EnergyCo

September 2023

Central-West Orana Renewable Energy Zone Transmission project

Technical paper 11 – Preliminary hazard analysis

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Central-West Orana Renewable Energy Zone Transmission project
Technical paper 11 – Preliminary hazard analysis

EnergyCo

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WSP acknowledges that every project we work on takes place on First Peoples lands.
We recognise Aboriginal and Torres Strait Islander Peoples as the first scientists and engineers and pay our respects to Elders past and present.

Table of contents

CONTENTS (Continued)

List of tables

List of figures

List of appendices

Glossary

Term	Description
Central-West Orana Renewable Energy Zone (CWO REZ)	A geographic area of approximately 20,000 square kilometres centred on the regional towns of Dubbo and Dunedoo and extending west to Narromine and east beyond Mudgee and to Wellington in the south and Gilgandra in the north, that will combine renewable energy generation, storage and transmission infrastructure to deliver energy to electricity consumers.
construction area	The area that would be directly impacted by construction of the project including (but not limited to) transmission towers and lines, brake and winch sites, access roads to switching stations and energy hubs, access tracks, energy hubs, switching stations, communications infrastructure, workforce accommodation camps, construction compounds and laydown and staging areas.
construction compound	An area used as the base for construction activities, usually for the storage of plant, equipment and materials, and/or construction site offices and worker facilities. It can also comprise concrete batching plant, crushing, grinding and screening plant, testing laboratory and wastewater treatment plant.
enabling works	Activities that would be carried out before the start of substantial construction in order to make ready the key construction sites (including workforce accommodation camps and compounds), facilitate the commencement of substantial construction, manage specific features or issues and collect additional information required to finalise the final design and construction methodology.
EnergyCo	The Energy Corporation of New South Wales constituted by section 7 of the *Energy and Utilities Administration Act 1987* as the NSW Government statutory authority responsible for the delivery of NSW's REZs.
Energy hub/s	An energy hub is a substation where energy exported from renewable energy generators or storage is aggregated, transformed to 500 kV (where required) and exported to the transmission network. For the project, this includes Merotherie Energy Hub and Elong Elong Energy Hub.
hazardous industry	A development, under State Environment Planning Policy (Resilience and Hazards), for the purposes of an industry which, when the development is in operation and when all measures proposed to reduce or minimise its impact on the locality have been employed (including, for example, measures to isolate the development from existing or likely future development on other land in the locality), would pose a significant risk in relation to the locality— (a) to human health, life or property, or (b) to the biophysical environment.
operation area	The area that would be occupied by permanent components of the project and/or maintained, including transmission line easements, transmission lines and towers, energy hubs, switching stations, communications infrastructure, access roads to the switching stations and energy hubs, maintenance facilities and permanent access tracks to the easements.
(the) proponent	EnergyCo

Term	Description
(the) project	The Central-West Orana REZ Transmission project as described in the Environmental Impact Statement.
Renewable Energy Zone (REZ)	A geographic area identified and declared by the NSW Government as a REZ.
substation	A facility used to increase or decrease voltages between incoming and outgoing lines (e.g. 330 kV to 500 kV).
switching station	A facility used to connect two or more distinct transmission lines of the same designated voltage.

Executive summary

This technical paper assess the hazards and risks of the Central-West Orana Renewable Energy Zone Transmission project (the project) and has been prepared to support and inform the Environmental Impact Statement (EIS) for the project.

The impacts have been assessed in accordance with the Secretary's Environmental Assessment Requirements (SEARs) issued by the NSW Department of Planning and Environment (DPE) and against the relevant legislation and guidelines as they apply to dangerous goods and hazardous materials.

Project overview

The NSW Government is leading the development of Renewable Energy Zones (REZ) across NSW to deliver renewable energy generation and storage (lithium batteries), supported by high voltage transmission infrastructure.
Energy Corporation of NSW (EnergyCo) is proposing the construction and operation of new electricity transmission infrastructure and new energy hubs and switching stations required to connect new energy generation and storage projects within the Central-West Orana REZ to the existing electricity network (the project). The project is located within the Warrumbungle, Mid-Western Regional, Dubbo Regional and Upper Hunter local government areas (LGAs) and extends generally north to south from Cassilis to Wollar and east to west from Cassilis to Goolma.

The project would enable 4.5 gigawatts of new network capacity to be unlocked by the mid-2020s (noting the NSW Government's proposal to amend the Central-West Orana REZ declaration to allow for a transfer capacity of six gigawatts), and enable renewable energy generators within the Central-West Orana REZ who are successful in their bids to access the new transmission infrastructure to export electricity to the rest of the network. Importantly, the development of renewable energy generation projects in the Central-West Orana REZ is the sole responsibility of private generators and subject to separate planning and environmental approvals.

Legislative and policy context

The hazards and risks from the project have been assessed in accordance with the relevant legislation and guidelines. This assessment was completed in accordance with the State Environmental Planning Policy (Resilience and Hazards) 2021 (Resilience and Hazards SEPP).

This report has also been prepared in accordance with the *Hazardous and Offensive Development Application Guidelines – Applying SEPP 33* (NSW Department of Planning (DoP, 2011a), *Hazardous Industry Planning Advisory Paper No. 6 – Guideline for Hazard Analysis* (DoP, 2011b) and *Multi-Level Risk Assessment* (DoP, 2011).

Methodology

The methodology used for this assessment generally follows the process outlined in *Hazardous and Offensive Development Application Guidelines – Applying SEPP 33* (NSW Department of Planning (DoP), 2011a). The methodology involved:

- risk screening of hazardous materials and dangerous goods to identify in the project is a potentially hazardous development
- preliminary hazard analysis (PHA) of operation of the project with a focus on the battery energy storage system (BESS)
- identification of mitigation measures to address potential hazards and risks.

The hazard and risk assessment process (including both the risk screening and the hazard analysis) applies a primarily qualitative method to assess adequacy of controls both in design and on site and to determine if the project can be developed with appropriate land use safety planning whilst applying As Low As Reasonably Practicable (ALARP) principles.

Potential impacts

The use and types of hazardous materials used during construction are temporary and variable. Hazardous materials associated with the construction phase of the project are not expected to be significant quantities. Any risk of hazardous materials used would be conducted as part of a standard Construction Environmental and Management Plan (CEMP).

Storage of hazardous materials and dangerous goods, such as fuels, oils, cleaning agents and lithium-ion battery pack containers associated with potential BESS at Merotherie Energy Hub, would be required during operation of the project. The hazardous materials and dangerous goods proposed to be stored during operation of the project would be below the screening thresholds provided in *Hazardous and Offensive Development Application Guidelines – Applying SEPP 33* (DoP, 2011a). The transport of dangerous goods to the operation area is also predicted to be below specified thresholds on both load quantity and weekly movement thresholds. Therefore, the project is not considered a 'potentially hazardous development' as defined by the Resilience and Hazards SEPP. Based on the assessment, a PHA based on these criteria is not required unless there are any changes to the actual site conditions during the operational phase of the project.

Given the changes in technology and experience with battery projects, and the limited standards currently in place, it is prudent to cover a broader range of the potential risks than that addressed by the Resilience and Hazards SEPP guidelines to show that issues have been considered. As such, the hazard identification process requirements of the PHA process has been undertaken in addition to the risk screening process for the project with particular emphasis on battery hazards as the primary Class 9 Dangerous Good on site should development of the project proceed with the inclusion of battery storage.

Additional hazards that may be present during operation of the project have also been identified as part of this assessment in relation to:

- fire and pollutants introduced by an external event
- fire and electricity exposure from internal fault
- natural hazards (bushfire, water/flooding, lightning, earthquake) causing a hazardous incident or a battery fire event causing a bushfire risk
- site security breach
- BESS thermal runaway.

These risks are primarily addressed through appropriate project controls in accordance with relevant standards, guidelines and codes. These risks range from low to moderate and the risk and would be managed to be ALARP, provided requirements outlined in the legislative guidelines, codes and relevant Australian Standards are complied with as part of the design development and operation of the project.

1 Introduction

1.1 Background

New South Wales (NSW) is currently undergoing an energy sector transformation that will change how we generate and use energy. The NSW Government is leading the development of Renewable Energy Zones (REZs) across NSW to deliver renewable energy generation and storage projects, supported by transmission infrastructure. A REZ connects renewable energy generation and energy storage systems to transmission infrastructure via energy hubs, requiring the coordination of power generation, power storage and transmission infrastructure. By doing so, REZs capitalise on economies of scale to deliver clean, affordable and reliable electricity for homes, businesses and industry in NSW.

The Central-West Orana REZ was formally declared on 5 November 2021 under the *Electricity Infrastructure Investment Act 2020* with an intended network capacity of three gigawatts. As NSW's first REZ, the Central-West Orana REZ will play a pivotal role in underpinning NSW's transition to a clean, affordable and reliable energy sector.

The Central-West Orana REZ declaration (November 2021) provides for an initial intended network capacity of three gigawatts. The NSW Government is proposing to amend the declaration to increase the intended network capacity to six gigawatts, which would allow for more renewable energy from solar, wind and storage projects to be distributed through the NSW transmission network.

The proposed amendment is consistent with the NSW Network Infrastructure Strategy (EnergyCo, 2023) which identifies options to increase network capacity to 4.5 gigawatts initially under Stage 1 (which would be based on the infrastructure proposed in this assessment) and up to six gigawatts by 2038 under Stage 2 (which would require additional infrastructure beyond the scope of this assessment, and subject to separate approval). The proposed amendment also supports recent modelling by the Consumer Trustee in the draft 2023 Infrastructure Investment Objectives Report (AEMO, 2023) showing more network capacity will be needed to meet NSW's future energy needs as coal-fired power stations progressively retire.

Energy Corporation of NSW (EnergyCo), a NSW Government statutory authority, has been appointed as the Infrastructure Planner under the *Electricity Infrastructure Investment Act 2020*, and is responsible for the development and delivery of the Central-West Orana REZ. EnergyCo is responsible for coordinating REZ transmission, generation, firming and storage projects to deliver efficient, timely and coordinated investment.

EnergyCo is seeking approval for the construction and operation of new electricity transmission infrastructure and new energy hubs and switching stations that are required to connect energy generation and storage projects within the Central-West Orana REZ to the existing electricity network (the project).

1.2 Purpose of this paper

The purpose of this report is to conduct and provide a screening to assist consent authorities in determining whether a proposed development is a potentially hazardous development under the State Environmental Planning Policy (Resilience and Hazards) 2021.

This report has been prepared to address the relevant Secretary's Environmental Assessment Requirements (SEARs) for the project issued by the Secretary of the NSW Department of Planning and Environment (DPE) for the project on 7 October 2022, and the supplementary SEARs on 2 March 2023. The SEARs relevant to the assessment of hazards are presented in Table 1-1.

Table 1-1 SEARs relevant to this paper

Reference	Assessment requirement	Location where it is addressed
Hazards and Risks:	A preliminary risk screening completed in accordance with the Department's *Applying SEPP 33*. If the screening indicates that the development is 'potentially hazardous', a Preliminary Hazard Analysis (PHA) must be prepared in accordance with the Department's *Hazardous Industry Planning Advisory Paper No. 6*, '*Hazard Analysis'* and *Multi-Level Risk Assessment*.	Chapter 5 and 6
	The EIS and PHA must also verify that the development can comply with all relevant standards and codes of practice, including Australian Standards AS1940: *The storage and handling of flammable and combustible liquids*.	Section 7.1

1.2.1 Related technical papers

This technical paper is linked to the assessments completed in the following technical papers:

- Technical paper 10 – Bushfire
- Technical paper 12 – Electro magnetic field assessment
- Technical paper 13 – Traffic and transport
- Technical paper 15 – Flooding
- Technical paper 16 – Contamination.

1.3 Project overview

The project comprises the construction and operation of new electricity transmission infrastructure, energy hubs and switching stations within the Central-West Orana REZ. The project would enable 4.5 gigawatts of new network capacity to be unlocked by the mid-2020s (noting the NSW Government's proposal to amend the Central-West Orana REZ declaration to allow for a transfer capacity of six gigawatts), and enable renewable energy generators within the Central-West Orana REZ who are successful in their bids to access the new transmission infrastructure to export electricity onto the National Electricity Market (NEM). A detailed description of the project, including a description of key project components, the construction methodology and how it would be operated is provided in Chapter 3 of the EIS.

1.3.1 Key features

This project includes the following key features:

- a new 500 kV switching station (the New Wollar Switching Station), located at Wollar to connect the project to the existing 500 kV transmission network
- around 90 kilometres of twin double circuit 500 kV transmission lines and associated infrastructure to connect two energy hubs to the existing NSW transmission network via the New Wollar Switching Station
- energy hubs at Merotherie and Elong Elong (including potential battery storage at the Merotherie Energy Hub) to connect renewable energy generation and storage projects within the Central-West Orana REZ to the 500 kV network infrastructure
- around 150 kilometres of single circuit, double circuit and twin double circuit 330 kV transmission lines, supported on towers, to connect renewable energy generation projects within the Central-West Orana REZ to the two energy hubs
- thirteen switching stations along the 330 kV network infrastructure at Cassilis, Coolah, Leadville, Merotherie, Tallawang, Dunedoo, Cobbora and Goolma, to transfer the energy generated from the renewable energy generation projects within the Central-West Orana REZ onto the project's 330 kV network infrastructure

- underground fibre optic communication cables along the 330 kV and 500 kV transmission lines between the energy hubs and switching stations
- a maintenance facility within the Merotherie Energy Hub to support the operational requirements of the project
- microwave repeater sites at locations along the alignment, as well as outside of the alignment at Botobolar, to provide a communications link between the project and the existing electricity transmission and distribution network. The Botobolar site would be subject to assignment at the submissions report stage
- establishment of new, and upgrade of existing access tracks for transmission lines, energy hubs, switching stations and other ancillary works areas within the construction area, (such as temporary waterway crossings, laydown and staging areas, earthwork material sites with crushing, grinding and screening plants, concrete batching plants, brake/winch sites, site offices and workforce accommodation camps)
- property adjustment works to facilitate access to the transmission lines and switching stations. These works include the relocation of existing infrastructure on properties that are impacted by the project
- utility adjustments required for the construction of the transmission network infrastructure, including adjustments to existing communications, water and wastewater utilities. This includes adjustments to Transgrid's 500 kV transmission lines 5A3 (Bayswater to Mount Piper) and 5A5 (Wollar to Mount Piper) to provide a connection to the existing NSW transmission network, including new transmission line towers along the Transgrid network along the frontage of the New Wollar Switching Station, and other locations where there is an interface with Transgrid's network.

1.3.2 Location

The project is located in central-west NSW within the Warrumbungle, Mid-Western Regional, Dubbo Regional and Upper Hunter Local Government Areas (LGAs). It extends north to south from Cassilis to Wollar and east to west from Cassilis to Goolma. The location of the project is shown in Figure 1-1.

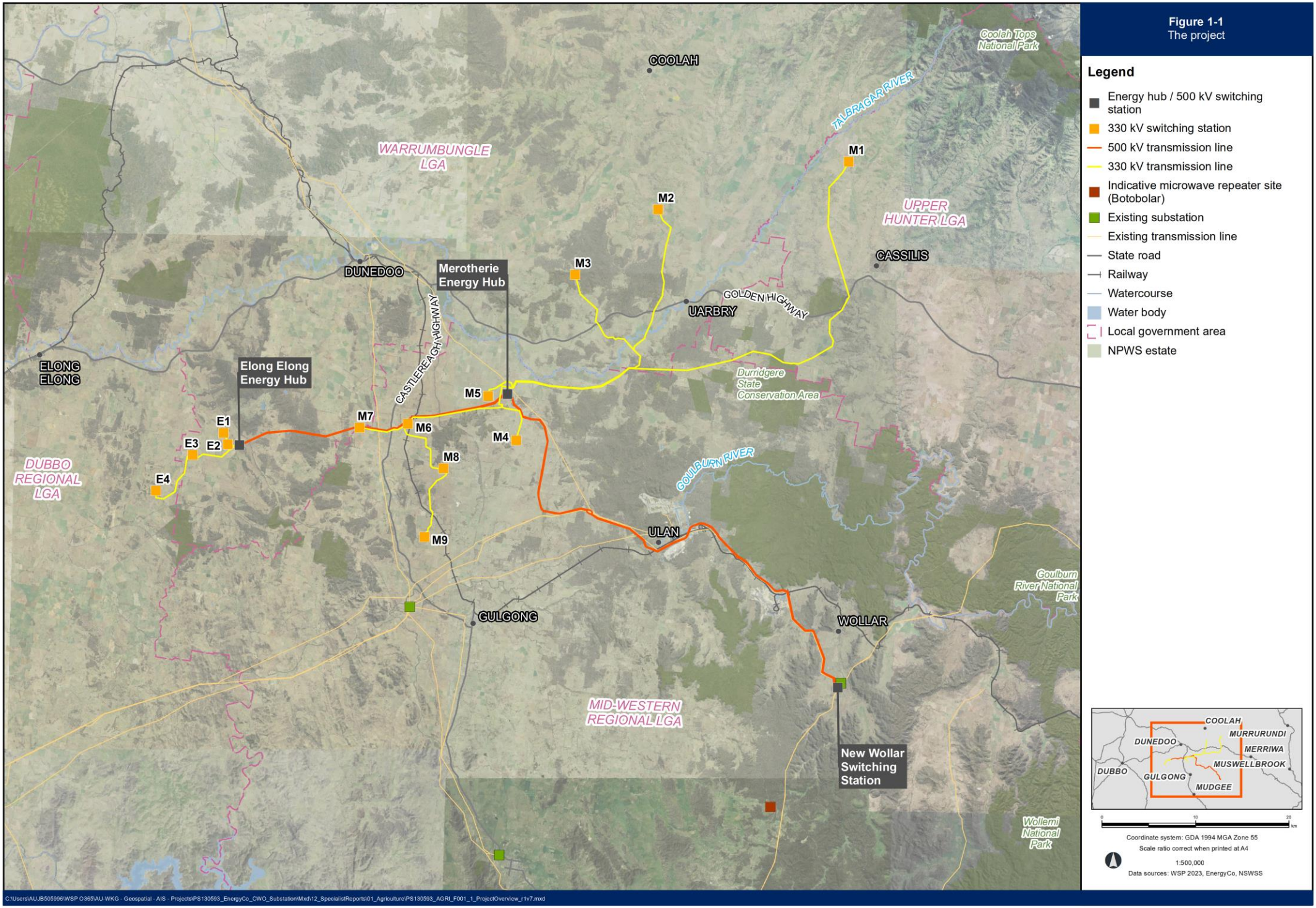

Figure 1-1
The project

Legend

- Energy hub / 500 kV switching station
- 330 kV switching station
- 500 kV transmission line
- 330 kV transmission line
- Indicative microwave repeater site (Botobolar)
- Existing substation
- Existing transmission line
- State road
- Railway
- Watercourse
- Water body
- Local government area
- NPWS estate

Coordinate system: GDA 1994 MGA Zone 55
Scale ratio correct when printed at A4

1:500,000

Data sources: WSP 2023, EnergyCo, NSWSS

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1.3.3 Timing

Construction of the project would commence in the second half of 2024, subject to NSW Government and Commonwealth planning approvals, and is estimated to take about four years. The project is expected to be commissioned/energised (i.e., become operational) in late 2027.

1.3.4 Construction

Key construction activities for the project would occur in the following stages:

- enabling works
- construction works associated with the transmission lines
- construction works associated with energy hubs and switching stations
- earthwork material site activities
- pre-commissioning and commissioning of the project
- demobilisation and rehabilitation of areas disturbed by construction activities.

Excavation and land forming works within the construction area would be required for transmission line tower construction, site preparation works at the energy hubs and switching station sites to provide level surfaces, to create trenches for drainage, earthing, communications infrastructure and electrical conduits, and to construct and upgrade access tracks.

Construction vehicle movements would comprise heavy and light vehicles transporting equipment and plant, construction materials, spoil and waste from construction facilities and workforce accommodation camp sites. There would also be additional vehicle movements associated with construction workers travelling to and from construction areas and accommodation camp sites. These movements would occur daily for the duration of construction.

To support the construction of the project a number of construction compounds would be required including staging and laydown facilities, concrete batching plants, workforce accommodation camps and construction support facilities. The main construction compounds would be established as enabling work and demobilised at the completion of construction. The size of the construction workforce would vary depending on the stage of construction and associated activities. During the peak construction period, an estimated workforce of up to around 1,800 people would be required.

1.3.5 Operation

During operation, the project would transfer high voltage electricity from the Central West-Orana REZ to the NEM. Permanent project infrastructure would be inspected by field staff and contractors on a regular basis, with other operational activities occurring in the event of an emergency (as required). Regular inspection and maintenance activities are expected to include:

- regular inspection (ground and aerial) and maintenance of electrical equipment and easements
- fault and emergency response (unplanned maintenance)
- general building, asset protection zone and landscaping maintenance
- fire detection system inspection and maintenance
- stormwater maintenance
- remote asset condition monitoring
- network infrastructure performance monitoring.

Operation of the project would require the establishment of transmission line easements. These easements would be around 60 metres for each 330 kV transmission line and 70 metres for each 500 kV transmission lines. Where network infrastructure is collocated, easement widths would increase accordingly (for example, a twin double circuit 500 kV transmission line would have an easement about 140 metres wide). Vegetation clearing would be required to some extent for the full width of the transmission line easement, depending on the vegetation types present.

2 Legislative and policy context

Environmental planning approval for the project is required in accordance with the *Environmental Planning and Assessment Act 1979* (EP&A Act). Sections 5.12 and 5.13 of the EP&A Act provide for the declaration of State significant infrastructure (SSI) and Critical State significant infrastructure (CSSI). On 23 November 2020, the Minister for Planning made the Environmental Planning and Assessment Amendment (Central-West Orana Renewable Energy Zone Transmission Order) 2020. The Order declares the whole Central-West Orana REZ Transmission project to be CSSI.

The project is a controlled action and would therefore require Commonwealth assessment and approval under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

This section describes the legislation and policies relevant to the assessment of hazardous materials and development.

2.1 Legislation

2.1.1 Environmental Planning and Assessment Act 1979

The EP&A Act and Environmental Planning and Assessment Regulation 2000 (EP&A Regulation) establish a framework for the assessment and approval of developments in NSW. They also provide for the making of environmental planning instruments, including state environmental planning policies (SEPPs) and local environmental plans (LEPs), which determine the permissibility and approval pathway for development proposals and form a part of the environmental assessment process.

Under Section 5.14 of the EP&A Act, the approval of the Minister for Planning is required for SSI (including CSSI), and an EIS has been prepared under Division 5.2 of the EP&A Act.

2.1.2 State Environmental Planning Policy (Resilience and Hazards) 2021

In 2022, the State Environmental Planning Policy (Resilience and Hazards) 2021 (Resilience and Hazards SEPP) repealed and superseded the State Environmental Planning Policy No 33 – Hazardous and Offensive Development (SEPP 33). Chapter 3 of the Resilience and Hazards SEPP provides a framework for identifying and assessing hazardous and offensive development.

The Resilience and Hazards SEPP defines potentially hazardous industry as a development which if it were to operate without employing any measures to reduce or minimise its impact in the locality, may pose a significant risk in relation to human health, life or property, or to the biophysical environment.

Under clause 3.7 of the Resilience and Hazards SEPP, "*In determining whether a development is a hazardous storage establishment, hazardous industry or other potentially hazardous industry, consideration must be given to current circulars or guidelines published by the Department of Planning relating to hazardous or offensive development*". One of the applicable circulars to the project is the former NSW Department of Planning (DoP) document *Hazardous and Offensive Development Application Guidelines – Applying SEPP 33* (DoP, 2011a) (Applying SEPP 33).

A preliminary risk screening in accordance with Applying SEPP 33 would indicate if the development is potentially hazardous. Under clause 3.11 of the Resilience and Hazards SEPP, potentially hazardous developments are required to prepare "*a preliminary hazard analysis in accordance with the current circulars or guidelines published by the Department of Planning and submit the analysis with the development application*". The project does not meet the thresholds to be considered a potentially hazardous industry. However, further hazards analysis was completed to address the potential hazards that may arise from the potential BESS at the Merotherie Energy Hub during operation of the project.

2.2 Policy, standards and guidelines

2.2.1 Hazardous and Offensive Development Application Guidelines – Applying SEPP 33 (DoP, 2011a)

Applying SEPP 33 provides advice on interpreting and implementing the repealed SEPP 33 (now the Resilience and Hazards SEPP). The guidelines mainly assist in identifying developments which should be considered under SEPP 33, and on the broad assessment requirements of the Resilience and Hazards SEPP. The guidelines provide a process for determining whether a development would be a potentially hazardous industry. A screening assessment of this project has been undertaken in accordance with these guidelines.

2.2.2 Hazardous Industry Planning Advisory Paper No. 6 – Guideline for Hazard Analysis (DoP, 2011b)

The *Hazardous Industry Planning Advisory Paper No. 6 – Guideline for Hazard Analysis* (DoP, 2011b) guideline assists stakeholders in implementing an integrated hazards-related assessment process for potentially hazardous developments. The guideline provides guidance on the general approach recommended for hazard analysis and details the requirements for reports to be submitted to government authorities.

2.2.3 Assessment Guideline – Multi-Level Risk Assessment (DoP, 2011)

The *Assessment Guideline – Multi-Level Risk Assessment* (DoP, 2011) provides guidance on the requirements for risk assessment, where the level and extent of the analysis reflects the nature, scale and location of each development. The guidelines propose a graded or multi-level framework aimed at ensuring a consistent approach. The objective is to progress the analysis and its assessment only as far as is needed to demonstrate that the operation being studied does not or will not pose a significant' risk to surrounding land uses. This may be achieved by using a combination of qualitative and quantitative approaches.

3 Methodology

3.1 Overview of approach

This chapter describes the methods used to assess potential hazards and risks of the project associated with hazardous materials and dangerous goods. The methodology used for this assessment generally follows the process outlined in Applying SEPP 33 as shown in Figure 3-1. The methodology involved:

- risk screening of hazardous materials and dangerous goods
- preliminary hazard analysis of operation of the project with a focus on the BESS
- identification of mitigation measures to address hazards and risks.

This assessment focuses on operation of the project and hazardous materials and dangerous good proposed to be installed and stored in the operation area.

This assessment does not constitute a construction safety study and does not include a detailed identification and assessment of construction and commissioning risks outside of the transportation of dangerous goods to site, or any required site work health and safety (WHS) management systems. The use and types of dangerous goods and hazardous materials used during construction are temporary and variable. Any risk of hazardous materials used would be conducted as part of a standard CEMP.

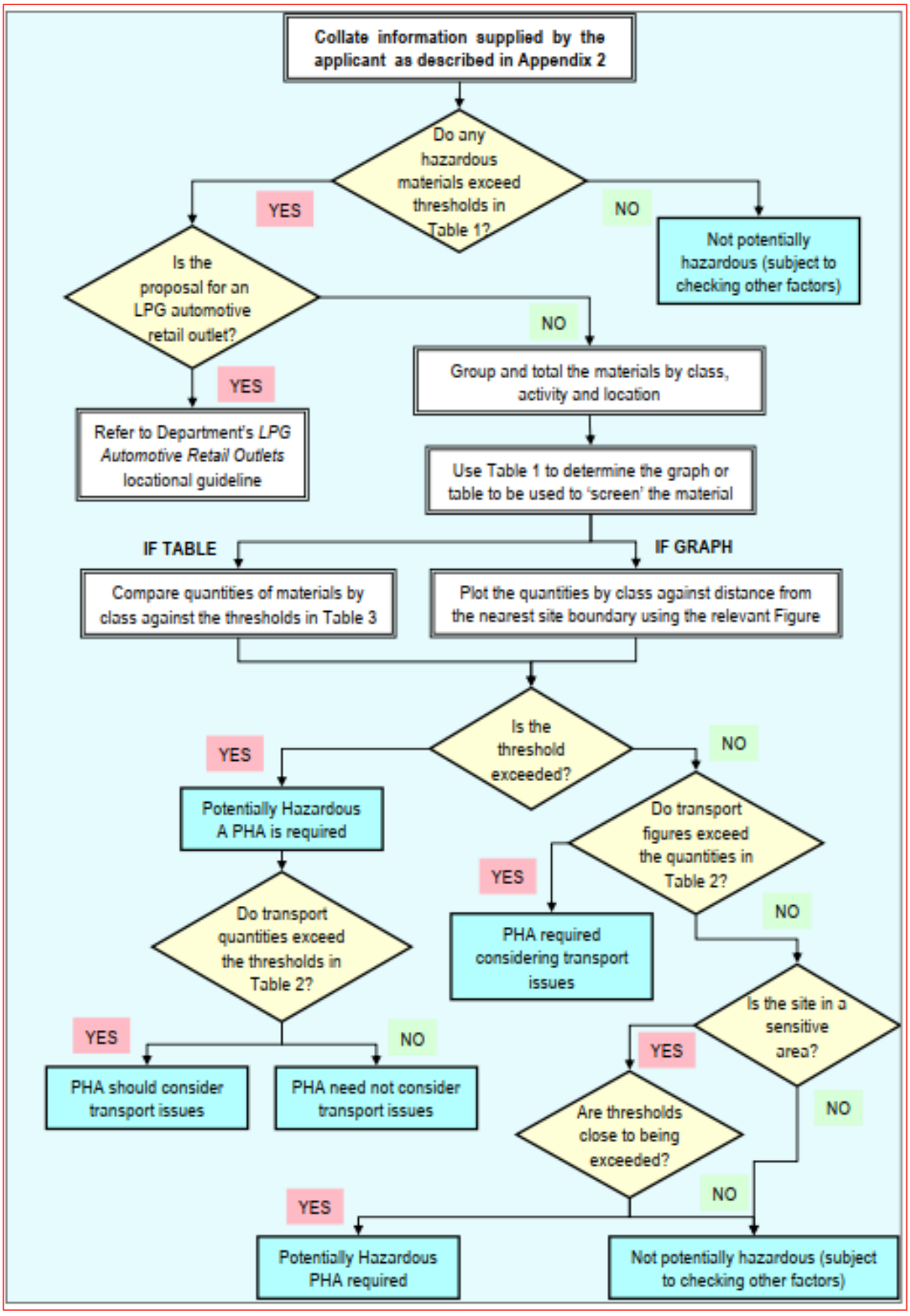


Figure 3-1 Applying SEPP 33 assessment process

3.2 Study area

The study area has been developed considering the rural location of the project and the distance to sensitive receivers considered in Applying SEPP 33. The study area comprises a one kilometre radius around the switching stations and energy hubs, where potential hazardous materials and dangerous goods would be stored during operation.

3.3 Risk screening method

Applying SEPP 33 deals with hazardous materials, which are substances falling within the classification of the Australian Code for Transportation of Dangerous Goods by Road and Rail (National Transport Commission, 2023). These materials are separated into classes with a classification number assigned to a dangerous good to indicate its most significant type of risk. Packing groups, where relevant, are used to indicate the degree of danger associated with the transport of dangerous goods of a given class:

- packing group I – substances presenting high danger
- packing group II – substances presenting medium danger
- packing group III – substances presenting low danger.

A risk screening assessment was undertaken using the methods outlined in Section 7 of Applying SEPP 33. The risk screening involved reviewing the quantities and types of dangerous goods and hazardous materials that would be stored and handled on-site during the operational phase and the frequency of transport of these materials against the screening threshold quantities defined in Applying SEPP 33.

The risk screening methodology in Applying SEPP 33 involves:

- collating project information including
  - a list of all the hazardous materials proposed to be stored
  - dangerous goods classification for each material, including subsidiary class(es) and packing groups
  - the mode of storage used (above ground or underground) and the maximum quantity stored or held on site
  - site layout plan and a locality plan showing the nearest residential property (sensitive receiver)
  - the distance of the stored material from the site boundary for any of the materials in dangerous goods classes 1.1, 2.1 and 3
  - the average number of annual and weekly road movements of hazardous material to and from the facility, and the typical quantity in each load (movement of materials during the construction phase for storage during operation were included)
- determining the quantities of all classes of hazardous materials identified. Where several hazardous materials of the same class are kept on site in the same general location, quantities were totalled by class and activity
- comparing the hazardous materials quantities and transport movements to the thresholds provided in Table 1 and 2 and Appendix 4 of the Applying SEPP 33
- determining if the project should be considered potentially hazardous depending on whether the screening thresholds are exceeded and therefore if a PHA is required.

3.4 Preliminary hazard analysis

Where a preliminary risk screening under Applying SEPP 33 determines that a PHA is required, additional hazard analysis is undertaken to ensure hazards are adequately identified and addressed as part of the project.

The applicable screening thresholds for dangerous goods and hazardous materials storage for the project were not exceeded (refer to Chapter 5) and therefore a PHA is not required on this basis. However, the design of the project includes a potential BESS as a replacement for one synchronous condenser at the Merotherie Energy Hub, which is a newer technology with limited standards currently in place. To address the potential hazards and risks associated with this BESS, a PHA process has been applied to the BESS component of the project in addition to the risk screening process for the overall project.

The preliminary hazard analysis has generally followed the approach outlined in the *Hazardous Industry Planning Advisory Paper No. 6 – Guideline for Hazard Analysis* (DoP, 2011b) and the *Assessment Guideline – Multi-Level Risk Assessment* (DoP, 2011).

3.4.1 Level of analysis

The *Assessment Guideline – Multi-Level Risk Assessment* (DoP, 2011) sets out three levels of risk analysis that may be appropriate for a PHA, as shown in Table 3-1. The outcomes of the hazard identification and consequence analysis were used to determine the appropriate level of analysis appropriate for this PHA.

Table 3-1 Level of analysis required for PHA

Level	Analysis type	Appropriate/can be justified if:
1	Qualitative	There are no potential events with significant off-site consequences and societal risk is negligible.
2	Partially quantitative	The frequency of occurrence of risk contributors having an off-site consequence(s) is low.
3	Quantitative	Significant off-site risk contributors are present, and a Level 2 analysis is unable to demonstrate that the risk criteria will be met.

Due to the remote location of the project (distance from nearest sensitive receiver) and the low potential for harm, a Level 1 PHA has generally been followed as described in *Assessment Guideline – Multi-Level Risk Assessment* (DoP, 2011). Level 1 is an essentially qualitative approach based on comprehensive hazard identification to demonstrate that the activity does not pose a significant risk.

The key steps in the Level 1 PHA process undertaken for the project has included:

- hazard identification
- a generalised consequence analysis of the key risk contributors
- determination of level of analysis required for the PHA
- an evaluation of the risks against the qualitative criteria (refer to Section 3.4.4)
- a demonstration of the adequacy of proposed technical and management controls to ensure ongoing safety of the proposed development.

3.4.2 Hazard identification

Given the project risk screening did not require a PHA to be undertaken, a desktop, qualitative hazard identification process was undertaken for the BESS component of the project only in accordance with the *Assessment Guideline – Multi-Level Risk Assessment* (DoP, 2011). The aim of the hazard identification process for the BESS was to demonstrate that the project does not present any significant risk. This process identified any risks associated with the interaction of the BESS with the surrounding environment and documented possible events that could lead to a possible off-site incident. As part of the hazard identification, all potential sources of an incident occurring as a result of the BESS were identified for all life cycle phases of the project.

3.4.3 Consequence analysis

A consequence analysis is a review of the potential for hazardous incidents to occur that could cause injuries, fatalities, and/or damage to assets and the environment, independent of the risk assessment process. A consequence analysis (which may include qualitative components) is undertaken where the hazard identification indicates more significant impact, typically external to the boundaries. Limited off-site impacts were identified during hazard identification, therefore consequence analysis is not required.

3.4.4 Risk assessment

The risk assessment method followed the risk management standard (ISO 31000), which aims to help projects take a methodical approach to risk management by doing three key things: identify risks; evaluate the probability of an event tied to an identified risk occurring; and determine the severity of the problems caused by the event occurring. The risk assessment has been conducted using the likelihood (Table 3-2) and consequence (Table 3-3) definitions and a risk matrix (refer to Table 3-4).

Evaluation of risks applied the As Low As Reasonably Practicable (ALARP) principle as identified in the *Hazardous Industry Planning Advisory Papers No. 4 – Risk Criteria for Land Use Safety Planning* (DoP, 2011c). The principle would show how an operator will meet regulatory requirements relevant to the control of significant event risks and the risks to health and safety of people at the operator's facility and neighbouring properties. Essentially, the operator must show, through reasoned and supported arguments, that there are no other practical measures that could reasonably be taken to reduce risks further.

Table 3-2 Definition of likelihood

Likelihood	Definition
Almost certain	Highly likely to happen and may occur multiple times per year (>90% chance of occurring).
Likely	Will probably occur in most circumstances when the activity is undertaken (51 to 90% chance of occurring).
Possible	Might occur when the activity is undertaken (21 to 50% chance of occurring).
Unlikely	Could happen at some time when the activity is undertaken (1 to 20% chance of occurring).
Rare	Rare – may happen only in exceptional circumstances when the activity is undertaken (less than 1% chance of occurring).

Table 3-3 Definition of consequence

Consequence	Definition
Catastrophic	Death and/or catastrophic effect on environment that may take longer than a year to restore and cost more than $1,000,000. Regulator notification mandatory.
Major	Life threatening injury or multiple injuries requiring admission to hospital and/or significant effect on environment that may take up to a year to restore and cost up to $1,000,000. Regulator notification mandatory.
Moderate	Injury requiring admission to hospital and/or effect on environment that may take 1–2 months to restore and requiring Regulator notification.
Minor	Minor illness or injury requiring medical treatment (e.g. first aid) and/or minor effect on environment that can be cleaned up. Any potential damage remediation likely to cost less than $5,000. Regulator notification unlikely to be required.
Insignificant	Illness or injury that doesn't require medical attention. No adverse effect on environment and regulator notification not required.

For the purposes of this risk assessment, risk levels as shown in in the risk matrix in Table 3-4 are defined as follows:

- Extreme – Must not proceed until suitable mitigation measures have been adopted to minimise the risk.
- High – Should not proceed without consideration of alternative options or additional controls to minimise risk.
- Medium – Acceptable with formal review. A documented action plan or standard is required.
- Low – Acceptable with review.

Where identified risks with a low to medium risk rating can be managed with controls to be ALARP, the risk is considered adequately controlled.

Table 3-4 Risk matrix

Likelihood	Consequence				
	Catastrophic	Major	Moderate	Minor	Insignificant
Almost certain	Extreme	Extreme	Extreme	High	Medium
Likely	Extreme	Extreme	High	Medium	Medium
Possible	Extreme	High	High	Medium	Low
Unlikely	High	High	Medium	Low	Low
Rare	Medium	Medium	Low	Low	Low

3.5 Exclusions and assumptions

The exclusions are summarised below:

- This assessment does not cover any risks associated with bushfire assessment which is covered Technical paper 10 – Bushfire (BlackAsh, 2023).
- This assessment does not cover risks from electric and magnetic fields generated by the project, which covered in Technical paper 12 – Electro magnetic field assessment (Aecom, 2023).
- This assessment does not cover any risks associated with flooding which is covered Technical paper 15 – Flooding (Lyalls, 2023).
- This assessment does not cover traffic and transport hazards which is covered Technical paper 13 – Traffic and transport (WSP, 2023).
- This screening is based on the all the details related to hazardous materials (dangerous goods) provided by EnergyCo. If the quantity of the hazardous materials is not available, it is assumed, based on similar battery projects, to be within/below the allowable threshold as per the Risk Screening methodology as defined in the Applying SEPP 33 document.
- The assessment does not provide a detailed account of potential health and safety risks to onsite workers for the project. Potential risks to onsite workers are regulated by workplace health and safety legislation (including the *Work Health and Safety Act 2011* (NSW)) and are not relevant to approval of the project. Site management would be the responsibility of the construction contractor, who would be required (under the *Work Health and Safety Act 2011*) to manage the site in accordance with relevant regulatory requirements.
- Construction risks related to methane hydrocarbons (HCM) potentially present in mining and spontaneous combustion within coal mining areas area intersected by the project are excluded and identified in the Technical paper 16 – Contamination.

4 Existing environment

The project is located in central-west NSW within the Warrumbungle, Mid-Western Regional, Dubbo Regional and Upper Hunter LGAs. It extends north to south from Coolah to Wollar and east to west from Cassilis to Goolma.

The operation area of the project is primarily surrounded by land zoned RU1 – Primary production. The New Wollar switching station is located next to the existing Transgrid Wollar substation.

The sensitive receivers within one kilometre of the switching stations and energy hubs, where potential hazardous materials and dangerous goods would be stored during operation, are described in Table 4-1 and shown in Appendix A. These are predominantly residential receivers consisting of dwellings on agricultural properties.

Table 4-1 Sensitive receivers within one kilometre of switching stations and energy hubs

Receiver ID	Type of receiver	Nearest project component that would potentially store dangerous goods during operation*	Approximate distance to the operation area (metres)	Orientation from the operational area
ID: 19	Residential	New Wollar Switching Station	900	North-east
ID: 9	Residential	New Wollar Switching Station	875	South
ID: 530	Residential	E3 Switching Station	460	South-west
ID: 580	Residential (unoccupied property)	E3 Switching Station	880	North-east
ID: 584	Residential	E3 Switching Station	830	North-east
ID: 585	Residential	E3 Switching Station	860	North-east
ID: 703	Residential	M4 Switching Station	540	North-west
ID: 627	Residential	M4 Switching Station	660	South-west
ID: 876	Residential	M5 Switching Station	285	North-east
ID: 880	Residential	M5 Switching Station	300	North-east
ID: 705	Residential	M7 Switching Station	990	South-west
ID: 717	Residential	M7 Switching Station	440	South

*Some sensitive receivers may be located within proximity to more than one project component that would potentially store dangerous goods during operation. However, for the purposes of this assessment, the assessment has been completed with consideration of the closest project component only.

5 Risk screening

5.1 Dangerous goods and hazardous materials for operation

During operation of the project, dangerous goods and hazardous materials would be stored at the switching stations and energy hub sites within the operation area. The type and purpose of these hazardous materials are described in Table 5-1. The project would not involve any production or manufacturing of dangerous goods or hazardous materials during operation.

Table 5-1 Dangerous goods proposed to be stored during operation

Material	Purpose	Dangerous good class
Lithium-ion battery pack containers	Forms part of the BESS	9 (miscellaneous)
Sulfur hexafluoride gas (SF6)	Insulating gas for high voltage switching gears	2.2 (non-toxic/non-flammable gas)
Transformer oil (mineral oil)	To support operation of transformers	Typically not classified
Fuel pod (diesel or petrol)	Back up electricity generation for operations and maintenance	3 (flammable liquid)
Oils, lubricants and hydraulic fluids	General maintenance of plant, vehicles and equipment	3 (flammable liquid)
Oxyacetylene	Welding and hot works for maintenance and emergency works	2.1 (flammable gas)
Degreasers/cleaning agent	Washing of parts and equipment	Typically corrosive or flammable or not classified
Biocides, algaecides and bio dispersants	Treatment of the cooling water for switching station equipment	6.1 (toxic substance)
Ph adjustment (alkalinity adjusters)	Treatment of the cooling water for switching station equipment	Typically not classified
Corrosion/scale inhibiters	Treatment of the cooling water for switching station equipment	8 (corrosive)
Disinfection treatment (including chlorination and chlorine dioxide)	Treatment of the cooling water for switching station equipment	2.3 (toxic gas)
Insulator cleaning solvent	Insulator cleaning in energy hubs	Typically corrosive or flammable or not classified
Flocculants	Treating and dewatering basins.	Typically, not classified
Oxygen and acetylene	Steel cutting needed for maintenance or emergency works	2.1 (flammable gas) 5.1 (oxidiser)
Liquefied petroleum gas (LPG)	Steel cutting needed for maintenance or emergency works	2.1 (flammable gas)
Pesticides and herbicides	Weed control	6.1 (toxic substance)

5.2 Screening assessment of dangerous goods and hazardous materials in project operation

The proposed inventory of dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (National Transport Commission, 2023) is provided in Table 5-2. The information contained in the table compares the total storage quantity of the required dangerous goods classes against the storage screening thresholds in Applying SEPP 33. The dangerous goods to be stored on the site were grouped into their respective classes. If more than one packing group was present in a class, it was assumed that the total amount for that class was the more hazardous pack.

Dangerous Good (DG) Classes 2.2, and 9 are excluded from the risk screening as per Applying SEPP 33. Class 2.2 goods are non-flammable, non-toxic gases and are not considered to be potentially hazardous with respect to off-site risk. Class 9 goods are miscellaneous dangerous goods, which pose minimal threat to people or property.

In relation to the potential BESS, specific details on chemical quantities for the battery would be subject to detailed design. As such the quantity provided shows the maximum capacity allowable for the site. The volumes provided are considered to be well within standard current battery storage operations.

Table 5-2 Dangerous goods classes in storage (proposed)

Substance	Class	Packing group	Total quantity stored per site	Storage site(s)	Threshold quantity	SEPP33 threshold finding*
Lithium ion batteries (including lithium ion polymer batteries)	Class 9[1] (miscellaneous dangerous goods, which pose little threat to people or property)	N/A	<10 tonnes	Merotherie Energy Hub	None	Not applicable[2]
Diesel or petrol (fuel pod)	Class 3 (Flammable liquids)	Mixed packing group assumed	<20 tonnes	Switching stations and energy hubs (above ground storage)	20 tonne (assuming storage 10 metres from site boundary)	Below, based on estimated volumes
Lubricating oils and greases						
Liquefied petroleum gas (LPG) – Stored above ground	Class 2.1 (Flammable gases)	N/A	<10 tonne or 16 square metres	Switching stations and energy hubs	10 tonne or 16 square metres	Below, based on estimated volumes
Acetylene (Pressurised)	Class 2.1 (Flammable gases)	N/A	<100 kg	Switching stations and energy hubs	100 kg (10 m from boundary threshold)	Below, based on estimated volumes
Disinfection Treatment (Chlorination, Chlorine dioxide etc.)	Class 2.3 (Toxic gases)	N/A	<1 tonne	Switching stations and energy hubs	1 tonne (chlorine and sulfur dioxide stored as liquefied gas in containers <100 kg)	Below, based on estimated volumes

Substance	Class	Packing group	Total quantity stored per site	Storage site(s)	Threshold quantity	SEPP33 threshold finding*
Biocides, algaecides and bio dispersants	Class 6 (toxic or infectious substances)	Mixed packing group assumed	<0.5 tonne	Switching stations and energy hubs	0.5 tonne	Below, based on estimated volumes
Pesticides & Herbicides						
Corrosion/ Scale inhibiters	Class 8 (Corrosive substances)	Mixed packing group assumed	5 tonne	Switching stations and energy hubs	5 tonne	Below, based on estimated volumes

(1) This screening does not negate the requirements for a Class 9 dangerous goods placard/licencing application, which would be required for quantities over 10,000 kg.

(2) Whilst not applicable, further risk assessment has been conducted in order to provide a more robust risk assessment of the Class 9 dangerous goods storage and use on site.

5.3 Dangerous goods transport screening

The project may be deemed potentially hazardous if the traffic movements for significant quantities of dangerous goods entering and leaving the site, are above the cumulative vehicle movements thresholds in the Applying SEPP 33. If quantities are below the thresholds, the potential risk is unlikely to be significant unless the number of traffic movements is high.

The maximum proposed weekly movements at the site per week are provided below in Table 5-3. The annual vehicle movements for the project would be slightly less than the accumulative weekly vehicle movements.

Table 5-3 Dangerous goods vehicle movements (proposed)

Substance	Class	Proposed maximum DG vehicle movements (per week)	SEPP33 threshold vehicle movements (per week and annual cumulative)	SEPP 33 threshold minimum quantities (per load)	Load type (relevant to facility)	SEPP 33 threshold level findings
Lithium ion batteries	9	<10	<60 per week with no more than 1,000 movements per year	No limit	Not applicable	Below, based on estimated movements
Diesel or petrol (fuel pod)	Class 3 (PGII and PGIII)	<45	<45 per week with no more than 750 movements per year	3 tonne	Not applicable	Below, based on estimated movements
Lubricating oils and greases						
Liquefied petroleum gas (LPG)	Class 2.1	<30	<30 per week with no more than 500 movements per year	2 tonne	Not applicable	Below, based on estimated movements
Acetylene						

Substance	Class	Proposed maximum DG vehicle movements (per week)	SEPP33 threshold vehicle movements (per week and annual cumulative)	SEPP 33 threshold minimum quantities (per load)	Load type (relevant to facility)	SEPP 33 threshold level findings
Disinfection Treatment (Chlorination, Chlorine dioxide etc.)	Class 2.3	<6	<6 per week with no more than 100 movements per year	1 tonne	Not applicable	Below, based on estimated movements
Biocides, algaecides and bio dispersants Pesticides and Herbicides	Class 6	No movements proposed carrying more than 1 tonne	All movements	1 tonne	Not applicable	Below, based on estimated movements
Corrosion/Scale inhibiters	Class 8	<30	<30 per week with no more than 500 movements per year	2 tonne	Not applicable	Below, based on estimated movements

5.4 Preliminary risk screening summary

The proposed dangerous goods and hazardous materials planned to be stored during operation of the project and the construction phase are expected to be below the screening thresholds based on the screening process and guidelines provided in Applying SEPP 33. The transport of dangerous goods to site would also be below thresholds on both load quantity and weekly movement. Therefore, the project is not considered potentially hazardous development under the Resilience and Hazards SEPP. Based on the assessment carried out in this document, a PHA is not required. However, further assessment of hazardous materials and dangerous goods would be undertaken during detailed design, when detailed information on material quantities and types, transport movements and battery design details are known.

6 Preliminary hazard analysis

Given the changes in technology and experience with battery projects, and the limited standards on battery storage currently in place, it is prudent to consider a broader range of the potential risks than that addressed by the SEPP guidelines to show that potential issues have been considered. As such, the PHA process has been undertaken in addition to the risk screening process for the project with particular emphasis on battery hazards. Additional hazards that may be present during operation of the project have also been identified as part of this assessment in relation to the BESS and associated chemical storage/maintenance.

6.1 Potential battery storage

There is the potential for the project to include a BESS at the Merotherie Energy Hub that would replace one synchronous condenser as shown in Figure 6-1. The potential BESS would consist of lithium-ion or lithium-iron phosphate batteries and have a capacity of 200 megawatts/400 megawatt hours.

The BESS would connect to substation infrastructure which provides a connection between the 330 kV network infrastructure from renewable energy generation projects in the Central-West Orana REZ to the project's 500 kV network infrastructure that would connect the project to the NEM. The Merotherie Energy Hub would comprise 500 kV and 330 kV switchyards and 500/330 kV substations including synchronous condensers; one of which may potentially be replaced with a BESS, subject to further technical investigations and feasibility considerations. The site would also have:

- a range of supporting electrical components including shunt reactors, circuit breakers, overhead conductors, busbars and gantries
- control and protection systems (including relays, metering, disturbance recorder, etc.)
- communications equipment, including microwave infrastructure
- auxiliary services and control buildings to accommodate protection for switchgear and fixed portions of secondary system (such as fire protection, security system, air conditioning etc.)
- a backup diesel powered generator to charge batteries for the control systems
- oil containment system (including bunding and containment tank) and oil water separation facility.

Security fencing would be installed at the Merotherie Energy Hub in addition to the following safety equipment:

- closed-circuit television (CCTV) security cameras
- motion sensors
- temperature monitors
- outdoor lighting
- anti-climbing barriers to all transmission line towers
- safety and public information signage on the infrastructure and transmission line towers.

To manage the risk of fire to and from the energy hub and switching station sites, an asset protection zone would be implemented and maintained around each site.

The BESS would consist of a series of containerised or stacked Lithium-ion (Li-ion) type battery cells located within enclosures (or units) together with associated control systems The design and layout of the battery would be subject to detailed design. Provided the battery is designed such that a battery fire would not propagate to other battery enclosures and provided the risk of a spill, runoff and exposure is minimised as per emergency and spill management, there is no serious potential for harm from the project and a Level 1 qualitative risk assessment can be justified. It is noted that there is sufficient separation distance between the proposed BESS location with the nearest sensitive receivers over one kilometre away.

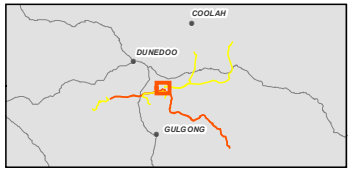
Figure 6-1
Merotherie Energy Hub

Legend

- Energy hub / 500 kV switching station
- 500 kV energy hub infrastructure
- Operation area
- Maintenance facility
- BESS location
- 330 kV switching station
- 500 kV transmission line
- 330 kV transmission line
- Existing transmission line
- 1km radius around energy hubs and switching stations
- Road
- Watercourse
- Water body
- Property to be acquired

Sensitive receiver

- House



Coordinate system: GDA 1994 MGA Zone 55
Scale ratio correct when printed at A4

1:30,000

Data sources: WSP 2023, EnergyCo, NSWSS

C:\Users\AUEB504167\WSP O365\AU-WKG - Geospatial - AIS - Projects\PS130593_EnergyCo_CWO_Substation\Mxd\16_Hazard\PS130593_HZD_F0601_MerotherieEnergyHub_r1v8.mxd

6.2 Hazard identification and consequence analysis

Apart from the preliminary risk screening, additional hazards, in particular those relating to the BESS, that may affect the project during the operational phase have been identified. Potential causes of hazards were identified as:

- inadequate maintenance
- inadequate design
- faulty infrastructure and equipment from production or installation
- improper operational practices implemented
- security breach
- extreme weather event such as flooding, lightning
- bushfire.

The resulting hazards were identified to be:

- fire
- chemical release
- electrical exposure.

One of the main hazards associated with lithium-ion batteries is thermal runaway, where the lithium-ion cell enters an uncontrollable, self-heating state. Thermal runway can occur as a result of various circumstances, including (but not limited to) battery defect, improper operation, mechanical damage, or a bushfire event. The occurrence of a thermal runway event can result in the release of extensive energy primarily as heat but also violent cell venting which can release gas, fumes, shrapnel and/or particulates.

The consequence of each potential hazard identified is considered in Table 6-1. There are no potential hazards with significant off-site consequences and societal risk is negligible. Due to the low potential for harm and the remote location of the project with nearest sensitive receiver to the BESS being over on kilometre distant, a Level 1 PHA has generally been followed as described in *Assessment Guideline – Multi-Level Risk Assessment* (DoP, 2011). Furthermore, due to the limited off-site impacts identified, further consequence analysis is not required.

Table 6-1 Identified hazard and potential consequences

Hazard	Consequence	Off-site impact/severity
Electrical exposure	Electrocution Fire	No offsite impact expected due to separation distance between the BESS and the nearest sensitive receivers.
Energy-Electrical Fault at substation or transformer	Intense light and heat Fire Arc flash/electrocution	No offsite impact expected due to separation distance between the BESS and the nearest receivers.
Fire (BESS/ Substation)	Release of toxic products Fire escalation (spread) to other assets	Limited offsite impact expected due to separation distance between the BESS and nearest sensitive receivers, dependent on wind direction. Establishment of asset protection zones around the Merotherie Energy Hub would also limit the potential for fire escalation.

Hazard	Consequence	Off-site impact/severity
Bushfire (relative to BESS location)	Fire escalation to adjoining sites	No offsite impact expected due to separation distance between the BESS and nearest sensitive receivers. Establishment of asset protection zones around project infrastructure, combined with, proposed vegetation clearance requirements and vegetation maintenance activities would also limit the potential for fire escalation from within the Merotherie Energy Hub (where the BESS would be located) to external sources.
Chemical (localised chemical leak)	Release of liquid or gas	No offsite impact expected due to separation distance between the BESS and nearest sensitive receivers. Quantities of chemicals proposed to be stored would be below Applying SEPP 33 thresholds.
Chemical (pollution)	Environmental pollution from containment failure	Environmental pollution from failure to contain cooling water and oils at the BESS (if applicable to design), and failure of secondary containment, along with limited chemical volumes.
Fire (Thermal Runaway)	Fire and release of toxic products and intense heat Fire escalation for adjoint assets	Limited, possible offsite impact possible. However, an offsite impact is considered unlikely due to separation distance between the BESS and nearest sensitive receivers, dependent on wind direction.
Site security breach	Intentional or accidental damage and/or failure of the BESS.	No offsite impact expected due to separation distance between the BESS and nearest sensitive receivers. Onsite impact possible, which may include damage to project .
External Factors (flooding or storm)	Water/flood/lightning resulting in damage and/or failure of the BESS	No additional offsite impact expected due to separation distance between the BESS and nearest sensitive receivers. Onsite impact possible.

6.3 Risk assessment

Table 6-2 below provides an evaluation of risks associated with the potential BESS at the Merotherie Energy Hub and the impact with off-site impacts.

Table 6-2 Hazards and risk assessment

Hazard	Consequences	Likelihood	Unmitigated risk outcome (off site)	Evaluation and mitigation
Electrical exposure	Insignificant	Unlikely	Low	With no offsite impact expected, this risk is manageable with suitable onsite controls.
Energy – Electrical fault at substation or transformer	Insignificant	Rare	Low	With no offsite impact expected, this risk is manageable with suitable onsite controls.
Fire (BESS/ Substation)	Moderate	Unlikely	Medium	Legislative guidelines, codes and relevant Australian Standards and NSW Fire Safety Standards provide clear guidance about steps for prevention and protection against a fault in a BESS escalating into a fire. Provided these design requirements are complied with, the risk at each individual battery enclosure is managed ALARP.
Bushfire (relative to BESS location)	Moderate	Unlikely	Medium	The risk would be reduced ALARP provided requirements outlined in the legislative guidelines, codes and relevant Australian Standards are complied with, in addition to any recommendations provided in Technical paper 10 – Bushfire.
Chemical (localised chemical leak)	Minor	Unlikely	Low	With no offsite impact expected, this risk is manageable with suitable onsite controls.
Chemical (pollution)	Moderate	Rare	Low	With no offsite impact expected, this risk is manageable with suitable onsite controls.

Hazard	Consequences	Likelihood	Unmitigated risk outcome (off site)	Evaluation and mitigation
Thermal runaway	Major	Rare	Medium	The BESS would be installed in line with *AS/NZS 5139:201 Electrical installations – Safety of battery systems for use with power conversion equipment*. Maintenance of optimal operational conditions of the potential BESS in accordance with the operational design requirements is recommended and *AS 1670: Fire detection, warning, control and intercom systems* and Best Practice Guide: Battery Storage Equipment – Electrical Safety Requirements (2018). Site access to fire and emergency Services would be made available to attend any fire event. Asset protection zones would be established at Merotherie Energy Hub as identified in Technical paper 10 – Bushfire. Implementation of these controls would allow the risk to be managed to ALARP, however it is identified that there is a potential in the event of a thermal runaway that toxic combustion products may evolve and could technically affect the nearby resident and emergency services personnel if down wind. A required control would be the inclusion of evacuation protocols (including for neighbouring properties) in the fire and emergency response plan.
Site security breach	Moderate	Rare	Low	Fencing and security features would be erected around the Merotherie Energy Hub infrastructure which would limit the potential for a breach to occur. Operation of the project would be carried out under project-specific security protocols, including only approved staff, contactors and visitors to be allowed within the active areas Merotherie Energy Hub.
External factors (flooding or storm)	Major	Rare	Medium	The risk is manageable provided requirements outlined in the legislative guidelines, codes and relevant Australian Standards are complied with in addition to any recommendations provided in Technical paper 15 – Flooding. It is noted that many of these risks are outside the control of the site. Regardless, it is important that these are managed ALARP so they do not impact off site condition during these situations.

6.4 Preliminary hazard analysis summary

Based on the findings of this PHA, the project is not considered to be potentially hazardous in accordance with the Resilience and Hazards SEPP, based on the expected storage and transport of dangerous goods and hazardous materials for the project. Potential hazards from the project are predominantly associated with the risk of a fire event affecting the batteries, thermal runaway leading to fire and environmental pollution from a spill of oil or other pollutant from the project, with other risks associated with electricity.

BESS and transformer fires do have the potential to propagate to areas outside of the battery enclosure area and potentially initiate a bushfire in the surrounding grass land if the risk of propagation is not managed. Toxic combustion products may evolve and could technically affect the nearby resident and emergency services personnel. As such mitigated controls will need to be implemented in order to reduce the risk to ALARP.

7 Recommended management and mitigation measures

7.1 Environmental and safety management

Hazards and risks would be managed in accordance with Network Operator's Safety Management System, policies and guidelines.

A project-specific Construction Environmental Management Plan would be prepared as part of the CEMP to address general risk management on site. The transportation and storage of any dangerous goods during the construction phase of the project has been included as per of the SEPP assessment.

An Emergency Management Plan would be prepared for operation of the project. The plan would address the hazards associated with a Lithium-ion packed battery fire and fire-fighting requirements in operational areas. Emergency procedures will include provisions for the management of pollution incidents (water runoff and air), and personnel would be trained in emergency response in accordance with the requirements of AS 3745:2010 *Planning for emergencies in facilities*.

7.2 Mitigation measures

Risk assessment hazards which reported a risk rating of medium or higher have been listed below and/or where suitable mitigation measures to address an ALARP approach has been provided. In addition, comment on managing, use and storage of hazardous materials is provided in Table 7-1.

Table 7-1 Recommended mitigation measures

Ref	Impact	Mitigation measures	Timing	Applicable location(s)
HR1	Storage and use of Dangerous Goods	Dangerous goods will be stored in accordance with supplier's instructions and relevant legislation, Australian Standards, and applicable guidelines; and may include bulk storage tanks, chemical storage cabinets/containers or impervious bunds. Any storage areas will be designed in accordance with Australian Standard *AS1940: The storage and handling of flammable and combustible liquids* where applicable. All personnel required to work with Dangerous Goods and other hazardous material will be trained in their safe use and handling.	Construction Operation	All locations

Ref	Impact	Mitigation measures	Timing	Applicable location(s)
HR2	Management of hazardous materials (design)	Further assessment of hazardous materials and dangerous goods will be undertaken during detailed design, when detailed information on material quantities and types, transport movements and BESS design details are known, to ensure the thresholds in Applying SEPP 33 are not exceeded. Safety in design will be considered and implemented in operational design in accordance with a Safety Management System (SMS) based on applicable Australian Standard and guidelines for the Lithium-ion packed batteries and Class 9 Dangerous Goods.	Detailed design	Energy hubs and switching stations
HR3	BESS thermal runaway and resultant fire	Prior to construction of the BESS, a Fire Safety Study will be prepared based on the final design of the BESS. The Fire Safety Study will be prepared in accordance with the *Hazardous Industry Planning Advisory Paper No. 2 'Fire Safety Study' guideline* (DoP, 2011d).	Detailed design Operation	Merotherie Energy Hub
HR4	BESS thermal runaway and resultant fire	The BESS would be installed in accordance with *AS/NZS 5139: Electrical installations - Safety of battery systems for use with power conversion equipment*. Optimal operation conditions of the BESS will be maintained in accordance with the operational design requirements, Australian Standard *AS 1670: Fire detection, warning, control and intercom systems* and Best Practice Guide: Battery Storage Equipment – Electrical Safety Requirements (2018) or equivalent.	Detailed design Operation	Merotherie Energy Hub
HR5	Pollutant release	The design of the BESS (if applicable) will identify containment measures to be provided for the containment of cooling water and oils to ensure no offsite discharge occurs.	Operation	Merotherie Energy Hub
HR6	Pollutants and smoke moving offsite	Emergency procedures will include details for the establishment of a downwind exclusion zone(s) and evacuation protocols to be implemented in the event of a fire at the BESS (depending on the severity of the event).	Operation	Merotherie Energy Hub

8 Conclusion

Based on the risk screening outcomes and risk evaluation of additional identified site hazards, it can be concluded that the project is not considered to be a potentially hazardous development as defined under the Resilience and Hazards SEPP and a PHA is not required at this stage of the risk screening process for the project.

As part of the hazard screening process within the SEPP, several other potential hazards have been identified which relate to Dangerous Goods stores and general risks from BESS facilities as well as transportation to the site and must be considered as part of the project's risk assessment processes. These have been highlighted along with mitigation measures and actions to effectively manage potential risks.

Regardless, a PHA was conducted and the analysis conducted found that the project can be managed in accordance with the established risk criteria and in accordance with ALARP principles. Most hazards can be prevented by employing a combination of common measures, including following all applicable AS/NZ Standards, separation distances and setbacks, physical protection and control systems measures.

The recommendations in this PHA would ensure the risk profile for the BESS is consistently within the Low or Moderate risk ranking and ALARP can be established as required under the SEPP guidelines.

9 References

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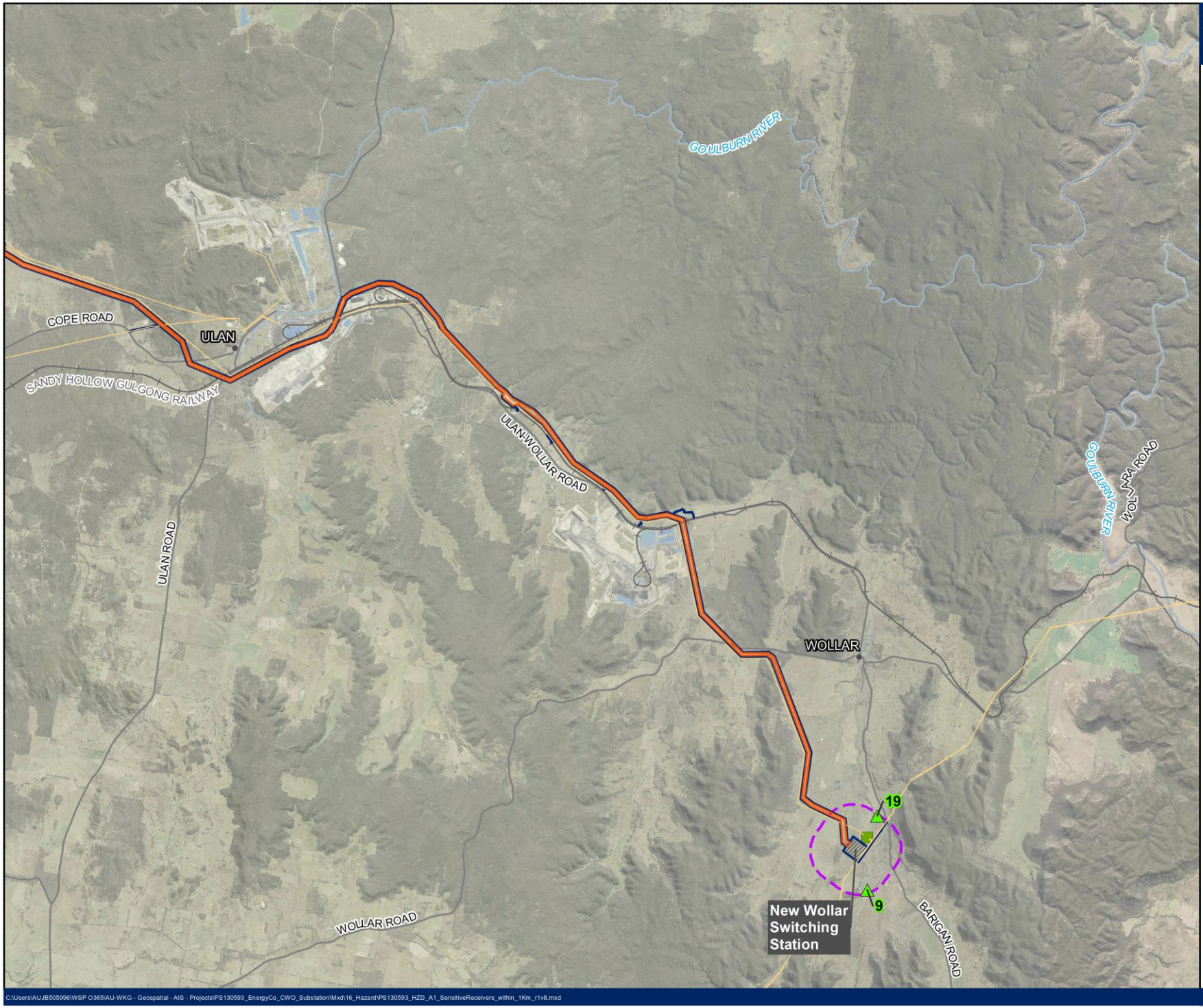
Appendix A

Project layout and sensitive receivers



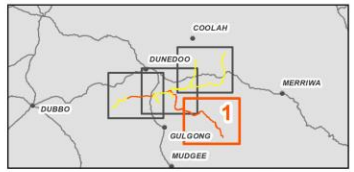
Appendix A
Sensitive receivers with 1km of energy hubs and switching stations
Page 1 of 4

Legend

- Operation area
- 1 km radius around energy hub/switching station
- Energy hub / 500 kV switching station
- 500 kV transmission line
- Existing substation
- Existing transmission line
- Road
- Railway
- Watercourse
- Water body

Sensitive receiver

- House



Coordinate system: GDA 1994 MGA Zone 55
Scale ratio correct when printed at A4
1:160,000
Data sources: WSP 2023, NSWSS, EnergyCo

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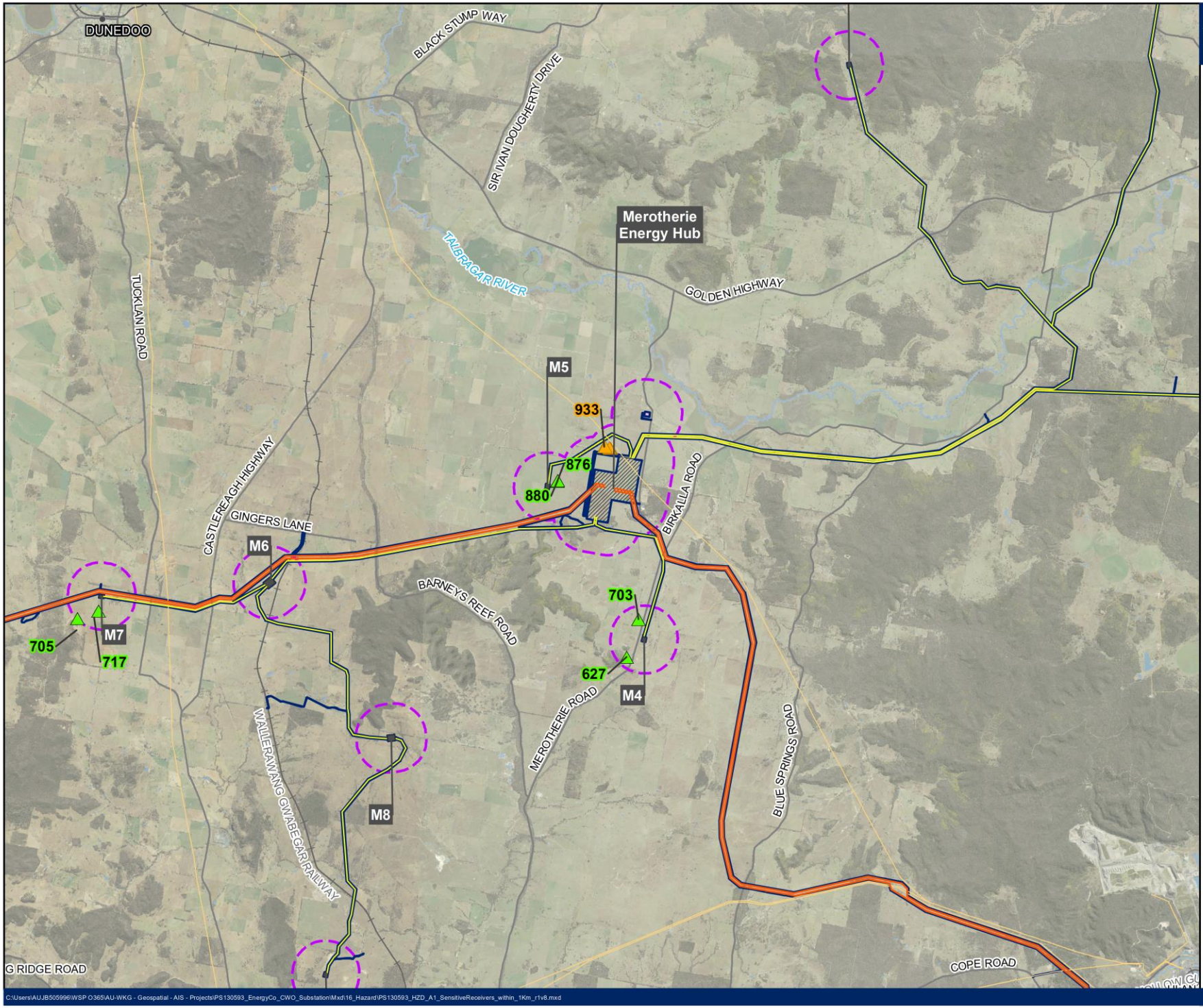


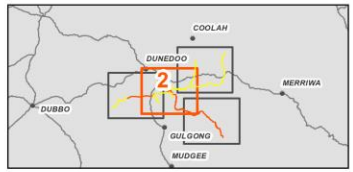
Appendix A
Sensitive receivers with 1km of energy hubs and switching stations
Page 2 of 4

Legend

- Operation area
- 1 km radius around energy hub/switching station
- Energy hub / 500 kV switching station
- Maintenance facility
- 330 kV switching station
- 500 kV transmission line
- 330 kV transmission line
- Existing transmission line
- Road
- Railway
- Watercourse
- Water body
- Property to be acquired

Sensitive receiver

- House



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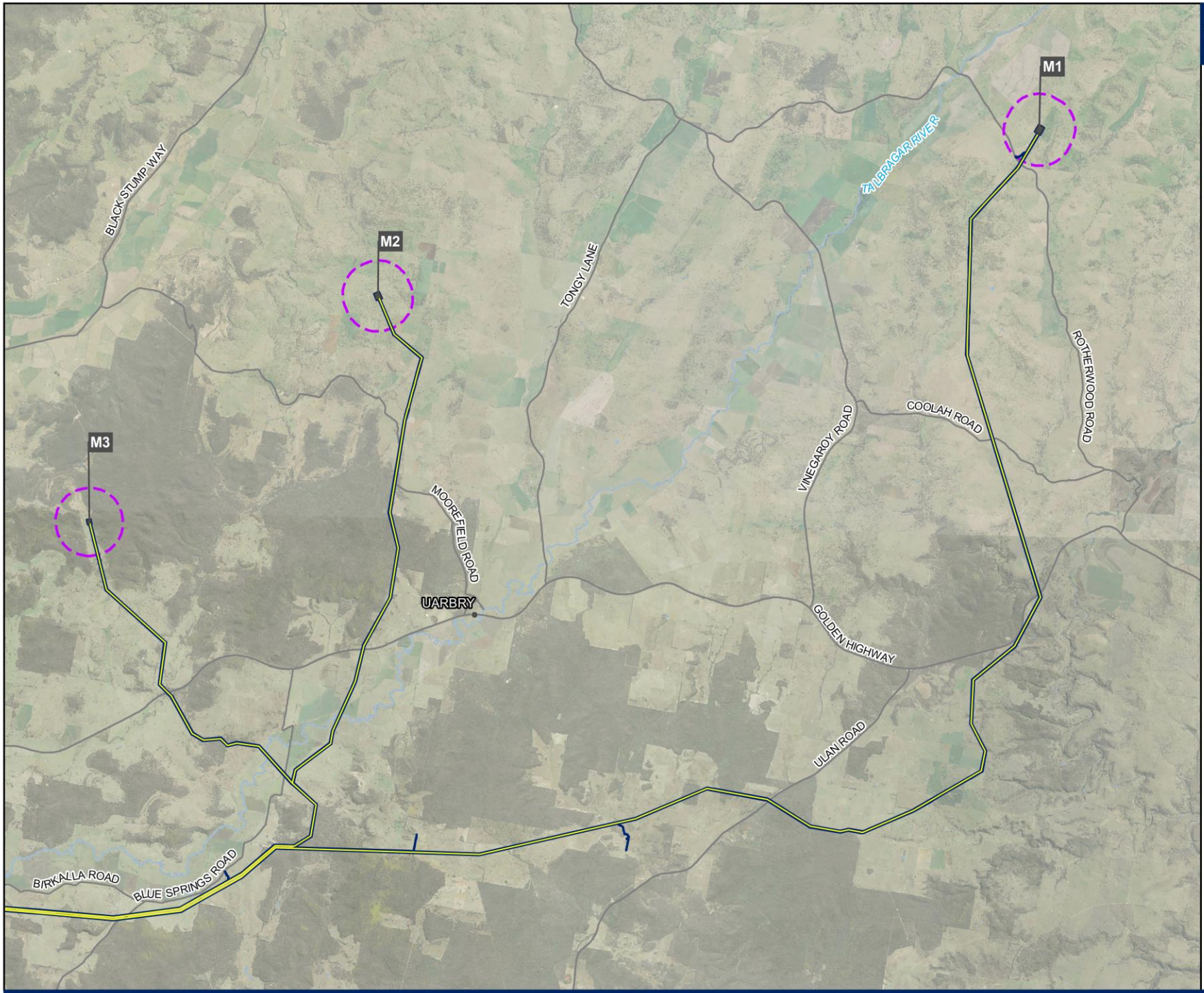
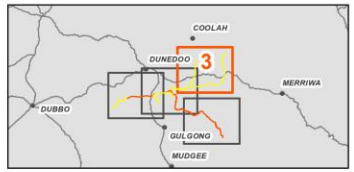


Appendix A
Sensitive receivers with 1km of energy hubs and switching stations
Page 3 of 4

Legend

- Operation area
- 1 km radius around energy hub/switching station
- 330 kV switching station
- 330 kV transmission line
- Road
- Watercourse
- Water body



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Scale ratio correct when printed at A4

1:160,000

Data sources: WSP 2023, NSWSS, EnergyCo

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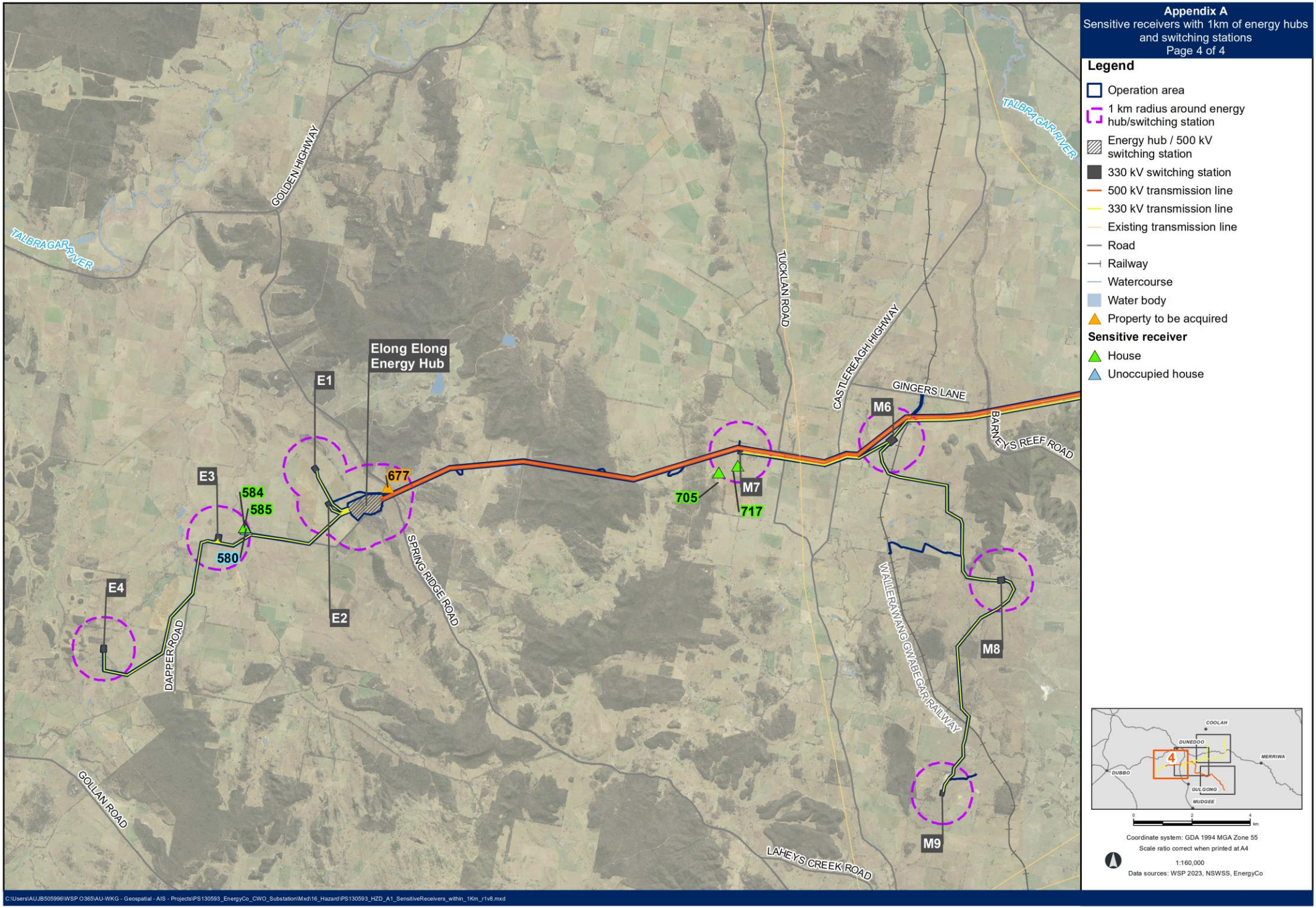
Elong Elong Energy Hub
E1
E2
E3
E4
677
584
585
580
705
M7
717
M6
M8
M9
GOLDEN HIGHWAY
TALBRAGAR RIVER
TUCKLAN ROAD
CASTLEREAGH HIGHWAY
GINGERS LANE
BARNEYS REEF ROAD
SPRING RIDGE ROAD
DAPPER ROAD
WALLERAWANG GWABEGAR RAILWAY
GOLLAN ROAD
LAHEYS CREEK ROAD
TALBRAGAR RIVER
Appendix A
Sensitive receivers with 1km of energy hubs and switching stations
Page 4 of 4
Legend
Operation area
1 km radius around energy hub/switching station
Energy hub / 500 kV switching station
330 kV switching station
500 kV transmission line
330 kV transmission line
Existing transmission line
Road
Railway
Watercourse
Water body
Property to be acquired
Sensitive receiver
House
Unoccupied house
COOLAH
DUNEDOO
MERRIWA
DUBBO
GULGONG
MUDGEE
4
0
2
4
km
Coordinate system: GDA 1994 MGA Zone 55
Scale ratio correct when printed at A4
1:160,000
Data sources: WSP 2023, NSWSS, EnergyCo
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