

Chapter 16: Air quality

Environment Effects Statement

16 Air quality

16.1 Introduction

This chapter summarises the potential impacts on air quality due to the construction, operation and decommissioning of the Victoria New South Wales Interconnector (VNI) West (Victorian component) (the Project). This chapter describes how impacts would be avoided, minimised or managed and summarises the outcomes of *Technical Appendix I: Air quality*.

This air quality assessment was undertaken in accordance with Environment Protection Authority (EPA) Victoria Publication 1961 Guidance for assessing and minimising air pollution and the Institute of Air Quality Management (IAQM) Guidance on the assessment of dust from demolition and construction. The existing land use surrounding the Project is mostly a mix of farming land, grassy woodland and rural residential land. Nearby dwellings are mainly farmhouses and are spaced well apart.

This assessment identified human sensitive receptors, such as dwellings, located within 250 m of the Project construction footprint and ecological receptors within 50 m (refer to Section 16.5.4). The air quality study area includes the area 250 m from the Project construction footprint (i.e. the Proposed Easement, Proposed Easement options, Tragowel Terminal Station, and Bulgana Reactor Station) and laydown and/or workforce accommodation areas, as well as the area 50 m from unsealed access roads.

In accordance with the evaluation criteria presented in *EES Chapter 6: Assessment framework*, a minimum setback distance of 300 m was applied to dwellings when locating the transmission line, therefore minimising the potential for sensitive receptors to be located within 250 m of the Project. National parks, state forests, state parks, nature conservation reserves, wildlife reserves and other protected areas were avoided. Applying this principle of avoidance during the design of the Project helped minimise impacts to nearby sensitive receptors to the extent practicable (refer to Section 16.2.1).

Sensitive receptors identified immediately adjacent to the Proposed Easement, within the study area, included five dwellings. For these dwellings VicGrid VNI West is continuing to work with impacted landholders on compensation or other appropriate response measures. Including the nine laydown and/or workforce accommodation areas and access roads that could be used by the Project during construction, there would be an additional 86 nearby sensitive receptors. A review of the size and vulnerability of these receptors using the 2021 census data from the Australian Bureau of Statistics (ABS) website indicated that:

- The Project is situated in an area with low population density, defined as either no population or a population of less than 500 per square kilometre (km²).
- Most of the Proposed Easement is situated in areas that are not vulnerable to air emissions, while the northern and southern sections are moderately vulnerable to air pollution, according to the socio-economic indexes for areas.

The primary impact to nearby sensitive receptors during construction of the Project would result from the generation of dust. The IAQM guideline provides advice for developers, consultants and environmental health practitioners on how to undertake a construction dust impact assessment. The assessment of dust impacts, conducted in accordance with the IAQM guidance, indicated that potential air quality impacts from dust would be low to negligible during construction of the Project, with the exception of unsealed roads, which if used would have a medium impact to air quality.

With the implementation of mitigation measures to be described in a Dust and Air Quality Management Plan (DAQMP) (EPR-AQ01), it is anticipated that residual dust impacts would be negligible at all nearby sensitive receptors and any potential impacts would be short-term and localised.

Due to their intermittent and transient nature, combustion emissions generated by plant and equipment during construction are not anticipated to significantly influence local air quality. With mitigation in place, residual impacts of exhaust emissions are expected to be negligible.

During the operation of the Project, regular inspection and maintenance activities would be required for the transmission line and the Tragowel Terminal Station. Fuel combustion emissions and dust from light vehicles used during these activities would be the main impact to air quality during operation.

The frequency to access the Project site during operation phase is anticipated to be low and the number of vehicles required during these events would be small. All vehicles used during operation of the Project would be maintained in good condition. Therefore, combustion and dust emissions during operation phase are anticipated to be negligible, and residual impacts on surrounding areas would also be negligible.

Overall, potential air quality impacts associated with the Project would be short-term and localised. With the mitigation measures in place, the residual potential for adverse effects to local air quality on amenity and at sensitive receptors and on other sensitive land uses during construction of the Project would be not significant.

16.2 Assessment scope

The scoping requirements provided by the Minister for Planning for the Project set out the specific environmental matters to be investigated and documented in this EES. The EES Scoping Requirements inform the extent and scope of each EES technical study. The issue identified in the EES Scoping Requirements to be addressed in this air quality assessment is:

- Potential for adverse effects to local air quality on amenity and at sensitive receptors and on other sensitive land uses during construction of the Project

Technical Appendix I: Air quality was prepared for this EES. The technical appendix provides more detailed information on the investigation and impact assessment conducted in response to the EES Scoping Requirements.

This chapter should be read in conjunction with other relevant EES chapters. EES chapters related to this assessment are listed in Table 16-1.

Table 16-1 Related EES chapters

EES Chapter	Relevance
<i>EES Chapter 9: Geology and soils</i>	Details geology and soils as relevant to the Project and includes details on dust.
<i>EES Chapter 13: Climate change</i>	Details climate change implications for areas traversed by the Proposed Easement.
<i>EES Chapter 18: Traffic and transport</i>	Details traffic and transport and any associated air quality impacts.
<i>EES Chapter 19: Noise and vibration</i>	Details noise and vibration which is relevant to this chapter.

EES Chapter	Relevance
<i>EES Chapter 23: Land use and planning</i>	Details potential impact on land use and planning associated with the construction, operation and decommissioning of the Project, which includes consideration of air quality and amenity.
<i>EES Chapter 26: Ecology</i>	Details ecological values in and around the Proposed Easement including values associated with air quality impacts.

16.3 Methodology

To address the scoping requirement outlined in Section 16.1, the selected air quality assessment methodology involved:

- Establishment of a study area, which for this assessment includes a 250 m buffer from the Project construction footprint (i.e. the Proposed Easement, Proposed Easement options, Tragowel Terminal Station, and Bulgana Reactor Station) and laydown and/or workforce accommodation areas as well as 50 m from unsealed access roads
- Review of national, state and local legislation relevant to the protection of air quality
- Characterisation of existing conditions and identification of sensitive assets, values and uses
- Review of relevant stakeholder and community feedback
- A proportional assessment of impacts during construction, operation and decommissioning of the Project
- Evaluation of predicted outcomes against performance benchmarks and assessment criteria derived from applicable legislation, policy and standards
- Identification of mitigation measures where necessary to address potentially significant environmental impacts
- Evaluation of residual environmental impacts against assessment criteria, taking into account the proposed mitigation measures and likely effectiveness
- A cumulative impact assessment with other proposed developments in the region

16.3.1 Avoidance and minimisation

The Proposed Easement was selected based on a combination of feedback from landholders, community members, Traditional Owners, government agencies and other stakeholders, as well as technical, engineering and environmental assessments. The selection process was based on the principles of:

- Avoiding environmental sensitivities wherever practicable
- Minimising potential impacts
- Maintaining technical integrity

An evaluation framework was developed for the Project, where key environmental considerations were identified and used to evaluate proposed options for the Project. The evaluation framework, which was applied consistently throughout Project development, is detailed in *EES Chapter 6: Assessment framework*.

For the air quality assessment, the following evaluation framework criteria are relevant:

- Avoid placing infrastructure within 5 km of major townships

- Avoid locating Project infrastructure within 300 m of a known dwelling as per the setback recommendations outlined in the Australian Energy Infrastructure Commissioner's 2022 Annual Report for 500 kV transmission lines
- Avoid locating infrastructure in national parks, state forests, state parks, nature conservation reserves, wildlife reserves and other protected areas

By following these criteria, the Project has been able to avoid and minimise air quality impacts to surrounding sensitive receptors. Further information on sensitive receptors is presented in Section 16.5.4 and impacts are discussed in Section 16.6 and 16.7.

16.3.2 Assessment criteria

The Environmental Reference Standard (ERS) sets out the environmental values of the ambient air that are sought to be achieved or maintained in Victoria. Environmental values are the uses, attributes and functions of the environment that Victorians value, such as being able to breathe clean air.

Although it is not a compliance standard, the ERS is a tool used to assess the impacts on human health and the environment that may result from a proposal or activity, or from existing environmental conditions on a site. The ERS is used and forms part of EPA's formal advice on major projects as part of the *Environment Effects Act 1978*.

Regulated pollutants relevant for this air quality assessment and their objectives in accordance with the ERS are presented in Table 16-2.

Table 16-2 ERS pollutants and objectives for the ambient air environment

Pollutant	Objective	Averaging period
Carbon monoxide (max. concentration)	9.0 ppm	8 hours
Nitrogen dioxide (max. concentration)	0.08 ppm	1 hour
	0.015 ppm	1 year
Sulphur dioxide (max. concentration)	0.075 ppm	1 hour
	0.02 ppm	1 day
Particulate matter as PM ₁₀ (max. concentration)	50 µg/m ³	1 day
	20 µg/m ³	1 year
Particulate matter as PM _{2.5} (max. concentration) ¹	25 µg/m ³	1 day
	8 µg/m ³	1 year

Note: ppm – parts per million, ug/m³ – micrograms per cubic metre

These are discussed in more detail with respect to the ambient air quality (Section 16.5.3) and impact assessment (Section 16.6 and 16.7). Further information on the assessment criteria for this air quality assessment is presented in Section 4.3 of *Technical Appendix I: Air quality*.

To determine the significance of air quality impacts associated with the construction of the Project, impacts were assessed using semi-quantitative methods outlined in the Guidance on the assessment of dust from demolition and construction 2024 prepared by the IAQM. This guidance offers a robust methodology for construction impact assessments which can be incorporated into large environmental assessments.

The methods outlined in the guideline use the scale of activities and the proximity of sensitive receptors to determine the potential for dust deposition and human health impacts. The assessment involves:

- Estimating dust emission magnitude (i.e. level of dust emission)
- Determining the surrounding area's sensitivity to dust emissions
- Combining these into a matrix to determine the potential dust impacts on surrounding receptors and categorising them as negligible, low, medium or high

The sensitive receptors surrounding the Project are presented in Section 16.5.4. The assessment of dust impacts is presented in Section 16.6.1.

16.4 Summary of stakeholder and community engagement

VicGrid VNI West acknowledges the importance of consultation and is committed to working closely with stakeholders, Traditional Owners, community members and landholders. Discussions with community stakeholders including local Councils and Traditional Owners commenced during the early stages of the Project.

To date, no specific feedback has been received relating to air quality. A summary of all stakeholder and community engagement is presented in *EES Chapter 7: Stakeholder and community engagement*.

16.5 Study area

Potential air quality impacts associated with the Project construction are expected to be localised and transient. In accordance with the IAQM Guidance on the assessment of dust from demolition and construction 2024, potential air quality impacts during construction were assessed up to 250 m from the Project construction footprint, encompassing the Proposed Easement, Proposed Easement options, Tragowel Terminal Station and the Bulgana Reactor Station, and laydown and/or workforce accommodation areas. Additionally, the study area encompasses a 50 m buffer from unsealed access roads that may be required to access the Project construction footprint.

This study area is also considered to be suitable to assess potential impacts during operation and decommissioning of the Project.

The study area is shown in Figure 16-1 to Figure 16-4.

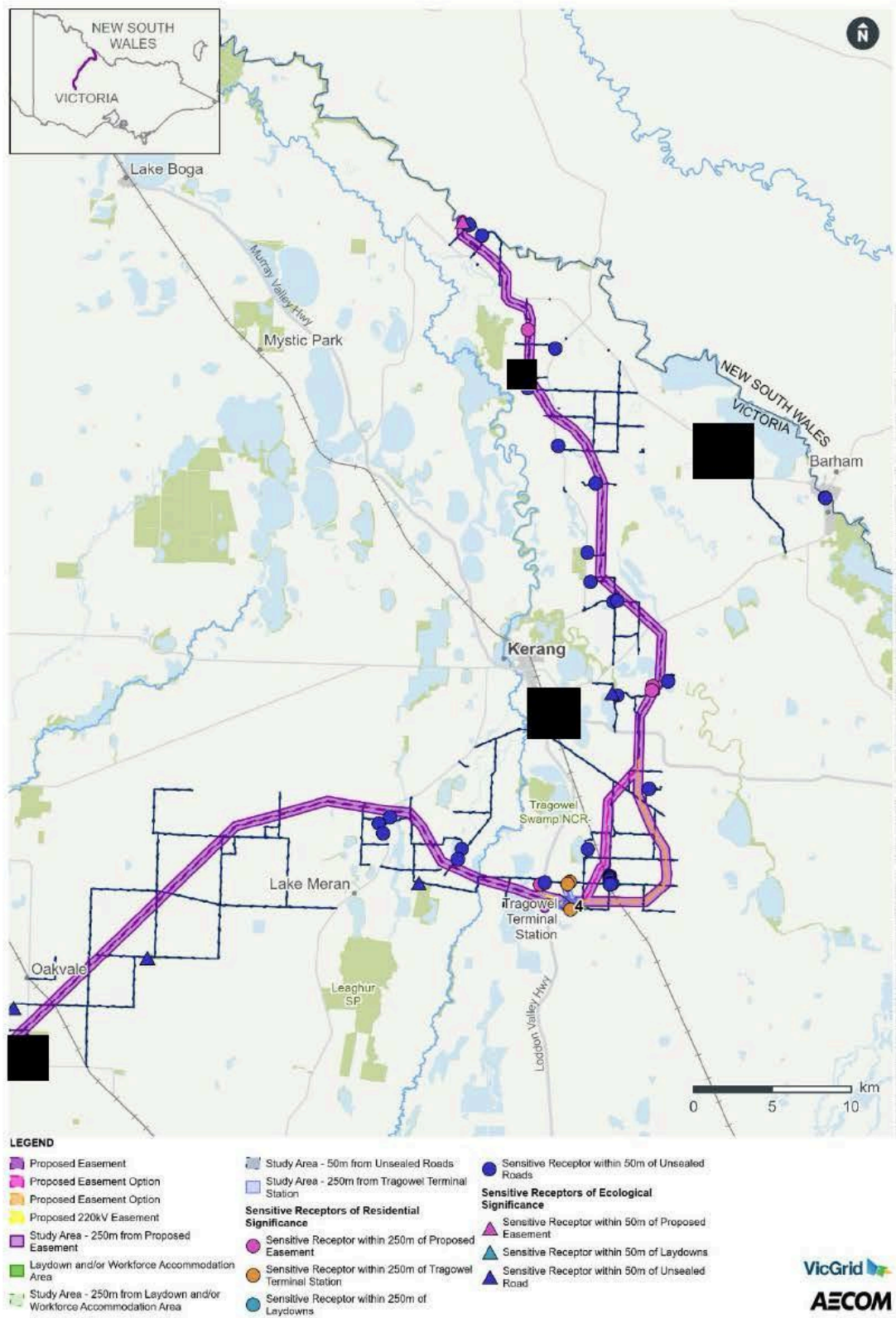


Figure 16-1 Study area and sensitive receptors (1/4)

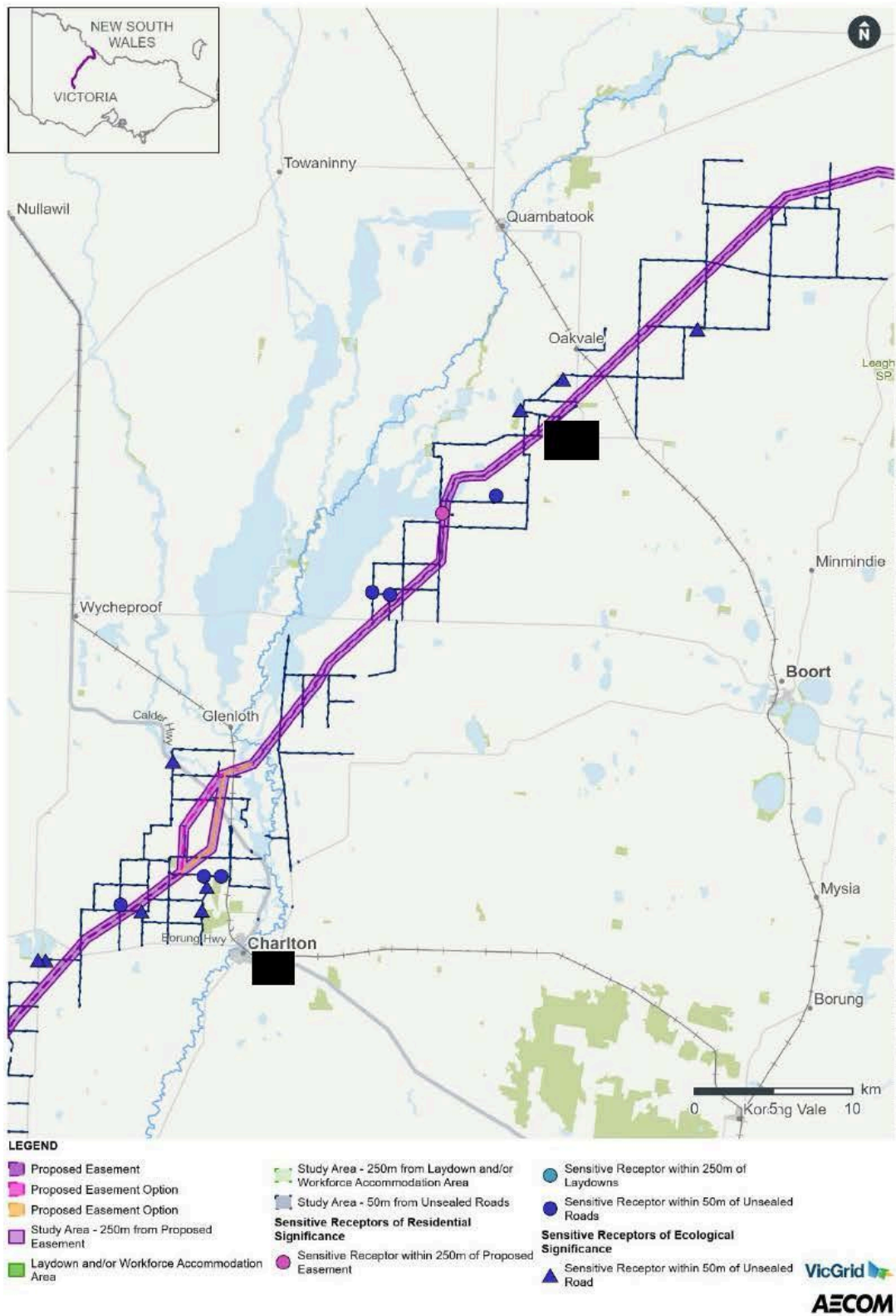


Figure 16-2 Study area and sensitive receptors (2/4)

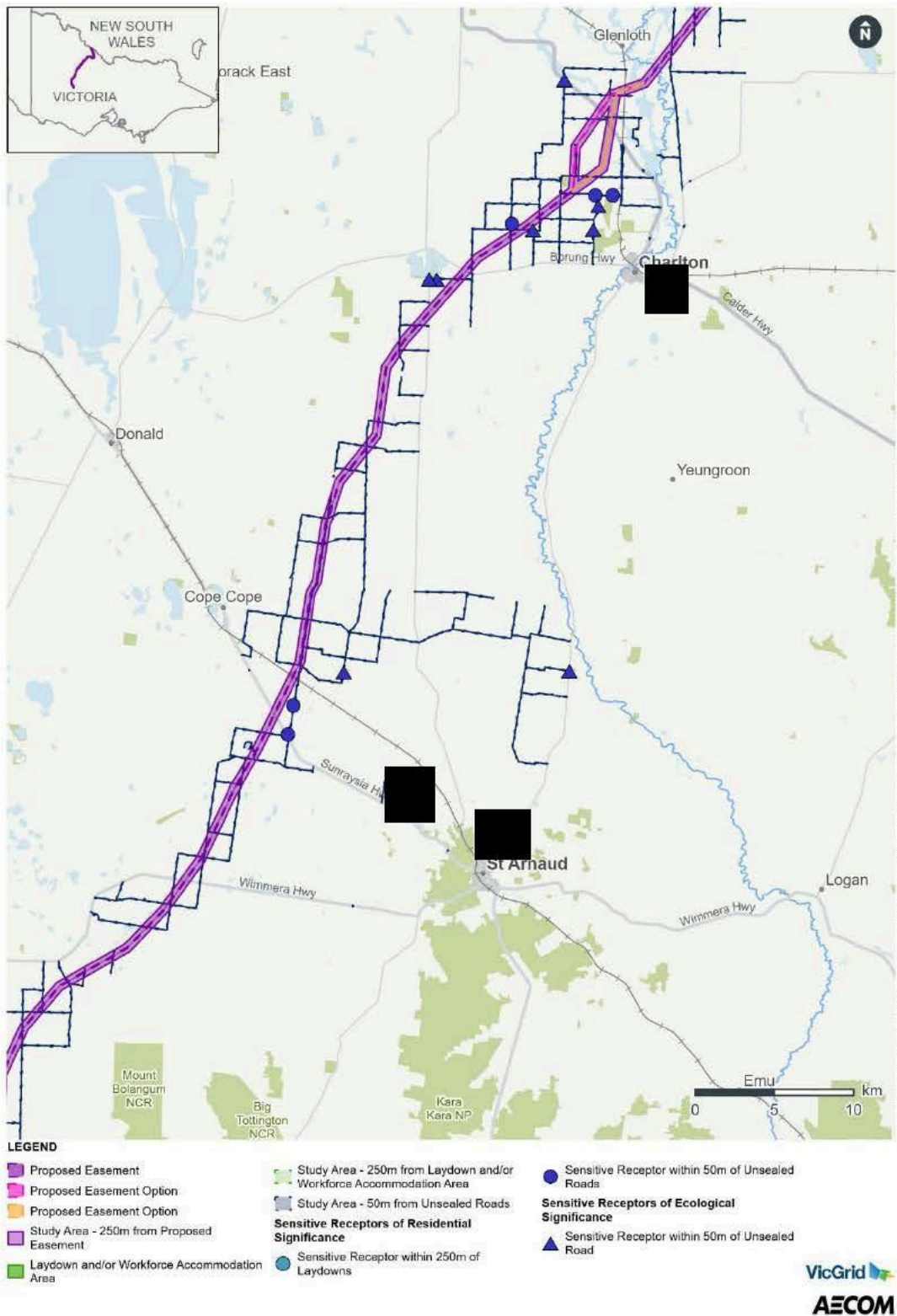


Figure 16-3 Study area and sensitive receptors (3/4)

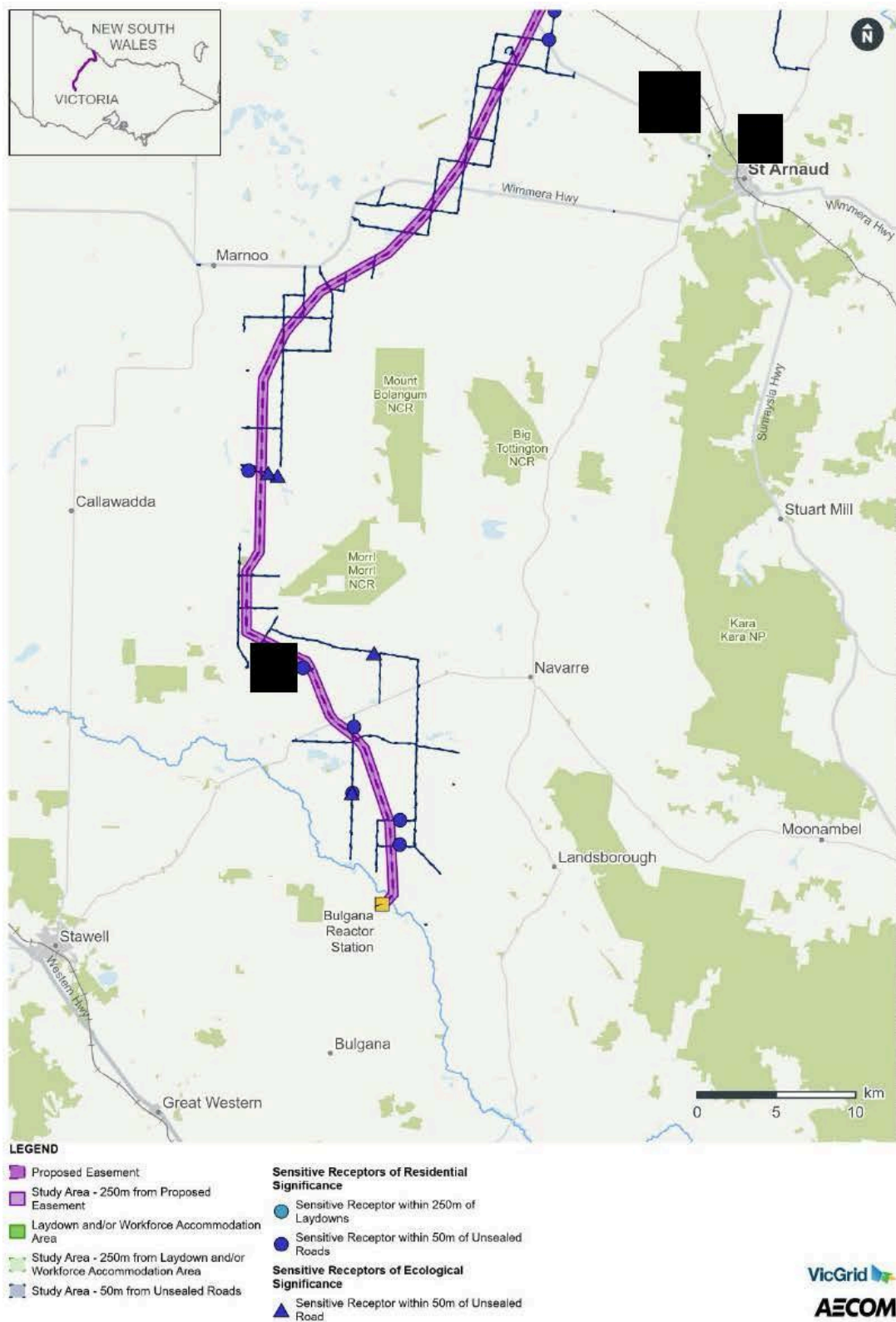


Figure 16-4 Study area and sensitive receptors (4/4)

16.6 Existing environment

A comprehensive study was undertaken to understand the existing environment of the study area to inform the air quality assessment. The existing conditions assessment used publicly available datasets to characterise the following aspects related to air quality:

- Land use and topography
- Climate and meteorology
- Ambient air quality
- Sensitive receptors

This section describes the existing conditions within the study area, as they relate to the air quality assessment.

16.6.1 Land use and topography

Existing land use in the study area is mostly a mix of farming land, grassy woodland and rural residential land. Dwellings in the area are mainly farm houses and are spaced well apart. Surface roughness is fairly low and would not impede winds greatly as they blow through the area.

The area, from the south to the north of the Proposed Easement, undergoes a noticeable transition from undulating landscapes to relatively flat terrain. The southern end of the Proposed Easement features undulating terrain with the influence of the Grampian Ranges. The landscape around this area includes hills, valleys, and potentially rugged mountainous features.

The northern end of the Proposed Easement is characterised by relatively flat terrain. This area is part of the Murray-Darling Basin, known for its expansive plains and agricultural landscapes. The transition from the south to the north includes a gradual decrease in elevation changes and a shift from hilly to more gently rolling terrain.

16.6.2 Climate

The Bureau of Meteorology collects climate statistics at Automatic Weather Stations across Australia. Due to the extensive distance covered by the Proposed Easement from north to south, this assessment analysed climate and meteorological data collected from the following three stations, to represent the existing conditions of the study area. These three stations collect climate statistics data and hourly average wind data:

- Swan Hill Aerodrome (077094): 30 km west of northern end of the Proposed Easement
- Charlton (080128): 8 km east of middle of the Proposed Easement
- Stawell Aerodrome (079105): 20 km west of the southern end of the Proposed Easement

The temperature and rainfall data from 2010 to 2023 reveal distinct regional patterns across the three stations:

- Temperature trends:
 - Mean maximum and minimum temperatures were the highest in summer days and lowest in winter months for all three stations, with the highest temperatures observed in January and lowest temperatures observed in July.
 - Swan Hill Aerodrome and Charlton stations experienced mean maximum temperatures above 30°C and mean minimum temperatures below 5°C. In contrast, Stawell Aerodrome recorded mean temperatures ranging between 5°C and 30°C.
- Rainfall patterns: Swan Hill Aerodrome and Charlton stations had consistently low rainfall throughout the year, whereas Stawell Aerodrome recorded slightly higher rainfall, particularly in winter.
- Regional differences: Moving from north to south, mean maximum and minimum temperatures generally decreased, except for winter mean minimum temperatures in the south, which were higher than those in the north. Temperature variations were greater in the north throughout the year. Additionally, annual rainfall increased towards the south.

Wind patterns over a similar time period (2011 to 2023) also revealed distinct regional patterns. Overall, wind directions were more evenly distributed in the north, while southerly winds clearly dominated in the south. This is mainly due to the changes in topography from a relatively flat area in the north to undulating terrain with the influence of the Grampian Ranges in the south.

EES Chapter 13: Climate change presents future trends in the climate as a result of climate change. These have the potential to impact air quality. In summary, Victoria is projected to experience a hotter, drier, and more extreme climate in the future. This would likely result in increased dust emissions from the existing environment during Project operation and decommissioning. Refer to Section 16.7 and Section 16.8 for a discussion of air quality impacts during Project operation and decommissioning.

16.6.3 Ambient air quality

The Project would be located in a rural setting with no major sources of air pollution nearby, aside from dust. The primary sources of dust in the study area would be:

- Wind driven dust from exposed surfaces
- Disturbance of material due to farming activities
- Wheel-generated dust from vehicles moving along unsealed roads
- Occasional bushfire smoke

A review of the National Pollution Inventory (NPI) database found two emission-reporting facilities within 5 km of the Proposed Easement for the 2023/2024 period. Both facilities were piggeries, and the only reported pollutant was ammonia, which is not relevant to this Project.



Key definition

National Pollution Inventory (NPI) – An internet database that provides the community, industry and government with free information about emission of 93 substances in Australia. The NPI is implemented cooperatively by the Federal Government, the EPA Victoria and other state and territory governments.

The nearest air quality monitoring station operated by EPA Victoria is in Bendigo, 110 km from the Proposed Easement. It measures $PM_{2.5}$ only. Due to the remote location of the northern part of the Project, and lack of nearby Victorian monitoring stations that monitor for the required dust concentrations, data from monitoring stations operated by the NSW Government in the vicinity of the Proposed Easement have been used to provide representative data for the study.

The nearest station, Wycheproof, is located 3.5 km west of the central part of the Proposed Easement. Given the similarities in surrounding land uses and rural settings, the monitoring data collected at this station was deemed representative of the background air quality for the majority of the study area.

The second-nearest station, Kyalite, is located 56 km northwest of the northern end of the Proposed Easement, and data from this station is considered representative of the northern section of the study area.

The nearest stations to the east of the Proposed Easement are Deniliquin and Loddon Plains, located 84 km and 89 km east of the Proposed Easement respectively. Given Wycheproof and Kyalite are closer and representative of the study area, data collected at Deniliquin and Loddon Plains was not further analysed in this assessment.

Location of the monitoring stations are shown in Figure 16-5.



Key definitions

Particulate matter (PM) – Dust is made up of particulate matter, tiny airborne particles that can be inhaled and affect human health. These pollutants are described as:

PM_{10} - Particles with a diameter of 10 micrometres or less. These can pass through the throat and nose, entering the lungs.

$PM_{2.5}$ - Finer particles with a diameter of 2.5 micrometres or less. These are small enough to penetrate deep into the lungs and even enter the bloodstream.

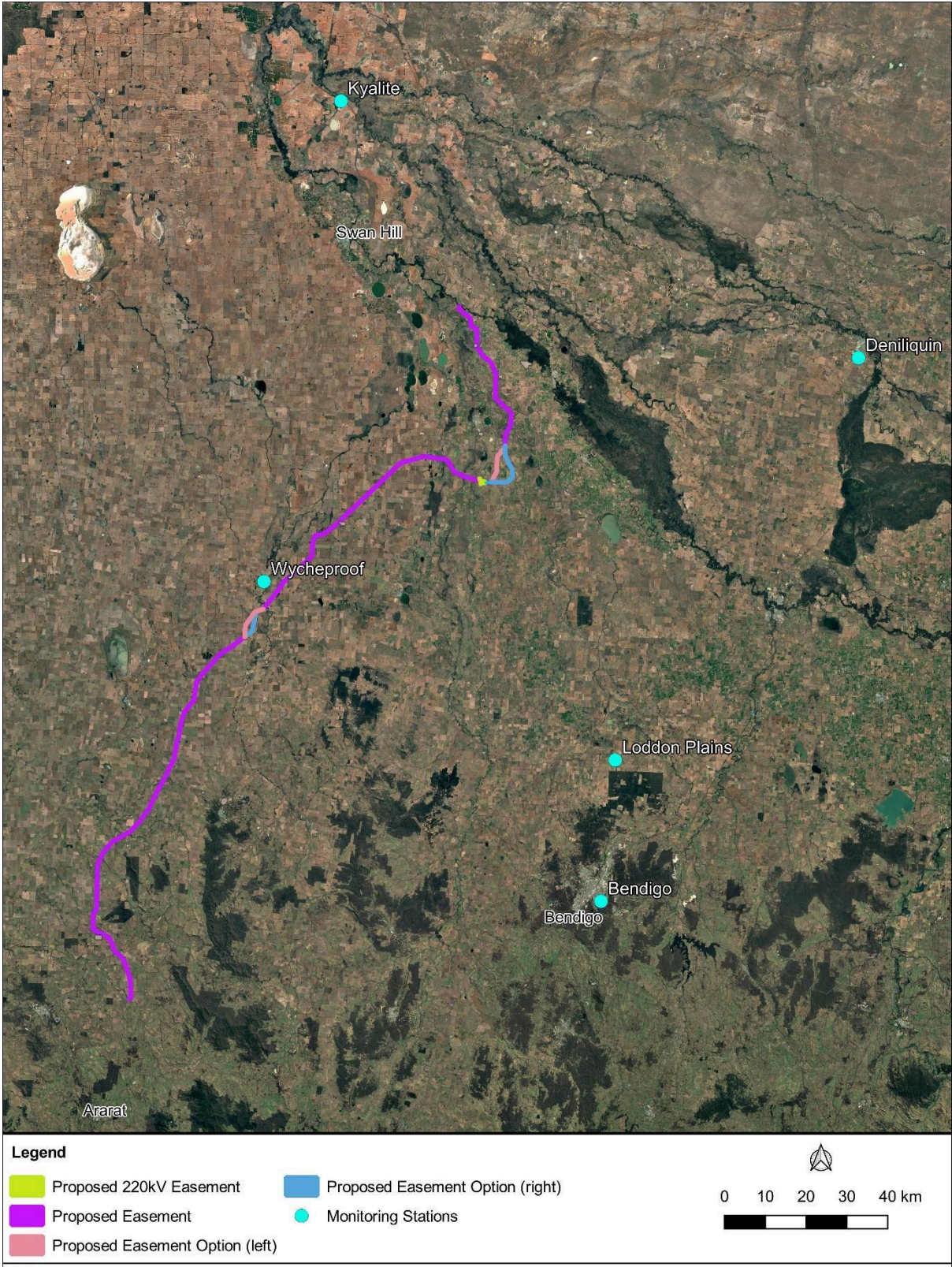


Figure 16-5 Nearby monitoring stations

The analysed monitoring stations presented PM_{2.5} and PM₁₀ concentrations as an average over 24 hours and as an annual average. These values were compared to guideline values as presented in EPA Victoria's ERS (refer to Section 16.2.2). The monitoring indicated that:

Kyalite

- The maximum 24-hour average PM₁₀ concentrations exceeded the ERS objective of 50 µg/m³ for all years between 2019 to 2022 and met the objective in 2023. The exceedances were mainly caused by windblown dust or bushfires.
- The maximum 24-hour average PM_{2.5} concentrations exceeded the ERS objective of 25 µg/m³ for 2019 and 2020 and met the objective in all other years. The exceedances were mainly caused by windblown dust or bushfires.
- Annual average PM₁₀ and PM_{2.5} concentrations complied with the ERS objectives for all five years.

Wycheproof

- 24-hour and annual average PM₁₀ and PM_{2.5} concentrations complied with the ERS objectives for all three years (i.e. 2021-2023).

Bendigo

- 24-hour and annual average PM₁₀ and PM_{2.5} concentrations complied with the ERS objectives for both years (i.e. 2021-2022), except for the 24-hour PM₁₀ exceedance in 2021.

Given the proximity to the study area, and similarities in surrounding land uses, the background air quality at Wycheproof station is considered most representative of the background level for the majority of the study area. As such, the overall background air quality in the study area is relatively good, with the northern section potentially being more susceptible to wind-blown dust.

16.6.4 Sensitive receptors and land uses

Sensitive receptors in the context of an air quality assessment relate to locations where people may be affected by air pollutants from a particular activity. A sensitive land use is one where it is plausible for people to be exposed over extended durations.

Sensitive land uses include, but are not limited to:

- residential premises
- educational and childcare facilities
- nursing homes
- retirement villages
- hospitals
- ecological significance (e.g. national parks or other areas of ecological significance)

In addition, the IAQM guidance recommends identifying sensitive receptors for construction impacts as follows:

- A human receptor within:
 - 250 m from the boundary of a site, or
 - 50 m from a route used by construction vehicles on public roads up to 250 m from a site entrance
- An ecological receptor within:
 - 50 m of the boundary of the site, or
 - 50 m from a route used by construction vehicles on public roads up to 250 m from a site entrance

Therefore, as per the study area discussed in Section 16.4, this assessment identified sensitive human receptors within 250 m of the Proposed Easement construction footprint, laydown and/or workforce accommodation areas and the Tragowel Terminal Station, and ecological receptors within 50 m of these locations in accordance with the EPA Publication 1961 and the IAQM guidance (refer to Figure 16-1 to Figure 16-4).

A total of eight sensitive receptors were identified within the study area proximal to the Proposed Easement, including five dwellings located between 109 m and 215 m from the easement, and three ecological reserves. Four of these dwellings are in proximity to the 500 kV easement and are either not permanently occupied or the subject of discussions between VicGrid VNI West and the landholders to reach an agreement on compensation or other appropriate response measures. The remaining dwelling is located in proximity to the existing 220 kV easement and no earthworks are expected at this location. In addition to this, one dwelling is currently located 155 m south of Tragowel Terminal Station and would be removed as part of the development of the NewSky Solar Farm to the south.



Key definition

Sensitive receptors – Land uses that may be sensitive to air quality impacts from a construction or operational source, including educational, health, community, and residential land uses.

In accordance with the evaluation criteria presented in *EES Chapter 6: Assessment framework*, a minimum setback distance of 5 km was applied to townships, 300 m was applied to dwellings and locating Project infrastructure in national parks, state forests, state parks, nature conservation reserves, wildlife reserves and other protected areas was avoided.

Sensitive receptors surrounding the Project were identified using a combination of aerial imagery and ground truthing during Project development.

In addition, 31 sensitive receptors were identified within the study area surrounding the nine laydown and/or workforce accommodation areas. This includes the Kerang Holiday Park, which was conservatively counted as 20 receptors, instead of one. A review of public roads likely to be used by the Project during construction identified a further 51 receptors within 50 m of unsealed roads. These unsealed roads were identified by the traffic and transport assessment (refer to *EES Chapter 18: Traffic and transport*) as roads that may be used during construction of the Project.

There are no sensitive receptors located within 250 m of the Proposed Easement options at Tragowel and Teddywaddy. While some sensitive receptors are situated along unsealed roads near the Proposed Easement options, these roads could be used for the construction of either of the Proposed Easement options. As such, there is no difference in sensitive receptors among the Proposed Easement options from an air quality perspective.

In accordance with EPA Publication 1961, population density and vulnerability has been assessed in the study area using 2021 census information from the Australian Bureau of Statistics (ABS) website. This information demonstrated that the Project is located within an area of low population density, and that population vulnerability along the Project ranges from Quintile 2 (the second most disadvantaged) to Quintile 5 (the least disadvantaged). EPA Publication 1961 defines vulnerable populations as those that are particularly sensitive to air pollution, such as people older than 65, children younger than 14, pregnant women and people with underlying health conditions, such as heart and lung conditions. Overall, most of the Proposed Easement is situated in areas that are not vulnerable to air emissions, while the northern and southern sections are considered to be moderately vulnerable to air pollution.

16.7 Construction impact assessment

The following sections describe the potential impacts to air quality during the construction of the Project. Construction of the Project would take up to approximately 3.5 years and it is expected that there would be multiple construction teams working in parallel along the Proposed Easement. Construction of the Project would take place at each of its components, namely:

- Along the transmission line itself
- At Tragowel Terminal Station and the Bulgana Reactor Station
- At laydown and/or workforce accommodation areas

Construction vehicles would utilise public roads between laydown and/or workforce accommodation areas and construction sites along the Proposed Easement. Where sealed roads are not available, these may include unsealed roads.

Primary impacts to air quality during construction would relate to dust emissions and emissions from construction plant and vehicles. Air emissions would typically be deposited (e.g. large particulates) or dispersed (e.g. gaseous combustion emissions such as nitrogen oxides and sulphur dioxide, and small particles such as PM_{2.5}) shortly after being generated. Odour is not expected to be generated by the Project, however in the event that odorous soils are encountered it will be managed in accordance with EPR-AQ01.

Overall, it was determined that potential air quality impacts during construction would not be significant and could be readily managed with the implementation of mitigation measures to be implemented through an DAQMP.

16.7.1 Dust impacts

Dust from the construction of the Project would have the potential to impact air quality. Sources of dust during construction would include:

- Demolition, i.e. the necessary removal of any existing infrastructure or services
- Earthworks, i.e. any benching or grading that is required
- Construction
- Trackout, i.e. the transportation of dirt, debris or mud from construction sites to external surfaces via construction vehicles (note that trackout dust emissions have been assessed separately, under the unsealed roads section below)

The assessment of dust impacts in accordance with IAQM guidance has considered both the magnitude of dust generation from construction activities and the sensitivity of the surrounding areas to estimate the significance of unmitigated dust impacts. A high sensitivity has been assigned to surrounding dwellings and to the Kerang Holiday Park and a low to medium sensitivity has been assigned to surrounding reserves.

A summary of IAQM receptor sensitivity definitions is presented in Table 16-3.

Table 16-3 IAQM receptor sensitivity definitions

Receptor sensitivity	Effect	IAQM definition of sensitivity
High	Dust soiling	• Users can expect a high level of amenity • The appearance, aesthetics or value of their property would be diminished by soiling • People or property are expected to be present continuously, or at least regularly for extended periods
	Health effects of PM ₁₀	• Locations where people are exposed for eight hours or more a day • Examples include private residences, hospitals, schools and residential care homes
Medium	Dust soiling	• Users would expect a reasonable level of amenity but would not reasonably expect to enjoy the same level of amenity as in their home • The appearance, aesthetics or value of their property could be diminished by soiling • People or property are not expected to be present continuously, or regularly for extended periods • Examples include parks and places of work
	Health effects of PM ₁₀	• Locations where the people exposed are workers, and exposure is over eight hours or more a day • Example is a commercial property
Low	Dust soiling	• The enjoyment of amenity would not reasonably be expected • Property is not expected to be diminished in appearance, aesthetics or value by soiling • Exposure is transient, with people or property expected to be present for limited periods of time • Examples include playing fields, farmland, footpaths and roads
	Health effects of PM ₁₀	• Locations where human exposure is transient • Examples include public footpaths, playing fields, parks and shopping streets

The potential dust emission magnitudes, as defined by the IAQM guidance, are summarised in Table 16-4 below.

Table 16-4 Potential dust emission magnitudes

Magnitude	Description
Small	Activities expected to produce low levels of dust, usually involving small-scale works, minimal ground disturbance, limited use of equipment, and materials unlikely to release much dust.
Medium	Activities that may generate a moderate amount of dust, typically due to moderate use of machinery, some disturbance of ground surfaces, and handling of moderately dust-prone materials.
Large	Activities that are likely to generate a high level of dust due to their large scale, use of heavy machinery, and significant disturbance of soil or building materials.

The significance of dust impacts, as defined by the IAQM guidance is shown in Table 16-5.

Table 16-5 Significance of dust emission impacts

Significance	Description
Negligible	- Dust emissions are expected to be minimal, with no significant impact on nearby receptors - This level typically applies to small-scale activities or sites with no sensitive receptors in close proximity - No specific mitigation beyond standard good practice is generally required
Low	- Dust may be generated, but the potential for adverse effects on health, amenity, or the environment is limited - This level is associated with minor to moderate activities and/or sites with some separation from sensitive receptors - Basic mitigation measures are recommended
Medium	- There is a moderate potential for dust to cause noticeable impacts, particularly where sensitive receptors are located nearby - This level is typically linked to larger, or more intensive activities, or close proximity to sensitive receptors - A detailed dust management plan and targeted mitigation measures are required
High	- Dust emissions are likely to cause significant impacts without effective control - This level is associated with large-scale or high-intensity activities in close proximity to sensitive receptors - Comprehensive mitigation strategies and ongoing monitoring are essential

Given that there are no sensitive receptors within 250 m of the Bulgana Reactor Station, dust impacts from the construction of this station, assessed in accordance with the IAQM guidance, would be negligible and has not been assessed further.

The assessment of dust impacts along the transmission line, at the Tragowel Terminal Station, at laydown and/or workforce accommodation areas and along access roads are discussed below.

Transmission line

The primary sources of dust generation during construction of the transmission line would be earthworks, construction and trackout. Note that trackout dust emissions have been assessed under the unsealed roads section below.

The dust emission magnitude from earthworks and construction activities along the transmission line would be small, given the small construction footprint for each tower at any given location. There would be no more than five heavy earthmoving vehicles active at one time. The main construction activities would include filling concrete foundations and assembling and erecting the tower structures. These activities are unlikely to cause significant dust emissions.

The areas surrounding the transmission line were found to have low sensitivity to dust impacts. This is primarily due to the avoidance of dwellings by the Project.

Taking both the estimated dust emission magnitude and proximity of sensitive receptors into account, earthworks and construction activities were estimated to have negligible impacts to air quality for nearby sensitive receptors.

Tragowel Terminal Station

Earthworks at the Tragowel Terminal Station would include site clearing, excavation and refilling. Excavated soil, unsuitable for compaction as a foundation would be removed using road transport trucks, trailers, graders and excavators. Substantial amounts of suitable fill material would be imported, and this material would be compacted in layers to form a suitable compacted level and drained surface on which to install the switchyard equipment and infrastructure. Given that the total area of the Tragowel Terminal Station site is large, approximately 257,000 square metres (m²), the dust emission magnitude for these activities is estimated to be large.

Construction activities would include the construction of concrete foundations, drainage system, electrical conduits, electrical trenches, oil containment work and associated concrete pits, pipes and tanks, auxiliary services buildings and the assembly and erection of steel structures, installation of electrical equipment, and erection of the terminal station site boundary security fencing, including site access gates. The majority of these activities have low potential to generate dust, but some may generate low levels of dust. As such, the overall dust emission magnitude for these activities was estimated to be small.

The area surrounding the Tragowel Terminal Station construction site was found to have low sensitivity to dust impacts.

Taking both the estimated dust emission magnitude and proximity of sensitive receptors into account, earthworks activities at the Tragowel Terminal Station construction site were estimated to have low impacts to air quality for nearby sensitive receptors.

Similarly, construction activities at the Tragowel Terminal Station construction site were estimated to have negligible impacts on dust soiling and human health.

Laydown and/or workforce accommodation areas

Construction activities at laydown and/or workforce accommodation areas would include the removal of existing buildings with a total estimated volume of less than 12,000 cubic metres (m³). This would be undertaken as part of site preparation. All demolition and removal activities would be less than 6 m above ground level and building construction material would be metal cladding, which has low potential for dust release. As such, dust emission magnitude during the building removal activities and from site clearance activities at laydown and/or workforce accommodation areas was estimated to be small.

The main construction activities include the construction of accommodation facilities, site offices, workshops, amenities and material laydowns. Construction materials would be pre-fabricated off-site and assembled on-site. Therefore, minimal dust emissions are expected.

Given that laydown and/or workforce accommodation areas would be used throughout the construction of the Project, further sources of dust emissions include:

- Wheel generated dust from vehicles travelling on unpaved roads/surfaces
- Wind erosion from unsealed surfaces
- Dust generated from materials being loaded and unloaded at the laydown areas

It is noted that most materials would be delivered directly to the Proposed Easement during construction. Some minor materials may be stored at laydowns but stockpiling of bulk materials would likely not be required. Under standard construction laydown areas management, dust emissions from these sources are not considered likely. This means that dust emission magnitude from laydown areas was estimated to be small.

The areas surrounding all laydown and/or workforce accommodation areas were found to have a low to medium sensitivity to dust impacts. This reflects an increase in dwellings surrounding these areas, as well as the Kerang Holiday Park. Therefore, demolition, earthworks and construction activities at laydown and/or workforce accommodation areas were estimated to have low to negligible impacts to air quality for nearby sensitive receptors.

Unsealed access roads

Where sealed access roads are not available, unsealed access roads may be used for transportation between laydown and/or workforce accommodation areas and construction sites. The majority of the unsealed roads length are greater than 100 m.

The main heavy vehicles that would be used for construction activities include excavators, cranes, rigid trucks and trailers, rollers, graders, and concrete agitator trucks. The total daily traffic from each laydown and/or workforce accommodation area to nearby towers was estimated to range from 35 to 131 vehicles for the nine workforce accommodation and/or laydown areas, across 19 primary access routes.

A total of 267 two-way vehicle movements per day are expected to be generated during the peak construction phase. The majority of vehicles accessing the site during the peak of the Tragowel Terminal Station construction are associated with the transportation of fill material from offsite sources for construction of the Tragowel Terminal Station bench. The bench fill works are anticipated to occur over 6 months.

Approximately 425,000 m³ of fill material required for construction of the bench could be sourced from Lake Boga Quarry and Pyramid Hill Quarry. Proposed routes connecting these quarries and the Tragowel Terminal Station are mainly sealed public roads, with minimal unsealed roads required near the Tragowel Terminal Station.

Based on the above, the dust emission magnitude from trackout was estimated to be large.

The areas surrounding the unsealed access roads were found to have a low to medium sensitivity to dust impacts. Therefore, trackout activities using unsealed roads were expected to have medium impacts to air quality for nearby sensitive receptors.

EPRs

To avoid or minimise impacts to air quality due as a result of dust emissions a Dust and Air Quality Management Plan (EPR-AQ01) will be developed and implemented as a sub-plan of the Construction Environmental Management Plan (CEMP) (EPR-EM03). This plan will be prepared in accordance with the General Environmental Duty (GED) and will document reasonably practicable controls to minimise air emissions. Further information is provided in Section 16.11.

Residual impacts

The Project has been located to avoid sensitive receptors to the extent practicable. Due to the minimal sources of dust generation, the generally low sensitivity of surrounding receptors and the intermittent and transient nature of dust emissions during construction, they are not anticipated to significantly influence local air quality. With the implementation of mitigation measures to avoid or further reduce impacts, residual impacts at nearby sensitive receptors would be negligible.

16.7.2 Exhaust emissions

Diesel fuel combustion from vehicle movements and on-site plant and machinery operation would generate carbon monoxide (CO), nitrogen oxides, sulphur dioxide and trace amounts of non-combustible hydrocarbons (i.e. volatile organic compounds (VOCs) and polycyclic aromatic hydrocarbons (PAHs)). The emission rates and potential impact on surrounding areas would depend on the number and power output of the combustion engines, the quality of fuel used, the condition of the engines and the intensity of use.

During construction, equipment and material would be transported to various construction sites along the Proposed Easement. The plant and machinery required during construction would include (but may not be limited to) excavators, cranes, rigid tippers, semi-trailers, rollers, dozers, concrete agitators, watercarts, graders, stringing winches, dump trucks, transport trucks, generators.

Although the exact number of daily heavy vehicle movements are currently unknown, an estimate has been used to determine potential fuel combustion emissions. It was found that fuel combustion emissions from plant and equipment along the transmission line corridor would be intermittent and transient. Given the anticipated duration of works at any given location, the likely number of emission sources, and scheduling of activities (i.e. not all machinery would be operating at the same location simultaneously), combustion emissions are not anticipated to significantly influence local air quality.

EPRs

The DAQMP will describe the management measures, including use of designated areas, minimising idling, restricting vehicle speeds and selecting vehicles and equipment to reduce exhaust emissions (EPR-AQ01). Further information is provided in Section 16.11.

Residual impacts

Due to their intermittent and transient nature, combustion emissions generated during construction are not anticipated to significantly influence local air quality. With the implementation of mitigation measures to be described in the DAQMP, residual impacts at nearby sensitive receptors would be negligible.

16.7.3 Residual construction impacts

Residual impacts are those that remain once mitigation and management measures have been implemented. This section describes potential residual impacts during the construction phase of the Project once mitigation and management measures have been considered and applied.

With the implementation of mitigations to be described in the DAQMP, dust and exhaust emissions impacts during construction of the Project are expected to be negligible.

16.8 Operation impact assessment

The following sections describe the potential impacts to air quality during operation of the Project. The operational life of the Project is anticipated to be approximately 50–100 years. Key operation activities include inspections and maintenance of both the transmission line and Tragowel Terminal Station. As such, exhaust emissions are the primary impact pathway during operation of the Project. Wheel generated dust from vehicles during operation of the Project is anticipated to have a negligible impact, primarily due to the fact that the frequency to access the Project during operation phase is anticipated to be low and the number of vehicles required during these events would be small.

Overall, it was determined that potential air quality impacts during operation would be negligible and could be readily managed with the implementation of mitigation measures discussed in Section 16.11.

16.8.1 Exhaust emissions

During the operation of the Project, regular inspection and maintenance activities would be required for the transmission line and at the Tragowel Terminal Station. Inspection and maintenance at the Bulgana Reactor Station would be similar to that at the Tragowel Terminal Station. Vehicles used to support inspection and maintenance activities would generate emissions.

The actual management methodology, inspection and maintenance schedule would be confirmed by the construction contractor, once appointed. However, it is anticipated that transmission line operation activities would include:

- Seasonal bushfire prevention surveys which include annual aerial inspection of the transmission lines, easement, vegetation
- Thermographic inspection of the transmission lines and both ground based and aerial light detection and ranging (lidar) imaging to identify potential issues such as overheating, electrical faults and line degradation
- Ground-based inspections of infrastructure involving multiple maintenance crews utilising access roads to drive vehicles along the easement to inspect each transmission tower
- Repairs or restoration of infrastructure if faults or degradation are identified through the inspection methods detailed above
- General maintenance on the line hardware, fittings, insulators, conductors as required.
- Vegetation management to ensure appropriate electrical safety clearances to the transmission lines are maintained along the easement
- Emergency fly overs to assess infrastructure conditions, followed by relevant maintenance/repair activities as required in the event of an unplanned outage or other emergency situation

Activities at the Tragowel Terminal Station would include:

- Routine inspection of terminal station infrastructure (such as transformers, reactors and other electrical plant and equipment) throughout the year by around two to three workers

- Routine maintenance of terminal station equipment, property, and switchyard areas on a scheduled basis. This would typically be monthly and undertaken by between one and five maintenance workers
- Ad-hoc fault and emergency work to repair any damaged infrastructure (i.e. through a weather event or other failure of infrastructure), with the amount of maintenance and number of crew dependent on the extent of repairs required
- Vegetation management along the operational access road, within the terminal station boundary and the asset protection zone (APZ)

The frequency to access the Project during operation are anticipated to be low and the number of vehicles required during these events would be small. All vehicles used during operation of the Project would be maintained in good condition. Therefore, combustion and dust emissions during the operation phase are anticipated to be negligible.

EPRs

The DAQMP will include measures for vehicle and plant management (EPR-AQ01). Further information is provided in Section 16.11.

Residual impacts

Due to their intermittent and transient nature, combustion and dust emissions generated during operation and maintenance activities along the transmission line are anticipated to have negligible impact on local air quality. With the implementation of mitigation measures to avoid or further reduce impacts, residual impacts at nearby sensitive receptors would be negligible.

16.8.2 Residual operation impacts

The frequency of access to the Project site during operation phase was anticipated to be low and the number of vehicles required during these events would be small. All vehicles used during operation of the Project would be maintained in good condition. Therefore, combustion and dust emissions during operation phase are anticipated to be negligible, and residual impacts on surrounding areas would also be negligible.

16.9 Decommissioning impact assessment

The potential impacts of the Project as a result of decommissioning activities have been assumed to be less than those associated with construction. For the purpose of this assessment, it is expected that all footings would be excavated and demolished to at least 600 mm below ground level and then backfilled with suitable material. The remaining portion of the footings below 600 mm would remain in-situ to minimise the disturbance associated with decommissioning activities.

Decommissioning activities would be conducted in accordance with the relevant legislative requirements, industry standards and best practice relevant at the end point of the infrastructure lifespan and would be managed as part of a Decommissioning Environmental Management Plan (EPR-EM05) (refer to *EES Chapter 28: Environmental management framework*).

Dust and exhaust emissions would be generated from above ground infrastructure decommissioning, especially from the Tragowel Terminal Station. However, these emissions are expected to be localised, short-term, and comparable or less than those associated with the construction of the Project. With the recommended mitigation measures implemented, the residual dust and exhaust emission impacts during decommissioning of the Project are expected to be negligible.

16.10 Cumulative impact assessment

A cumulative assessment of air quality impacts was undertaken with other proposed projects in the region. For the purpose of evaluating cumulative impacts, this assessment has identified other proposed projects located within the study area.

Four proposed developments have been identified within 250 m of the Project (refer to Figure 16-6 to Figure 16-8):

- Virya Energy Meering West Wind Farm
- New Sky Tragowel Solar Farm
- Navarre Green Power Hub
- Cannie Wind Farm

Similar to the Project, the main air quality impacts for the four proposed projects are expected to be dust impacts during construction. These Projects may have some overlap in construction timelines but given the progressive nature of transmission line construction, the likelihood of the four projects identified to have cumulative dust impacts on the same receptors as the Project is low.

Even if the construction of multiple projects were to occur concurrently, dust impacts for each project would be managed through the implementation of CEMPs for each project. Therefore, potential cumulative impacts are not expected to be significant.

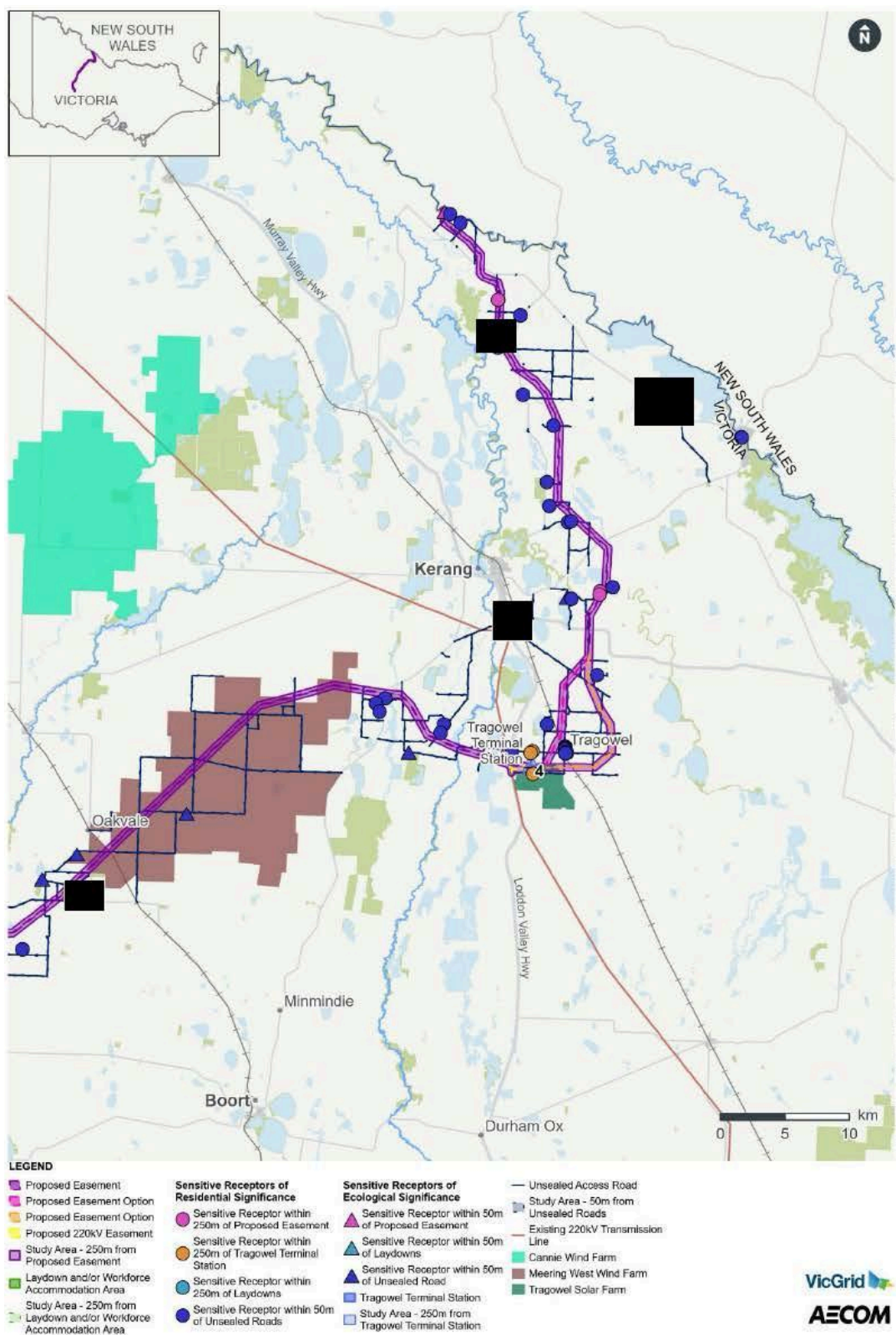


Figure 16-6 Assessed developments (1/3)

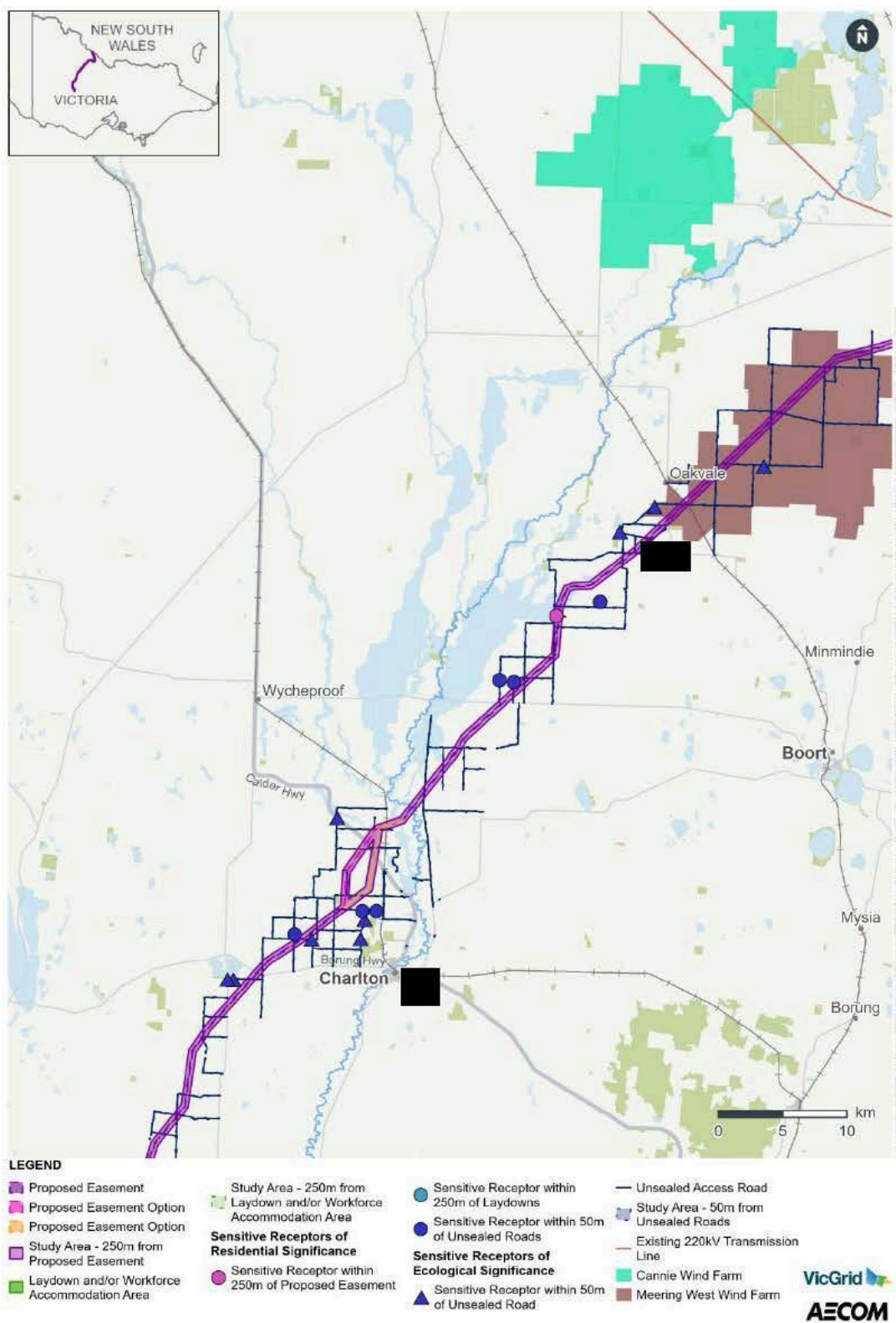


Figure 16-7 Assessed developments (2/3)

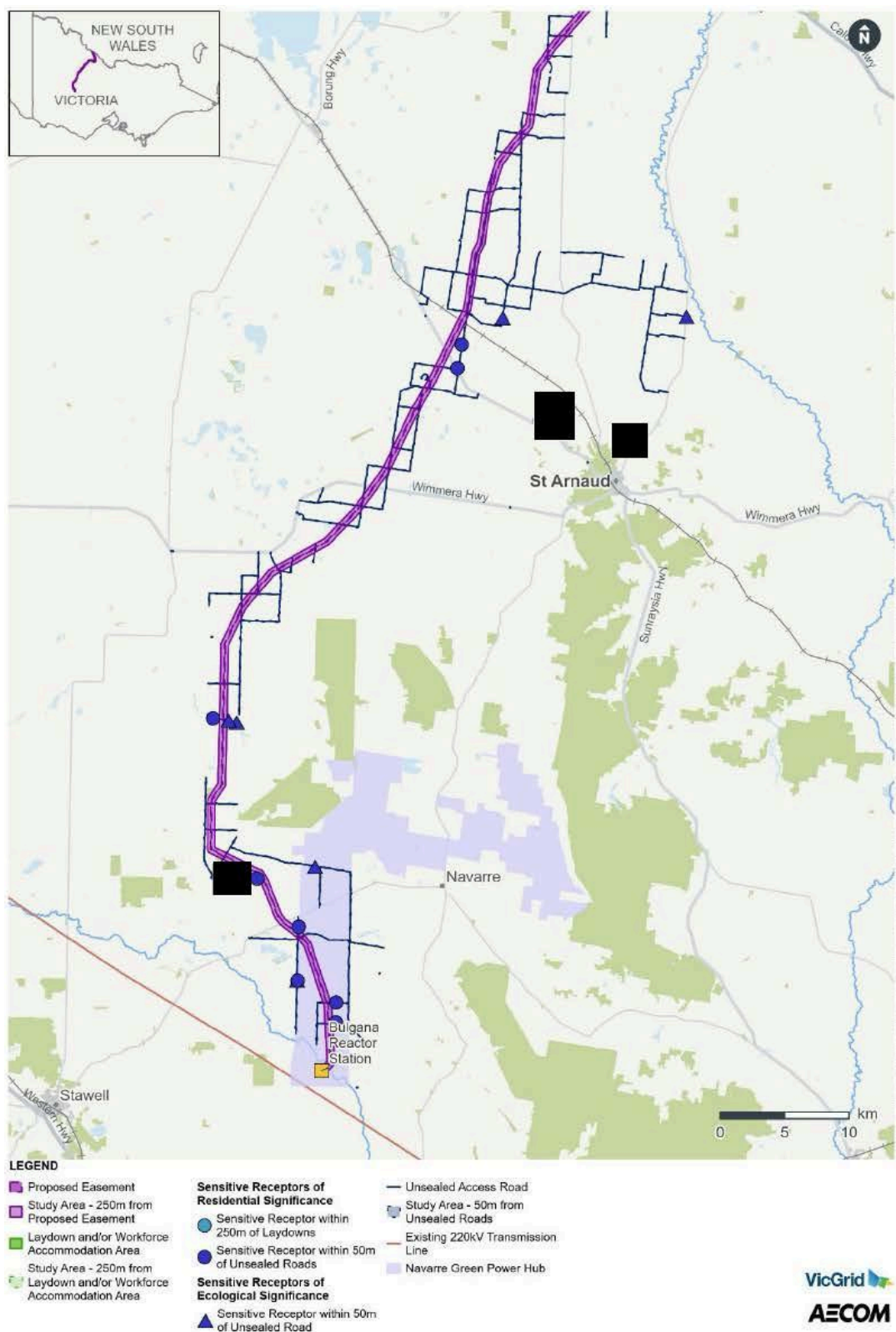


Figure 16-8 Assessed developments (3/3)

16.11 Summary of EPRs, monitoring and contingency measures

16.11.1 EPRs

Table 16-6 outlines the EPRs developed to avoid and minimise potential impacts during construction, operation and decommissioning of the Project.

Table 16-6 EPRs

EPR ID	EPR	Phase
AQ01	Dust and Air Quality Management Plan (DAQMP) Prior to the commencement of construction, the Delivery Partner / Principal Contractor will develop and implement a Dust and Air Quality Management Plan (DAQMP) as a sub-plan of the CEMP to avoid and minimise dust and other air quality impacts during construction and decommissioning. Prior to operation, the TNSP will review and update the AQMP, where required, for operational air quality matters. The DAQMP will be prepared in accordance with this EMF, the General Environmental Duty under the <i>Environment Protection Act 2017</i>, and relevant guidance, as updated from time to time, including: • EPA Victoria Publication 1834.2 – Civil Construction, building and demolition guide • EPA Victoria Publication 1943 – Guidance for assessing nuisance dust • EPA Victoria Publication 1961 – Guideline for assessing and minimising air pollution in Victoria • EPA Victoria Publication 1894 – Managing soil disturbance • EPA Victoria Publication 1895 – Managing stockpiles • EPA Victoria Publication 1897 – Managing truck and other vehicle movement • UK Institute of Air Quality Management (IAQM) Guidance on the Assessment of Dust from Demolition and Construction. The DAQMP will document risks of harm to human health and the environment from dust and air emissions will be managed in accordance with the GED, including consideration of reasonably practicable controls. The Plan will include, at a minimum: • Measures to minimise vegetation disturbance and exposed soil areas • Measures to minimise drop heights from loading or handling equipment • Stockpile management measures, including minimising stockpile duration and covering stockpiles where required • Progressive stabilisation, rehabilitation or revegetation of exposed areas where practicable • Requirements for covering or otherwise managing loads with potential for dust or litter loss during transport • Dust suppression measures for unsealed work areas, access tracks, stockpiles and dust-generating activities, including use of water sprays, water carts, screens or other suitable controls where required	Pre-construction Construction Operation (where relevant) Decommissioning

- Vehicle and mobile equipment management measures, including use of designated areas, minimising idling, restricting vehicle speeds and selecting vehicles and equipment with lower emissions where feasible and reasonable
 - Procedures for identifying and managing odorous soils, odorous materials or other odour-generating sources encountered during works
 - Weather monitoring procedures to identify conditions likely to increase air quality impacts at sensitive receptors, and requirements to modify works where required
 - Site inspection procedures to confirm that dust controls are in place and effective, including increased inspection frequency where works are near sensitive receptors, where activities have a high dust generation potential, or during prolonged dry, hot or windy conditions
 - Dust and air quality monitoring requirements where required to verify the effectiveness of controls
 - Procedures requiring works to be modified, temporarily ceased or additional controls implemented where dust is observed to be creating a hazard, causing visible offsite dust impacts, or where implemented controls are not effective
 - Procedures for managing complaints, incidents and non-compliances, including investigation, response, corrective action and update of controls
 - Procedures for review and update of the DAQMP where monitoring results, audit findings, complaints, incidents or changes in construction methodology indicate additional or modified controls are required.
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16.11.2 Monitoring measures

Table 16-7 outlines the monitoring and contingency measures for the air quality assessment.

Table 16-7 Monitoring measures

Relevant EPR	Monitoring	Location	Frequency	Project phase(s)	Assigned responsibility
AQ01	Monitor weather conditions relevant to dust generation, including extreme heat and wind events	Project-wide/ active work areas near sensitive receptors	Daily/ ongoing during active works, based on forecast conditions	Construction Decommissioning	Principal Contractor
AQ01	Monitor dust generation through routine site inspections and increased inspection frequency where activities are close to sensitive receptors or high-risk dust conditions occur	Active work areas, especially near sensitive receptors	Routine (daily visual observations), with increased frequency in dry / windy conditions or near sensitive receptors	Construction Decommissioning	Principal Contractor
AQ01 EM09	Monitor and respond to air quality complaints and verified incidents	Complaint location and relevant source area	Event-triggered	Construction Operation Decommissioning	Principal Contractor VicGrid VNI West/TNSP Principal Contractor for decommissioning

16.12 Conclusion

The primary potential impacts to air quality during the construction, operation and decommissioning of the Project would relate to dust emissions and emissions from construction plant and vehicles.

Dust emissions during construction of the Project were assessed in accordance with IAQM guidance. It was determined that potential air quality impacts from dust would be negligible along the transmission line itself. This is primarily due to the lesser magnitude of dust emissions and the reduced amount of nearby sensitive receptors.

The large scale of earthworks and trackout at the Tragowel Terminal Station and the sensitive receptors surrounding the laydown and/or workforce accommodation areas meant that potential air quality impacts from dust would be low to negligible at these locations. An increased magnitude of dust emissions from trackout on unsealed access roads, where used, would result in a medium impact to air quality.

EPRs would be implemented to avoid or minimise impacts to sensitive receptors in accordance with the GED. These would include minimising the extent of disturbance to the extent practicable, revegetating exposed areas, covering construction vehicles to minimise the potential loss of load and using dust suppression at construction areas and along access tracks. Access tracks would also be stabilised with crushed rock or other suitable materials to prevent vehicle movements raising dust. In addition, ongoing performance evaluation through monitoring and continuous improvement would ensure ongoing compliance, accordance with the GED. With the implementation of mitigation measures, dust impacts at nearby sensitive receptors would be negligible.

Vehicle and plant emissions during construction and operation of the Project would be intermittent and transient. As such, emissions during construction and operation would not significantly influence local air quality and impacts at nearby sensitive receptors would be negligible.

