

Navarre Green Power Hub

Preliminary Electromagnetic Interface Assessment

Neoen Pty. Ltd.

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1 Introduction

Neoen Pty. Ltd. (Neoen) engaged Aurecon to assist with development activities at the proposed Navarre Green Power Hub in Victoria, Australia. This report summarises the results of the high-level assessment and commentary on the potential impact on existing telecommunication paths.

1.1 Inputs and assumptions

Aurecon has used the wind turbine layout configuration and receptor locations provided by Neoen. The wind turbine maximum dimensions were provided by the client, with rotor diameter of 190 m and hub height of 175 m.

1.2 Limits

The risk of wind turbines affecting microwave telecommunications is mitigated by ensuring that the turbine structure (tower, nacelle, blades) are kept out of a zone around the microwave path. This assessment uses a conservative 2nd Fresnel Zone (ie zone number 2) when assessing turbine distances to microwave telecommunications paths.

2 Project Overview

2.1 Project location

The Navarre Green Power Hub (the Project) comprises approximately 18,404 hectares (ha) of predominantly private land immediately north of Navarre in north-western Victoria (Project Area). The Project Area consists of 4 main sub-areas:

- Wind Farm Project Area – Eastern Layout: Approximately 5,266 ha located to the east of Ararat Street-Arnaud Road and west of Kara Kara National Park.
- Wind Farm Project Area – Western Layout: Approximately 4,873 ha located to the west of Ararat Street-Arnaud Road and east of Morrl Morrl Nature Conservation Reserve.
- Transmission Line Project Area – Eastern and Western Layout Link: Approximately 1,272 ha investigation corridor located between the Eastern Layout and Western Layout.
- Transmission Line Project Area – Bulgana Terminal Station Connection: Approximately 6,993 ha investigation corridor located between the Eastern Layout and Bulgana Terminal Station.

2.2 Project description

The Project will have a nominal capacity of around 600 MW and will incorporate a total of 102 wind turbines, split across two areas:

- The Wind Farm Project Area – Eastern Layout, which will consist of 50 wind turbines across approximately 5,266 ha of land.
- Wind Farm Project Area – Western Layout, which will consist of 52 wind turbines across approximately 4,873 hectares (ha) of land.

The Project will include a 220 kV transmission line between the Western and Eastern Layout and a 220 kV transmission line between the Western Layout and the Bulgana Terminal Station.

In addition to the turbines and transmission lines, the Project will also include the permanent and temporary infrastructure listed below (Table 1 and Table 2).

Table 1 Permanent and temporary infrastructure associated with the Project – Eastern Layout

The Wind Farm Project Area – Eastern Layout	
Permanent	Temporary
<ul style="list-style-type: none"> ■ A substation (up to 10ha) ■ Hardstand and laydown areas surrounding each turbine ■ Access tracks and site access points. It is expected the site access points will be at one location on Barkly-Navarre Road, one location on Ararat-St Arnaud Road and one location on Winjallock Road. ■ Operations and maintenance building and laydown ■ A Battery Energy Storage System with a capacity of 600MW / 1200MWh ■ Road upgrades to the local roads ■ Meteorological monitoring masts ■ Internal power collection stations ■ Internal underground cabling ■ A quarry to source raw material required for construction and maintenance during operations. 	<ul style="list-style-type: none"> ■ A construction office and compounds. This will include site offices, car parking, storage and amenities. ■ A concrete batching plant.

Table 2 Permanent and temporary infrastructure associated with the Project – Western Layout

The Wind Farm Project Area – Western Layout	
Permanent	Temporary
<ul style="list-style-type: none"> ■ A substation (up to 10ha) ■ Hardstand and laydown areas surrounding each turbine. ■ Access tracks and site access points. It is expected the site access points will be at one location on Callawadda-Navarre Road and three locations on Bolangum Inn Road. ■ Operations and maintenance building and laydown. ■ Road upgrades to the local roads. ■ Meteorological monitoring masts. ■ Internal power collection stations. ■ Internal underground cabling. ■ A quarry to source raw material required for construction and maintenance during operations. 	<ul style="list-style-type: none"> ■ A construction office and compounds. This will include site offices, car parking, storage and amenities. ■ A concrete batching plant.

3 Assessment and results

Aurecon has assessed the potential impact that the wind turbines would have on the telecommunication paths (point-to-point or microwave telecommunications) between existing radio-telecommunication equipment, specifically those that may pass through the Wind Farm Project Areas.

Wind turbines, like other structures and objects, have the potential to interfere with point-to-point telecommunications paths. This potential interference can be avoided by locating turbines away from the

telecommunication path. The telecommunication path follows both the line of sight from transmitter to receiver but also curved paths from transmitter to receiver. Obstructions in these paths (buildings, trees, wind turbines) can cause constructive or destructive interference in the telecommunication signal. A rule of thumb used in the telecommunication industries to ensure no destructive interference is to limit the size of any obstruction to no more than 20% of the area of the 1st Fresnel Zone¹. The Fresnel Zone is an ellipsoid around the line of sight of the path. The ellipsoid radius is defined by the distance along the path, length of path, the signal frequency, and the zone number. The radius of the ellipsoid is proportional to the square root of the zone number. In the wind industry the normal practice is to completely avoid any part of the turbine structure encroaching into the 1st or 2nd Fresnel Zone. This assessment uses the more conservative 2nd Fresnel Zone (ie zone number 2).

Aurecon accessed the database maintained by the Australian Communications and Media Authority² (ACMA) to obtain the broadcasting locations (path start and end points) and other relevant details on 10 March 2023. GIS software was then used to produce lines between each identified start and end pair which was then overlaid on a map showing the proposed wind turbine locations.

The review identified two telecommunication paths that intersect the Project. One intersects the Wind Farm Project Area – Eastern Layout and one intersects the Wind Farm Project Area – Western Layout. The details of the identified paths are provided in Table 3.

Table 3 Telecommunications paths from ACMA

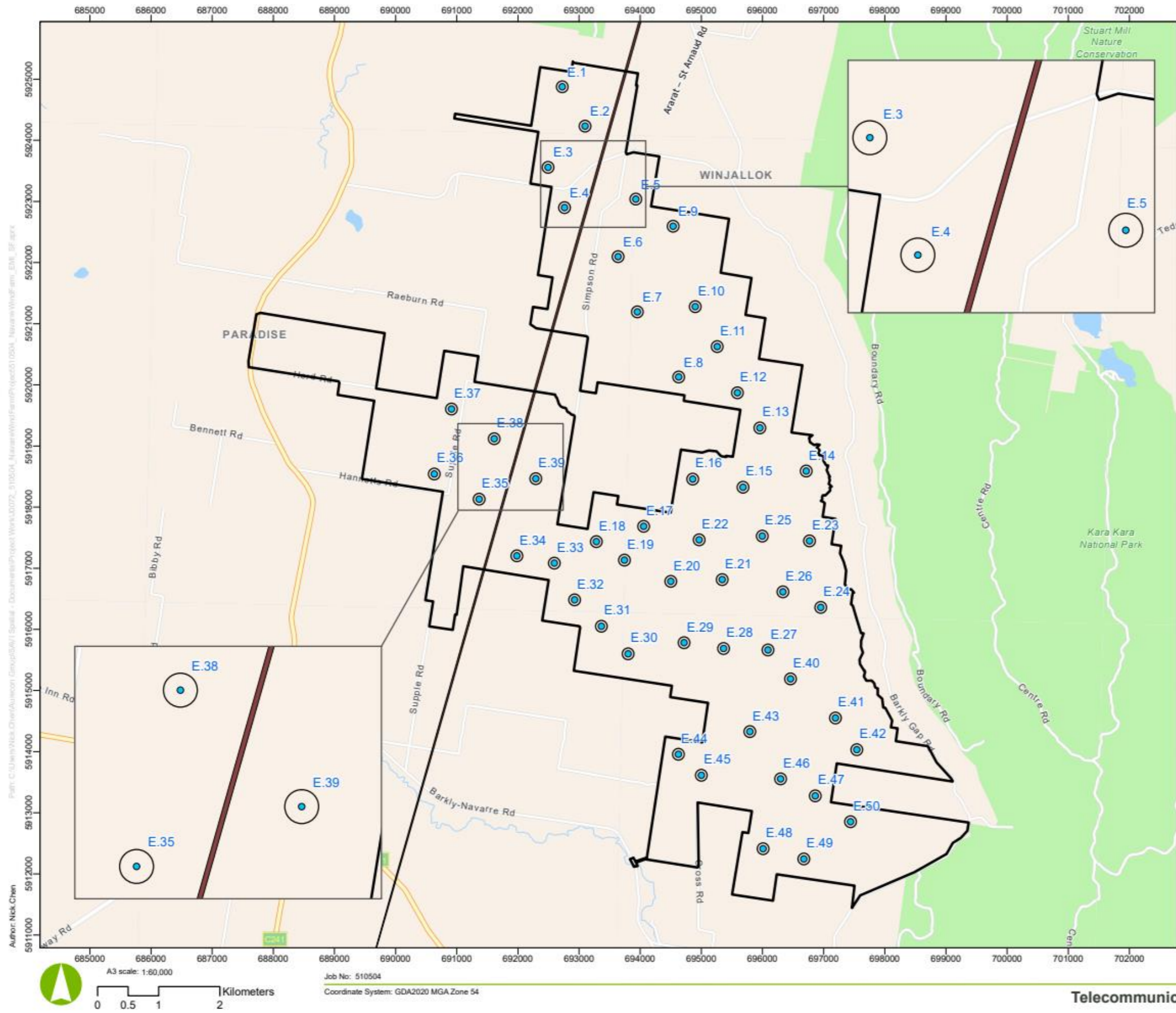
Licence Number	Owner	Tower location name	Easting [MGA94z54]	Northing [MGA94z54]	Antenna Height [m]	End Tower location name	Frequency [MHz]	Easting [NZMG]	Northing [NZMG]	End Antenna Height [m]
1349838	Northern Grampians Shire Council (141831)	Education Department Site 29 km W of Ararat MT WILLIAM	642145	5871198	Not specified	Viewpoint Wattle Street ST ARNAUD	7592.5	699641	5946128	Not specified
1349839	Northern Grampians Shire Council (141831)	Viewpoint Wattle Street ST ARNAUD	699641	5946128	Not specified	Education Department Site 29 km W of Ararat MT WILLIAM	7431.5	642145	5871198	Not specified
3489856	Telstra Corporation Limited (39310)	235 Glenisters Gap Road	689253	5909277	Not specified	Telstra Site VIEWPOINT	6212.1	699696	5945978	Not specified
3489859	Telstra Corporation Limited (39310)	Telstra Site VIEWPOINT	699696	5945978	Not specified	235 Glenisters Gap Road	5960	689253	5909277	Not specified

3.1 Wind Farm Project Area – Eastern Layout

The telecommunication path that passes through the Wind Farm Project Area – Eastern Layout and Fresnel Zone is shown in Figure 3.

¹ Coleman, Westcott, David, David (2012). Certified Wireless Network Administrator Official Study Guide. John Wiley & Sons, Inc. p. 126. ISBN 978-1-118-26295-5.

² ACMA Database (web.acma.gov.au)



- Legend**
- Eastern Fresnel Zone
 - Eastern Layout
 - Turbines with a circle radius of 0.5 D
 - Layout Boundary

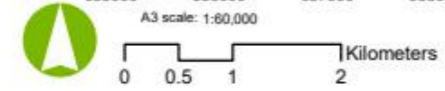
Source:
Esri, Vicmap (2023), Aurecon (2023)

Date: 9/05/2023 Version: 1

Navarre Green Power Hub

Telecommunication paths with the eastern layout

Path: C:\Users\Nick.Chen\Aurecon\Group\SAV\Spatial - Documents\Project\Works\002_510504_NavarreWindFarm\Project\010004_NavarreWindFarm_EW_01.aprx
 Author: Nick.Chen



Job No: 510504
Coordinate System: GDA2020 MGA Zone 54

Figure 1 Telecommunication paths with the east layout

The length of the telecommunication path is approximately 38.2 km, with the transmitters and receivers are located 7km, 25km and 56km away from the site. This means there is no risk of near field impact from the wind turbines. The communication frequencies for the path of interest were identified in the ACMA database as 5.96-6.21 GHz.

The maximum radius (at the mid-point of the path) for the Fresnel Zone is approximately 31 m.

The nearest turbines (turbines E.4 and E.35) are located approximately 340 m and 380 m away from the Fresnel Zone respectively. The proposed turbines were found not to encroach on the Fresnel Zone exclusions around the telecommunication paths, and therefore no mitigation measures are required.

The proposed maximum micro-siting distance will also not cause the wind turbines to encroach on the Fresnel Zone exclusions. If turbines are moved by larger distances or if the turbine maximum dimensions change then the assessment will need to be reviewed.

3.2 Wind Farm Project Area – Western Layout

The telecommunication path that passes through the Wind Farm Project Area – Western Layout and Fresnel Zone is shown in Figure 2.

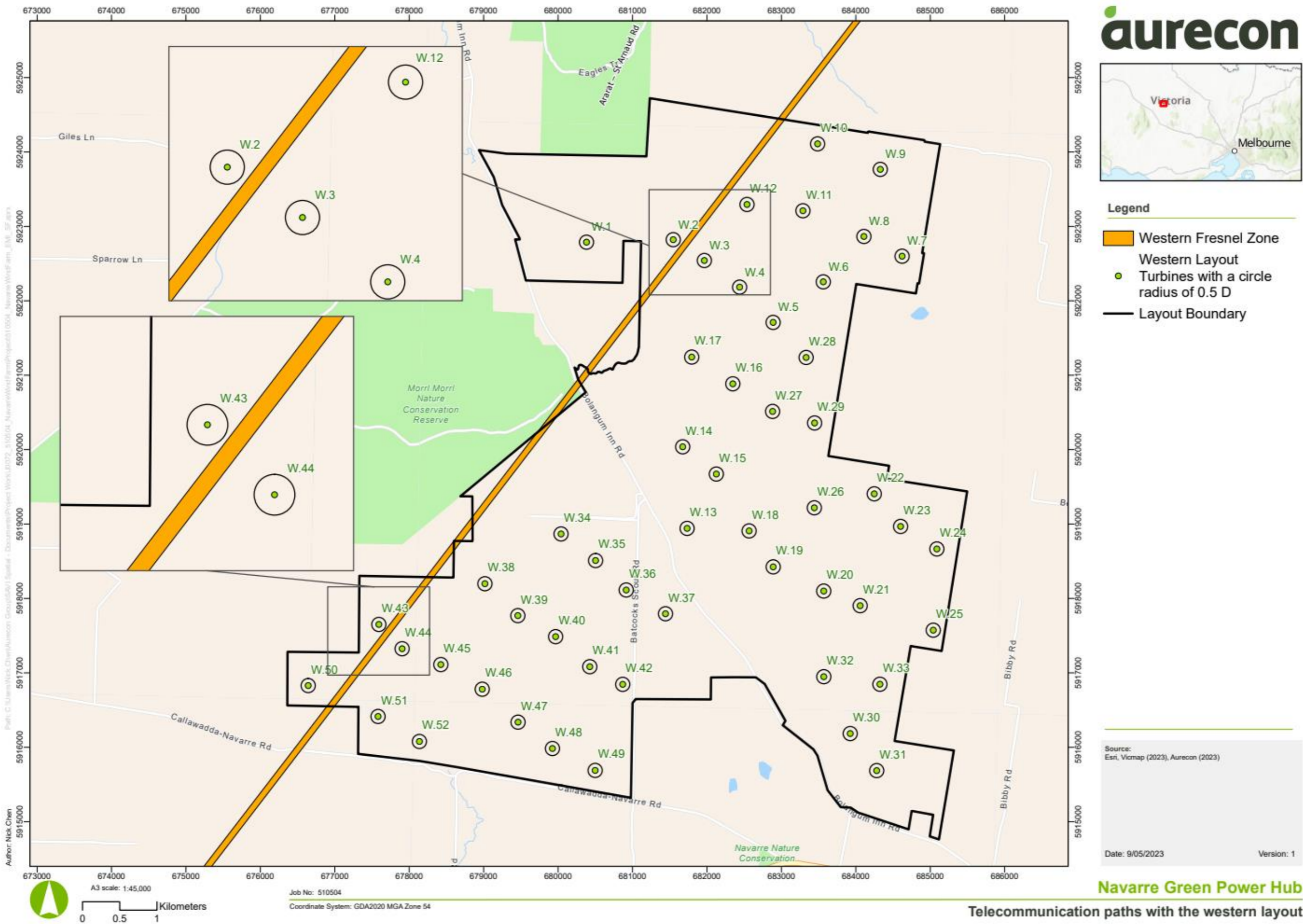


Figure 2 Telecommunication paths with the west layout

The length of the telecommunication path that intersects with the Wind Farm Project Area – Western Layout is approximately 94.5 km, with each end being located several kilometres away (25km and 56km) from the site. This means there is no risk of near-field impact from the wind turbines. The communication frequencies for the path of interest were identified in the ACMA database as 7.4-7.6 GHz.

The maximum radius (at the mid-point of the path) for the Fresnel Zone is approximately 46 m.

The nearest turbines (turbine W.43 and W.2) are located approximately 120 m and 130 m away from the Fresnel Zone respectively. The proposed turbines were found not to encroach on the Fresnel Zone exclusions around the telecommunication paths, and therefore no mitigation measures are required.

The proposed maximum micro-siting distance will not cause the wind turbines to encroach on the Fresnel Zone exclusions. If turbines are moved by larger distances or if the turbine maximum dimensions change then the assessment will need to be reviewed.

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