, 2020d) and *Surveying Threatened Plants and their Habitats: NSW Survey Guide for the Biodiversity Assessment Method* (DPIE, 2020e).

A detailed description of the methodology employed by GHD (2024b) for the Project is provided in Appendix D.

Threatened Fauna Survey

Targeted searches were undertaken for threatened fauna species with particular focus on species credit species (as defined by the *NSW BioNet Threatened Biodiversity Profile Data Collection* [NSW DCCEEW, 2024b]), that were either predicted to occur within the Project Disturbance Footprint by the BAM Calculator (BAM-C) or identified during the desktop review as having potential to occur within the Project Disturbance Footprint given known distributions, previous records in the locality and habitat requirements for each species.

Fauna surveys of the Project Disturbance Footprint were undertaken across multiple seasons (between November 2022 and April 2024) in accordance with the BAM (DPIE, 2020d), *'Species Credit' Threatened Bats and their Habitats: NSW Survey Guide for the Biodiversity Assessment Method* (DPIE, 2021c), *Threatened Reptiles Biodiversity Assessment Method Survey Guide* (DPE, 2022h), *NSW BioNet Threatened Biodiversity Profile Data Collection* (NSW DCCEEW, 2024b) and *Koala (Phascolarctos cinereus) Biodiversity Assessment Method Survey Guide* (DPE, 2022i).

Fauna survey techniques included habitat assessments, camera trapping, ultrasonic bat detection (Anabat), diurnal bird surveys, spotlighting, call-playback, reptile surveys, frog surveys, funnel trapping, roost searches, and opportunistic observations (Appendix D).

A detailed description of the methodology employed by GHD (2024b) for the Project is provided in Appendix D.

Consideration of SMC Land

Approximately 468 ha of the Project Disturbance Footprint is located on land previously disturbed by the SMC. Of this area, approximately 148 ha has been rehabilitated by SCPL, with landforms and vegetation cover established, including approximately 14 ha of mapped native vegetation (i.e. established rehabilitation areas mapped as native vegetation). There is no proposal for further disturbance of any vegetation in this area for the SMC, and accordingly, these rehabilitated areas have been considered in the BDAR.

A further approximately 320 ha of land impacted by operations associated with the SMC requires landform rehabilitation (irrespective of the Project). As this land will be disturbed to achieve closure obligations, it has not been considered for further assessment in the BDAR.

6.5.2 Existing Environment

Landscape Features

The dominant landscape feature within and adjacent to the Project is the existing SMC and associated disturbance and infrastructure, including carparks, workshops, haul roads and other services and utilities.

The Project Disturbance Footprint also consists of previously cleared land for agricultural production (cattle grazing and dairying) dominated by non-native vegetation.

A vegetated ridgeline is located to the east of the Project, which has been partially disturbed by the existing ETL that runs adjacent the Stratford East Dam, as well as past logging and cattle grazing.

The Project is located in the Avondale Creek and Dog Trap Creek sub-catchments of the Manning River Catchment, which flow into the Avon River approximately 2.4 km north of the Project. Drainage features within and in the vicinity of the Project Disturbance Footprint are described in Section 6.3.2.

No registered Nationally important wetlands and mapped coastal wetlands occur within or adjacent to the Project (Appendix D).

There are no karst, caves, cliffs, or other geological features of significance located within the Project Disturbance Footprint or known to occur within the Project Disturbance Footprint (Appendix D).

There are no Areas of Outstanding Biodiversity Value, as defined under the BC Act, within the Project Disturbance Footprint or surrounds (Appendix D).

Native Vegetation and Threatened Ecological Communities

Eleven PCTs were identified within the Project Disturbance Footprint representing rainforests, wet sclerophyll forests, grassy woodlands, dry sclerophyll forests, and forested wetland formations (Table 6-9) (Appendix D).

The PCTs within the Project Disturbance Footprint are shown on Figure 6-15.

Two endangered ecological communities (EEC) listed under the BC Act occur within the Project Disturbance Footprint, including (Appendix D):

- *Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions* (Lowland Rainforest).
- *Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion* (Subtropical Coastal Floodplain Forest).

Two related TEC's listed under the EPBC Act occur within the Project Disturbance Footprint and surrounds, including (Appendix D):

- The critically endangered ecological community (CEEC) *Lowland Rainforest of Subtropical Australia.*
- The EEC *Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions.*

The association of the TEC's is outlined in Table 6-9 and their extent is shown on Figure 6-15.

Threatened Flora Species and Populations Listed Under the BC Act and EPBC Act

Two threatened flora species were identified within the Project Disturbance Footprint (Appendix D), including:

- Scrub Turpentine (*Rhodamnia rubescens*) – A total of 217 stems recorded in the proposed upper reservoir footprint.
- Craven Grey Box (*Eucalyptus largeana*) – A total of 46 individuals recorded in the upper reservoir footprint.

These flora species records are shown on Figure 6-16.

Threatened Fauna Species Listed Under the BC Act and EPBC Act

The following threatened fauna species were recorded within the Project Disturbance Footprint by GHD (2024b) (Appendix D):

- Black-necked Stork (*Ephippiorhynchus asiaticus*) – Endangered under the BC Act.
- White-bellied Sea Eagle (*Haliaeetus leucogaster*) – Vulnerable under the BC Act.
- Latham's Snipe (*Gallinago hardwickii*) – Vulnerable under the BC Act and EPBC Act.
- South-eastern Glossy Black-Cockatoo (*Calyptorhynchus lathami lathami*) – Vulnerable under the BC Act and EPBC Act.
- Little Lorikeet (*Glossopsitta pusilla*) – Vulnerable under the BC Act.
- Sooty Owl (*Tyto tenebricosa*) – Vulnerable under the BC Act.
- Powerful Owl (*Ninox strenua*) – Vulnerable under the BC Act.
- White-throated Needletail (*Hirundapus caudacutus*) – Vulnerable under the BC Act and EPBC Act.
- Grey-crowned Babbler (*Pomatostomus temporalis temporalis*) – Vulnerable under the BC Act.
- Varied Sitella (*Daphoenositta chrysoptera*) – Vulnerable under the BC Act.
- Spotted-tailed Quoll (*Dasyurus maculatus maculatus*) – Vulnerable under the BC Act and Endangered under the EPBC Act.
- Brush-tailed Phascogale (*Phascogale tapoatafa*) – Vulnerable under the BC Act.
- Koala (*Phascolarctos cinereus*) – Endangered under the BC Act and EPBC Act.
- Yellow-bellied Glider (south-eastern) (*Petaurus australis australis*) – Vulnerable under the BC Act and EPBC Act.

Table 6-9
Plant Community Types within the Project Disturbance Footprint

Vegetation Community (GHD, 2024b)	PCT ID and Condition Status (Refer to Figure 6-15)	Project Disturbance Footprint (ha)
Rainforests		
Lower North Hinterland Riparian Dry Rainforest[1, 2]	3086 High	2.15
Lower North Hinterland Riparian Dry Rainforest[1, 2]	3086 Moderate	3.99
Wet Sclerophyll Forests (Grassy sub-formation)		
Northern Hinterland White Mahogany Moist Grassy Forest	3170 Moderate	2.02
Lower North White Mahogany-Spotted Gum Moist Forest	3241 Moderate	9.69
Lower North White Mahogany-Spotted Gum Moist Forest	3241 Low	2.72
Lower North Spotted Gum-Mahogany-Ironbark Sheltered Forest	3244 High	13.91
Lower North Spotted Gum-Mahogany-Ironbark Sheltered Forest	3244 Moderate	32.51
Lower North Spotted Gum-Mahogany-Ironbark Sheltered Forest	3244 Low	2.73
Northern Gorges Diverse Grassy Forest	3251 High	5.59
Northern Gorges Diverse Grassy Forest	3251 Moderate	17.49
Northern Gorges Diverse Grassy Forest	3251 Low	2.25
Northern Gorges Diverse Grassy Forest	3251 Planted	0.46
Northern Hinterland Grey Gum-Mahogany Grassy Forest	3252 Moderate	3.85
Northern Hinterland Grey Gum-Mahogany Grassy Forest	3252 Low	6.64
Northern Hinterland Tallowwood-Forest Oak Grassy Forest	3254 Moderate	0.75
Grassy Woodlands		
Northern Hinterland Valleys Red Gum Grassy Forest[3]	3329 High	0.22
Northern Hinterland Valleys Red Gum Grassy Forest[3]	3329 Moderate	4.62
Northern Hinterland Valleys Red Gum Grassy Forest[3]	3329 Low	2.13
Dry Sclerophyll Forests (Shrub/grass sub-formation)		
Lower North Foothills Ironbark-Box-Gum Grassy Forest	3446 Moderate	4.47
Lower North Foothills Ironbark-Box-Gum Grassy Forest	3446 Low	6.21
Forested Wetlands		
Lower North Riverflat Eucalypt-Paperbark Forest[3, 4]	4042 Moderate	10.22
Lower North Riverflat Eucalypt-Paperbark Forest[3, 4]	4042 Low	9.56
Lower North Riverflat Eucalypt-Paperbark Forest[3, 4]	4042 Planted	0.82
Lower North Hinterland River Oak Forest	4073 Planted	0.08
	Total	**145.08**

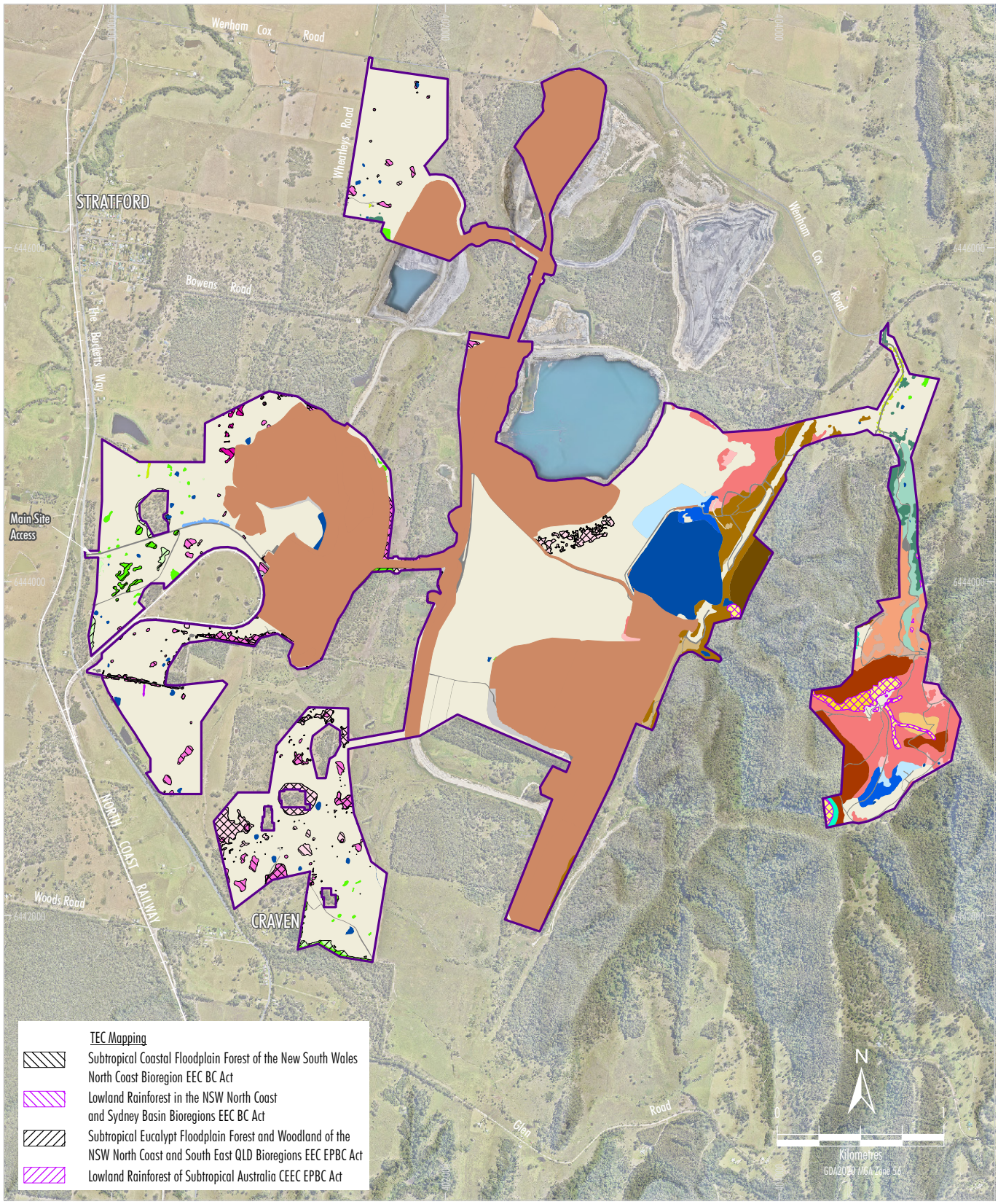
1 *Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions* EEC, BC Act.

2 *Lowland Rainforest of Subtropical Australia* CEEC, EPBC Act.

3 *Subtropical Eucalypt Floodplain Forest and Woodland of the New South Wales North Coast and South East Queensland Bioregions* EEC, EPBC Act.

4 *Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion* EEC, BC Act.

* Including approximately 14 ha of SMC Rehabilitated Native Vegetation.



YAN-22-45 SREH EIS Sect6_229B

LEGEND

Project Components

- Project Disturbance Footprint
- SMC Areas where Rehabilitation and Landform Establishment is Not Complete – SREH Development is Contingent on SCPL Rehabilitation

PCT Mapping and Condition Status

- 3086 High
- 3086 Moderate
- 3170 Moderate
- 3241 Low
- 3241 Moderate
- 3244 High
- 3244 Moderate
- 3244 Low
- 3251 High
- 3251 Moderate
- 3251 Low
- 3251 Planted
- 3252 Low
- 3252 Moderate
- 3254 Moderate
- 3329 High
- 3329 Moderate
- 3329 Low
- 3446 Low
- 3446 Moderate
- 4042 Low
- 4042 Moderate
- 4042 Planted
- 4073 Planted
- Exotic woodland
- Exotic
- Waterbody
- Cleared
- Existing Infrastructure

Source: NSW Spatial Services (2023); Yancoal (2023); GHD (2024)

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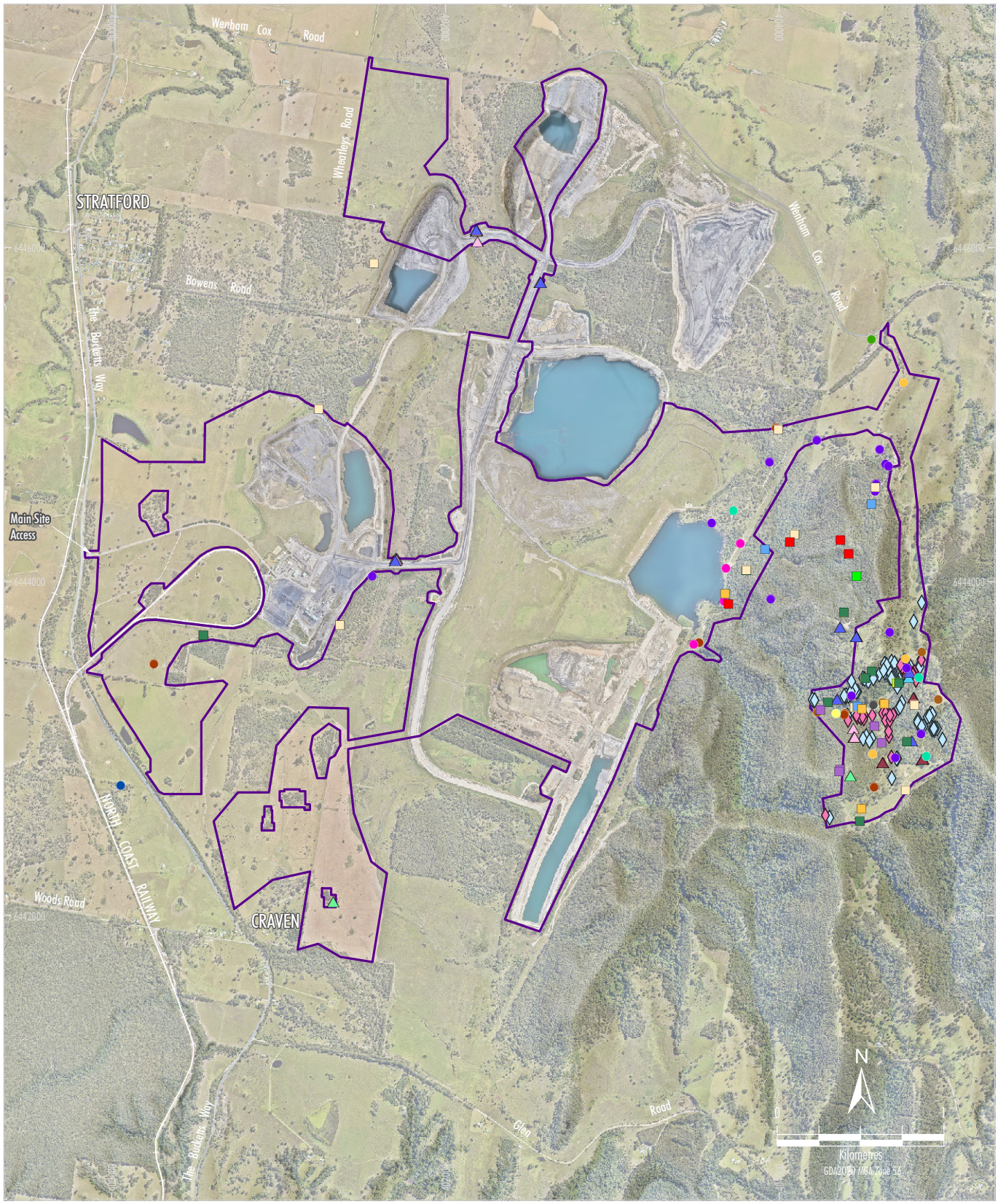
Vegetation Mapping

Figure 6-15



YAN-22-45 SREH EIS Sect6_230A

LEGEND

Project Components
- Project Disturbance Footprint

Flora
- Craven Grey Box
- Scrub Turpentine

Birds
- Black-necked Stork
- White-bellied Sea-Eagle
- Latham's Snipe
- Southern-eastern Glossy Black-Cockatoo
- Little Lorikeet
- Sooty Owl
- Powerful Owl
- White-throated Needletail
- Grey-crowned Babbler (eastern subspecies)
- Varied Sittella

Mammals
- Spotted-tailed Quoll
- Brush-tailed Phascogale
- Koala
- Yellow-bellied Glider
- Squirrel Glider
- Long-nosed Potoroo
- Parma Wallaby
- New Holland Mouse

Bats
- Grey-headed Flying-fox
- Eastern Coastal Free-tailed Bat
- Little Bent-winged Bat
- Large Bent-winged Bat
- Large-eared Pied Bat
- Eastern False Pipistrelle
- Southern Myotis

Source: NSW Spatial Services (2023); Yancoal (2023)

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Threatened Species Records

Figure 6-16

- Squirrel Glider (*Petaurus norfolcensis*) – Vulnerable under the BC Act.
- Long-nosed Potoroo (*Potorous tridactylus*) – Vulnerable under the BC Act and EPBC Act.
- Parma Wallaby (*Notamacropus parma*) – Vulnerable under the BC Act and EPBC Act.
- Grey-headed Flying-fox (*Pteropus poliocephalus*) – Vulnerable under the BC Act and EPBC Act.
- Eastern Coastal Free-tailed Bat (Micronomus norfolkensis) – Vulnerable under the BC Act.
- Little Bent-winged Bat (*Miniopterus australis*) – Vulnerable under the BC Act.
- Large Bent-winged Bat (*Miniopterus orianae oceanensis*) – Vulnerable under the BC Act.
- Large-eared Pied Bat (*Chalinolobus dwyeri*) – Endangered under the BC Act and EPBC Act.
- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*) – Vulnerable under the BC Act.
- Southern Myotis (*Myotis macropus*) – Vulnerable under the BC Act.
- New Holland Mouse (*Pseudomys novaehollandiae*) – Vulnerable under the EPBC Act.

Threatened fauna species records are shown on Figure 6-16. Species polygons showing the area of suitable fauna species habitat for relevant 'species credit species' confirmed or assumed present by GHD (2024b) were prepared in accordance with the BAM (DPIE, 2020a) and are provided in Appendix D.

Migratory Species Listed Under the EPBC Act

The following species listed as migratory under the EPBC Act were recorded in the Project Disturbance Footprint by GHD (2024b) (Appendix D):

- Latham's Snipe (*Gallinago hardwickii*) – also Vulnerable under the EPBC Act.
- White-throated Needletail (*Hirundapus caudacutus*) – also Vulnerable under the EPBC Act.
- Rufous Fantail (*Rhipidura rufifrons*).
- Spectacled Monarch (*Symposiachrus trivirgatus*).
- Black-faced Monarch (*Monarcha melanopsis*).

6.5.3 Potential Impacts

The potential direct and indirect impacts of the Project on terrestrial ecology have been assessed in the BDAR (Appendix D). The potential impacts and measures to avoid, minimise, mitigate and manage likely impacts on biodiversity values are described below.

Measures to Avoid and Minimise

Avoidance and minimisation of potential biodiversity impacts have been considered in the site selection, design, construction, operation and rehabilitation objectives of the Project.

The Project has been designed to avoid or minimise impacts on terrestrial biodiversity values through (Appendix D):

- maximising the use of previously disturbed areas associated with the SMC to minimise new disturbance;
- maximising the use of areas previously cleared for agriculture (currently mapped as exotic grassland);
- avoiding areas of remnant vegetation to reduce impacts of the Project on areas of higher quality biodiversity value;
- avoiding reliance on natural watercourses by using water stored in SMC mine voids;
- set back of the Solar Farm footprint from existing creek lines (such as Avondale Creek) to maintain riparian corridors (Riparian Corridor Protection Zones); and
- designing the PHES to use a tunnelled waterway, rather than above-ground pipes, to minimise surface disturbance impacts.

For the total Project Disturbance Footprint (approximately 870 ha):

- Approximately 468 ha is located within SMC land.
  - Of this approximately 468 ha of the SMC land, approximately 14 ha of mapped native vegetation (i.e. 2% of the total Project Disturbance Footprint) is included in the Project Disturbance Footprint.
- Outside of the SMC, approximately 131 ha is mapped as native vegetation and approximately 265 ha is mapped as exotic vegetation and existing infrastructure (including dams and roads).

- Accordingly, the Project comprised a total of approximately 145 ha of native revegetation (including approximately 14 ha of rehabilitated land) which represents approximately 17% of the total Project Disturbance Footprint (approximately 870 ha)

For the Solar Farm footprint (approximately 510 ha):

- Approximately 308 ha of the Solar Farm footprint is located within the SMC (60% of the Solar Farm footprint).
- Outside of the SMC (approximately 402 ha), approximately 14 ha is mapped as native vegetation and approximately 185 ha (36%) is mapped as exotic vegetation.

The most significant Project infrastructure involving disturbance of native vegetation is the upper reservoir, which cannot be located in any other location as it is determined by topography.

By comparison, the Solar Farm footprint is more flexible in its location. Approximately 96% of the Solar Farm footprint is located on land previously disturbed by the SMC, or land mapped as exotic vegetation outside the SMC.

Direct Impacts

Construction of the Project would require the clearance of approximately 145 ha of native vegetation (including approximately 14 ha of SMC rehabilitation), which represents approximately 17% of the total Project Disturbance Footprint (approximately 870 ha).

These native vegetation areas contain TECs and provide habitat for threatened flora and fauna species. In the context of the extensive areas of native vegetation surrounding the site, the Project would disturb a small proportion of vegetation and available habitat in the locality.

A number of measures to mitigate residual impacts on biodiversity would be implemented (Section 6.5.4).

Indirect Impacts

Indirect impacts on native vegetation, threatened entities and their habitat due to the Project (e.g. reduced habitat viability due to increased edge effects, noise, dust, lighting and introduction of pathogen/disease) are limited, however are assessed in Appendix D.

Measures to mitigate and manage potential indirect impacts are described in Section 6.5.4.

Cumulative Impacts

No material biodiversity impacts in the local region are anticipated with the closest Major Projects, given their distance from the Project (at least 37 km away) (Appendix D). Potential cumulative impacts on biodiversity with the SMC are mitigated through rehabilitation of the SMC progressively providing habitat for species.

Prescribed Biodiversity Impacts

Habitat Connectivity

Existing connectivity is represented by the large, intact bushland areas surrounding the Project including The Glen Nature Reserve, Barrington Tops National Park and Berrico Nature Reserve (Appendix D).

The Project site has been largely modified through mining operations and given the extent of native vegetation around and between areas of development within the Project Disturbance Footprint, further impacts to habitat connectivity are unlikely to have significant impacts on any relevant native species' life cycles (Appendix D).

Water Bodies, Water Quality and Hydrological Processes That Sustain Threatened Species and Threatened Ecological Communities

Artificial waterbodies exist within the Project Disturbance Footprint, primarily associated with the SMC.

The majority of artificial waterbodies require some level of dewatering as part of SMC closure which may impact threatened species that use them for foraging, roosting and nesting, however dewatering of these artificial waterbodies will occur (irrespective of the Project).

The construction of the upper reservoir would also reduce the average annual number of flow days (from approximately 20% to 13% of the days of the year) in the Unnamed Tributary immediately downstream of the upper reservoir (Section 6.3.3).

Serious and Irreversible Impacts

Under the BC Act, a determination of whether an impact is serious and irreversible must be made for 'potential Serious and Irreversible Impact (SAII) entities' identified in the BAM-C. There are three potential SAII entities relevant to the Project, namely the Scrub Turpentine, Sooty Owl and Stuttering Frog.

The Project would result in the clearance of approximately (Appendix D):

- 217 Scrub Turpentine stems.
- 30 ha of Sooty Owl habitat.
- 67 ha of potential Stuttering Frog habitat.

Scrub Turpentine

Scrub Turpentine across NSW has become infected with 'Myrtle rust', an airborne fungal disease. The specimens of Scrub Turpentine in the Project Disturbance Footprint had variable levels of infection from Myrtle rust (Appendix D).

Sooty Owl

The Sooty Owl was recorded by GHD (2024b) within the Project Disturbance Footprint and it is expected the upper reservoir footprint forms part of the home range for a pair of Sooty Owls (Appendix D). The species polygon was prepared from a buffer of a potential hollow-bearing nest tree in the upper reservoir footprint observed to be used by the Sooty Owl (Appendix D).

Stuttering Frog

The Stuttering Frog was assumed present due to limited audio/visual surveys being undertaken for the Project as a result of issues with safe site access during optimal survey conditions (i.e. following rainfall) (Appendix D).

The current population of the Stuttering Frog north of the Hunter River is considered stable, however populations of the Stuttering Frog south of the Hunter River are declining. Populations north of the Hunter River (where the Project is located) are more robust and impacts are unlikely to be considered SAII (NSW DCCEEW, 2024b).

6.5.4 Mitigation Measures

Biodiversity Management Plan

A Biodiversity Management Plan would be prepared for the Project which would form a sub-plan of the CEMP and OEMP for the Project. The Biodiversity Management Plan would be informed by successful management measures implemented for the SMC.

Measures to mitigate impacts from the Project are outlined in Table 6-10 and include:

- Implementation of a Vegetation Clearance Protocol including delineation of areas to be cleared.
- Protocols developed for hygiene and biosecurity matters during construction and operation phases.
- Weed and pest management measures.
- Implementation of vehicle speed limits.
- Riparian vegetation monitoring and adaptive management.
- Rehabilitation of disturbed areas not affected by permanent works following construction.

SAII Targeted Management

In addition to the proposed Biodiversity Offset Strategy (Section 6.5.5), Yancoal commits to the following proposed mitigation and management strategies for SAII entities within the Project Disturbance Footprint.

Scrub Turpentine

The known population of the Scrub Turpentine is suffering from Myrtle rust disease. Surviving plants, if present outside of the Project Disturbance Footprint will likely continue to be subject to Myrtle rust disease (Appendix D). Accordingly, mitigation in the form of translocation is understood to be ineffective in the long-term.

If the Project is approved, Yancoal would contribute $250,000 to funding a recognised species recovery program for the Scrub Turpentine, such as those established by Saving Our Species.

Sooty Owl

The potential hollow-bearing tree observed to be used by the Sooty Owl in the upper reservoir footprint cannot be avoided for the Project. However, to preserve the habitat features of this tree (i.e. the hollow), Yancoal would relocate the hollow to a suitable area outside the Project Disturbance Footprint (Appendix D).

Yancoal would also install alternative habitat most appropriate to the species (e.g. artificial hollows) with the objective of achieving a net gain in habitat.

Table 6-10
Summary of Key Proposed Measures to Mitigate and Manage Residual Impacts

Mitigation Measures	Techniques	Timing	Frequency
Targeted SAII management	***Sooty Owl*** • To preserve the habitat features of the potential hollow-bearing tree observed to be used by the Sooty Owl in the upper reservoir footprint tree (i.e. the hollow), Yancoal would relocate the hollow to a suitable area outside the Project Disturbance Footprint. Relocation would be undertaken outside of the breeding period (March to September). • Alternative habitat most appropriate to the species (e.g. artificial hollows) would also be installed with the objective of achieving a net gain in habitat. • Ongoing monitoring of the relocated hollow and alternative habitat installations would be conducted to assess for signs of use and to inform changes where necessary. ***Scrub Turpentine*** • Yancoal would contribute $250,000 to funding a recognised species recovery program for the Scrub Turpentine, such as those established by Saving Our Species. ***Stuttering Frog*** • Nomination of a species expert and further investigation is proposed for this species to determine its occurrence within the Project Disturbance Footprint and the extent of potential impacts (if any).	Prior to and during construction.	Throughout the duration of construction and operations.
Vegetation Clearance Protocol	The Vegetation Clearance Protocol for the Project would include, but not be limited to: • staff and contractors involved in vegetation clearance works would be made aware of clearing limits; • clear delineation of areas to be disturbed prior to clearing activities (e.g. to ensure protection of retained vegetation within the Project Disturbance Footprint), disturbance boundaries would be digitally captured and displayed within the site survey and GIS databases. This data would be made available either digitally or in map format. Where native vegetation clearing is to be carried out on a campaign basis, then prior to each clearing campaign the area to be cleared would be identified and marked; • pre-clearance fauna surveys would be undertaken by a suitably trained and qualified ecologist or wildlife handler to: – avoid disturbance during breeding periods for relevant threatened species (e.g. Sooty Owl); – locate potential habitat features within proposed disturbance areas (such as hollows [e.g. habitat for threatened woodland birds, owls, arboreal mammals and bats]) that may require special management during clearing and/or can be salvaged (where practicable) for reuse in adjoining non-disturbed native vegetation areas;	Prior to and during vegetation clearing.	As required during construction and operations.

Table 6-10 (Continued)
Summary of Key Proposed Measures to Mitigate and Manage Residual Impacts

Mitigation Measures	Techniques	Timing	Frequency
Vegetation Clearance Protocol (continued)	– identify trees with actively nesting threatened birds; and – search for threatened species within areas of suitable habitat (particularly buildings for the presence of any microbat species); • a suitably trained and qualified ecologist or wildlife handler would be present during the clearing of identified habitat trees to manage animals that may be encountered during land clearing; • options to minimise harm to fauna by modifying the clearance method may include shaking or nudging tree trunks to evacuate mobile fauna lowering trees with suspected tree hollows being used by fauna with the hollow facing upwards to enable fauna to exit; • management of the Koala in consideration of the *Code of Practice for Injured, Sick and Orphaned Koalas* (OEH, 2011a); and • management of fauna may include relocating the individual to adjacent habitat or treating injuries as required.	Prior to and during vegetation clearing.	As required during construction and operations.
Pathogen/disease management	Pathogen/disease management for the Project with a focus on vehicle/machinery hygiene control to prevent bringing disease into the Project site and minimise spread of pathogens and disease within the Project site, as well as physical and/or chemical weed removal/control (including best practice ways for disposal of infected plants).	Within the first year of commencement of mining and ongoing throughout Project operations.	Throughout the duration of construction and operations.
Animal pest management	Pest animal control for the Project with a focus on pest species known to impact native flora and fauna.	Within the first year of commencement of mining and ongoing throughout Project operations.	Throughout the duration of construction and operations.
Vehicle speeds	Appropriate speed limits would be imposed on all vehicles using internal roads and access tracks to minimise chances of fauna vehicle strikes.	During operations.	Throughout the duration of construction and operations.
Edge effect management	Project design and disturbance area includes buffer areas around final infrastructure (e.g. Asset Protection Zones around the solar farm footprint, construction allowance around PHES) as a key mitigation for edge effects (including noise and light or erosion and sedimentation at the interface of intact vegetation and cleared areas).	During operations.	Throughout the duration of construction and operations.
Lowland Rainforest monitoring and adaptive management	Lowland Rainforest monitoring along the Unnamed Tributary between the upper reservoir and lower reservoir would be complemented by surface water monitoring (flow and quality) and adaptively managed based on a performance measure of no material change in distribution and composition of the Lowland Rainforest to be determined via baseline and ongoing monitoring.	During construction and operations.	Throughout the duration of construction and operations.

Source: Appendix D

Ongoing monitoring of the relocated hollow and alternative habitat installations would be conducted to assess for signs of use and to inform changes where necessary (Appendix D).

Stuttering Frog

The Stuttering Frog was assumed present (Appendix D) however there are currently no species experts accredited in the North East Region. Nomination of a species expert and further investigation is proposed for this species to determine its occurrence within the Project Disturbance Footprint and the extent of potential impacts (if any). If the species is present, surveys would also be used to determine habitat on Yancoal land outside the Project Disturbance Footprint to identify suitable offset areas, and/or management and mitigation.

6.5.5 Biodiversity Offset Strategy

Project Biodiversity Offset Strategy

The subsections below describe how the Project Biodiversity Offset Strategy addresses both NSW and Commonwealth biodiversity offset requirements.

NSW Offset

Tables 6-11 and 6-12 provides a summary of the ecosystem and species credits associated with the Project.

The NSW offset requirements for the Project would be addressed via one, or a combination, of the following:

- The retirement of biodiversity credits based on the like-for-like provisions in the NSW *Biodiversity Conservation Regulation 2017* (BC Regulation).
- The funding of a biodiversity conservation action.
- Undertaking ecological rehabilitation that creates the same ecological community or threatened species habitat.
- Payment into the Biodiversity Conservation Fund.

Commonwealth Offsets

Yancoal would address the Commonwealth offset requirement consistent with the NSW Biodiversity Offsets Scheme under the Bilateral Agreement which includes the BAM (DPIE, 2020d), the offset rules, the BC Regulation, and payments to the Biodiversity Conservation Trust (now referred to as Nature Markets and Offsets Division).

Yancoal would provide offsets for the following EPBC Act listed TECs and threatened species in accordance with the NSW Biodiversity Offsets Scheme (Appendix D):

- *Lowland Rainforest of Subtropical Australia* CEEC.
- *Subtropical Eucalypt Floodplain Forest and Woodland of the New South Wales North Coast and South East Queensland* EEC.
- Craven Grey Box (*Eucalyptus largeana*).
- Scrub Turpentine (*Rhodamnia rubescens*).
- Stuttering Frog (*Mixophyes balbus*).
- Giant Barred Frog (*Mixophyes iteratus*).
- Green and Golden Bell Frog (*Litoria aurea*).
- South-eastern Glossy Black-cockatoo (*Calyptorhynchus lathami lathami*).
- Masked Owl (*Tyto novaehollandiae*).
- Koala (*Phascolarctos cinereus*).
- Long-nosed Potoroo (*Potorous tridactylus*).
- Parma Wallaby (*Notamacropus parma*).
- Large-eared Pied Bat (*Chalinolobus dwyeri*).

Table 6-11
Project Ecosystem Credit Requirements

Plant Community Type	Total Credits
Ecosystem Credits	
Lower North Hinterland Riparian Dry Rainforest (PCT 3086 High)[1, 2]	88
Lower North Hinterland Riparian Dry Rainforest (PCT 3086 Moderate)[1, 2]	141
Northern Hinterland White Mahogany Moist Grassy Forest (PCT 3170 Moderate)	49
Lower North White Mahogany-Spotted Gum Moist Forest (PCT 3241 Moderate)	225
Lower North White Mahogany-Spotted Gum Moist Forest (PCT 3241 Low)	29
Lower North Spotted Gum-Mahogany-Ironbark Sheltered Forest (PCT 3244 High)	390
Lower North Spotted Gum-Mahogany-Ironbark Sheltered Forest (PCT 3244 Moderate)	869
Lower North Spotted Gum-Mahogany-Ironbark Sheltered Forest (PCT 3244 Low)	30
Northern Gorges Diverse Grassy Forest (PCT 3251 High)	174
Northern Gorges Diverse Grassy Forest (PCT 3251 Moderate)	304
Northern Gorges Diverse Grassy Forest (PCT 3251 Low)	29
Northern Gorges Diverse Grassy Forest (PCT 3251 Planted)	6
Northern Hinterland Grey Gum-Mahogany Grassy Forest (PCT 3252 Moderate)	81
Northern Hinterland Tallowwood-Forest Oak Grassy Forest (PCT 3254 Moderate)	15
Northern Hinterland Valleys Red Gum Grassy Forest (PCT 3329 High)[3]	8
Northern Hinterland Valleys Red Gum Grassy Forest (PCT 3329 Moderate)[3]	109
Northern Hinterland Valleys Red Gum Grassy Forest (PCT 3329 Low)[3]	21
Lower North Foothills Ironbark-Box-Gum Grassy Forest (PCT 3446 Moderate)	110
Lower North Riverflat Eucalypt-Paperbark Forest (PCT 4042 Moderate)[3, 4]	396
Lower North Riverflat Eucalypt-Paperbark Forest (PCT 4042 Low)[3, 4]	147
Lower North Riverflat Eucalypt-Paperbark Forest (PCT 4042 Planted)[3, 4]	9
Total Ecosystem Credits	**3,230**

1 *Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions* EEC, BC Act.

2 *Lowland Rainforest of Subtropical Australia* CEEC, EPBC Act.

3 *Subtropical Eucalypt Floodplain Forest and Woodland of the New South Wales North Coast and South East Queensland* EEC, EPBC Act.

4 *Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion* EEC, BC Act.

Table 6-12
Project Species Credit Requirements

Species	BC Act Status^	EPBC Act Status^	Total Credits
Species Credits			
Craven Grey Box (*Eucalyptus largeana*)*	E	E	92
Scrub Turpentine (*Rhodamnia rubescens*)*	CE	CE	651
Stuttering Frog (*Mixophyes balbus*)* (assumed present)	E	V	3,226
Giant Barred Frog (*Mixophyes iteratus*)* (assumed present)	V	V	224
Green and Golden Bell Frog (*Litoria aurea*)* (assumed present)	E	V	59
Green-thighed Frog (*Litoria brevipalmata*) (assumed present)	V	-	688
Stephen's Banded Snake (*Hoplocephalus stephensii*) (assumed present)	V	-	3,453
White-bellied Sea-eagle (*Haliaeetus leucogaster*)	V	-	336
South-eastern Glossy Black-Cockatoo (*Calyptorhynchus lathami lathami*)*	V	V	1,269
Sooty Owl (*Tyto tenebricosa*)	V	-	1,642
Masked Owl (*Tyto novaehollandiae*)* (assumed present)	V	V	968
Powerful Owl (*Ninox strenua*)	V	-	1,449
Brush-tailed Phascogale (*Phascogale tapoatafa*)	V	-	2,791
Common Planigale (*Planigale maculata*) (assumed present)	V	-	3,667
Koala (*Phascolarctos cinereus*)*	E	E	3,452
Squirrel Glider (*Petaurus norfolcensis*)	V	-	3,596
Long-nosed Potoroo (*Potorous tridactylus*)*	V	V	2,592
Parma Wallaby (*Notamacropus parma*)*	V	V	3,386
Large-eared Pied Bat (*Chalinolobus dwyeri*)*	E	E	5,091
Southern Myotis (*Myotis macropus*)	V	-	1,973
		Total Species Credits	**40,605**

* Community or species would be offset in accordance with the EPBC Act.
^ Conservation status listed under the BC Act and EPBC Act (current as at September 2024).

CE Critically Endangered; E Endangered; V Vulnerable.

6.6 AQUATIC ECOLOGY

Section Overview

- This section summarises potential impacts to aquatic ecology.
- An *Aquatic Ecology Assessment* was prepared by GHD (2024c) and is presented in Appendix E.
- Key legislation and guidelines considered were the FM Act, *Policy and guidelines for fish habitat conservation and management Update 2013, Guidelines for Controlled Activities on Waterfront Land* and *Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings*.
- Avoidance and minimisation of impacts for surface water (as described in the earlier section) are relevant to aquatic ecology.
- No threatened species under the FM Act (or aquatic EPBC Act listed species) were recorded for the Aquatic Ecology Assessment, consistent with previous studies for the SMC.
- Key mitigation, management and monitoring would be described in the *Biodiversity Management Plan*.

6.6.1 Methodology

The assessment of potential impacts on aquatic ecology draws on information and assessments in the following technical reports prepared for the Project:

- Surface Water Assessment (Appendix B).
- Groundwater Impact Assessment (Appendix C).

The Aquatic Ecology Assessment (Appendix E) was prepared in accordance with the SEARs as well as relevant legislative requirements under the EPBC Act and FM Act.

The Aquatic Ecology Assessment has also been informed by the following:

- *Policy and guidelines for fish habitat conservation and management Update 2013* (DPI, 2013).
- Database searches of the species occurring in the area, including the EPBC Act *Protected Matters Search Tool* (Cth DCCEEW, 2023a), *Fisheries NSW Spatial Data Portal* (DPI, 2022), *NSW BioNet Atlast Database* (NSW DCCEEW, 2024c) and Atlas of Living Australia.
- Fisheries Scientific Committee profiles for threatened aquatic ecological communities and *NSW Threatened Species Priorities Action Statements* (DECC, 2007b).
- *Manning River Water Quality and River Flow Objectives* (NSW Government, 2006).
- Previous aquatic ecology assessment undertaken for the Stratford Extension Project (frc environmental, 2012) and annual sampling undertaken by Invertebrate Identification Australasia (IIA) (IIA, 2013-2022).

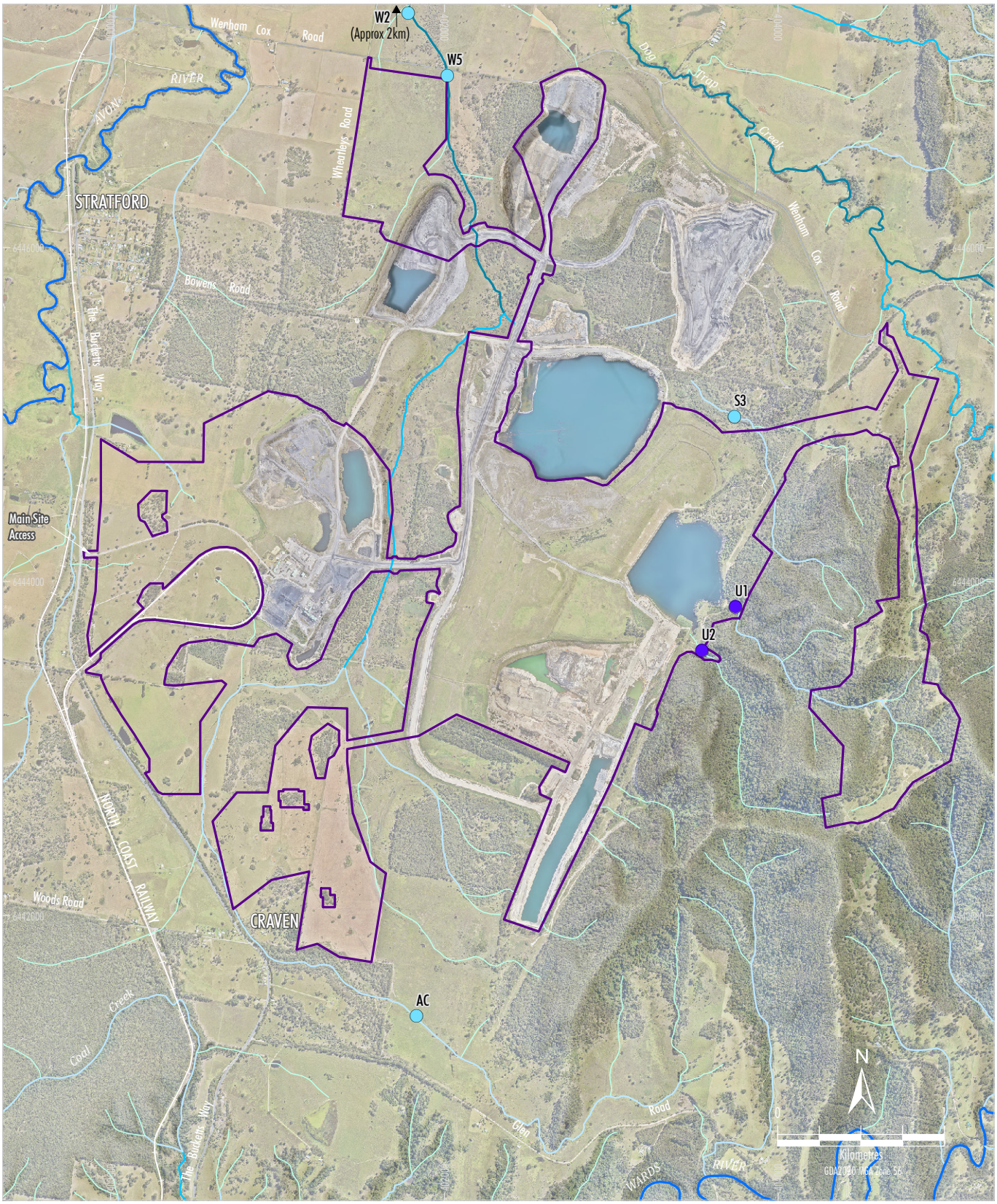
An aquatic ecology survey for the Project was conducted by GHD (2024c) between 2 and 7 June 2023 at the survey sites presented in Figure 6-17 and Table 6-13. The field survey included aquatic habitat assessment, water quality assessment, macroinvertebrate sampling and fish surveying (Appendix E).

Table 6-13
Aquatic Ecology Survey Sites (June 2023)

Site	Site Description	Date Sampled
U1	Unnamed tributary 1, the ephemeral waterway between the upper reservoir and lower reservoir.	5 June 2023
U2	Unnamed tributary 2, the ephemeral waterway downstream of the upper reservoir spillway.	7 June 2023
AC	Avondale Creek, upstream of the Solar Farm.	6 June 2023
S3	Unnamed tributary of Avondale Creek, downstream of lower reservoir.	6 June 2023
W5	Avondale Creek, downstream of the Solar Farm.	6 June 2023
W2	Avon River, downstream of the Project, and upstream of Dog Trap Creek confluence.	2 June 2023

Source: Appendix E.

The aquatic habitat assessment identified the existing ecological value, different habitat types, sensitive key fish habitats present and channel form (as well as other features to identify habitats that may be lost or created by the Project) (Appendix E).



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LEGEND

Project Disturbance Footprint

Aquatic Ecology Monitoring

Lowland sites (≤ 150 m)

Upland sites (> 150 m)

Strahler Stream Order

1st Order

2nd Order

3rd Order

4th Order

5th Order

Source: NSW Spatial Services (2023); Yancoal (2023)

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Aquatic Ecology Monitoring Sites

Figure 6-17

Site based water quality sampling was also conducted to record temperature, pH, EC and dissolved oxygen content to characterise the habitat quality. Water samples for each site were analysed at a National Association of Testing Authorities accredited laboratory for additional parameters to provide an index of habitat condition, enabling a comparison of the aquatic habitat quality between sites (Appendix E).

Macroinvertebrates were sampled following Rapid Biological Assessment protocols in accordance with the *New South Wales (NSW) Australian River Assessment System (AUSRIVAS) Sampling and Processing Manual 2004* (Turak et al., 2004) (Appendix E).

Macroinvertebrates were identified using published taxonomic keys (Hawking, 2000), unpublished working keys and an extensive specimen reference collection maintained by GHD.

Fish surveys were undertaken using electrofishing, in accordance with the *Australian Code of Electrofishing Practice* (NSW Fisheries, 1997) and Environmental DNA (eDNA). Samples for eDNA analysis was undertaken by accredited eDNA laboratory technicians.

6.6.2 Existing Environment

Aquatic Ecology

Aquatic Habitat

The lowland (less than 150 m altitude) areas around the existing SMC have been disturbed for mining and agricultural land use. Numerous ephemeral watercourses run through or around the boundary of the Project site, ranging from first to fourth order streams. The waterways are generally in poor condition (Appendix E).

'Key fish habitat' is referred to as aquatic habitats that are important to the maintenance of fish populations and the survival and recovery of threatened aquatic species (Appendix E).

The 'key fish habitat' in the lowland waterways is generally of low to moderate sensitivity, with low occurrence of instream aquatic plants (macrophytes) and very infrequent snags (logs or large branches) due to the limited riparian woody vegetation (Appendix E).

Fringing macrophyte such as sedges are common around dams and more permanent pools on waterways.

Riparian Corridor Protection Zones

Riparian vegetation is considered part of 'key fish habitat' under the *Policy and guidelines for fish habitat conservation and management Update 2013* (DPI, 2013). Riparian Corridor Protection Zones (Figure 6-9), with appropriate buffers, would be implemented where relevant (Section 6.3.3).

Project Survey Results

During the June 2023 survey, water in the lowland streams of the Project area was largely shallow (less than 0.5 m deep and often less than 0.3 m deep) and narrow (less than 1 m wide) (Appendix E).

Avondale Creek sites (Sites AC and W5) showed isolated pools and slow flowing water. Fish passage in Avondale Creek and its tributaries had restricted passage, with potential for improved passage during wetter periods (Appendix E).

The Avon River (Site W2), downstream of the Project site, exhibited greater ecological value with deeper pools (approximately 1.5 to 2 m), well defined banks with riparian vegetation, snags and more variable substrate and flow conditions (Appendix E).

Farm or mine dams currently present are mostly off-river dams (Appendix E). Many of the mine dams would be decommissioned as part of the SMC closure activities, irrespective of the Project.

The key 'upland waterways' in the Project include the two steep, ephemeral tributaries that drain from the upper reservoir footprint, referred to as Unnamed tributary 1 (downstream of the upper reservoir dam wall) and Unnamed tributary 2 (downstream of the upper reservoir spillway).

Both tributaries drain to a terminal pool, which has been constructed as part of the SMC clean water diversion, which directs water north around the Stratford East Dam to the Unnamed tributary of Avondale Creek (e.g. Site S3). Unnamed tributary 2 (e.g. Site U2), a first order stream, does not provide fish habitat as there is not sufficient pooled water. Unnamed tributary 1 (Site U1), while shallow and steep, provides habitat for aquatic invertebrates, although not for fin fish (Appendix E).

Threatened Aquatic Ecology

Terrestrial crayfish (*Euastacus maccai)* were observed in an area of the upper reservoir footprint. Terrestrial crayfish (*Euastacus maccai*) are not listed as threatened under the FM Act or EPBC Act. A spiny crayfish (Genus *Euastacus*) was also observed within the upper reservoir footprint. It was confirmed that the observed *Euastacus* species is not any of the crayfish species listed under the FM Act or EPBC Act (Appendix E).

No threatened aquatic fauna listed under the FM Act or EPBC Act were observed during the baseline fish surveys conducted for the Project in June 2023, or in previous monitoring undertaken for the Stratford Extension Project (frc environmental, 2012) (Appendix E).

There is some suitable habitat (slow flowing, relatively shallow water with macrophytes) for the Southern Purple Spotted Gudgeon (*Mogurnda adspersa*) (a fish species that is listed as Endangered under the FM Act) in the lowland waterways including Avondale Creek, however no specimens were recorded for the Project (Appendix E).

6.6.3 Potential Impacts

No threatened species listed under the FM Act, BC Act or EPBC Act were recorded. All aquatic flora and fauna species detected in the vicinity of the Project during surveys are common to the region.

The Project is expected to have negligible impacts on aquatic ecology at a regional scale (Appendix E).

Riparian Vegetation

Due to the implementation of Riparian Corridor Protection Zones proposed by Yancoal, there would not be any significant removal of riparian vegetation from key fish habitat areas during construction of the Project (Appendix E).

Proposed fencing of the Riparian Corridor Protection Zones where the solar panels are setback from areas of Avondale Creek is expected to improve conditions in the waterways through exclusion of stock (where present) and associated improvements in riparian vegetation, bank stability and water quality.

Further discussion of riparian zones and waterfront land is provided in Section 6.3.3.

Fish Habitat

Construction of the PHES would result in the loss of habitat for the terrestrial crayfish (*Euastacus maccai* and Genus *Euastacus*) in the upper reservoir footprint (Appendix E).

The Solar Farm is not expected to impact on the water quality of lowland waterways providing key fish habitat, with the implementation of erosion and sediment control measures to control potential erosional risks during construction and operation (Appendix B).

6.6.4 Avoidance, Mitigation and Management

Potential impacts to aquatic ecosystems would be avoided, mitigated and managed by the following key design measures (Appendix E):

- Water for the PHES would be sourced from water stored in SMC mine voids, with no extraction from natural waterways.
- The PHES would be a closed system during normal operations, with no requirement to discharge to waterways in the lowland area to maintain the PHES water balance.
- The clean water diversion around the lower reservoir would minimise changes to downstream surface water flows.
- Erosion and sediment controls would be implemented during construction.
- Solar panels would be setback from streams with catchment upslope of the Project.
- Riparian Corridor Protection Zones would be implemented, including revegetation works in riparian zones.
- Fencing along portions of Avondale Creek immediately adjacent the Project Disturbance Footprint.

A Biodiversity Management Plan and Surface Water Management Plan would be prepared for the Project as part of the CEMP, which would outline measures to manage potential impacts to aquatic ecology.

6.7 ABORIGINAL HERITAGE

Section Overview

- This section summarises consultation undertaken with RAPs and potential impacts to Aboriginal heritage and cultural values.
- An ACHA (and Cultural Values Assessment) was prepared by Niche (2024a) in consultation with RAPs, and is presented in Appendix F.
- Key guideline considered was the *Aboriginal cultural heritage consultation requirements for proponents 2010*.
- Avoidance and minimisation of impacts includes the avoidance of a Potential Archaeological Deposit within the Solar Farm footprint, and avoidance of direct disturbance to a potential location of cultural significance known as CTS-1.
- There would be direct impact to four Aboriginal cultural heritage sites of low scientific (archaeological) significance, with surface salvage collection to be undertaken prior to disturbance.
- Ongoing engagement with the Aboriginal community would continue over the life of the Project.
- Key mitigation, management and monitoring would be described in a *Heritage Management Plan*.

6.7.1 Methodology

The ACHA has been undertaken in accordance with the SEARs for the Project, the NPW Act, the NPW Regulation and the following guidelines:

- *Aboriginal cultural heritage consultation requirements for proponents 2010* (DECCW, 2010a) (the Consultation Requirements);
- *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW, 2010b);
- *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (OEH, 2011b);
- *NSW Minerals Industry Due Diligence Code of Practice for the Protection of Aboriginal Objects* (NSW Minerals Council, 2010); and
- *The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance* (Australia International Council on Monuments and Sites [ICOMOS], 2013).

Aboriginal Cultural Heritage Assessment

The ACHA (Appendix F) incorporates relevant information from previous assessments, the results of field surveys undertaken for the Project and consultation with the Aboriginal community, including:

- results from field work and investigations previously undertaken by archaeologists and representatives of the Aboriginal community;
- search results from the Aboriginal Heritage Information Management System (AHIMS) database and other heritage searches;
- results of archaeological and cultural surveys conducted by archaeologists and representatives of the Aboriginal community for the Project in November 2023;
- a consultation program undertaken for the Project; and
- outcomes of consultation with the Aboriginal community regarding archaeological and cultural values as part of the ACHA, as well as previous investigations.

6.7.2 Existing Environment

Aboriginal History

The Project is located within the administrative boundaries of the MidCoast Council LGA, the Forster Local Aboriginal Land Council (LALC) and within the traditional country of the Worimi and Birpai people (Appendix F).

The Birpai tribe occupied the area from the mouth of the Manning River at Taree and inland to near Gloucester. The Worimi tribe were located from the Hunter River to Forster near Cape Hawke along the coast, at Port Stephens and inland to near Gresford (Appendix F).

From historical literature, there is evidence of contact between Aboriginal groups living in the region. Wafer and Lissarrague (2008) provide descriptions of regular gatherings, and inter-tribal participation, with alliances with other clans and language groups being maintained through a system of regulated movement for ceremonial, ritual and trading purposes.

Leon and Feeney (1998) indicate that the Worimi people had a distinctive way of life and periodically visited the coast, which corresponded with seasonal movements of seafood. The Worimi people also attended various locations for ceremonial purposes. Natural stone material used for manufacturing tools was obtained within the Worimi area and also through trade with neighbouring tribal groups (Leon and Feeney, 1998).

Natural Resources

Water sources were available to Aboriginal groups in the drainage lines and creeks located within and surrounding the Project area, with permanent water (i.e. Avon River) located to the west of the Project area.

Variable climatic conditions affected the availability of water and may have subsequently influenced the way Aboriginal people moved through the landscape over time.

Transitory movement throughout the region also included the rugged foothills of what is now called the Great Dividing Range, the lower bush-covered hills, and the open woodland of the Gloucester Valley (Appendix F). These various environments and vegetational communities contained a number of floral species that would have been utilised by Aboriginal peoples both for food as well as to fulfil social and cultural needs.

Previous Archaeological Investigations

A number of Aboriginal cultural heritage surveys, assessments and salvage programs have previously been undertaken within the Project area and surrounds associated with the SMC. An Aboriginal cultural heritage survey and assessment was undertaken for the Stratford Extension Project by Kayandel Archaeological Services (Kayandel) (2012). Various other minor surveys and assessments have also been undertaken to support ongoing exploration and other ancillary works associated with the SMC.

A detailed description of previous archaeological assessments and surveys undertaken within the Project area and surrounds is provided in Appendix F.

Heritage Register Searches

Searches of the following heritage registers and planning instruments were undertaken in relation to the Project:

- AHIMS database;
- Australian World Heritage Database;
- Commonwealth Heritage List and National Heritage List;
- NSW State Heritage Register and State Heritage Inventory;
- Native Title Register; and
- Gloucester, Great Lakes and Greater Taree LEPs.

Community Consultation

Consultation with RAPs regarding the Project to date has involved various methods including public notices, meetings, written and verbal correspondence, archaeological survey attendance and site inspections (Appendix F).

Consultation for the Project was undertaken in accordance with the Consultation Requirements and the NPW Regulation.

A total of 23 RAPs registered an interest and were consulted in relation to the Project ACHA. A detailed account of the consultation process for the Project is provided in Appendix F.

Table 6-14 summarises the main stages of the ACHA consultation process undertaken for the Project.

Subject Area

The Proposed Methodology for the Project ACHA defined a Subject Area, which was determined on the basis of a preliminary project design.

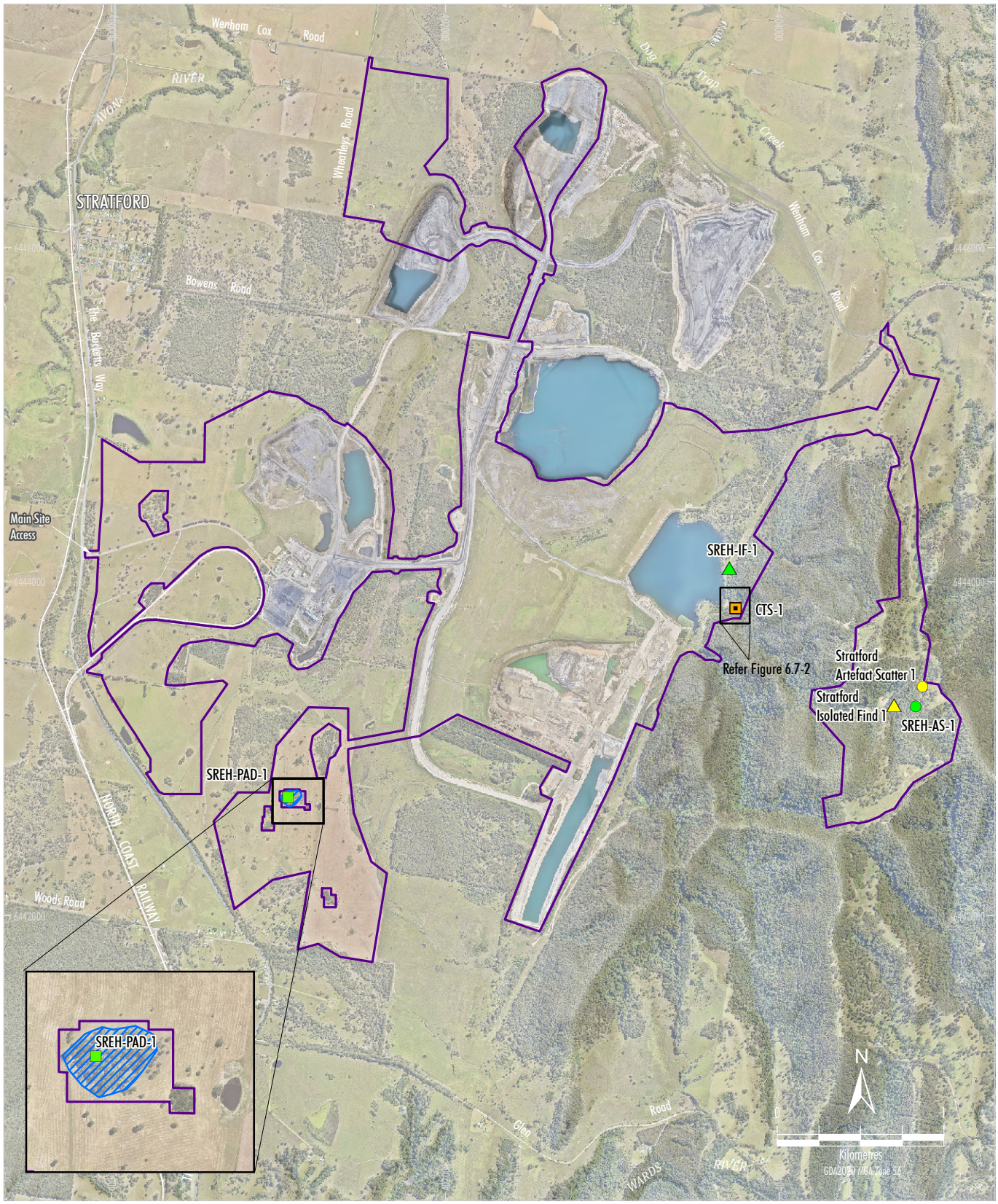
As a result of the detailed design and consideration of avoidance and mitigation measures, a surface disturbance footprint was prepared for the Project (Project Disturbance Footprint) (Figure 6-18). The Project Disturbance Footprint is contained wholly within the Subject Area.

Potential impacts in the Project Disturbance Footprint were assessed in the ACHA.

Table 6-14
Summary of Aboriginal Heritage Consultation Undertaken for the Project

Date	Consultation
Notification of the Project and Registrations	
9 June 2023	Letters requesting the names of Aboriginal parties or groups that may be interested in registering for the consultation process were sent to Heritage NSW, National Native Title Tribunal, Native Title Services Corporation Limited (NTS Corp), Office of the Registrar (*Aboriginal Land Rights Act 1983*), MidCoast Council, Forster LALC and Hunter Local Land Services (LLS), in order to identify Aboriginal stakeholders.
9 June 2023	Responses to the above request were received from NTS Corp, Heritage NSW, Office of the Registrar and Hunter LLS.
14 June 2023	A public notice was placed in the Gloucester Advocate and Koori Mail inviting interested Aboriginal parties or groups to register for the Project ACHA.
26 June 2023	Letters seeking registrations of interest were sent to the Aboriginal stakeholders identified by the above step.
26 June 2023	Letters were also provided to all Aboriginal stakeholders who had previously registered an interest in the existing SMC and closed Duralie Coal Mine advising of automatic registration for the consultation process.
July 2023	A total of 23 organisations and/or individuals were registered as RAPs for the Project following completion of the registration period (June 2023 to July 2023).
31 July 2023	A record of names of Aboriginal stakeholders was provided to Heritage NSW and the Forster LALC in accordance with the Consultation Requirements (apart from the Aboriginal stakeholders who requested that their contact information not be provided).
Proposed Methodology Review	
6 September 2023	The Proposed Methodology for undertaking the ACHA was distributed to the RAPs for comment.
October 2023	Feedback from the RAPs in regard to the Proposed Methodology was received, and consideration was given to all comments
2 November 2023	A face-to-face Project Information Session was held at the SMC Site Office with representatives of SCPL, Yancoal and RAPs.
Field Surveys	
9 October 2023	An invitation to participate in the field surveys for the Project was distributed to RAPs. The invitation explained that participation in surveys would be subject to provision of an Expression of Interest form and holding applicable insurance details.
13 to 21 November 2023	Aboriginal cultural heritage surveys were undertaken by archaeologists from Niche accompanied by RAPs and their representatives. The cultural significance of the Subject Area and the identified Aboriginal heritage sites was discussed with the RAPs and representatives.
Draft ACHA Review, Information Sessions and Site Inspection	
28 May 2024	A copy of the draft ACHA was provided to all RAPs for their review and comment. The draft ACHA included outcomes of field surveys, archaeological and cultural significance assessment (based on feedback received during consultation and fieldwork), consideration of potential impacts and proposed mitigation and management measures. Feedback was requested by 26 June 2024.
4 June 2024	An invitation (distributed with the draft ACHA) was provided to all RAPs to attend an information session on 4 June 2024 to discuss the findings, provide any information on cultural knowledge and/or significance, and provide an opportunity to comment on the draft ACHA.
26 June 2024	All comments received on the draft ACHA were considered and included in the final ACHA (Appendix F).

Source: Appendix F



LEGEND

Project Components

- Project Disturbance Footprint

Previously Recorded Aboriginal Cultural Heritage Site

- Artefact Scatter
- Isolated Find

Newly Recorded Aboriginal Cultural Heritage Site

- Artefact Scatter
- Isolated Find
- Potential Archaeological Site
- Potential Archaeological Site Extent

Potential Site

- Potential Cultural Heritage Site

Source: NSW Spatial Services (2023); Yancoal (2023); Niche (2024)

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Location of Extant Aboriginal Cultural Heritage Sites within the Project Disturbance Footprint

Figure 6-18

Survey Methodology

Archaeological surveys for the Project were undertaken in November 2023, including participation from RAPs. The archaeological and cultural surveys were informed by the archaeological predictive model and were undertaken to ground truth sites previously recorded in addition to identifying new sites (Appendix F). Areas subject to existing and approved disturbance as part of the SMC were excluded from the archaeological survey.

During the survey and throughout the consultation process, representatives of RAPs were asked to identify any areas of cultural significance within the Project Disturbance Footprint and wider ACHA Subject Area or any cultural values relevant to the area. All cultural comments relating to the Subject Area and/or the wider region were recorded and are included in Appendix F.

Summary of Archaeological Findings

As a result of the field survey, a total of two previously recorded Aboriginal cultural heritage sites were identified within the Project Disturbance Footprint, and three newly recorded Aboriginal cultural heritage sites (Appendix F) (Figure 6-18).

Four sites were assessed as low archaeological (scientific) significance (Appendix F). One site (a PAD which would be avoided by the Project) was assessed as unknown archaeological (scientific) significance due to the absence of test excavations which were deemed not necessary as the Project would avoid direct disturbance (Appendix F).

A detailed description of each Aboriginal heritage site identified in the ACHA is provided in Appendix F.

Overall, Niche (2024a) concluded that the findings of the ACHA demonstrate that the Project area was only use for transient occupation (i.e. temporary settlements).

6.7.3 Cultural Values

Niche (2024a) describes the cultural values of the Subject Area, including the spiritual connection held by Aboriginal people to Country through tangible and intangible values.

Previous consultation with the Aboriginal community undertaken as part of the Stratford Extension Project ACHA (Kayandel, 2012) had noted a possible women's site within the Subject Area. Kayandel (2012) notes that female RAPs who visited the site, referred to as CTS-1, verbally confirmed its significance. Other Aboriginal stakeholders who later visited the area provided the following written conclusion (Kayandel, 2012):

> *After an extensive assessment of the site, we conclude that the natural springs contained within the site are alongside the walking path of the local traditional peoples and would have been used as a clean water source.*
>
> *We found no psychological or physical evidence to support the claim that the area was a traditional women's birthing site or contained any further cultural significance other than that listed above.*

As no definitive position was reached regarding the cultural significance of CTS-1, SCPL adopted a conservative management approach by restricting access to the area including an exclusion buffer zone (Appendix F).

As part of the ACHA and Cultural Values Assessment process, Niche (2024a) sought feedback from the Aboriginal community, particularly regarding potential cultural values of the Subject Area. No written feedback was provided from RAPs.

Further, feedback was sought from Elder women regarding the cultural significance of CTS-1. Due to continuous wet weather making the location inaccessible, a site visit has not been undertaken, however verbal feedback from some of the Elder women indicated CTS-1 as being culturally significant (Appendix F).

6.7.4 Potential Impacts

Direct Impacts to Archaeological Sites

Sites located within the Project Disturbance Footprint have the potential to be totally or partially impacted by the Project (Appendix F).

The Project would result in direct disturbance (associated with the construction of the upper and lower reservoirs) of two previously recorded sites, comprising one artefact scatter and one isolated find, and two newly recorded sites, comprising one artefact scatter and one isolated find (Figure 6-18). All four sites are of low archaeological (scientific) significance.

The third newly recorded site is a PAD, which would be wholly avoided by the Project Disturbance Footprint. The extent of the PAD was determined based on its location within a small, elevated portion of grazed paddock comprising juvenile and mature trees which were likely left in-situ to provide shelter for livestock. The PAD is located in context with a stand of trees and intact soil profile which hold the potential for subsurface archaeological material (Appendix F). The Project would avoid direct impacts to the PAD, as shown on Figure 6-18.

Indirect Impacts

No other known Aboriginal cultural heritage sites would be indirectly impacted as a result of the Project.

CTS-1

The Project would avoid direct disturbance of CTS-1 and the existing exclusion buffer zone (Figure 6-19). It is noted that the Project would involve additional development in relatively close proximity to CTS-1, which may affect the amenity of the site and its connection to the cultural landscape.

Cumulative Impacts

A consideration of the potential cumulative impacts associated with the Project, including the existing SMC and other surrounding operations, has been undertaken and is presented in Appendix F.

The Project would not cause a loss of heritage resources that could be viewed as being very rare or unique or unlikely to exist elsewhere (Appendix F). Therefore, Niche (2024a) concluded that the Project would not result in any significant cumulative impact on Aboriginal heritage in the region.

6.7.5 Mitigation Measures

The mitigation, management and monitoring measures detailed below have been developed in consultation with the Aboriginal community, in consideration of the cultural and archaeological significance of the Aboriginal heritage sites predicted to be impacted, and the cultural significance of the area.

Niche (2024a) has developed recommended management measures for each known Aboriginal heritage site proposed to be impacted by the Project.

Yancoal would implement the management and mitigation measures described in Appendix F, which were described in the draft ACHA provided to RAPs for comment and are consistent with the protocols that have been agreed to and implemented for the SMC (SCPL, 2022b).

Aboriginal Heritage Management Plan

An Aboriginal Heritage Management Plan would be developed for the Project which would incorporate the Project ACHA recommended mitigation and management measures for the sites identified within the Project Disturbance Footprint, in consultation with RAPs and the NSW DCCEEW (Environment and Heritage Group), and any requirement of the Project Infrastructure Approval.

Surface Disturbance

For those areas where Aboriginal heritage sites would be subject to direct surface disturbance as a result of the Project, surface collection and salvage works prior to disturbance has been recommended by Niche (2024a) (Appendix F).

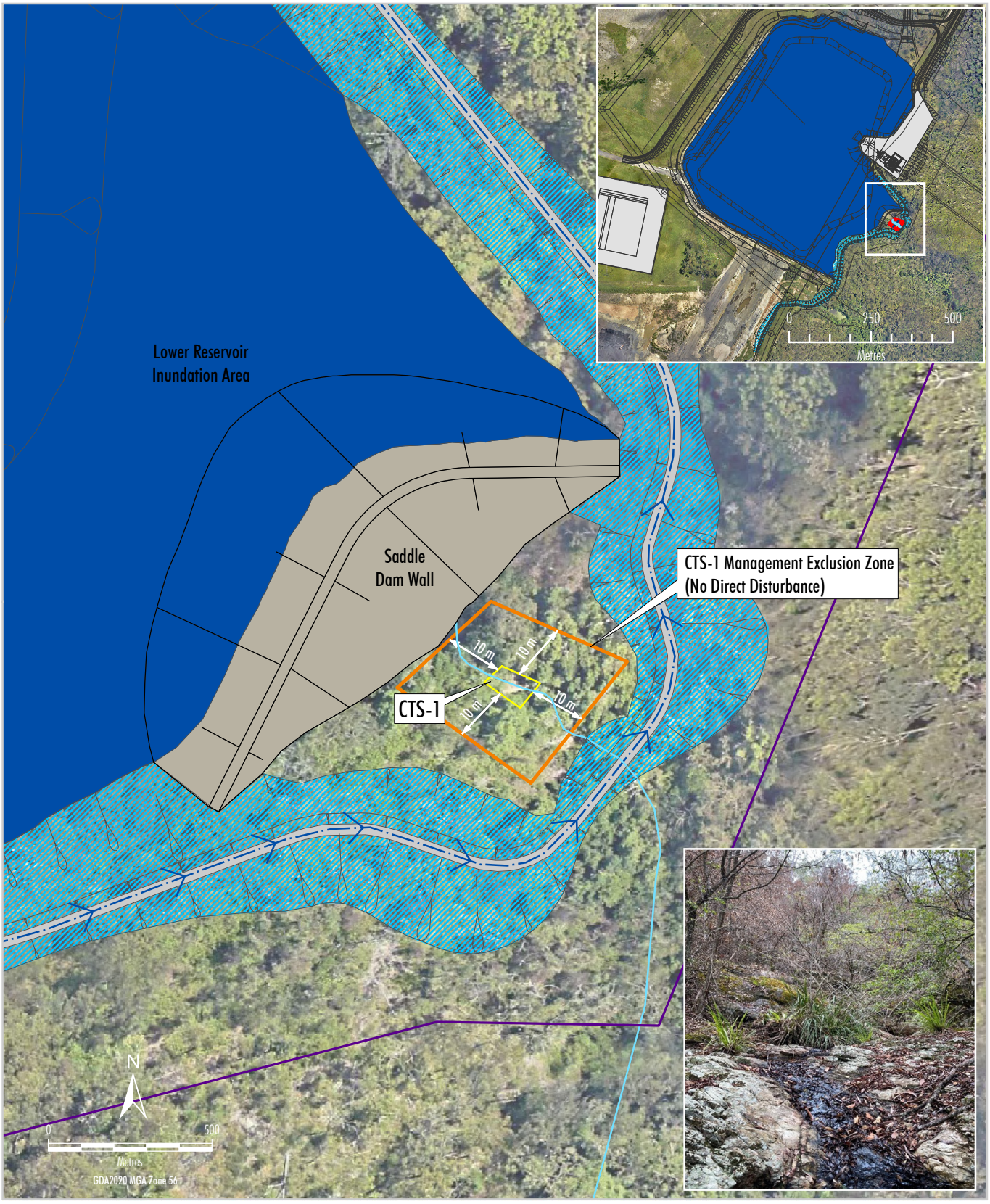
No-Construction Zone

Temporary high visibility fencing around the PAD extent would be installed as recommended by Niche (2024a) to highlight that no construction works are to occur in this area.

CTS-1

As described within the ACHA, further consultation with the Aboriginal community is recommended to determine the cultural significance of CTS-1. A site visit to the location by the Elder Aboriginal women and qualified archaeologists would be coordinated once weather and site access permits, to better inform recollection of the area and cultural significance of the site.

The existing exclusion buffer zone is to be maintained to avoid direct disturbance to CTS-1. If deemed to be culturally appropriate, photographic recording of this site is recommended as part of the Aboriginal Heritage Management Plan.



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LEGEND

- Project Disturbance Footprint
- Clean Water Diversion
- Area Available for Erosion and Sediment Control

Source: Orthophoto - Yancoal (2021); NSW Spatial Service (2023)

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CTS-1 Avoidance Measures

Figure 6-19

General Measures

Where surface collection and salvage works are not applicable, a number of general measures have been formulated in consultation with RAPs to mitigate impacts, including (Appendix F):

- Ongoing consultation with RAPs over the life of the Project, including Aboriginal representation during archaeological fieldwork (i.e. salvage of artefacts prior to disturbance).
- In the event that previously unknown Aboriginal object(s) and/or sites, or suspected human remains are encountered during construction, all work in the area that may cause further impact must cease immediately and the procedure detailed in Appendix 4 of the ACHA would be followed.
- Long-term storage of any artefacts located during the surface salvage process would be discussed with all of the RAPs prior to the salvage being undertaken. The long-term disposition of collected artefacts may include reburial onsite or may be managed under a Care and Control Agreement under section 85A(1)(c) of the NPW Act.

6.8 HISTORIC HERITAGE

Section Overview

- This section summarises potential impacts to non-Aboriginal heritage.
- A HHA was prepared by Niche (2024b) and is presented in Appendix G.
- Key legislation considered was the *Heritage Act 1977*.
- No known sites of historic (non-Aboriginal) significance would be impacted by the Project.

6.8.1 Methodology

The assessment prepared by Niche (2024b) (presented in Appendix G) takes into consideration the principles and articles contained in (but not limited to):

- *The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance* (Australia ICOMOS, 2013).
- *NSW Heritage Manual* (Department of Urban Affairs and Planning, 1996).
- *Assessing heritage significance: Guidelines for assessing places and objects against the Heritage Council of NSW criteria* (DPE, 2023c).
- *Guidelines for preparing a statement of heritage impact* (DPE, 2023d).
- *Assessing Significance for Historical Archaeological Sites and 'Relics'* (Department of Planning, 2009).

6.8.2 Existing Environment

Historical Overview

The Project area was part of a very large land grant held from the early 19th Century by the Australian Agricultural Company that extended from Port Stephens to the Manning River (Appendix G).

Stratford (immediately west of the Subject Area) was established following the auction of the southern section of the Gloucester Estate Company purchase (the Avon Subdivision). In 1903, the first 37 lots were auctioned in Stroud together with 26,000 acres of farming land in the upper Avon (Appendix G). Stratford subsequently doubled in size in 1905-1906. The railway line and the railway station at Stratford opened in 1913.

The establishment of Craven was heavily influenced by the ability to export timber using the newly constructed railway. The first settlers in Craven bought three blocks totalling 450 acres from the Gloucester Estate Company in 1906. The Sydney-based timber company, Allen Taylor & Co Ltd was the first to begin operations at Craven with the Craven Mill becoming operational in 1914 (Appendix G). Ten cottages were constructed to house mill workers, forming the core of Craven.

Further discussion on the early European settlement and the pastoral history of relevance to historic items in the vicinity of the Project is provided in Appendix G.

Heritage Register Searches

A review of the heritage registers listed in Section 6.7.2 (as well as the Former Register of the National Estate) for listed historical heritage items located within the vicinity of the Project was undertaken by Niche (2024b).

Previous Investigations

A Non-Aboriginal Heritage Assessment was undertaken by Heritage Management Consultants (2012) for the Stratford Extension Project. The assessment identified five items of local significance and seven items of no heritage significance within and adjacent to the Project area.

Project Investigation

Following a desktop assessment and review of the outcomes of previous investigations, a site investigation was conducted by Niche in November 2023 across areas of the Project Disturbance Footprint that have not been previously disturbed by existing SMC operations (i.e. the approved SMC surface disturbance extent was excluded from the survey area).

The site investigation focused on locating and characterising previously identified historic heritage items, as well as identification of any additional potential heritage sites.

Places Identified During the Study

As a result of the heritage register searches, previous historic heritage investigations and the site investigation undertaken for the Project, one newly recorded identified place (SREH_1 Farm Structure) was noted within the Project Disturbance Footprint (Figure 6-20). Niche (2024b) determined that SREH_1 Farm Structure is not of heritage significance and therefore does not meet the criterion for local or State significance.

A previously recorded place (Cottage and Dairy Complex) by Heritage Management Consultants (2012) is located within the Project Disturbance Footprint. This place was noted by Heritage Management Consultants (2012) as not of heritage significance. Although approved for disturbance, due to changes in mine planning, the Cottage and Diary Complex has not been disturbed and currently exists in the north-western extent of the Project Disturbance Footprint (Figure 6-20). Niche (2024b) confirmed this site as having no heritage significance and therefore does not meet the criterion for local or State significance.

The Glen Craven Logging Tramline has been previously assessed by Heritage Management Consultants (2012) as locally significant and is currently listed on the Gloucester LEP (Niche, 2024b). The Glen Craven Logging Tramline is located outside the Project Disturbance Footprint as shown on Figure 6-20.

6.8.3 Potential Impacts

Potential Direct Impacts

Neither the SREH_1 Farm Structure nor the Cottage and Dairy Complex are of heritage significance (Niche, 2024b).

The Glen Craven Logging Tramline is located outside the Project Disturbance Footprint and would not be impacted by the Project.

Potential Indirect Impacts

Due to distance of the Project from the Glen Craven Logging Tramline and intervening vegetation and landforms, there would be limited potential visual indirect impacts on the heritage values of the Glen Craven Logging Tramline (Niche, 2024b).

Cumulative Impacts

No significant impacts to historic heritage in the region are expected when the Project is considered cumulatively with the existing SMC and other projects in the region.

Statement of Heritage Impact

Niche (2024b) concluded:

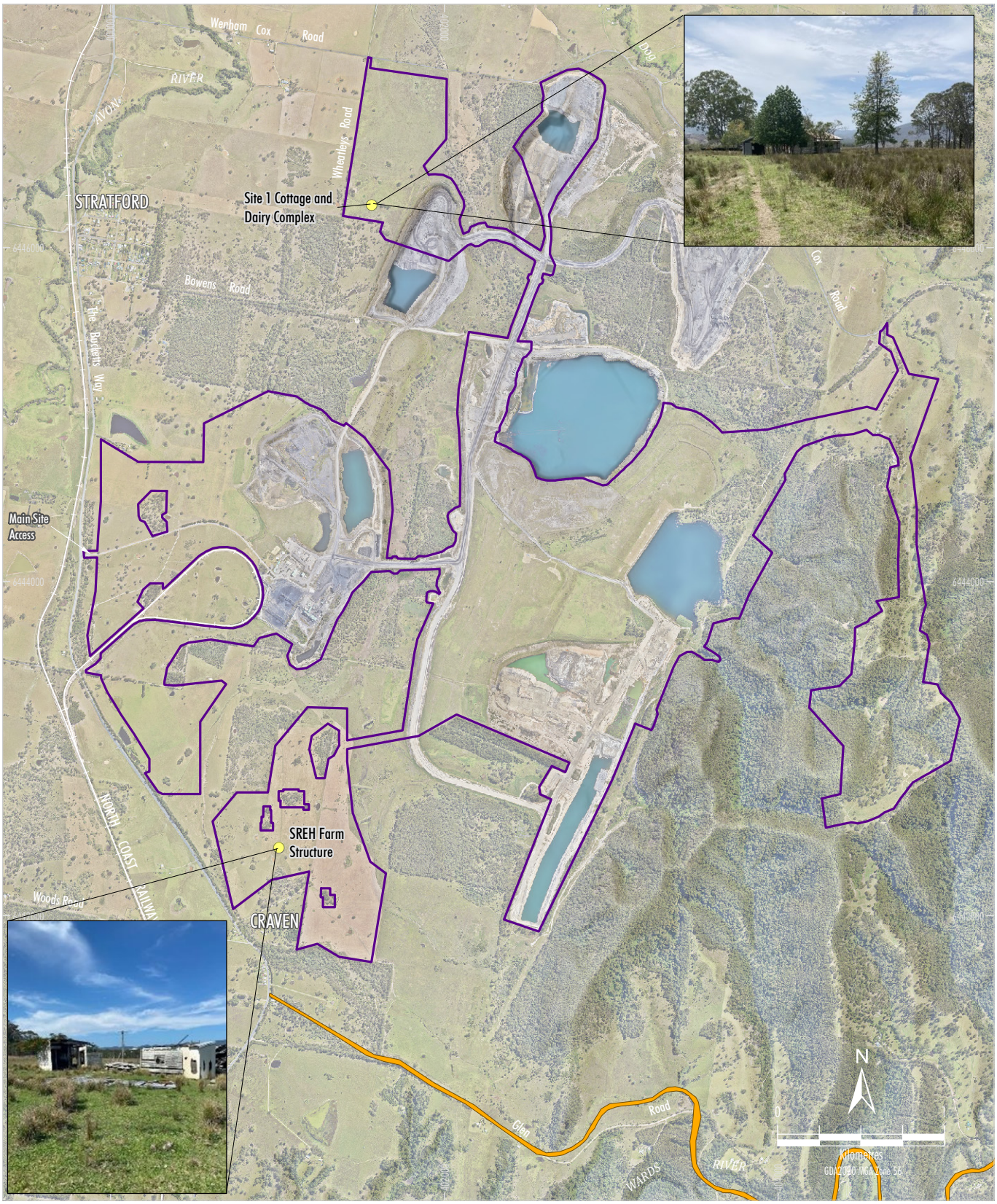
> *Through the examination of the history associated with the Subject Area, physical inspection of the site, and analysis of the cultural heritage values of the site, this assessment has identified no additional sites of historical heritage value at the State or local level.*

6.8.4 Management Measures and Monitoring

Niche (2024b) detailed an unexpected finds protocol (Appendix 1 of Appendix G) to be followed in the event that unexpected historic heritage, including archaeological relics, is discovered during work associated with the Project.

It is recommended by Niche (2024b) that any future works in the vicinity of the Glen Craven Logging Tramline be reviewed to ensure the mapped alignment of the site is avoided.

No management or mitigation measures are recommended for the SREH_1 Farm Structure or Cottage and Diary Complex located within the Project Disturbance Footprint.



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LEGEND

- Project Disturbance Footprint
- Noted Place Identified (No Historic Significance)
- Glen/Craven Logging Tramline (MidCoast LEP)

Source: NSW Spatial Services (2023); Yancoal (2023)

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Location of Places Identified within the Project Disturbance Footprint

Figure 6-20

6.9 ROAD TRANSPORT

Section Overview

- This section summarises potential impacts to the safety and efficiency of the public road network.
- A *Road Transport Assessment* was prepared by TTPP (2024) and is presented in Appendix H.
- Key guidelines considered were the *Guide to Traffic Management* and the *Guide to Traffic Generating Development*.
- Avoidance and minimisation of impacts includes the use of the existing SMC access road as the primary site access for construction traffic.
- Project construction workforce would result in an increase in traffic volumes, particularly on The Bucketts Way, however there would be no exceedances of the road network capacity and reduction in efficiency.
- Key mitigation, management and monitoring would be described in a *Traffic Management Plan*.

6.9.1 Methodology

The Road Transport Assessment (Appendix H) was prepared in accordance with the SEARs and following guidelines:

- *Guide to Traffic Management Part 3: Transport Study and Analysis Methods* (Austroads, 2020a);
- *Guide to Traffic Management Part 6: Intersections, Interchanges and Crossings Management* (Austroads, 2020b); and
- *Guide to Traffic Generating Developments* (Roads and Traffic Authority NSW, 2002).

Reference is also made to applicable Australian Standards and other Austroads guidelines where relevant.

6.9.2 Existing Environment

Road Network

The existing road network includes the following roads relevant to access to the Project (Appendix H):

- The Bucketts Way (Main Road 90).
- Wenham Cox Road.

The Bucketts Way is a regional road that extends from the Pacific Highway (State Highway 10) at Twelve Mile Creek in the south to Gloucester in the north, then to the Pacific Highway at Nabiac in the east. The Bucketts Way is an approved route for 19 m B doubles (over 50 tonnes) between the Pacific Highway at Twelve Mile Creek and Gloucester (Appendix H).

In the vicinity of the Project site, The Bucketts Way has a single travel lane in each direction, and a posted speed limit of 90 km per hour. The carriageway is typically 7 m wide, with central linemarking, painted edge lines, and sealed shoulders of varying widths (Appendix H). The Bucketts Way provides a channelised access to and from the SMC.

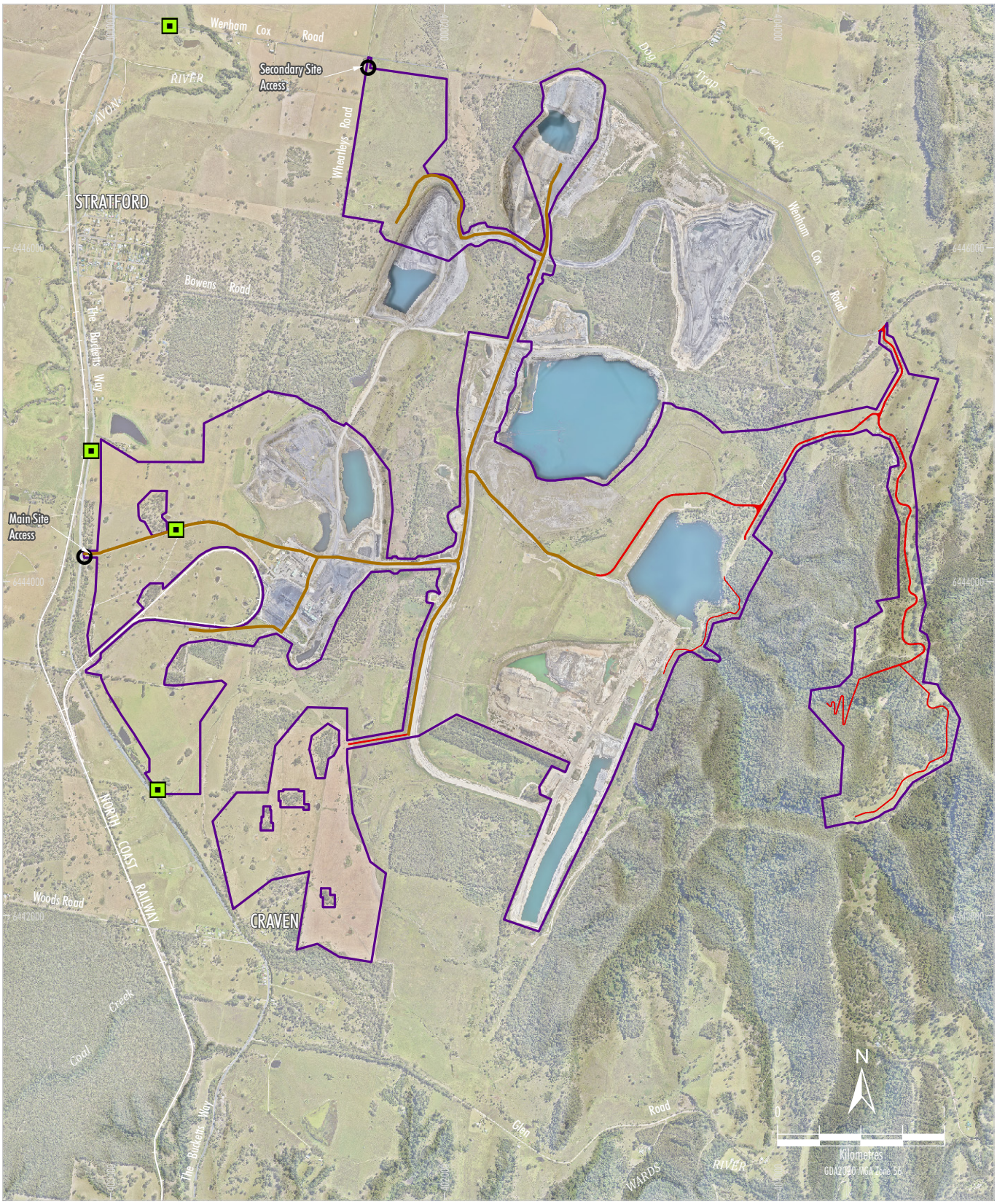
Wenham Cox Road is a local road that extends eastwards from The Bucketts Way north of Stratford. It provides access to a limited number of private properties as land on both sides of the road is predominantly owned by Yancoal due to the proximity to the SMC.

Wenham Cox Road intersects with Wheatleys Road approximately 1.5 km east of The Bucketts Way. Between The Bucketts Way and Wheatleys Road, Wenham Cox Road is typically a sealed two-lane, two-way road that follows a straight alignment. Between The Bucketts Way and Wheatleys Road, Wenham Cox Road has a sealed surface approximately 6 m wide, with unsealed shoulders and guideposts (Appendix H).

Surveys of Existing Traffic Volumes

Traffic surveys were undertaken in June and October 2023. The surveys utilised Automatic Tube Counters at (Figure 6-21):

- The Bucketts Way north of the SMC access road;
- The Bucketts Way south of the SMC access road;



Source: NSW Spatial Services (2023); Yancoal (2023); TTPP (2024)

LEGEND

- Project Disturbance Footprint
- Site Access Point
- Automatic Tube Counter Survey Location
- Existing Internal Access Roads
- New Internal Access Roads

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Traffic Survey Locations

Figure 6-21

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- SMC access road east of The Bucketts Way; and
- Wenham Cox Road between The Bucketts Way and Wheatleys Road.

Road Safety

A review of TfNSW road crash data for the period of 1 January 2017 to 31 December 2021 was completed by TTPP (2024) as part of the Road Transport Assessment.

Over the five-year review period, no crashes were reported at or near the intersection of The Bucketts Way and the SMC access road. One crash occurred at the intersection of The Bucketts Way and Wenham Cox Road in May 2021. No crashes occurred along Wenham Cox Road (Appendix H).

A summary of the road safety data review is presented in Appendix H.

Road Network Efficiency

The capacity of a road is defined as the maximum hourly rate at which vehicles can reasonably be expected to traverse a point or uniform section of a lane or roadway during a given time period under the prevailing roadway, traffic and control conditions.

Level of Service (LOS) represents road users' perceptions of the quality of service provided by a road link, and describes operational conditions. LOS are designated A through F, indicating progressively worse traffic conditions.

Review of the existing traffic volumes showed that the LOS of The Bucketts Way proximal to the Project is expected to be A or B (Appendix H).

Intersection Operations

The existing and baseline future peak hour traffic volumes on The Bucketts Way are below 200 vehicles per hour and those on the SMC access road are below 80 vehicles per hour, noting the peaks on the two roads do not coincide. There is no capacity concerns regarding the operation of the intersections (Appendix H).

6.9.3 Potential Impacts

Potential impacts of the Project on traffic generation, roadway capacity and safety are assessed in Appendix H and summarised below. These potential impacts have been assessed in the context of anticipated future background traffic growth.

Project-related Traffic

Construction Traffic

The Project construction activities would occur over a period of approximately 4 years, nominally commencing in 2025 (Figure 3-2). Nominally, the peak Project construction workforce would be expected during Month 27 of the Project construction schedule in 2027. It was assumed that the Project construction workforce would travel independently with light vehicles (i.e. no car pooling) presenting a worst-case traffic generating scenario.

Vehicular access for most of the Project construction activities would be via the existing SMC access road and The Bucketts Way (Appendix H).

Heavy vehicle deliveries during the construction stage would include semi-trailers, truck and dog combinations, B-doubles, and some OSOM vehicles (Appendix H).

The construction of the northern portion of the Solar Farm would temporarily use Wenham Cox Road as the construction site access. There would be some light vehicle traffic generated by the associated construction workforce and heavy vehicle deliveries expected on Wenham Cox Road. The construction of the northern portion of the Solar Farm would be expected to occur after the peak Project construction, nominally during Month 31 of the Project construction schedule in 2027 (Appendix H).

Operational Traffic

The operational workforce is expected to generate approximately 20 light vehicle trips per day. Deliveries during operation would generate approximately four heavy vehicle trips per day, which would primarily occur during daylight hours. Additional heavy vehicle deliveries would occur during scheduled maintenance (Appendix H).

Operational traffic demands would remain well below the existing SMC and the peak construction traffic demands. Therefore, no quantitative traffic assessment was required (Appendix H).

Background Growth

General growth in background traffic demands could occur, which are not related to a particular development. A growth rate of 1% per year was applied to predict the future background traffic on The Bucketts Way (Appendix H).

Due to the limited use of Wenham Cox Road, no background traffic growth was applied on Wenham Cox Road (Appendix H).

Forecast Cumulative Traffic During Construction

The Road Transport Assessment considered the following traffic sources for assessment of cumulative traffic volumes during Project construction (Appendix H):

- project-related traffic;
- background growth;
- SMC rehabilitation traffic; and
- exclusion of the current SMC operational traffic.

Table 6-15 summarises the existing average daily traffic volumes, the estimated background traffic volume in 2027, the estimated project-related traffic volumes and the cumulative total traffic volumes for two scenarios as follows:

- Scenario 1: Project peak construction traffic in Month 27; and
- Scenario 2: Project construction traffic during construction of the northern Solar Farm in Month 31.

Impacts on Road Network Efficiency

Potential impacts of Project construction traffic on the road network efficiency have been reviewed. The capacity of The Bucketts Way would not be exceeded by the forecast traffic volumes.

The maximum impacts to road network efficiency performance is predicted to occur on The Bucketts Way south of SMC access road with a change to LOS C. At LOS C, vehicle speed may be curtailed and drivers may experience delays due to the presence of other vehicles on the road, with limited opportunities to overtake during peak hours (Appendix H).

The LOS of other sections of The Bucketts Way is expected to be maintained as A or B.

Impacts on Intersection Operation

Two key intersections were assessed in regard to intersection operation performance during peak Project construction traffic (Appendix H):

- SMC access road intersection with The Bucketts Way; and
- Wenham Cox Road intersection with The Bucketts Way.

The assessment showed both intersections could be expected to operate at a good LOS during the morning and evening peak hours, with LOS A expected, inclusive of Project traffic (Appendix H).

Safe Intersection Sight Distance (SISD) at each intersection was also assessed. The sight distances available for drivers approaching both intersections exceeded 300 m, which is greater than the minimum the SISD requirements of 214 m (Austroads, 2023). The Project would not change intersection SISDs (Appendix H).

Table 6-15
Summary of the Existing Traffic Volumes in 2023 and the Estimated Traffic Volumes in 2027

Road and Location	Average Daily Traffic Volume 2023	Forecast Baseline (no Project) Traffic Volume 2027	Scenario 1		Scenario 2	
			Project-only Traffic Volumes	Total Traffic Volumes	Project-only Traffic Volumes	Total Traffic Volumes
The Bucketts Way north of SMC access road	1,939	1,999	98	2,091	82	2,081
The Bucketts Way south of SMC access road	1,875	1,902	758	2,667	654	2,556
SMC access road east of The Bucketts Way	167	180	856	1,036	614	794
Wenham Cox Road between The Bucketts Way and Wheatleys Road	68	68	N/A	N/A	122	190

Source: Appendix H

No upgrades to the intersections would be required to maintain the intersection operation efficiency and safety (Appendix H).

Oversize Overmass Vehicles

Infrequent OSOM vehicle movements for Project construction would include oversize vehicles for earth moving activities during the early construction stage, and for transport of equipment such as transformers. It is expected that the majority of OSOM vehicles would approach the Project site from the south via The Bucketts Way (Appendix H).

The loads historically transported to the SMC and the largest mining vehicles used at the SMC are a similar size or larger to the OSOM vehicles required for Project. Since The Bucketts Way had been used for the OSOM vehicle transport of the SMC, it is anticipated that access for the Project OSOM vehicles along The Bucketts Way would be satisfactory, with no civil works required. In addition, several narrow bridges on The Bucketts Way have recently been upgraded and widened (Appendix H).

The proposed movement of OSOM vehicles would be subject to permits from the National Heavy Vehicle Regulator and load declarations obtained in accordance with *Additional Access Conditions: Oversize and overmass heavy vehicles and loads* (TfNSW, 2020) (Appendix H).

Opportunities to backload SMC OSOMs for the Project would be investigated to reduce cumulative OSOMs.

6.9.4 Mitigation Measures

The Road Transport Assessment identifies that no specific road or intersection upgrades that would be required to mitigate the impacts of the Project construction activities on the capacity, safety and efficiency of the road network or to accommodate OSOMs (Appendix H).

The following road transport management measures are recommended to be implemented (Appendix H):

- advance warning signs be installed on Wenham Cox Road during construction of the northern portion of the Solar Farm to alert drivers to the presence of trucks entering and exiting the northern Solar Farm access;
- Project workers receive training regarding safe driving behaviours and fatigue management as part of induction and regular training programs;
- measures be implemented to encourage the workforce to car pool during the construction stage of the Project, to reduce the impact of the movement of the workforce to and from the site each day; and
- a Traffic Management Plan and Driver Code of Conduct be developed and implemented.

6.10 LANDSCAPE AND VISUAL

Section Overview

- This section summarises potential visual impacts.
- A LVIA was prepared by GHD (2024d) and is presented in Appendix I.
- Key guideline considered was the *Large-Scale Solar Energy Guideline's Technical Supplement – Landscape and Visual Impact Assessment.*
- The existing visual landscape has been modified by the SMC.
- Avoidance and minimisation of impacts includes the removal and/or setback of solar panels originally proposed in consideration of community feedback, and visual screening along portions of The Bucketts Way with no existing vegetation screening.
- Visual impacts to views from private dwellings were assessed as "low" or "very low".
- Visual impacts to views from public viewpoints were assessed as "moderate" to "very low".
- Key mitigation, management and monitoring would be described in a *Landscape and Visual Impact Management Plan*.

6.10.1 Methodology

The LVIA prepared by GHD (2024d) has been guided by the requirements of the SEARs for the Project, including agency advice, as well as the *Technical Supplement – Landscape and Visual Impact Assessment* as part of the *Large-Scale Solar Energy Guideline* (DPE, 2022j) (hereafter referred to as the Technical Supplement).

Preliminary Visual Assessment

A Preliminary Visual Assessment (PVA) was undertaken by GHD (2023) in accordance with the Technical Supplement and was presented as Attachment D of the Scoping Report.

The purpose of the PVA was to identify sensitive receiver locations that may have direct views of the Project based on topography alone (i.e. not considering intervening vegetation or other structures that may obscure the view).

The Technical Supplement requires identification of public and private receivers within 4 km of the Project Disturbance Footprint as well as identification of viewpoints from public road and rail lines within 2.5 km of the Project Disturbance Footprint.

To inform the selection of public and private receiver locations, a desktop review of the landscape and visual environment, as well as a 'zone of theoretical visibility' analysis (also referred to as a 'reverse viewshed analysis'), were undertaken identifying land with the potential to view components of the Project (GHD, 2023).

Project Design Changes

Following the outcomes of community engagement conducted for the Project, Yancoal amended the design of the Solar Farm layout as originally proposed in the Scoping Report due to concerns raised about potential visual impacts.

Solar panels located on the western portion of The Bucketts Way were removed from the Project design in consideration of feedback from the community.

Further, solar panels located on the eastern side along The Bucketts way were also removed from the Project design in consideration of feedback from the community.

Landscape and Visual Impact Assessment

Stage 1 – Refine and Classify Viewpoints

Site inspections were undertaken by GHD between 25 to 28 November 2023, 3 to 6 March 2024 and on 21 May 2024. The purpose of the site inspections was to (Appendix I):

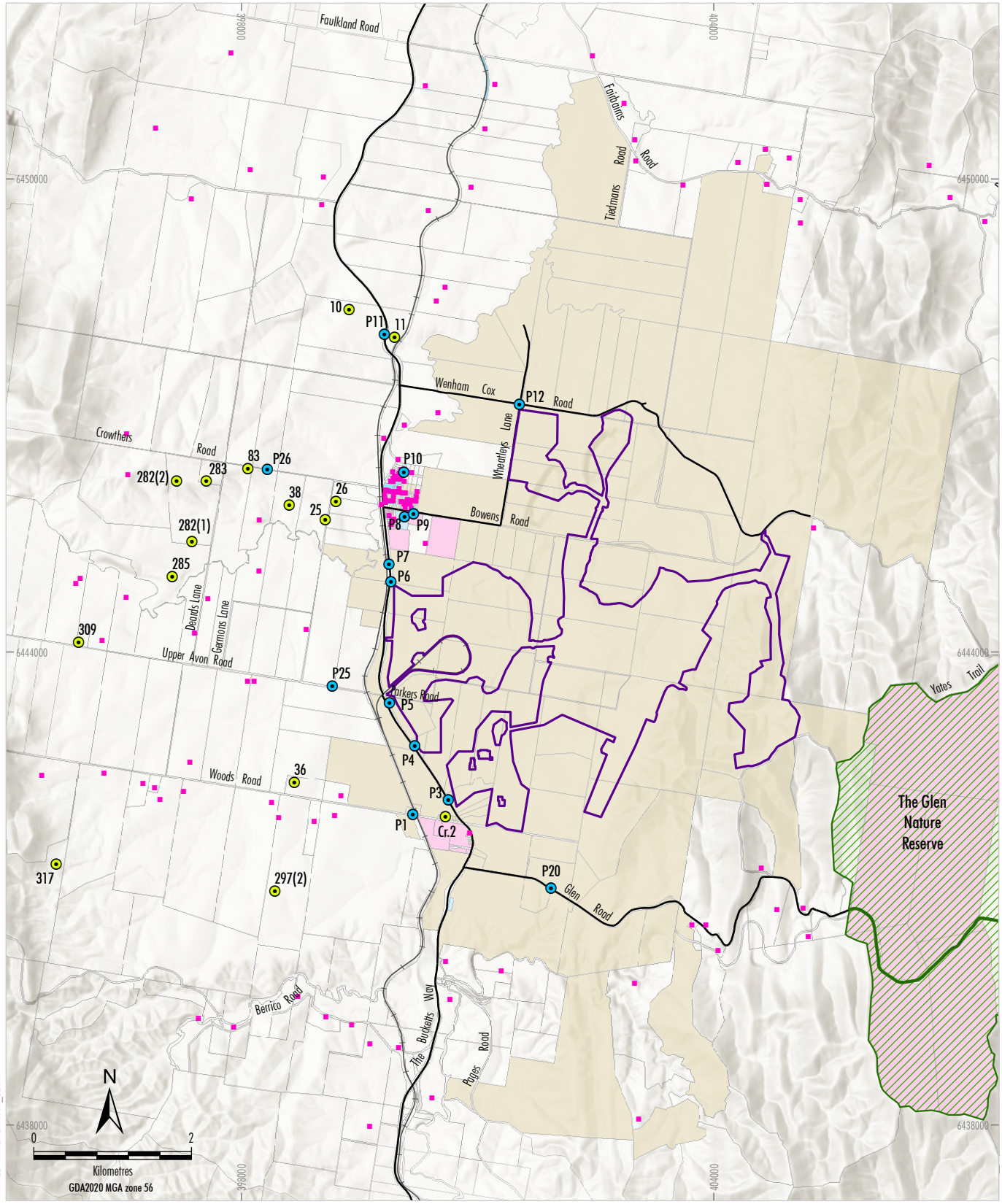
- Assess the landscape character of the Project area and identify landscape and visual sensitivities.
- Inspect views from private and public receiver locations identified in the PVA as requiring detailed assessment, and any additional locations as required.
- Undertake site photography suitable for detailed assessment and photomontages.

Following the site inspections, receivers identified in the PVA as requiring detailed assessment were refined and classified through analysis of the site photography and determining if there was a line of sight to the Project, including consideration of intervening vegetation.

Dwellings located on the western side of The Bucketts Way were determined to have greatest potential for direct views of the Project. Accordingly, 29 private dwelling owners were provided the opportunity for baseline photographs to be taken and visual simulations prepared from their residence. 15 dwelling owners accepted, and visual simulations have been prepared as presented in Appendix I. For the remaining dwellings, visual impact was assessed based on representative views and other tools, such as use of the 3D model (Appendix I).

Public viewpoint locations were selected to represent views from The Bucketts Way, publicly accessible areas in Stratford and Craven, as well as other local roads such as Wheatleys Road and Wenham Cox Road. Visual simulations and photomontages were prepared for 14 public viewpoints.

The locations of public and private viewpoints for which simulations have been prepared for the LVIA are shown on Figure 6-22.



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LEGEND

- National Park, Nature Reserve or State Conservation Area
- Crown
- State Government
- Local Government
- Privately Owned
- Yancoal (or Subsidiary) Owned
- Privately Owned Dwelling
- Project Disturbance Footprint

Visual Simulations

- Public Viewpoints
- Private Viewpoints

Source: NSW Spatial Services (2023); Yancoal (2023); GHD (2024)

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Visual Simulation Assessment Locations

Figure 6-22

Stage 2 – Visual Magnitude

The Technical Supplement defines the visual magnitude of a project as its apparent size relative to the horizontal and vertical viewscape.

Visual magnitude is determined using the Technical Supplement by applying the Visual Magnitude Grid Tool over photomontages prepared at a sensitive receiver to determine the number of cells occupied by the Project.

A cell is unoccupied if elements of a project, including solar panels, do not occupy more than approximately 25% of a cell (DPE, 2022j).

The number of occupied cells in each photomontage was compared to visual magnitude thresholds within the Technical Supplement as shown in Table 6-16 to determine the visual magnitude rating.

Table 6-16
Visual Magnitude Rating

Number of Occupied Cells	Visual Magnitude Rating
1-6	Very Low
7-12	Low
13-21	Moderate
22-30	High
31+	Very High

Source: DPE (2022j)

Stage 3 – Visual Sensitivity

The Technical Supplement refers to visual sensitivity as the quality of the existing view and how sensitive the view is to the proposed change. Visual sensitivity is determined by identifying the viewpoint sensitivity and the scenic quality of the area (DPE, 2022j).

Viewpoint sensitivity relates to the relative importance of viewpoints and the value that the community or visitors may place on landscapes viewed from public use areas, roads and private viewpoints.

Each viewpoint was assigned a sensitivity classification based on the criteria in Table 6-17.

Scenic quality refers to the relative scenic, cultural or aesthetic value of the landscape within the vicinity of the viewpoint. The existing environmental analysis and landscape character analysis informs the classification scenic quality.

Each viewpoint was assigned a scenic quality rating based on the guide provided in the Technical Supplement, as shown in Table 6-18.

The visual sensitivity for each viewpoint was then determined using the matrix provided in the Technical Supplement, as shown in Table 6-19.

Stage 4 – Visual Impact

The overall visual impact rating of each viewpoint was determined using the matrix provided in the Technical Supplement, and provided in Table 6-20.

It is noted that there is currently no landscape and visual assessment guideline for multi-infrastructure projects (e.g. pumped hydro and solar). Therefore, a dual-assessment approach has been adopted by GHD (2024d) whereby the Technical Supplement has been applied to an assessment of the solar, and the PHES components have been considered both separately and cumulatively.

Stage 5 – Mitigation and Performance Objectives

As outlined in the Technical Supplement, for each viewpoint assessed, the need for specific visual mitigation is informed by the performance objectives associated with the visual impact rating, as shown in Table 6-21.

Table 6-17
Viewpoint Sensitivity Levels as Defined by the Technical Supplement

Viewpoint type	Very Low	Low	Moderate	High
Residential	No place of residence present	Secondary view from dwellings in rural areas (zoned RU1, RU2, RU3, RU4 and RU6), large lot residential areas (zoned R5) and in environmental or conservation areas (zoned C2, C3 and C4)	Primary view from dwellings in rural areas (zoned RU1, RU2, RU3, RU4 and RU6), large lot residential areas (zoned R5) and in environmental or conservation areas (zoned C2, C3 and C4)	Dwellings in residential areas and rural villages (zoned R1, R2, R3, R4 and RU5) Historic rural homesteads/residences on the national, state or local heritage list
Transport / Infrastructure	Local sealed and unsealed roads Passenger rail lines with daily daylight services State highways, freeways and classified main roads Walking tracks and navigable waterways	Tourist roads and scenic drives Walking tracks and navigable waterways	N/A	N/A
Social / Cultural	Private recreation areas and sporting fields (defined as land zoned RE2)	Cemeteries, memorial parks	Tourist and visitor accommodation and places of worship (such as bed and breakfasts, motels, hotels) Tourist uses in tourist areas (zoned SP3) Publicly accessible green and open spaces including picnic areas, parks, public recreation areas Town centres and central business districts	N/A

Source: DPE (2022j)

Table 6-18
Scenic Quality

Viewpoint Type	Low Scenic quality	Moderate Scenic Quality	High Scenic Quality
Landform	Large expanses of flat or gently undulating terrain. Indistinct, dissected or unbroken landforms that provide little illusion of spatial definition or landmarks with which to orient.	Steep, hilly and undulating ranges that are not visually dominant. Broad shallow valleys. Moderately deep gorges or moderately steep valley walls. Minor rock outcrops.	Isolated peaks, steep rocky ridges, cones or escarpments with distinctive form and/or colour contrast that become focal points. Large areas of distinctive rock outcrops or boulders Well defined, steep sided valley gorges.
			
Vegetation	Extensively cleared and cropped areas with very limited variation in colour and texture. Pastoral areas, human created paddocks, pastures or grasslands and associated buildings typical of grazing lands.	Predominantly open forest or woodland combined with some natural openings in patterns that offer some visual relief. Vegetative stands that exhibit a range of size, form, colour, texture and spacing including human influenced vegetation such as vineyards, and orchards.	Strongly defined patterns with combinations of native forest, naturally appearing openings, streamside vegetation and/or scattered exotics. Distinctive stands of vegetation that may create unusual forms, colours or textures in comparison to surrounding vegetation.
			
Waterbodies	Absence of natural waterbody. Farm dams, irrigation canals or stormwater infrastructure.	Intermittent streams, lakes, rivers, swamps and reservoirs.	Visually prominent lakes, reservoirs, rivers, streams, wetlands and swamps. Presence of harbour, inlet, bay or open ocean.
			

Table 6-18 (Continued)
Scenic Quality

Viewpoint Type	Low Scenic Quality	Moderate Scenic Quality	High Scenic Quality
Social / Cultural	Places of worship, cemeteries/memorial parks, private open spaces.	Local heritage sites. Distinguishable entry ways to a regional city identified in the Transport and Infrastructure SEPP.	Culturally important sites, world heritage areas, national parks/reserves, Commonwealth and state heritage sites.
			
Human Presence	Dominating presence of infrastructure, human settlements, highly modified landscapes and higher density populations such as regional cities, industrial areas, agricultural transport or electricity infrastructure.	Dispersed yet evident presence of human settlement such as villages, small towns, isolated pockets of production and industry, lower scale and trafficked transport infrastructure.	Natural/undisturbed landscape. Minimal evidence of human presence and production.
			

Source: Adapted from DPE (2022j).

Table 6-19
Visual Sensitivity Matrix as Defined by the Technical Supplement

	High scenic quality	Moderate scenic quality	Low scenic quality
High viewpoint sensitivity	High	High	Moderate
Moderate viewpoint sensitivity	High	Moderate	Moderate
Low viewpoint sensitivity	Moderate	Low	Low
Very low viewpoint sensitivity	Low	Very low	Very low

Source: DPE (2022j)

Table 6-20
Visual Impact Matrix as Defined by the Technical Supplement

	High visual sensitivity	Moderate visual sensitivity	Low visual sensitivity	Very low visual sensitivity
Very high magnitude	High	High	Moderate	Moderate
High magnitude	High	Moderate	Moderate	Low
Moderate magnitude	Moderate	Moderate	Low	Low
Low magnitude	Moderate	Low	Low	Very low
Very low magnitude	Low	Low	Very low	Very low

Source: DPE (2022j)

Table 6-21
Visual Performance Objectives as Defined by the Technical Supplement

High visual impact	This level of impact should be avoided unless the applicant can justify that: – All reasonable efforts have been made to avoid the impact and alternative project designs are not feasible or would be unlikely to materially reduce the impact. – All reasonable mitigation options have been considered. – The proposed mitigation measures would effectively mitigate the impact and would not result in a significant obstruction of views. – The project site is strategically important because of its location. – The project is in the public interest.
Moderate visual impact	Visual impact mitigation is required in consultation with the affected landowner and should be proportionate to the scale of impact. There is no expectation this mitigation should eliminate the view of the development entirely but must reduce the impact to an acceptable level. Appropriate mitigation options include vegetation screening or project landscaping to reduce impacts. If available mitigation options would not be effective in reducing impacts or are unsuitable due to the nature of the impact, then project redesign and/or impact agreements should be considered.
Low and very low visual impact	No mitigation is required.

Source: DPE (2022j)

6.10.2 Existing Environment

Landscape Environment

The Project is located in the Gloucester Valley, which has areas of high scenic quality such as 'The Bucketts' located to the north of the Project.

Surrounding the Project, the landscape includes lower lying areas, largely cleared for agricultural and mining activities.

A large portion of the land for the Project is currently used for the SMC, which has been subject to disturbance and modification of the landscape.

Vegetated ridgelines are located on the eastern and western sides of the Gloucester Valley.

Rural residential areas located in the vicinity of the Project include the villages of Stratford to the north-west and Craven to the south-west.

The Bucketts Way is the main road in the Gloucester Valley and a tourist drive that connects Gloucester to the Pacific Highway. Other local roads surrounding the Project include Wenham Cox Road and Wheatleys Road.

The North Coast Railway is located to the west of the Project running north to south and is the principal regional freight and passenger line in the Gloucester Valley.

Night-Lighting

Existing glow and night-lighting in the Project area is primarily from the existing night-lighting from the SMC.

Vale of Gloucester

The SMC (and the Project) is located within the Vale of Gloucester Landscape Conservation Area, which was registered by the National Trust of Australia (NSW) in 1976 for its historical and scenic values.

The Vale of Gloucester Landscape Conservation Area was considered in the assessment and approval of the SMC.

6.10.3 Potential Impacts

Direct Impacts

The Project would result in visual impacts to some private and public locations through direct views of the Project components, particularly the Solar Farm and upper reservoir dam wall.

Private Viewpoints

Simulations from 15 private dwellings were assessed within the LVIA (Figure 6-22). Due to intervening vegetation and topography, GHD (2024d) determined that private dwellings located in Stratford did not have a direct line of sight to the Project and therefore visual simulations were not prepared.

Figures 6-23a to 6-23c show visual simulations for the private receivers that had the highest visual magnitude.

The Solar Farm and PHES components have been considered separately and are highlighted as red occupied cells (Solar Farm) and yellow occupied cells (PHES) in the visual magnitude simulations. This methodology has been adopted by GHD (2024d) to assess the Project components separately and cumulatively.

GHD (2024d) concludes that the Project would have 'low' or 'very low' visual impacts from all private residences for the solar component, PHES and the Project infrastructure cumulatively.

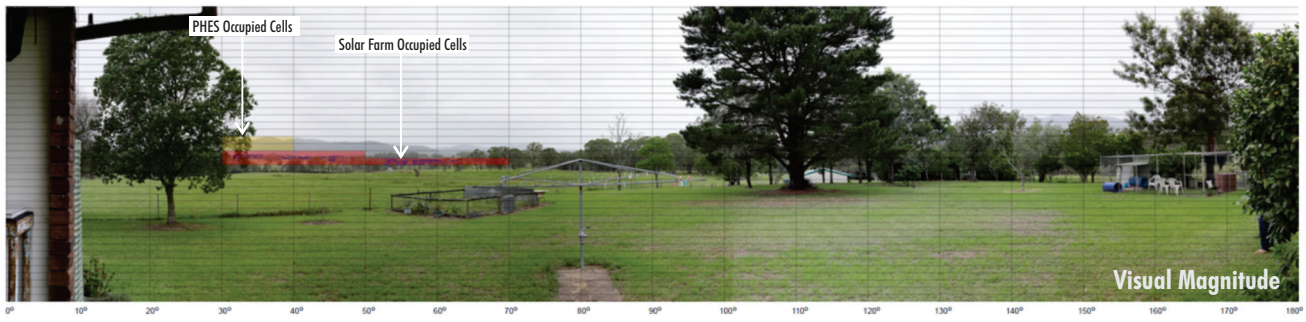
Public Viewpoints

Visual simulations for The Bucketts Way and Wheatleys Road are shown on Figures 6-24a to 6-24c.

GHD (2024d) concludes that the Project would have 'moderate' to 'very low' visual impacts from all public locations.

Public locations assessed as 'moderate' visual impact include The Bucketts Way noting its proximity to the Project and higher visual sensitivity being a tourist route.

Wheatleys Road (P12) was also assessed as 'moderate' visual impact due to the proximity of the Solar Farm.



Refer Figure 6-22 for Visual Simulation Location

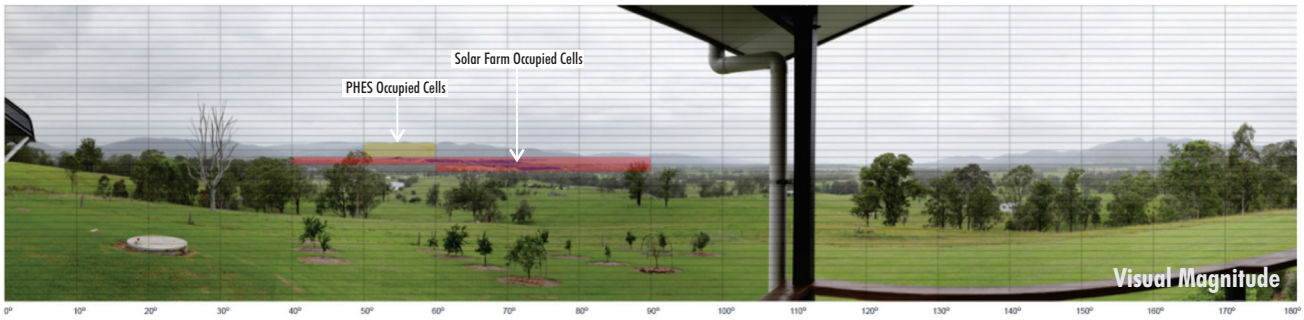
Source: GHD (2024)

YAN-22-45 SREH EIS Sect6_001A

YANCOAL - STRATFORD RENEWABLE ENERGY HUB

Private Receiver Visual Simulation
Viewpoint 25

Figure 6-23a



Refer Figure 6-22 for Visual Simulation Location

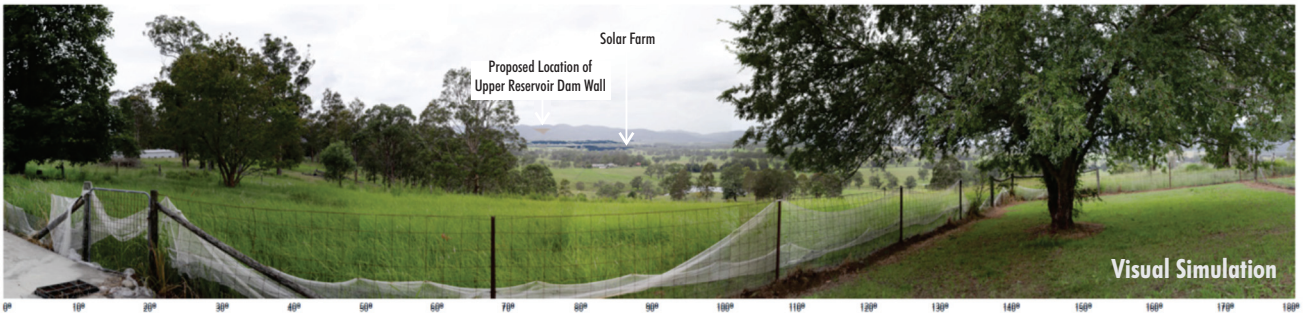
Source: GHD (2024)

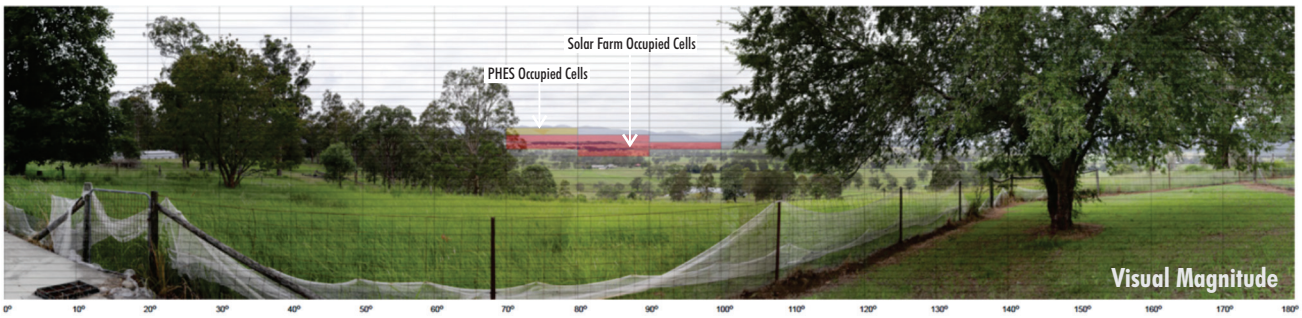
YAN-22-45 SREH EIS Sect6_002A

YANCOAL - STRATFORD RENEWABLE ENERGY HUB

Private Receiver Visual Simulation
Viewpoint 83

Figure 6-23b





Refer Figure 6-22 for Visual Simulation Location

Source: GHD (2024)

YAN-22-45 SREH EIS Sect6_003A

YANCOAL - STRATFORD RENEWABLE ENERGY HUB

Private Receiver Visual Simulation
Viewpoint 283

Figure 6-23c

Refer Figure 6-22 for Visual Simulation Location

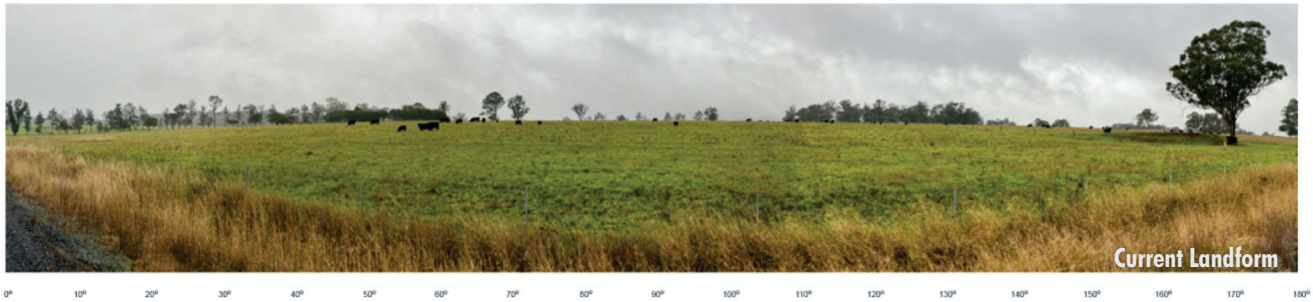
Source: GHD (2024)

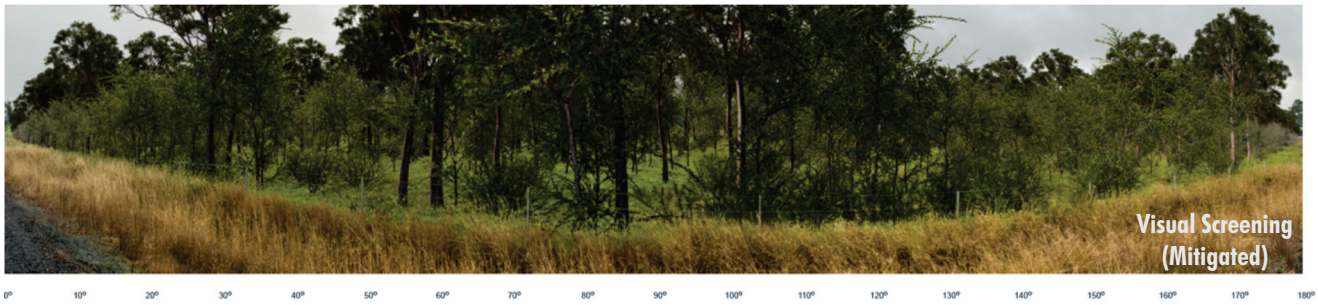
YAN-22-45 SREH EIS Sect6_004A

YANCOAL - STRATFORD RENEWABLE ENERGY HUB

Public Receiver Visual Simulation
P5 (The Bucketts Way North)

Figure 6-24a





Refer Figure 6-22 for Visual Simulation Location

Source: GHD (2024)

YAN-22-45 SREH EIS Sect6_005A

YANCOAL - STRATFORD RENEWABLE ENERGY HUB

Public Receiver Visual Simulation
P6 (The Bucketts Way South)

Figure 6-24b

Refer Figure 6-22 for Visual Simulation Location

Source: GHD (2024)

YAN-22-45 SREH EIS Sect6_006A

YANCOAL - STRATFORD RENEWABLE ENERGY HUB

Public Receiver Visual Simulation
P12 (Wheatleys Road)

Figure 6-24c

Indirect Impacts

Night-Lighting

An assessment of night-time lighting impacts was undertaken through a comparative assessment of night-time lighting of the existing SMC.

Generally, construction of the Project would occur during daytime construction hours. However, there are 24-hour construction activities involved with tunnelling activities that would require lighting at the surface. Lighting associated with construction would be required for safety reasons, however these lights would be downward facing to mitigate potential night-lighting impacts (Appendix I).

During operation, the PHES would operate 24 hours per day, 7 days per week. This would involve limited lighting other than as required for safety on internal roads, and in offices and control rooms (Appendix I).

Overall, it is anticipated that the lighting impacts during the Project would be lower compared to the existing environment, which has included operation of the SMC 24 hours per day, 7 days per week (Appendix I).

6.10.4 Mitigation Measures

In accordance with Stage 5 of the Technical Supplement, no mitigation is required for low or very low visual impacts (GHD, 2024d). Therefore, no at-receiver mitigation is required for private residences. Yancoal continues to engage with local landowners with potential views of the Project.

To mitigate direct views of the Project from The Bucketts Way, GHD (2024d) has recommended visual screening to act as barriers for any views, and this has been adopted in the Project design, along with setbacks of the Solar Farm along the Bucketts Way.

Visual screening would comprise a mix of quick-grown and long-lived native species to provide sustained visual screening (Appendix I).

GHD (2024d) has prepared a Landscape Plan for proposed visual screening along The Bucketts Way. Consistent with the SEARs, and understanding that the MidCoast Council is the owner of The Bucketts Way, Yancoal has sought feedback from the MidCoast Council in regards to the proposed mitigation measures of vegetative screening, in particular the location and extent of the screens.

Visual screening is not proposed along Wheatleys Road due to its infrequent road use.

Visual screening practices and maintenance, as well as night-lighting practices would be documented in a Landscape and Visual Impact Management Plan prepared for the Project.

6.11 GLINT AND GLARE

Section Overview

- This section summarises potential glint and glare impacts.
- A *Glint and Glare Assessment* was prepared by GHD (2024e) and is presented in an attachment to Appendix I.
- Key guideline considered was the Technical Supplement to the *Large-Scale Solar Energy Guideline.*
- Glare is expected to be within the thresholds noted in the Guideline for all receivers (roads and residential).

6.11.1 Methodology

The Glint and Glare Assessment has been guided by the requirements of the SEARs for the Project, including agency advice, as well as the *Large-Scale Solar Energy Guideline* (DPE, 2022a).

Model Development

The Glint and Glare Assessment used the Solar Glare and Hazard Analysis Tool (SGHAT).

The following assumptions were used by the SGHAT for the assessment:

- clear atmospheric conditions assumed, as this would present the strongest conditions for glare, the effect of clouds and dust would be excluded;
- no shading by native vegetation; and
- digital baseline topography.

Accordingly, the SGHAT provides a worst-case modelling scenario to allow for a conservative assessment.

Glare Categories

The SGHAT identifies glare as either green, yellow or red glare using Ho et al. (2011) classification as follows (Appendix I):

- Green glare: low potential for after-image.

- Yellow glare: potential for after-image.
- Red glare: potential for permanent eye damage.

After-image is referred to as a temporary flash that causes an image to continue to appear in the eyes after a period of exposure to the original image (Ho et al,. 2011).

6.11.2 Assessment Inputs

Tracking of the Solar Farm

The Solar Farm would use SAT PV module mounting structures at Solar Farm Areas 1 to 12, and fixed tilt structure at Solar Farm Areas 13 and 14 (Figure 3-10).

Some SAT PV module mounting structures use a "backtracking" function whereby the controller lowers the rotational angle of the panels during times of low sun angle. The backtracking function could minimise the occurrence of panel-on-panel shading, increasing electricity generation (Plates 6-1 and 6-2). However, the backtracking function could also increase risk of glare (Appendix I).

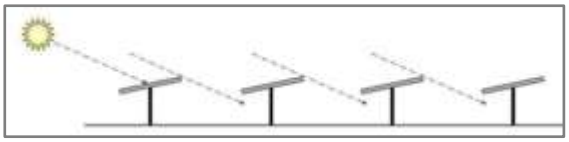


Plate 6-1 "Back-Tracking", Preventing Panel-on-Panel Shading while also Increasing the Risk of Glare (GHD, 2024e).

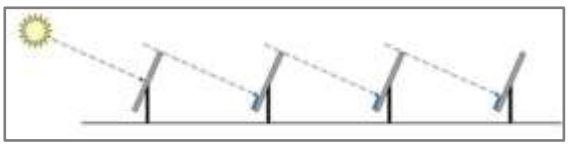


Plate 6-2 Perpendicular "Tracking", Panel-on-Panel Shading Observed at Low Sun Angles (GHD, 2024e).

The Glint and Glare Assessment has considered both "back-tracking" and perpendicular tracking (Appendix I).

Assessment receptors

The *Large-Scale Solar Energy Guideline* (DPE, 2022a) provides assessment requirements to the following three types of receptors:

- residential receivers;
- transport routes (i.e. road and rail) receptors; and
- aviation receptors.

Residential Receivers

The LVIA identified multiple private dwellings in proximity of the proposed Solar Farm, however, only those with a direct line of sight to the Solar Farm were considered in the modelling and assessment. In total, 13 observation points (OPs) were assessed, and key parameters of each OP are provided in Appendix I.

Transport Routes

The transport route receptors within a 1 km radius of the Project (which is the recommended region for road and rail assessments noted in the *Large-Scale Solar Energy Guideline*) were considered in the modelling and assessment. These receptors include (Appendix I):

- Roads in Stratford, including:
  - Anne Street;
  - Avon Street;
  - Bowens Road;
  - Henley Street;
  - High Street; and
  - William Street;
- Wenham Cox Road;
- Wheatleys Road;
- Glen Road;
- The Bucketts Way;
- Crowthers Road;
- Upper Avon Road;
- Woods Road; and
- North Coast Railway.

Aviation Receptors

The Gloucester Airfield is a recreational airstrip approximately 6 km north of the Project. The Gloucester Airfield does not have an air traffic control tower, hence no analysis of air traffic control tower receptors was required in the Glint and Glare Assessment (Appendix I).

6.11.3 Potential Impacts

Appendix I assumes that back-tracking would be switched 'off' for the Project to reduce glare impact. Accordingly, potential impacts discussed in this sub-section assume back-tracking is off.

Notwithstanding, this would be reviewed at the detailed design stage and opportunities to include back-tracking would be reviewed and incorporated into the Project design should resulting glare continue to meet the requirements of the *Large-Scale Solar Energy Guideline* (DPE, 2022a).

Impacts on Residential Receivers

For the 13 OPs with potential direct line of sight assessed, the predicted glare impacts would be low (Appendix I).

Transport Routes

Wenham Cox Road

Solar Farm Area 14 was also predicted to cause yellow and green glare towards the eastern end of Wenham Cox Road in the evening during spring and summer (Plate 6-3).

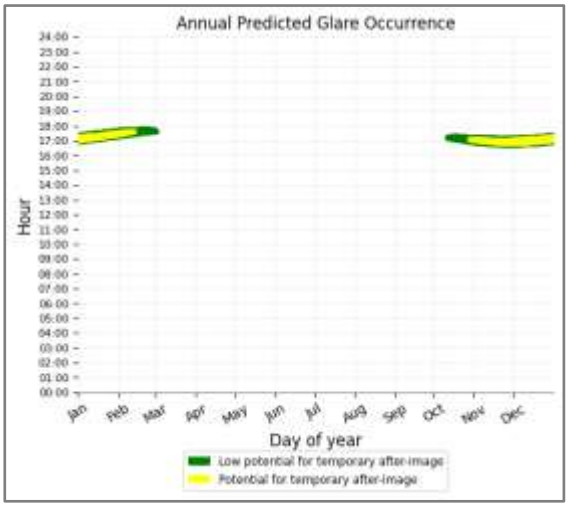


Plate 6-3 Time of Impact of Predicted Glare (Worst Case) for Wenham Cox Road from Solar Farm Area 14 (GHD 2024e).

There is only one private residence located along Wheatleys Road and Wenham Cox Road, therefore vehicle volumes are low. The predicted glare impacts on safe operation of vehicles would be very low. In addition, existing tree cover between Wenham Cox Road and Solar Farm Area 14 could also mitigate the glare impacts (Appendix I).

Wheatleys Road

Green glare (i.e. low potential for after-image) from Solar Farm Area 6 was predicted on Wheatleys Road (refer to Figure 3-10). Wheatleys Road is a rarely trafficked road. Impacts on safe operation of vehicles were predicted to be very low (Appendix I).

Aviation

The SGHAT predicted that no impacts on flight approaches of Gloucester Airfield from the Solar Farm would occur (Appendix I).

6.11.4 Mitigation Measures

Although the Solar Farm has low potential for glint and glare impacts to receivers, optimisation of the Solar Farm during detailed design would consider any opportunities to incorporate SAT increase where fixed-tilt structures are currently assumed. In addition, detailed design would also identify opportunities to incorporate back-tracking in the SAT PV areas where possible.

6.12 NOISE AND VIBRATION

Section Overview

- This section summarises potential noise and vibration impacts.
- A *Noise and Vibration Impact Assessment* was prepared by SLR (2024b) and is presented in Appendix J.
- Key guidelines considered were the *Noise Policy for Industry, Interim Construction Noise Guideline* and *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration*.
- The existing environment includes the 24 hour per day operations of the SMC, noting noise will reduce for SMC closure.
- Construction noise levels at private receivers are predicted to be below the relevant construction noise criteria, with the exception of one privately owned receiver.
- Operational noise levels meet all relevant criteria at private receivers.
- Negligible blast-related impacts are predicted.
- Key mitigation, management and monitoring would be described in a *Noise Management Plan*.

6.12.1 Methodology

The Noise and Vibration Impact Assessment was prepared by SLR (2024b) in accordance with the following guidelines (Appendix J):

- *Noise Policy for Industry* (NPfI) (EPA, 2017);
- *Interim Construction Noise Guideline* (ICNG) (DECC, 2009); and
- *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration* (Australian and New Zealand Environment Council, 1990).

6.12.2 Existing Environment

The SMC has operated since the mid-1990s, with elements of the SMC operating 24 hours per day, 7 days per week.

SMC operations are scheduled to cease in 2024, however, ongoing noise-generating activities at the SMC will continue during closure.

6.12.3 Potential Impacts

The Noise and Vibration Impact Assessment includes assessments of the following potential impacts:

- on-site construction noise;
- on-site operational noise; and
- on-site blasting.

These aspects are discussed further below and in Appendix J. In addition, off-site road traffic noise impacts are presented in Appendix J.

Construction Noise Assessment Criteria

The ICNG sets out noise management levels for residential and other noise-sensitive receivers and outlines how they are to be applied. The policy suggests restricting the hours of construction for activities that generate noise at residences above the “highly affected” noise management level. A summary of the construction noise management levels from the ICNG is provided in Table 6-22.

Generally, construction activities would occur during daytime construction hours. However, due to the need for continuous activities for tunnelling and other associated activities (i.e. to manage construction schedule risk by allowing for a more efficient continuous operation and reduce safety risks), these activities would be conducted 24 hours per day, 7 days per week.

Other construction activities may occur 24 hours per day, 7 days per week, subject to compliance of out-of-hours noise criteria.

Operational Noise Assessment Criteria

The NPfI recommends two noise assessment criteria, “intrusiveness” and “amenity”, both of which are relevant for the noise impact assessment for the Project (Appendix J).

The intrusiveness criteria are based on an energy average noise level over a 15-minute period. The intrusiveness criteria require the equivalent continuous noise level (L_{Aeq}) from the source being assessed, when measured over 15 minutes, to not exceed the rating background level (RBL) by more than 5 A-weighted decibels (dBA) in accordance with the NPfI.

The amenity criteria are based on the setting of the area (e.g. rural, suburban, urban, industrial, etc.), which are based on the energy average noise level over the entire day, evening or night period rather than a 15-minute interval.

Noise Assessment Approach

A computer model was used by SLR (2024b) to predict noise emissions from the operation and construction of the Project. The noise modelling was undertaken using the CONCAWE algorithms within SoundPLAN v8.2 software.

The noise modelling completed for the Project is based on meteorological data obtained from the SMC. The meteorological data used includes wind speed, wind direction and stability class (Appendix J). From this review, noise enhancing winds and temperature inversions were considered as part of this assessment.

Table 6-22
Construction Noise Management Levels

Receiver Type	Construction Noise Management Levels (NMLs) $L_{Aeq(15min)}$ (dBA)				
	Standard Hours[1]	Highly Noise Affected	Out-of-Hours[2]		
	Day	Day	Day	Evening	Night
All Residential	45	75	40	35	35
School Classroom	55[3] when in use				
Passive Recreation	60 when in use				
Commercial	70 when in use				

Source: Appendix J

1 Calculated based on adopted RBL + 10 dB, with the adopted day RBL = 35 dB as defined in the NPfI.

2 Calculated based on adopted RBL + 5 dB, with the adopted day/evening/night RBL = 35/30/30 dB respectively as defined in the NPfI.

3 Equivalent external noise level.

Construction Noise

Details of construction scenarios and equipment used over the approximately four-year period were reviewed by SLR (2024b).

Separate scenarios were developed for standard daytime hours (7.00 am to 6.00 pm, 7 days per week) and out-of-hours construction activities (24 hours per day, 7 days per week). The out-of-hours construction activities are required to manage construction schedule risk and reduce safety risk.

Further, a worst-case construction scenario was developed, which would represent the highest total sound power level during construction, as well as considering proximity of construction activities to receivers.

Modelling of this worst-case construction scenario indicates that all non-project related receivers are below the relevant Construction Noise Management Levels (CNMLs), with the exception of privately owned receiver 23 located to the north-east of the site under noise enhancing weather conditions (Figure 6-25).

Construction noise levels are predicted to exceed the CNMLs at this location by up to 4 decibels (dB) during standard construction hours and by up to 2 dB during out-of-hours tunnelling works. Given the minor exceedance of the CNMLs is predicted under noise enhancing weather conditions, impacts are likely to be minor (Appendix J).

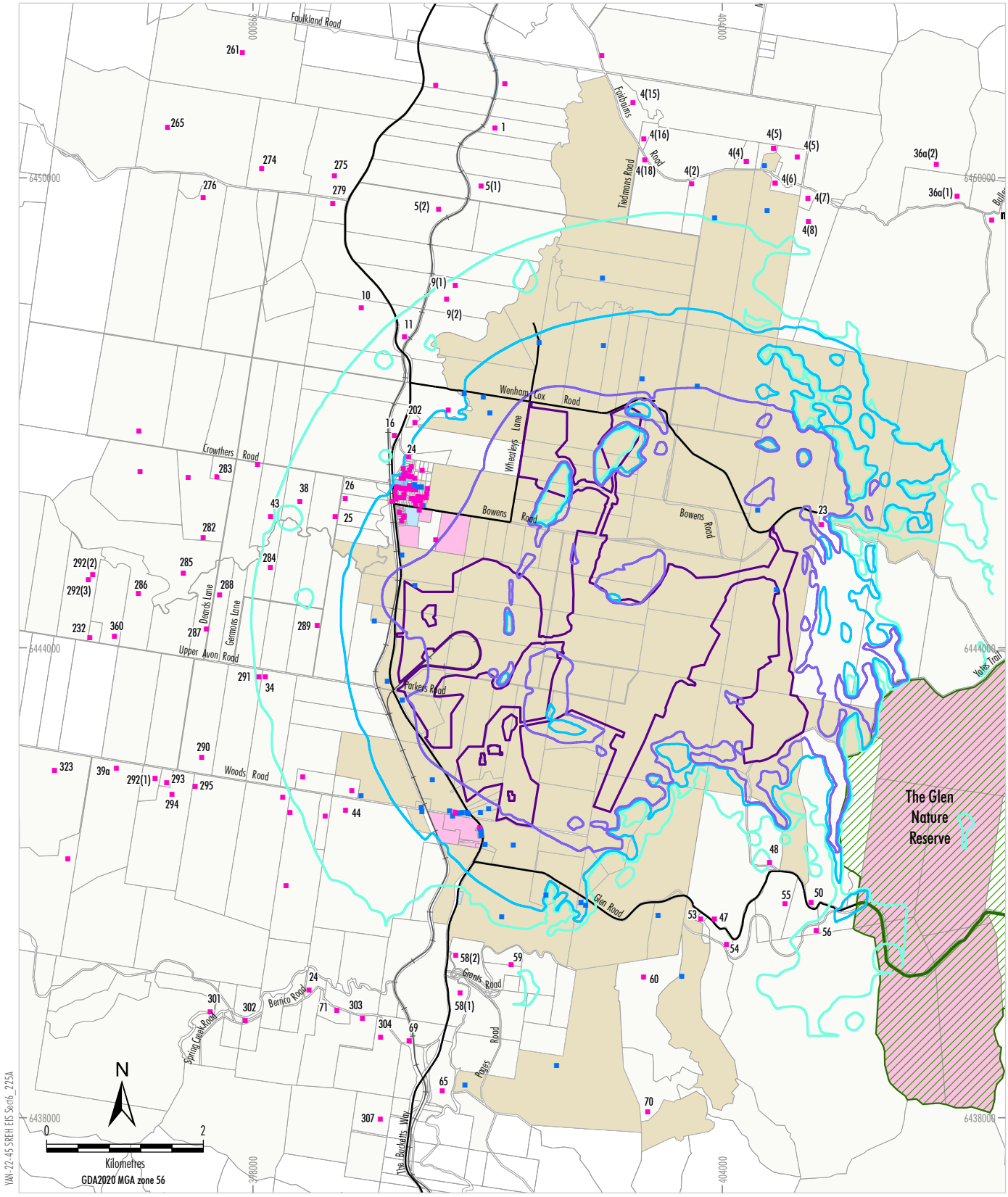
Notwithstanding, appropriate feasible and reasonable construction noise mitigation measures would be applied to the works and are discussed in Section 6.12.4.

Operational Noise

The operational plant associated with the powerhouse would primarily consist of pumps/turbines located approximately 100 m underground in an underground silo and as such are not expected to cause any significant noise emissions from the surface (Appendix J).

Noise sources associated with the Solar Farm would primarily consist of solar tracking motors and inverters located throughout the Project area (Appendix J).

Appendix J predicts operational noise levels would meet relevant criteria at all receivers.



LEGEND

- National Park, Nature Reserve or State Conservation Area
- Crown
- State Government
- Local Government
- Privately Owned
- Yancoal (or Subsidiary) Owned
- Project Disturbance Footprint

Noise Contours dB(A)

- 35
- 40
- 45

Source: NSW Spatial Services (2023); Yancoal (2023)

YANCOAL

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Noise Contours for Standard Construction Hours Under Adverse Meteorological Conditions

Figure 6-25

Cumulative Noise

An assessment of cumulative noise levels from operation of the Project and closure and ongoing rehabilitation works at the SMC following the completion of mining has been undertaken by SLR (2024b).

The cumulative operational noise amenity levels are below the NPfI recommended amenity levels at all receivers (Appendix J).

Construction Vibration Assessment

Tunnelling construction activities for the Project would be undertaken using drill and blast techniques.

Construction blasting would involve significantly lower blasts sizes compared to blasting for the SMC.

Typical construction blast sizes for the Project would involve a Maximum Instantaneous Charge (MIC) of approximately 20 kilograms (kg), compared to a MIC of between 400 kg and 1,500 kg used during mining at the SMC. Typical construction blast sizes of up to a MIC of 20 kg are predicted by SLR (2024b) to result in negligible impacts.

The nearest non-project related residential receiver is located approximately 2 km from the nearest potential blast location. Blast impacts at private dwellings are predicted to be negligible.

Similarly, no damage to infrastructure or CTS-1 due to blast vibration is predicted (Appendix J).

6.12.4 Mitigation Measures, Management and Monitoring

Appropriate feasible and reasonable construction noise mitigation measures would be applied to the construction works.

Measures would include Project planning and timing of works to be scheduled in a staged manner. Works, with the exception of tunnelling works, would generally be completed during standard daytime construction hours. A full list of mitigation measures is provided in Appendix J.

A Noise Management Plan would be prepared as part of the CEMP and OEMP for the Project and blast management measures would be described in the CEMP.

6.13 AIR QUALITY

Section Overview

- This section summarises potential air quality impacts.
- An *Air Quality and Greenhouse Gas Assessment* was prepared by Airen (2024) and is presented in Appendix K.
- Key guideline considered was the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*.
- The existing environment includes the 24 hours per day operations of the SMC, noting dust levels from the SMC will reduce for closure.
- Dust from Project construction is predicted to comply with relevant air quality criteria at all private receivers.
- No significant air emissions sources during operation of the Project.
- Key mitigation, management and monitoring would be described in a *Dust Management Plan*.

6.13.1 Methodology

The air quality assessment was prepared by Airen (2024) in accordance with the EPA's *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (EPA, 2022).

6.13.2 Existing Environment

A review of recent and historical meteorological and ambient air quality conditions was completed. The review was informed by data collected from the existing air quality and meteorological monitoring stations in the SMC (Figure 6-3).

A summary of meteorological data for the area is provided in Section 6.2.1.

Existing Air Quality Conditions

Air quality conditions are strongly correlated to climatic conditions. The following air quality parameters are monitored at the SMC and reviewed as part of the air quality assessment (Appendix K):

- total suspended particulates (TSP);
- particulate matter with equivalent aerodynamic diameter of 10 microns or less (PM_{10});

- particulate matter with equivalent aerodynamic diameter of 2.5 microns or less ($PM_{2.5}$); and
- deposited dust.

Assumed background levels for the air quality assessment were established to determine the potential cumulative impacts. It is also important to note that the measurements would have contained some contributions from the existing SMC.

The SMC would have progressed into a closure phase by the time the Project is operating so the use of measurement data that contain contributions from the SMC for the Project assessment is a conservative approach.

Appendix K provides an analysis of baseline air quality data at the SMC.

Table 6-23 shows the assumed background levels against the EPA's assessment requirements. These assumed background levels were used for impact assessment at sensitive receivers around the Project.

6.13.3 Potential Impacts

Model Development

An air quality model was developed to predict the dust emissions associated with construction of the PHES. The Project construction schedule is presented as Figure 3-2 in Section 3 of this EIS. The Project construction would occur over approximately 4 years. For the purpose of conservative modelling, it was assumed that all PHES construction activities would occur in parallel, in a single year (Appendix K).

The major emission sources modelled for construction are associated with (Appendix K):

- dozer operations;
- rock screening;
- hauling spoil and waste rocks; and
- wind erosion from exposed areas.

The CALPUFF model was used by Airen (2024) for the dispersion modelling to assess potential air quality impacts.

A description of the dispersion model methodology and emission inventories is provided in Appendix K.

Potential Project Only Impacts

PHES Construction

The air quality modelling has assessed for each of the key particulate matter listed in Section 6.13.2.

All privately owned receivers were predicted to comply with the EPA's criteria for 24-hour average PM_{10} and $PM_{2.5}$ concentrations, annual average PM_{10}, $PM_{2.5}$ and TSP concentrations as well as dust deposition (Appendix K).

The modelling results represent the contributions from the Project as well as background levels. The actual background levels at the time of Project construction would likely be lower than the adopted levels, as SMC operations would have ceased, with only mine rehabilitation activities occurring in parallel to Project construction (Appendix K).

Table 6-23
Assumed Background Levels

Air Quality Indicator	Averaging Time	Assumed Background Level that Applies to Sensitive Receivers	EPA Assessment Criterion
Particulate Matter (PM_{10})	24-hour	24-hour: variable, with the maximum 24-hour average of 26.1 $\mu g/m^3$	50 $\mu g/m^3$
	Annual	6.8 $\mu g/m^3$	25 $\mu g/m^3$
Particulate Matter ($PM_{2.5}$)	24-hour	24-hour: variable, with the maximum 24-hour average of 10.4 $\mu g/m^3$	25 $\mu g/m^3$
	Annual	2.7 $\mu g/m^3$	8 $\mu g/m^3$
Particulate Matter (TSP)	Annual	13 $\mu g/m^3$	90 $\mu g/m^3$
Deposited Dust	Annual	1 g/m^2/month	Maximum increase: 2 g/m^2/month
			Maximum total: 4 g/m^2/month

Source: Appendix K

$\mu g/m^3$ = micrograms per cubic metre

g/m^2/month = grams per square metre per month

Solar Farm Construction

As the Solar Farm construction involves only minor earthworks and other activities such as the physical installation and assembly which have low potential for dust generation, it is not a substantial potential source of dust and so a risk-based assessment has been undertaken by Airen (2024).

The primary air quality risk for the Solar Farm construction relates to generation of dust from clearing areas and transporting materials over unsealed access tracks.

The risk assessment showed that the Solar Farm construction would not cause adverse air quality impacts (Appendix K).

Project Operation

There would be no significant air emissions sources during operation of the Project. Some vehicle movements and maintenance activities may be required during operation, however, at a far lower rate than during construction.

As the Project is not anticipated to cause any adverse air quality impacts during construction, none are anticipated during the operational phase (Appendix K).

6.13.4 Mitigation Measures, Management and Monitoring

Standard dust mitigation measures would be implemented during Project construction (Appendix K), including:

- watering of access haul routes and heavily trafficked construction areas;
- minimising vehicle speeds;
- modifying activities if excessive dust is visible;
- minimising the areas of disturbed land as far as practicable; and
- rehabilitating disturbed areas as soon as practicable.

With the implementation of these standard dust mitigation measures, as well as other additional measures identified during the Project construction, it is anticipated that the Project is unlikely to cause any adverse air quality impacts.

A Dust Management Plan would be prepared as part of the CEMP for the Project.

6.14 GREENHOUSE GAS

Section Overview

- This section summarises potential greenhouse gas emissions from the Project, particularly during construction.
- Greenhouse gas emissions were quantified by Airen (2024) in the *Air Quality and Greenhouse Gas Assessment* (Appendix K).
- Key legislation and guidelines considered were the draft *Greenhouse Gas Assessment Guide for Large Emitters, National Greenhouse and Energy Reporting Act 2007* and *National Greenhouse Accounts Factors.*
- Renewable energy generated by the Project would positively contribute to reducing greenhouse gas emissions in the electricity sector.
- The Project would avoid between 320,000 and 550,000 t CO_2-e/year, if energy equivalent to the Project was alternatively produced by gas fired power generation.
- Total Scope 1 emissions during construction would be 0.0006% of NSW emissions and 0.0002% of Australia's emissions.
- Although the Project would import electricity from the grid to supplement the Solar Farm, it is a net producer of renewable electricity (solar plus PHES), meaning net electricity consumption and associated Scope 2 emission are less than zero.

6.14.1 Methodology

While the Project is a renewable energy project, which would positively contribute to reducing greenhouse gas emissions in the electricity sector, it has potential to generate greenhouse gas emissions during construction and operation.

Greenhouse gas emissions are separated into three categories known as 'Scopes'. Scopes 1, 2 and 3 are defined by the Greenhouse Gas Protocol (World Resource Institute, 2004) and can be summarised as follows:

- Scope 1 – Direct emissions from sources that are owned or operated by the organisation (examples include combustion of diesel in company owned vehicles or used in on-site generators).
- Scope 2 – Indirect emissions associated with the import of energy from another source (examples include importation of electricity or heat).
- Scope 3 – Other indirect emissions (other than Scope 2 energy imports) which are a direct result of the operations of the organisation but from sources not owned or operated by them (examples include business travel, by air or rail, and product usage).

The greenhouse gas assessment was conducted in accordance with the following Federal and State legislation and policies, including:

- Commonwealth *National Greenhouse and Energy Reporting Act 2007* (NGER Act);
- Commonwealth *National Greenhouse and Energy Reporting (Measurement) Determination 2008* (Measurement Determination); and
- the National Greenhouse Accounts Factors (NGA Factors) (Cth DCCEEW, 2023b).

The NGER Act is used for the measurement, reporting and verification of Greenhouse gas emissions.

The EPA has released the draft *Greenhouse Gas Assessment Guide for Large Emitters* (EPA, 2024b), which applies to projects with Scope 1 and 2 emissions of 25,000 t CO_2-e/year during the operational life of the Project. Given the Project's emissions do not exceed this threshold, the draft Guide does not apply to the Project.

The greenhouse gas emissions calculation methodologies for the Project have been based primarily on the NGA Factors (Cth DCCEEW, 2023b).

6.14.2 Potential Impacts

Greenhouse Gas Emissions Calculation Methodology

A greenhouse gas inventory was developed in accordance with the principles of the Greenhouse Gas Protocol and the *Technical Guidelines for the Estimation of Greenhouse Gas Emissions by Facilities in Australia* (Department of Climate Change, 2007).

The inventory for this assessment includes all significant sources of Scope 1 and 2 greenhouse gas emissions associated with the Project (Appendix K).

Future projections of fuel usage and electricity consumption provided by the Cth DCCEEW (2022) were used to determine the potential greenhouse gas emissions from the Project. It is noted that the Project would draw electricity (Scope 2) from the grid to supplement the Solar Farm input when overall grid demand is low, including times when renewable energy supply is abundant. Emissions due to electricity demand are therefore expected to be much lower than from an average grid generation mix.

The Project would also result in vegetation (woodland) loss, which would result in an associated loss of carbon sink. Loss of carbon sink due to vegetation clearance is not considered under the NGERs or the NGA Factors, but has been considered in Appendix K.

Scope 3 emissions associated with the upstream emissions associated with diesel and electricity production were also quantified based on the Scope 3 emission factors from the NGA Factors (Cth DCCEEW, 2023b).

Table 6-24 shows the key emission sources that have been considered in the assessment as well as the estimation methodologies (Appendix K).

Table 6-24
Greenhouse Gas Emission Sources and Estimation Methodologies

Activity	Description	Scope(s)	Emission estimation methodology
Diesel consumption	Combustion of diesel fuel from on-site mobile and stationary plant and equipment.	1, 3	Emission factors from NGA Factors (Cth DCCEEW, 2023b).
Electricity^ consumption	Electricity consumption.	2, 3	Emission factor projections from Cth DCCEEW (2022):
Vegetation removal*	Loss of carbon sink due to removal of vegetation (noting that the use of the SMC mining footprint for the Project would reduce these emissions compared with a greenfield PHES).	1	Calculated using 'Carbon Gauge' developed by the Transport Authorities Greenhouse Group (2013). Vegetation assumed to be 100% open woodlands. Biomass class set to "Class 4: 150 - 250 tonnes of dry matter per hectare" based on the Project location.

Source: Appendix K

^ Emission factors projected to decline over life of the Project to reflect decarbonisation of electricity supply. Estimated annual emission factors are provided in Cth DCCEEW (2022).

* Vegetation removal emissions are not reported under NGERs.

Construction Greenhouse Gas Emissions

Table 6-25 summarises the estimated greenhouse gas emissions during Project construction.

Table 6-25
Estimated Greenhouse Gas Emissions from Project Construction

Emissions Category	Average during Project Construction (Mt CO_2-e/year)	Maximum during Project Construction (Mt CO_2-e/year)
Scope 1	0.000675	0.002854
Scope 2	0.000528	0.000708
Scope 3	0.000182	0.000747

Source: Appendix K

Mt CO_2-e/year = Million tonnes of carbon dioxide equivalent per year

It was estimated that Project average annual Scope 1 emissions during construction would be in the order of 0.0006% of NSW emissions (111.00 Mt CO_2-e in 2022) and 0.0002% of Australia's emissions (432.62 Mt CO_2-e in 2022) (Appendix K).

In addition, the resultant emissions from the vegetation (woodland) loss due to construction equates to approximately 26,050 t CO_2-e over the life of the Project (which could be greater than 50 years). This represents carbon sequestration loss due to the removal of the vegetation (Appendix K).

Operational Greenhouse Gas Emissions

Scope 2 emissions due to importing electricity from the grid have been considered in Appendix K. However, the combined renewable electricity production from the Solar Farm and PHES (in generation mode) is forecast to exceed the electricity required to be imported from the grid.

As such, the Project is a net electricity producer (i.e. electricity consumption by the Project is less than zero).

From a greenhouse gas accounting perspective, as net electricity consumption is less than zero, Scope 2 greenhouse gas emissions are zero.

There are no significant sources of Scope 1 greenhouse gas emissions during operations.

Project Greenhouse Gas Savings

The annual emissions greenhouse gas savings associated with the Project has been calculated. Greenhouse gas savings were estimated by comparing the Project's emissions to the gas-fired Hunter Power project (with an emissions intensity of 0.52 t CO_2-e/megawatt hour) (Appendix K).

The greenhouse gas savings for the Project using this method (i.e. greenhouse gas savings due to net power generated by the Project compared with gas fired generation) are estimated to be between 0.32 (Years 5 to 10) and 0.55 Mt CO_2-e/year (Years 10 onwards) (up to 0.39% of NSW emissions in 2019) (Appendix K).

6.14.3 Mitigation Measures, Management and Monitoring

Mitigation of greenhouse gas emissions from the Project construction activities would include (Appendix K):

- planning and scheduling works to minimise fuel usage and to maximise energy efficiency as far as practicable;
- maintenance of plant and equipment to minimise fuel consumption and associated emissions; and
- training staff on improvement strategies to minimise fuel usage and maximise energy efficiency.

Greenhouse gas mitigation and management measures would be documented in the CEMP.

6.15 SOCIAL

Section Overview

- This section summarises the outcomes of consultation and assessment regarding social impacts.
- A SIA was prepared by Aigis Group (2024) and is presented in Appendix L.
- Key guideline considered was the *Social Impact Assessment Guideline for State Significant Projects.*
- A range of consultation was undertaken to inform the identification of potential social impacts.
- Key concerns raised included increased demand for community services (e.g. housing) and environmental impacts.
- The benefits of the Project were acknowledged by stakeholders, including the benefits of renewable energy, employment and opportunities for businesses.
- A *Construction Workforce Accommodation Strategy* would be prepared for the Project.

6.15.1 Methodology

The SIA (Appendix L) was prepared by Aigis Group (2024) in accordance with the *Social Impact Assessment Guideline for State Significant Projects* (DPE, 2021a) and the *Technical Supplement – Social Impact Assessment Guideline for State Significant Projects* (DPE, 2021b).

Consultation for the SIA was undertaken in consideration of the *Undertaking Engagement Guidelines for State Significant Projects* (DPHI, 2024b).

The SIA considered the following key stakeholder engagement (Appendix L):

- Direct outcomes of stakeholder engagement undertaken for the SIA via in-person interviews.
- Feedback from online community survey seeking community views on the Project.
- Stakeholder engagement activity undertaken by SCPL and Yancoal for closure of the SMC, which has formed important context for stakeholder engagement for the Project.
- Broader public perception on renewable energy based on contemporary literature.

Stakeholder engagement for the Project has resulted in the following avoidance, mitigation and management measures (Appendix L):

- Removal of the section of the Solar Farm proposed on the western side of The Bucketts Way, with the aim of reducing the overall visual impact.
- Following additional stakeholder engagement, an area of the Solar Farm adjacent to The Bucketts Way (on the eastern side) with higher visibility was also removed from the Project. Vegetative screening is now proposed in this area, to further mitigate visual impact.

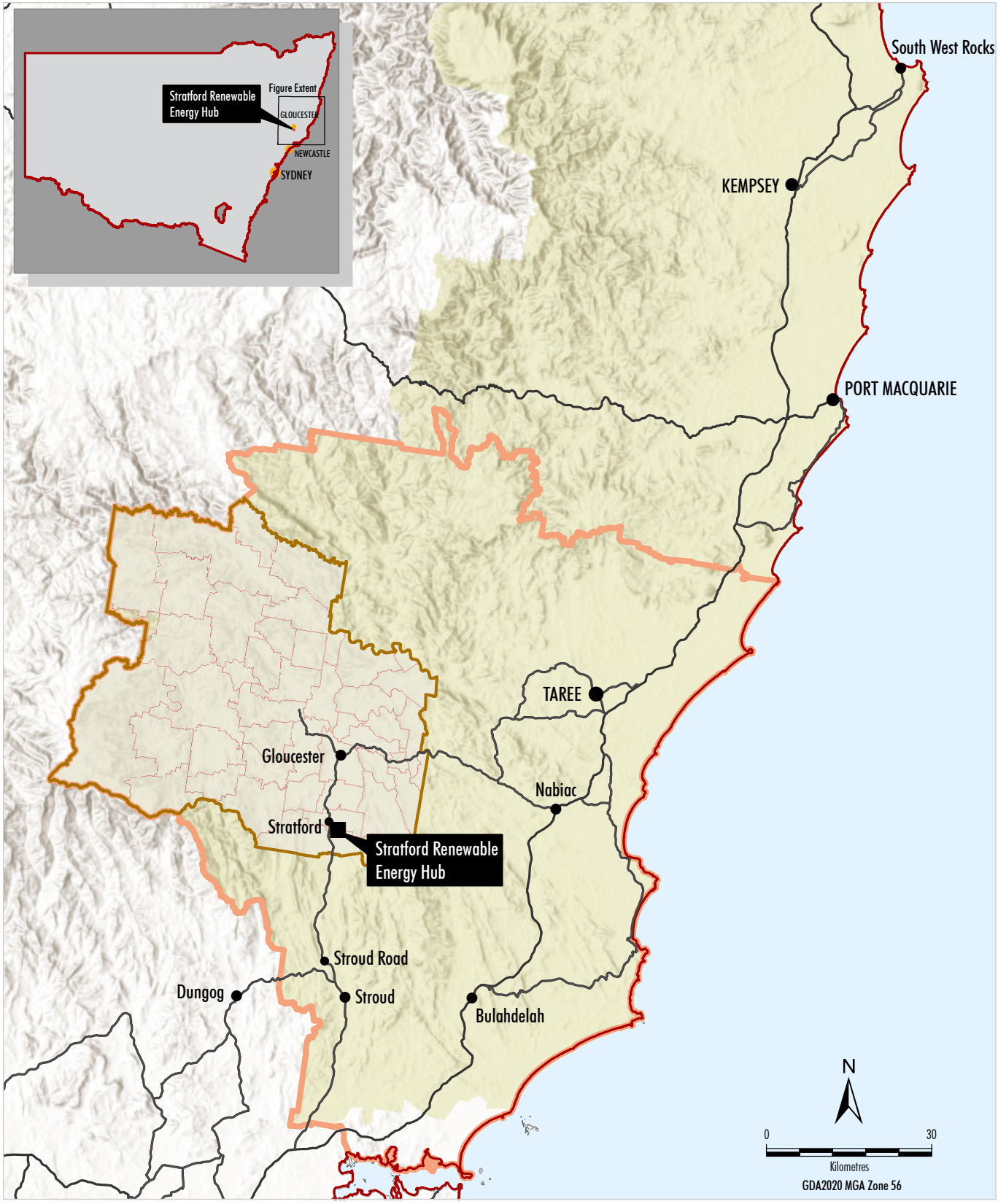
Stakeholder engagement for the SIA is described in the SIA (Appendix L).

6.15.2 Existing Environment

Social Locality

Due to the distribution of potential social benefits and impacts associated with the Project, the SIA defines the Project social locality as (Appendix L):

- Gloucester Statistical Area Level 2 (Gloucester SA2) (Figure 6-26) – immediate vicinity of the Project (which encompasses Gloucester, Stratford and Craven, as well as natural features like the Avon River State Forest, Woke National Park and Curracabundi National Park) where people may experience direct and localised impacts during construction and operation of the Project (particularly Stratford and Craven).



LEGEND

State and Regional Roads

Social Locality

Gloucester Statistical Area Level 2 (SA2) (Immediate Vicinity)

Mid-North Coast Statistical Area Level 4 (SA4)

MidCoast Council Local Government Area (Surrounding Vicinity)

New South Wales (Broad Vicinity)

Source: NSW Spatial Services (2023); ABS (2023)

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Social Locality – ABS Boundaries

Figure 6-26

- MidCoast Council LGA (Figure 6-26) – surrounding vicinity of the Project (encompassing the major population centres of Taree and Forster-Tuncurry) where people may benefit from the Project but not necessarily be exposed to negative direct social impacts.
- Mid North Coast Statistical Area Level 4 (Mid North Coast SA4) (Figure 6-26) – broader region associated with the Project (which encompasses a large portion of the MidCoast Council LGA and Nambucca Valley Council LGA, wholly encompasses the Port Macquarie-Hastings Council LGA and Kempsey Shire Council LGA, and partially encompasses the Armidale Regional Council LGA), where the labour market may be drawn for the Project.
- NSW – broadest vicinity for the SIA, as electricity produced by the Project would be delivered across NSW via the electricity grid.

Potential impacts of the Project were considered for each of the above, where relevant (Appendix L).

Social Baseline

Beneficial Use of Mine Site

The Project proposes the use of land associated with the SMC. The closure of the SMC (including decommissioning and rehabilitation activities) would occur simultaneously with development of the Project and, accordingly, is an element of the social baseline.

The SMC and Duralie Coal Mine commenced in 1995 and 2003, respectively, and have been relatively large employers and traders in the context of the small total and working population for the Gloucester SA2 and MidCoast Council LGA.

Closure of the SMC and Duralie Coal Mine is likely to affect the social baseline as follows (Appendix L):

- Employment levels: Initially, a consistent employee level (relative to the current) is expected to continue through closure for decommissioning and rehabilitation activities, however this will inevitably decline.
- Local commercial interactions: Initially, interaction with local business is expected to be consistent through closure for decommissioning and rehabilitation activities, however this will inevitably decline.
- Amenity impacts to nearby landowners: Operational impacts at the SMC will decline.

Community Demographic Profile

The Gloucester SA2 is typical of small regional communities (Appendix L).

The Gloucester SA2 is considered to be particularly vulnerable to significant changes in its socio-economic circumstances, such as the closure of the SMC and Duralie Coal Mine (Appendix L).

The larger regional populations (MidCoast Council LGA, Mid North Coast SA4 and NSW) are considered as being unlikely to be materially impacted by significant socio-economic changes within the Gloucester SA2 (Appendix L).

Demographic data for the Project social locality, including a description of the existing population profile, housing, employment, age and gender distributions, cultural and religious diversity and dwelling demand, is provided in the SIA (Appendix L).

Feedback from SIA Consultation

Stakeholder engagement undertaken for the SIA established an understanding of perceived positive and negative impacts associated with the Project from the perspective of members of the community (Appendix L).

Reasonably broad support for the Project was received as part of stakeholder engagement undertaken for the SIA (Appendix L). This was exemplified by the overall positive view expressed in the online survey, other SIA engagement with local residents and key service providers (e.g. the Gloucester Community Health Service), whose resources may be most called upon, particularly during Project construction.

Notwithstanding, stakeholders raised concerns regarding potential negative social and environmental impacts.

Table 6-26 provides a summary of the key perceived positive and negative impacts (Appendix L).

Table 6-26
Summary of Perceived Positive and Negative Impacts

Impact
Perceived Positive Project Aspects
• Support for renewable energy projects in the Gloucester Valley. • Construction stage workforce (demand increase in trade for local businesses and service providers). • Operations stage workforce (permanent economic and social activity and periodic additional economic activity). • Positive economic impacts of Yancoal's investment in the region. • Ongoing communication with the community by Yancoal/SCPL. • Beneficial use of the SMC site. • Contribution to NSW/NEM electricity supply and system stability. • Contribution to meeting NSW Government emissions reduction targets. • Reduction in energy costs across NSW/NEM. • Construction stage workforce (regular high occupancy levels and income for accommodation providers). • Construction stage workforce demographic effects (few negative impacts for previous projects). • Engagement with Gloucester Worimi First Peoples' Aboriginal Corporation, RAPs, etc. to identify and preserve cultural heritage items. • Solar Farm land use will create broad distribution of benefit rather than benefit accruing to one land occupant. • Recycling and beneficial use of Solar Farm waste (e.g., PV panel materials/componentry refuse).
Perceived Negative Project Aspects/Concerns
• Construction stage workforce (increased demand for and pressure on housing). • Concerns with engagement process. • Construction stage workforce increase in demand for services (e.g., medical) may impact community access. • Construction stage workforce (increased pressure on accommodation detracting from tourist activity). • Construction stage workforce (temporary change in demographic structure of the population). • Solar Farm (visual impacts). • Solar Farm (maintenance water usage, site management [weeds etc.] and lack of agrisolar use). • Management of waste from the Solar Farm. • Concerns for impacts on biodiversity (particularly construction of the upper reservoir and subsequent inundation). • Concern for impacts on Aboriginal cultural heritage and related community impacts. • Concern for potential overspill of upper reservoir/flooding. • Construction stage traffic (The Bucketts Way). • Solar Farm (exclusion of alternative land uses, particularly agricultural use).

Source: Appendix L
NEM = National Electricity Market

6.15.3 Potential Impacts

Key social impacts identified by the SIA can generally be categorised into impacts related to:

- benefits;
- social infrastructure, for example demographic changes due to the large temporary construction workforce and their associated consequences to community services such as housing and medical; and
- fears and perceptions relating to other environmental matters, for example concern about visual impacts.

Social benefits of the Project include (Appendix L):

- Large temporary construction workforce:
  - Temporary increase in demand and trade for local businesses and service providers.
  - Temporary regular high occupancy levels and income for accommodation providers.
- Operational workforce:
  - Permanent economic and social activity, and periodic additional economic activity.
- Contribution to electricity supply and system stability.

Potential social impacts related to social infrastructure include (Appendix L):

- Large temporary construction workforce:
  - Temporary increase in demand for, and pressure on, housing.
  - Temporary increase in demand for services which may impact community access.
  - Temporary increase in pressure on accommodation detracting from tourist activity.
  - Temporary change in demographic structure.

Potential social impacts related to fears and perceptions of other environmental impacts include (Appendix L):

- Concern regarding visual impacts associated with the Solar Farm.
- Concern regarding impacts on biodiversity.
- Concern regarding impacts on Aboriginal cultural heritage.
- Concern about traffic during construction.

It is noted that technical matters relating to environmental impacts are addressed elsewhere in the EIS (including the technical studies), acknowledging this does not directly address social impacts relating to concern for these matters.

Potential social impacts would likely be most acutely experienced in the Gloucester SA2 and this would diminish with distance from the Project.

Stakeholders across NSW more broadly would experience positive social impacts from the electricity produced by the Project, and are unlikely to experience material negative social impacts (Appendix L).

6.15.4 Mitigation and Monitoring

A number of management and mitigation strategies have been identified by Aigis Group (2024) that would enhance potential positive social impacts and minimise potential negative social impacts including:

- Ongoing stakeholder engagement and provision of community information; including:
  - Implementation of a structured approach to continuing stakeholder engagement.
  - Provision of information throughout the various stages of the Project.
  - Use consistent engagement channels and contacts.
  - Progressive monitoring of stakeholder responses (including via the Project website, email address and community hotline).
  - Engagement with community representative groups that have a strong interest in the Project at all stages of the Project.
  - Distribution of Project description material in ‘plain English’.
- Given the potential negative social impacts from the Project are associated with the large temporary construction workforce (including impacts on housing and accommodation), development and implementation of a Construction Workforce Accommodation Strategy is proposed.

- Development and implementation of a CEMP to manage environmental impacts, including those of concern to the community.

In addition, an Environmental Management Strategy would be prepared to manage complaints and incident response protocols.

6.16 ECONOMIC

Section Overview

- This section summarises the economic impact of the Project.
- An *Economic Assessment* was prepared by AnalytEcon (2024) and is presented in Appendix M.
- The Economic Assessment was prepared with reference to the SEARs and in accordance with the NSW SSD/SSI Guidelines and *Large-Scale Solar Energy Guideline*.
- It considers the local, regional and NSW-wide direct and indirect benefits of the Project's capital expenditure, including direct and flow-on income for workers.

6.16.1 Existing Environment

Population and Economy

The MidCoast Council LGA is a diverse region with an estimated population in 2022 of around 97,000. The towns of Taree and Forster-Tuncurry are major population centres, with major infrastructure, public services and industry located in Taree, while Forster-Tuncurry is a tourism centre that also hosts many retirees (Appendix M).

Gloucester is a rural centre within the Barrington Coast hinterland. As of 2022, the Gloucester SA2 had a population of around 5,300 (Appendix M).

The key employment sectors in the Gloucester SA2 are the service sectors, agriculture, construction sector, retail trade and manufacturing (Appendix M). Around 4% of the Gloucester SA2 population is currently employed in mining (Appendix M).

Employment

As of 2022, the SMC reportedly employed around 100 workers, and Yancoal's procurement expenditures with businesses in the region amounted to around $74 million (Appendix M).

Following completion of the SMC mining operations, a portion of the workforce will remain on-site to continue closure works, however employment will inevitably decline.

6.16.2 Potential Impacts

Employment and Income – Construction Phase

Project construction is expected to take place over approximately 4 years. Total construction expenditures (excluding wages) are estimated at approximately $1.56 billion, of which (Appendix M):

- approximately $1.4 billion would be sourced from NSW suppliers; and
- approximately $156 million would be sourced from suppliers located in the MidCoast Council LGA.

Over the four-year timeframe, the average construction workforce is expected to amount to approximately 300 FTE persons with a peak of 350 FTE persons, of which approximately 90% would be expected to reside in NSW and 10% in the MidCoast Council LGA. Total construction income and wages accruing to the NSW construction workforce over that timeframe are expected to amount to approximately $327 million, with corresponding total disposable income of approximately $189 million (Appendix M).

Employment and Income – Operational Phase

During operations, Yancoal expects to incur operational expenditures of approximately $6 million per annum (excluding purchase of electricity), and to employ a workforce of around 10 people over an operational life of 50 to 100 years (or more) (Appendix M).

Flow-on Effects

The estimated flow-on effects from additional income and employment generated during the construction phase of the Project are summarised as follows (Appendix M):

- For NSW, construction of the Project could generate $123 million in additional disposable income in Net Present Value (NPV) terms over the four-year period, or $36 million in additional disposable income per annum. The construction of the Project could additionally generate 184 jobs per annum over the construction period.

- For the MidCoast Council LGA, the construction of the Project could generate $11 million in NPV terms in additional disposable income over the four-year period, or $3 million in additional disposable income per annum. The construction of the Project could additionally generate 18 jobs per annum over the construction period.

6.17 HAZARDS

Section Overview

- This section summarises the outcomes of a PHA (Appendix O).
- It considers potential hazards associated with the Project and appropriate avoidance, mitigation and management.

6.17.1 Methodology

The PHA has been conducted in accordance with the general principles of risk evaluation and assessment as outlined in the following:

- *Assessment Guideline - Multi-level Risk Assessment* (Department of Planning and Infrastructure [DP&I], 2011).
- *Hazardous Industry Planning Advisory Paper No 6: Hazard Analysis* (Department of Planning, 2011a) (HIPAP No. 6).
- *Hazardous Industry Planning Advisory Paper No 4: Risk Criteria for Land Use Safety Planning* (Department of Planning, 2011b) (HIPAP No. 4).
- International Organisation for Standardisation (ISO) 31000:2018 *Risk Management – Guidelines.*

The PHA has also been prepared in accordance with the requirements in Chapter 3 (Hazards and Offensive Development) of the Resilience and Hazards SEPP.

Consistent with the requirements of the SEARs, the PHA addresses potential hazards relating to bushfire and flooding risks, as well as the handling and use of dangerous goods and hazardous materials.

The risk of bushfires related to the Project has been further assessed in Appendix P of this EIS. Findings of the Bushfire Assessment are provided in Section 6.18.

The following methodology was employed during preparation of the PHA:

1. Identify the hazards associated with the Project.
2. Analyse the consequences of identified hazardous events.
3. Qualitatively estimate the likelihood of the identified hazardous events.
4. Propose risk treatment measures for the identification of hazardous events.
5. Qualitatively assess risks to the environment, members of the public and their property arising from atypical and abnormal events and compare these to the risk criteria outlined in ISO 31000:2018 *Risk Management – Guidelines,* and in HIPAP No. 4.
6. Recommend further risk treatment measures, if necessary.
7. Qualitatively determine the residual risk assuming the implementation of the recommended risk treatment measures.

6.17.2 Potential Impacts

Interactions with electromagnetic fields (EMFs), handling of hydrocarbons, chemicals, explosives, liquid and non-liquid waste, potential for fire ignition and dam failure have been considered as potential hazards for the Project within the PHA.

In accordance with the *Assessment Guideline – Multi-level Risk Assessment* (DP&I, 2011), the PHA covers any potentially hazardous impacts of the Project and any public safety risks, including bushfire and flooding risks (including potential impacts on nearby landholdings).

The PHA, therefore, considers off-site risks to people, property and the environment (in the presence of controls) arising from atypical and abnormal hazardous events and conditions (i.e. equipment failures, operator error and external events), with specific focus on fixed installations on-site. The PHA does not consider risks to Project employees or Yancoal-owned property, risks that are not atypical or abnormal and does not encompass off-site transportation risks by pipeline, road, rail, air or sea.

The following classes of incidents were identified for consideration in the PHA:

- leak/spill;
- fire/explosion;

- dam wall break;
- electromagnetic field;
- uncontrolled/unauthorised movement;
- malfunctioning/damaged on-site equipment;
- theft;
- malicious acts/terrorism; and
- release of disease/biological pathogen.

These incident classes were applied to the Project component areas to identify scenarios for which treatment measures were developed (Appendix O).

Following identification of the potential hazards associated with the Project, a qualitative assessment of the risks to the environment, members of the public and their property associated with the Project was undertaken (Appendix O).

An assessment of the combination of the consequence and likelihood rankings for the identified hazards inconsideration of hazard treatment measures, whereby the Project results in a 'low' level of potential risk. Proposed risk treatment measures are described in Section 6.17.3.

Flooding Hazards

Dambreak

An *Intermediate Dambreak and Consequence Category Assessment* (dambreak assessment) was undertaken to inform feasibility considerations for the Project (GHD, 2024f). The dambreak assessment evaluated the potential impacts that could arise following a breach in the dam wall of either the upper or lower reservoirs associated with the Project.

The dambreak affected zone (DAZ) associated with a breach of the upper reservoir would impact the SMC site and rural areas between the SMC boundary and confluence of Avon River and Dog Trap Creek. Beyond the confluence, the DAZ impacts are generally contained to the creek channel and associated floodplains (GHD, 2024f).

The DAZ associated with a breach of the lower reservoir is largely contained within the floodplain and rural lands upstream of Gloucester. For these areas, the DAZ is limited to areas inundated by the 1% AEP flood event (GHD, 2024f).

Potential impacts of flooding as a result of rainfall are discussed in Section 6.3.3.

Electromagnetic Fields

The main source of EMF would be the proposed on-site substation; however, the installation of the proposed high voltage transmission line and associated infrastructure has the potential to increase the electric and magnetic field exposure of personnel in the area (Appendix O).

The proposed realignment of the existing 132 kV ETL around the lower reservoir has considered reference levels for EMF in accordance with applicable health and safety guidelines, and there should be no concern to public safety. Compliance monitoring during operation of the assets would ensure that guidance levels are met.

Accordingly, since the regular use of Project infrastructure is not likely to give rise to health effects, the PHA has considered the potential for abnormal or unexpected EMF increases (Appendix O).

Dangerous Goods

Of the hazardous materials that would be handled and/or stored at the Project (Section 3.10), only petrol is classified as a dangerous good in accordance with the criteria in the ADG Code.

6.17.3 Mitigation Measures

Yancoal would implement a safety management system for the Project to manage risks to health and safety in accordance with the requirements of the *Work Health and Safety Act 2011.*

It is noted that mitigation and management of environmental aspects which are of relevance to potential hazards are provided elsewhere in this section of the EIS.

A number of hazard controls, including mitigation and management measures, would be described in management plans or internal control strategy documents for the Project. Management plans would include:

- CEMP;
- OEMP; and
- Bushfire Emergency and Operations Management Plan.

In addition, the following key hazard controls and mitigation measures would be adopted by Yancoal to reduce the likelihood and/or consequences of potentially hazardous incidents associated with the Project:

- **Maintenance** – Ongoing and timely maintenance of all mobile and fixed plant equipment in accordance with the recommended maintenance schedule of the original equipment manufacturer, and consistent with maintenance schemes required by relevant legislation.
- **Staff Training** – Equipment operators and drivers would be trained and (where appropriate) licensed for their positions. Only personnel who are appropriately licensed to undertake skilled and potentially hazardous work would be permitted to do so.
- **Engineering Structures** – Civil engineering structures would be constructed in accordance with the applicable Australian Standards, codes and guidelines. Where applicable, Yancoal would obtain the necessary licences and permits for the construction of engineering structures.
- **Contractor Management** – All contractors employed by Yancoal would be required to operate in accordance with the relevant Australian Standards and NSW legislation.
- **Storage Facilities** – Storage and usage procedures for potentially hazardous materials (e.g. hydrocarbons, chemicals and explosives) would be developed consistent with Australian Standards and relevant legislation. A register would be kept up to date with the chemicals and dangerous goods stored on-site.
- **Emergency Response** – Firefighting and spill management equipment would be kept on-site in appropriate locations. Emergency response procedures systems and manuals would continue to be implemented.
- **Waste Management System** – Waste would be managed in consideration of general waste management principles (reduce, use, recycle). Waste disposal measures and a waste monitoring program would be described in the CEMP and OEMP.

6.18 BUSHFIRE

Section Overview

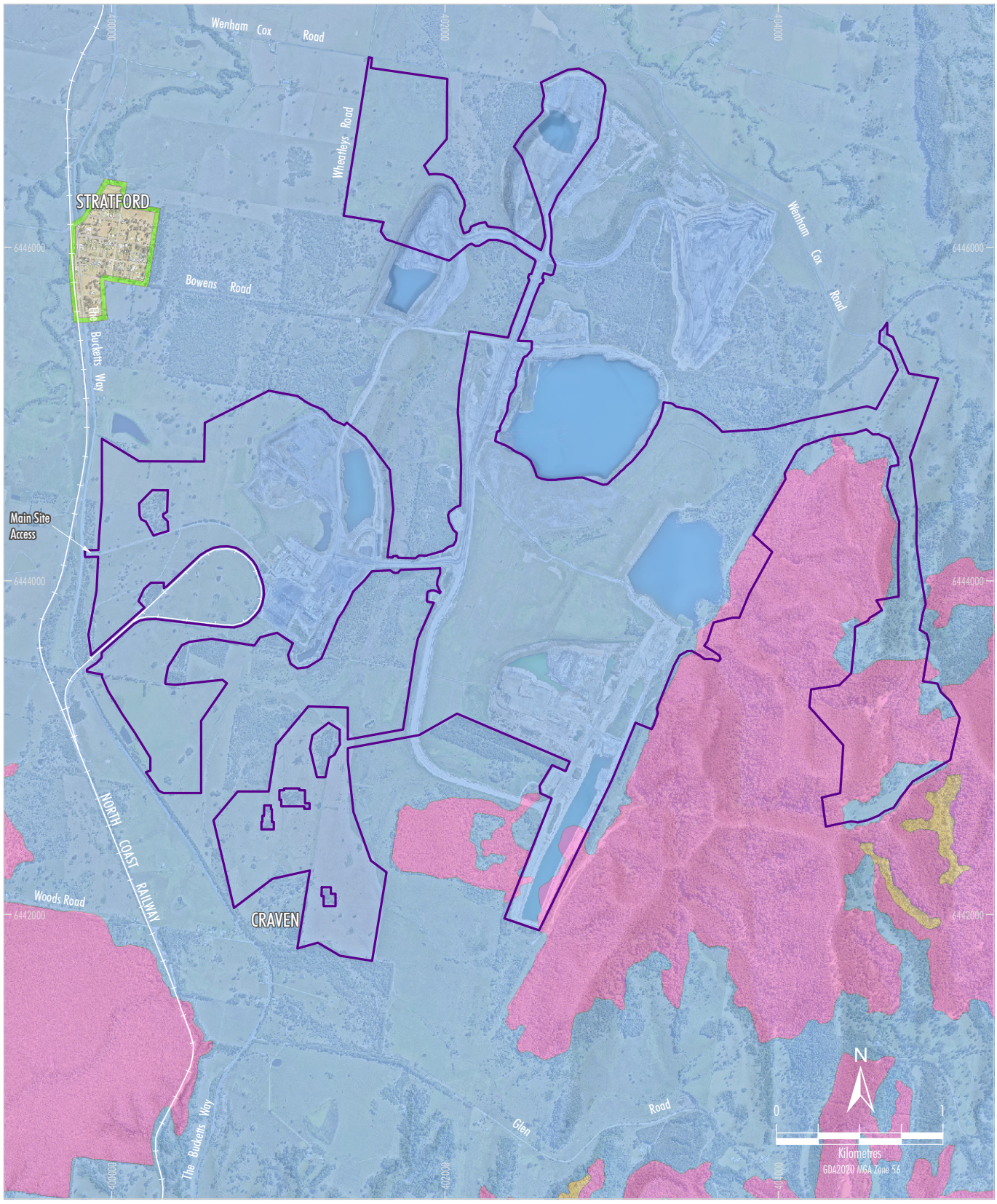
- This section summarises the outcomes of the *Bushfire Assessment* prepared by Peterson Bushfire (2024) and is presented in Appendix P.
- It outlines strategies to avoid and minimise bushfire risk.
- Asset Protection Zones would be implemented around the Solar Farm and powerhouse.
- A *Bushfire Emergency Management and Operations Plan* would be prepared for the Project.

6.18.1 Methodology

The Bushfire Assessment has been conducted in accordance with the NSW Rural Fire Service (RFS) document *Planning for Bush Fire Protection 2019* (PBP). The aim of PBP is to provide for the protection of human life and minimise impacts on property from the threat of bushfire, while having due regard to development potential, site characteristics and protection of the environment. Section 8.3.5 of PBP outlines the specific assessment requirements and minimum bushfire protection measures for solar farms.

NSW RFS Bush Fire Prone Land (BFPL) mapping designates areas that are considered to be higher bushfire risk. Mapping is updated periodically in accordance with the *Guide for Bush Fire Prone Land Mapping* (NSW RFS, 2015). The Project involves land identified as 'bushfire prone land' (Figure 6-27) as per the NSW RFS BFPL. Development proposals on land identified as bushfire prone require assessment in accordance with the PBP.

An analysis of the bushfire landscape, or parameters that give rise to the bushfire threat, provides the foundation for assessment of bushfire risk and determination of appropriate bushfire protection measures. The parameters analysed and discussed in Appendix P include bushfire hazard (comprising vegetation and topography), fire weather, fire history, potential ignition sources, fire intensity patterns, assets at risk and likely fire behaviour.



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LEGEND

Project Components

- Project Disturbance Footprint
- Vegetation Buffer
- Vegetation Category 1
- Vegetation Category 2
- Vegetation Category 3

Source: NSW Spatial Services (2023); Yancoal (2023)

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Bushfire Prone Land

Figure 6-27

6.18.2 Existing Environment

Bushfire Landscape Features

The predominant bushfire landscape features within and surrounding the Project consists of (Appendix P):

- A predominant of cleared rural lands generally to the north, west and south dominated by grazing along the north-south aligned Avon River Valley.
- Stratford to the west.
- Large expanse of forested range adjoining to the east which includes The Glen Nature Reserve.
- Large expanse of forested landscaped greater than 4 km to the west includes State Forests and Barrington Tops National Park.
- Sizeable patches of forest among the Project area including SMC biodiversity offset areas under rehabilitation (located outside the Project Disturbance Footprint).

Fire History

Fire history mapping shows that the surrounding land has not been affected by wildfire in more than 10 years (the wildfire data does not include small fires and ignitions). The most recent fire occurred 10 years ago to the east of the Project area. The remaining fires were more than 2 to 3 km away in the ranges and were single occurrences. Multiple fires have occurred greater than 3 km to the south-east within The Glen Nature Reserve. These ignitions could possibly be related to campers and users of the park (Appendix P).

The fires of the 2019 and 2020 ‘Black Summer’ fire season occurred more than 10 km to the south of the Project area.

Fire history mapping presented in Appendix P reveals that although fires have occurred in the range systems either side of the valley, these fires have not spread into the valley grasslands to impact assets.

6.18.3 Potential Impacts

Factors such as vegetation communities, topography, fire weather, fire history, fire intensity, potential fire ignition and assets at risk were analysed as part of the bushfire landscape assessment to determine the relevant contributing factors affecting bushfire risks (Appendix P).

Vegetation communities

Bushfire fuel is the vegetative material in the landscape that burns during a bushfire, and significantly influences the behaviour and intensity of a bushfire (Appendix P).

The predominant vegetation patterns that would influence fire intensity across the landscape are listed below (Appendix P):

- Expansive areas of forest vegetation to the east of the Project which are comprised of primarily of wet sclerophyll forest communities which have high fuel loads in the vicinity of 33 to 36 tonnes per hectare (t/ha). Rainforest communities are present along the creek lines and gullies however the overall area and spatial distribution of these is not significant enough to counteract the high fuel loads and prevalence of the wet sclerophyll assemblages.
- Cleared grazing lands generally to the north, west and south along the valley provide a low fuel environment. The paddocks can present a potential grassland hazard depending on the level of growth, curing and grazing practices. Fuel loads associated with native grassland systems are low (6 t/ha) and are expected to be lower for grazing lands.
- The cleared lands of the valley do support large remnants of open grassy forest and woodland. These patches are generally of a size such that they can present a bushfire hazard, even though they are disconnected from the surrounding ranges. The fuel loads are lower (18 to 25 t/ha) than the wet sclerophyll forests of the ranges.

Topography

Slope is a major factor determining the direction and rate of fire spread, as steeper slopes can significantly increase the rate of spread of fires.

Across the surrounding landscape, there is an occurrence of steep terrain adjoining the eastern side of the Project area. The land rises upslope out of the valley to the east and becomes rugged terrain. It is this terrain that supports the wet sclerophyll forests and rainforest gullies. Similar steep terrain exists greater than 4 km to the west.

The surrounding lands to the north, west and south are predominantly gently undulating and synonymous with the grazing lands of the valley.

Fire Weather

As described in the *Mid Coast Bush Fire Risk Management Plan* (Mid Coast Bush Fire Management Committee, 2019) the area has a warm temperate climate with predominant summer rainfall.

The bushfire season generally runs from July to November and can extend into January if summer rainfall is lower than average. Dangerous bushfire seasons are generally associated with a combination of two or more of the following factors (Appendix P):

- Persistent north-west to south-west winds.
- Lower than average rainfall through winter and spring.
- Occurrence of an extended drought period.

Fire Intensity Analysis

Predicted fire intensity analysis was undertaken by Peterson Bushfire (2024) within 5 km of the Project. The analysis used several factors including measures fire behaviour, vegetation (fuel load), slope, fire weather and direction of fire spread.

The fire intensity analysis determined that the higher intensity areas are to the east of the Project.

The higher intensity areas result from the combination of high fuel loads on the ridgeline and steeper terrain. Conversely, the surrounding lands to the north, west and south of the Project area show lower fire intensity due to low fuel loads of the grassland and open grassy forest and woodland patches (Appendix P). Accordingly, the cleared lands provide a buffer from higher intensity fires on the ridgeline (Appendix P).

Potential Fire Ignition

The *Mid Coast Bush Fire Risk Management Plan* (Mid Coast Bush Fire Management Committee, 2019) states that the main sources of ignition consists of:

- escapes from approved burning off;
- arson;
- illegal burning off;
- lightning; and
- ignition from previous hazard reduction burn.

These forms of ignitions can occur anywhere surrounding the Project and could involve a private farm or a public reserve such as national parks or The Glen Nature Reserve.

There is the potential for ignitions to occur within the Project area as a result of works associated with construction and operation of the Project (Appendix P). Management of activities would be implemented to avoid fire risk during all stages of the Project. Management measures are described further below.

6.18.4 Management and Preventative Measures

The following management and preventative measures would be implemented for the Project to minimise bushfire risks (Appendix P):

- **Vegetation Management*:*** Asset Protection Zones (with relevant minimum perimeter dimensions as specified by Peterson Bushfire [2024]) would be maintained around solar panels and the powerhouse to ensure that vegetation, including groundcover and any landscaping, is in a minimal fuel condition to prevent the spread of fire.
- **Access for firefighting*:*** the PBP requires safe operational access to structures and water supply for emergency services, as well as firefighter access to the perimeter of a development between the asset and the hazard. All internal access roads would comply with the standard of ‘property access’ as listed in the PBP.
- **Water supply for firefighting:** Static water supply tanks would be installed within the Project site.
- **Bushfire Emergency and Operations Management Plan:** A Bushfire Emergency and Operations Management Plan would be prepared for the Project which would identify all potential risks associated with the construction, operation and maintenance.

7 JUSTIFICATION OF THE PROJECT

This section provides a justification and conclusion for the Project as a whole, having regard to its environmental, economic and social impacts and the principles of ESD. Consistent with the requirement of the SEARs, this section also provides an evaluation of the merits of the Project.

As part of this justification, consideration has been given to:

- the design of the Project, including the avoidance and minimisation measures implemented (Section 7.1);
- strategic planning context relevant to the Project, including the suitability of the site (Section 7.2);
- statutory requirements and planning policies relevant to the Project and assessment of the Project against the objects of the EP&A Act and EPBC Act (Section 7.3);
- key engagement outcomes and associated Project design decisions and consideration of alternatives (Section 7.4);
- key impacts and benefits (Section 7.5); and
- assessment of the Project against the principles of ESD (Section 7.6).

7.1 DESIGN OF THE PROJECT

7.1.1 Objectives of the Project

The following section provides a summary of the objectives of the Project and how they would be achieved through the relevant Project design elements.

Provide a commercially attractive PMLU opportunity that comprises LDS

The Project would be capable of producing up to 300 MW over 12 hours (or 400 MW over 9 hours), which exceeds the definition of LDS under the EII Act.

If approved, the Project could contribute to the additional 2 GW of LDS that is required and legislated under the EII Act to be in place prior to 2030, and could assist in addressing the anticipated electricity reliability challenges, which are projected to occur in the near future by the NSW Government and AEMO.

The NSW Government's *Practical guide: Post mining land use* (Department of Regional NSW, 2023) identifies energy generation as a key opportunity for alternative PMLUs.

Further, the development of the Project is aligned with the *Hunter Regional Plan 2041* (DPE, 2022b), being able to continue attracting investment in the region after the closure of the SMC.

The Project aligns with the NSW Government's intentions to facilitate beneficial use of mining land to attract investment in new industries following the completion of mining operations.

If approved, the Project would be a model of beneficial PMLU.

Repurpose mine infrastructure and beneficially use previously disturbed areas where possible to minimise environmental impacts associated with the PMLU

The Project has been designed to maximise the use of previously disturbed areas associated with the SMC in order to minimise new disturbance associated with the Project.

In particular, the footprint of the Solar Farm has targeted areas previously disturbed by the SMC. For portions of the Solar Farm not proposed on land disturbed for the SMC, the Project has maximised areas previously cleared for agriculture and dominated by non-native vegetation.

In addition, the Project would maximise the use of existing SMC infrastructure for construction and operation to avoid and/or minimise additional disturbance required for the Project.

The Project would also involve the upgrade of the existing Stratford East Dam for the lower reservoir, which avoids the need to construct a new dam.

The PHES provides an opportunity for water contained within the SMC mine voids to be beneficially used to initially fill the PHES and top-up the PHES if required during operations. This would avoid reliance on natural water sources to fill and maintain water levels in the PHES.

Optimise the location and size of the PHES to maximise both power generation and energy storage

The Project is able to make use of the Stratford East Dam for the lower reservoir which, once upgraded, would allow sufficient water storage capacity for the PHES with limited additional disturbance required.

In addition, the variation in topography between the location of the lower reservoir and upper reservoir (over 200 m difference in vertical elevation) is sufficient to maximise the 'head' of water in the system and allow for optimised power generation of the PHES.

The topography of the upper reservoir provides a natural basin that reduces the disturbance and construction activities required to establish the reservoir and provides the required storage capacity.

Produce at least 300 MW AC solar energy to maximise the availability of on-site solar to charge the PHES

The EII Act sets out the NSW Government's minimum investment objectives for LDS for the period ending 31 December 2029, being the establishment of 12 GW of additional renewable energy generation, and an additional 2 GW of LDS capacity.

As described above, if approved, the Project could contribute to the additional 2 GW of LDS, legislated under the EII Act to be in place prior to 2030.

The Solar Farm is proposed as part of the Project to provide a local source of renewable energy to contribute to the energy required to pump water from the lower reservoir to 'charge' the upper reservoir.

The Solar Farm would supply approximately 320 MW AC electricity to the PHES and would also export electricity to the grid in times of surplus solar generation.

7.1.2 Project Design

Key components of the Project include the following:

- upper reservoir;
- lower reservoir;
- underground powerhouse and associated assembly bay;
- tunnelled waterways;
- Solar Farm;
- electrical substation and switchyard;
- transmission infrastructure, including internal connection network from the powerhouse and the Solar Farm to the site electrical substation; and
- upgraded internal access tracks.

Each of these components are briefly summarised in the sub-sections below.

Upper Reservoir

The upper reservoir would be a new structure constructed to the east of the existing Stratford East Dam within the ridgeline which provides suitable elevation for maximised head of water.

The upper reservoir would have a total volume of approximately 8.2 GL, with an active storage of approximately 6.95 GL. The upper reservoir has been designed with freeboard in consideration of a PMF event.

Lower Reservoir

The lower reservoir would be a zoned embankment dam, developed via augmentation of the existing Stratford East Dam.

The lower reservoir would have a total volume of approximately 7.1 GL, with an active storage of approximately 6.95 GL. The lower reservoir has been designed in consideration of a PMF event.

Prior to the construction of the Project, a clean water diversion system would be constructed on the eastern side of the lower reservoir, which would capture upslope catchment runoff between the upper and lower reservoirs, and direct this runoff to the north of the site. This enables the PHES to operate as a 'closed system', meaning no inputs from natural watercourses are required to operate the PHES.

Powerhouse

An underground powerhouse, with a silo approximately 100 m deep, would be constructed to the east of the lower reservoir. Two pumps/turbines, used to pump water from the lower reservoir to the upper reservoir and generate electrical energy when water is released from the upper reservoir to the lower reservoir, would be housed at the base of the powerhouse silo.

Tunnelled Waterways

Tunnelled waterways would be constructed to transfer water between the upper reservoir and the lower reservoir. The tunnelled waterways would comprise a vertical shaft approximately 100 m deep from the upper reservoir, a headrace tunnel connecting the vertical shaft to the powerhouse, and a tailrace tunnel connecting the powerhouse to the lower reservoir.

Solar Farm

The Solar Farm has been designed to produce more than 300 MW power to maximise the locally generated renewable energy available to pump water from the lower reservoir to the upper reservoir.

The Solar Farm would have an indicative capacity of approximately 320 MW AC (equivalent to 375 MW DC).

The various areas of solar across the Project would be accessed via new or existing access roads, and would connect to the electrical substation via underground transmission cables.

Electrical Substation

The electrical substation would be located proximal to the lower reservoir and the 132 kV ETL, and would connect the PHES and Solar Farm to the existing ETL network.

Whilst construction of the substation forms part of the Project, it is expected that a portion of this asset would be owned/managed by Transgrid.

Transmission Infrastructure

Prior to the construction of the Project, a section of the existing Transgrid 132 kV ETL that currently traverses the Stratford East Dam would be realigned to the west of the lower reservoir to enable safe construction of the powerhouse.

Once realigned, this section of ETL would form part of the Transgrid ETL network.

Other transmission infrastructure required for the Project would include overhead powerlines connecting the PHES substation to the Project electrical substation, and underground cables connecting the Solar Farm to the Project electrical substation.

Access Tracks

The main access to the Project site from the public road network would be via the existing SMC access road off The Bucketts Way. Access during construction to the northern Solar Farm area immediately south of Wenham Cox Road would be via a new access point at Wenham Cox Road.

Existing SMC internal roads would be used as the internal access roads of the Project, where possible, with upgrades and maintenance as required. New access tracks would be required beyond the existing SMC disturbance area to facilitate construction access to Project areas.

Hours of Operation

The Project would operate 24 hours per day, 7 days per week.

Pumping cycles of the PHES would be optimised on a daily basis to maximise power supply to the grid, and maximise power consumption from the Solar Farm. Typically, power generation and pumping could each occur for up to approximately 12 hours over a 24-hour period (i.e. 12 hours of pumping followed by 12 hours of power generation).

Generally, construction activities would occur during daytime construction hours. However, due to the need for continuous activities for tunnelling and other associated activities (i.e. to manage construction schedule risk by allowing for a more efficient continuous operation and reduce safety risks), these activities are required to be conducted 24 hours per day, 7 days per week.

Other construction activities may occur 24 hours per day, 7 days per week, subject to compliance of out-of-hours construction noise criteria.

7.1.3 Alternatives Considered

The key feasible alternatives to the Project that were considered and not adopted are as follows:

- Not proceeding with the Project.
- Alternatives to PHES location and power output.
- Alternatives to Solar Farm arrangement.

These are detailed further in the subsections below.

Consequences of Not Proceeding with the Project

The consequences of not proceeding with the Project include:

- The Project would not contribute to the decarbonisation of NSW's electricity network.
- The Project would not be available to provide LDS, particularly during periods when VREs are not sufficient to meet consumer demands.

- The requirement to satisfy LDS requirements identified by the NSW Government and AEMO would need to be met by large-scale batteries and/or alternative pumped hydro projects in more remote locations (potentially without direct ETL access), with greater potential environment impacts.
- The economic and social benefits of further investment in the Gloucester Valley would not be realised.
- The potential impacts of the Project along with the Project management measures and offsets, would not occur.
- The SMC would be rehabilitated to final land uses (native vegetation and pasture) with lower economic benefits and would not contribute to the National or State greenhouse gas emission reduction targets.

Alternative to the PHES Location and Power Output

There is limited flexibility in the location of the PHES, given its location is determined and constrained by topography. Similarly, the designed energy output of the PHES (3.6 GWh) is limited by the potential water storage capacity of the upper reservoir, which is constrained by the topography of the upper reservoir area.

A PHES comprising the use of an existing mine void as the lower reservoir and the augmented Stratford East Dam as the upper reservoir was considered. However, as the existing mine voids are predicted to fill with water due to groundwater inflow and incidental rainfall, they would not provide the required elevation difference between the upper reservoir and lower reservoir.

The Project is able to make use of the existing Stratford East Dam for the lower reservoir, and so use of an existing mine void as the lower reservoir was not considered further.

Alternatives to Solar Farm Arrangement

The Solar Farm has been designed to maximise the use of land previously disturbed for the SMC operations to minimise new disturbance.

The remaining Solar Farm areas have been designed around the SMC Biodiversity Offset Areas and minimise impacts to isolated stands of trees and other native vegetation by using areas previously cleared for agriculture (and currently mapped as non-native grassland).

Key changes to the Solar Farm layout have been made during the environmental assessment review, including (Figure 2-6):

- removal of an area of the Solar Farm from the western side of The Bucketts Way due to community feedback regarding potential visual impacts;
- setting back the Solar Farm from The Bucketts Way to enable vegetative screening to be planted and reduce potential visual impacts;
- avoidance of higher biodiversity value patches of native vegetation;
- avoidance of a PAD identified during Aboriginal cultural heritage surveys undertaken for the Project ACHA; and
- setting back solar panels from existing creek lines such as Avondale Creek to maintain riparian corridors.

Alternative designs to reduce the indicative Solar Farm capacity of approximately 320 MW AC were considered. However, any solar not developed as part of the Project would lead to the additional input of energy via the grid and would require development of renewable generation in other areas (which may result in additional impacts compared to those proposed for the Project).

Avoidance

Project design refinements were implemented primarily for the Solar Farm layout as the location of the upper reservoir is constrained by topography.

Key avoidance includes maximising use of SMC disturbed areas for the Solar Farm and the lower reservoir.

For portions of the Solar Farm not proposed on land disturbed for the SMC, the Project has maximised areas previously cleared for agriculture and dominated by non-native vegetation, avoiding areas of high biodiversity value. Overall, approximately 96% of the Solar Farm is located on either SMC disturbance areas or areas of non-native vegetation.

The Project avoids direct disturbance to key Aboriginal heritage sites (such as a PAD and CTS-1).

Further, the PHES component of the Project has been designed to use a tunnelled waterway, rather than above-ground pipes, to avoid surface disturbance and visual impacts.

Project Design Changes in Response to Community Feedback

A number of alternatives to the Project have been considered by Yancoal in the development of this EIS in light of engagement feedback.

Yancoal has sought to address stakeholder concerns through commitment to a number of significant Project design measures including changes to the Project Disturbance Footprint (relative to the Scoping Report) to minimise visual, biodiversity and Aboriginal cultural heritage impacts.

A key project design change in response to stakeholder feedback was to the Solar Farm layout (compared to the Scoping Report) to remove solar panels on the western side of The Bucketts Way and setback of solar panels on the eastern side of The Bucketts Way.

7.2 STRATEGIC CONTEXT

7.2.1 Suitability of the Site

Suitability of the Site for PHES

The upper and lower reservoirs proposed as part of the Project would be located in areas with elevations approximately between 160 and 400 m AHD. This variation in elevation between the two reservoirs is the key factor to support a commercially viable PHES.

Post-Mining Land Use

A large portion of the land for the Project is currently used for the SMC (both mining areas and buffer lands).

Consistent with government policies and guidelines encouraging investigation of PMLU's, the Project represents an opportunity to beneficially use mining land in support of the transition to renewable energy.

Associated benefits of the Project include the beneficial use of mine infrastructure and water stored in SMC dams and mine voids, which reduces environmental impacts compared to a greenfield project.

Rehabilitation and closure obligations related to the SMC are outlined in Development Consent SSD-4966 and various mining leases and exploration licences held by SCPL under the NSW *Mining Act 1992*. SCPL will undertake rehabilitation and closure activities for the SMC in parallel with the potential approval and construction of the Project.

Attachment 6 provides an overview of how the Project would interact with the rehabilitation and closure of the SMC.

Other Land Use

The most prevalent land use in the area surrounding the Project, other than mining, is agricultural production.

A portion of the Project would be located on Yancoal-owned land previously cleared for agricultural use and currently used for low-intensity grazing.

Proximity to Existing Infrastructure

The Project would be located within close proximity to existing transmission infrastructure and would connect to the existing 132 kV ETL that runs through the site, minimising the need to establish new ETL easements to connect the Project to the grid (reducing disturbance).

Further, the Project can be accessed by key population centres (such as Gloucester, Newcastle and Sydney) via existing major roads and highways, avoiding the need to construct or upgrade public roads.

Nature Reserves/National Parks

The closest nature reserve to the Project area is The Glen Nature Reserve, which is located more than 900 m south-east of the Project.

Impacts to The Glen Nature Reserve would be negligible given distance and intervening vegetation and topography. In addition, The Glen Nature Reserve is located in a separate water catchment to the Project.

The Project has been considered against the requirements of the *Development adjacent to National Parks and Wildlife Services lands* (DPIE, 2020c), as described in Section 6.2.6.

7.2.2 Regional Context

The localities relevant to the Project include:

- **Stratford** – The Project sits adjacent to Stratford. There are approximately 160 people residing in Stratford.
- **Craven** – Craven is located to the south-west of the Project and has a population of approximately 100 people.
- **Gloucester** – Gloucester is located immediately north of the Project and has a population of approximately 2,500 people. It is the closest key township to the Project.

The SMC has contributed to the incomes and employment of residents of the Gloucester Valley, including Stratford and Craven. The SMC is forecasted to cease mining operations in 2024. The Project would provide new opportunities for employment as part of the construction and operation workforce.

The Project would also result in the following local socio-economic benefits (Appendix L):

- employment of up to 350 employees during the construction phase;
- employment of approximately 10 employees during the operational phase, which is expected to be greater than 50 years;
- opportunities for young people to stay in the region due to continued employment opportunities;
- increased demand for goods, services and public infrastructure and utilities;
- generation of additional disposable income and likely indirect jobs in the MidCoast Council LGA over the construction period; and
- total EDC of approximately $1.8 billion, resulting in increased local supply and flow-on economic effects in the MidCoast Council LGA.

Gloucester Local Environmental Plan 2010

Notwithstanding the Gloucester LEP does not apply to the Project due to its CSSI declaration, the Project is generally consistent with the aims of the Gloucester LEP, as construction of the Project would be undertaken in a manner that mitigates impacts to rural and agricultural land (as majority of the Project would be developed on land previously disturbed for the SMC), natural resources such as water and places of heritage significance.

Hunter Regional Plan 2041

The *Hunter Regional Plan 2041* (DPE, 2022b) outlines a key planning priority in the Barrington District (which is relevant to the Project location) being to "*Plan for alternative land uses for former power stations and mining sites*". More specifically, the *Hunter Regional Plan 2041* (DPE, 2022b) states (emphasis added):

> *The Stratford and Duralie mines near Gloucester provide potential re-use opportunities over the 20-year period of this plan. Existing hard stand areas, vehicular access and transmission lines* ***could support renewable energy*** *and batteries.*

The *Hunter Regional Plan 2041* (DPE, 2022b) identified the opportunity for the existing SMC and Duralie Coal Mine to be repurposed to support the transition to renewable energy. In this regard, the development of the Project aligns with this strategy, being able to continue attracting investment in the region after the closure of the SMC and Duralie Coal Mine.

7.2.3 State, National and International Context

State Greenhouse Gas Emission Reduction Targets

The NSW Government has endorsed Australia's commitments to the *Paris Agreement* and has implemented a long-term objective of achieving net zero emissions by 2050 through the *NSW Climate Change Policy Framework* (OEH, 2016). To achieve this target, the NSW Government has introduced a suite of policies and legislation, as described below.

To achieve the 2050 target, the *Net Zero Plan Stage 1: 2020-2030* forecasted to deliver a 35% reduction in emissions below the 2005 levels by 2030.

The objectives in the *Net Zero Plan Stage 1: 2020-2030* to reach net zero by 2050 was reviewed through the *Net Zero Plan Stage 1: 2020-30 Implementation Update* released in 2021. The NSW Government updated its objective to reduce emissions by 50% below 2005 levels by 2030.

Since the *Net Zero Plan Stage 1: 2020-30 Implementation Update* (DPIE, 2021a), the NSW Government has introduced several new policies and programs that will contribute to reducing emissions and supporting NSW economy. Taking these into account, the NSW Government has extended its objective to reduce its emissions by 70% below 2005 levels by 2035.

Accordingly, the NSW Government has committed to the reduction of greenhouse gas emissions in support of Australia's contribution to the *Paris Agreement*.

State Renewable Energy Investment Policies

The *NSW Electricity Infrastructure Roadmap* (DPIE, 2020b) and the EII Act outline the regulatory framework to coordinate investment in the transmission, generation, storage and firming infrastructure required to maintain reliability, while decarbonising the NSW electricity grid.

Part 6 of the EII Act sets out the NSW Government's minimum investment objectives for LDS for the period ending 31 December 2029, being the establishment of 12 GW of additional renewable energy generation and an additional 2 GW of LDS capacity.

Demand for Long Duration Storage

While the current greenhouse gas emissions projections align with the above greenhouse gas emission reduction targets and policies, due to the scheduled closure of coal-fired power stations and replacement with VRE (e.g. solar and wind); the *2023 Electricity Statement of Opportunities* (AEMO, 2023a) identified reliability gaps expected in NSW from 2025 to 2026.

Accordingly, LDS projects, like the Project, have been identified as being critical to complement VRE (e.g. solar and wind) and address forecast exceedances of electricity reliability standards.

If approved, the Project would be capable of producing up to 300 MW for 12 hours (or 400 MW over 9 hours), which exceeds the definition of LDS under the EII Act. The Project could also contribute to the additional 2 GW of LDS, legislated under the EII Act to be in place prior to 2030, and could assist in addressing the abovementioned anticipated electricity reliability challenges.

7.3 STATUTORY REQUIREMENTS

The following sub-section is a brief synthesis of the statutory requirements as described in Section 4.

The EP&A Act and EP&A Regulation set the framework for planning and environmental assessment in NSW. Approval for the Project is being sought under the CSSI provisions (i.e. Division 5.2) under Part 5 of the EP&A Act.

For CSSI, section 2.4(3b) of the EP&A Act prevents the Minister to delegate the function of determining an application under Division 5.2 of the Act for approval to carry out CSSI. Accordingly, the Minister for Planning and Public Spaces has the power to grant approval and is the approval authority for this Project.

The Project is a "controlled action" under the EPBC Act and therefore requires approval from the Commonwealth Minister.

The Project would require secondary approvals and licences, such as an EPL under the PoEO Act.

In accordance with section 5.22(2) of the EP&A Act, EPIs do not apply to SSI and CSSI, beyond the declaration of the Project as CSSI.

7.3.1 Consideration of the Project against the Objects of the EP&A Act

The SEARs (Attachment 1) require consideration of the consistency of the Project against the objects of the EP&A Act. Section 1.3 of the EP&A Act describes the objects of the EP&A Act as follows:

> *(a) to promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources,*
>
> *(b) to facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment,*
>
> *(c) to promote the orderly and economic use and development of land,*
>
> *(d) to promote the delivery and maintenance of affordable housing,*
>
> *(e) to protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats,*
>
> *(f) to promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage),*
>
> *(g) to promote good design and amenity of the built environment,*
>
> *(h) to promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants,*

(i) to promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State,

(j) to provide increased opportunity for community participation in environmental planning and assessment.

The Project is considered to be generally consistent with the objects of the EP&A Act, as a result of the following:

- The Project would continue to facilitate local and regional employment and economic development opportunities (Appendices L and M).
- The Project would incorporate relevant ESD considerations (Section 7.6).
- The Project presents an opportunity to beneficially use mining land (Section 2).
- The Project would allow economic use and development of the land through renewable power generation (Section 2).
- The Project would incorporate a range of measures for the protection of the environment, including the avoidance and protection of native plants and animals, threatened species, and their habitats (Section 6 and Attachment 3).
- The Project includes an ACHA and HHA, which identify suitable management and mitigation measures for potential direct and indirect impacts of the Project on heritage matters (Sections 6.7 and 6.8 and Appendices F and G).
- The Project PHA has been conducted to assess the potential hazards associated with the Project (Section 6.17 and Appendix O).
- The Project would be determined by the Minister, however, a wide range of stakeholders have been consulted throughout the assessment process (Section 5 and Appendix L).
- The Project would be developed in a manner that incorporates community engagement (Section 5 and Appendix L).

7.3.2 Consideration of the Project against the Objects of the EPBC Act

A delegate of the Commonwealth Minister determined on 11 April 2024 that the Project is a "controlled action" and, therefore, the Project also requires approval under the EPBC Act.

Section 3 of the EPBC Act describes the objects of the EPBC Act as follows:

(a) to provide for the protection of the environment, especially those aspects of the environment that are matters of national environmental significance; and

(b) to promote ecologically sustainable development through the conservation and ecologically sustainable use of natural resources; and

(c) to promote the conservation of biodiversity; and

(ca) to provide for the protection and conservation of heritage; and

(d) to promote a co-operative approach to the protection and management of the environment involving governments, the community, land-holders and indigenous peoples; and

(e) to assist in the co-operative implementation of Australia's international environmental responsibilities; and

(f) to recognise the role of indigenous people in the conservation and ecologically sustainable use of Australia's biodiversity; and

(g) to promote the use of indigenous peoples' knowledge of biodiversity with the involvement of, and in co-operation with, the owners of the knowledge.

The Project is considered to be generally consistent with the objects of the EPBC Act as:

- The Project incorporates measures to protect the environment (including aspects of the environment that are of national significance), via the Project design (Section 3) and the application of mitigation, offsets and other measures (Section 6).
- The Project incorporates relevant ESD considerations (Section 7.6).
- The Project includes a BDAR and Aquatic Ecology Impact Assessment; and a strategy to offset unavoidable impacts on ecology, as well as other compensatory measures (Sections 6.5 and 6.6 and Appendices D and E).
- The Project includes an ACHA and HHA, which identify suitable management and mitigation measures for potential direct and indirect impacts of the Project (Sections 6.7 and 6.8 and Appendices F and G).
- The Project would be developed in a manner that incorporates engagement (Section 5 and Appendix L).

- The Project includes consideration of Yancoal's contribution to maintaining Australia's international environmental responsibilities and the potential impacts on these matters (e.g. consideration of greenhouse gas emissions) (Sections 2 and 6.14).

The Project is to be assessed pursuant to the Assessment Bilateral Agreement with the NSW Government. Therefore, this EIS provides an assessment of potential impacts on the following controlling provisions under the EPBC Act considered by the Commonwealth Minister (or delegate) to be relevant to the Action:

- threatened species and communities (sections 18 and 18A); and
- migratory species (sections 20 and 20A).

7.4 KEY ENGAGEMENT OUTCOMES AND ASSOCIATED PROJECT DESIGN

7.4.1 Consultation Undertaken

Consultation conducted during the preparation of this EIS has been undertaken in consideration of *Undertaking Engagement Guidelines for State Significant Projects* (DPHI, 2024b) and provided the opportunity to identify issues of concern or interest to stakeholders and to consider these issues within this EIS.

An overview of consultation is provided in the following sub-sections. In general:

- Extensive consultation has been conducted via a range of engagement activities.
- The extensive consultation undertaken has allowed for key concerns in regard to the Project to be well understood.
- Design changes have been made for the Project to reduce environmental impacts in response to stakeholder feedback, particularly removal of solar panels along The Bucketts Way.
- There is a commitment to continue consultation with a range of stakeholders following the lodgement of the EIS and during the life of the Project.

7.4.2 Summary of Feedback

Regulatory and public engagement by Yancoal for the Project (Section 5) identified the following key assessment issues for the Project:

- Support for renewable energy development and positively acknowledged the proposed PMLU of the SMC.
- Acknowledged the positive socio-economic benefits of the Project including employment opportunities, direct benefits for local businesses, keeping people in Gloucester (and surrounding areas) and providing ongoing investment in the region.
- The potential for visual amenity impacts, particularly the solar array in proximity to The Bucketts Way.
- Concern for potential impacts on biodiversity and Aboriginal cultural heritage.
- Concern for potential noise generation by construction and operation of the Project.
- The disposal of waste from replaced solar panels as part of the Solar Farm.
- Residents in Stratford were concerned that the construction workforce for the Project would result in temporary impacts on housing and accommodation, and changes to demographic structure.
- Concerns regarding the impacts to SMC final landform and land uses (e.g. agriculture).
- Requested ongoing stakeholder engagement, including additional community information sessions.

Key potential adverse impacts raised by the community can be generally grouped into:

- amenity impacts (e.g. visual and noise) to nearby residences, particularly visual impacts of the Solar Farm;
- impacts to housing demand and demographic structure; and
- impacts to land uses (e.g. agriculture) as a result of the Project final landform.

Key potential benefits of the Project identified during stakeholder engagement included the long-term beneficial use of the SMC site, investment in the Gloucester region that supports a level of sustainable long-term employment and economic activity, and investments in the State's transition to renewable energy (Appendix L).

7.5 EVALUATION OF KEY IMPACTS AND BENEFITS

7.5.1 Key Potential Impacts

A summary of the potential environmental impacts, the government policies under which they are assessed in this EIS, and key management measures are provided in Table 7-1.

7.5.2 Key Potential Benefits

Key potential benefits identified for the Project include:

- Generation of LDS which addresses the anticipated electricity reliability challenges projected to occur by AEMO (2023b), and supply in renewable energy equivalent to the usage of approximately 140,000 to 180,000 households.
- Construction stage workforce of up to 350 personnel and associated increase in trade for local businesses and service providers.
- Economic benefits of Yancoal's investment in the region, including directly to NSW and local suppliers, and flow-on benefits.
- Beneficial use of the SMC site.
- Contribution to meeting NSW Government emissions reduction targets via avoidance of between 320,000 and 550,000 t CO_2-e/year, if this electricity from the Project was alternatively produced by gas-fired power generation.

Consideration of key government policies, criteria and Project objectives is provided in Table 7-1.

7.5.3 Compliance Monitoring

Attachment 3 describes the key environmental management and monitoring that would be implemented for the Project to manage potential environmental impacts as a result of the Project.

Key management plans for the Project would contain a suite of sub-plans and procedures which target key environmental aspects of the Project and proposed monitoring, management and mitigation measures to be implemented.

Compliance would be reported in independent environmental audits, monitoring reports and environment performance reports.

7.5.4 Key Uncertainties

Uncertainties identified through the preparation of this EIS have been minimised via the following strategies:

- Environmental assessments have been prepared by suitably qualified and experienced specialists using recognised predictive models, where relevant.
- For the BDAR, where a species has potential to occur in the Project Disturbance Footprint, but was not identified during surveys, the species has been assumed present for the purposes of assessment.
- CTS-1 has been directly avoided, although consultation and investigations regarding the cultural significance of the site are still ongoing.
- The Groundwater Impact Assessment includes an uncertainty analysis on parameters which are most likely to impact model predictions.
- Assessment of sensitivity of climate in the Surface Water Assessment, including in consideration of climate change.

7.6 ECOLOGICALLY SUSTAINABLE DEVELOPMENT CONSIDERATIONS

7.6.1 Background

The concept of sustainable development came to prominence at the World Commission on Environment and Development (1987), in the report titled *Our Common Future*, which defined sustainable development as:

> *… development that meets the needs of the present without compromising the ability of future generations to meet their own needs.*

In recognition of the importance of sustainable development, the Commonwealth Government developed the NSESD (Commonwealth of Australia, 1992) that defines ESD as:

> *… using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased.*

Table 7-1
Key Environmental Assessment Findings

Aspect	Key Policies Considered	Avoidance, Minimisation, Mitigation and Offset	Key Outcomes	Proposed Management Plans/Strategies
Agriculture	*Agricultural Impact Assessment requirements of the Large-Scale Solar Energy Guideline*	• No high value agricultural land (based on LSC class mapping) in the Project area. • No BSAL mapped within the Project area. • Project Disturbance Footprint would generally be returned to agricultural use following Project operation. • Soil that is proposed to be disturbed would be stripped and used in construction and/or stockpiled for later use in decommissioning/rehabilitation. • Agrisolar (grazing within the solar array area) would be considered to reduce area of land removed from agricultural use.	• Temporary loss of agricultural land , including the loss of 300 ha of agricultural land proposed as part of the SMC final land use. • Permanent loss of approximately 12 ha of agricultural land due to the Project electrical substation and a portion of the upper reservoir, which is considered to be a negligible impact.	Revegetation, Rehabilitation and Decommissioning Management Plan. Erosion and Sediment Control Plan within the Surface Water Management Plan (sub-plan of CEMP and OEMP).
Surface Water	*Water Management Act 2000* Landcom "Blue Book" *Guideline for Controlled Activities on Waterfront Land*	• PHES to be a 'closed system' including development of clean water diversion system around the lower reservoir. • Initial fill of the PHES from water stored in SMC dams and mine voids to avoid reliance on natural waterways. • Use of SMC voids (subject to commercial agreement) for ongoing transfer of water to/from the PHES to optimise water levels if required. • Setbacks from the riparian corridors of key drainage lines (i.e. with catchments upslope of the Project Disturbance Footprint). • Surface Water Monitoring Program. • Erosion and sediment controls, stormwater and runoff management.	• Small sections of some first and second order streams impacted due to construction of upper and lower reservoir, Solar Farm and construction areas. • Reduction in flow days in the unnamed drainage line located between the upper and lower reservoirs. • Limited change in flow downstream of the Project.	Surface Water Management Plan (sub-plan of CEMP and OEMP).

Table 7-1 (Continued)
Key Environmental Assessment Findings

Aspect	Key Policies Considered	Avoidance, Minimisation, Mitigation and Offset	Key Outcomes	Proposed Management Plans/Strategies
Groundwater	*NSW Aquifer Interference Policy* *Water Management Act 2000*	• Tunnelled waterways to be concrete-lined following completion of construction. • Upper and lower reservoirs to be constructed to minimise seepage to groundwater. • Installation of groundwater monitoring bores. • Groundwater quality monitoring of the drainage line downgradient of the upper reservoir during construction and operation.	• Project predicted to meet the Level 1 'Minimal Impact' criteria under the AIP. • Groundwater seepage rates are predicted to be minor, in comparison to the overall groundwater flow. • Inflows predicted due to construction of the tunnelled waterways with associated groundwater depressurisation, however groundwater levels are expected to recover following lining of the tunnels. • Groundwater baseflow reductions due to tunnel expected to be localised, and any temporary reduction in baseflow is unlikely to have a significant impact on stream flow.	Groundwater Management Plan (sub-plan of CEMP and OEMP).
Biodiversity	*Biodiversity Conservation Act 2016* *Environment Protection and Biodiversity Conservation Act 1999* *Biodiversity Assessment Method 2020*	• Locating 53% of disturbance on land previously disturbed by the SMC and 30% of disturbance on land (outside the SMC) mapped as non-native vegetation (due to previous agricultural activities). • When considering the Solar Farm, approximately 96% of the Solar Farm area is on land previously disturbed by the SMC or land mapped as non-native vegetation. • Avoidance of higher biodiversity value patches of native vegetation. • Minimising impacts to isolated stands of trees and other native vegetation. • Use of tunnelled waterway rather than overland pipes. • Specific management measures for SAII entities (additional to offset credit requirements). • Biodiversity Offset Strategy implemented to address residual impacts on biodiversity values. • Biodiversity monitoring and vegetation clearance protocol.	• Disturbance of approximately 145 ha of native vegetation and associated species habitat. • Potential impact to three SAII species, including Scrub Turpentine, and habitat for the Sooty Owl and Stuttering Frog (this species was assumed present). • Potential impact to two TECs and two threatened flora species credit species. • Potential impacts to 19 threatened fauna species credit species.	Biodiversity Management Plan, including a Construction Vegetation Clearance Protocol (sub-plan of CEMP and OEMP). Biodiversity Offset Strategy, including maximising the use of Yancoal-owned land adjacent to the Project to generate offset credits. Specific management strategies for SAII entities (in addition to offsets).

Table 7-1 (Continued)
Key Environmental Assessment Findings

Aspect	Key Policies Considered	Avoidance, Minimisation, Mitigation and Offset	Key Outcomes	Proposed Management Plans/Strategies
Aquatic Ecology	*Fisheries Management Act 1994* *Policy and guidelines for fish habitat conservation and management Update 2013* *Guidelines for Controlled Activities on Waterfront Land* *Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings*	• Beneficial use of water stored in SMC dams and mine voids, avoiding reliance on water from natural watercourses for the PHES. • Setting back solar panels and construction areas from existing creek lines with catchments upstream of the Project area to maintain riparian corridors, and implementation of Riparian Corridor Protection Zones. • Appropriately designed creek crossings. • Project design (i.e. PHES closed system) and water management to prevent significant downstream impacts.	• No threatened species under the FM Act (or aquatic EPBC Act listed species) recorded in the Project Disturbance Footprint. • All aquatic flora and fauna species identified in vicinity of the Project are common to the region.	Biodiversity Management Plan (sub-plan of CEMP and OEMP). Surface Water Management Plan, including a Sediment and Erosion Control Plan (sub-plan of CEMP and OEMP).
Heritage	*Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* *Heritage Act 1977*	• Avoidance of a PAD within the Solar Farm footprint, and implementation of high visibility fencing during construction to avoid construction activity in this area. • Avoidance of direct disturbance of CTS-1 (potential cultural heritage site), and existing SCPL exclusion zone maintained. Continued consultation with the Aboriginal community regarding the cultural significance and management of this site. • Surface collection and salvage of sites prior to disturbance.	• Direct impact to four Aboriginal cultural heritage sites of low scientific (archaeological) significance. Surface collection and salvage to be undertaken prior to disturbance. • Ongoing engagement with the Aboriginal community to continue in regard to management of CTS-1. • No impacts on sites of historic (non-Aboriginal) significance.	Aboriginal Heritage Management Plan.

Table 7-1 (Continued)
Key Environmental Assessment Findings

Aspect	Key Policies Considered	Avoidance, Minimisation, Mitigation and Offset	Key Outcomes	Proposed Management Plans/Strategies
Transport	*Guide to Traffic Management* *Guide to Traffic Generating Development*	• Use of the existing SMC main access off The Bucketts Way. • Advance warning signs installed on Wenham Cox Road during construction of the northern part of the Solar Farm to alert minor local traffic to the possible presence of trucks entering and exiting the northern Solar Farm access. • Project workers receive training regarding safe driving behaviours and fatigue management. • Encourage the workforce to car pool during the construction stage of the Project.	• Project construction workforce would result in an increase in traffic volumes, particularly on The Bucketts Way, however there would be no exceedances of the road network capacity and reduction in efficiency. • No upgrades to public roads are required to facilitate OSOM vehicles.	Traffic Management Plan (sub-plan of CEMP).
Visual	*Large-Scale Solar Energy Guideline's Technical Supplement – Landscape and Visual Impact Assessment*	• Removal and/or setback of solar panels originally proposed in consideration of community feedback. • Visual screening along portions of The Bucketts Way to mitigate direct views of the Project for road travellers.	• All private receivers assessed as low or very low visual impact. • With the implementation of visual screening, public viewpoints assessed as low or very low visual impact. • Visual screening would be implemented where relevant to mitigate views of the Project along roads.	Landscape and Visual Impact Management Plan.
Glint and Glare	*Large-Scale Solar Energy Guideline's Technical Supplement – Landscape and Visual Impact Assessment*	• Existing vegetation mitigates potential glare impacts.	• Glare is expected to be within the thresholds noted in the *Large-Scale Solar Energy Guideline* for all receivers (roads and residential).	Landscape and Visual Impact Management Plan.
Noise	*Noise Policy for Industry, Interim Construction Noise Guideline*	• Planning and timing of works to be scheduled in a staged manner. • Works, with the exception of tunnelling works, would be completed during standard daytime construction hours. • Noise mitigation measures would be implemented.	• Private receivers are below the relevant construction noise criteria, with the exception of one receiver which exceeds the construction noise criteria under noise enhancing conditions. • Operational noise levels meet all relevant criteria at non-project related receivers.	Noise Management Plan (sub-plan of CEMP and OEMP).

Table 7-1 (Continued)
Key Environmental Assessment Findings

Aspect	Key Policies Considered	Avoidance, Minimisation, Mitigation and Offset	Key Outcomes	Proposed Management Plans/Strategies
Vibration	*Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration*	• Maintaining blast sizes achieve relevant vibration and overpressure criteria (with generally small blast MICs of 20 kg or less).	• Negligible blast related impacts as a result of the Project at residences, public infrastructure and CTS-1.	Blast management measures described in CEMP.
Air Quality	*Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*	• Construction dust mitigation measures implemented such as watering of internal roads and minimising vehicle speeds.	• No significant air emissions sources during operation of the Project. • All private receivers predicted to comply with relevant air quality criteria during construction of the PHES. • Construction of the Solar Farm would not cause adverse air quality impacts.	Dust Management Plan (sub-plan of CEMP).
Greenhouse Gas Emissions	*Greenhouse Gas Assessment Guide for Large – Emitters* *National Greenhouse and Energy Reporting Act 2007* The National Greenhouse Accounts Factors	• Project would positively contribute to minimising impacts of climate change due to the supply of renewable power that is necessary to support global decarbonisation efforts. • Planning and scheduling works to minimise diesel usage and to maximise energy efficiency during construction. • Maintenance of plant and equipment to minimise fuel consumption. • On-site Solar Farm provides a local source of renewable energy to reduce electricity consumption from the grid (and associated Scope 2 emissions).	• Project would avoid between 320,000 and 550,000 t CO_2-e/year, if energy equivalent to the Project was alternatively produced by gas-fired power generation. • Average annual Scope 1 emissions during construction would be 0.0006% of NSW emissions and 0.0002% of Australia's emissions. • Operational greenhouse gas emissions (Scope 1 and Scope 2) less than zero as the Project is a net producer of renewable energy.	Greenhouse gas minimisation measures for construction (diesel consumption) to be outlined in the CEMP.
Social	*Social Impact Assessment Guideline for State Significant Projects*	• Ongoing stakeholder engagement and provision of community information. • Management of complaints and incident response protocols through an Environmental Management Strategy.	• Concerns raised, including increased demand for community services (e.g. housing) and environmental impacts. • Benefits of the Project acknowledged, including benefits of renewable energy, employment and opportunities for businesses.	Construction Workforce Accommodation Strategy. Environmental Management Strategy.

The NSESD was developed with the following core objectives:

- *to enhance individual and community well-being and welfare by following a path of economic development that safeguards the welfare of future generations;*
- *to provide for equity within and between generations; and*
- *to protect biological diversity and maintain essential processes and life support systems.*

Australia's commitment to the principles of ESD is considered in the EPBC Act, which defines the principles of ESD as:

(a) decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations;

(b) if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation;

(c) the principle of inter-generational equity—that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations;

(d) the conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making;

(e) improved valuation, pricing and incentive mechanisms should be promoted.

For the purposes of this EIS, the relevant definition of ESD is that found in section 6(2) of the PoEO Act, which is the definition adopted by the EP&A Act. Section 6(2) of the PoEO Act provides:

… ecologically sustainable development requires the effective integration of social, economic and environmental considerations in decision-making processes. Ecologically sustainable development can be achieved through the implementation of the following principles and programs—

(a) the precautionary principle—namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.

In the application of the precautionary principle, public and private decisions should be guided by—

(i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and

(ii) an assessment of the risk-weighted consequences of various options,

(b) inter-generational equity—namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations,

(c) conservation of biological diversity and ecological integrity—namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration,

(d) improved valuation, pricing and incentive mechanisms—namely, that environmental factors should be included in the valuation of assets and services, such as—

(i) polluter pays—that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement,

(ii) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste,

(iii) environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.

7.6.2 Consideration of Ecologically Sustainable Development for the Project

Project design, planning and assessment have been carried out applying the principles of ESD, through:

- safeguarding intergenerational equity during the transition to low carbon energy sources (e.g. if the Project were not to proceed, future generations would not receive the environmental and socio-economic benefits as a result of the Project, which are likely to accrue over the next 50 years or greater);
- minimisation of impacts through efficient use of existing SMC disturbance areas and use of SMC infrastructure;

- avoidance and mitigation of impacts to biological systems via riparian corridor and stream setbacks and habitat clearing constraints (particularly in the southern portion of the Solar Farm area);
- incorporation of risk assessment and analysis at various stages in the Project design and environmental assessment and within decision-making processes; and
- consultation with regulatory and community stakeholders.

Assessment of potential medium-term and long-term impacts of the Project was carried out during the preparation of this EIS on aspects of surface water and groundwater, transport movements, air quality emissions (including greenhouse gas emissions), noise emissions, aquatic and terrestrial ecology, heritage and socio-economics.

The Project design takes into account biophysical considerations, including the principles of ESD as defined in section 6(2) of the PoEO Act.

In addition, it can be demonstrated that the Project can be operated in accordance with ESD principles through the application of mitigation measures, compensatory measures and offset measures that have been developed based on conservative impact assumptions for the Project.

The following sub-sections describe the consideration and application of the principles of ESD to the Project.

Precautionary Principle

Environmental assessment involves predicting the likely environmental outcomes of a development. The precautionary principle reinforces the need to take risk and uncertainty into account, especially in relation to threats of irreversible environmental damage.

An ERA (Appendix N) and PHA (Appendix O) were conducted to identify Project-related risks and develop appropriate mitigation measures and strategies.

The PHA considers off-site risks to people, property and the environment (in the presence of controls) arising from atypical and abnormal hazardous events and conditions (i.e. equipment failures, operator error and external events), with specific focus on fixed installations on-site.

The ERA addressed potential environmental impacts associated with the Project, including long-term effects. In addition, potential long-term risks are considered by the specialist studies conducted in support of this EIS (Section 1.6).

A range of mitigation measures have been adopted as components of the Project design to minimise the potential for serious and/or irreversible damage to the environment, including the development of environmental management and monitoring programs and ecological offsets based on conservative assumptions. Where residual risks are identified, contingency controls have been considered (Attachment 3).

Social Equity

Social equity is defined by inter-generational and intra-generational equity. Inter-generational equity is the concept that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations, while intra-generational equity is applied within the same generation.

The principles of social equity are addressed through:

- assessment of the social and economic impacts of the Project (Appendices L and M, and Sections 6.15 and 6.16);
- allowing for intergenerational equity during the transition to low carbon energy sources (e.g. if the Project were not to proceed, future generations would not receive the socio-economic benefits as a result of the Project, which are likely to accrue over the next 50 years or greater);
- management measures to be implemented in relation to the potential environmental impacts of the Project (Section 6); and
- implementation of targeted environmental monitoring programs (Section 6) to minimise potential environmental impacts by reviewing the efficacy of implemented management measures.

The Project would benefit current and future generations through the continuation of the operational workforce employment and economic benefits to the region and State (Appendix L).

Conservation of Biological Diversity and Ecological Integrity

Biological diversity or "biodiversity" is considered to be the number, relative abundance, and genetic diversity of organisms from all habitats (including terrestrial, marine and other aquatic ecosystems, and the ecological complexes of which they are a part), and includes diversity within species and between species as well as diversity of ecosystems (Lindenmayer and Burgman, 2005).

For the purposes of this EIS, ecological integrity has been considered in terms of ecological health and ecological values.

While the Project Disturbance Footprint avoids key environmental features and targets areas of lower ecological integrity (i.e. existing SMC disturbance and previously cleared grazing areas), it also includes areas with recognised ecological values, primarily in the upper reservoir extent, which include the presence of threatened fauna species as well as TECs.

The environmental assessments in Sections 6.5 and 6.6 (and Appendices D and E) describe the potential impacts of the Project on the biological and ecological environment, associated Project mitigation and the indicative offset strategy.

Valuation

One of the common broad underlying goals or concepts of sustainability is economic efficiency, including improved valuation of the environment.

Consideration of economic efficiency, with improved valuation of the environment, has the effect of integrating economic and environmental considerations in decision making, as required by the principles of ESD.

Wherever possible, direct environmental effects of the Project would be internalised through the adoption and funding of mitigation measures by Yancoal to mitigate potential environmental impacts (e.g. biodiversity offset costs).

The Economic Assessment in Appendix M has estimated the incremental benefits accruing to the local region and to NSW with reference to the additional salaries and wages paid to NSW employees and long-term contractors of the Project.

The long-term Project benefits are considered to outweigh the Project impacts, with economic advantages expected during construction of the Project as well as during operation from increased energy reliability and supply to NSW.

Any Project-related decisions have and would continue to consider environmental factors in a cost-effective way and be guided by the costs of providing goods and services.

7.7 CONCLUSION

Overall, the Project aligns with the NSW Government's intentions to develop LDS whilst beneficially using former mining land.

The Project has been declared 'critical' by the NSW Government, indicating that the Project is considered by the NSW Government to be "*essential to NSW for economic, social and environmental reasons"*.

The key Project component is the PHES, providing LDS and a source of reliable, renewable and dispatchable energy during periods when solar/wind is not available, assisting with the stability of the NSW electricity grid as coal-fired power is phased out.

The Project Solar Farm provides a source of local and renewable energy to charge the PHES. When considering the Solar Farm and PHES combined, the Project would be a net energy producer.

The Project would supply enough electricity for approximately 140,000 to 180,000 households, and would avoid between 320,000 to 550,000 t CO_2-e/year, if this electricity was alternatively produced by gas-fired power generation.

The Project is permissible, and would comply with applicable statutory requirements and relevant strategic and statutory planning policy objectives.

The Project would provide employment opportunities during construction and operations through the long life of the Project (expected to be greater than 50 years). It would also continue to support the economic sustainability of the Gloucester region.

The variation in topography between the lower reservoir and upper reservoir makes the site ideal for pumped hydro.

Locating the Project at the SMC also has a number of strategic advantages as the Project can use and repurpose existing SMC disturbance areas, infrastructure, and water stored in mine voids. In addition, the Project is strategically located in close proximity to existing transmission infrastructure and established transport routes. This reduces environmental impacts compared to alternative large-scale renewable energy projects located in remote locations.

The layout and location of the Project Disturbance Footprint have been through a design process to avoid and/or reduce impacts to biodiversity values. This includes avoidance of TECs and threatened fauna habitat through targeting the Project on existing disturbed areas (either through the SMC or previous agricultural activities), as well as setback of solar panels from creek lines and riparian corridors.

Engagement with members of the public and key NSW Government agencies has informed Yancoal's design of the Project, including adoption of a range of avoidance measures to minimise potential amenity impacts to nearby residences (Section 7.4).

Yancoal would apply offsets and other Project-specific measures to address key residual impacts on terrestrial ecology (Section 6.5 and Appendix D).

If approved, the Project would be a model of beneficial PMLU, while minimising environmental impacts, and is in the public interest.

The Project is considered to satisfy the objectives of the EP&A Act, EPBC Act, and align with the principles of ESD.

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9 ABBREVIATIONS AND ACRONYMS

%	percent
°C	degrees Celsius
µg/m^3	micrograms per cubic metre
µS/cm	microsiemens per centimetre
AC	Alternating Current
ACHA	Aboriginal Cultural Heritage Assessment
ADG Code	*Australian Code for the Transport of Dangerous Goods by Road or Rail*
AEMO	Australian Energy Market Operator
AEP	Annual Exceedance Probability
AHIMS	Aboriginal Heritage Information Management System
Airen	Airen Consulting
ANZECC	Australian and New Zealand Environmental and Conservation Council
ANZG	Australian and New Zealand Guidelines
AOO	Area of Occupancy
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
AS	Australian Standard
BAM	NSW *Biodiversity Assessment Method 2020*
BAM-C	NSW *Biodiversity Assessment Method (BAM) Calculator*
BC Act	NSW *Biodiversity Conservation Act 2016*
BCD	NSW Biodiversity and Conservation Division
BDAR	Biodiversity Development Assessment Report
BESS	Battery Energy Storage System
BFPL	Bush Fire Prone Land
"Blue Book"	*Managing Urban Stormwater: Soils and Construction – Volume 2E Mines and quarries*
BoM	Commonwealth Bureau of Meteorology
BSAL	Biophysical Strategic Agricultural Land
CCC	Community Consultative Committee
CEEC	Critically Endangered Ecological Community
CEMP	Construction Environmental Management Plan
CK Consultants	CK Consultants Pty Ltd
CNML	Construction Noise Management Level
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CSSI	Critical State Significant Infrastructure
Cth DCCEEW	Commonwealth Department of Climate Change, Energy, the Environment and Water
DAZ	dambreak affected zone
dB	decibels
dBA	A-weighted decibels
DC	Direct Current
DEC	Department of Environment and Conservation
DECC	Department of Environment and Climate Change
DECCW	Department of Environment, Climate Change and Water

DP&I	Department of Planning and Infrastructure
DPE	Department of Planning and Environment
DPHI	Department of Planning, Housing and Infrastructure
DPI	Department of Primary Industries
DPIE	Department of Planning, Industry and Environment
EC	electrical conductivity
EDC	Estimated Development Cost
eDNA	Environmental DNA
EEC	Endangered Ecological Community
EII Act	*Electricity Infrastructure Investment Act 2020*
EIS	Environmental Impact Statement
EMF	Electromagnetic Fields
EnergyCo	Energy Corporation of NSW
EOO	Extent of Occurrence
EMF	Electromagnetic Field
EP&A Act	*Environmental Planning and Assessment Act 1979*
EP&A Regulation	*Environmental Planning and Assessment Regulation 2021*
EPA	Environment Protection Agency
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EPI	environmental planning instrument
EPL	Environment Protection Licence
ERA	Environmental Risk Assessment
ESD	Ecologically Sustainable Development
ETL	electricity transmission line
FM Act	*Fisheries Management Act 1994*
FSL	full supply level
FTE	Full-Time Equivalent
g/m^2/month	grams per square metre per month
GDE	Groundwater Dependent Ecosystem
GHD	GHD Pty Ltd
GL	gigalitre
Gloucester LEP	*Gloucester Local Environmental Plan 2010*
Gloucester SA2	Gloucester Statistical Area Level 2
GW	gigawatt
GWh	gigawatt-hours
ha	hectare
HHA	Historic Heritage Assessment
HIPAP No. 4	*Hazardous Industry Planning Advisory Paper No 4: Risk Criteria for Land Use Safety Planning*
ICNG	*Interim Construction Noise Guideline*
ICOMOS	Australian International Council on Monuments and Sites
IIA	Invertebrate Identification Australasia
ISO	International Organisation for Standardisation
kg	kilogram
km	kilometre
km^2	square kilometres
kV	kilovolt
L_{Aeq}	equivalent continuous noise level

LALC	Local Aboriginal Land Council
LDS	Long Duration Storage
LGA	Local Government Area
LOS	Level of Service
LSC	Land and Soil Capability
LTAAEL	Long-Term Average Annual Extraction Limit
LVIA	Landscape and Visual Impact Assessment
m AHD	metres Australian Height Datum
m	metre
m/s	metres per second
m^3/s	cubic metres per second
MIC	Maximum Instantaneous Charge
MidCoast LEP	*Draft MidCoast Local Environmental Plan*
Mid North Coast SA4	Mid North Coast Statistical Area Level 4
Minesoils	Minesoils Pty Ltd
ML	megalitre
ML/day	megalitres per day
ML/year	megalitres per year
mm	millimetre
mm/day	millimetres per day
Mt CO_2-e/year	million tonnes of carbon dioxide equivalent per year
MVA	megavolt-amperes
MW	megawatt
NEM	National Electricity Market
NGA Factors	National Greenhouse Account Factors
NGER Act	Commonwealth *National Greenhouse and Energy Reporting Act 2007*
Niche	Niche Environment and Heritage Pty Ltd
NPfI	*Noise Policy for Industry*
NPV	Net Present Value
NPW Act	*National Parks and Wildlife Act 1974*
NPW Regulation	*National Parks and Wildlife Regulation 2019*
NSW	New South Wales
NSW DCCEEW	NSW Department of Climate Change, Energy, the Environment and Water
NTS Corp	Native Title Services Corporation Limited
OEH	Office of Environment and Heritage
OEMP	Operations Environmental Management Plan
OP	Observation Point
OSOM	Oversize Overmass
PAD	Potential Archaeological Deposit
PBP	*Planning for Bushfire Protection 2019*
PCT	Plant Community Type
PHA	Preliminary Hazard Analysis
PHES	Pumped Hydro Energy Storage
Planning Systems SEPP	*State Environmental Planning Policy (Planning Systems) 2021*
PM_{10}	particulate matter with equivalent aerodynamic diameter of 10 microns or less
$PM_{2.5}$	particulate matter with equivalent aerodynamic diameter of 2.5 microns or less
PMF	Probable Maximum Flood
PMLU	Post-mining land use

PoEO Act	*Protection of the Environment Operations Act 1997*
PV	photovoltaic
PVA	Preliminary Visual Assessment
RAPs	Registered Aboriginal Parties
RBL	Rating Background Level
Renewable Energy Act	*Renewable Energy (Electricity) Act 2000*
Resilience and Hazards SEPP	*State Environmental Planning Policy (Resilience And Hazards) 2021*
RFS	Rural Fire Service
SAII	serious and irreversible impact
SAT	single-axis tracking
SCPL	Stratford Coal Pty Ltd
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SF_6	Sulphur Hexafluoride
SGHAT	Solar Glare and Hazard Analysis Tool
SIA	Social Impact Assessment
SISD	Safe Intersection Sight Distance
SLR	SLR Consulting Australia Pty Ltd
SMC	Stratford Mining Complex
SREH	Stratford Renewable Energy Hub
SSI	State Significant Infrastructure
t CO_2-e/year	tonnes of carbon dioxide equivalent per year
t/ha	tonnes per hectare
TEC	Threatened Ecological Community
TfNSW	Transport for NSW
TSP	total suspended particulates
TTPP	The Transport Planning Partnership Pty Ltd
VRE	Variable Renewable Energy
WAL	Water Access Licence
WM Act	*Water Management Act 2000*
WQO	Water Quality Objective
WSP	Water Sharing Plan
Yancoal	Yancoal Australia Limited