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NEOEN

THUNDERBOLT ENERGY HUB

Preliminary Visual Analysis

FINAL

November 2020

NEOEN

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Preliminary Visual Analysis

FINAL

Prepared by
Umwelt (Australia) Pty Limited
on behalf of
Neoen Pty Ltd

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Report No.	7066/R04
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Document Status

Rev No.	Reviewer		Approved for Issue	
	Name	Date	Name	Date
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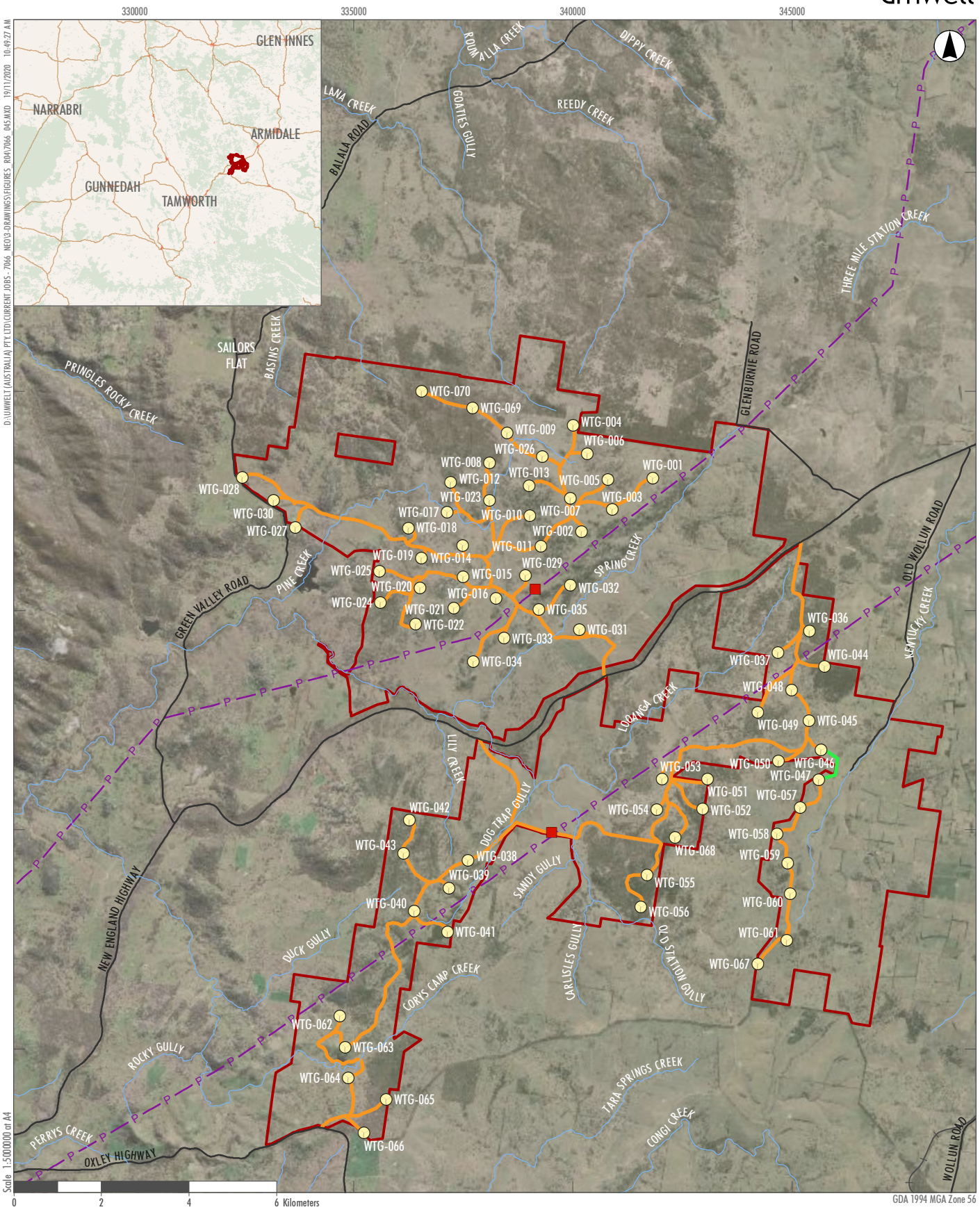
1.0 Introduction

The following Preliminary Visual Impact Analysis (PVIA) has been prepared for Neoen Pty Ltd (the Proponent) as part of the Scoping Report and request for SEARs for the Thunderbolt Energy Hub Project.

The PVIA has been prepared to address the requirements of the Department of Planning, Industry and Environment (DPIE) Wind Energy Guideline and the Visual Assessment Bulletin (2016) (the Visual Bulletin).

This PVIA has considered the preliminary layout for the Project (refer to **Figure 1.1**). The Project includes the construction, operation, and maintenance of approximately 70 (3 blade steel) wind turbines, with a total height (tip height) of 250m. Associated infrastructure is also proposed including operation and maintenance buildings, civil works, a battery facility and electrical infrastructure required to connect to the existing transmission network. It is noted that this PVIA has focused on the preliminary assessment of the proposed turbines, with the ancillary infrastructure including roads, substations and transmission lines to be subject to further design refinement and assessed in further detailed during the Environmental Impact Statement (EIS) phase.

The preliminary layout prepared by Neoen locates the wind turbines predominately along ridgelines while also focussing on the areas identified as having higher wind resources. The project layout will be subject to further refinement as the detailed environmental and social impact assessment progresses as part of the EIS phase.



Legend

- Project Area
- Primary Access Road
- Electrical Easement Only
- Preliminary Turbine Layout
- Possible Substation Location
- Existing 330kV Power Lines
- Road
- Railway
- Watercourse

FIGURE 1.1

Conceptual Layout

Image Source: Data source: Geoscience Australia; Forestry Corporation of NSW (2019); DSFI (2017); NPWS Estate (2019), Neoen (2020)

2.0 Assessment Requirements

At the scoping phase of the Project the Visual Bulletin requires proponents to undertake a preliminary environmental assessment that includes:

- *Undertaking community consultation to establish key landscape features valued by the community, key viewpoints in the area (both public and private) along with information about the relative scenic quality of the area;*
- *Production of a map detailing the key landscape features (informed by community consultation and any ground-truthing undertaken), the preliminary wind turbine layout, the location of dwellings and key public viewpoints and an overlay of the wind resource; and*
- *Results of the application of the preliminary assessment tools for both the visual magnitude and multiple wind turbine parameters.*

These requirements are addressed in the following sections.

2.1 Community Consultation

The Visual Bulletin indicates that consultation with the community during early stages of the assessment process *may be broad, but should include discussions about the proposed project area, likely corridors for development, or preliminary turbine layouts and must involve people from the visual catchment*.

The intent of undertaking this early community consultation regarding visual aspects of the Project is to:

- establish the key landscape features, areas of scenic quality and key public viewpoints valued by that community
- allow the community to have input into the ranking of those features and scenic quality into high, moderate or low visual significance
- inform landholders about the proposed project area, likely corridors for development, preliminary turbine layouts and access routes, and
- inform the community about the proposed project, listen to the community's concerns and suggestions for alternative siting and location designs, and discuss potential visual impacts.

Neoen undertook community consultation during the scoping phase which included a public information session, face to face meetings with involved and nearby landholders and an online survey. The community involvement to date has included:

- attendance of 40 - 50 stakeholders at the public information session in Kentucky
- 27 near neighbour meetings
- 38 responses to the online survey.

The Visual Bulletin states that *key landscape features can include natural features of the landscape (for example, a distinctive mountain peak) as well as important cultural features (for example, an iconic church). Consideration of areas of scenic quality involves the identification of areas of the landscape that are of high scenic quality and those that are moderate or low.*

No specific key landscape features within the vicinity of the Project Area and potentially impacted by the Project were identified by the community, however, stakeholders indicated that the most visually valued aspect of the local area was the 'rural landscape and beauty'. The only specific visually important location identified by stakeholders during the consultation was the views of the vegetated hills (Harnham Hill) to the northeast of Kentucky. The Project will be located to the west of Kentucky and will not impact on views to the northeast of Kentucky.

Neoen has indicated that the consultation undertaken to date has indicated that the visual impact concerns of the community relate to how wind turbines will impact the views from their homes generally rather than disrupting their views of a particular landscape feature or key viewpoint. Further information in relation to the community consultation undertaken by Neoen is provided in the Community Relations Plan, prepared by Neoen which forms Appendix 1 of the scoping report.

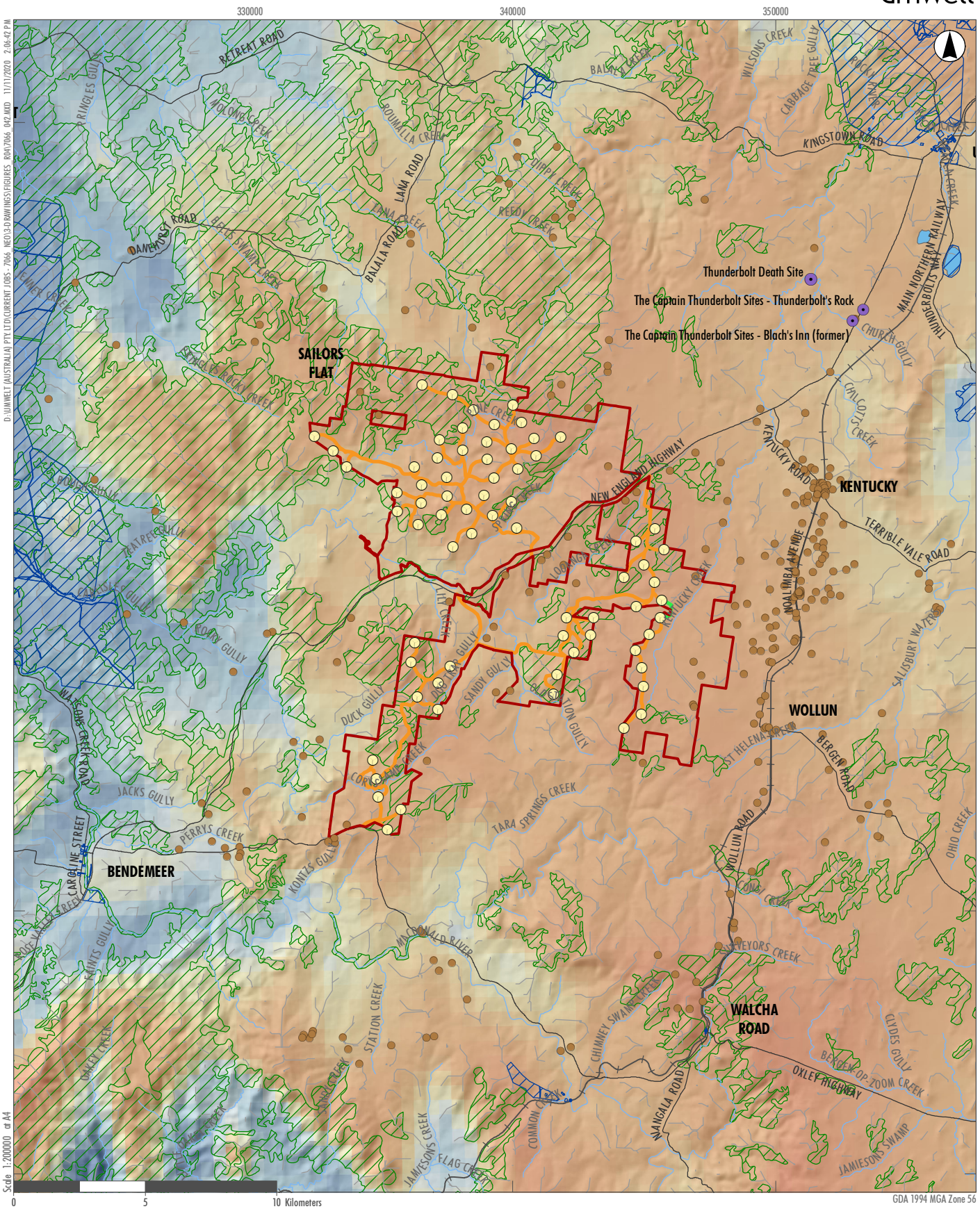
Based on land use and zoning (predominately RU1-Primary Production and small areas of R02 – Rural Landscape in the northern section of the Project Area), land cover and topography, a preliminary landscape analysis has been prepared which identified the following landscape areas within and in proximity to the Project Area:

- rural residential townships of Kentucky, Kentucky South, Wollun, Walcha and Bendemeer
- cleared farming land/pasture
- hills and rock outcrops
- pasture with open and isolated trees
- road corridors (New England Highway, Oxley Highway and various local roads)
- minor creek lines, and
- timbered hills.

Figure 2.1 provides an overview of the key landscape features with wind resource overlay (as required by the Visual Bulletin). **Plates 2.1** to **2.6** also illustrate the current views within the Project Area.

There are no National Parks or Nature Reserves within the vicinity of the Project Area, however, as noted above, there are National Park areas more distant to the east of Kentucky (approximately 30 km at nearest point). The closest State Heritage Conservation Areas are <10 km from the Project Area. The closest State Heritage Item (Thunderbolt Death Site) is located approximately 8.4 km to the north east of the Project Area.

The key public vantage points of the Project will be from the New England Highway which runs through the centre of the Project Area. Extensive areas within and surrounding the Project Area have been cleared for agricultural purposes with areas of remnant vegetation scattered across the Project Area and extensive stands of vegetation along the New England Highway. The roadside vegetation will, in some locations, partially screen views from some parts of the highway with this to be subject to further assessment as part of the detailed visual assessment. While no specific landscape features within or nearby to the Project Area have been identified through the consultation process, the Project Area and surrounding area is predominately utilised for agricultural land uses. The Project will be visible from both involved and non-involved landholders, with these views the focus of this preliminary assessment.



Legend

- Project Area
- Primary Access Road
- Electrical Easement Only
- Preliminary Turbine Layout
- Road
- Railway
- Watercourse
- State Heritage Item
- Rural Residential Dwellings
- State Heritage Conservation Area
- Native Vegetation
- Lakes
- Ridgelines

Wind speed (metres per second)

High : 10.2

Low : 2.4

FIGURE 2.1

Key Landscape Features

Image Source: ESRI Basemap, Data source: DFSI (2020), Neoen (2020)

Plate 2.1 View northeast from the southern end of the Project Area

Plate 2.2 Coreys Creek Camp Crossing on Rimbanda Road within Project Area

Plate 2.3 Existing vegetation within Southern portion of Project Area

Plate 2.4 Heading south along New England Highway towards the Project Area

Plate 2.5 Heading north east along New England Highway towards the Project Area

Plate 2.6 View east from the Southern End of the Project Area

2.2 Visual Magnitude Assessment

The Visual Bulletin states that by *mapping the dwellings, key public viewpoints and proposed turbines at scale, the potential visual magnitude of a turbine relative to that dwelling or public viewpoint can be established. This is based on the height of the proposed wind turbines to the tip of the blade and distance from dwellings or key public viewpoints shown in the graph at Figure 2* (of the Visual Bulletin).

The visual magnitude is determined by a ratio of turbine height and distance. This assessment establishes the visual extent of turbines relative to dwellings and key public view points and is useful in identifying which viewpoints may require further assessment during the preparation of the EIS.

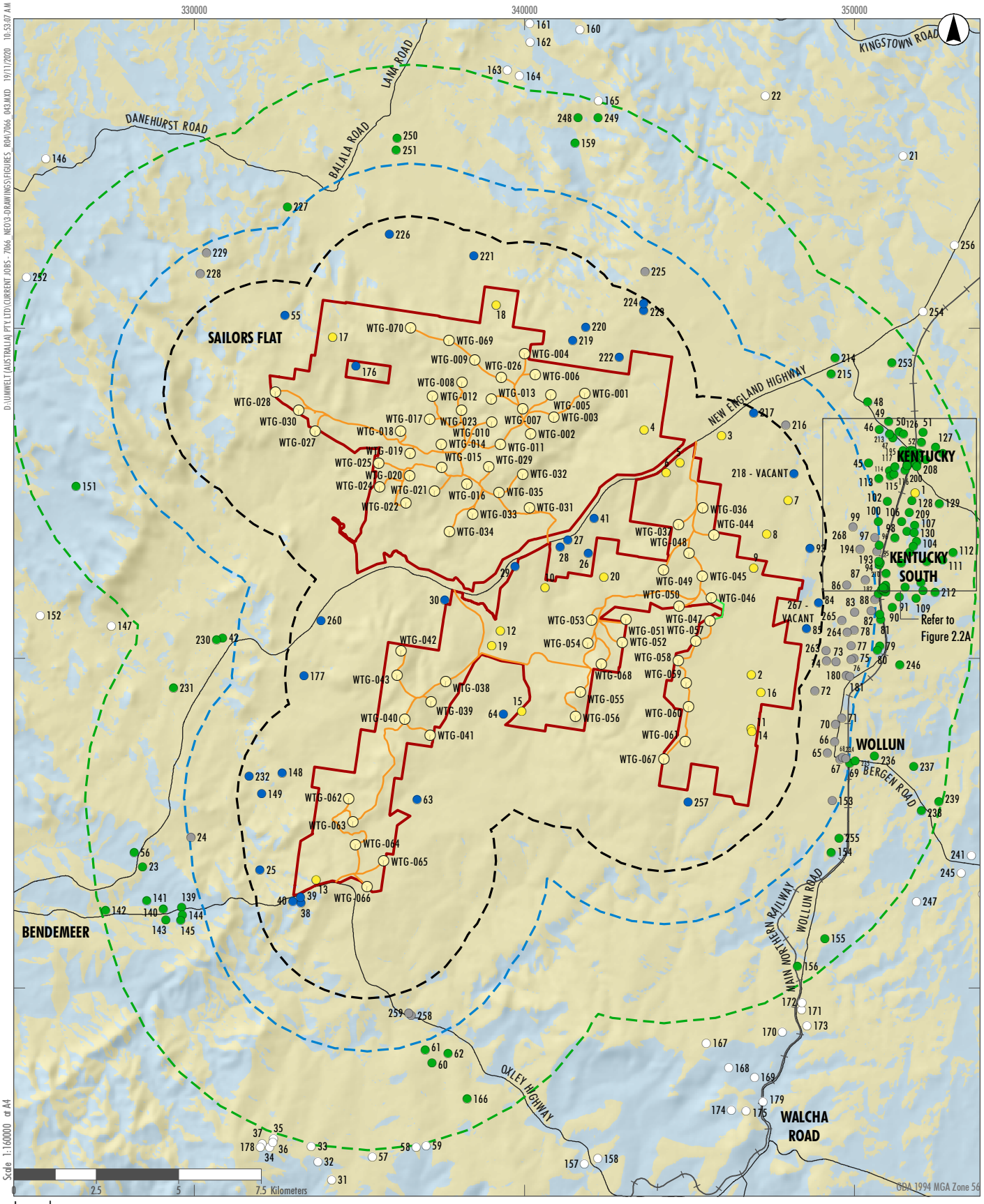
Based on the proposed wind turbine height of 250 m, a distance of approximately 3.4 km applies (black line on **Figure 2.2** and **Figure 2.2A**) in accordance with Figure 2 of the Visual Bulletin. It is noted that key public vantage points and residential dwellings outside of the 3.4 km buffer also require consideration as part of the detailed assessment during the EIS phase, additionally Figure 5 of the Visual Bulletin establishes an additional buffer of 5 km (blue line on **Figure 2.2** and **Figure 2.2A**).

In determining the visual baseline as part of the EIS phase of a Project the 'blue line' informs the visual magnitude assessment and has been considered in this preliminary assessment to provide further context given the number of dwellings located outside of the 3.4 km buffer however within close range (<8 km).

Within the 3.4 km buffer (0 to 3.4 km) there are 20 involved and 32 non-involved dwellings, within 3.4 to 5 km there are 0 involved and 36 non-involved dwellings. Within the 5 to 8 km buffer zone there are 123 non-involved dwellings. The turbine layout, dwelling locations and relevant buffers are shown on **Figure 2.2** and **Figure 2.2A**. The visual magnitude assessment indicates that 67 of the proposed turbines are located within 3.4km of a dwelling (below the black line). Proposed turbines WTG-015, WTG-20 and WTG-024 are located 3.7 km from a dwelling (below the blue line).

Figure 2.2 also illustrates the Visual Zone of Influence Analysis, which indicates areas within the landscape from which the turbines will not be visible. However, it should be noted this analysis is preliminary only generated from topography mapping and does not take into consideration other factors that would restrict views such as orientation, vegetation, distance, perspective etc.

It should be noted that the Visual Bulletin also states that the preliminary assessment tools are not determinative and are not designed to provide a 'yes' or 'no' answer as to whether particular turbines are or are not acceptable. Rather providing early indication of where placement of turbines will require further detailed assessment and justification, and where consultation with potentially affected landowners needs to be focused which may include discussions for landholder agreements.



Legend

- Project Area
- Primary Access Road
- Electrical Easement Only
- Preliminary Turbine Layout
- Road
- Railway

Dwelling Proximity

- Involved Dwelling
- Within 3.4km (below the black line)
- 3.4km to 5km (between black and blue line)
- 5km to 8km
- Greater than 8km

Visual Influence Zones

- Zone 1 (3.4km)
- Zone 2 (5km)
- Zone 3 (8km)

Bare Earth Viewshed Analysis (250m Turbines)

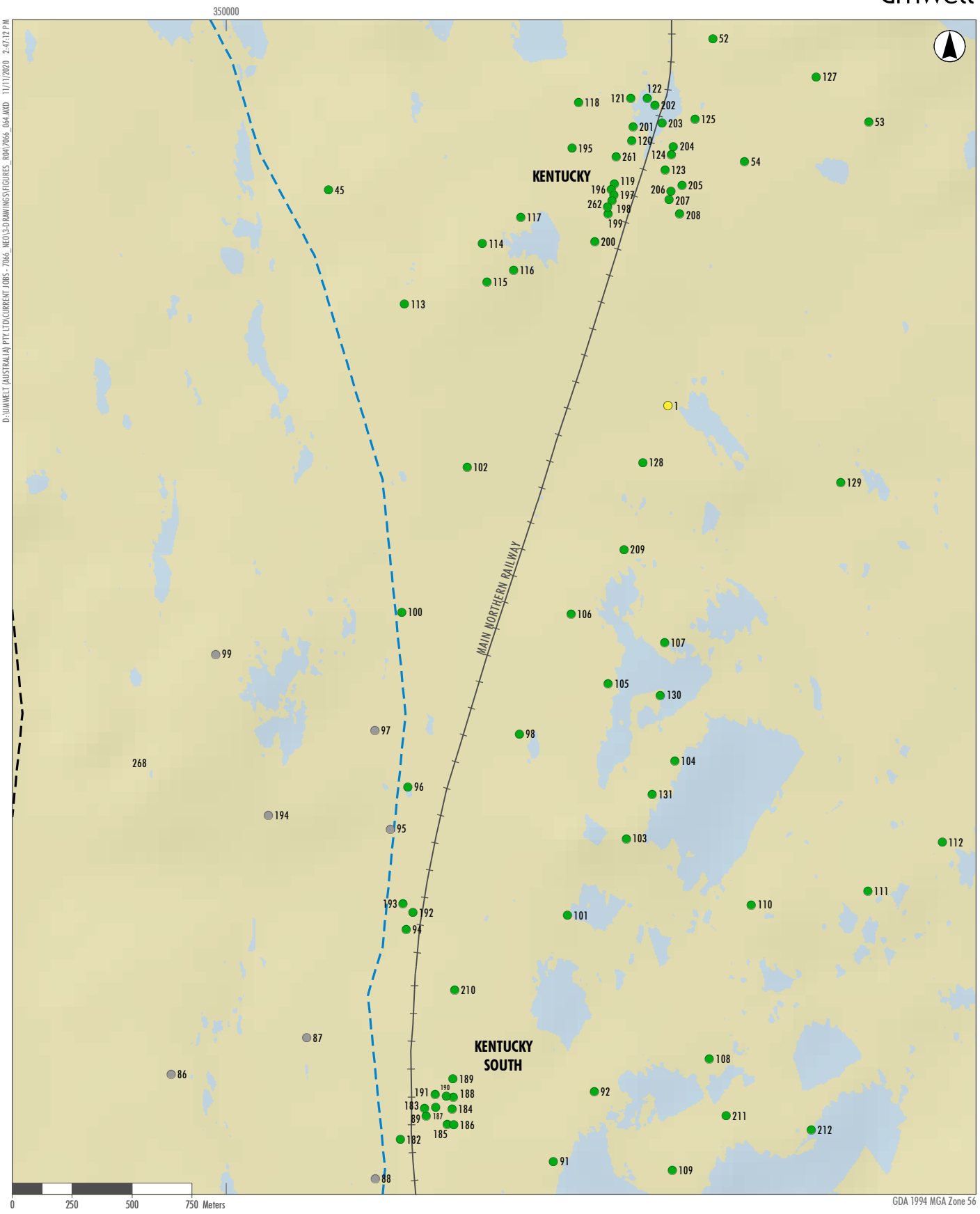
(Vegetation NOT Considered)

- Not Visible
- Visible

FIGURE 2.2

Visual Magnitude

Image Source: ESRI Basemaps (2020) Data source: DFSI (2020); Neoen (2020)



Legend

- Road
- Railway
- Watercourse

Dwelling Proximity

- Involved Dwelling
- 3.4km to 5km (between black and blue line)
- 5km to 8km

Visual Influence Zones

- Zone 1 (3.4km)
- Zone 2 (5km)
- Zone 3 (8km)

Bare Earth Viewshed Analysis (250m Turbines)

(Vegetation NOT Considered)

- Not Visible
- Visible

FIGURE 2.2A

Visual Magnitude

Image Source: ESRI Basemap, Data source: DFSI (2020), Neoen (2020)

2.3 Multiple Wind Turbines Assessment

The Visual Bulletin outlines the requirements for the multiple wind turbine assessment which provides a *preliminary indication of potential cumulative impacts arising from the proposed wind energy project. To establish whether the degree to which dwellings or key public viewpoints may be impacted by multiple wind turbines, the proponent must map into six sectors of 60° any proposed turbines, and any existing or approved turbines within eight kilometres of each dwelling or key public viewpoint.*

The multiple wind turbine analysis has been undertaken for each dwelling within the viewshed and the results illustrated on **Figure 2.3** and **Figure 2.3A**. This gives an indication of the number of turbines visible across the landscape, note this is based on topography alone and does not take into consideration other factors such as orientation, vegetation, distance, perspective etc, which would restrict views of the turbines. This may result in the turbines being either completely screened from view or only partially visible (i.e. only the tip of the turbine may be visible). This screening assessment does not differentiate the extent of a turbine that may be visible, with any views of any part of the turbines no matter how small resulting in the turbine being identified as visible. The detailed visual assessment will determine the extent of visibility from different locations and the level of visual impact.

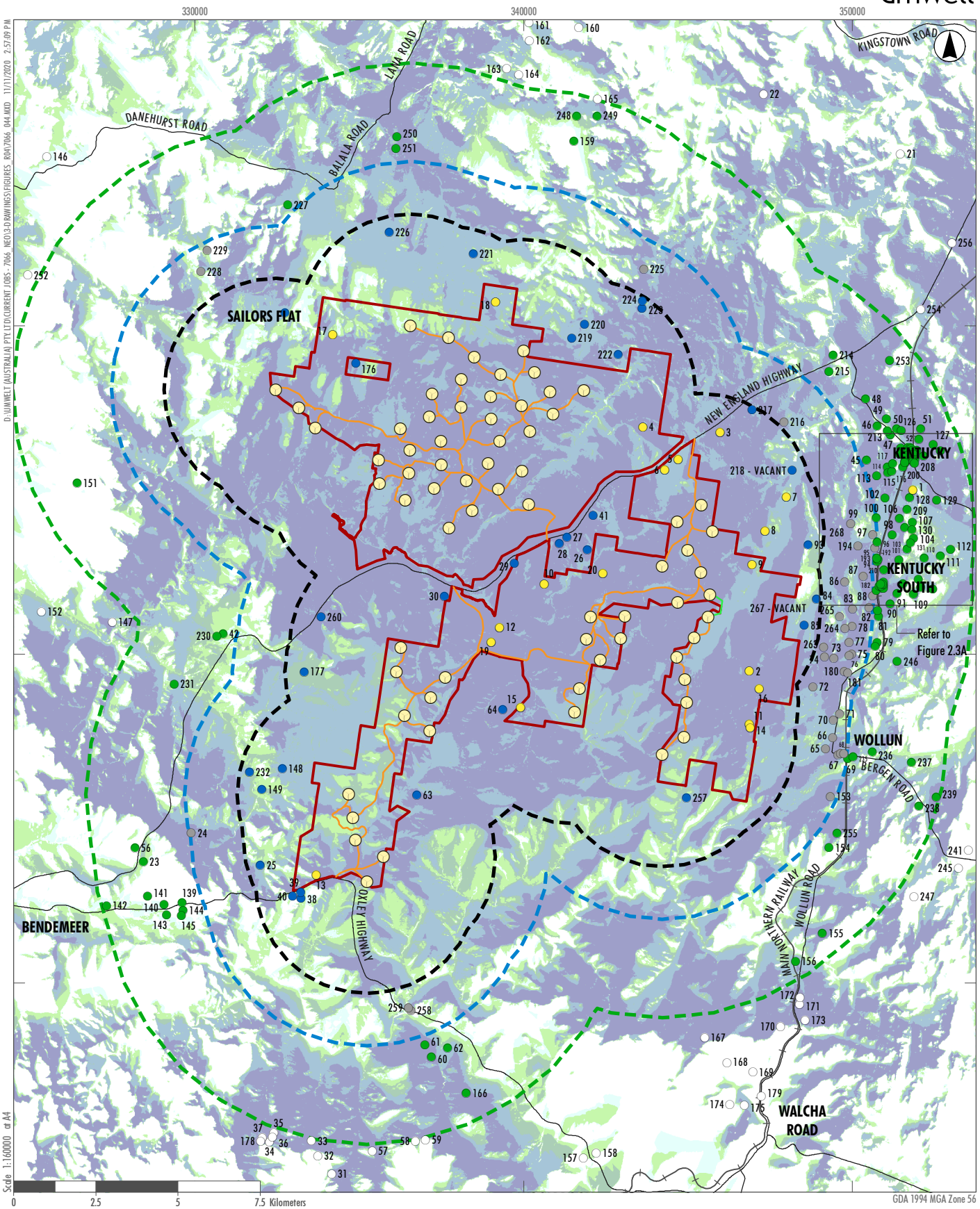
In relation to mapping the proposed turbines into six sectors of 60°, for the purposes of this preliminary report eight representative viewpoints have been identified, refer to **Figure 2.4** and **Figure 2.4A**. The representative viewpoints include:

- Viewpoint 1 – from New England Highway travelling southwest towards the Project Area
- Viewpoint 2 – From residential area of Kentucky
- Viewpoint 3 – From residential area of Kentucky South
- Viewpoint 4 – From the residential area of Wollun
- Viewpoint 5 – From the south of the Project Area on the Oxley Highway
- Viewpoint 6 – From dwellings north of Bendemeer, southwest of the Project Area
- Viewpoint 7 – From dwellings on New England Highway in centre of Project Area
- Viewpoint 8 – From dwellings on New England Highway in centre of Project Area.

The sector mapping for each viewpoint is shown on **Figure 2.5** to **Figure 2.12**.

It is noted that there are 33 non-involved dwellings within the 3.4km buffer of the turbines and these dwellings will likely have views of multiple turbines in 1 to 3 sectors and will require further detailed analysis during the EIS phase. Based on the analysis, the dwellings directly east of the Project Area in Kentucky South (Viewpoint 3 - **Figure 2.7**) will potentially have views of multiple turbines in two sectors, the remainder of the dwellings located around the Project Area will have views within 1-2 sectors.

There are also six non-involved dwellings located in the centre of the Project Area (on the New England Highway) which could potentially have views of multiple turbines within 3-6 sectors (refer to **Figure 2.11** and **Figure 2.12**). These two viewpoints represent an area of potentially high visual impact, although it should be noted again that this is based on topography only, the visual impact in relation to these dwellings will require detailed assessment as part of the EIS phase of the Project.



Legend

- Project Area
- Primary Access Road
- Electrical Easement Only
- Preliminary Turbine Layout
- Watercourse
- Road
- Railway

Dwelling Proximity

- Involved Dwelling
- Within 3.4km (below the black line)
- 3.4km to 5km (between black and blue line)
- 5km to 8km
- Greater than 8km

Visual Influence Zones

- Zone 1 (3.4km)
- Zone 2 (5km)
- Zone 3 (8km)

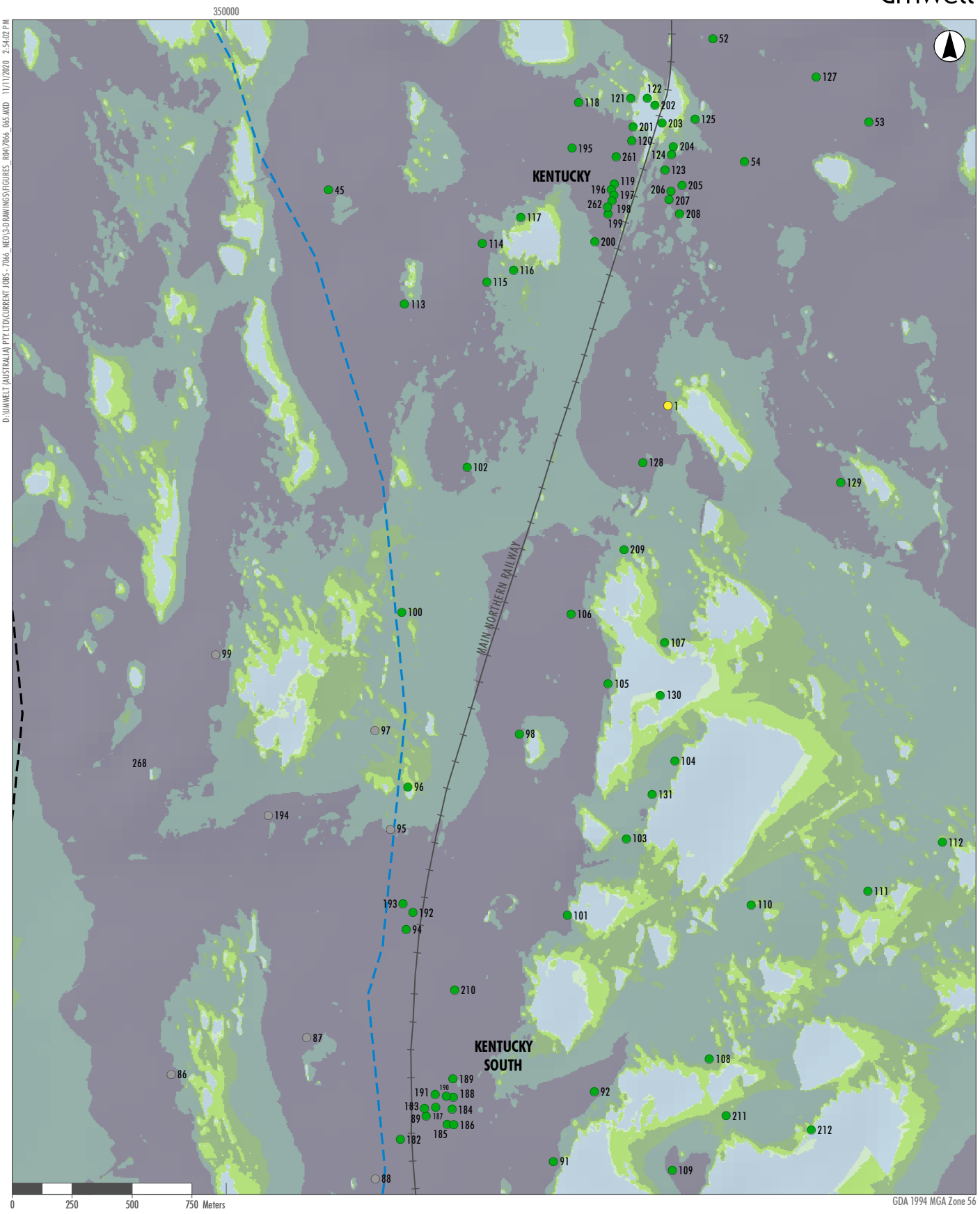
Number of Potentially Visible Turbines (Vegetation not Considered)

- 1
- 1 - 5
- 5 - 10
- 10 - 30
- 30 - 70

FIGURE 2.3

Multiple Wind Turbine Analysis

Image Source: ESRI Basemap, Data source: DFSI (2020), Neoen (2020)



Legend

- Road
- Railway
- Watercourse

Dwelling Proximity

- Involved Dwelling
- 3.4km to 5km (between black and blue line)
- 5km to 8km

Visual Influence Zones

- Zone 1 (3.4km)
- Zone 2 (5km)
- Zone 3 (8km)

Number of Potentially Visible Turbines

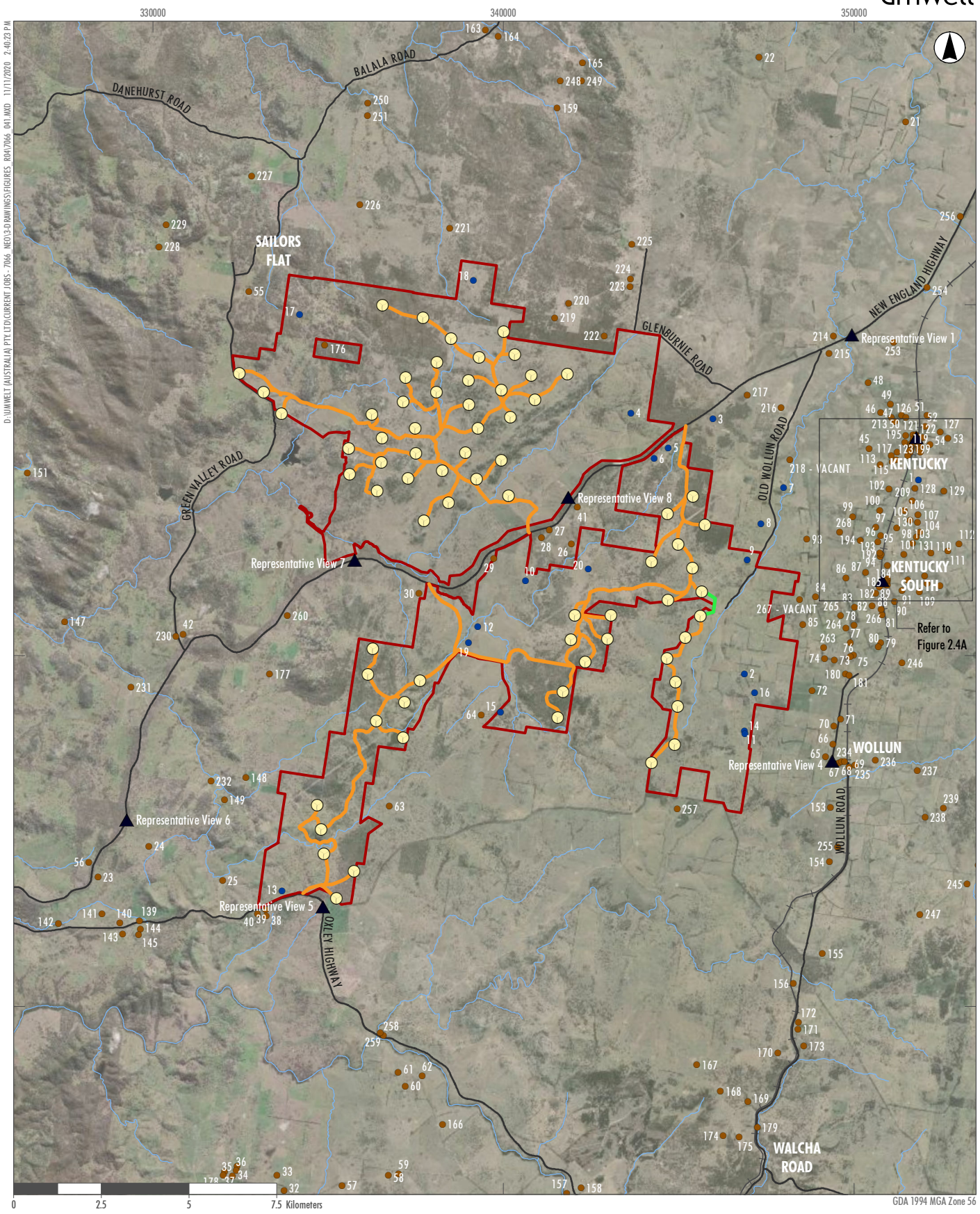
(Vegetation not Considered)

- 1
- 1 - 5
- 5 - 10
- 10 - 30
- 30 - 70

FIGURE 2.3A

Multiple Wind Turbine Analysis

Image Source: ESRI Basemap, Data source: DFSI (2020), Neoen (2020)



Legend

- Project Area
- Primary Access Road
- Electrical Easement Only
- Preliminary Turbine Layout
- Representative View
- Involved Landholder
- Non-involved Landholder
- Road
- Railway
- Watercourse

FIGURE 2.4

Representative Viewpoints for Multiple Wind Turbine Analysis

Image Source: ESRI Basemap, Data source: DFSI (2020), Neoen (2020)

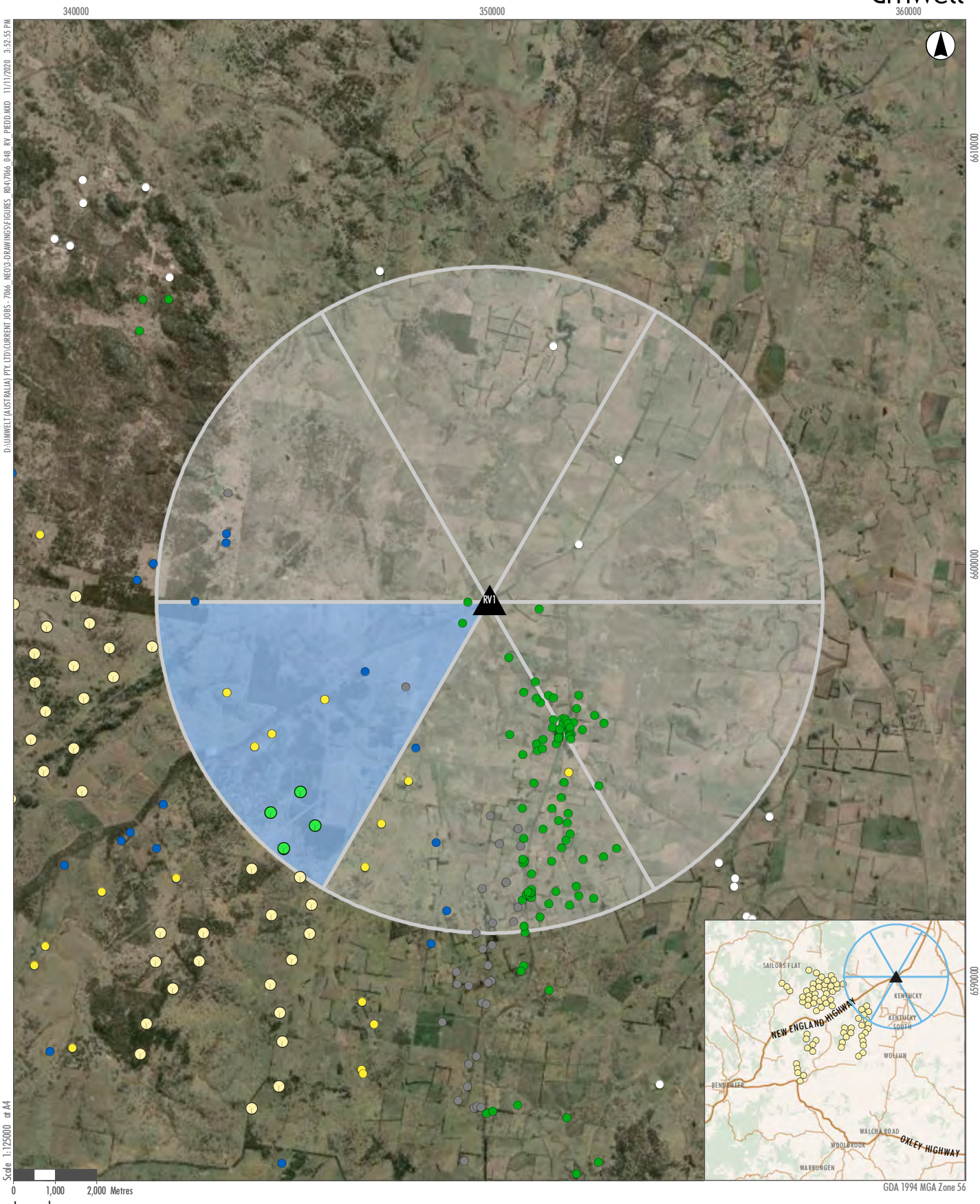
Legend

- Representative View
- Involved Landholder
- Non-involved Landholder
- Road
- Railway
- Watercourse

FIGURE 2.4A

Representative Viewpoints for Muiltiple Wind Turbine Analysis

Image Source: ESRI Basemap, Data source: DFSI (2020), Neoen (2020)



Legend

- Representative View Location

Proposed Turbines Visibility

- WTG is Potentially Visible (within 8km)
- WTG is Not Visible (within 8km)
- Proposed Turbines (beyond 8km)

Dwelling Proximity to Proposed WTGs

- Within 3.4km
- 3.4km to 5km
- 5km to 8km
- Greater than 8km
- Involved Dwelling

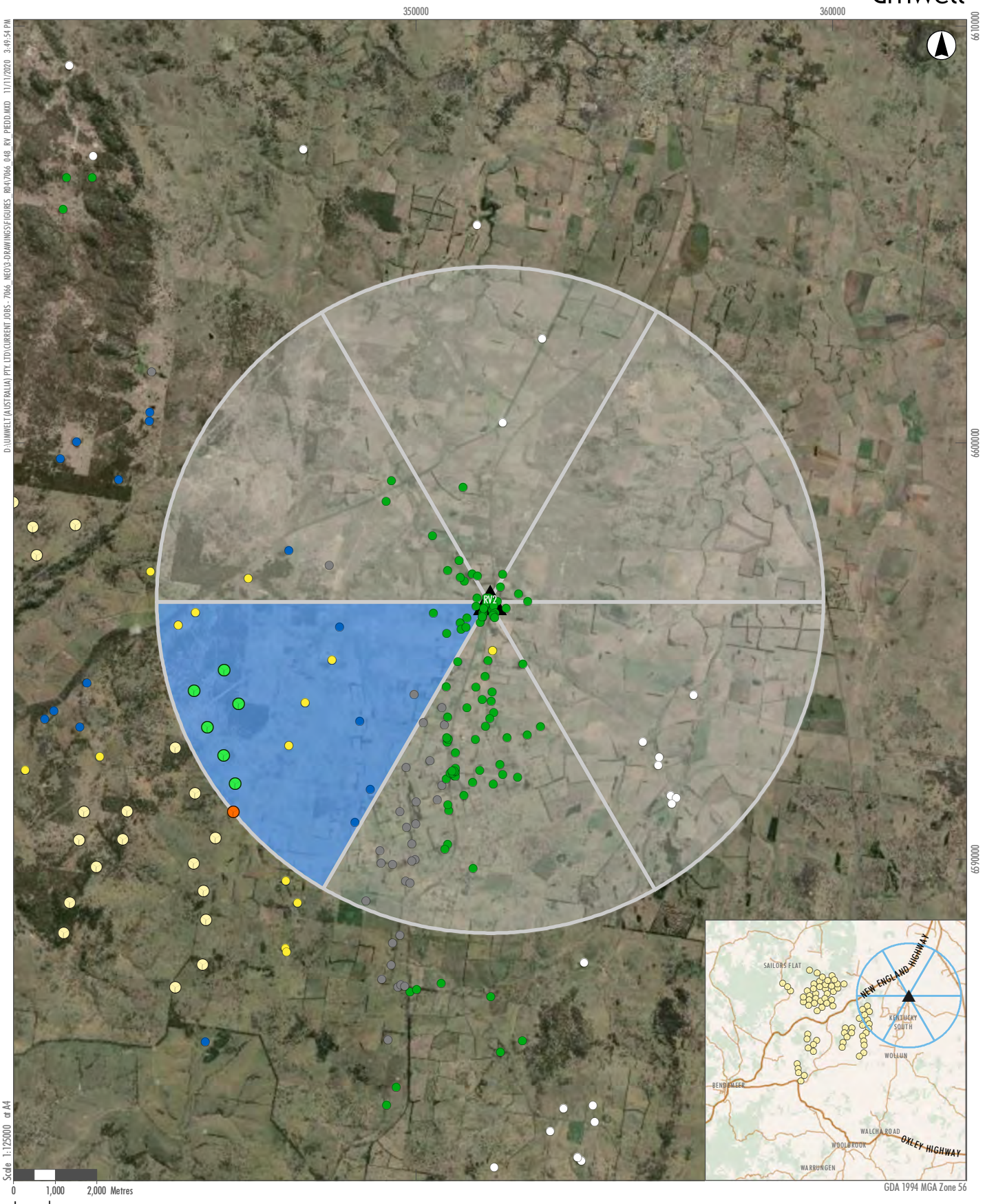
8km Multiple Turbine Visibility Analysis (Visible Turbine Count)

- 0
- 1 - 3
- 4 - 5
- 6 - 10
- 11 - 28

FIGURE 2.5

Representative View 1

Image source: ESRI Basemap Data source: Umwelt (2020)



Legend

- Representative View Location

Proposed Turbines Visibility

- WTG is Potentially Visible (within 8km)
- WTG is Not Visible (within 8km)
- Proposed Turbines (beyond 8km)

Dwelling Proximity to Proposed WTGs

- Within 3.4km
- 3.4km to 5km
- 5km to 8km
- Greater than 8km
- Involved Dwelling

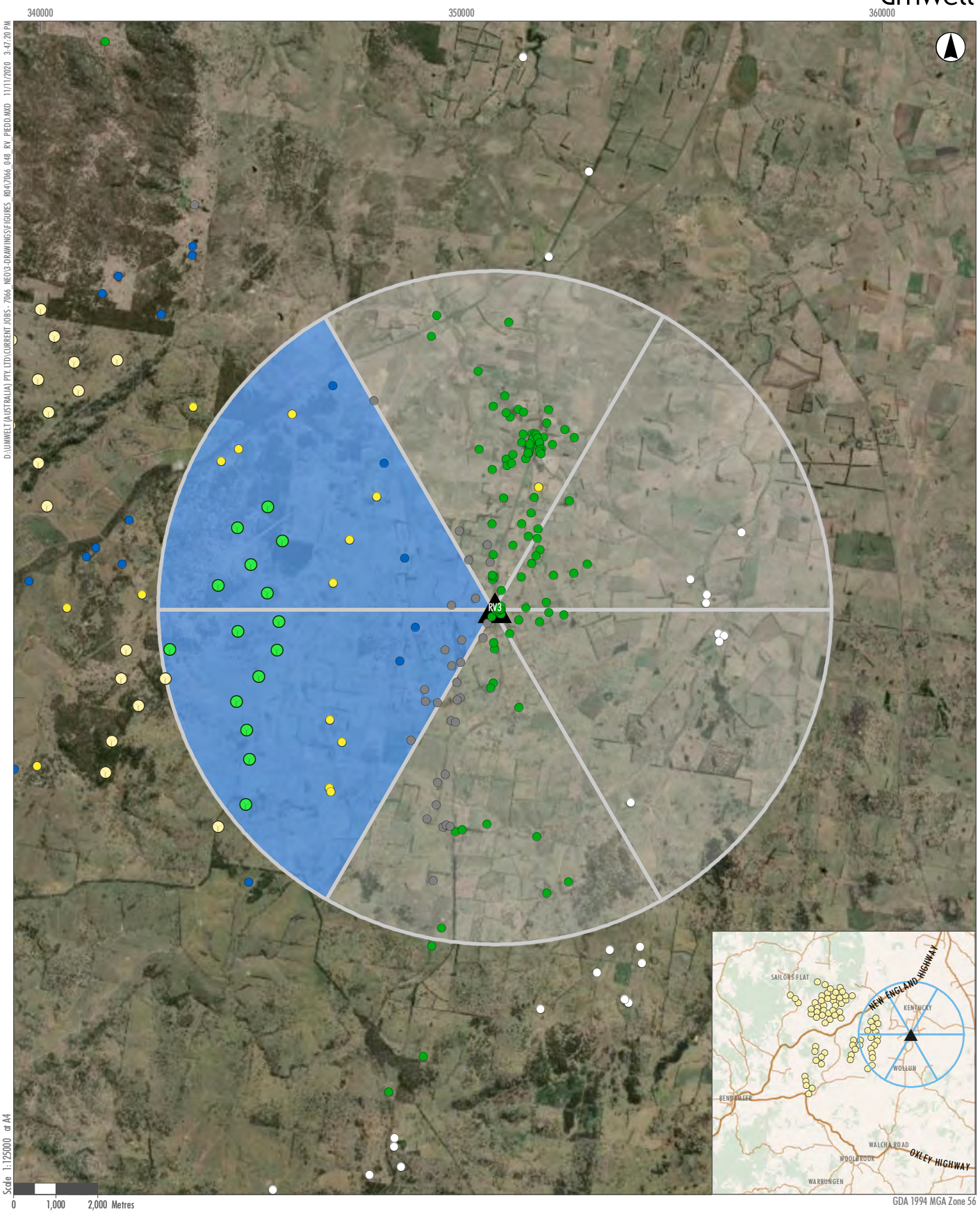
8km Multiple Turbine Visibility Analysis (Visible Turbine Count)

- 0
- 1 - 3
- 4 - 5
- 6 - 10
- 11 - 28

FIGURE 2.6

Representative View 2

Image source: ESRI Basemap Data source: Umwelt (2020)



Legend

▲ Representative View Location

Proposed Turbines Visibility

- WTG is Potentially Visible (within 8km)
- WTG is Not Visible (within 8km)
- Proposed Turbines (beyond 8km)

Dwelling Proximity to Proposed WTGs

- Within 3.4km
- 3.4km to 5km
- 5km to 8km
- Greater than 8km
- Involved Dwelling

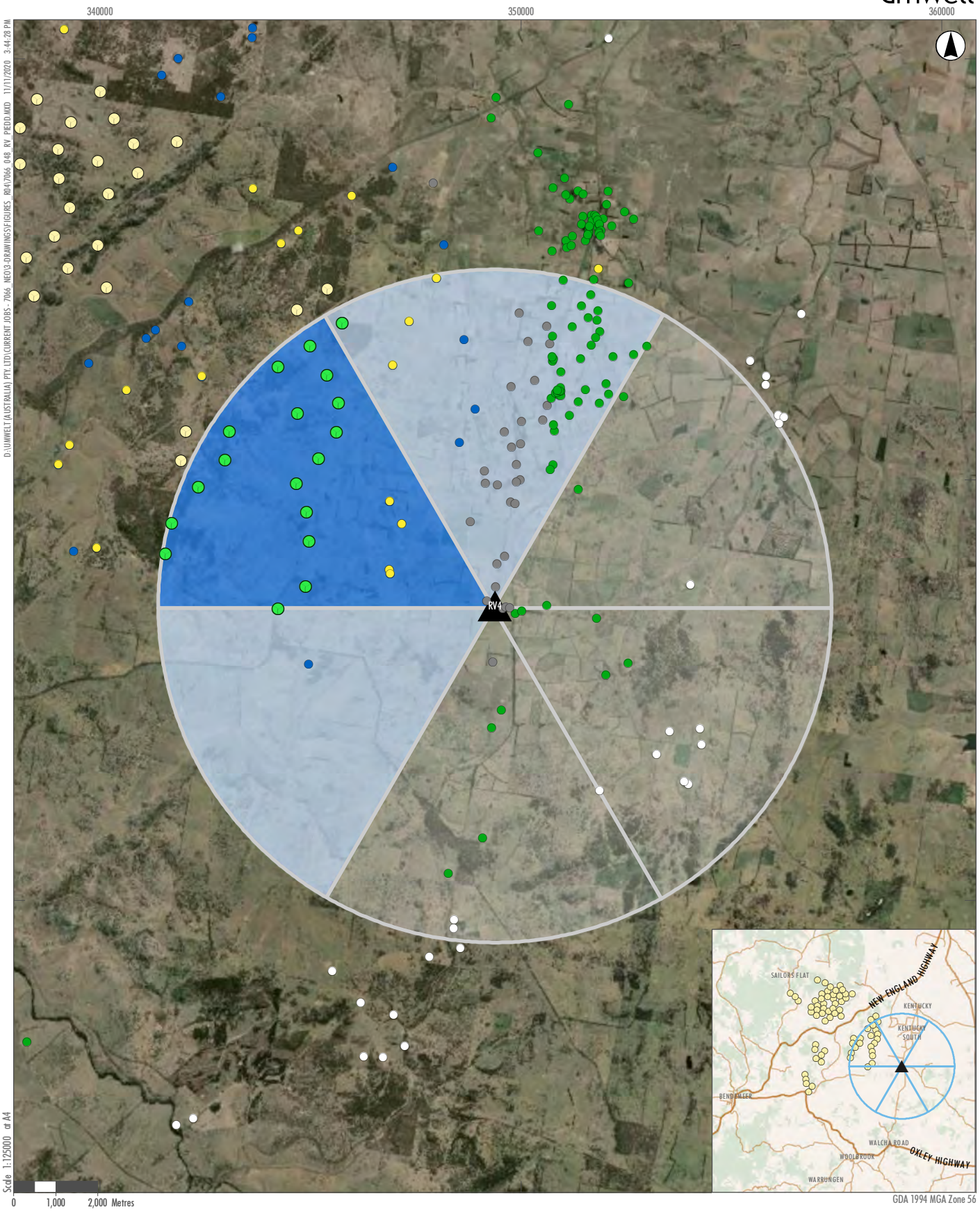
8km Multiple Turbine Visibility Analysis (Visible Turbine Count)

- 0
- 1 - 3
- 4 - 5
- 6 - 10
- 11 - 28

FIGURE 2.7

Representative View 3

Image source: ESRI Basemap Data source: Umwelt (2020)



Legend

- ▲ Representative View Location

Proposed Turbines Visibility

- WTG is Potentially Visible (within 8km)
- WTG is Not Visible (within 8km)
- Proposed Turbines (beyond 8km)

Dwelling Proximity to Proposed WTGs

- Within 3.4km
- 3.4km to 5km
- 5km to 8km
- Greater than 8km
- Involved Dwelling

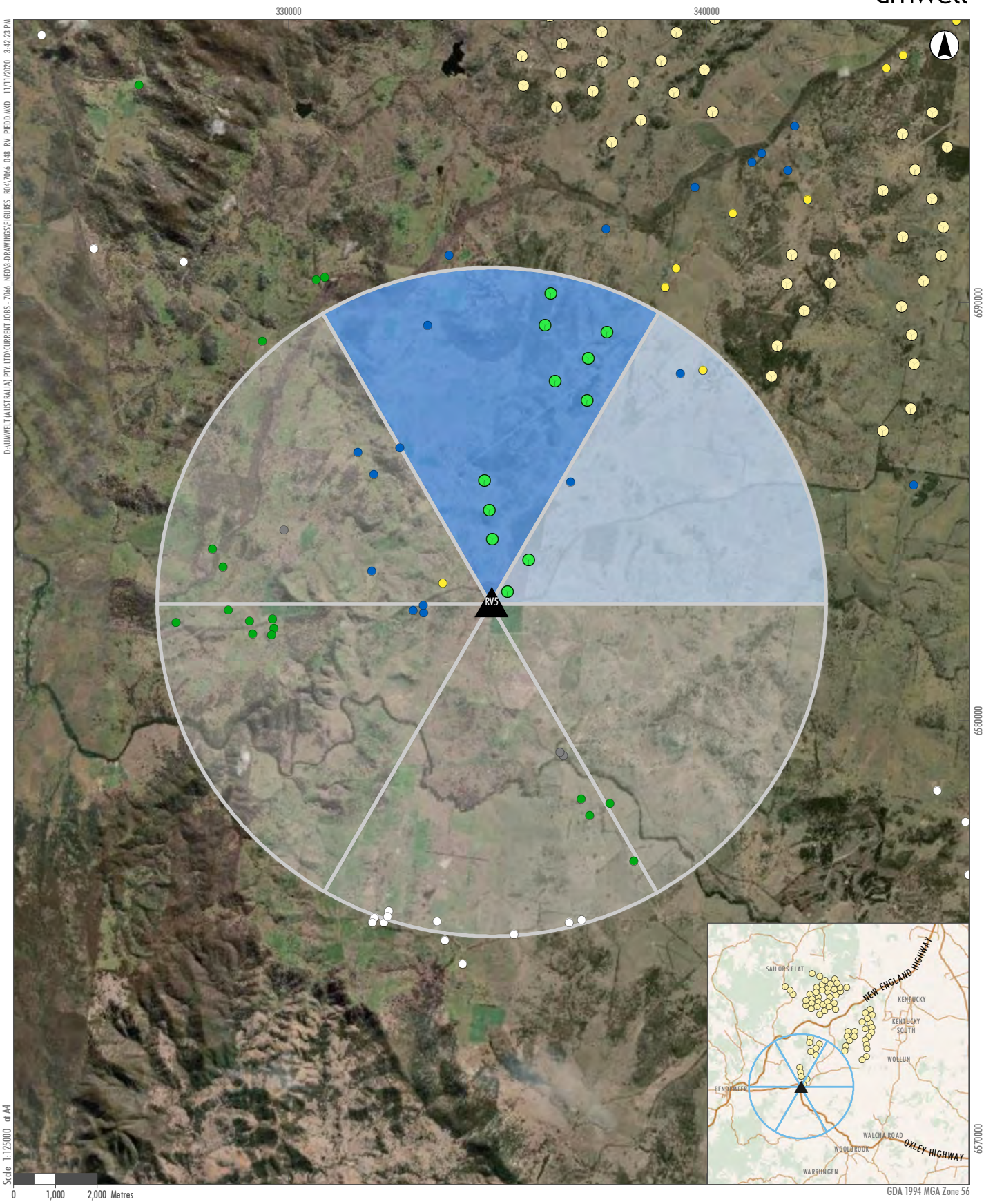
8km Multiple Turbine Visibility Analysis (Visible Turbine Count)

- 0
- 1 - 3
- 4 - 5
- 6 - 10
- 11 - 28

FIGURE 2.8

Representative View 4

Image source: ESRI Basemap Data source: Umwelt (2020)



Legend

- ▲ Representative View Location

Proposed Turbines Visibility

- WTG is Potentially Visible (within 8km)
- WTG is Not Visible (within 8km)
- Proposed Turbines (beyond 8km)

Dwelling Proximity to Proposed WTGs

- Within 3.4km
- 3.4km to 5km
- 5km to 8km
- Greater than 8km
- Involved Dwelling

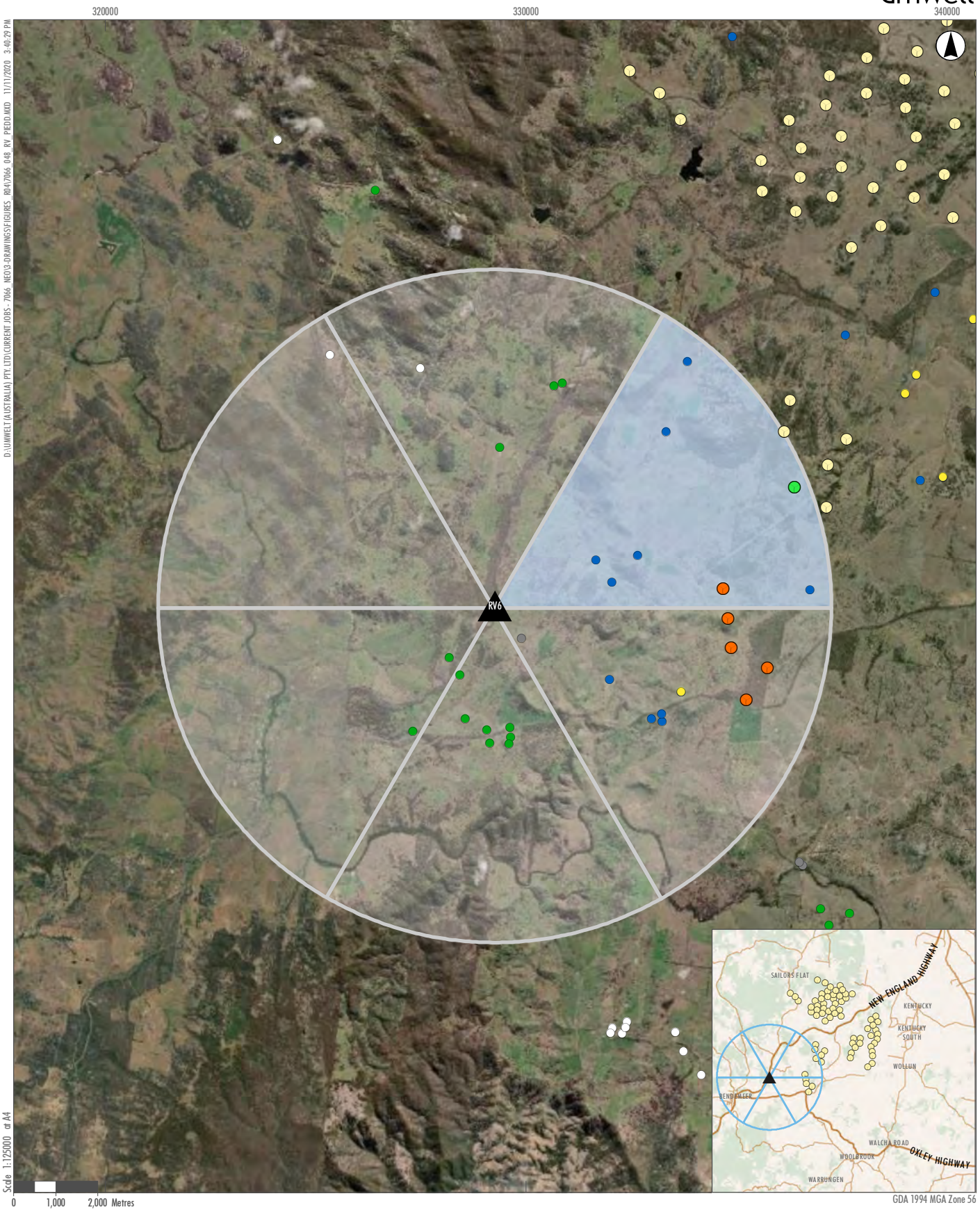
8km Multiple Turbine Visibility Analysis (Visible Turbine Count)

- 0
- 1 - 3
- 4 - 5
- 6 - 10
- 11 - 28

FIGURE 2.9

Representative View 5

Image source: ESRI Basemap Data source: Umwelt (2020)



Legend

- ▲ Representative View Location

Proposed Turbines Visibility

- WTG is Potentially Visible (within 8km)
- WTG is Not Visible (within 8km)
- Proposed Turbines (beyond 8km)

Dwelling Proximity to Proposed WTGs

- Within 3.4km
- 3.4km to 5km
- 5km to 8km
- Greater than 8km
- Involved Dwelling

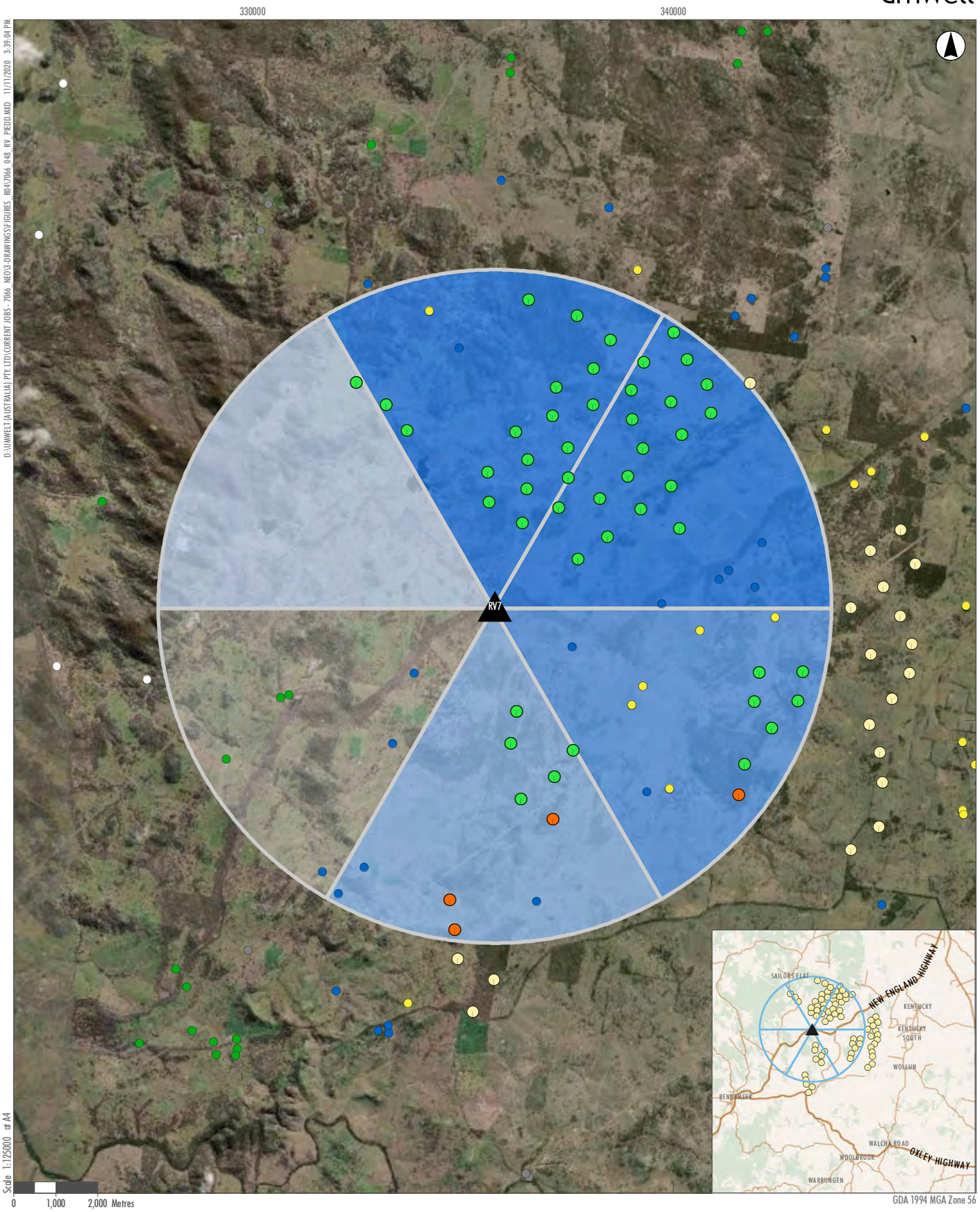
8km Multiple Turbine Visibility Analysis (Visible Turbine Count)

- 0
- 1 - 3
- 4 - 5
- 6 - 10
- 11 - 28

FIGURE 2.10

Representative View 6

Image source: ESRI Basemap Data source: Umwelt (2020)



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Scale 1:125000 at A4

Legend

- ▲ Representative View Location

Proposed Turbines Visibility

- WTG is Potentially Visible (within 8km)
- WTG is Not Visible (within 8km)
- Proposed Turbines (beyond 8km)

Dwelling Proximity to Proposed WTGs

- Within 3.4km
- 3.4km to 5km
- 5km to 8km
- Greater than 8km
- Involved Dwelling

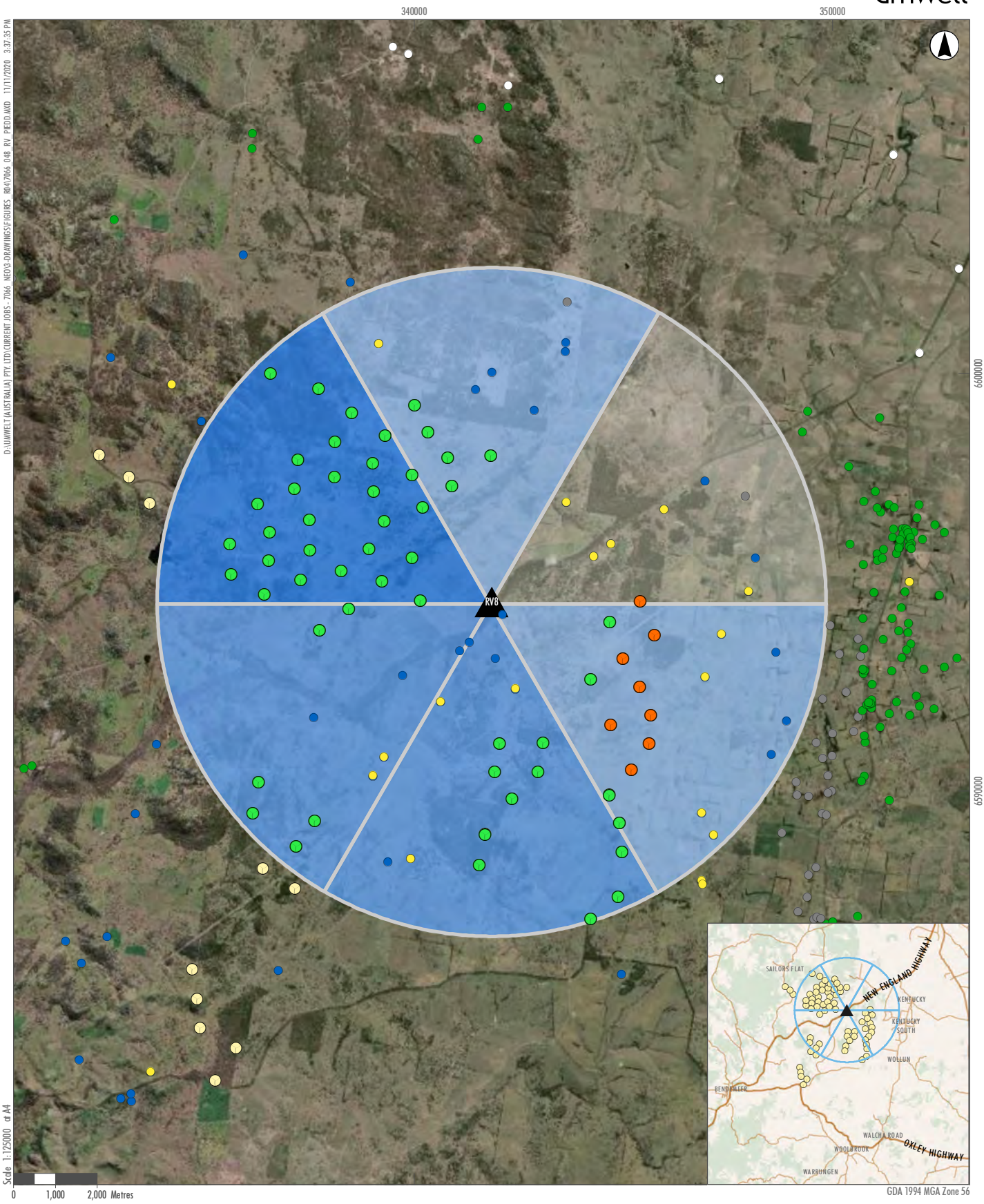
8km Multiple Turbine Visibility Analysis (Visible Turbine Count)

- 0
- 1 - 3
- 4 - 5
- 6 - 10
- 11 - 28

FIGURE 2.11

Representative View 7

Image source: ESRI Basemap Data source: Umwelt (2020)



Legend

- ▲ Representative View Location

Proposed Turbines Visibility

- WTG is Potentially Visible (within 8km)
- WTG is Not Visible (within 8km)
- Proposed Turbines (beyond 8km)

Dwelling Proximity to Proposed WTGs

- Within 3.4km
- 3.4km to 5km
- 5km to 8km
- Greater than 8km
- Involved Dwelling

8km Multiple Turbine Visibility Analysis (Visible Turbine Count)

- 0
- 1 - 3
- 4 - 5
- 6 - 10
- 11 - 28

FIGURE 2.12

Representative View 8

Image source: ESRI Basemap Data source: Umwelt (2020)

3.0 Conclusion

This Preliminary Visual Impact Analysis for the Project has been prepared to indicate the level of potential visual impacts associated with the Project and to inform the required scope of work for the detailed visual assessment to be undertaken as part of the EIS. The preliminary assessment tools used in this preliminary assessment are not determinative and are not designed to provide a 'yes' or 'no' answer as to whether particular turbines are or are not acceptable. Rather, the preliminary assessment provides an early indication of where placement of turbines will require further detailed assessment and justification, and where consultation with potentially affected landowners needs to be focused which may include discussions for landholder agreements.

The preliminary assessment has found that a turbines will be visible from a number of residences and other public viewing locations such as roads, and that further detailed assessment will be required to both inform the final Project layout and as part of the EIS.

Neoen has also commenced consultation with local residents and the broader community regarding the Project and has gathered information about stakeholder views on the visual landscape, potential visual impacts and views on the Project more generally. This stakeholder feedback will be considered by Neoen in finalising the Project design and in the completion of the detailed visual assessment. Neoen will continue to consult with stakeholders as the Project progresses.

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