APPENDIX K LANDSCAPE AND VISUAL IMPACT ASSESSMENT

The Plains Wind Farm

Landscape and Visual Impact Assessment

moir
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The Plains Wind Farm

Landscape and Visual Impact Assessment

Prepared for
Engie Group C/o ERM Pty Ltd

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Contents

Executive Summary 5

1.0 Introduction 7

1.1 Introduction 7
1.2 Relevant Experience 7

2.0 Study Method 9

2.1 Secretary's Environmental Assessment Requirements (SEARs) 9
2.2 Wind Energy: Visual Assessment Bulletin 9
2.3 Overview of the Study Method 9
2.4 Report Structure and LVIA Process 10
2.6 Additional Literature 12
2.7 Policy Considerations 12

3.0 Project Overview 14

3.1 Regional Context 14
3.2 The Study Area 15
3.3 The Project Area 15
3.4 The Project 15
3.5 Wind Turbine Design 17
3.6 Associated Infrastructure 18
3.7 Other Definitions 18

4.0 Community Consultation 21

4.1 Community Consultation Process 21
4.2 Results of Preliminary Stakeholder Engagement and Consultation 21
4.3 Community Perception and Concerns 21

5.0 Visual Baseline Study 24

5.1 Visual Baseline Study 24
5.2 Bioregion Context 25
5.3 Sensitive Land Use Designations 26
5.4 Key Features and Viewpoints 29
5.5 Scenic Quality Class Rating 32
5.6 Landscape Character Unit Classification 32

6.0 Preliminary Assessment Tools 38

6.1 Overview of Preliminary Assessment Tools 38
6.2 Preliminary Assessment Tool 1: Visual Magnitude 38
6.3 Results of Preliminary Assessment Tool 1: Visual Magnitude 40
6.4 Preliminary Assessment Tool 2: Multiple Wind Turbine Tool 41

7.0 Zone of Visual Influence 46

7.1 Zone of Visual Influence 46
7.2 Summary of Zone of Visual Influence 46

8.0 Public Viewpoint Analysis 50

8.1 Overview of Public Viewpoint Analysis 50
8.2 Public Viewpoint Analysis Methodology 50
8.3 Visual Influence Zone (VIZ) 51
8.4 Summary of Public Viewpoint Analysis 53

9.0 Dwelling Assessments 55

9.1 Overview of Dwelling Assessment 55
9.2 Study Method for Dwelling Assessments 55
9.3 Visual Impact Rating Methodology 57
9.4 Overview of Lots with Dwelling Entitlements 61
9.5 Summary of Dwelling Assessment 65

10.0 Photomontages and Wire Frame Diagrams 67

10.1 Overview of Photomontages and Wire Frame Diagrams 67
10.2 Photomontage Limitations 67
10.3 Photomontage Selection Process 68
10.4 Photomontage Development Methodology 69

11.0 Night Lighting Assessment 72

11.1 Overview of Night Lighting 72
11.2 Aviation Hazard Lighting 72
11.3 Overview of potential visual impacts from Night lighting 74
11.4 Recommendations to reduce the potential visual impacts from Night lighting 74
11.5 Potential Impacts of Lighting Associated with Ancillary Infrastructure 75

12.0 Shadow Flicker and Blade Glint Assessment 78

12.1 Overview of Shadow Flicker 78
12.2 Shadow Flicker Assessment Methodology 78
12.3 Results of Shadow Flicker Assessment 79
12.4 Overview of Blade Glint 79

13.0 Cumulative Impact Assessment 82

13.1 Overview of Cumulative Visual Impacts 82
13.2 Nearby Renewable Energy Projects 83
13.3 Cumulative Impact Assessment of Nearby Renewable Energy Projects 83
13.4 Cumulative Visual Impact on the Broader Landscape Character 89

14.0 Associated Infrastructure Assessment 91

14.1 Overview of Associated Infrastructure 91
14.2 Transmission Lines 91
14.3 Internal Access Roads 93
14.4 On-site Substations 93
14.4.1 Substations 93
14.5 Meteorological Monitoring Masts 93
14.6 Operations and Maintenance (O&M) Facility 94
14.7 Workers Accommodation Facility 94
14.8 Other Temporary Infrastructure 94
In addition, temporary infrastructure elements such as: 94

15.0 Overview of Impact on Landscape Character 96

15.1 Overview of Visual Impacts on Landscape Character 96
15.2 Overview of the Visual Impact on LCUs 96

16.0 Mitigation Measures 99

16.1 Overview of Mitigation Measures 99
16.2 Project Layout and Design 99
16.3 Mitigation Measures - Residences 100
16.4 Landscaping Principles 100

17.0 Evaluation of Visual Performance Objectives 102

17.1 Overview of Visual Performance Objectives 102

18.0 Conclusion 107

Appendix A - Visual Influence Zone Study Method

Appendix B - Public Viewpoint Analysis

Appendix C - Detail Dwelling Assessments

Appendix D - Photomontages and Wire Frame Diagrams

Appendix E - Mitigation Measures at Non-associated Dwellings

List of Figures

Figure 1: Regional Context 14
Figure 2: Birds Eye View of the Site 15
Figure 3: Project Layout 16
Figure 4: Wind Turbine Parameters 17
Figure 5: Results of Community Interviews - Positive feedback 22
Figure 6: Results of Community Interviews - Neutral / mixed feedback 22
Figure 7: Results of Community Interviews - Negative feedback 22
Figure 8: NSW Riverina Bioregion 25
Figure 9: Land Use Zoning 27
Figure 10: Land Use 28
Figure 11: Existing Landscape Features 31
Figure 12: Landscape Character Units 33
Figure 13: Preliminary Assessment Tool 1: Visual Magnitude thresholds for Project Layout 38
Figure 14: Preliminary Assessment Tool 1: Visual Magnitude 39
Figure 15: Preliminary Assessment Tool 2: Multiple Wind Turbines 41
Figure 16: Preliminary Assessment Tool 2:Multiple Wind Turbine Tool 43
Figure 17: Cumulative Multiple Wind Turbine Tool 44
Figure 18: Zone of Visual Influence (Blade Tip Height 270 m) 47
Figure 19: Zone of Visual Influence (Hub Height 180 m) 48
Figure 20: Methodology for determining Visual Influence Zone (VIZ) 51
Figure 21: Public Viewpoint Analysis Locations 52
Figure 22: Detailed Dwelling Assessment Locations 58
Figure 23: Lots with Dwelling Entitlements 62
Figure 24: Photomontage Development Process 70
Figure 25: Photomontage Locations (Public and Private Receptors) 71
Figure 26: Surface Reflectivity 77
Figure 27: Downward Lighting 77
Figure 28: Light Shielding 77
Figure 29: Shadow Flicker Assessment 81
Figure 30: SW REZ 84
Figure 31: Renewable Energy Projects within proximity of the Project 84
Figure 32: Cumulative Visual Impact (MWTT) 86
Figure 33: Wire frame diagram - Cumulative Visual Impact from 16 Mile Gums Rest Area 88
Figure 34: Wire frame diagram - Cumulative Visual Impact from 16 Mile Gums Rest Area 89
Figure 35: Associated Infrastructure 93

List of Tables

Table 1 Report Structure 11
Table 2 Wind Turbine Parameters for Visual Assessment 17
Table 3 Associated Infrastructure 18
Table 4 Visual Baseline Study Inputs as per the Bulletin 24
Table 5 Scenic Quality Rating Frame of Reference 32
Table 6 Overview of LCU Scenic Quality Ratings 36
Table 7 Dwellings within 8,000 m of the nearest turbine 40
Table 8 Photography Specifications 50
Table 9 Dwelling Assessment Process 56
Table 10 Visual Impact Rating Methodology - Residences 57
Table 11 Summary of Assessment of Non-associated Dwellings 59
Table 12 Summary of Assessment of Lots with Dwelling Entitlements 63
Table 13 Overview of Photomontage Locations 68
Table 14 Shadow Flicker Assessment Parameters 78
Table 15 Receptors with potential to experience shadow flicker 79
Table 16 Summary of nearby renewable energy projects 82
Table 17 Non-associated dwellings and key public viewpoints (receptors) within 8,000 m of surrounding wind farm projects identified using Multiple Wind Turbine Tool 86
Table 18 Overview of Impact on Landscape Character Units 97
Table 19 Evaluation of Visual Performance Objectives - Visual Magnitude 102
Table 20 Landscape Scenic Integrity - Evaluation of Visual Performance Objectives 103
Table 21 Multiple Wind Turbine Effects - Evaluation of Visual Performance Objectives 104
Table 22 Shadow Flicker & Blade Glint - Evaluation of Visual Performance Objectives 104
Table 23 Aviation Hazard Lighting - Evaluation of Visual Performance Objectives 105

Executive Summary

Moir Landscape Architecture (Moir LA) have been commissioned by ERM Pty Ltd on behalf of Engie Group Pty Ltd (the Applicant) to prepare a Landscape and Visual Impact Assessment (LVIA) for the proposed The Plains Wind Farm (the Project).

The Project is located in the Riverina region of New South Wales, approximately 15 kilometres (km) south of Hay. The Project includes the construction, operation and decommissioning of a wind farm with an estimated capacity 1350 megawatts (MW) and a maximum blade tip height of up to 270 metres (m).

In addition to the wind turbines, the Project consists of ancillary infrastructure including access tracks, road upgrades, underground and overhead electricity cabling, high voltage transmission lines, substations, easements for connections, battery energy storage system, switching station, quarrying locations, concrete batching plants, operations and a maintenance facility. The point of connection into the grid is expected to be via the proposed 330kV NSW-SA interconnector known as 'Project Energy Connect' that is being undertaken by ElectraNet and TransGrid.

Moir LA have utilised a quantitative study methodology that is in accordance with the requirements of the *NSW Wind Energy: Visual Assessment Bulletin* (2016) (referred to hereafter as 'the Bulletin'). Relevant literature and guidelines relating to large scale energy projects and Moir LA's previous experience on large scale infrastructure projects were also influential in developing the Study Method.

The LVIA includes a comprehensive assessment of the existing landscape character, scenic quality and visibility of the Project. Visual Influence Zones have been established from viewpoints and sensitive receptors and assessed against the visual performance objectives outlined in the Bulletin.

Field work was undertaken by Moir LA in November 2021 during the Scoping phase and in March and August 2023 during the EIS phase to understand the visual context of the proposal and to inform a visual baseline which the Project has been assessed against. The assessment determined that the regional landscape character, that is typical of the Southwest NSW and Riverina region, is defined by extensive flat, open landscapes utilised for grazing and dryland or irrigated cropping. The landscape was categorised into six (6) Landscape Character Units (LCUs). A quantitative frame of reference was applied to establish the Scenic Quality Rating of these LCUs which ranged from low to high.

The Scenic Quality Ratings are utilised in defining Visual Influence Zones (VIZ) which are assessed against objectives outlined in the Bulletin.

The Bulletin states that, generally, the visual impact of a wind energy project will depend upon the characteristics and values of the existing landscape, the extent to which the existing landscape is changed by the Project and how these changes are perceived by individuals and the broader community. The assessment, in conjunction with community consultation identified the key landscape features and viewpoints within the Study Area.

The open and flat nature of the landscape will afford expansive, open views of the Project from most public locations. However, the predominant existing landscape character is considered to be of low scenic quality due to it being highly modified and lacking any distinct landscape features. Surrounding settlements are scattered and large tracts of land are generally uninhabited. Windbreak vegetation and ancillary structures around the dwellings play an important role in limiting views of the Project. The assessment found that while the Project would change the character of the surrounding landscape, the landscape was not determined to be rare or largley unmodifed, and therefore highly sensitive to change and development.

In accordance with the Bulletin, Moir LA applied the Preliminary Assessment Tools to the Project layout to determine dwelling receptors that require detailed assessment. The assessment identified a total of eight (8) non-associated dwellings within 8,000 m of the nearest turbine, of which two (2) non-associated dwellings are located within the black line of visual magnitude (3,500 m of the nearest turbine) and three (3) non-associated dwellings are located within the blue line of visual magnitude (5,300 m of the nearest turbine). As of March 2024, one (1) lodged Development Application (DAD_1) was identified within 8,000 m of the nearest turbine. Site inspections and desktop assessment identified that:

- None of the existing non-associated dwellings have the potential for a high visual impact.
- Five (5) non-associated dwellings have the potential for moderate visual impact.
- The remaining three (3) non-associated dwellings and one (1) DA location were assessed as having a low visual impact rating.

Practical and feasible mitigation measures have been proposed for each of the five (5) non-associated dwellings with a moderate visual impact rating. The proposed mitigation methods recommended in the report will assist in reducing the visual impact from these dwellings. Mitigation measures in keeping with the existing character include screen planting and supplementary planting of existing vegetation.

The Project has been assessed against the Visual Performance Objectives as per the Bulletin.

01
Introduction

1.0 Introduction

1.1 Introduction

Engie (the Applicant) proposes to develop The Plains Renewable Energy Hub, which comprises of a hybrid wind farm, solar farm and battery energy storage system (BESS). Moir Landscape Architecture (Moir LA) has been commissioned by ERM Pty Ltd on behalf of the Applicant to prepare this Landscape and Visual Impact Assessment (LVIA) for The Plains Wind Farm (the Project) which is located south of Hay, NSW.

The Project will involve the construction, operation and decommissioning of up to 188 Wind Turbine Generators (WTGs) with a maximum installed capacity of 1350 MW. The Project also includes the construction of ancillary infrastructure such as a Battery Energy Storage System (BESS), substation, collector substations, operations and management facility, high-voltage overhead transmission lines, switchyard and other temporary infrastructure.

The purpose of this report is to provide a comprehensive assessment of visibility and potential visual impacts associated with the Project on the landscape character, landscape values, landscape amenity and any scenic vistas. The report details the results of the field work, documents the assessment of the landscape character and visual setting, and makes recommendations to assist in the mitigation of any potential impacts resulting from the proposed development.

This LVIA has been prepared in accordance with the *Wind Energy: Visual Assessment Bulletin December* (2016), referred to hereafter as 'the Bulletin'. This LVIA forms a part of the Environmental Impact Statement (EIS) to be submitted to the Department of Planning, Housing and Infrastructure (DPHI). This information will assist the community and the DPHI to understand and assess the likely visual impacts.

1.2 Relevant Experience

The Bulletin states: *"the proponent is expected to engage professionals from relevant natural resource management and design professions (for example environmental planners, geographers, landscape architects, architects, or other visual resource specialists), with demonstrated experience and capabilities in visual assessment to carry out a wind energy project visual assessment"* (DPE, 2016).

Moir LA is a professional design practice and consultancy specialising in the areas of Landscape Architecture, Landscape Planning and Landscape and Visual Impact Assessments. Our team has extensive experience in undertaking LVIAs for large scale infrastructure projects, including the mining industry, sustainable energy sector and commercial developments in visually sensitive areas. Our capabilities include digital terrain modelling, viewshed assessment, photomontage development, landscape character assessment and community consultation.

Our team has extensive experience in undertaking LVIAs for wind energy projects. In the context of our experience and with guidance from the Bulletin we have developed methodologies to ensure a comprehensive and qualitative assessment of the Project.

Relevant experience includes the preparation of Preliminary Visual Impact Assessments (PVIAs) and LVIAs for the following Wind Energy Projects:

- *Keri Keri Wind Farm PVIA* (Keri Keri, New South Wales)
- *Dinawan Energy Hub Wind Farm PVIA* (Coleambally, New South Wales)
- *Wilan Wind Farm PVIA* (Keri Keri, New South Wales)
- *Bullawah Wind Farm PVIA* (30 km southeast of Hay, New South Wales)
- *Uungula Wind Farm LVIA* (Wellington, New South Wales)
- *Hills of Gold Wind Farm LVIA* (Nundle, New South Wales)
- *Jeremiah Wind Farm LVIA* (Adjungbilly, New South Wales)
- *Valley of the Winds Wind Farm LVIA* (Coolah, New South Wales)
- *Thunderbolt Wind Farm LVIA* (Kentucky, New South Wales)

02

Study Method

2.0 Study Method

2.1 Secretary's Environmental Assessment Requirements (SEARs)

The Project is classified as State Significant Development (SSD) and will be assessed and determined under the provisions of the *Environmental Planning and Assessment Act 197*9.

Secretary's Environmental Assessment Requirements (SEARs) issued on the 16th of December 2022 for the Project state the EIS must address the following specific issues for the wind farm and associated infrastructure relating to potential visual impacts:

"Landscape and Visual – including a detailed assessment of the visual impacts of all components of the project (including turbines, transmission lines, substations, and any other ancillary infrastructure in accordance with the NSW Wind Energy: Visual Assessment Bulletin (DPE, 2016), including detailed consideration of potential visual impacts on local residences (including approved developments, lodged development applications and dwelling entitlements), scenic or significant vistas and road corridors in the public domain." (DPE, 2022c).

A brief overview of the requirements of the Bulletin for State Significant Wind Energy Development is provided in **Section 2.2**.

2.2 Wind Energy: Visual Assessment Bulletin

The Bulletin was adopted by the then DPE (now DPHI) in December 2016. The Bulletin has been developed to guide the appropriate location of wind energy development in NSW and to establish a framework for the assessment of visual impacts associated with wind energy.

The objectives of the Bulletin are to:

- Provide the community, industry and decision-makers with a framework for visual impact analysis and assessment that is focused on minimising and managing the most significant impacts;
- Facilitate improved wind turbine and ancillary infrastructure siting and design during the pre-lodgement phase of a project, and encourage early consideration of visual impacts to minimise conflicts and delays where possible, and provide for a better planning outcomes;
- Provide the community and other stakeholders with greater clarity on the process along with an opportunity to integrate community landscape values into the assessment process; and
- Provide greater consistency in assessment by outlining appropriate assessment terminology.

The visual assessment process is broken into two main stages:

Stage 1: Preliminary Environmental Assessment and
Stage 2: LVIA

This LVIA responds to the requirements of Stage 2 of the Bulletin. The Preliminary Visual Impact Assessment (PVIA) prepared for Stage 1 was undertaken by Moir LA in November 2022 and the findings of that assessment have been included in this report.

2.3 Overview of the Study Method

In accordance with the Bulletin, the visual assessment includes (DPE, 2016):

- *a baseline study that includes analysis of the landscape character, scenic quality and visibility from viewpoints of different sensitivity levels;*
- *establishment of visual influence zones from viewpoints using data collected in the baseline study;*
- *assessment of the proposed layout against visual performance objectives; and*
- *justification for the final proposed layout and identification of mitigation and management measures.*

Moir LA have formulated a quantitative study methodology with regards to the Bulletin and with consideration of previous experience on large scale infrastructure projects and relevant literature and guidelines relating to large scale energy projects.

Extensive field work and photographic survey work for the study was undertaken in March 2023 from public and private properties. In addition, field work and photographic survey conducted in the PVIA phase was also utilised for detailed assessment.

2.4 Report Structure and LVIA Process

The flow chart provides a high level overview of the LVIA process utilised to undertake the assessment. **Table 1** provides an outline of the report structure, a brief overview of the objectives of the Bulletin and a summary of how these have been addressed in the LVIA. Detailed methodologies for each section of the assessment have been included in the relevant chapters of the report.



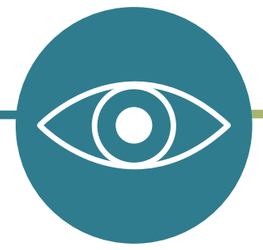
Project Overview

Provide an overview of the aspects of the Project and the parameters against which the assessment is based.



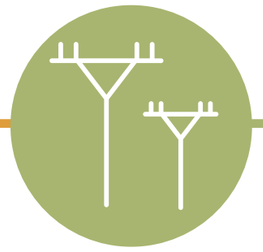
Visual Baseline Study

Comprehensive assessment of the existing landscape character to determine the baseline against which the Project will be assessment against. Input from the community to determine landscape values is integral in this phase.



Define the Visual Catchment

Determine the visual catchment through the use of Preliminary Assessment Tools and GIS mapping to determine the extent of visibility and identify areas upon which to undertake detailed assessment.



Other Considerations

Assessment of other aspects which have the potential to contribute to the visual impact. This includes an assessment of associated infrastructure, cumulative impact from surrounding Projects and night lighting.



Visualisations

The use of visualisation tools (including photomontages and wire frame diagrams) to assist in the assessment of the Project.



Key Viewpoint Analysis

Undertake assessments from key viewing locations identified within the ‘visual catchment’ to determine the impact of the Project. This includes an assessment from public and private viewing locations.



Summary and Recommendations

Summary of the findings of the report and preliminary recommendations for reducing the identified impacts.

Landscape and Visual Impact Assessment Report Structure:

PROJECT OVERVIEW	**Section 3.0: Project Overview**	**The Bulletin Requirements Addressed:**
	• Detailed Project Description • Wind Turbine Design • Associated Infrastructure	• *The VIA is to include a full description of the proposed wind energy project design, the layout, structural elements and scenarios being considered.*
VISUAL BASELINE STUDY	**Section 4.0: Community Consultation**	**Visual Bulletin Requirements Addressed:**
	• Community Consultation Process • Community Landscape Values • Community Perception	• *The proponent is to further consult with the community to verify the community consultation findings from the scoping and design stage.*
	Section 5.0: Visual Baseline Study	**Visual Bulletin Requirements Addressed:**
	• Detailed assessment of Landscape Character and Key Features of the Region • Landscape Character Unit Classification • Application of Scenic Quality Class Ratings	• *A visual baseline study must be undertaken to establish the existing landscape and visual conditions. The baseline study is prepared and evaluated by the proponent prior to undertaking any visual analysis.* • *Describe, assess and map these factors in written and graphic forms supported by photographic representations of the area.* • *Identify Scenic Quality Classes.*
VISUAL CATCHMENT	**Section 6.0: Preliminary Assessment Tools**	**Visual Bulletin Requirements Addressed:**

	Define the Visual Catchment of the Project:
	• Preliminary Assessment Tools:
	  • Visual Magnitude
	  • Multiple Wind Turbine Effect
		• *Visual Magnitude Assessment: Mapping the dwellings, key viewpoints and proposed turbines at scale to establish the potential visual magnitude.*
		• *Map into six sectors of 60º any proposed turbines and any existing or approved turbines within each dwelling or key public viewpoint.*

	Section 7.0: Zone of Visual Influence	**Visual Bulletin Requirements Addressed:**
	• Zone of Visual Influence (ZVI)	• *Establish the theoretical 'zone of visual influence' of the proposal (the area from which the proposal is theoretically visible or the 'visual catchment').*
KEY VIEWPOINT ASSESSMENT	**Section 8.0: Public Viewpoint Analysis**	**Visual Bulletin Requirements Addressed:**
	• Assessment of viewpoints from areas identified within the visual catchment. **Refer to Appendix B - Public Viewpoint Analysis**	• *All key public viewpoints and individual dwellings within the 'visual catchment' should be identified and assessed.* • *The visual performance objectives form the principle framework and guide for assessing the proposed wind energy project when applied to individual viewpoints.*
	Section 9.0: Dwelling Assessment Overview	**Visual Bulletin Requirements Addressed:**
	• Assessment and summary of visual impacts from key viewpoints of dwellings located within visual catchment. **Refer to Appendix C - Dwelling Assessments**	• *All key public viewpoints and individual dwellings within the 'visual catchment' should be identified and assessed.*
VISUALISATIONS	**Section 10.0: Photomontage & WIre Frame Diagrams**	**Visual Bulletin Requirements Addressed:**
	• Photomontage selection process • Photomontage development process **Refer to Appendix D - Photomontages & Wire Frame Diagrams**	• *Photomontages shall be prepared in accordance with the Scottish Natural Heritage Visual Representation of Wind Farms.* • *The visual assessment needs to include a concise description of the complete methodology used to create any photomontages presented in the visual assessment.*
OTHER ASPECTS	**Section 11.0 Night Lighting**	**Visual Bulletin Requirements Addressed:**
	• Night Lighting Assessment	• *Consider whether any obstacle lighting required is likely to result in any significant increase in visual impacts.*
	Section 12.0 Shadow Flicker and Blade Glint Assessment	**Visual Bulletin Requirements Addressed:**
	• Shadow Flicker and Blade Glint Assessment	• *The EIS must incorporate an assessment of the number of hours of potential 'shadow flicker' and minimized blade glint.*
	Section 13.0 Cumulative Visual Impacts	**Visual Bulletin Requirements Addressed:**
	• Cumulative Visual Impacts	• *Address potential cumulative impacts of wind energy projects in the region (the wind energy project as well as existing and approved projects).*
	Section 14.0 Associated Infrastructure	**Visual Bulletin Requirements Addressed:**
	• Overview of impact resulting from Associated infrastructure	• *The assessment of visual impacts from all ancillary facilities and infrastructure will be required.*
SUMMARY AND RECOMMENDATIONS	**Section 15.0 Visual Impact on Landscape Character**	**Visual Bulletin Requirements Addressed:**
	• Overview of Landscape Character Units with regards to Visual Performance Objectives • Summary of impact on Landscape Character	• *Assess the Project using Visual Performance Objectives.*
	Section 16.0 Mitigation Methods	**Visual Bulletin Requirements Addressed:**
	• Mitigation Methods for Residences	• *An outline of any mitigation and management options proposed, including consultation with affected property owners regarding the proposed mitigation works.*
	Section 17.0 Visual Performance Evaluation	**Visual Bulletin Requirements Addressed:**
	• Evaluation of Visual Performance Objectives	• *An assessment of the proposed wind energy project against each visual performance objective.*
	Section 18.0 Conclusion	

Table 1 Report Structure

2.6 Additional Literature

In addition to the Bulletin, the following literature assisted in the formulation of the study methodology and where relevant have been referenced in the report:

- Scottish Natural Heritage, Visual Representation of Wind Farms - Good Practice Guidance (February, 2017)
- Environment Protection and Heritage Council, Draft National Wind Farm Development Guidelines (July, 2010)
- Landscape Institute and Institute of Environmental Management & Assessment, Guidelines for Landscape and Visual Impact Assessment Third edition (2013)
- Clean Energy Council, Best Practice Guidelines for Wind Energy Development (June, 2018)

2.7 Policy Considerations

2.7.1 Local Government Policies

The Project is located within the extents of the Hay Shire Council Local Government Area (LGA), and borders the Edward River Council LGA to the south. The proposal is a State Significant Development (SSD) and will be assessed as such by the DPHI. However, relevant local government policies outlined in the Hay Shire LEP 2011 have also been considered.

2.7.2 NSW Roads and Maritime Services

The LVIA includes an assessment of shadow flicker, blade glint and reflectivity to consider impacts on road users. This has been included in **Section 11.0** of this LVIA.

2.7.3 Civil Aviation Safety Authority

The Aviation Impact Assessment states that obstacle lighting is required for temporary meteorological masts and/or any other permanent masts not in proximity of the turbine. The LVIA includes an assessment of potential visual impact associated with night lighting on the temporary meteorological masts in accordance with the Civil Aviation Safety Authority (CASA). Refer to **Section 11.0** of this LVIA.

03

Project Overview

3.0 Project Overview

3.1 Regional Context

The Project is located approximately 15 kilometres (km) south of Hay in southwest NSW. The majority of the Project is located within the extents of the Hay Shire Council LGA and a small part of the Project is located within the Edward River Council LGA. The Project can be accessed via Cobb Highway, Jerilderie Road and Booroorban-Tchelery Road (refer to **Figure 3**).

The Project is located within the South-West Renewable Energy Zone (SW REZ). The NSW Government has proposed the geographical extent of this REZ and has highlighted that an abundance of high quality wind and solar resources are available in the area. The intended transmission capacity for this REZ is 2.5 gigawatts (GW) (EnergyCo, 2022). The Project is therefore strategically located in a broad area identified as suitable for renewable energy projects.

The development of this REZ will also involve the construction of a new 330 kilovolts (kV) electrical capacity which will run parallel to the existing 220 kV transmission line as part of Project EnergyConnect (Energy NSW, 2022). The existing 220 kV transmission line currently runs east-west with the majority of the Project located on the northern side of this transmission line (refer to **Figure 1**). It is anticipated that a new 330 kV electrical transmission line will be built adjacent to the existing 220 kV electrical transmission line to increase the transmission capacity of the region (EnergyCo, 2022).



Figure 1: Regional Context (Map Source: ESRI Topographic Map, 2022)

3.2 The Study Area

The Study Area is generally defined as the Project Area and surrounding land which requires assessment. The Study Area includes land up to 8 km from the nearest-proposed turbine. The closest landmarks include the town of Hay, the rural locality of Booroorban, a part of the Southwest Woodland Nature Reserve and the 16 Mile Gums Rest Area. The Project is located on either side of the 16 Mile Gums Rest Area (refer to **Figure 2**).

3.3 The Project Area

The Project Area encompasses an area of approximately 53,894 hectares (ha). It is defined by the land encompassed by the Project Area Boundary shown in **Figures 2 and 3**. These properties are primarily utilised for agricultural activities such as grazing and cropping. The Project is located approximately 15 km south of Hay.

3.4 The Project

The Project includes the construction and operation of approximately 188 wind turbines spread across an area of up to 53,894 ha. Associated infrastructure includes battery storage, operation and maintenance (O&M) facilities, internal access roads, civil works and electrical infrastructure (including on-site substations/switching stations, underground cabling and overhead transmission line connections) required to connect to the existing electricity transmission network.

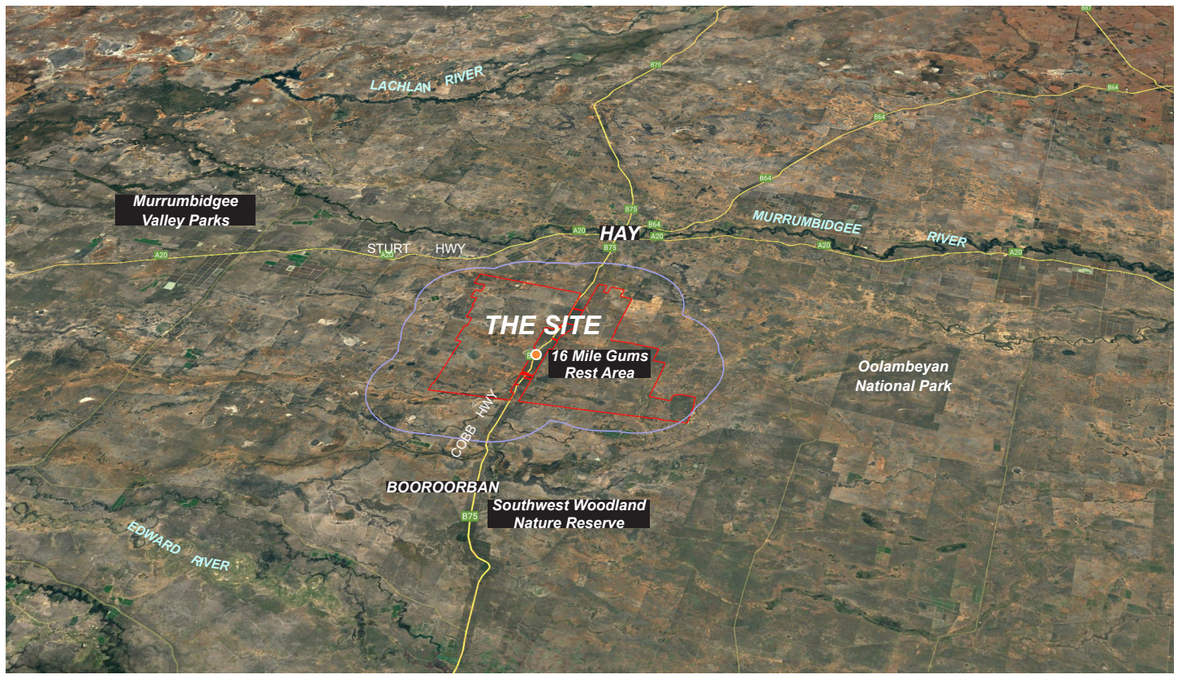


Figure 2: Birds Eye View of the Site (Map Source: Google Maps 2022) (Not to scale)

The Project will have a maximum installed capacity of 1,350 megawatt (MW) and will use turbines with a generator capacity of at least 6 MW. The Project will share the main substation, switchyard, O&M building and BESS identified in The Plains Renewable Energy Park Solar Farm (located directly east of the Project, and subject of a separate SSD application) to allow for the capture and storage of dispatchable energy.

The point of connection into the grid is expected to be via the existing 220 kV electricity transmission line. A new 330 kV electrical transmission line will be built adjacent to the existing 220 kV electrical transmission line as part of Project EnergyConnect (PEC) (EnergyCo, 2022). The layout for the Project has been prepared to locate the turbines within areas identified as having high wind resources and includes the locations of associated and non-associated dwellings (refer to **Figure 3**).

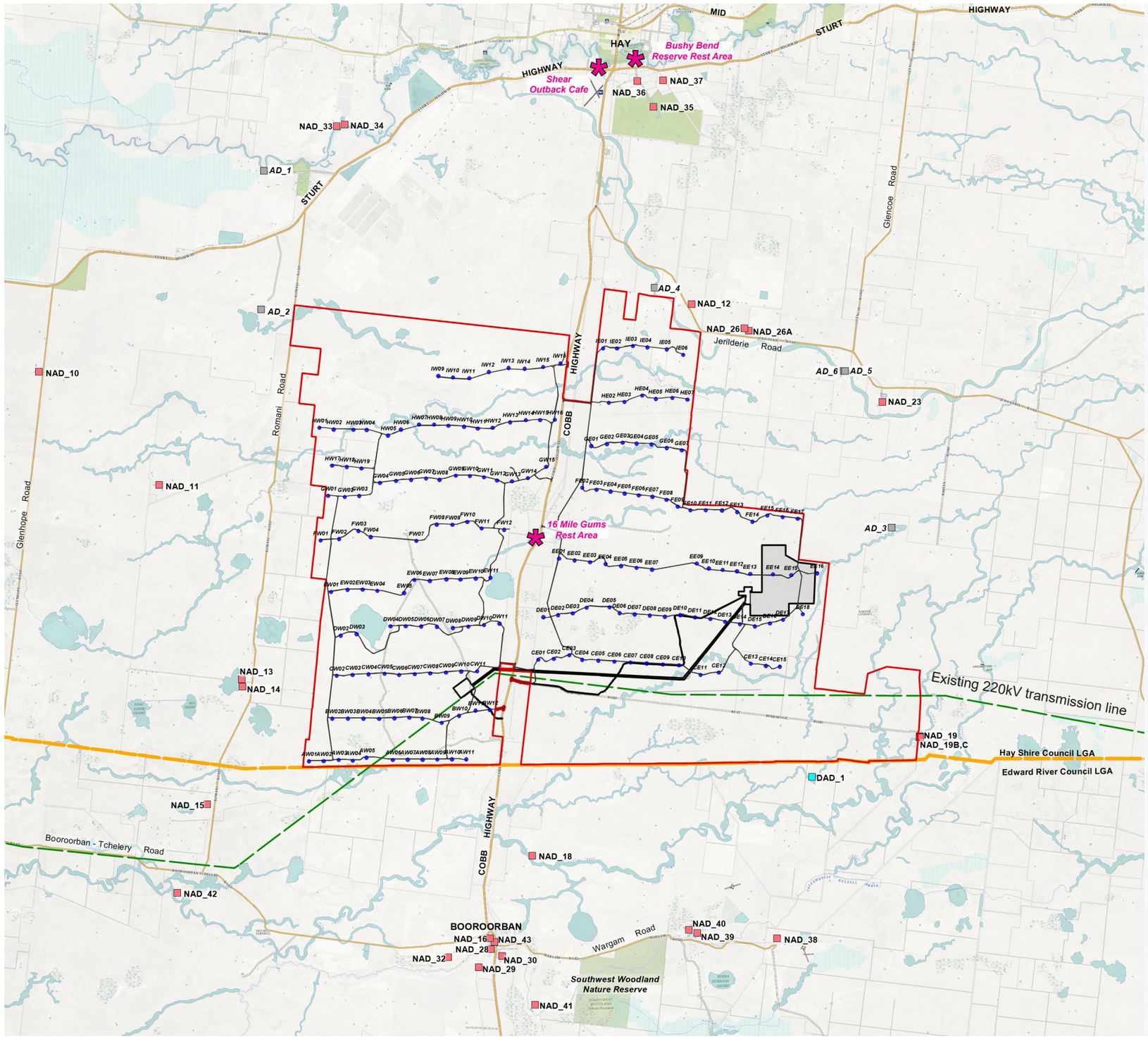
Key components of the Project include:

- 188 (three blade steel) wind turbines with a total maximum height (tip height) of 270 metres (m) AGL.
- Internal project access roads to connect WTG's and ancillary project infrastructure.
- Collector groups connected with predominately 33 kV underground cabling and occasionally overhead lines.
- Up to two (2) temporary and up to 10 permanent meteorological masts.
- Up to two (2) accommodation compounds on-site as well as accommodation housing for workers in Hay.
- Crane hardstand areas, turbine laydown areas and concrete batching plants.
- The Project will share the main substation, switchyard, O&M building and BESS identified in The Plains Renewable Energy Park Solar Farm.
- 330 kV High-voltage overhead lines connecting collector groups of turbines to the main substations, and a switchyard for connection to the project energy connect.
- O&M Building.
- Switchyard to connect into PEC.
- Main substations, facilitating connection to the National Energy Market (NEM) includes transformers, voltage controls, storage units and potentially power quality control equipment.
- Up to two (2) collector substations, with overhead 330 kV lines running back to main substation.
- Up to eight (8) access points to the Project off the Cobb Highway.

The proposed infrastructure would be contained within the Project Area including all turbine rotor sweep paths.

Project Layout

The Plains Wind Farm



LEGEND

- Project Area Boundary
- The Plains Renewable Energy Park Solar Farm site
- Proposed Turbine Location
- Access tracks
- Proposed solar farm (subject to separate SSD application)
- Associated dwellings
- Non-associated dwellings
- Approved DA location
- Existing 220kV transmission line
- Main Road
- Low Use Road
- Rivers / creek corridors
- National Park / Nature Reserve
- LGA Boundary
- Key Viewpoint Locations

N

0 4 8 12 16km

Figure 3: Project Layout (Map Source: Six Maps 2011)

3.5 Wind Turbine Design

This report considers a maximum blade tip height of 270 m as a worst case scenario. The turbine specification are outlined below:

- A generating capacity of at least 6 MW;
- a 4-7 part tubular steel tower holding the nacelle;
- three (3) blades mounted to a rotor hub on a tubular steel tower, with a combined height of blade and tower limited to a maximum tip height of up to 270 m AGL;
- a gearbox and generator assembly housed in a nacelle; and
- adjacent hardstands for use as crane pads and assembly and laydown areas.

Table 2 provides an overview of dimensions of the turbine components that have been used for this assessment. To best represent a worst case scenario, the maximum hub height of 180 m has been used for modelling and visualisation purposes in this report. **Figure 4** illustrates the turbine parameters utilised for this report.

Wind Turbine Components		
Project Component	**Dimensions used in LVIA:**	**Quantity**
Uppermost Blade Tip	270 m AGL	188
Tower (hub) height	180 m	
Blade length	90 m (including nacelle)	
Swept Area	38,013 sqm	

Table 2 Wind Turbine Parameters for Visual Assessment

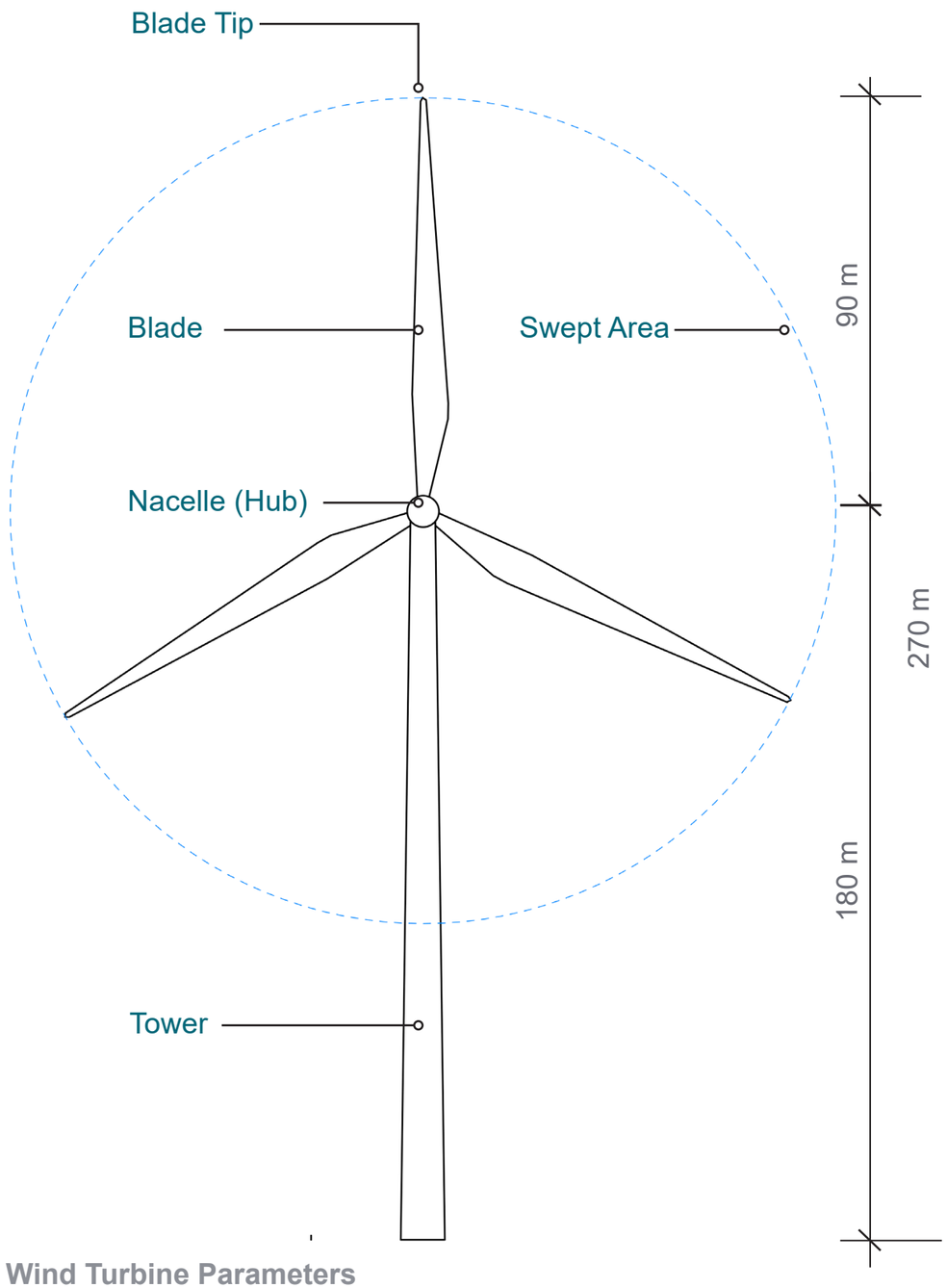


Figure 4: Wind Turbine Parameters

3.6 Associated Infrastructure

In addition to the turbines, the following provides an overview of the associated infrastructure components proposed for the Project which may contribute to the visual impact. An overview of the assessment of the potential visual impacts resulting from the associated infrastructure has been provided in **Section 14.0** of this report.

Associated Infrastructure	
Project Component	**Description**
On-site substations	Construction of on-site electrical substations [up to two (2) collector substations and main connection substation [approximately 5 m high].
Transmission Lines	Underground 33 kV and overhead 33 kV, plus overhead 330 kV transmission line (approximately 50 m high, lattice tower arrangement).
Construction Control Room	O&M Building (up to 6 m high), switchgear and associated control systems in the vicinity of the wind turbines.
Workers Accommodation	Two accommodation compounds (up to 4 m buildings) on-site as well as accommodation housing for workers in Hay.
Battery Energy Storage System (BESS)	BESS to store the produced electricity (up to 5 m high).
Meteorological monitoring masts	Up to two (2) temporary and up to 10 permanent meteorological masts (150 m high).
Internal & External Roads	Upgrade to existing local road infrastructure and internal unsealed tracks with provision of up to eight (8) access points to Project Area off Cobb Highway.

Table 3 Associated Infrastructure

The following temporary elements will be required during the construction of the Project:

- construction compounds;
- laydown areas; and
- concrete batching plants.

3.7 Other Definitions

For the purposes of this report, ‘associated dwellings’ are defined as residences where the property owners within the Study Area have entered into land or Neighbour agreement (landholder agreement) with the Applicant. ‘Non-associated dwellings’ are defined as residences within the Study Area that have not entered into land or Neighbour agreement (landholder agreement) with the Applicant.



Image 1 Typical transmission tower (Source: ERM)



Image 2 Indicative BESS (Source: ERM)



Image 4 Typical Substation (Source: ERM)



Image 3 Typical Switchyard (Source: ERM)



Image 5 Typical Operations and Maintenance Facility (Source: ERM)

04

Community Consultation

4.0 Community Consultation

4.1 Community Consultation Process

In accordance with the Guideline: "*All DAs for large-scale solar energy development will be subject to a comprehensive assessment that includes extensive community consultation and a detailed consideration of any environmental, social and economic impacts*." (DPE, 2022a).

In accordance with the Guideline, ongoing community consultation has been undertaken by the Applicant between December 2022 and June 2023. As of June 2023, a total of 30 people participated and responses were received from 21 people through regular face-to-face interview sessions or direct communication including written correspondence, emails, virtual meetings and over-the-phone conversations (Voconiq, 2023). These have been outlined in the following section.

Community engagement will continue through the EIS phase of the Project and provide the community with further opportunities to provide input into the Visual Baseline Study of the LVIA.

4.2 Results of Preliminary Stakeholder Engagement and Consultation

The scoping phase identified key landscape features that are of importance to the local community (Moir LA, 2022). There were nine (9) responses to the question: ***"In your opinion, what are the key landscape features of the area?"*** Key landscape features identified by the community include:

- "*Open Native Grassland Plains*"
- "*Wide, flat plains*" and "*flat, open spaces*"
- "*Open Plain landscape with world renowned sunsets*"
- "*The Murrumbidgee River and the view across the plains and amazing sunsets*"

Nine (9) responses were given to the question: ***"What are the best lookouts / public viewing locations in the area?"***

Key public viewing locations identified by the community include:

- "*16 Mile Gums on Cobb Hwy from Hay"*
- *"There is no "one" best viewing location in this area"*
- "*The open plains"*

In addition, a total of nine (9) responses were received towards the question: ***"What do you value the most about your local area?".*** The majority of respondents identified 'farming' and 'environment (flora and fauna)' as key values, followed by 'community / family'.

4.3 Community Perception and Concerns

Understanding of the community perception towards the proposed development is an intrinsic component of the LVIA process. A CSIRO study published in 2012: *Exploring community acceptance of rural wind farms in Australia* provides a snapshot of community acceptance levels regarding Australian wind farms from a variety of stakeholder perspectives. Although the study was completed in relation to wind farms, the findings can be applied to other energy projects. It found levels of acceptance among the public are highly subjective and can differ depending on location, local context and place attachment (Hall, Ashworth and Shaw 2012).

During the interview, participants were asked a wide range of questions to help understand the community context, their knowledge on The Plains Wind Farm project, potential changes that the energy hub could bring to the community/their lives, and if the participants were aware of any other renewable energy projects. Responses received in the interview process have been categorised into three types of feedback: positive feedback, neutral/mixed feedback and negative feedback. The number of mentions for each concern have been illustrated in **Figures 5, 6 and 7**.

Generally, positive feedback was received for the socio-economic impacts that the Project is likely to generate for the local community. The majority of the participants felt positive that The Plains Wind Farm project would generate employment opportunities for the local community. They also highlighted that it would provide economic diversification and support various community groups due to revenue generation (refer to **Figure 5**).

A few participants provided neutral and mixed feedback for factors such as limitations in access and strain on existing infrastructure, disaster management, and potential impacts on property value. Some community members expressed their concerns towards the use of agricultural land and it being locked up for renewable energy projects. Other community members expressed that the Plains Wind Farm project would provide an income stream and wind farms were seen as being more complimentary to existing agriculture than solar (Voconiq, 2023). Generally, most participants were concerned about the regulatory and decision-making processes where they felt that the local community has not been involved extensively in decision-making processes around the development of renewable energy projects in the region (refer to **Figure 6**).

Most participants highlighted that their main concerns surrounding the Project include visual amenity factors, potential impacts on sense of place and uncertainty around the future and nature of the Project. The community identified the impact of visual changes to the area, noise from turbines and potential light pollution as main concerns. Most landowners also expressed that they did not want turbines and solar panels to be abandoned and permanently impact the landscape. Other concerns included impact on existing biodiversity factors such as fauna, traffic management during the construction phase, and rehabilitation of the land at the end of the lifetime of the Project (refer to **Figure 7**). It was also identified that the community has significant concerns about the potential cumulative impacts of other proposed renewable energy projects in the area.

The overall consultation process identified that the community members living in the town of Hay do not have significant concerns due to the economic benefits the Project would bring to the region. Preliminary consultation undertaken by the Proponent in the scoping phase identified the 16 Mile Gums Rest Area as a key viewpoint location. Consultation in the EIS phase identified that impact on existing land uses were viewed as being negative for the solar farm. However, many landowners stated that they preferred the solar farm over the wind farm since the former would have lower impacts on existing visual amenity (Voconiq, 2023).

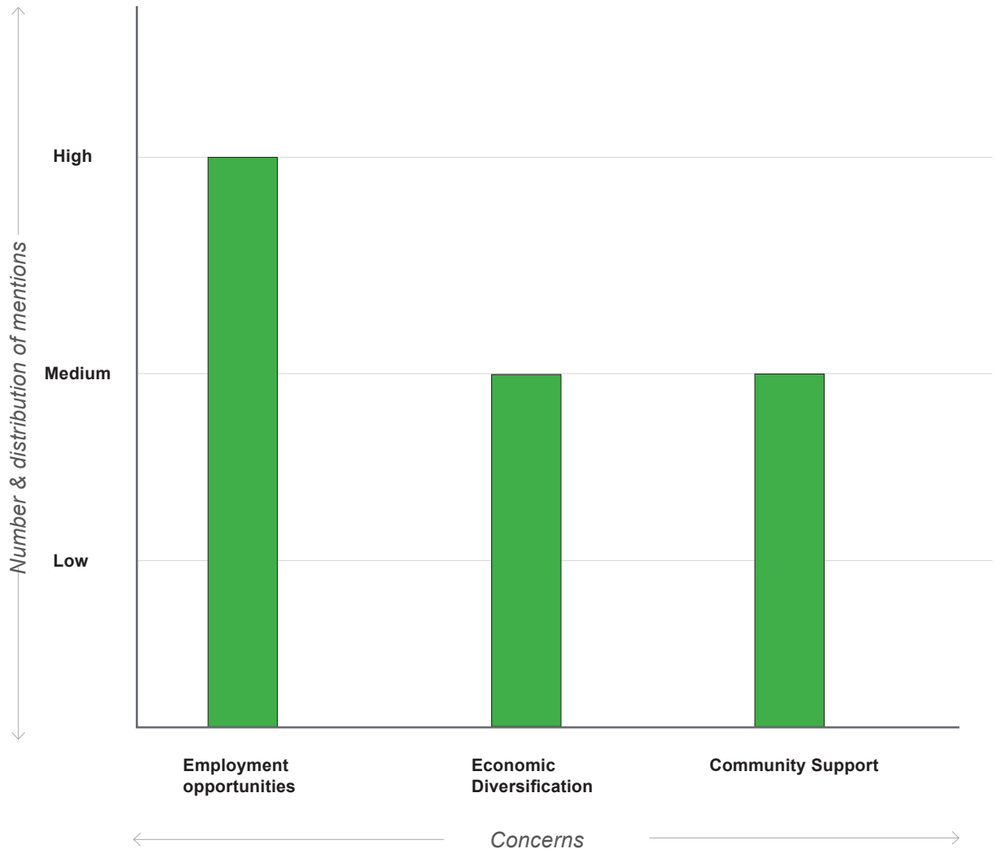


Figure 5: Results of Community Interviews - Positive feedback
(Data Source: Voconiq, 2023)

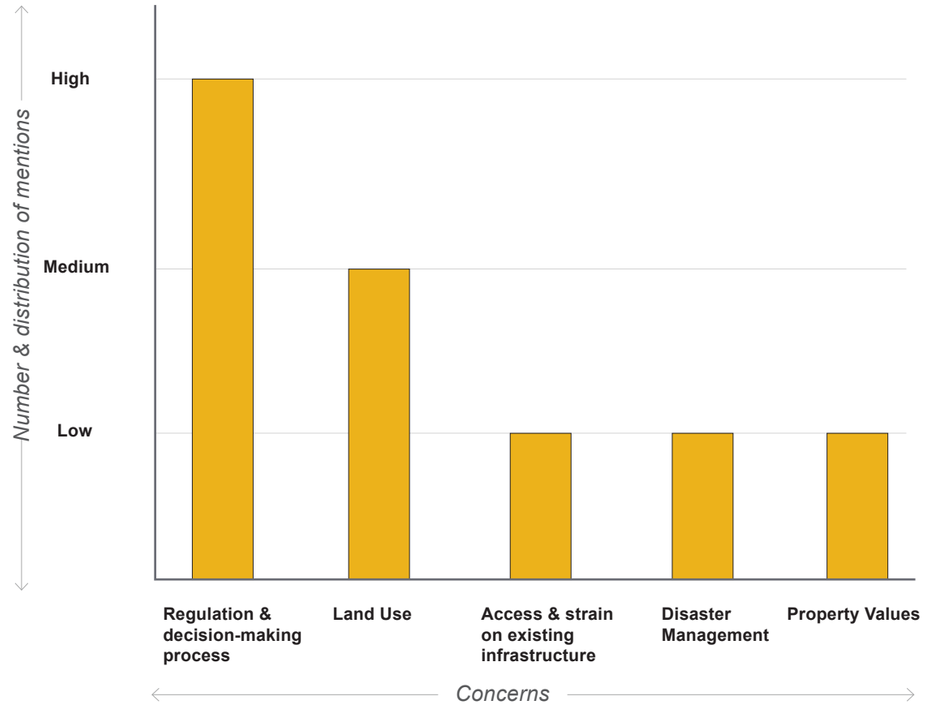


Figure 6: Results of Community Interviews - Neutral / mixed feedback
(Data Source: Voconiq, 2023)

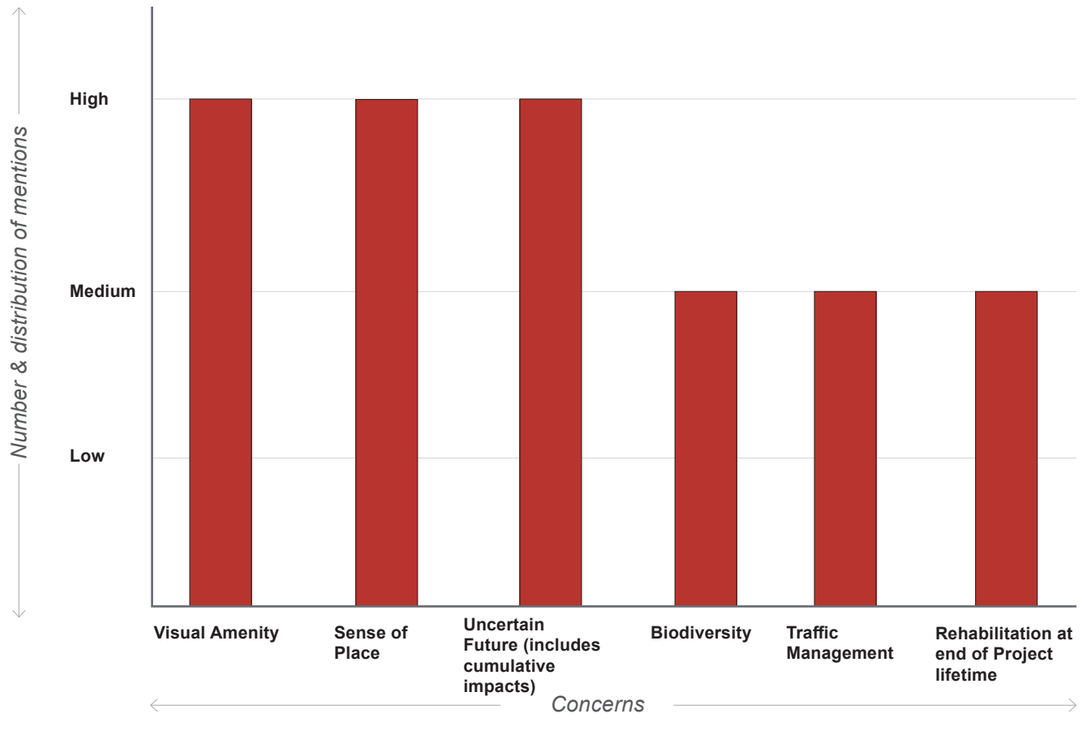


Figure 7: Results of Community Interviews - Negative feedback
(Data Source: Voconiq, 2023)

05

Visual Baseline Study

5.0 Visual Baseline Study

5.1 Visual Baseline Study

In accordance with the Bulletin:

"A visual baseline study must be undertaken to establish the existing landscape and visual conditions. This forms the basis of determining the level of impacts of a proposed wind energy project. The baseline study is prepared and evaluated by the proponent prior to undertaking any visual analysis." (DPE, 2016).

A PVIA was undertaken by Moir LA as part of Stage 1: Preliminary Environmental Assessment (pre-lodgement) in accordance with the Bulletin. Moir LA have developed upon the study undertaken in the PVIA to provide a detailed baseline study for the LVIA.

In accordance with the Bulletin, the Visual Baseline Study should consider the following inputs in the 'visual catchment' for the Project:

- elements of the landscape important to the community, including public and private viewpoints;
- the sensitivity of the viewers who use those viewpoints, and the distances at which they may view the landscape and potential wind turbines and other ancillary facilities;
- the character of the landscape associated, its key features and the relative scenic quality of the area; and
- the location of any existing operational or approved wind energy projects within both a regional and local context, including any nearby surrounding wind energy projects within eight kilometres which may have the potential to create direct or indirect visual impacts between the proposed and any other operational, approved or proposed wind energy projects.

The purpose of the Visual Baseline Study is to establish the existing landscape and visual conditions through descriptions, mapping and photographic representations. The study method for undertaking the Visual Baseline Study has been established in accordance with Appendix A of the Bulletin (DPE, 2016) where relevant and in conjunction with previous experience on large scale wind energy projects.

Table 4 provides an overview of the methodology used to establish a quantitative approach to defining and assessing the landscape character.

Visual Baseline Study Inputs as per the Bulletin and relevant section of this LVIA:	
Landscape Character Type	
• *Describe the broad area of land in which the wind energy project is located.*	**Refer to Section 5.2**
Sensitive Land Use Designations	
• *Map Layer identifying National and State Sensitive Land use Designations and LEP Zones.*	**Refer to Section 5.3**
Key Landscape Features	
• *Identify areas of visual interest or quality that stand out visually in the landscape.*	**Refer to Section 5.4**
Landscape Character Unit Classification	
• *Landscape is categorised into Landscape Character Units (LCU) and Scenic Quality Ratings are applied to each LCU.*	**Refer to Section 5.6**
Visibility Distance Zones	
• *Undertake visibility or view shed mapping when assessing what may be visible from a given viewpoint looking in all directions.*	**Refer to Section 7.0**
Viewpoint Inventory and Sensitivity Levels	
• *Undertake a viewpoint inventory from public and private locations and establish the Visual Influence Zones for each.*	**Refer to Section 8.0**

Table 4 Visual Baseline Study Inputs as per the Bulletin

5.2 Bioregion Context

The Project sits within the Riverina Bioregion (see **Figure 8**) in southwest NSW. The area is characterised by extensive saltbush plains with small depressions and minor undulations.

Topography is generally flat with very minor and isolated rises of coarse-textured aeolian material (Walker, 1991). Grey cracking clays, red brown earths and compact brown clays are predominant in the region (NPWS, 2003). The plains are dominated by saltbush and bluebush with old man saltbush, cottonbush, myall and grasses. Vegetation communities on channels and swamps include black box (*Eucalyptus largiflorens*) and lignum (*Muehlenbeckia florulenta*). A detailed description of this character is defined in **Section 5.4** of this report.

Images 6 - 7 illustrate the typical character of the landscape within the Study Area.



Image 6 Typical character of the Riverina saltbush and blue bush plains



Image 7 Typical creek corridors characterised by dense clumps of black box and lignum with shrubby and grassy understorey

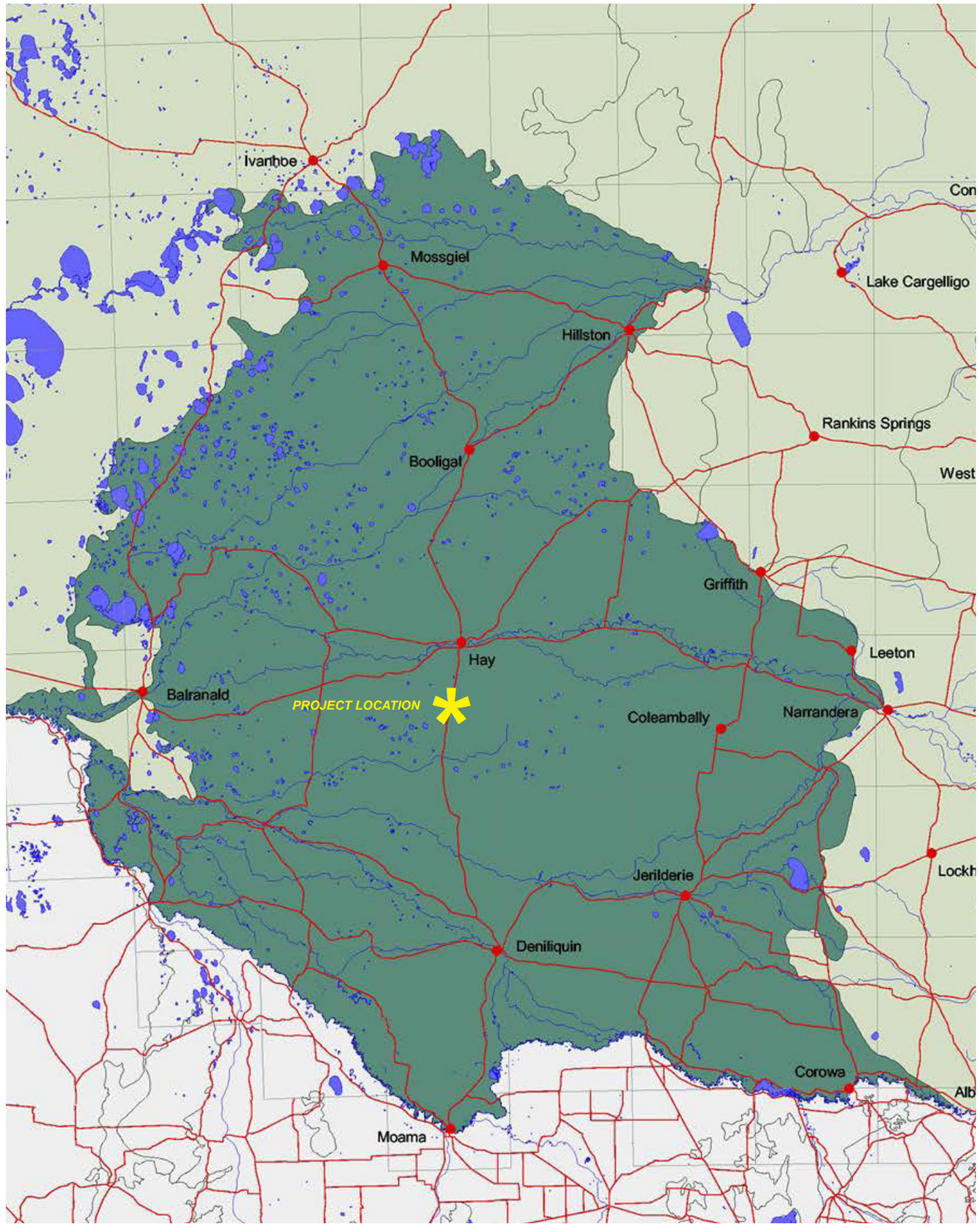


Figure 8: NSW Riverina Bioregion (Not to scale, Source: NPWS, 2003)

5.3 Sensitive Land Use Designations

5.3.1 Land Use Zoning

The Project is located within the extents of Hay Shire Council, and borders the Edward River LGA in the south. The Edward River LGA utilises three different Local Environment Plans (LEPs), one of which is the Conargo LEP 2013. The policies and objectives of the Hay Shire LEP 2011 are applicable for the Project, and the Conargo LEP 2013 informs a greater understanding of the overall land use context of the Project. The following gives an overview of the main land use zoning within the Study Area (see **Figure 9**):

RU1 - Primary Production

Land within and around the Study Area is zoned *RU1 - Primary Production*. The Hay Shire LEP 2011 states the following objectives of the RU1 zoning relevant to the visual impact assessment:

- *To minimise the fragmentation and alienation of resource lands.*
- *To minimise conflict between land uses within this zone and land uses within adjoining zones.*
- *To encourage diversity in primary industry enterprises and systems appropriate for the area.*

C1 - National Parks and Nature Reserves

South West Woodland Nature Reserve is located approximately 10 km south of the Project Area and is classified as *C1- National Parks and Nature Reserves.* It is spread over parcels of land south of Wargam Road.

According to the South West Woodland Nature Reserve Statement of Management Intent, the area is *'reserved under the NPW Act to protect and conserve areas that have outstanding, unique or representative ecosystems, species, communities or natural phenomena'* and is classed as a Nature Reserve (NPWS, 2014). The Nature Reserve does not have any recreational associations. No key viewpoints were identified within the South West Woodland Nature Reserve.

Other areas identified with *C1- National Parks and Nature Reserves* zoning include the Oolambeyan National Park which is located approximately 16 km east of the Project Area and Murrumbidgee Valley Regional Parks which are located approximately 13 km north of the Project Area.

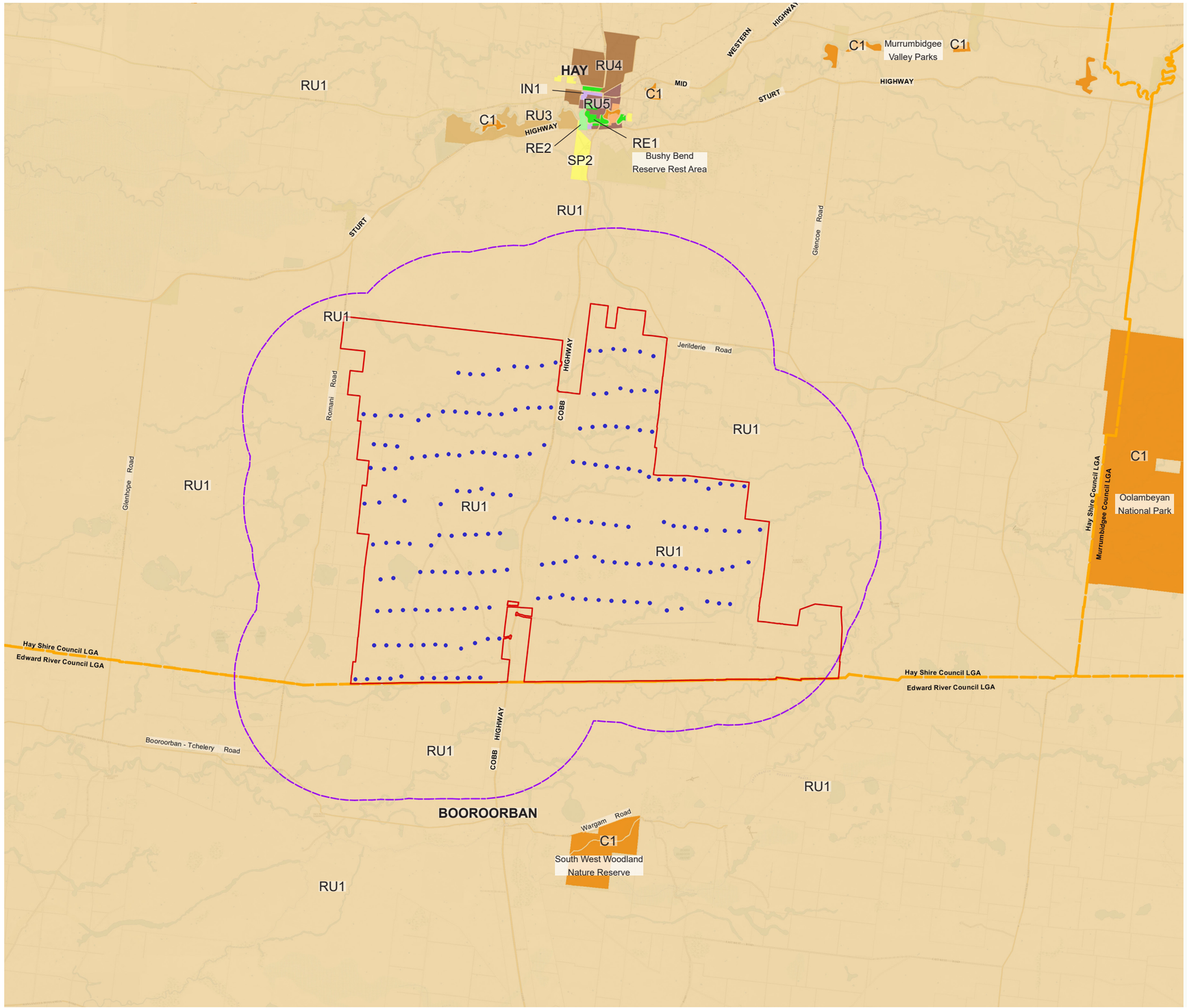
5.3.2 Land Use

Land use within and around the Project Area predominately comprises of agricultural production activities including grazing over native vegetation pastures and irrigated cropping (see **Figure 10**). **Figure 10** has been prepared using the Australian Land Use and Management (ALUM) 18 - Class mapping system information (DPE, 2023).

The South West Woodland Nature Reserve and Oolambeyan National Park are classified as lands under 'minimal use'. In accordance with the ALUM classification, areas classified as 'minimal use' include lands with residual native vegetation cover that are mainly unused or used for non-production, or conserved for environmental reasons such as protection of native vegetation, wildlife or natural resources (ARDC, 2023). These areas are located approximately 10 km south and 16 km east of the Project Area respectively. Areas classified as 'minimal use' are located outside the Study Area.

The Cobb Highway serves as an important commuting corridor providing a connection between Hay and Booroorban. The Sturt Highway is located approximately 11 km north of the Project Area. Low use roads in the area include Jerilderie Road, Booroorban-Tchelery Road, Romani Road and West Burrabogie Road.

A range of industrial and commercial operations associated with Hay are located approximately 4.5 km north of the Project Area and accessed via the Cobb Highway.



Land Use

The Plains Wind Farm

LEGEND

- Project Area Boundary
- Proposed Turbine Location
- 8000 m from nearest proposed turbine (extent of Study Area)
- RU1 - Primary Production
- RU3 - Forestry
- C1 - National Parks and Nature Reserves
- RE1 - Public Recreation
- RE2 - Private Recreation
- SP2 - Infrastructure
- RU4 - Primary Production Small Lots
- RU5 - Village
- LGA boundary

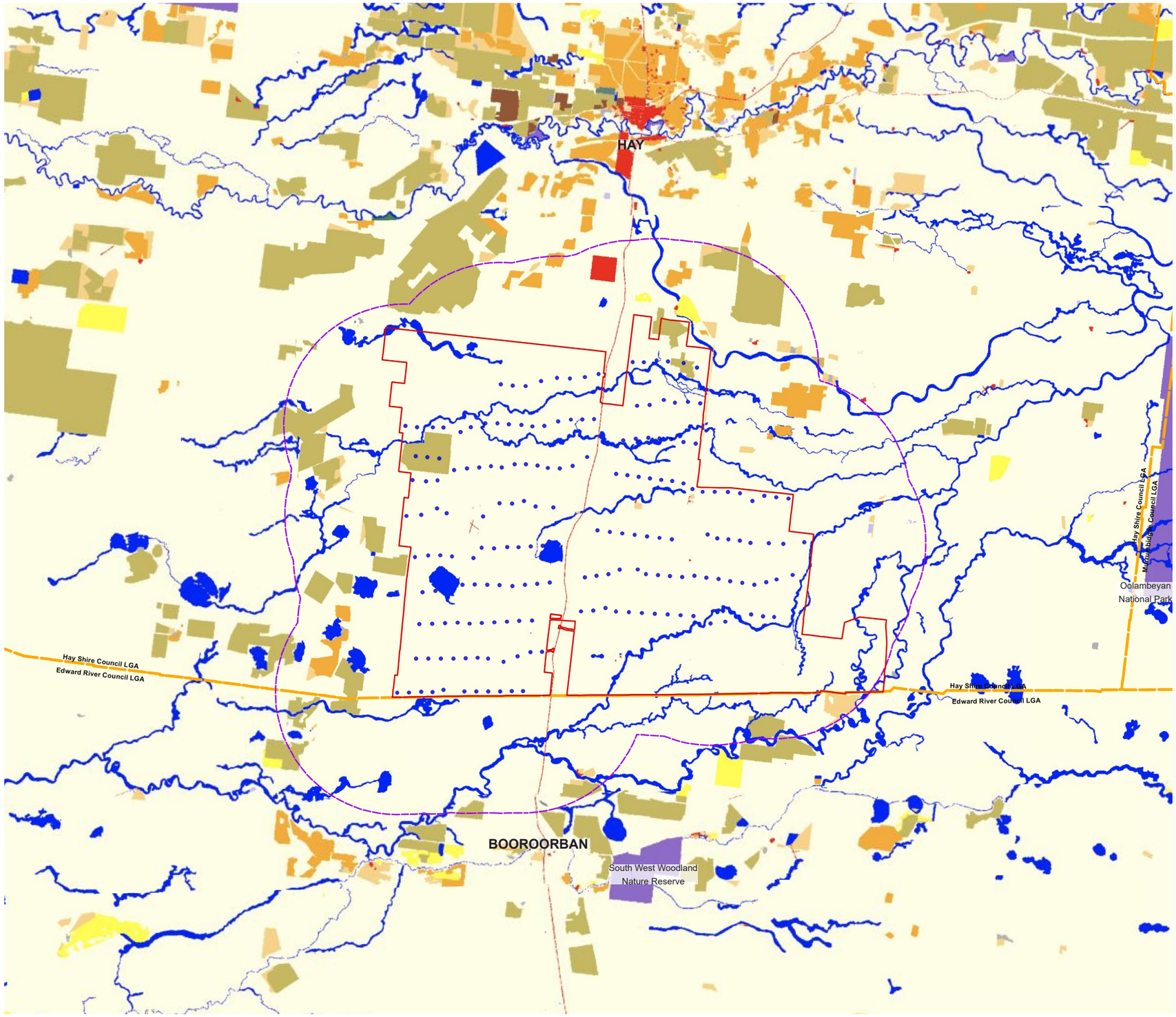
N

0 4 8 12 16km

Figure 9: Land Use Zoning (Source: Hay Shire LEP 2011, Edward River LEP 2013, SixMaps 2011)

Land Use

The Plains Wind Farm



LEGEND

- Project Area Boundary
- Proposed Turbine Location
- 8000 m from nearest proposed turbine (extent of Study Area)
- Irrigated cropping
- Minimal Use
- Grazing, modified pasture
- Grazing, native vegetation
- Dryland cropping
- Irrigated pastures
- Rural residential and farm infrastructure
- Urban and intensive uses
- LGA boundary
- Waterways

N

0 4 8 12 16km

Figure 10: Land Use (Source: LandUse (2017), ALUM 18-class; DPE, 2023)

5.4 Key Features and Viewpoints

The Bulletin states: "*proponents must identify key landscape features, dwelling locations and key public viewpoints. The following section provides an overview of the key features identified within and around the Study Area"* (DPE, 2016). Refer to **Figure 11**.

Geology and Landform

The region is made up of Quaternary alluvial sediments with shallow and small depressions that are as deep as 2 m (Environment NSW, 2011). These depressions form large swamps and dry lakes. The landform is also characterised by isolated low rises formed by aeolian processes, i.e., through wind action (Environment NSW, 2011). Landform is generally flat with seasonal water corridors and floodplains (NPWS, 2003).

Vegetation Character

Vegetation is typically characterised by large tracts of saltbush and native grasses with scattered stands of trees and mid-storey shrubs near creek corridors and dwellings.

A number of saltbush and cottonbush varieties dominate the region with very sparse tree and shrub communities. Prominent species include black box and myall trees, and shrubs such as lignum and nitre goosefoot (NPWS, 2003). The lack of tall canopy species allows higher wind speeds with continual wind actions on the landscape. The vast, flat plains are covered in saltbush, bluebush and speargrass communities that define the character of this region.

Creeks, Swamps and Floodplains

Prominent waterforms identified in the region carry seasonal water. These include creek corridors, swamps and floodplains. Some of the hydrological features identified in the area include Abercrombie Creek, Telegraph Creek, Nyangay Creek, Murrumbidgee River, Curtains Creek, Death Adder Swamp and Box Swamp.

Swamps and floodplains are generally shallow and covered with low-storey, scrubby vegetation such as saltbush, dillon bush and canegrass species (Environment NSW, 2011). These areas have the capacity to hold water and are generally favoured for livestock grazing.

Some watercourses such as Nyangay Creekand Forest Creek are identified by dense clumps of black box trees, lignum, nitre goosefoot, saltbush, speargrass and forbs (Environment NSW, 2011). Abercrombie Creek and Telegraph Creek that are located within the central and northern parts of the Project Area are characterised by shallow channels of grasses that carry seasonal water.



Image 8 Saltbush and cotton bush on plains that are used extensively for emu, kangaroo and sheep grazing.



Image 9 Saltbush and speargrass communities with sparse tree cover typical of the Study Area.



Image 10 Typical character of Nyangay Creek channel defined by lignum and blackbox trees.

Nature Reserves

South West Woodland Nature Reserve is located approximately 10 km south of the Project Area. The Nature Reserve exhibits characteristics of the Riverina Bioregion's Murrumbidgee subregion. No recreational associations were identified.

Key viewing locations and Points of Interest

Recreational associations have been identified at locations along the Murrumbidgee River within the town of Hay. The Murrumbidgee River Rest Area in Hay offers picnic areas and walking tracks that are used by the local community and visitors in the area.

The Shear Outback is a visitor centre located south of the town of Hay. It offers opportunities for visitors to experience local history on shearing.

Community consultation identified key public viewpoints such as the 16 Mile Gums Rest Area which forms part of the 'Long Paddock' touring route. The rest stop is used by motorists travelling along the Cobb Highway between Hay and Deniliquin.

Other points of interest in the area include various parts of Murrumbidgee Valley Regional Parks which are located approximately 13 km north of the Project Area.

Access Roads

Cobb Highway is the main road that runs through the central part of the Project Area. It connects Hay to surrounding towns such as Jerilderie, Deniliquin, Moulamein and Conargo.

The Sturt Highway is another important commute corridor that runs east - west and is located approximately 14 km north of the Project Area. It connects Hay to other towns such as Balranald, Darlington Point and Narrendera.

Low use roads identified in the region include Booroorban-Tchelery Road, Jerilderie Road, Romani Road, and West Burrabogie Road. These roads provide access to rural properties in the region and are predominantly unsealed.

Towns and Settlements

Hay is the nearest town which and is located 15 km north of the Project Area. The estimated resident population of the town is 2,828 people (ABS, 2021).

Booroorban is a small rural locality with a resident population of 36 people (ABS, 2021). It is located 6 km south of the Project Area.



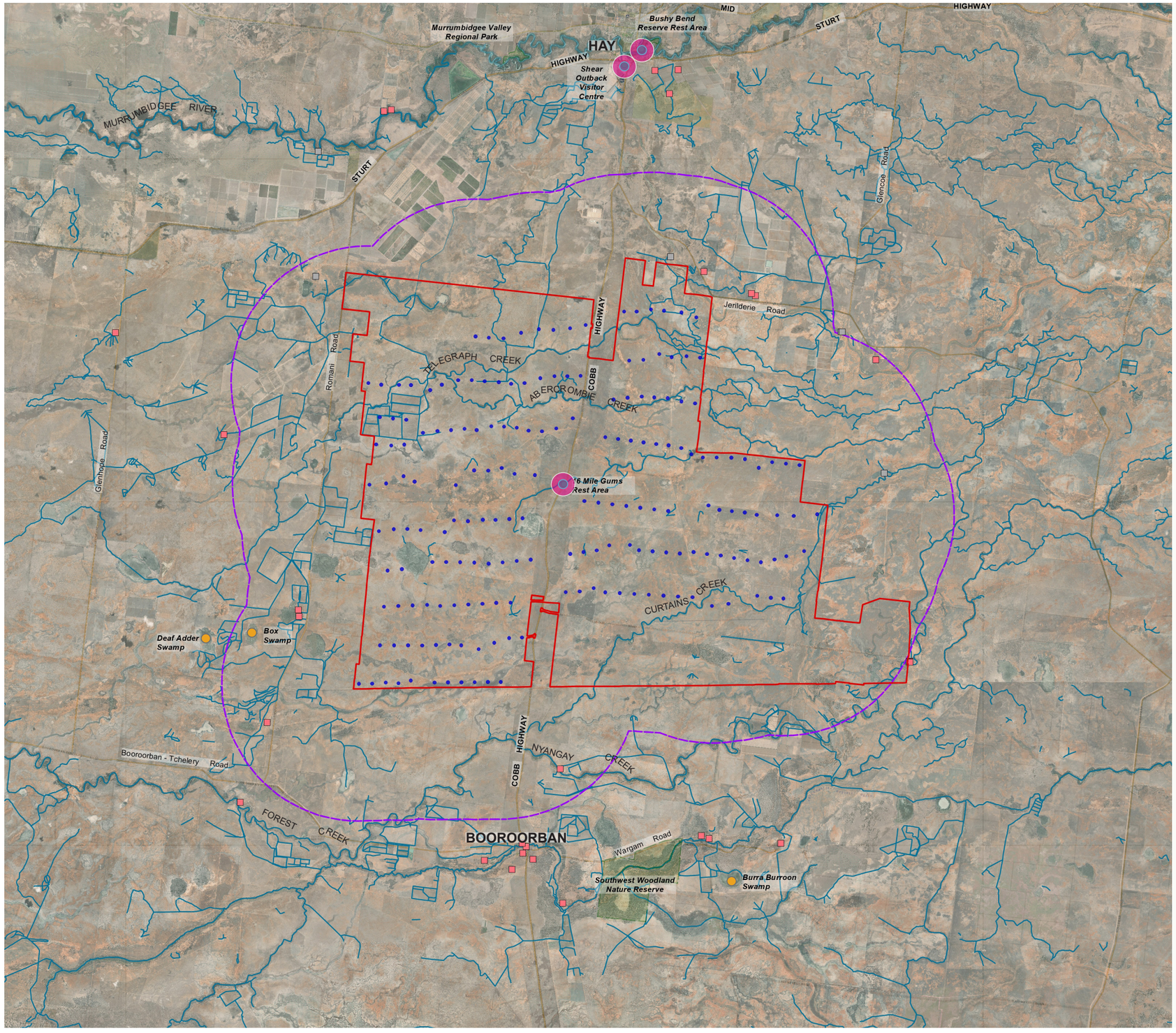
Image 11 Character of some creek corridors in the area is defined by grassy channels with no tree cover.



Image 12 Surroundings of 16 Mile Gums Rest Area are defined by patchy tree cover and lands with native grasses and saltbush communities.



Image 13 Character of swamps typically defined by shallow, low depressions covered with grasses and saltbush communities.



Existing Landscape Features

The Plains Wind Farm

LEGEND

- Project Area Boundary
- Proposed Turbine Location
- Associated dwellings
- Non-associated dwellings
- Main Road
- 8,000 m from nearest turbine (extent of Study Area)
- Key Public Viewpoints
- Swamps
- Rivers and creek corridors
- National Park / Nature Reserve

N

0 4 8 12 16km

Figure 11: Existing Landscape Features (Map Source: ESRI Imagery 2023, SixMaps 2011)

5.5 Scenic Quality Class Rating

The Bulletin states: "(...) *the baseline study inputs, including key landscape features and sensitive land use designations, should lead to the identification of Scenic Quality Classes. Scenic quality refers to the relative scenic or aesthetic value of the landscape based on the relative presence or absence of key landscape features known to be associated with community perceptions of high, moderate or low scenic quality. It is both a subjective and complex process undertaken by experts in visual impact assessment, taking into account community values identified in early community consultation."* (DPE, 2016)

In accordance with the Bulletin, a Scenic Quality 'frame of reference' has been formulated by Moir LA (**Table 5**) utilising *An Approach To Landscape Sensitivity Assessment* by Natural England (Tudor, 2019). The frame of reference developed for The Plains Wind Farm is in keeping with the example frame of reference provided in the Bulletin.

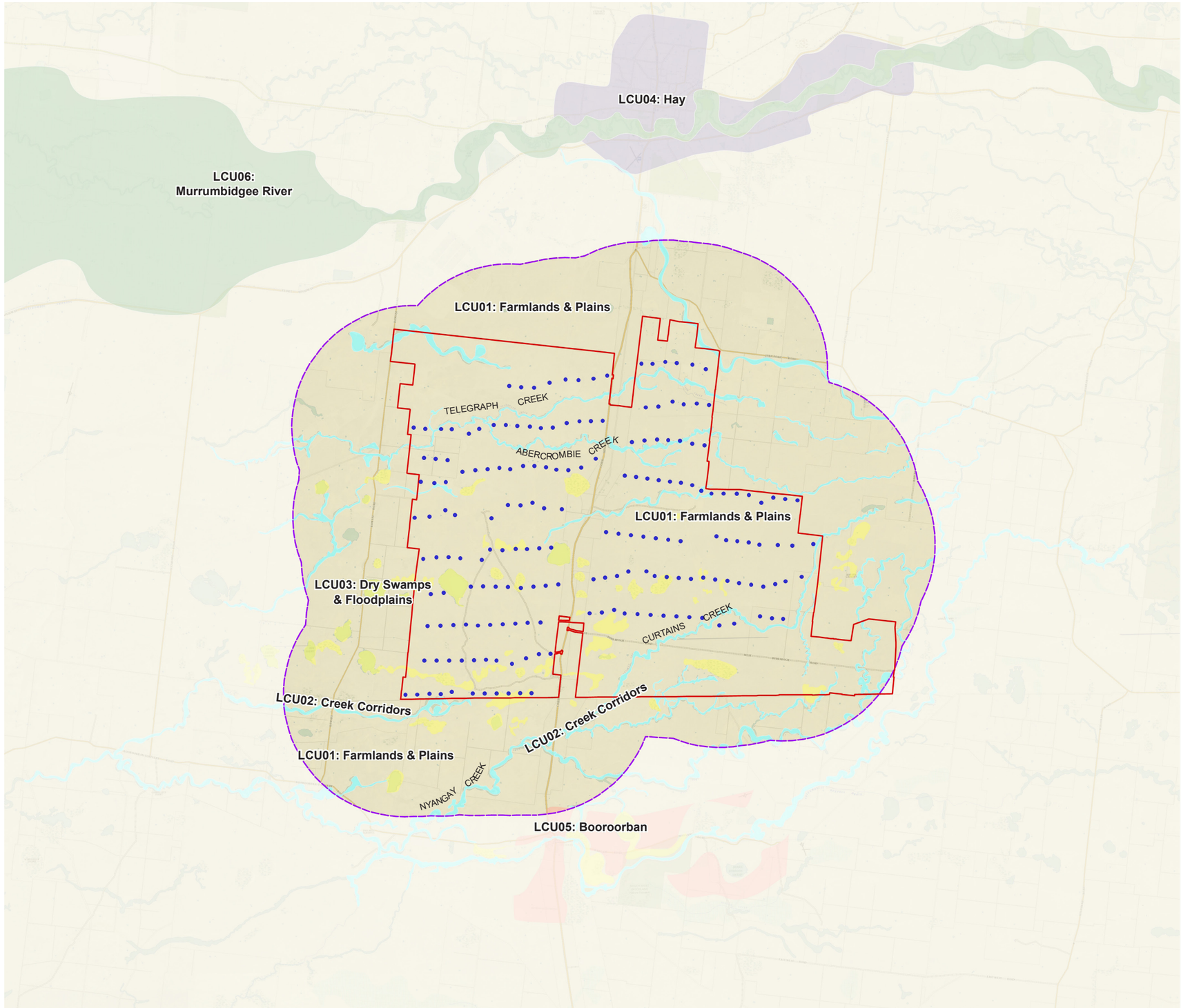
Each category of the 'frame of reference' has been quantified for each Landscape Character Unit (LCU) (summarised in **Table 6**) to determine a Scenic Quality Rating of **low**, **moderate** or **high.** The resulting Scenic Quality Rating is used to assist in defining the Visual Influence Zones in accordance with the Bulletin (refer to matrix in **Appendix A**).

5.6 Landscape Character Unit Classification

An assessment considering the land use and the existing landscape features and condition identified six (6) key LCUs present within the Study Area. These include the Farmlands and Plains LCU, the Creek Corridors LCU, Swamps and Floodplains LCU, Hay LCU, Booroorban LCU and Murrumbidgee River LCU (refer to **Figure 12** and **Table 6**).

SCENIC QUALITY RATING FRAME OF REFERENCE		
LOW	**MODERATE**	**HIGH**
LAND FORM		
- Flat topography - Absence of landscape features - Open, broad extents of spaces		- Diversity in topographical range - Unique landscape features - Intimate spaces
WATER FORMS		
- Absence of water		- Presence of water - Visually prominent lakes, reservoirs, rivers streams and swamps
VEGETATION		
- Absence of vegetation - Lack of diversity - Land cleared of endemic vegetation - Low level of connection between vegetation and landscape / topography		- Abundant vegetation - High diversity - High retention of endemic vegetation. - High level of connectivity between natural landscape and landforms
HUMAN INFLUENCE		
- High population. - High density in settlement - High presence of Infrastructure - High levels of landscape modification		- Low / dispersed population - No settlement - Absence of infrastructure - Landscape in natural state
ACTIVITY		
- High levels of traffic movement - Presence of freight and passenger transport networks - Presence of production or industry		- Low traffic movement - Absence of freight and passenger transport - Absence of production or industry
RARITY		
- Typical landscape within a local and regional context		- Unique combination of landscape features in a local and regional context
RELATIONSHIP WITH ADJOINING LANDSCAPES		
- Low visible connection with adjoining landscapes - Low variability between adjoining landscapes - Landscape features do not contribute to amenity from adjoining landscapes		- High visibility with adjoining landscapes - High variability and contrast with adjoining landscapes - Landscape features contribute significantly to amenity of adjoining landscapes

Table 5 Scenic Quality Rating Frame of Reference (adapted from DPE, 2016 and Tudor, 2019)



Landscape Character Units

The Plains Wind Farm

LEGEND

- Project Area Boundary
- Proposed Turbine Location
- Main Road
- Minor Road
- 8,000 m from nearest turbine (extent of Study Area)
- LCU01: Farmlands and Plains
- LCU02: Creek Corridors
- LCU03: Dry Swamps and Floodplains
- LCU04: Hay
- LCU05: Booroorban
- LCU06: Murrumbidgee River

N

0 4 8 12 16km

Figure 12: Landscape Character Units (Map Source: SixMaps 2011)



Image 14 Flat, open and expansive parcels covered in grasses and saltbush.



Image 15 Typical character of Study Area is defined by scattered trees across the plains.

LCU01: Farmlands and Plains

Landform within this LCU is typically defined by flat, open and generally treeless land parcels that are used extensively for grazing. Grazing pastures are typically covered with native grasses and occasional trees. Vegetation typically found in this LCU is characteristic of the Murrumbidgee Subregion - Riverina IBRA Bioregion.

The LCU comprises of roads and infrastructure elements such as the existing 220kV electrical transmission line.

Scenic quality rating: Low.
See Images 14 and 15.



Image 16 Character of Nyangay Creek defined by dense vegetation and gentle depressions.



Image 17 Patchy vegetation including tree cover associated with Curtains Creek .

LCU02: Creek Corridors

Landform within this LCU is characteristic of gentle undulations that typically carry seasonal water in the region. Vegetation character is typically defined by grasses and low storey bush species with some areas covered in mid-storey shrubs such as lignum and nitre goosefoot.

Creek corridors within this LCU generally remain dry throughout the year. Land adjacent to this LCU supports agricultural and pastoral grazing in most areas. Human intervention in the form of transmission easements are a visible element from some locations within the LCU.

Scenic quality rating: Moderate
See Images 16 and 17.



Image 18 Typical character of swamps and depressions



Image 19 Grassy and saltbush communities dominate the shallow depressions

LCU03: Dry Swamps and Floodplains

Landform within this LCU is defined by gentle, shallow depressions that act as a refuge for excess water in the region. Some areas within the LCU are also used for grazing.

Prominent vegetation typologies within this LCU include saltbush and cottonbush communities that are characteristic of the region. Adjacent lands typically include creek corridors and plains. Landscape within this LCU comprises of native vegetation and is not extensively modified by human intervention.

Scenic quality rating: Low
See Images 18 and 19.



Image 20 Outskirts of Hay typically include vegetation corridors.



Image 21 Flat, open rural land parcels dominate the town outskirts.



Image 22 Booroorban pub and hotel.



Image 23 Rural dwellings in the town are located along the Cobb Highway.



Image 24 The Murrumbidgee River environs include dense vegetation



Image 25 The River offers recreational opportunities.

LCU04: Hay

The LCU comprises of the township of Hay and rural surrounds.

Hay lies adjacent to the banks of the Murrumbidgee River and is defined by the historic buildings, low density residential dwellings and agricultural heritage.

The LCU is defined by generally flat land and the landscape is highly modified.

Scenic quality rating: Low
See Images 20 and 210.

LCU05: Booroorban

The LCU comprises of the rural locality of Booroorban and surrounds.

Booroorban is located to the south of the Project Area and consists of a small number of rural dwellings, a hotel and public hall.

The LCU is characterised by rural dwellings located along the Cobb Highway.

Scenic quality rating: Low
See Images 22 and 23.

LCU06: Murrumbidgee River

The LCU consists of the Murrumbidgee River and its associated floodplains. It is an important water channel in the region. The river and is associated floodplains are prominent landscape features for the town of Hay.

Prominent species within this LCU include river red gums and black box along river channels and belah, lignum, black box in floodplains. The river is an important water source in the region.

Scenic quality rating: High
See Images 24 and 25.

Landscape Character Units

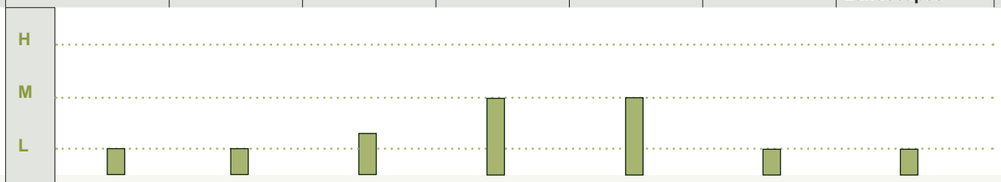
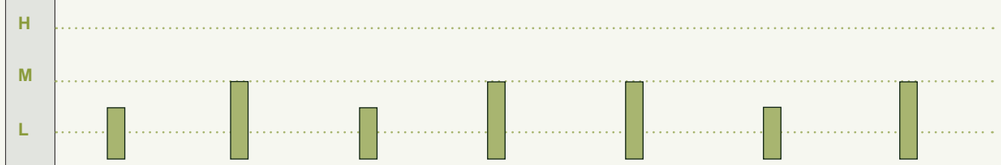
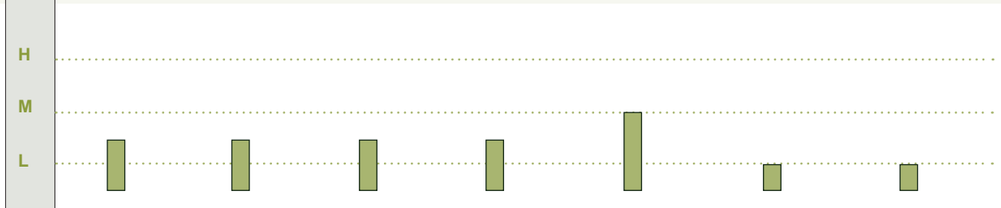
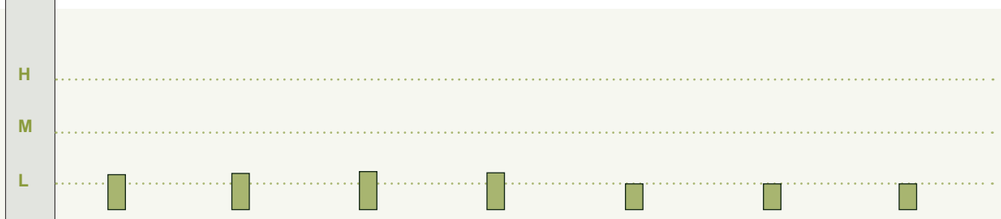
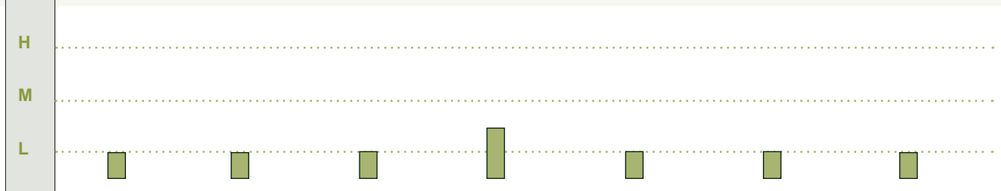
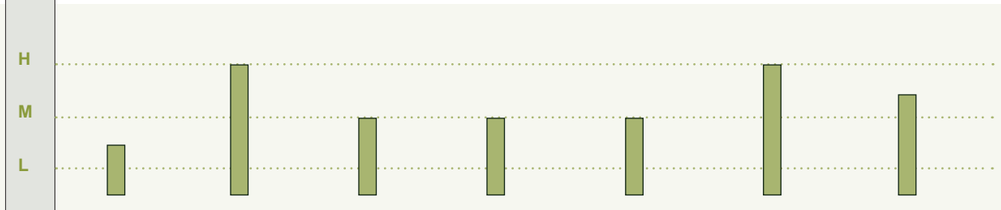
LCU:	Name:	Key Landscape Features:	Key locations:	Application of Scenic Quality Rating Frame of Reference: Landform / Waterforms / Vegetation / Human Influence / Activity / Rarity / Relationship with Adjoining Landscapes	Scenic Quality Rating:
LCU01	Farmlands and Plains	Flat, open expanses, sparse tree cover, large tracts of grass and bush, grazing lands	16 Mile Gums Rest Area (as identified during community consultation)		LOW
LCU02	Creek corridors	Seasonal creeks and waterways grasses and shrubs with groupings of trees, flat with topographical depressions	Channels such as Abercrombie Creek, Telegraph Creek, Nyangay Creek, Curtains Creek		MODERATE
LCU03	Dry Swamps and Floodplains	Gentle, shallow depressions acting as a refuge for seasonal water, sparse tree cover, areas of bush and grass, grazing areas	Box Swamp, Deaf Adder Swamp		LOW
LCU04	Hay	Highly modified landscape with flat topographical character, historic buildings, low density residential dwellings and agricultural heritage.	Shear Outback Visitor Centre, rest areas along Sturt Highway		LOW
LCU05	Booroorban	Small number of rural dwellings, patchy to dense tree cover, flat topography	Booroorban Hotel, rural dwellings		LOW
LCU06	Murrumbidgee River	Main Water Corridor in the region, Cultural and recreation areas, dense clumps of trees grouped on banks	Murrumbidgee River Rest Area		MODERATE

Table 6 Overview of LCU Scenic Quality Ratings

06

Preliminary Assessment Tools

6.0 Preliminary Assessment Tools

6.1 Overview of Preliminary Assessment Tools

To assist in defining the visual catchment, Preliminary Assessment Tools have been developed in the Bulletin. In accordance with the Bulletin, the purpose of the Preliminary Assessment Tools are: *"to provide an early indication of where turbines require careful consideration because of potential visual impacts. The tools apply to both dwellings and key public viewpoints in the study area. The tools provide an early indication of where placement of turbines will require further assessment and justification, and where consultation with potentially affected landowners needs to be focused – including discussions for landholder agreements"* (DPE, 2016).

The Preliminary Assessment Tools involve analysis of two key visual parameters:

1. Visual Magnitude (Refer to **Section 6.2**)
2. Multiple Wind Turbine Tool (Refer to **Section 6.4**)

The Bulletin states: *Further assessment and justification for placement of turbines located in these sensitive areas in the EIS will be required, along with a description of mitigation and management measures being employed to reduce impacts. This assessment may identify that factors such as topography, relative distance and existing vegetation may minimise or eliminate the impacts of the project* (DPE, 2016).

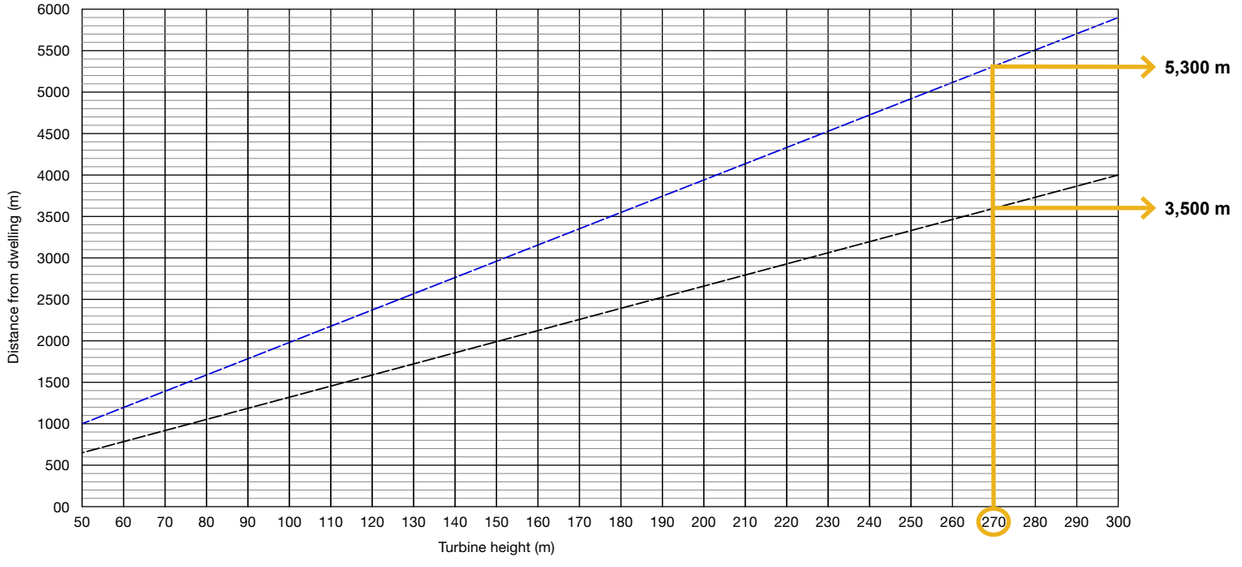
Dwellings identified through the application of the Preliminary Assessment Tools have been assessed in detail in **Appendix C** of this LVIA.

6.2 Preliminary Assessment Tool 1: Visual Magnitude

The Visual Magnitude Threshold is based on the height of the proposed wind turbines to the tip of the blade and distance from dwellings or key public viewpoints as shown in **Figure 13**.

In accordance with the Bulletin: "*proposed turbines below the black line must be identified along with the dwellings or key public viewpoints as part of the request for SEARs"* (DPE, 2016). The proposed wind turbines are based on a worst case scenario with a tip height of ***270 m***. The 'black line 'intersects at a distance of ***3,500 m*** and the 'blue line' intersects at ***5,300 m***.

For the purpose of the Preliminary Assessment, the Visual Magnitude thresholds are based on a 2D assessment of the Project alone. Further assessment indicates factors such as topography, relative distance and existing vegetation may minimise or eliminate the impacts of the Project on residences.



- - - - - Black Line of Visual Magnitude = 3,500 m

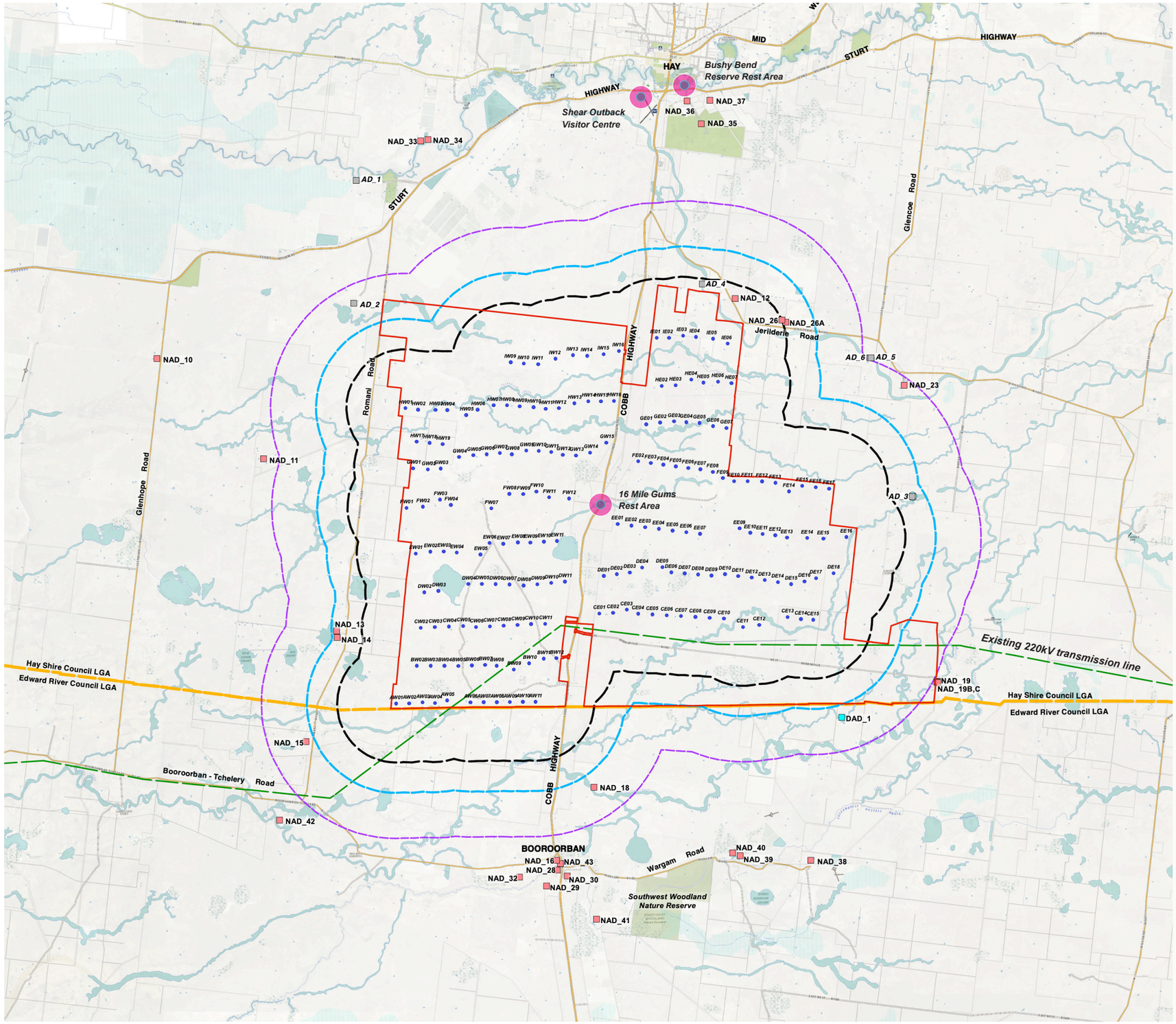
- - - - - Blue Line of Visual Magnitude = 5,300 m

Figure 13: Preliminary Assessment Tool 1: Visual Magnitude thresholds for Project Layout

(Source: DPE, 2016)

Visual Magnitude

The Plains Wind Farm



LEGEND

- Project Area Boundary
- Proposed Turbine Location
- Non-associated dwellings
- Associated dwellings
- DA locations
- Key Public Viewpoints
- Main Road
- Minor Road
- 3,500 m from nearest turbine (black line of visual magnitude)
- 5,300 m from nearest turbine (blue line of visual magnitude)
- 8,000 m from nearest turbine (extent of Study Area)
- LGA Boundary
- Existing 220kV transmission line
- National Park / Nature Reserves

Note:

Preliminary Assessment Tool 1: Visual Magnitude is based on a 2D Assessment alone and does not take into account topography, vegetation or other screening factors which may reduce the potential for viewing turbines.

N

0 4 8 12 16km

Figure 14: Preliminary Assessment Tool 1: Visual Magnitude (Map Source: SixMaps 2011)

6.3 Results of Preliminary Assessment Tool 1: Visual Magnitude

Application of the Preliminary Assessment Tools identified dwellings that require further assessment. A total of eight (8) non-associated dwellings have been identified within 8,000 m of the nearest turbine.

Non-associated dwellings identified within 3,500 m and between 3,500 - 5,300 m of the nearest proposed turbine are shown on **Figure 14.**

Of the eight (8) non-associated dwellings identified within 8,000 m of the nearest turbine:

- *Two (2)* non-associated dwellings have been identified within 3,500 m of a proposed wind turbine location (within the black line). See **Table 7.**
- *Three (3)* non-associated dwellings are located within 3,500 - 5,300 m of a proposed wind turbine (within the blue line). See **Table 7.**
- *Three (3)* non-associated dwellings are located within 5,300 - 8,000 m of a proposed wind turbine (within the purple line). See **Table 7.**

Detailed assessments of representative dwellings have been assessed in **Section 9.0** and detailed assessments have been provided in **Appendix C**.

Non-associated dwellings within 3,500 m of nearest WTG (Black Line of Visual Magnitude)

Dwelling ID:	Distance to nearest Turbine:	Nearest Turbine:	Number of turbines within 3,500m
NAD_12	2.70 km	IE06	Three (3)
NAD_26	3.49 km	IE06	One (1)

Non-associated dwellings between 3,500 - 5,300 m of nearest WTG

Dwelling ID:	Distance to nearest Turbine:	Nearest Turbine:	Number of turbines within 5,300m
NAD_13	4.97 km	CW02	Two (2)
NAD_14	4.75 km	CW02	Three (3)
NAD_26A	3.66 km	IE06	Three (3)

Non-associated dwellings between 5,300 - 8,000 m of nearest WTG

Dwelling ID:	Distance to nearest Turbine:	Nearest Turbine:	Number of turbines within 8000m
NAD_15	5.79 km	AW01	Five (5)
NAD_18	6.13 km	AW11	Five (5)
NAD_23	7.60 km	FE17	Two (2)

Table 7 Dwellings within 8,000 m of the nearest turbine

6.4 Preliminary Assessment Tool 2: Multiple Wind Turbine Tool

The Multiple Wind Turbine Tool (MWTT) 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 (6) sectors of 60° any proposed turbines, and any existing or approved turbines within 8 km of each dwelling or key public viewpoint. **Figure 15** below provides examples of where a dwelling or key public viewpoint may have views to turbines in multiple 60° sectors.

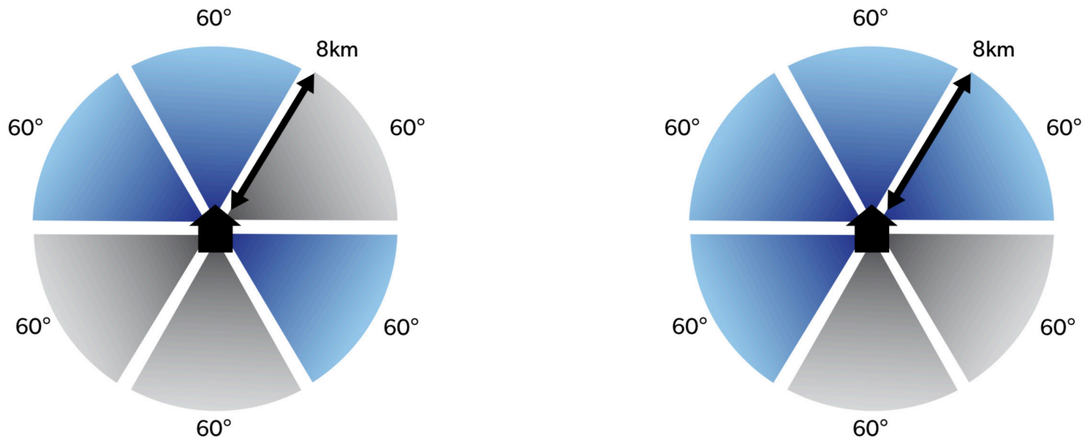


Figure 15: Preliminary Assessment Tool 2: Multiple Wind Turbines
(Source: DPE, 2016)

In accordance with the Bulletin where wind turbines are visible within the horizontal views of the dwelling or key public viewpoints in three (3) or more 60° sectors, the proponents must identify the turbines, relative dwelling and key public viewpoint, along with the relative distance and submit these to the DPE as part of the request for SEARs. These turbines will become a focus for assessment in the EIS.

Figure 16 provides an overview of the number of 60º sectors visible from each of the dwellings identified within 8 km.

6.5 Results of Preliminary Assessment Tool 2: Multiple Wind Turbine Tool

When applied, the 2D MWTT identified that all eight (8) non-associated dwellings within 8 km of the Project will have turbines associated with the Project in up to two (2) 60 degree sectors which is deemed appropriate in accordance with the Bulletin.

The MWTT is a 2D assessment that helps identify locations that require further investigation. The 2D assessment was applied to key public viewpoints such as the 16 Mile Gums Rest Area, the Shear Outback Visitor Centre and the Bushy Bend Reserve Rest Area which were identified as key public viewpoint locations in the **Section 5.0** of this report (see **Figure 16**). The application of this tool identified the following:

- Turbines associated with the Project are located in up to six (6) 60 degree sectors (up to 360º) for the 16 Mile Gums Rest Area. A detailed assessment of the viewpoint location is included in **Appendix B**.

- Based on the 2D assessment tool, no turbines were identified within any 60 degree sectors at the Bushy Bend Reserve Rest Area or the Shear Outback Visitor Centre because they are located approximately 13 km north of the nearest turbine.

The Project is located in the proximity of three (3) other renewable energy projects, ie, Bullawah Wind Farm (BWF), Pottinger Wind Farm (PWF) and Pottinger Solar Farm (PSF). The Plains Solar Farm (TPSF) project is located within the extent of the Project boundary. As of November 2023 and based on the information available on the Major Projects website, SEARs have been issued for these renewable energy projects and they are currently in the EIS preparation phase (DPE, 2023b). The Plains Renewable Energy Park also proposes a solar farm, which will be assessed as a separate SSD application.

The turbines utilised for the assessment of the BWF and PWF, and the solar development footprint layout of PSF are associated with the project layouts which are available in the public domain (accessed via NSW Planning Portal's *Major Projects* website, accessed in November 2023). **Figure 17** shows their location with respect to the Project.

It is important that this assessment considers the potential cumulative effects of surrounding renewable energy projects through the application of the MWTT. **Figure 17** shows that no dwellings or key public viewpoints were identified within 8,000 m of the Project, TPSF, PWF and BWF. However, dwellings were identified within 8,000 m of up to two (2) renewable energy projects.

When applied, the MWTT gave the following results for cumulative impacts:

- One (1) associated dwelling was identified within 8,000 m of the Project and BWF. Since AD_3 has been identified as an associated dwelling, the MWTT was not applied at this dwelling.

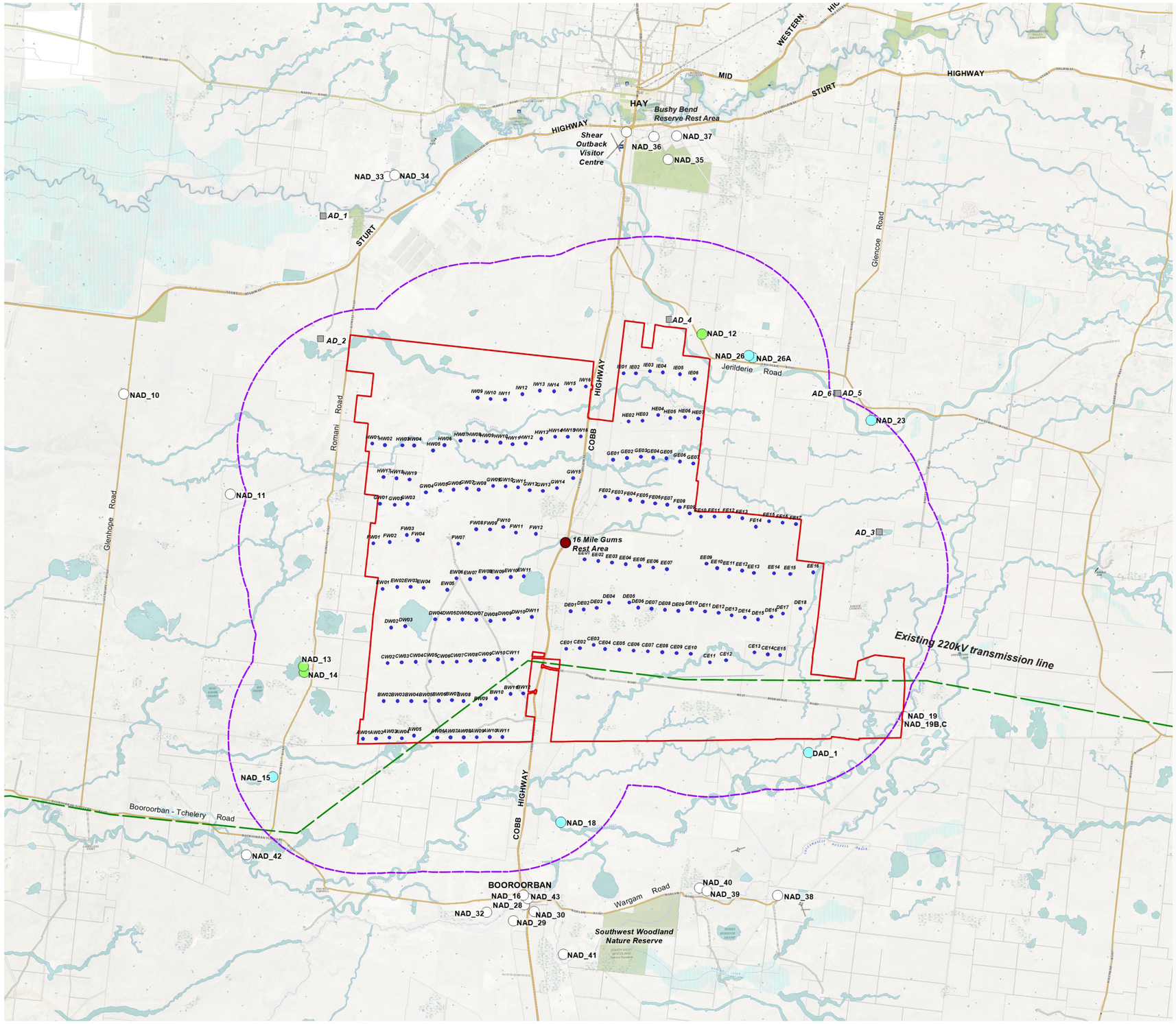
- One (1) DA location was identified within 8,000 m of the Project and PWF. The MWTT identified that turbines associated with PWF and the Project are located in up to five (5) 60 degree sectors. As per the Major Projects website, the dwelling is associated with the PWF project. The dwelling is yet to be constructed. An overview of potential cumulative impacts of BWF and PWF projects is discussed in **Section 13.0**.

- Three (3) non-associated dwellings were identified within 8,000 m of the BWF and PWF. The MWTT identified that turbines associated with BWF and PWF are located in up to four (4) 60 degree sectors. Based on the information available on the Major Projects website, NAD_19, NAD_19B and NAD_19C are likely to be associated with the PWF project (DPE, 2023b). These non-associated dwellings are, however, located outside 8,000 m of the nearest Project-related turbine, and therefore, have not been assessed in further detail.

It should be noted that the MWTT is a 2D assessment tool and does not consider intervening elements such as topography, vegetation, structures. Existing screening factors (including vegetation and structures) are likely to reduce visibility of the turbines in many instances. In accordance with the Bulletin, non-associated dwellings within the Study Area have been assessed in further detail in **Appendix C**.

Multiple Wind Turbine Tool

The Plains Wind Farm



LEGEND

- Project Area Boundary
- Proposed Turbine Location
- Associated dwellings
- Main Road
- Minor Road
- 8,000 m from nearest turbine (extent of Study Area)
- Existing 220kV transmission line
- National Park / Nature Reserves

MWTT Results for Non-associated Dwellings & key viewpoints:

- Dwellings or viewpoints in excess of 8,000 m
- One (1) 60º Sector (60º)
- Up to two (2) 60º Sectors (120º)
- Up to three (3) 60º Sectors (180º)
- Up to four (4) 60º Sectors (240º)
- Up to five (5) 60º Sectors (300º)
- Up to six (6) 60º Sectors (360º)

Note:

Preliminary Assessment Tool 2: Multiple Wind Turbine Tool is based on a 2D Assessment alone and does not take into account topography, vegetation or other screening factors which may reduce the potential for viewing multiple turbines.

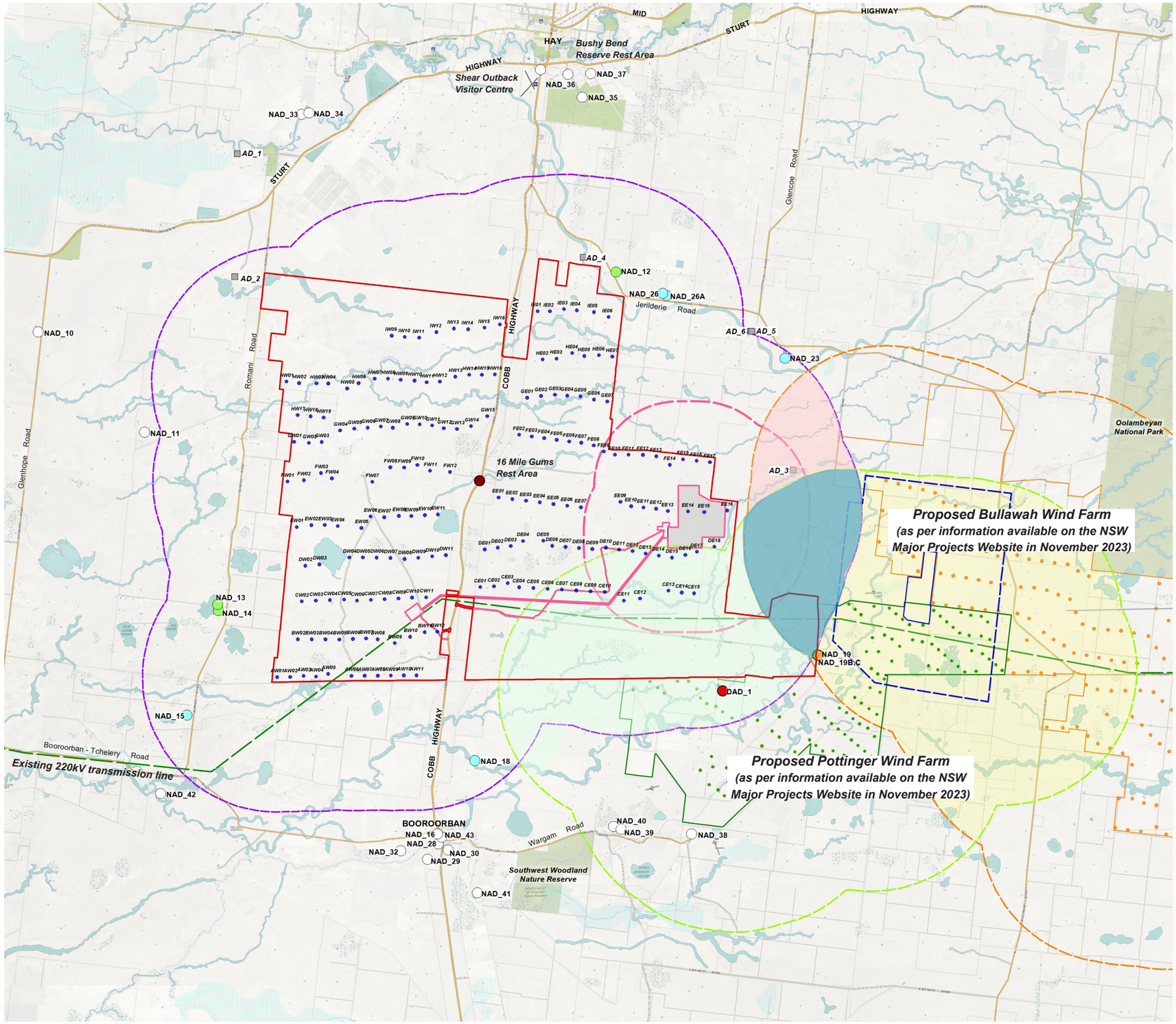
N

0 4 8 12 16km

Figure 16: Preliminary Assessment Tool 2:Multiple Wind Turbine Tool (Map Source: SixMaps 2011)

Cumulative Multiple Wind Turbine Tool

The Plains Wind Farm



LEGEND

- Project Area Boundary
- Project Boundary for the proposed The Plains Renewable Energy Park Solar Farm (TPSF) *(subject to separate SSD application)*
- Project Boundary for the proposed Bullawah Wind Farm (BWF) *(as per information available on the NSW Major Projects Website in November 2023)*
- Project Boundary for the proposed Pottinger Wind Farm (PWF) *(as per information available on the NSW Major Projects Website in November 2023)*
- Proposed Turbine Location for TPWF
- Proposed Turbine Location for BWF
- Proposed Turbine Location for PWF
- Proposed TPSF Location
- Proposed Pottinger Solar Farm (PSF) Location
- Associated dwellings
- 8,000 m from nearest TPWF turbine (extent of Study Area)
- 8,000 m from nearest BWF turbine
- 8,000 m from nearest PWF turbine
- 4,000 m from PWF Solar Farm Investigation Area
- 4,000 m from TPSF Solar Farm Investigation Area
- Existing 220kV transmission line
- Area with dwellings within 8000 m of TPWF & PWF
- Area with dwellings within 8000 m of TPWF & BWF
- Area with dwellings within 8000 m of PWF & BWF
- Area with dwellings within 8000 m of TPWF, PWF & BWF

MWTT Results for Non-associated Dwellings & key viewpoints:

- Receptors in excess of 8 km of all projects
- One (1) 60º Sector (60º)
- Up to Two (2) 60º Sectors (120º)
- Up to Three (3) 60º Sectors (180º)
- Up to Four (4) 60º Sectors (180º)
- Up to Five (5) 60º Sectors (180º)
- Up to Six (6) 60º Sectors (180º)

Note:

Preliminary Assessment Tool 2: Multiple Wind Turbine Tool is based on a 2D Assessment alone and does not take into account topography, vegetation or other screening factors which may reduce the potential for viewing multiple turbines.

N

0 4 8 12 16km

Figure 17: Cumulative Multiple Wind Turbine Tool (Map Source: SixMaps 2011)

07

Zone of Visual Influence

7.0 Zone of Visual Influence

7.1 Zone of Visual Influence

The Bulletin states: *'the use of Geographic Information Systems (GIS) to facilitate the application of the tools will streamline the evaluation phase of the evaluation phase of a project during the pre-lodgement stage. This can also assist in refining the number of turbines and viewpoints that will ultimately need more detailed assessment."* (DPE, 2016).

Two (2) Zone of Visual Influence (ZVI) diagrams have been prepared for the Project to illustrate the theoretical visibility of the proposed turbines from the blade tip height and the hub height.

Figure 18 depicts the areas of land from which the proposed development may be visible and provides an indicative number of wind turbines based on the blade tip height of 270 m.

Figure 19 depicts the areas of land from which the proposed development may be visible and provides an indicative number of wind turbines based on the hub height of 180 m.

The ZVI diagram represents the area over which a development can theoretically be seen and is based on a Digital Terrain Model (DTM). The ZVI usually presents a bare-ground scenario - ie. a landscape without screening, structures or vegetation, and is usually presented on a base map (Scottish Natural Heritage, 2017). It is also referred to as a zone of theoretical visibility (The Landscape Institute and the Institute of Environmental Management and Assessment, 2002).

The ZVI has been determined through the use of digital topographic information and 3D modelling software *WindPro*. The ZVI has been assessed to be approximately 30 km from the centre of the Project Area.

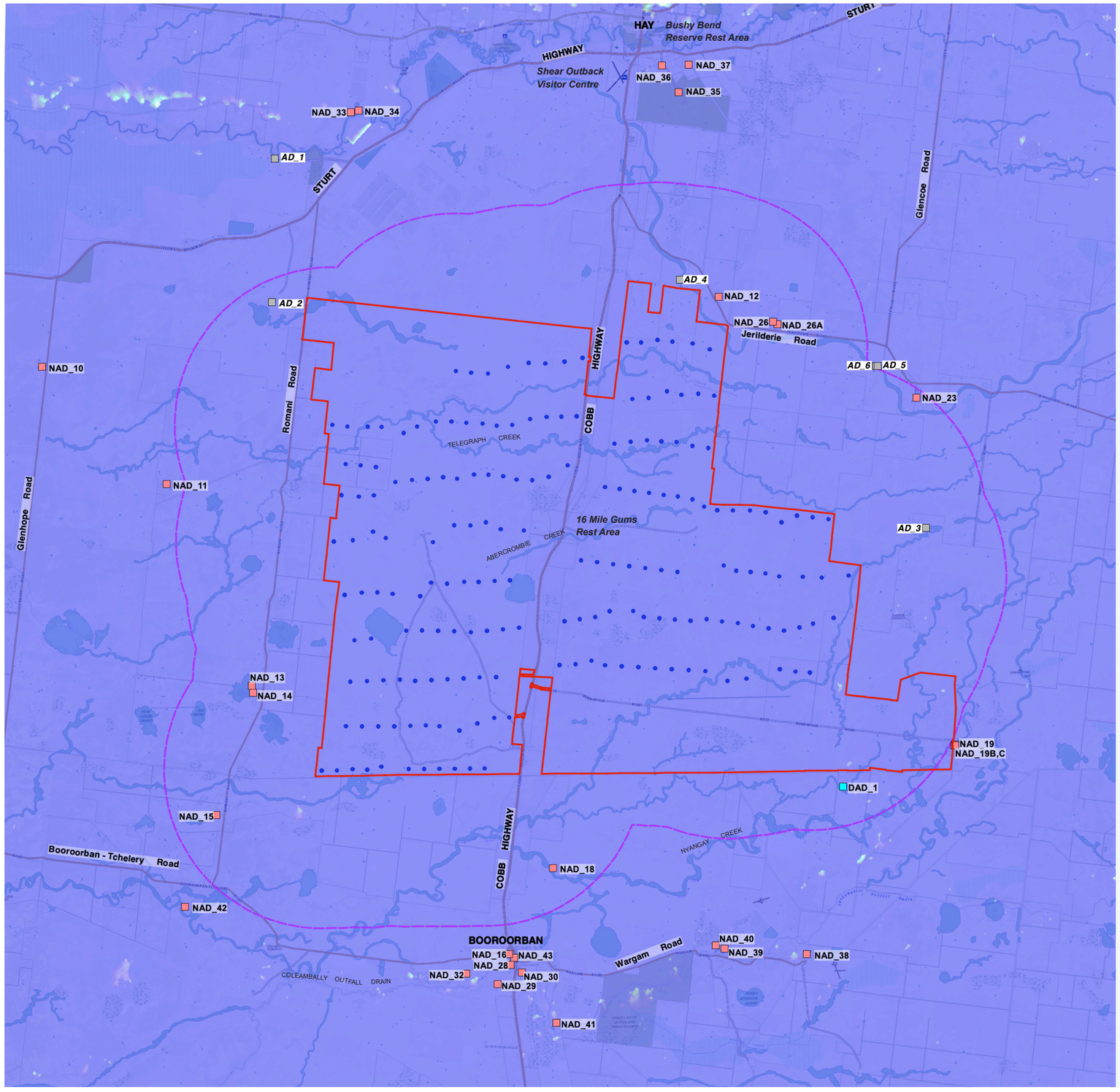
7.2 Summary of Zone of Visual Influence

The following provides a summary of the ZVI diagrams prepared for the Project:

- Due to the relatively flat topography that characterises this landscape, the majority of turbines associated with the Project are likely to be visible from most areas around the Project Area.
- Localised topographical changes in certain areas along the Murrumbidgee River that are located within Hay and generally north of the Project Area provide limit some views toward the Project.
- Some areas along the Coleambally Outfall Drain to the south have been identified as having limited views of the Project Area.
- Views to the majority of turbines associated with the Project are likely to be available for all dwellings within eight (8) kilometres of the wind turbines. This assessment is based on a consideration of topography alone and does not consider intervening elements such as vegetation and existing structures.

Following the development of the ZVI, detailed site investigations (in the form of a viewpoint analysis inventory and dwelling assessments) have been undertaken to ground-truth the findings (see **Appendix B**). Viewpoint analysis (from 15 public locations) and assessment of 15 sensitive receptors (ie, 12 non-associated dwellings, two (2) potential dwellings and one (1) DA location) have been included in **Appendix B** and **Appendix C** respectively. The assessments illustrate that existing vegetation that surrounds the majority of the non-associated dwellings will help limit the visibility of the Project.

It is important to reiterate that this is an assessment based on worst-case scenario that does not consider the impact of vegetation or structures. The ZVI figures have been utilised to identify areas that require additional analysis. Ground-truthing has been undertaken from these locations during fieldwork and analysis. A summary of these assessments have been included in **Section 8.0** and **Section 9.0** of this LVIA.



Zone of Visual Influence Blade Tip Height 270 m

The Plains Wind Farm

LEGEND

- Project Area Boundary
- Proposed Turbine Location
- Non-associated dwellings
- Associated dwellings
- DA locations
- 8,000 m from turbine (extent of Study Area)
- Road

Number of visible turbines (at tip height)
(Based on topography alone):

- 0
- 1 - < 63
- 63 - < 126
- 126 - <= 188

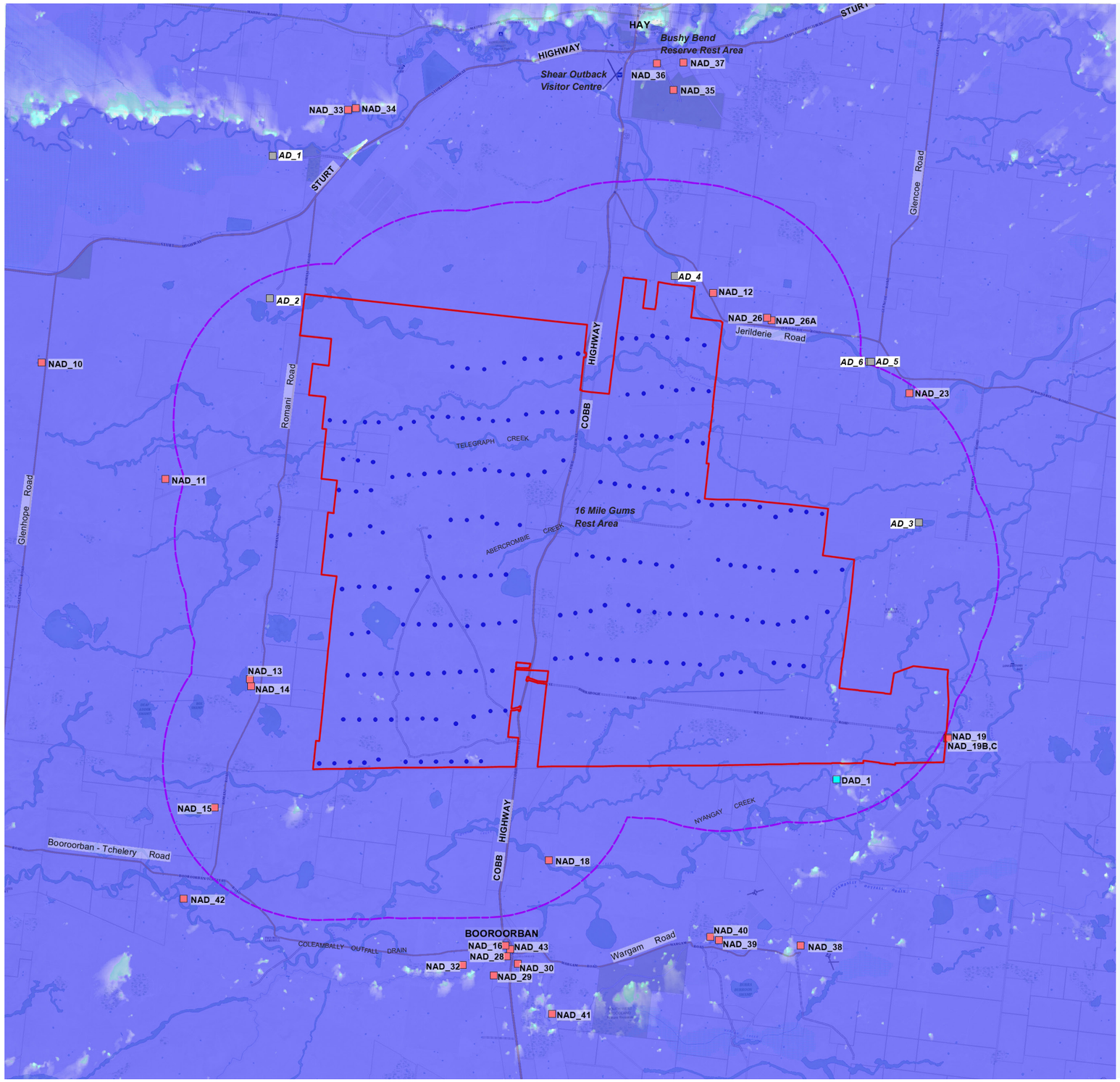
Note:

The ZVI is a preliminary assessment tool that represents a bare ground scenario - ie. a landscape without screening, structures or vegetation. As accurate information on the height and coverage of vegetation and buildings is unavailable, it is important to note the ZVI is based solely on topographic information. Therefore this form of mapping should be acknowledged as representing the worst case scenario.

N

0 4 8 12 16km

Figure 18: Zone of Visual Influence (Blade Tip Height 270 m) (Map Source: Six Maps 2011)



Zone of Visual Influence Hub Height 180 m

The Plains Wind Farm

LEGEND

- Project Area Boundary
- Proposed Turbine Location
- Non-associated dwellings
- Associated dwellings
- DA locations
- 8,000 m from turbine (extent of Study Area)
- Road

Number of visible turbines (at tip height)
(Based on topography alone):

- 0
- 1 - < 63
- 63 - < 126
- 126 - <= 188

Note:

The ZVI is a preliminary assessment tool that represents a bare ground scenario - ie. a landscape without screening, structures or vegetation. As accurate information on the height and coverage of vegetation and buildings is unavailable, it is important to note the ZVI is based solely on topographic information. Therefore this form of mapping should be acknowledged as representing the worst case scenario.

N

0 4 8 12 16km

Figure 19: Zone of Visual Influence (Hub Height 180 m) (Map Source: Six Maps 2011)

08

Public Viewpoint Analysis

8.0 Public Viewpoint Analysis

8.1 Overview of Public Viewpoint Analysis

In accordance with the Bulletin: *"all key public viewpoints and individual dwellings within the 'visual catchment' should be identified and assessed."* (DPE, 2016).

A total of 15 viewpoints were taken from public locations during the field work process. Viewpoints were carefully selected to be representative of the range of views within the Study Area. The selection of viewpoints is generally informed by the topographical maps, field work observations and other relevant influences such as access, residences, landscape character and the popularity of vantage points. Viewpoints are selected to illustrate a combination of the following;

- Viewpoints identified by the community in community consultation phase of scoping paper,
- Present landscape character types,
- Areas of potentially high landscape or scenic value,
- Range of distances,
- Varying aspects and elevations,
- Varying extent of wind farm visibility (full and partial visibility), and
- Sequential views along specific routes.

It is important to note that viewpoints for this LVIA study have been taken predominantly from accessible public land (typically roads and rest areas) which were identified as having a potentially high visual impact through the desktop review process.

The viewpoint locations assessed for the Project have included key viewpoints identified through the community engagement process undertaken by the Proponent.

Selected viewpoint assessment locations are shown on **Figure 21**.

8.2 Public Viewpoint Analysis Methodology

Once the viewpoints had been selected, panoramic photographs are taken in accordance with the standards outlined in the Scottish Natural Heritage Visual Representation of Wind Farms Guidance Version 2.2.

Photographs used for viewpoints are taken on a level tripod at a height of 150 cm (to represent eye level). Photographs were taken with a Canon EOS 5D Mark III Full Frame digital SLR through a 50 mm fixed focal lens which closely represents the central field of vision of the human eye. Parameters for the photography is provided in **Table 8**.

The visual impact of the viewpoint was assessed both on site and through a desktop assessment utilising with the topographic and aerial information to ensure accuracy.

The locations of the viewpoints have been identified in **Figure 21** and the general viewing direction of each viewpoint is identified on the map on each viewpoint.

Viewpoint analysis prepared for the Project from public locations has been included as **Appendix B.**

Photography Specifications:	
Camera Make and Model:	**Canon EOS 5D Mark IV Full Frame Digital SLR**
Lens:	**EF50mm f/1.2L USM**
Focal Length:	**50mm f/0**
Aperture Setting:	**f/6.3 - 10**
Tripod Height:	**150 cm**

Table 8 Photography Specifications

8.3 Visual Influence Zone (VIZ)

Visual Influence Zones have been established from the Project Area from dwellings and key viewpoints. This establishes the relative landscape significance against which the potential impacts of wind turbines may be assessed. The Visibility Distance Zone, Viewer Sensitivity Level and Scenic Quality Class of each viewpoint have been assessed which, when combined, result in an overall Visual Influence Zone (see **Figure 20** below and refer to tables in **Section 17.0**). An evaluation using the corresponding visual performance objectives (Table 2 of the Bulletin) has been included for each viewpoint.

For each viewpoint, the potential visual impact was analysed through the use of a combination of the 3D terrain modelling, topographic maps and on site analysis.

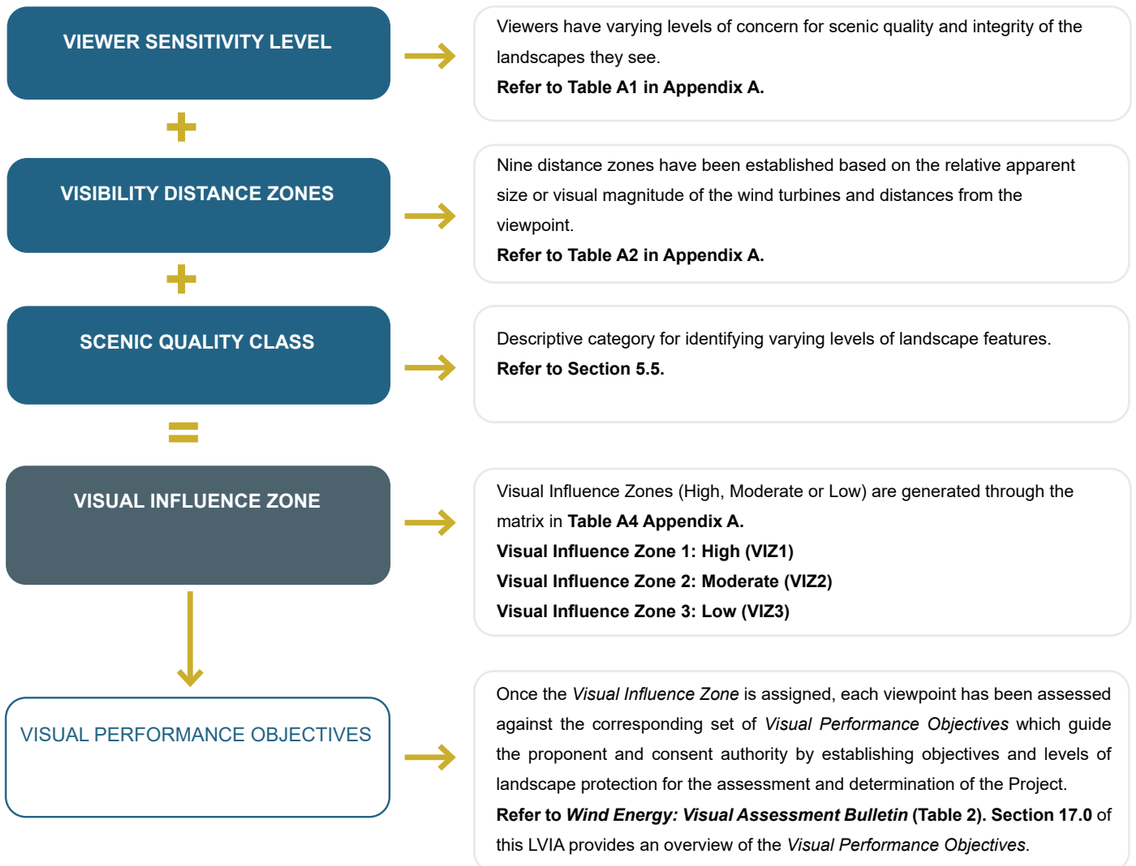


Figure 20: Methodology for determining Visual Influence Zone

Public Viewpoint Analysis Locations

The Plains Wind Farm

LEGEND

- Project Area Boundary
- Proposed Turbine Location
- Associated Dwellings
- Non-associated Dwellings
- DA Locations
- 3,500 m from turbine (black line of visual magnitude)
- 5,300 m from turbine (blue line of visual magnitude)
- 8,000 m from turbine (extent of Study Area)
- Main Road
- Minor Road
- LGA Boundary
- Public Viewpoint Analysis Location

N

0 4 8 12 16km

Figure 21: Public Viewpoint Analysis Locations (Map Source: Six Maps 2011)

8.4 Summary of Public Viewpoint Analysis

The 15 public viewpoints assessed for the purpose of this LVIA were taken from varying distances and locations surrounding the Project. This includes the key locations of 16 Mile Gums Rest Area along the Cobb Highway, the Shear Outback Visitor Centre and the Bushy Bend Reserve Rest Area in Hay.

Each viewpoint was assigned a Visual Influence Zone (VIZ) based on their Viewer Sensitivity Level, Visibility Distance Zone and Scenic Quality Class combinations (refer to the methodology in **Section 17.0**). Each viewpoint was assessed against the objectives for the VIZ. The detailed viewpoint analysis is found in **Appendix B** and a summary of the findings is included below.

Visual Influence Zone 2 (VIZ2):

Three (3) public viewpoints were rated as Visual Influence Zone 2 (VIZ2) due to the proximity of their location to the Project. These include VP02, VP03 and VP04. The Project was assessed as being a visible element in the landscape at these three (3) public viewpoint locations. The following gives an overview of the visual impact at these locations:

- VP02 is located on the Cobb Highway and represents views from the southern parts of the Project Area. The photomontage prepared for this location identified that the Project is likely to be a major element in the landscape due to its proximity to this viewing location. Existing vegetation associated with Nyangay Creek will partially limit views of some turbines (refer to Photomontage 08 - **Appendix D**).

- VP03 is located at the 16 Mile Gums Rest Area on the Cobb Highway and was identified as a key viewing location during community consultation in the PVIA phase. The turbines are likely to be a major element in the landscape due to their proximity to this location. The Rest Area does not offer views to any key landscape features. The Project is likely to become a defining character element in the view (refer to Photomontage 02 - **Appendix D**).

- VP04 is located on the Cobb Highway and represents views from the central parts of the Project Area. The viewpoint assessment prepared for this location identified that the Project is likely to be a major element in the landscape due to its proximity. The landscape lacks key landscape features. The Project is likely to become a defining character element in the view (refer to assessment VP04 a and b - **Appendix B**).

Visual Influence Zone 3 (VIZ3):

12 public viewpoint locations were rated as VIZ3 in accordance with the methodology in the Bulletin. There are no performance objectives for VIZ3 rated viewpoints.

09
Dwelling Assessments

9.0 Dwelling Assessments

9.1 Overview of Dwelling Assessment

9.1.1 Dwelling Assessment Requirements

The Bulletin states: *"all key public viewpoints and individual dwellings within the 'visual catchment' should be identified and assessed."* (DPE, 2016).

The SEARs state the LVIA must include a *"(...) detailed consideration of potential visual impacts on local residences (including approved developments, lodged development applications and dwelling entitlements) (...)"* (DPE, 2022c).

Non-associated Dwellings:

The Preliminary Assessment Tools (**Section 6.0**) defined the 'visual catchment' and identified non-associated residences within the Study Area which require further assessment. These include:

- Two (2) non-associated dwellings (dwellings NAD_26, and NAD_12) were identified within 3,500 metres of the nearest Project-related turbine (black line of visual magnitude).
- Three (3) non-associated dwellings (dwellings NAD_13, NAD_14 and NAD_26A) were identified within 3,500 - 5,300 metres of the nearest Project-related turbine (blue line of visual magnitude).
- Three (3) non-associated dwellings (dwellings NAD_15, NAD_18 and NAD_23) were identified within 5,300 - 8,000 metres of the nearest Project-related turbine.
- Detailed dwelling assessments for these eight (8) dwellings have been included in **Appendix C** to identify potential visual impacts since the existing landscape character is defined by flat plains with scattered vegetation.

Approved Developments and Lodged Development Applications:

As of November 2023, one (1) lodged Development Application (DAD_1) was identified within 8 km of the nearest Project-related turbine. DAD_1 is located within Pottinger Wind Farm project boundary. Detailed assessments for this location have been included in **Appendix C** to identify potential visual impacts since the existing landscape character is predominantly defined by flat plains with scattered vegetation.

Dwelling Entitlements:

As of November 2023, a total of 21 lots with dwelling entitlements were identified within 5,000 m of the nearest Project-related turbine in the Edward River Council and Hay Shire Council LGAs. An assessment based on the topography alone suggests that all lots have the potential for views to the majority of the Project. **Section 9.4** provides an overview of the percentage of each 'Zone of Visual Influence band' for each lot.

9.2 Study Method for Dwelling Assessments

In accordance with the Bulletin *"sensitive receptors have been identified through the use of the preliminary assessment tools"* (DPE, 2016). Moir LA have undertaken detailed dwelling assessment for these receptors.

With the advice of Moir LA, the Applicant offered on site and desktop dwelling assessments to be undertaken for all non-associated, approved and potential dwellings within 8,000 m of the nearest turbine.

The Bulletin states: "*The black and blue lines are not determinative of acceptability. Instead, they provide a basis for the assessment to be undertaken. There may be reasons why the proposed turbine will not have the impact as identified by (the visual magnitude thresholds) and detailed justification can be provided for proposed turbines... for example ground truthing may identify that existing vegetation or topography will screen views to a proposed turbine*." (DPE, 2016).

Table 9 provides an overview of the study method for undertaking the dwelling assessments.

Study Method	Process
Step 1: Application of Preliminary Assessment Tools	Preliminary Assessment Tools were applied in accordance with the Bulletin at each dwelling to assess the following two parameters: - Visual Magnitude (identify the number of turbines within blue and black lines) - Multiple 60º Sector Assessment (identify the number of 60º sectors based on a 2D assessment).
Step 2. 3D Assessment (based on topography alone)	Using 3D modelling, Moir LA identified turbines which will not be visible from the dwelling due to topography. As a result the extent of visibility is generally decreased when compared to the 2D assessment. The application of the Preliminary Assessment Tools are updated to account for 3D modelling.
Step 3. Aerial Imagery	Information on the extent of visibility extracted from the 3D model is then overlaid onto a recent aerial image of the dwelling and its surrounds. This provides a detailed assessment of the direction and extent of potentially visible turbines and identifies any intervening elements (such as structures, wind break planting or vegetation) which may reduce the potential visibility.
Step 4. Site Inspection	Where access was granted, Moir LA attended the property to undertake a site inspection to ground truth potential screening factors that were identified on aerial imagery. This included photographic assessment from the dwelling. During the site inspection Moir LA identified potential intervening elements including vegetation and structures.
Step 5: Photomontage / Wire Frame Diagrams	Where potential impacts were identified, photomontages or wire frame diagrams were prepared from dwellings to represent those with potential impacts or to best represent the appearance of the Project from clusters of dwellings.
Step 6. Evaluation of VIZ Objectives	In accordance with the Bulletin, the Visual Influence Zone was defined and the relevant objectives were evaluated for each dwelling based on the assessment.
Step 7. Visual Impact Rating	A visual impact rating is applied to each dwelling with regards to the parameters outlined in **Section 9.3 (Table 11).**
Step 8. Consideration of mitigation methods	Mitigation methods have been suggested for non-associated dwellings where the Project has the potential to cause visual impact. **Refer to Section 16.**

Table 9 Dwelling Assessment Process

9.3 Visual Impact Rating Methodology

The Bulletin states: *"The Department adopts the widely accepted and commonly utilised approach that visual impact can be determined from a combination of receiver sensitivity and the magnitude of visual effect. This approach is documented in numerous Australian and international guidelines, and is considered to be industry best practice."* (DPE, 2016).

In addition to assessing against the visual performance objectives outlined in the Bulletin, Moir LA have developed a framework for defining and rating the level of visual impact from each dwelling.

The framework in **Table 10** has been prepared with regards to the third edition of the Guidelines for Landscape and Visual Impact Assessment (GLVIA3), Residential Visual Amenity Assessment (RVAA) and Moir LA's professional experience in undertaking LVIA's for wind energy projects.

Published in 2013, the GLVIA3 is well established as providing 'best practice guidance' when undertaking Landscape and Visual Impact Assessment (LVIA). RVAA is a stage beyond LVIA and focusses exclusively on private views and private visual amenity. Considerations outlined in the RVVA which provide a framework for describing and evaluating the predicted magnitude of visual change and related visual amenity effects include:

- Distance of property from the proposed development having regard to its size / scale and location relative to the property (e.g., on higher or lower ground);
- Type and nature of the available views (e.g., panoramic, open, framed, enclosed, focused) and how they may be affected, having regard to seasonal and diurnal variations;
- Direction of view / aspect of property affected, having regard to both the main / primary and peripheral / secondary views from the property;
- Extent to which development / landscape changes would be visible from the property (or parts of) having regard to views from principal rooms, the domestic curtilage (e.g., garden) and the private access route, taking into account seasonal and diurnal variations;
- Scale of change in views having regard to such factors as the loss or addition of features and compositional changes including the proportion of view occupied by the development, taking account of seasonal and diurnal variations;
- Degree of contrast or integration of new features or changes in the landscape compared to the existing situation in terms of form, scale and mass, line, height, colour and texture, having regard to seasonal and diurnal variations;
- Duration and nature of the changes, whether temporary or permanent, intermittent or continuous, reversible or irreversible; and
- Mitigation opportunities – consider implications of both embedded and potential further mitigation.

(Source: RVAA, 2019).

VISUAL IMPACT RATING - RESIDENCES				
	NEGLIGIBLE	**LOW**	**MODERATE**	**HIGH**
Distance	The Project may be partially visible but very difficult to discern due to distance and / or intervening elements.	Turbines may be visible in distance or very partially visible in the foreground.	Turbines maybe visible in the middle ground or a small number may be visible in the near ground.	Turbines are highly visible in the foreground.
Type of views		Views from the dwelling are not focused on the Project.	Views from the dwelling are not focused entirely on the Project.	Views are focused directly towards the Project.
Direction of view		The Project may be visible in peripheral views or form a very minor element in primary views.	The Project may be visible from, yet will not dominate primary views.	The Project will be highly visible and has the potential to be a dominant element in primary views from the property.
Extent of visibility		The Project may be partially visible or fragmented.	The Project may be visible from the dwelling yet will not significantly alter the existing visual character.	The Project has the potential to significantly alter the existing visual character when viewed from the dwelling.
Scale of change		The Project may be visible yet will not change to the existing visual character.	The Project has the potential to become a noticeable element in the view, yet will not overly diminish the existing visual character.	The Project has the potential to alter the existing visual character.
Degree of contrast		The Project will have a low level of contrast with the existing landscape.	The Project will result in a moderate level of contrast with the existing landscape.	The scale of the Project will result in a high level of contrast with the existing landscape.
Duration of change		Changes are temporary.	Changes to the landscape have the potential to be reduced over time (with the employment of. mitigation methods).	Changes to the landscape are continuous and / or irreversible.
Mitigation Options		Existing screening factors contribute to reducing the potential visibility.	Some existing screening factors may contribute to fragmenting the Project or there is opportunity to screen the Project.	Limited opportunities to screen the Project.

Table 10 Visual Impact Rating Methodology - Residences

Detailed Dwelling Assessment Locations

The Plains Wind Farm

LEGEND

- Project Area Boundary
- Proposed Turbine Location
- Associated Dwellings
- Non-associated Dwellings
- DA Locations
- 3,500 m from turbine (black line of visual magnitude)
- 5,300 m from turbine (blue line of visual magnitude)
- 8,000 m from turbine (extent of Study Area)
- Main Road
- Minor Road
- LGA Boundary

DWELLING IMPACT RATINGS:

- Low Visual Impact Rating
- Moderate Visual Impact Rating

N

0 4 8 12 16km

Figure 22: Detailed Dwelling Assessment Locations (Map Source: Six Maps 2011)

Non-associated dwellings within 3,500 m of nearest WTG (Black Line of Visual Magnitude)

Dwelling ID:	Distance to nearest Turbine:	Nearest Turbine:	Number of turbines within 3,500 m:	Theoretical number of 60º sectors within 8000 m (Based on 2D Assessment):	Number of 60º sectors within all distances (Based on 3D Assessment):	Number of potentially visible turbines (based on topography alone):	Visual Influence Zone Rating:	Visual Impact Rating:	Assessment Notes:
NAD_12	2.70 km	IE06	Three (3)	Two (2)	Two (2)	188 all at hub	VIZ2	MODERATE	Moir LA attended the dwelling in March 2023. A viewpoint was selected in consultation with the owner and was taken from the southern side of the dwelling to represent views from the property. It is likely that the majority of the Project will be screened by existing vegetation and farm buildings in the dwelling's foreground. No key landscape features are impacted by the Project. The introduction of screen planting on the south western side of the dwelling can potentially limit views of the nearest turbines. Refer to detailed assessment **C.1.** in **Appendix C** and **E.3.** in **Appendix E**.
NAD_26	3.49 km	IE06	One (1)	One (1)	Two (2)	188 all at hub	VIZ2	MODERATE	Moir LA attended the dwelling in March 2023. A viewpoint was selected in consultation with the owner and was taken from the southern side of the dwelling to represent views from the property. It is likely that the majority of the Project will be visible due to lack of intervening elements. There are no key landscape features impacted by the Project. The introduction of screen planting on the south western side of the dwelling can potentially limit views of the nearest turbines. Refer to detailed assessment **C.2.** in **Appendix C** and **E.1.** in **Appendix E**.

Non-associated dwellings between 3,500 - 5,300 m of nearest WTG (Blue Line of Visual Magnitude)

Dwelling ID:	Distance to nearest Turbine:	Nearest Turbine:	Number of turbines within 5,300 m	Theoretical number of 60º sectors within 8000 m (Based on 2D Assessment):	Number of 60º sectors within all distances (Based on 3D Assessment):	Number of potentially visible turbines (based on topography alone):	Visual Influence Zone Rating:	Visual Impact Rating:	Assessment Notes:
NAD_13	4.97 km	CW02	Two (2)	Two (2)	Three (3)	188 all at hub	VIZ3	MODERATE	Moir LA attended the dwelling in March 2023. A viewpoint was selected in consultation with the owner and was taken from the northern side of the dwelling to represent views from the property. Existing vegetation and structures on the eastern side of the dwelling will limit views of turbines in up to two (2) 60 degree sectors which is deemed acceptable in accordance with the Bulletin. There are no key landscape features impacted by the Project. The introduction of screen planting on the north eastern side of the dwelling can potentially limit views of the nearest turbines. Refer to detailed assessment **C.4.** in **Appendix C** and **E.4.** in **Appendix E**.
NAD_14	4.75 km	CW02	Three (3)	Two (2)	Three (3)	188 all at hub	VIZ3	MODERATE	Moir LA attended the dwelling in March 2023. A viewpoint was selected in consultation with the owner and was taken from the eastern side of the dwelling to represent views from the property. Existing vegetation on the eastern side of the dwelling will limit views of turbines in up to two (2) 60 degree sectors which is deemed acceptable in accordance with the Bulletin. There are no key landscape features impacted by the Project. The introduction of screen planting in keeping with the existing vegetation character around the dwelling can potentially limit views to other turbines. Refer to detailed assessment **C.5.** in **Appendix C** and **E.5.** in **Appendix E**.
NAD_26A	3.66 km	IE06	Three (3)	One (1)	Two (2)	188 all at hub	VIZ2	MODERATE	A wire frame diagram has been prepared to assess the potential impacts on the dwelling. Assessment based on topography alone suggests that all turbines will be visible at the dwelling. Existing scattered vegetation in the middleground is likely to limit views of some turbines but it is likely that the majority of the Project will be visible due to lack of intervening elements. There are no key landscape features impacted by the Project. The introduction of screen planting on the south western side of the dwelling can potentially limit views of the nearest turbines. Refer to detailed assessment **C.3.** in **Appendix C** and **E.2.** in **Appendix E**.

Table 11 Summary of Assessment of Non-associated Dwellings

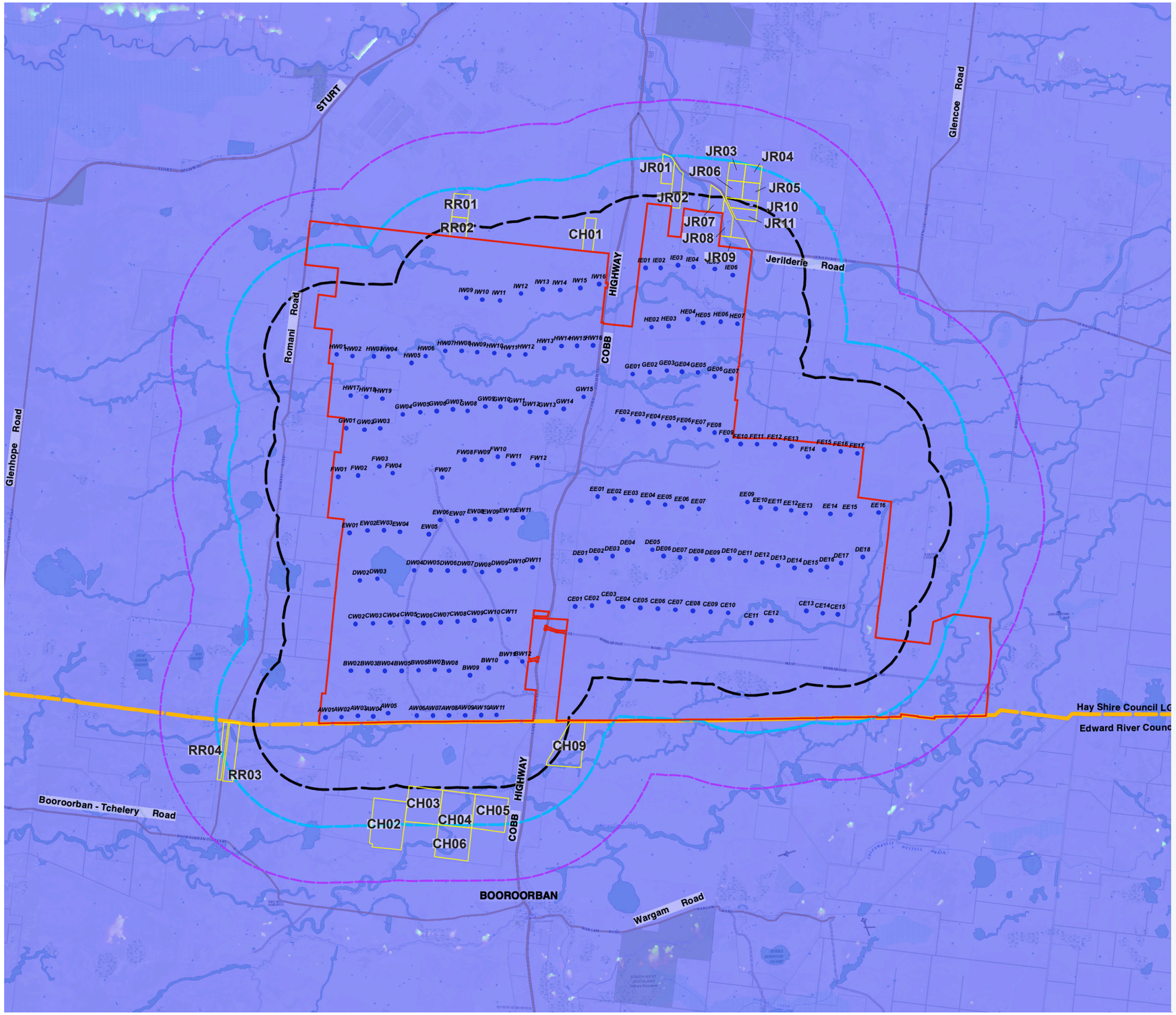
Non-associated and proposed dwellings between 5,300 - 8,000 m of nearest WTG									
Dwelling ID:	**Distance to nearest Turbine:**	**Nearest Turbine:**	**Number of turbines within 8,000 m:**	**Theoretical number of 60º sectors within 8000 m (Based on 2D Assessment):**	**Number of 60º sectors within all distances (Based on 3D Assessment):**	**Number of potentially visible turbines (based on topography alone):**	**Visual Influence Zone Rating:**	**Visual Impact Rating:**	**Assessment Notes:**
NAD_15	**5.79 km**	**AW01**	**Five (5)**	**One (1)**	**Two (2)**	**188 all at hub**	**VIZ3**	**LOW**	Moir LA attended the dwelling in March 2023. A viewpoint was selected in consultation with the owner and was taken from the eastern side of the dwelling to represent views from the property. Existing vegetation limits views to the majority of the turbines. There are no key landscape features impacted by the Project. Few turbines will be partially visible. Refer to detailed assessment **C.6**. in **Appendix C**.
NAD_18	**6.13 km**	**AW11**	**Five (5)**	**One (1)**	**Two (2)**	**188 all at hub**	**VIZ3**	**LOW**	Moir LA attended the dwelling in March 2023. A viewpoint was selected in consultation with the owner and was taken from the northern side of the dwelling to represent views from the property. Existing vegetation partially limits views to some of the turbines. No key landscape features are impacted by the Project. Refer to detailed assessment **C.7**. in **Appendix C**.
NAD_23	**7.60 km**	**FE17**	**Two (2)**	**One (1)**	**Two (2)**	**188 all at hub**	**VIZ3**	**LOW**	Moir LA attended the dwelling in March 2023. A viewpoint was selected in consultation with the owner and was taken from the western side of the dwelling to represent views from the property. Visible turbines are located in excess of 8 km from the dwelling and these are not likely to be dominant in the visual catchment. There are no key landscape features impacted by the Project. Refer to detailed assessment **C.8**. in **Appendix C**.
DAD_1	**6.08 km**	**CE15**	**Five (5)**	**One (1)**	**Two (2)**	**188 all at hub**	**VIZ3**	**LOW**	Moir LA attended the site in March 2023. A viewpoint was selected in consultation with the owner and was taken from the southern side of the DA location to represent views from the potential structure. Existing vegetation associated with the unnamed creek corridor will limit views of the majority of the Project and it is likely that up to two (2) turbines and four (4) blade tips will be visible at the location. No key landscape features are impacted by the Project. Refer to detailed assessment **C.9**. in **Appendix C**.

Table 11 Summary of Assessment of Non-associated Dwellings (continued)

9.4 Overview of Lots with Dwelling Entitlements

Figure 23 shows all lots with dwelling entitlements located within 5 km of the nearest wind turbine. A ZVI model has been overlaid to illustrate the number of potentially visible turbines for each lot (based on topography alone). It is important to understand that the ZVI model represents a bare ground scenario and does not consider intervening elements such as vegetation and structures.

Table 12 provides an overview of the percentage of each 'Zone of Visual Influence band' for each lot. The bands refer to the number of potentially visible turbines as per the **Figure 23**.



Lots with Dwelling Entitlements

The Plains Wind Farm

LEGEND

- Project Area Boundary
- Proposed Turbine Location
- 3,500 m from turbine (black line of visual magnitude)
- 5,300 m from turbine (blue line of visual magnitude)
- 8,000 m from turbine (extent of Study Area)
- Road
- Lots with dwelling entitlements
- LGA boundary

Number of visible turbines (at tip height)
(Based on topography alone):

- 0
- 1 - < 63
- 63 - < 126
- 126 - <= 188

Note:

The ZVI is a preliminary assessment tool that represents a bare ground scenario - ie. a landscape without screening, structures or vegetation. As accurate information on the height and coverage of vegetation and buildings is unavailable, it is important to note the ZVI is based solely on topographic information. Therefore this form of mapping should be acknowledged as representing the worst case scenario.

N

0 4 8 12 16km

Figure 23: Lots with Dwelling Entitlements (Map Source: Six Maps 2011)

MLA Reference	Lot / DP & Address:	LGA:	Lot Size:	Percentage of Lot Covered by 'ZVI Band':				Assessment Notes:
				Nil	1 - < 63 turbines	63 - < 126 turbines	126 - < =188 turbines	
CH01	**Lot 97 / DP756797** Cobb Highway, Hay South 2711	**Hay Shire Council LGA**	75.94 ha	**0.0%**	**0.0%**	**0.0%**	**100%**	The lot is located entirely within black line (3,500 m) and shares its boundary with the Project boundary. It is recommended that structures are sited further away to the north and screening that limits views of the Project is considered for reduced potential visual impact.
CH02	**Lot 31 / DP756321** Cobb Highway, Booroorban 2710	**Edward Shire Council LGA**	354.57 ha	**0.0%**	**0.0%**	**0.0%**	**100%**	The majority of the lot is located within blue line (5,300 m). It is recommended that structures are sited further away to the south within the black and blue line for reduced potential visual impact. Screen planting can potentially limit impacts.
CH03	**Lot 1 / DP756277** Cobb Highway, Booroorban 2710	**Edward Shire Council LGA**	262.20 ha	**0.0%**	**0.0%**	**0.0%**	**100%**	The majority of the lot is located within blue line (5,300 m). It is recommended that structures are sited further away to the south and screening that limits views of the Project is considered for reduced potential visual impact.
CH04	**Lot 2 / DP756277** Cobb Highway, Booroorban 2710	**Edward Shire Council LGA**	261.47 ha	**0.0%**	**0.0%**	**0.0%**	**100%**	The lot is located within blue line (5,300 m). It is recommended that structures are sited further away to the south and screening that limits views of the Project is considered for reduced potential visual impact.
CH05	**Lot 3 / DP756277** Cobb Highway, Booroorban 2710	**Edward Shire Council LGA**	261.50 ha	**0.0%**	**0.0%**	**0.0%**	**100%**	The lot is located within blue line (5,300 m). It is recommended that structures are sited further away to the south and screening that limits views of the Project is considered for reduced potential visual impact.
CH06	**Lot 5 / DP756277** Cobb Highway, Booroorban 2710	**Edward Shire Council LGA**	254.74 ha	**0.0%**	**0.04%**	**0.16%**	**100%**	Part of the lot is located within blue line (5,300 m). It is recommended that structures are sited further away to the south within the black and blue line for reduced potential visual impact. Screen planting can potentially limit impacts.
CH09	**Lot 15 / DP756313** Cobb Highway, Booroorban 2710	**Edward Shire Council LGA**	260.28 ha	**0.0%**	**0.0%**	**0.0%**	**100%**	Majority of the lot is located within blue line (5,300 m) and a small part is located within the black line (3,500 m). It is recommended that structures are sited further away to the south east and screening that limits views of the Project is considered for reduced potential visual impact.
JR01	**Lot 48 / DP756774** Jerilderie Road, Hay South 2711	**Hay Shire Council LGA**	95.10 ha	**0.0%**	**0.0%**	**0.0%**	**100%**	Majority of the lot is located within blue line (5,300 m). It is recommended that structures are sited further away to the north and screening that limits views of the Project is considered for reduced potential visual impact.
JR02	**Lot 91 / DP756774** Jerilderie Road, Hay South 2711	**Hay Shire Council LGA**	73.77 ha	**0.0%**	**0.0%**	**0.0%**	**100%**	Majority of the lot is located within blue line (5,300 m) and partly within black line (3,500 m). It is recommended that structures are sited further away to the north for reduced potential visual impact. Screen planting can potentially limit impacts.
JR03	**Lot 87 / DP756774** Jerilderie Road, Hay South 2711	**Hay Shire Council LGA**	65.01 ha	**0.0%**	**0.0%**	**0.0%**	**100%**	The lot is located entirely within the blue line (5,300 m). It is recommended that structures are sited further away to the north and screening that limits views of the Project is considered for reduced potential visual impact.
JR04	**Lot 88 / DP756774** Jerilderie Road, Hay South 2711	**Hay Shire Council LGA**	65.03 ha	**0.0%**	**0.0%**	**0.0%**	**100%**	The majority of the lot is located within the blue line (5,300 m). It is recommended that structures are sited further away to the north and screening that limits views of the Project is considered for reduced potential visual impact.
JR05	**Lot 85 / DP756774** Jerilderie Road, Hay South 2711	**Hay Shire Council LGA**	66.60 ha	**0.0%**	**0.0%**	**0.0%**	**100%**	The lot is located entirely within blue line (5,300 m). It is recommended that structures are sited further away to the north west of the lot for reduced potential visual impact. Screen planting can potentially limit impacts.

Table 12 Summary of Assessment of Lots with Dwelling Entitlements

MLA Reference	Lot / DP & Address:	LGA:	Lot Size:	Percentage of Lot Covered by 'ZVI Band':				Assessment Notes
				Nil	1 - < 63 turbines	63 - < 126 turbines	126 - < 188 turbines	
JR06	**Lot 86 / DP756774** Jerilderie Road, Hay South 2711	**Hay Shire Council LGA**	66.41 ha	**0.0%**	**0.0%**	**0.0%**	**100%**	Majority of the lot is located within blue line (5,300 m) and a small part is located within the black line (3,500 m). It is recommended that structures are sited further away to the north of the lot for reduced potential visual impact. Screen planting can potentially limit impacts.
JR07	**Lot 47 / DP756774** Jerilderie Road, Hay South 2711	**Hay Shire Council LGA**	81.48 ha	**0.0%**	**0.0%**	**0.0%**	**100%**	Majority of the lot is located within black line (3,500 m) and a small part is located within the blue line (5,300 m). It is recommended that structures are sited further away to the north of the lot for reduced potential visual impact. Screen planting can potentially limit impacts.
JR08	**Lot 82 / DP756774** Jerilderie Road, Hay South 2711	**Hay Shire Council LGA**	66.91 ha	**0.0%**	**0.0%**	**0.0%**	**100%**	The lot is located entirely within the black line (3,500 m). It is recommended that structures are sited further away to the north and screening that limits views of the Project is considered for reduced potential visual impact.
JR09	**Lot 79 / DP756774** Jerilderie Road, Hay South 2711	**Hay Shire Council LGA**	62.06 ha	**0.0%**	**0.0%**	**0.0%**	**100%**	The lot is located entirely within the black line (3,500 m) and shares its boundary with the Project boundary. It is recommended that structures are sited further away to the north or north west and screening that limits views of the Project is considered for reduced potential visual impact.
JR10	**Lot 84 / DP756774** Jerilderie Road, Hay South 2711	**Hay Shire Council LGA**	67.33 ha	**0.0%**	**0.0%**	**0.0%**	**100%**	Majority of the lot is located within the black line (3,500 m) and a small part is located within the blue line (5,300 m). It is recommended that structures are sited further away to the north and screening that limits views of the Project is considered for reduced potential visual impact.
JR11	**Lot 83 / DP756774** Jerilderie Road, Hay South 2711	**Hay Shire Council LGA**	62.99 ha	**0.0%**	**0.0%**	**0.0%**	**100%**	The lot is located entirely within the black line (3,500 m). It is recommended that structures are sited further away to the north and screening that limits views of the Project is considered for reduced potential visual impact.
RR01	**Lot 30 / DP756797** Romani Road, Hay South 2711	**Hay Shire Council LGA**	86.28 ha	**0.0%**	**0.0%**	**0.0%**	**100%**	The lot is located entirely within the blue line (5,300 m). It is recommended that structures are sited further away to the north and screening that limits views of the Project is considered for reduced potential visual impact.
RR02	**Lot 31 / DP756797** Romani Road, Hay South 2711	**Hay Shire Council LGA**	74.47 ha	**0.0%**	**0.0%**	**0.0%**	**100%**	Majority of the lot is located within the black line (3,500 m) and a small part is located within the blue line (5,300 m). It is recommended that structures are sited further away to the north and screening that limits views of the Project is considered for reduced potential visual impact.
RR03	**Lot 34 / DP756321** Romani Road, Hay South 2711	**Edward Shire Council LGA**	207.54 ha	**0.0%**	**0.0%**	**0.0%**	**100%**	The majority of the lot is located within the blue line (5,300 m). It is recommended that structures are sited further away to the west and screening that limits views of the Project is considered for reduced potential visual impact.

Table 12 Summary of Assessment of Lots with Dwelling Entitlements (continued)

9.5 Summary of Dwelling Assessment

An overview of the visual assessment for each of the representative dwellings and detailed assessments have been included in **Appendix C**. The following provides a summary of the assessment and proposed recommendations in accordance with the Bulletin.

9.5.1 Dwellings within 3,500 m of the nearest turbine (black line of visual magnitude)

A total of two (2) non-associated dwellings were identified within 3,500 m of a proposed turbine. All two (2) non-associated dwellings were assessed as having a moderate visual impact rating.

Both non-associated dwellings located within 3,500 m of the nearest turbine were assessed as being Visual Influence Zone 2 (VIZ2). In accordance with the Bulletin, objectives for VIZ2 receptors within the black line (3,500 m) of the nearest turbine are to: *Manage impacts as far as practicable, justify residual impacts, and describe proposed mitigation measures below black line.*

Practical mitigation measures such as provision of screen planting for dwellings NAD_26 and NAD_12 would reduce the level of visual impact from moderate to low. Once established, it is anticipated the residual impacts would be acceptable. An overview of the mitigation measures for these dwellings has been included in **Appendix E.**

9.5.2 Dwellings between 3,500 - 5,300 m of the nearest turbine (blue line of visual magnitude)

A total of three (3) non-associated dwellings were identified between 3,500 - 5,300 m of a proposed turbine. One (1) non-associated dwelling located between 3,500 - 5,300 m of a proposed turbine was assessed as being Visual Influence Zone 2 (VIZ2). In accordance with the Bulletin, objectives for VIZ2 receptors within the blue line (5,300 m) of the nearest turbine are to: *Consider screening between the blue line and the black line.*

Two (2) non-associated dwellings located between 3,500 - 5,300 m of the nearest turbine were assessed as being Visual Influence Zone 3 (VIZ3). In accordance with the Bulletin, no visual performance objectives have been noted for VIZ3 receptors. However, screen planting has been proposed to reduce potential visual impacts from these dwelling locations which have been assessed as having a moderate visual impact rating.

9.5.3 Dwellings in excess of 5,300 m and within 8,000 m of the nearest turbine

A total of three (3) non-associated dwellings and one (1) approved DA location were identified were identified beyond 5,300 m and within 8,000 m of a proposed turbine.

The assessment found that all four (4) dwelling locations as having a low visual impact rating.

All non-associated dwellings located beyond 5,300 m and within 8,000 m of the nearest turbine were assessed as being Visual Influence Zone 3 (VIZ3). In accordance with the Bulletin, no visual performance objectives have been noted for dwellings rated as VIZ3.

9.5.4 Lots with Dwelling Entitlements

An overview of the visual assessment for 21 lots with dwelling entitlements identified within 5,000m of the nearest turbine has been included in this report. An assessment based on topography alone suggests that the majority of the Project will be visible on all lots with dwelling entitlements. This assessment, however, is based on topography alone and does not account for intervening elements such as vegetation.

It is recommended that dwellings are sited and orientated away from the Project as per the recommendations provided in **Table 12**. The introduction of screen planting around any future dwellings will also help limit visual impacts of the Project.

The Bulletin states: "*where relatively close clustering of houses belonging to different landowners or occupants occur, representative viewpoints may be selected and assessed in lieu of every single dwelling in the following types of areas:*

- *rural residential clusters;*
- *rural villages; and*
- *urban residential and commercial areas*." (DPE, 2016).

In addition to the detailed assessment of dwellings identified within the visual catchment, Moir LA undertook Public Viewpoint Analysis which provides representative visual assessments from dwellings in excess of 5,300 m of the Project (refer to **Section 8.0** and **Appendix B**).

10

Photomontages and Wire Frame Diagrams

10.0 Photomontages and Wire Frame Diagrams

10.1 Overview of Photomontages and Wire Frame Diagrams

10.1.1 Photomontages

The Bulletin states: "*Photomontages shall be prepared in accordance with the Scottish Natural Heritage Visual Representation of Wind Farms, Version 2.1 December 2014 guidelines, noting they are generally consistent with the Land and Environment Court's Photomontage Policy. The visual assessment needs to include a concise description of the complete methodology used to create any photomontages presented in the visual assessment.*" (DPE, 2016).

A photomontage combines a photograph of an existing view with a computer-rendered image of a proposed development. Photomontages are used to illustrate the likely view of a proposed development as it would be seen in a photograph (not as it would appear to the human eye in the field).

Although photomontages are based on a photograph of the existing landscape, it is important to note that they are not a substitute for visiting a viewpoint in the field. They are only one tool to aid assessment. They provide a two-dimensional image that can be compared with an actual view of the landscape to provide information, such as the scale and potential appearance of a proposed development.

Photomontages prepared for the Project have been included in Appendix D.

10.1.2 Wire Frame Diagrams

A wire frame is a computer-generated image based on a digital terrain model, that indicates the 3D shape of the landscape in combination with additional elements. They are a valuable tool in the wind farm LVIA process as they allow the assessor to compare the position and scale of the turbines to the existing view of a landscape (Scottish Natural Heritage, 2017). Wire frame images can be seen as a worst-case scenario as they do not take into account factors such as vegetation and building structures.

Wire frame diagrams have been utilised in this LVIA to assist in the assessment of the Project from inaccessible locations. In instances where access to a location was not available, wire frame diagrams have been utilised as an assessment tool to provide a worst-case scenario view of the Project.

10.2 Photomontage Limitations

Visualisations in themselves can never provide the full picture in terms of potential impacts; they only inform the assessment process by which judgements are made. Visualisations of wind farms have a number of limitations which stakeholders should be aware of when using them to form a judgement on a wind farm proposal.

These include:

- A visualisation can never show exactly what the wind farm will look like in reality due to factors such as: different lighting, weather and seasonal conditions which vary through time and the resolution of the image;
- The images provided give a reasonable impression of the scale of the turbines and the distance to the turbines, but can never be 100% accurate; and
- A static image cannot convey turbine movement, or flicker or reflection from the sun on the turbine blades as they move.

Source: Scottish Natural Heritage Visual Representation of Wind Farms, Version 2.2 February 2017.

10.3 Photomontage Selection Process

Indicative viewpoints have been selected for the preparation of photomontages from public locations and private dwelling locations to best illustrate the potential appearance of the proposed wind farm from varying distances and locations with differing views in public locations (refer to **Figure 25**).

Public Photomontage Locations:

A total of ***eight (8) public viewpoint locations*** selected for the preparation of visual photomontages are based on feedback received from the community. Exact photomontage locations were selected on site to represent a worst-case scenario for the viewpoint location. Localised screening factors such as vegetation were avoided (where possible) to ensure maximum exposure to the Project.

Private Photomontage Locations:

A total of ***nine (9) photomontages*** have been prepared from private properties. The locations selected were based on those that granted access.

Public Receptor Photomontages		
S.No.	**Photomontage Number**	**Location**
Photomontage 01	PM01	Shear Outback Visitor Centre, Sturt Highway, Hay South
Photomontage 02	PM02	16 Mile Gums Rest Area, Cobb Highway, Booroorban
Photomontage 03	PM03	Intersection of Cobb Highway and Symons Crescent, Booroorban
Photomontage 04	PM04	Rest Area near Hay, Sturt Highway, Hay
Photomontage 05	PM05	Jerilderie Road, Hay South
Photomontage 06	PM06	Intersection of Romani Road and Booroorban-Tchelery Road, Booroorban
Photomontage 07	PM07	Romani Road, Hay
Photomontage 08	PM08	Cobb Highway, Booroorban
Private Receptor Photomontages		
Photomontage 09	PD01	Dwelling NAD_12
Photomontage 10	PD02	Dwelling NAD_26
Photomontage 11	PD03	Dwelling NAD_13
Photomontage 12	PD04	Dwelling NAD_14
Photomontage 13	PD05	Dwelling NAD_15
Photomontage 14	PD06	Dwelling NAD_18
Photomontage 15	PD07	Dwelling AD_3
Photomontage 16	PD08	Dwelling NAD_23
Photomontage 17	PD09	DA Location DAD_1

Table 13 Overview of Photomontage Locations

10.4 Photomontage Development Methodology

The process for generating the photomontages involves computer generation of a wire frame perspective view of the wind turbines and the topography from each viewpoint. As per the requirements of the Bulletin, photomontages have been prepared in accordance with the Scottish Natural Heritage Visual Representation of Wind Farms, Version 2.2 February 2017. The process for photomontage development is demonstrated in **Figure 24**.

The photomontages are based on a worst-case scenario of a maximum turbine height dimension of 290 m with a hub height of 180 m, without the inclusion of the proposed mitigation methods.

Moir LA have prepared the photomontages using the most current available version of Wind Pro software using the following process:

Step 1: Develop 3D Model

Detailed 3D model of the Site is developed in Wind Pro. The wind turbines and associated infrastructure (substations, transmission lines, wind masts etc.) are modelled and sited in the 3D model to scale.

Step 2: Align Photograph and Model

The digital panorama is imported into Wind Pro and EXIF properties of the file are inserted automatically defining all relevant visualization information as e.g., type of camera lens used, field of view for panoramas, the position and direction. Topography, control points, obstacle objects, existing wind masts can be used as reference to calibrate the camera model precisely.

Step 3: Render Photomontage

The software calculates the position of the sun based on the time and date of photograph and renders the wind turbines in accordance with the specific weather conditions and position of the sun. Once rendered, detailed removal of intervening elements (such as vegetation) is undertaken to provide an accurate representation of the Project.

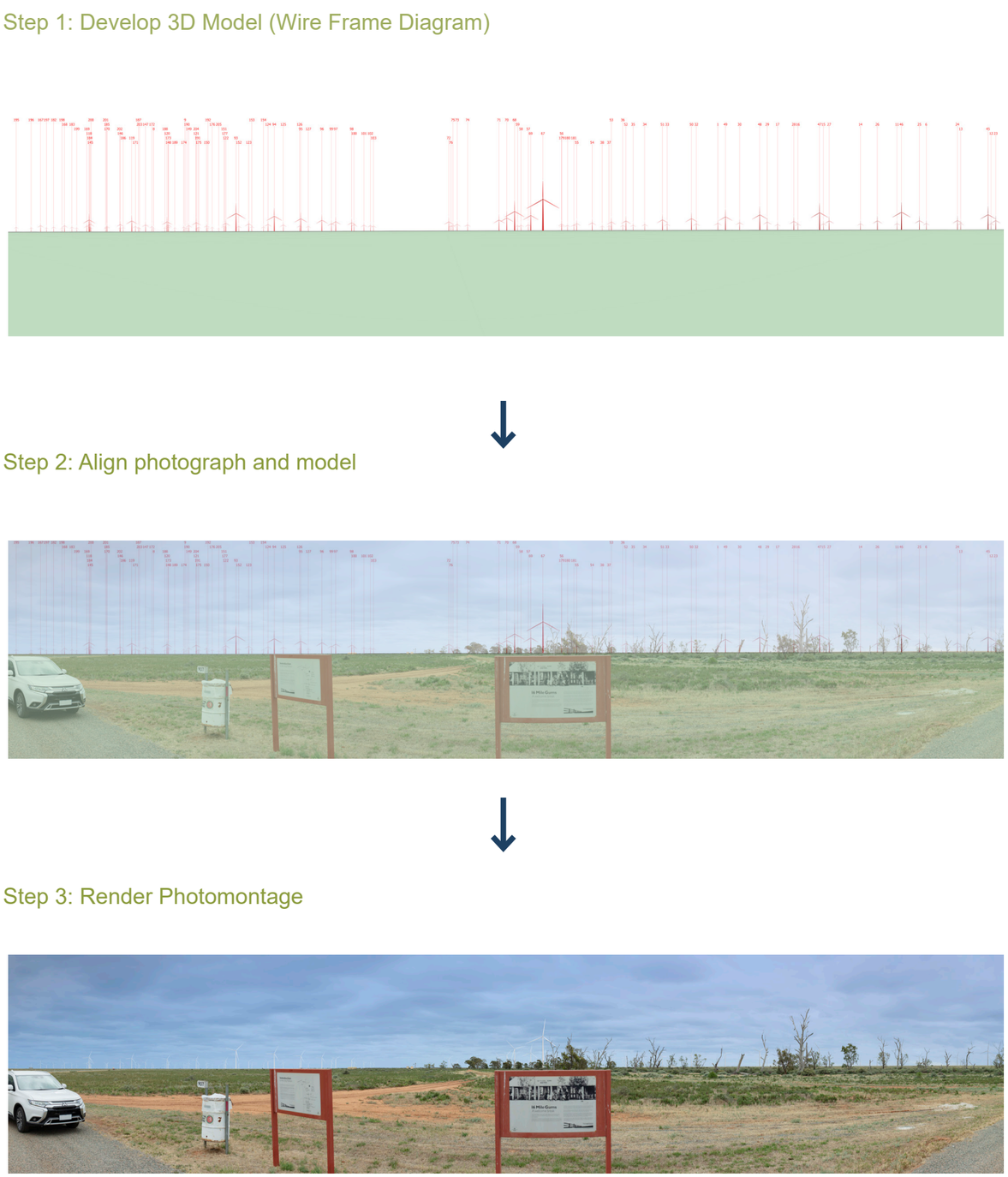
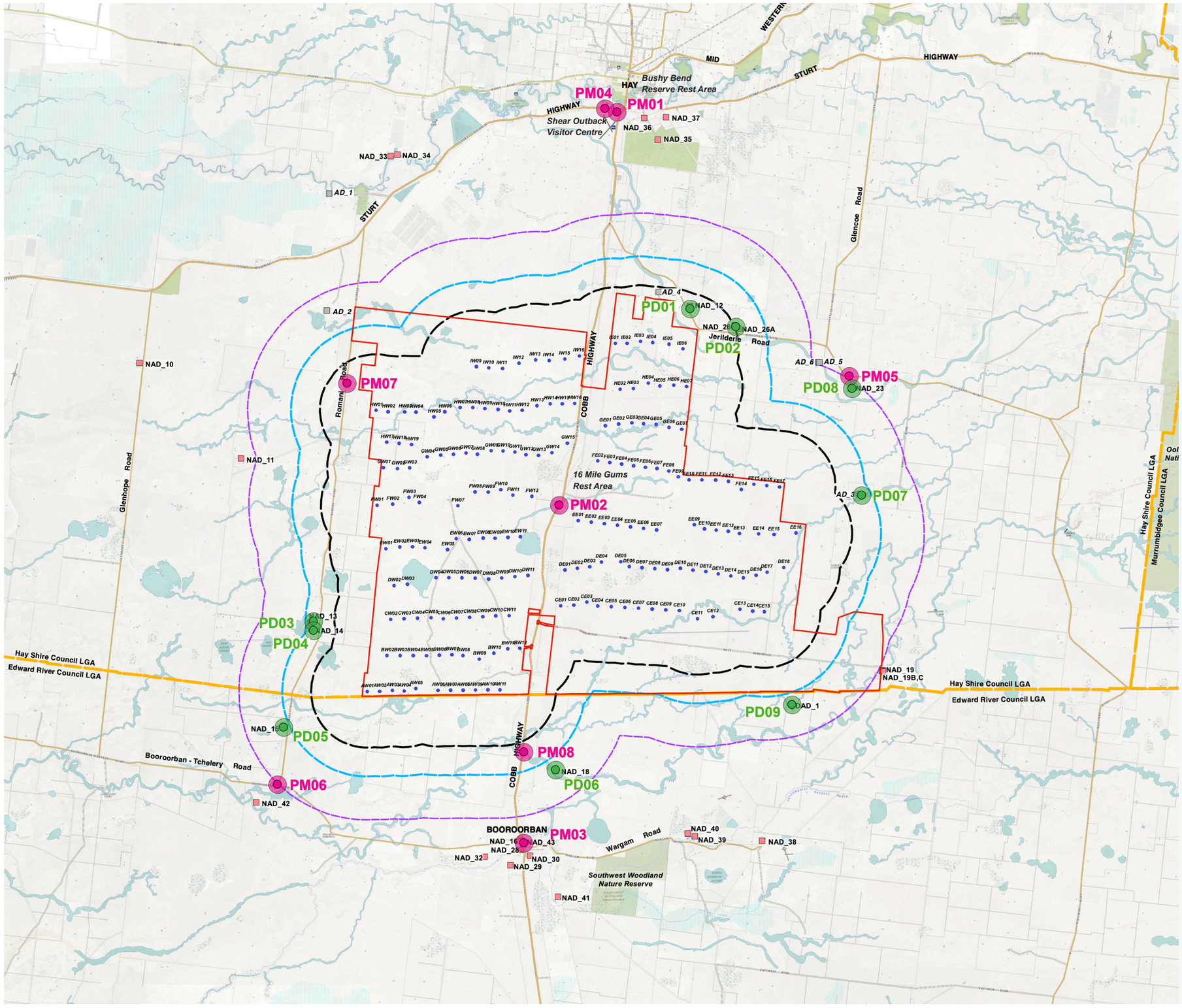


Figure 24: Photomontage Development Process

Photomontage Locations (Public and Private Receptors)

The Plains Wind Farm



LEGEND

- Project Area Boundary
- Proposed Turbine Location
- Associated Dwellings
- Non-associated Dwellings
- DA Locations
- 3,500 m from turbine (black line of visual magnitude)
- 5,300 m from turbine (blue line of visual magnitude)
- 8,000 m from turbine (extent of Study Area)
- Main Road
- Minor Road
- LGA Boundary
- Photomontage Location (public receptors)
- Photomontage Location (private receptors)

N

0 4 8 12 16km

Figure 25: Photomontage Locations (Public and Private Receptors) (Map Source: Six Maps 2011)

11

Night Lighting Assessment

11.0 Night Lighting Assessment

11.1 Overview of Night Lighting

The following section of the report provides an assessment of the visual impacts of potential night lighting of the Project. Night lighting has the potential to result in the alteration of the nighttime landscape character of the region. Potential light sources include:

- Low-intensity red non-flashing light on top of Meteorological Masts (height of up to 150 - 165 m AGL. Note: height of mast will be confirmed during detail design phase).
- Night lighting for safety and security on ancillary structures and O&M facility. Continuously operating security lighting would be installed on posts up to 3.5 m high.
- Flood lights to be installed near workers' accommodation.

11.2 Aviation Hazard Lighting

The requirement of AHL on meteorological masts for the Project is subject to the advice of the Civil Aviation Safety Authority (CASA). It is noted that the turbines proposed for the Project will possibly be up to 270 m in height and CASA generally recommends night lighting if an obstacle exceeds 160 m above ground level.

In accordance with the framework outlined in the NASF Guideline D '*Managing the risk to aviation safety of wind turbine installations (wind farms) / wind monitoring towers*' (NASAG, 2012), specifications for lighting should be installed:

- *to identify the perimeter of the wind farm;*
- *respecting a maximum spacing of 900m between flashing lights along the perimeter, unless an aeronautical study shows that a greater spacing can be used;*
- *where flashing lights are used, they flash simultaneously; and*
- *within a wind farm, any wind turbines of significantly higher elevation are identified wherever located*.

Representative images of aviation lighting (installed in August 2020) on turbines at Biala Wind Farm have been included to best illustrate the potential visual appearance of aviation lighting. Photographs of the aviation lighting at varying distances and times have been included in this report. **Images 26 - 28** illustrate the appearance of night lighting on a dark rural landscape at intervals after sunset.



Image 26 View towards Biala Wind Farm - 2.0 km from turbine at 6:20pm (30 minutes after sunset)



Image 27 View towards Biala Wind Farm - 1.75 km from turbine at 6:35pm (45 minutes after sunset)

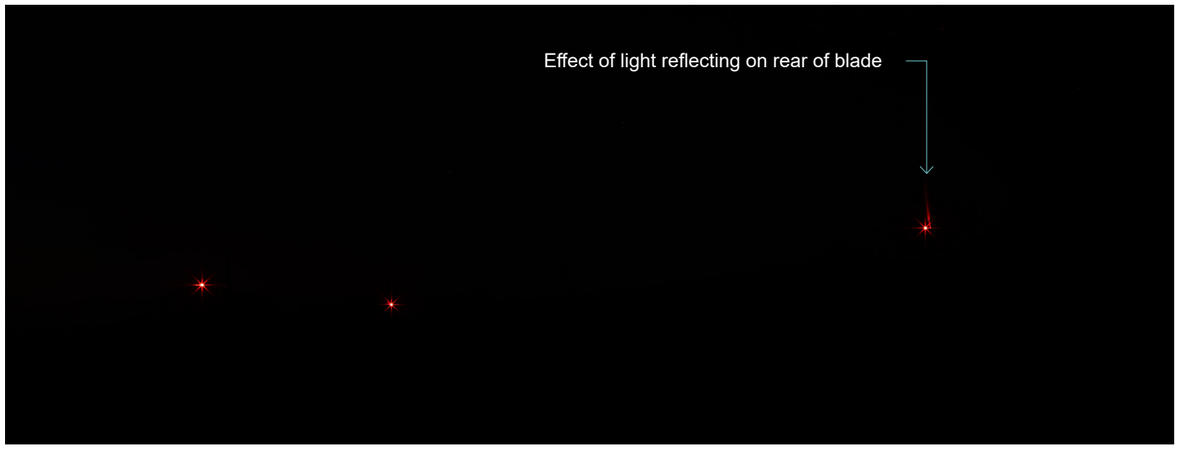


Image 28 View towards Biala Wind Farm - 1.85 km from turbine at 6:50pm (60 minutes after sunset)



Image 29 View towards Biala Wind Farm - 3.5 km from turbine



Image 30 View at night towards Biala Wind Farm - 3.5 km from turbine



Image 31 View towards Biala Wind Farm - 8.5 km from turbine

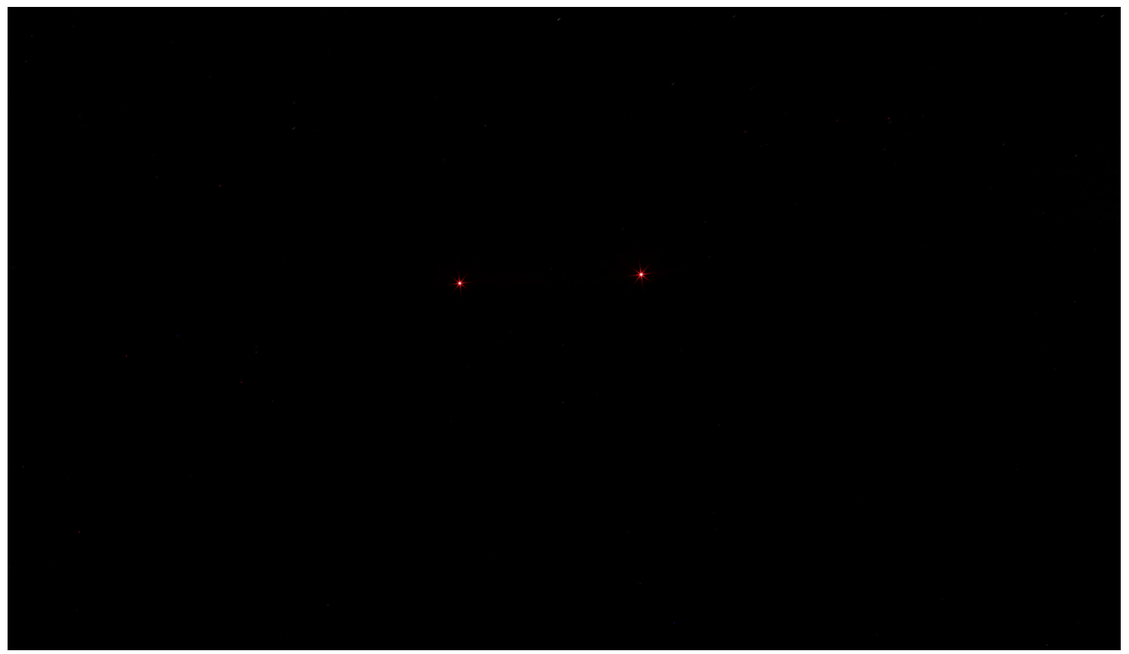


Image 32 View at night towards Biala Wind Farm - 8.5 km from turbine

11.3 Overview of potential visual impacts from Night lighting

Night lighting of associated infrastructure such as meteorological masts has the potential to extend the visual effect into the nighttime. Aviation hazard lighting (AHL) has the potential to be visible from distances in excess of 20 km (Scottish Natural Heritage, 2017). However, the distance depends on a number of variables, including light intensity, topography, vegetation coverage and climatic conditions.

Other proposed night lighting sources include flood lights at workers' accommodation and standard outdoor night lighting at the O&M facility and ancillary infrastructure. It is anticipated that the lighting will be installed at an approximate height of 3.5 m - 6 m.

Due to the relatively isolated location of the Project, very few existing sources of lighting are present in the nighttime landscape of the Study Area. Some existing lighting associated with homesteads and motor vehicles is dispersed around the Study Area. Isolated receptors within the Study Area experience a dark night sky with minimal light sources. The impact of night lighting is unlikely to be experienced from inside of a dwelling as internal lights reflect on windows and limit views to the exterior at nighttime.

The highest visual impact is likely to be where people experience the night landscape outdoors. Dark sky is a valued quality of the rural landscape, due to the lack of light pollution. Aviation lighting has the potential to impact on receptors who view the landscape at night, in particular night-sky enthusiasts, photographers, star gazers, campers and some landowners with potential visibility of the turbines hub.

The visual impact of potential aviation lighting could be reduced by employing mitigation methods outlined in **Section 11.4.** Considering the height of the meteorological masts and the implementation of low-intensity non-flashing lighting on top of the masts, the source of visible light is likely to be reduced to ambient lighting as opposed to direct visibility of the light itself when viewed from the ground.

11.4 Recommendations to reduce the potential visual impacts from Night lighting

The Bulletin states: "*If such lighting is required, the CASA guidelines recommend that to minimise visual impacts "obstacle lights may be partially shielded, provided it does not compromise their operational effectiveness. Where obstacle lighting is provided, lights should operate at night, and at times of reduced visibility. All obstacle lights on a wind farm should be turned on simultaneously and off simultaneously." The lights should be fully shielded from the view of any dwelling within 2 km. As part of the assessment of visual impacts of wind energy projects, the Department will consider whether any obstacle lighting required is likely to result in any significant increase in visual impacts."* (DPE, 2016).

To assist in the amelioration of the effect of Aviation Hazards Lighting on wind turbines and associated infrastructure the following should be applied:

- If used, air navigation lighting should be spaced around the outer edges of the wind farm. Lights are not required on every tower. Where possible, careful consideration should be given to the selection of turbines requiring lighting to avoid unnecessary impact upon residences.
- Treatment of the rear of blades with a non-reflective coating to reduce reflection off the rotating blade at night.
- Use of the lowest candela intensity allowed by CASA.
- According to the CASA requirements, shielding may be provided to restrict the downward spill of light to the ground plane by ensuring that no more than 5% of the nominal light intensity should be emitted at or below 5° below horizontal (refer to **Image 33**).
- No light should be emitted at or below 10° below horizontal.

Technology in both aviation and wind farm development is constantly evolving. One example of evolving technology is Air Detection Lighting System (ADLS). Although these haven't been utilised in New South Wales, an ADLS has recently been installed at the Lal Lal Wind Farm just east of Ballarat in Victoria. An ADLS is an effective measure to reduce visual impacts, save electricity and improve aviation safety. Aviation lighting is activated when an aircraft approaches within four to six kilometres.

As this technology such as ADLS become more cost effective and readily available, it may become a viable option for the Project.

Over time as wind farm development has occurred throughout NSW, there are precedents for the review of the requirement of aviation lightings on a number of wind farms post-construction. In the Upper Lachlan Shire, on November 1, 2010 Cullerin Wind Farm, owned by Origin Energy, switched off turbine aviation lighting after guidelines set out by CASA were withdrawn. Requirement of aviation lighting for Crookwell 2 Wind Farm was reviewed by CASA in 2019 and allowed to be turned off (Crookwell Gazette, 2019).

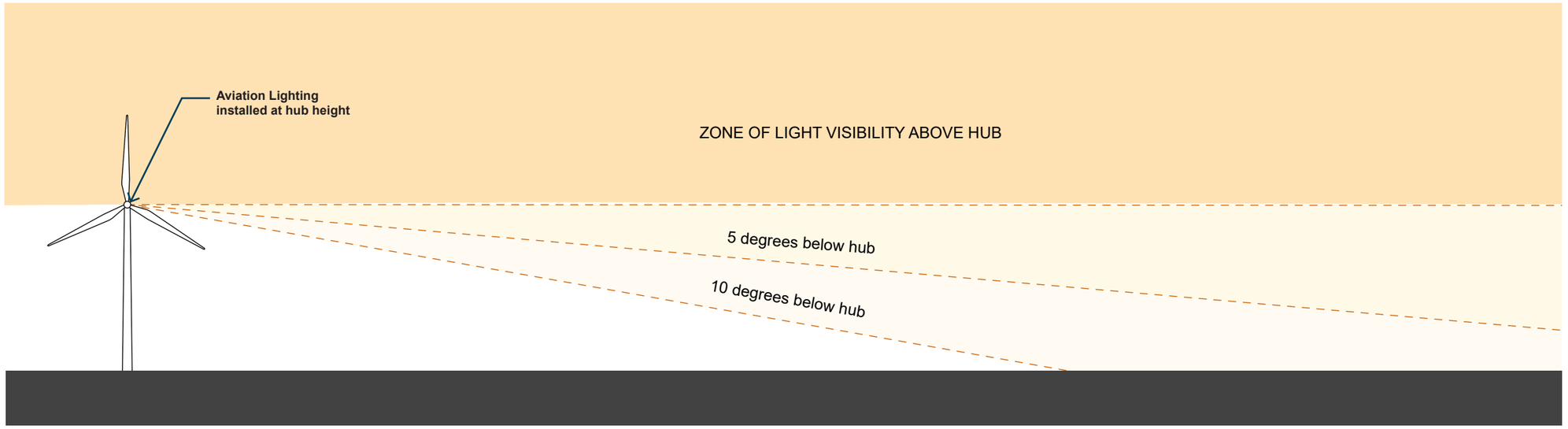


Image 33 Recommended Light Shielding to reduce lighting spread

11.5 Potential Impacts of Lighting Associated with Ancillary Infrastructure

In addition to lighting on meteorological masts, standard outdoor night lighting is likely to be required on ancillary infrastructure including switching stations, workers accommodation and facilities buildings.

Maintenance lighting will be installed at the substations and at the O & M building for night work including emergency operations. It is proposed that flood lights will be installed at the workers accommodation. All maintenance lighting will be designed to reduce disturbance to neighbouring properties and will be used only when there are staff onsite or during emergencies.

Continuously operating security lighting would be installed on posts up to 3.5 m high adjacent to the security fencing and O & M buildings.

It is unlikely the proposed night lighting associated with the ancillary infrastructure would create a noticeable impact on the existing night time landscape.

To assist in the amelioration of the effect of night lighting on ancillary structures the following should be applied:

- Security lighting throughout the wind farm, switching station and substation should be minimised to decrease the contrast between the wind farm and the nighttime landscape of the area.
- Motion detectors should be used to activate nighttime security lighting when required.
- Lighting is to be designed to ensure it does not spill onto nearby roads or residences.

If design principles are incorporated into the night lighting for Ancillary Infrastructure, it is likely there will be no visual impacts resulting from night lighting of Ancillary Structures.

1. Control the level of lighting:

- Only use lighting for areas that require lighting ie. paths, building entry points.
- Reduce the duration of lighting:
- Switch off lighting when not required
- Consider the use of sensors to activate lighting and timers to switch off lighting

2. Lighting Design:

- Use the lowest intensity required for the job
- Use energy efficient bulbs and warm colours
- Direct light downwards
- Ensure lights are not directed at reflective surfaces
- Use non-reflective dark coloured surfaces to reduce reflection of lighting **(Figure 26)**
- Keep lights close to the ground and / or directed downwards **(Figure 27)**
- Use light shield fittings to avoid light spill (refer to **Figure 28**).

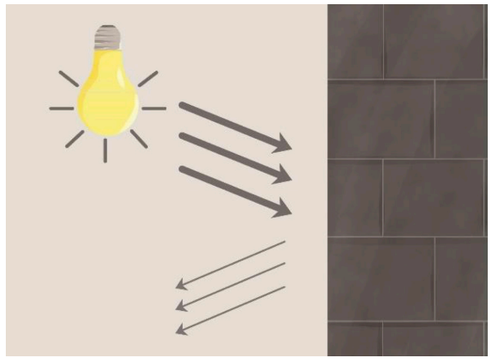


Figure 26: Surface Reflectivity
Source: Department of Environment and Energy National Light Pollution Guidelines for Wildlife (2020)

In accordance with the recommendations of the LVIA, ancillary structures are to painted in a dark non-reflective paint to reduce any potential reflectivity from light and remain sympathetic to the surrounding landscape.

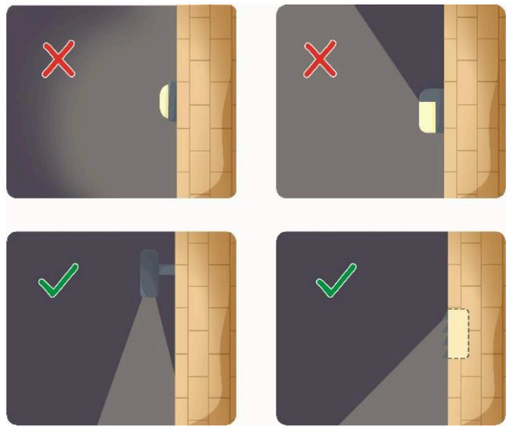


Figure 27: Downward Lighting
Source: Department of Environment and Energy National Light Pollution Guidelines for Wildlife (2020)

Where possible, lighting is to be directed downwards.

Where possible, lighting should be fully or partially shielded to prevent spill into surrounding areas.

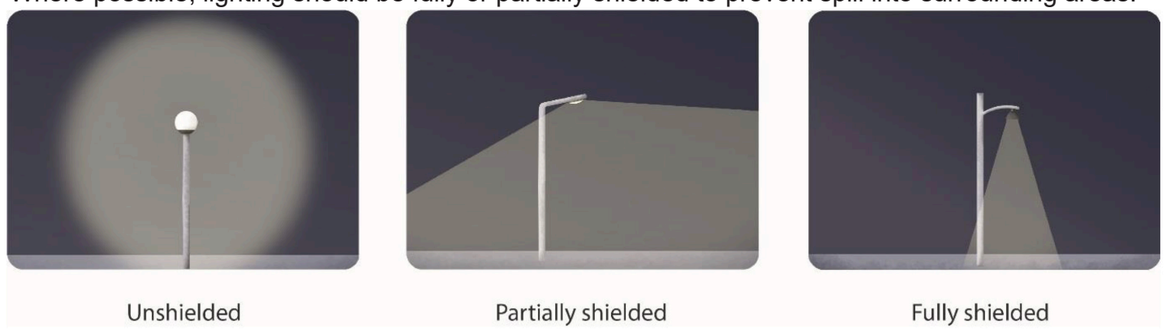


Figure 28: Light Shielding
Source: Department of Environment and Energy National Light Pollution Guidelines for Wildlife (2020)

12

Shadow Flicker & Blade Glint Assessment

12.0 Shadow Flicker and Blade Glint Assessment

12.1 Overview of Shadow Flicker

Shadow flicker is defined as the visual effect that occurs when rotating turbines cause moving shadows as the blades pass in front of the sun. The effect will occur under circumstances where the turbine is located such that at certain times of day the sun's rays pass through the swept area of the rotating blades, potentially affecting the viewpoint. The effect is diminished by the distance of the viewpoint from the turbine. Shadowing is also influenced by increased cloud cover, and is dependent on the angle of the sun's rays (Draft National Wind Farm Development Guidelines, 2016).

The Bulletin states: "*The shadow flicker caused by certain sun angles in relation to the rotation of wind turbine blades on dwellings will be limited to 30 hours per year, and may require mitigation measures such as amended siting and design of turbines to minimise the amount of shadow flicker."* (DPE, 2016).

12.2 Shadow Flicker Assessment Methodology

As there is no methodology for the assessment of shadow flicker in the Bulletin, Moir LA have referred to the Draft National Wind Energy Guidelines (2010) to define the parameters for the assessment.

Model Parameter	Setting Used:
Zone of Visual Influence of Shadows	265 x Maximum blade chord
Minimum angle of sun	3 degrees
Shape of the sun	Disk
Time and duration of modelling	One full year
Orientation of the rotor	The rotor plane is always perpendicular to the line from the WTG to the sun
Time step	1 minute
Effects of topography	Included
Receptor Height	2.4 m AGL
Grid size	1 m

Table 14 Shadow Flicker Assessment Parameters

Modelling of the shadow flicker was conducted using specialist industry software (Wind Pro), assessing the largest turbine (based on a 270 m maximum tip height) proposed for the project to represent the worst case impact scenario. Refer to **Figure 29**.

The parameters used for the Shadow Flicker Assessment are as follows:
It is important to note the shadow flicker modelling undertaken for the Project is based on topography alone and therefore the extent of impact may be decreased by a number of variables including:

- the aspect of the residence relative to the turbine(s) (window locations, living area locations etc);
- the extent of natural or screening vegetation between the turbine(s) and the receptor;
- the existence of other screening elements (buildings, structures etc) between the turbine(s) and the receptor;
- the time of year;
- the proportion of daylight hours in which the turbines operate, and;
- the frequency of bright sunshine and cloudless skies (particularly at low elevations above the horizon).

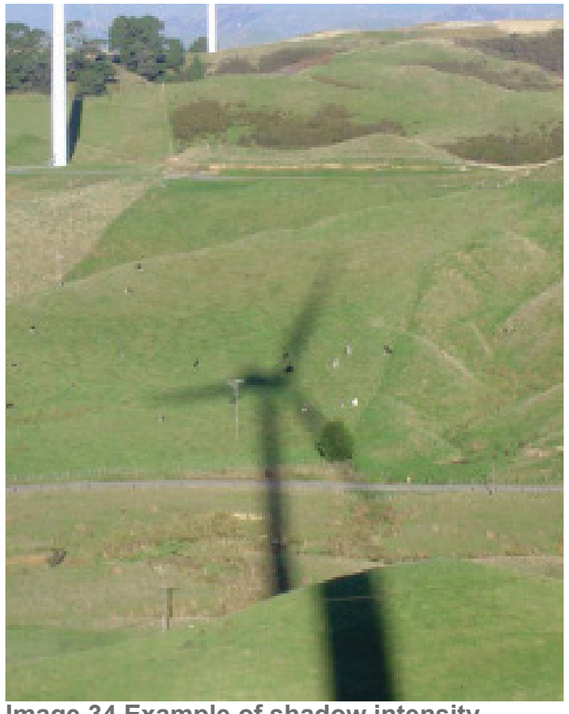


Image 34 Example of shadow intensity variation with distance

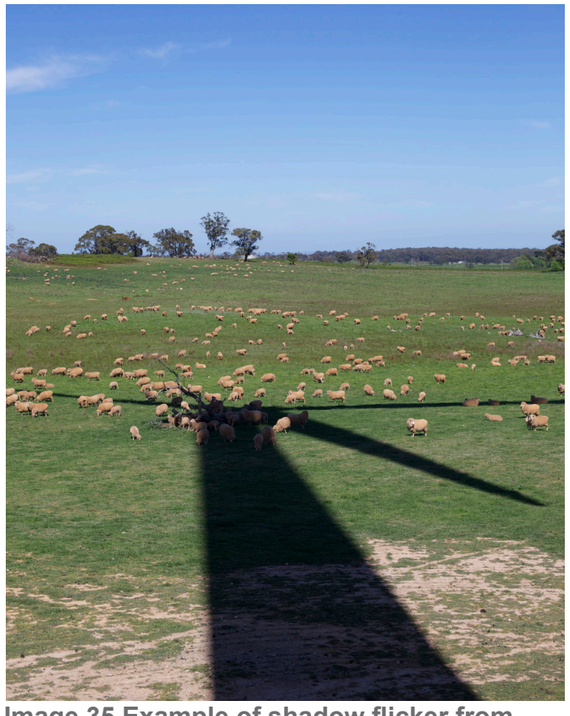


Image 35 Example of shadow flicker from base of turbine

12.3 Results of Shadow Flicker Assessment

The Bulletin states: *"the shadow flicker caused by certain sun angles in relation to the rotation of wind turbine blades on dwellings will be limited to 30 hours per year, and may require mitigation methods such as amend siting and design of turbines to minimise the amount of shadow flicker."* (DPE, 2016).

No non-associated dwellings were identified with potential shadow flicker hours. However, it was identified that the 16 Mile Gums Rest Area are likely to experience shadow flicker.

The following results were obtained:

Location	Shadow Hours per year:	Shadow Days per year:	Max Shadow Hours per day:	Assessment Notes:
16 Mile Gums Rest Area	14:04 / Year	42	0:28	*In accordance with the Bulletin, this is an acceptable level for dwellings (less than 30 hours per year). No limitations have been identified for public receptors.*

Table 15 Receptors with potential to experience shadow flicker

In accordance with the Bulletin, shadow flicker should be limited to 30 hours per year for dwellings. No limitations have been identified for public areas that are likely to experience shadow flicker for over 30 hours per year.

The assessment identified that 16 Mile Gums Rest Area is likely to experience 10 - <30 hours of shadow flicker per year. This, generally, is an acceptable level for dwellings. Since the rest area has been identified as a key viewpoint location during community consultation, similar inference can be drawn for the impact of shadow flicker on this location. Therefore, an acceptable level of shadow flicker is likely to be experienced at the 16 Mile Gums Rest Area.

Although there are no guidelines in the Bulletin relating to the acceptable level of shadow flicker on road users, shadow flicker has the potential to cause annoyance to commuters. The shadow flicker assessment identified extents of the Cobb Highway and small sections of West Burrabogie Road and Jerilderie Road which have the potential to experience shadow flicker. The impact, however, will be temporary.

12.4 Overview of Blade Glint

Blade Glint (also referred to as blade reflectivity) refers to the regular reflection off one or more rotating blades. This can be a temporary effect at any particular location, though the vast bulk of any glint occurs where the viewer is located above the altitude of the turbine hub.

The Bulletin recommends: "*turbine blades be finished with a low reflectivity surface treatment to ensure any actual or perceived blade glint impact is minimised*." (DPE, 2016)

All major wind turbine blade manufacturers currently finish their blades with a low reflectivity treatment. This prevents potentially a reflective glint from the surface of the blades and the possibility of a strobing reflection when the turbine blades are spinning. Therefore, the risk of blade glint from a new development is considered to be very low in accordance with the *Draft - National Wind Farm Development Guidelines* (EPHC, 2010).

It is recommended that the turbines selected for the Project should be finished with a low reflectivity surface treatment in accordance with the requirements of the Bulletin.

Shadow Flicker Assessment

The Plains Wind Farm

LEGEND

- Project Area Boundary
- Proposed Turbine Location
- Non-associated Dwelling
- Associated Dwellings
- DA Locations
- Key Viewpoint location
- 3,500 m from turbine (black line of visual magnitude)
- 5,300m from turbine (blue line of visual magnitude)

Number of Hours of potential Shadow Flicker per year:

- 0
- 0.1 - <10 Hours
- 10 - < 30 Hours
- 30 - < 100 Hours
- 100 - < 500 Hours
- 500 - < 1,000 Hours
- 1,000 - 2,000 Hours

Assumptions for shadow calculations :
A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values.

The calculated times are “worst case” given by the following assumptions:
- The sun is shining all the day, from sunrise to sunset.
- The rotor plane is always perpendicular to the line from the WTG to the sun.
- The WTG is always operating.

N

0 4 8 12 16km

Figure 29: Shadow Flicker Assessment (Map Source: Six Maps 2011)

13

Cumulative Impact Assessment

13.0 Cumulative Impact Assessment

13.1 Overview of Cumulative Visual Impacts

The NSW Cumulative Impact Assessment Guidelines for SSD Projects state that *"Cumulative impacts are a result of incremental, sustained and combined effects of human action and natural variations over time and can be both positive and negative. They can be caused by the compounding effects of a single project or multiple projects in an area, and by the accumulation of effects from past, current and future activities as they arise."* (DPE, 2022a).

It is acknowledged that the existing landscape character will potentially be altered by nearby wind and solar farms which are expected to occur within renewable energy zones, and therefore, a cumulative impact assessment is required.

The Bulletin states: "*The visual assessment must assess, in accordance with the SEARs, the overall and broader landscape impacts of the proposed wind energy project. It will also address potential cumulative impacts of wind energy projects in the region (the proposed wind energy project, as well as existing and approved projects).*" (DPE, 2016).

Cumulative landscape and visual effects result from additional changes to the landscape or visual amenity caused by the proposed development in conjunction with other developments (associated with or separate to it) or actions that occurred in the past, present or are likely to occur in the foreseeable future (Landscape Institute et al, 2008). Cumulative effects may also affect the way a landscape is experienced and can be positive or negative. They may be considered to form part of the mitigation measures if multiple projects are proposed in an area.

In addition to the requirements of the above-mentioned guidelines, Moir LA has assessed the potential cumulative visual impacts on the broader landscape character and regional context that the Project forms part of.

Cumulative impact assessment has several dimensions:

- The impact of the wind farm, when added to the combined impacts of all other existing developments such as wind and solar farms, and the environmental characteristics of the area.
- The impact of this development in the context of the potential for development of wind energy developments in the local, regional and national context.
- The impact of developments which are ancillary to, or otherwise associated with the proposed wind farm eg. the development of transmission lines.
- The potential for future development of wind farms in the region.

The re-occurrence of wind farms, solar farms and infrastructure within a region has the potential to alter the perception of the overall landscape character irrespective of being viewed in a single viewshed or along a journey. As these developments prevail, it is important to determine whether the effect of multiple developments within the region would combine to become a dominant or defining visual element, altering the perception of the overall landscape character.

Project	Distance to nearest turbine (Estimated)*	Project Size (Estimated)*	Planning Status (as of November 2023)*
The Plains Solar Farm	Within Project Area	1.37 hectares (approx)	SEARs issued: December 2022
Pottinger Wind Farm	<1 km (adjacent)	108 turbines	SEARs issued: July 2023
Pottinger Solar Farm	<1 km (adjacent)	150 hectares (approx)	SEARs issued: July 2023
Hay Solar Project	15 km north	684 hectares (approx)	Approved
Bullawah Wind Farm	9 km east	170 turbines	SEARs issued: December 2022
Dinawan Wind Farm	approx. 4 km east	250 turbines	SEARs issued: December 2022
Argoon Wind Farm*	Unknown	10,500 ha (approx)	SEARs issued: December 2023
Baldon Wind Farm	approx. 48 km west	157 turbines	SEARs issued: July 2022
Tchelery Wind Farm	approx. 25 km west	120 turbines	SEARs issued: July 2023
Other projects in the area located in excess of 50 km from the Project			
Dinawan Solar Farm	approx. 76 km southeast	2500 hectares (approx)	SEARs issued: December 2022
Wilan Wind Farm	approx. 59 km west	138 turbines	SEARs issued: December 2022
Junction Rivers Wind Farm	approx. 95 km west	107 turbines	SEARs issued: December 2021
Keri Keri Wind Farm	approx. 55 km west	226 turbines	SEARs issued: December 2022
Keri Keri Solar Farm	59 km east	1.97 hectares (approx)	SEARs issued: December 2022
Yanco Delta Wind Farm	approx. 50 km southeast	208 turbines	Approved
Mallee Wind Farm	approx. 200 km northwest	150 turbines	SEARs issued: December 2022
Limondale Solar Farm	approx. 100 km west	900 hectares (approx)	Operating
Sunraysia Solar Farm	approx. 100 km southwest	1000 hectares (approx)	Operating

Table 16 Summary of nearby renewable energy projects **Source: RES (2023)

*Note: Information available on NSW Major Project Database accessed November 2023.

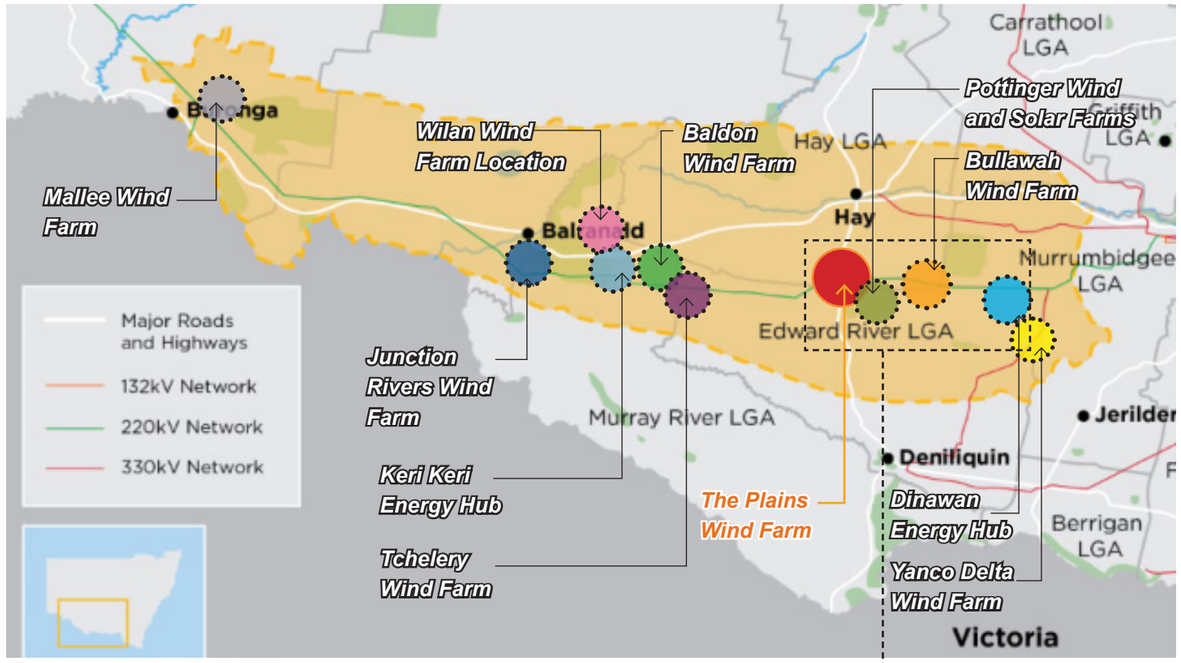


Figure 30: SW REZ (Map Source: Energy NSW, 2022)

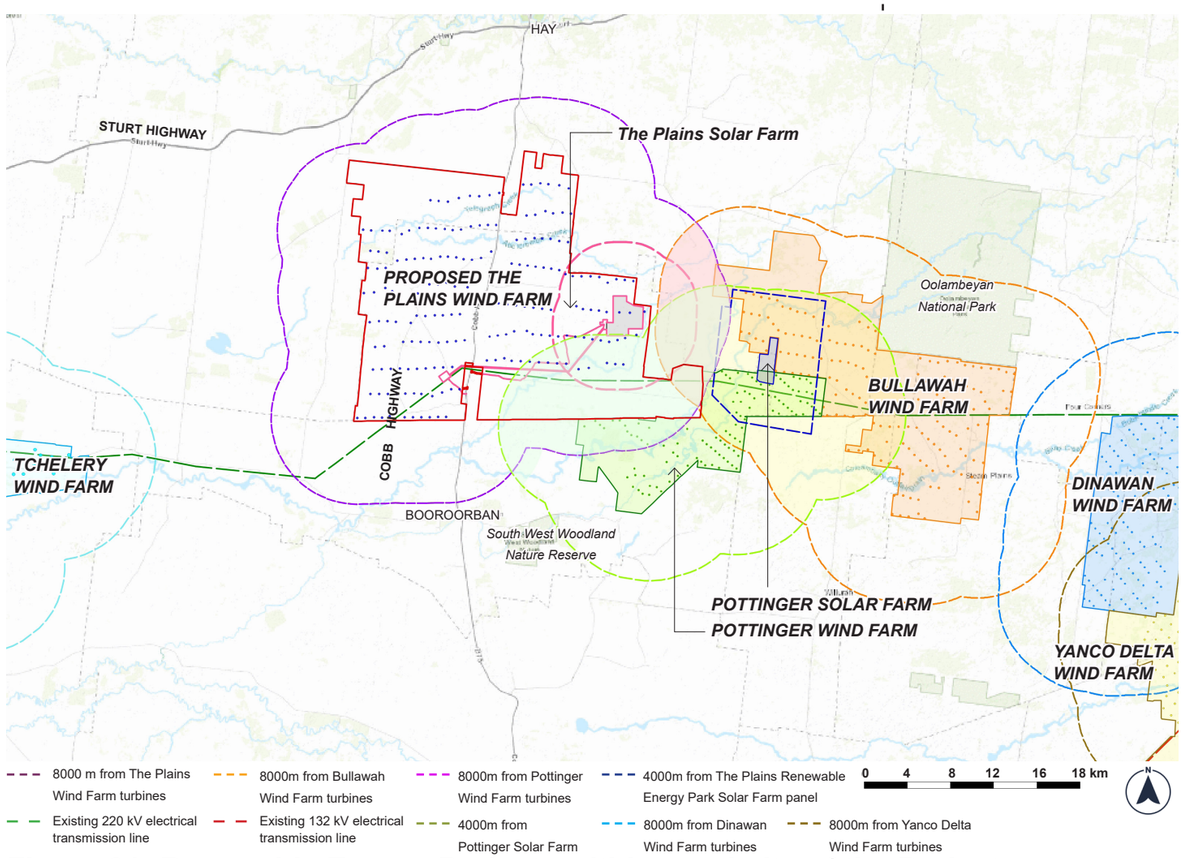


Figure 31: Renewable Energy Projects within proximity of the Project (Map Source: Six Maps, 2020)

13.2 Nearby Renewable Energy Projects

The Project is located within the SW REZ. The REZ has been identified by the NSW Governments Electricity Strategy (DPE, 2019). The REZ is expected to play a vital role in the delivery of affordable energy to the community across NSW (Energy NSW, 2022). Currently, nine (9) renewable energy projects are proposed within 50 km of the Project Area. These have been listed in **Table 16** and shown in **Figure 30.**

13.3 Cumulative Impact Assessment of Nearby Renewable Energy Projects

The Bulletin states: *"The application of the cumulative tools to a distance of eight kilometres from a dwelling or public viewpoint is based on visibility research conducted by Sullivan et. al. (2012), Bishop (2002), Shang and Bishop (1999) and others. At eight kilometres, turbines and objects recede into the background in terms of visibility"* (DPE, 2016).

Figure 31 shows that the proposed renewable energy projects that are located in proximity of the Project. Therefore, the potential cumulative visual impact considers a total of four (4) proposed renewable energy projects that are located within eight (8) km of the Project. These include: Pottinger Wind Farm (PWF), Bullawah Wind Farm (BWF), Pottinger Solar Farm (PSF) and The Plains Solar Farm (TPSF). The MWTT assists in identifying dwellings and public viewpoint locations that are likely to have cumulative impacts. The findings of the application of this tool are discussed in **Section 6.5**.

The following provides a brief overview of the proposed layouts for the surrounding renewable energy projects:

Pottinger Wind Farm (PWF)

The nearest proposed wind farm to the Project is the PWF, which is located south of and adjacent to the Project Area. The nearest PWF turbine is located 5.04 km south of turbine CE11 of the Project. SEARs were issued for the PWF project in July 2023. There is potential to view PWF and the Project simultaneously, especially along West Burrabogie Road and at DA location DAD_1.

Bullawah Wind Farm (BWF)

The proposed layout for BWF indicates that it is located approximately 9 km east of the Project Area. The nearest BWF turbine is located 9.2 m east of turbine EE16 of the Project. SEARs were issued for the BWF project in December 2022. There is some potential to view BWF and the Project simultaneously, especially along West Burrabogie Road and at dwellings NAD_19, NAD_19B, NAD_19C.

Pottinger Solar Farm (PSF)

The proposed PSF forms part of the overall Pottinger Energy Park project. The solar farm is currently proposed to be located on the northern side of the proposed Pottinger Wind Farm (refer to **Figure 30**). SEARs were issued for the PSF project in July 2023. There is limited potential to view PSF and the Project simultaneously from public viewing locations.

The Plains Solar Farm (TPSF)

The proposed TPSF project forms part of the overall The Plains Renewable Energy Park project. The solar farm is currently proposed to be located on the eastern side of the Project (refer to **Figure 31**). SEARs were issued for the TPSF project in December 2022. The assessment of potential visual impacts associated with TPSF will be submitted as a separate SSD application.

13.3.1 Cumulative Impact Assessment of Nearby Wind Farm Projects

The existing topographic character of the region allows clear, open views of the surrounds. It is likely that the Project, BWF and PWF will be clearly visible along West Burrabogie Road which is a low use road that provides access to rural dwellings and farm lots on the southern side of the Project. **Figure 31** represents the location of the surrounding wind farm projects and receptors located within 8,000 m of the nearest turbines of all three (3) wind farm projects, ie, the Project, PWF and BWF.

The MWTT has been applied to surrounding dwellings and key public viewpoints to help identify cumulative visual impacts (refer to **Figure 32**).

Table 17 provides an overview of the dwellings located in proximity of the three (3) wind farm projects and existing screening factors.

As per **Figure 32**, the highest level of visibility of all three (3) wind farm projects is likely to occur on the eastern side of West Burrabogie Road and near dwellings NAD_19, NAD_19B and NAD_19C. It should be noted that as per the Major Projects website, these dwellings are associated with PWF (DPE, 2023b) and existing intervening elements such as vegetation and structures are likely to limit views towards turbines associated with the three (3) wind farm projects. No key public viewpoint locations have the potential to view the three (3) wind farm projects.

DA location DAD_1 is likely to view the majority of PWF and may have distant views of the Project. As per the Major Projects website, the dwelling is associated with the PWF project. The dwelling is yet to be constructed.

The 16 Mile Gums Rest Area was identified as a key viewpoint location during community consultation in the PVIA phase. The rest area is located on the Cobb Highway between Hay, Booroorban and Deniliquin. Due to its location and proximity to the Project, it is likely that views at this location will be dominated by the Project and the surrounding wind farm projects are likely to be visible in the background.

Figure 33 and **Figure 34** represent wire frame diagrams that have been prepared to demonstrate the potential visibility of the three (3) wind farm projects from the 16 Mile Gums Rest Area. A site visit conducted by Moir LA identified the character and scenic quality rating of the surrounding land which falls within the extents of LCU04: Farmlands (refer to Section 5.6). As per the assessment in **Section 5.0** of this report, it was determined that the LCU is of low scenic quality.

13.3.2 Cumulative Impact Assessment of Nearby Solar Farm Project

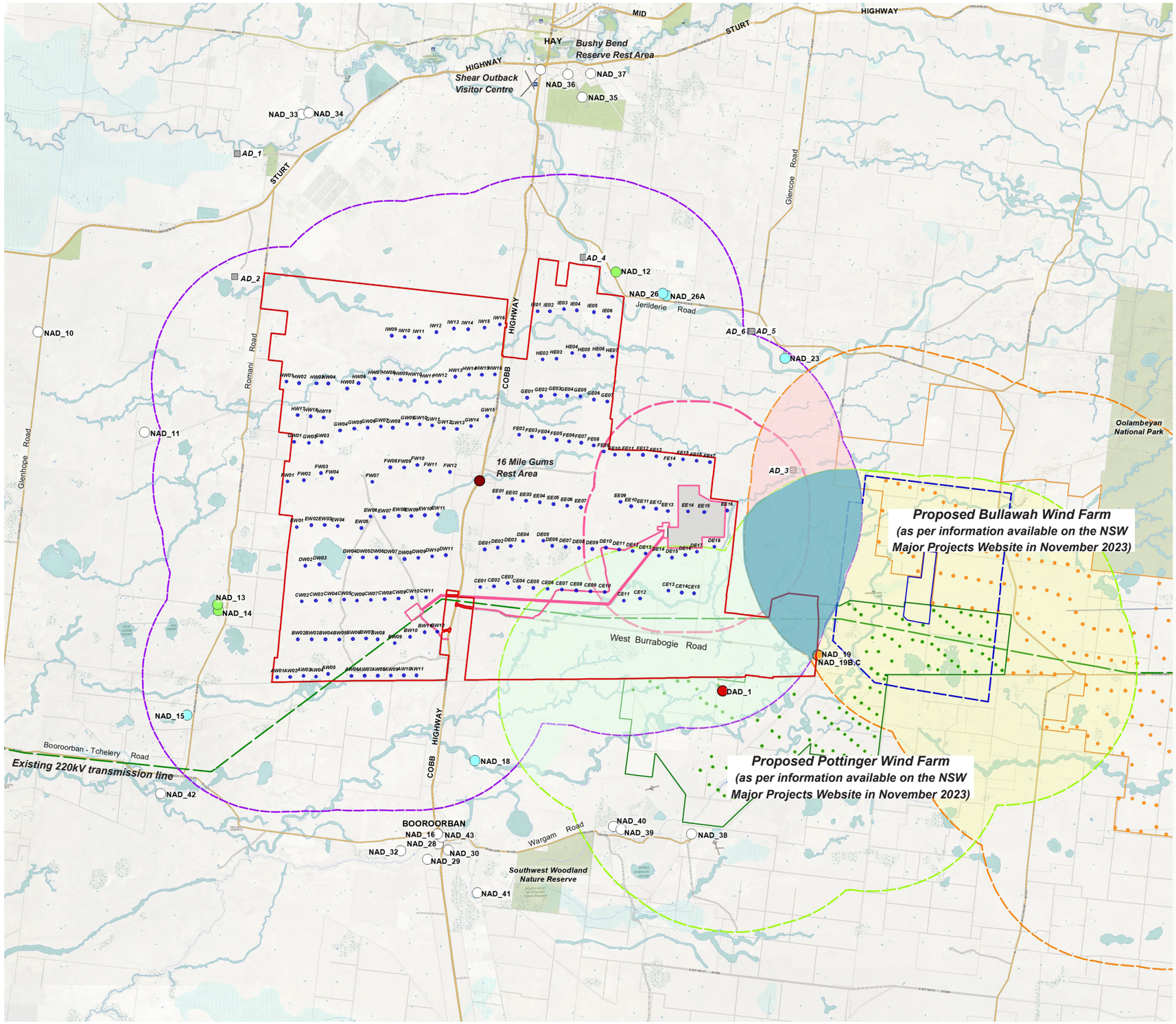
Figure 32 identifies the location of the proposed PSF project and the TPSF in relation to the Project. In accordance with the *Large-Scale Solar Energy Guideline August 2022* and the *Technical Supplement - Landscape and Visual Impact Assessment, Large-Scale Solar Energy Guideline August 2022,* a radius of 4,000 m from the nearest solar farm investigation area has been considered in order to identify receptors that are likely to be impacted by PSF and the Project (DPE, 2022b and DPE, 2022c).

No non-associated dwellings or key public viewing locations were identified within 4,000 m of the PSF, TPSF and the Project. The nearest dwellings are NAD_19, NAD_19B and NAD_19C which have been identified as associated dwellings for the PSF project.

West Burrabogie Road is the nearest publicly accessible road which runs east - west and is located on the southern side of PSF and the Project. West Burrabogie Road is a low use rural road that is utilised predominantly by residents and farm workers to access dwellings and surrounding farmlands. No destinations or key viewing locations were identified in proximity of the PSF. Further assessment of the impact on viewing locations on West Burrabogie Road and impacts on the surrounding character have been discussed in **Appendix B**.

Cumulative Visual Impact (MWTT)

The Plains Wind Farm



LEGEND

- Project Area Boundary
- Project Boundary for the proposed The Plains Renewable Energy Park Solar Farm (TPSF) *(subject to separate SSD application)*
- Project Boundary for the proposed Bullawah Wind Farm (BWF) *(as per information available on the NSW Major Projects Website in November 2023)*
- Project Boundary for the proposed Pottinger Wind Farm (PWF) *(as per information available on the NSW Major Projects Website in November 2023)*
- Proposed Turbine Location for TPWF
- Proposed Turbine Location for BWF
- Proposed Turbine Location for PWF
- Proposed TPSF Location
- Proposed Pottinger Solar Farm (PSF) Location
- Associated dwellings
- 8,000 m from nearest TPWF turbine (extent of Study Area)
- 8,000 m from nearest BWF turbine
- 8,000 m from nearest PWF turbine
- 4,000 m from PWF Solar Farm Investigation Area
- 4,000 m from TPSF Solar Farm Investigation Area
- Existing 220kV transmission line
- Area with dwellings within 8000 m of TPWF & PWF
- Area with dwellings within 8000 m of TPWF & BWF
- Area with dwellings within 8000 m of PWF & BWF
- Area with dwellings within 8000 m of TPWF, PWF & BWF

MWTT Results for Non-associated Dwellings & key viewpoints:

- Receptors in excess of 8 km of all projects
- One (1) 60º Sector (60º)
- Up to Two (2) 60º Sectors (120º)
- Up to Three (3) 60º Sectors (180º)
- Up to Four (4) 60º Sectors (180º)
- Up to Five (5) 60º Sectors (180º)
- Up to Six (6) 60º Sectors (180º)

Note:

Preliminary Assessment Tool 2: Multiple Wind Turbine Tool is based on a 2D Assessment alone and does not take into account topography, vegetation or other screening factors which may reduce the potential for viewing multiple turbines.



Figure 32: Cumulative Visual Impact (MWTT) (Map Source: SixMaps 2011)

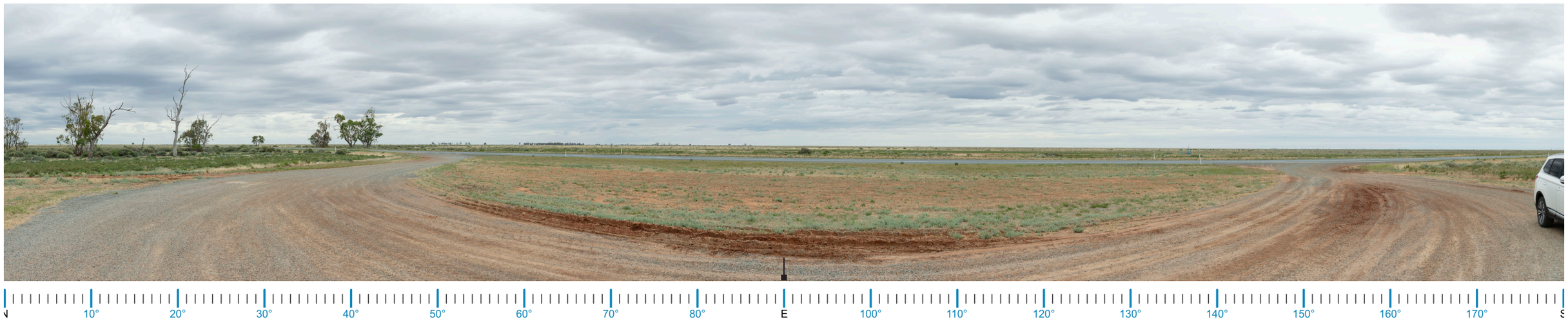
13.3.3 Cumulative Impact Assessment of Transmission Lines

The *Draft Renewable Energy Zone (South West) Access Scheme Order 2023* has been established by the NSW Office of Energy and Climate Change to coordinate the development and delivery of electricity in the SW REZ. It is proposed that a new 330 kV electrical transmission line will be built adjacent to the existing 220 kV electrical transmission line as part of Project EnergyConnect (EnergyCo, 2022).

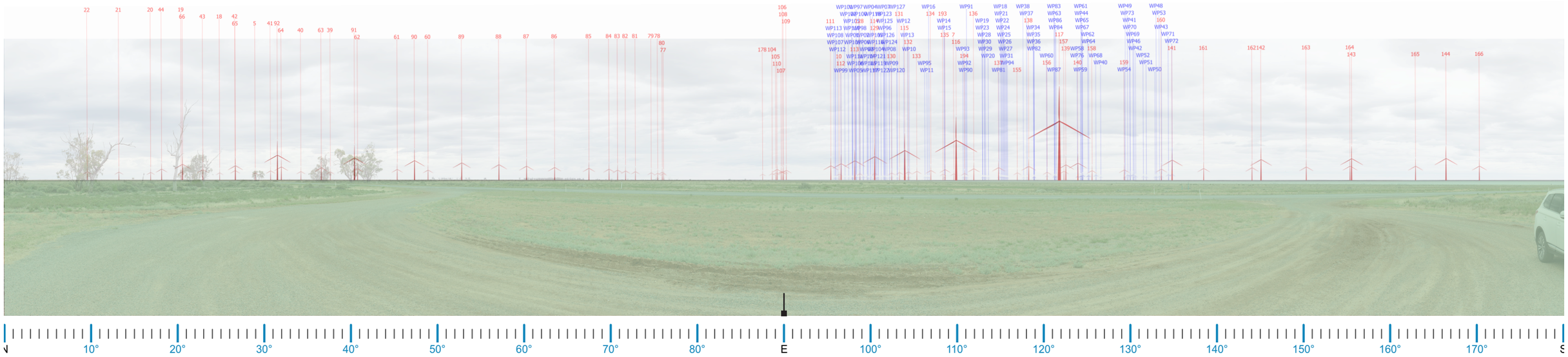
The existing transmission line runs in a generally east - west direction and is located in the southern half of the Project Area. Little detail is provided on the upgrade of the existing 220 kV electrical transmission line at this stage and it is assumed the cumulative impacts will be considered in the future detailed design phase of the proposed transmission line infrastructure.

Dwelling ID	Distance to nearest WTG:	Number of 60º Sectors (Based on a 2D Cumulative Assessment):	Number of 60º Sectors associated with the Project (based on 3D Assessment):	Number of 60º Sectors associated with surrounding wind farm (BWF or PWF) (based on 3D Assessment):	Existing conditions (as per Google Earth Aerial Imagery 2022):
Non-associated receptors with turbines in up to four (4) 60º Sectors (up to 240º):					
NAD_19	**2.73 km (PWF)**	Four (4) 60º Sectors (up to 240º)	Nil	One (1) 60º Sector (up to 60º) (BWF) Three (3) 60º Sectors (up to 180º) (PWF)	*Highest impacts likely to be associated with BWF and PWF. The Project is likely to be visible in background (ie, in excess of 8 km from the dwelling). However, the dwelling is surrounded by vegetation which is likely to limit views.*
NAD_19B	**2.69 km (PWF)**	Four (4) 60º Sectors (up to 240º)	Nil	One (1) 60º Sector (up to 60º) (BWF) Three (3) 60º Sectors (up to 180º) (PWF)	*Highest impacts likely to be associated with BWF and PWF. The Project is likely to be visible in background (ie, in excess of 8 km from the dwelling). However, the dwelling is surrounded by vegetation which is likely to limit views.*
NAD_19C	**2.74 km (PWF)**	Four (4) 60º Sectors (up to 240º)	Nil	One (1) 60º Sector (up to 60º) (BWF) Three (3) 60º Sectors (up to 180º) (PWF)	*Highest impacts likely to be associated with BWF and PWF. The Project is likely to be visible in background (ie, in excess of 8 km from the dwelling). However, the dwelling is surrounded by vegetation and sheds which are likely to limit views.*
Non-associated receptors with turbines in up to five (5) 60º Sectors (up to 300º):					
DAD_1	**0.41 km (PWF)**	Five (5) 60º Sectors (up to 300º)	One (1) 60º Sector (up to 60º)	One (1) 60º Sector (up to 60º) (The Project) Four (4) 60º Sectors (up to 240º) (PWF)	*Highest impacts likely to be associated with PWF. The Project is likely to be visible and an assessment of potential impacts associated with the Project are included in Appendix C. As per the Major Projects website, the dwelling is associated with the PWF project. Dwelling is yet to be constructed.*
Non-associated receptors with turbines in up to six (6) 60º Sectors (up to 360º):					
16 Mile Gums Rest Area	**1.50 km (The Project only)**	Six (6) 60º Sectors (up to 360º)	Six (6) 60º Sectors (up to 360º)	Nil (the viewpoint is located in excess of 8 km of the other two wind farm projects)	*Highest impacts likely to be associated with the Project. BWF and PWF are likely to be visible in the background (ie, in excess of 8 km from the rest area). Note: The rest area is located on Cobb Highway between the towns of Hay and Booroorban. No key landscape features were identified at this location. The surrounding landscape character is defined by flat, open lands with grassy vegetation that are used extensively for grazing and cropping.*

Table 17 Non-associated dwellings and key public viewpoints (receptors) within 8,000 m of surrounding wind farm projects identified using Multiple Wind Turbine Tool



Existing View | 180º Baseline Panorama



Wireframe Diagram Overlay looking East

Turbine associated with the Project

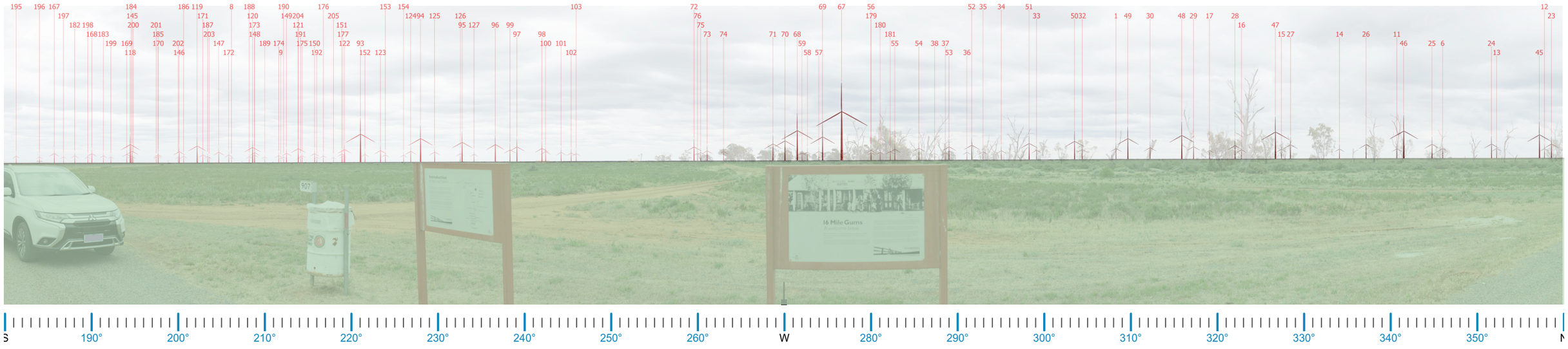
Turbine associated with BWF

Turbine associated with PWF

Figure 33: Wire frame diagram - Cumulative Visual Impact from 16 Mile Gums Rest Area



Existing View | 180º Baseline Panorama



Wireframe Diagram Overlay looking West

Turbine associated with the Project

Figure 34: Wire frame diagram - Cumulative Visual Impact from 16 Mile Gums Rest Area

13.4 Cumulative Visual Impact on the Broader Landscape Character

The New South Wales Government has identified five (5) Renewable Energy Zones (REZ) in regional areas of NSW. The Project is located within the SW REZ. The proposed land use associated with the Project is consistent with the NSW Government Policy for this area, however, visual impacts are to be reduced where possible. The existing landscape character of the region allows for optimum harvest of wind energy due to the large expanse of flat, treeless land parcels that are mostly uninhabited and cause minimal obstructions in the landscape.

The re-occurrence of wind farms within a region has the potential to alter the perception of the overall landscape character irrespective of being viewed in a single viewshed. It is important to determine whether the cumulative effect of wind farms and other major infrastructure within the region would combine to become the dominant visual element, altering the perception of the regions landscape character.

The MWTT and wireframe diagrams prepared illustrate the extent of theoretical visibility of the Project combined with nearby major wind farm projects. These suggest that it is likely that simultaneous views of all three (3) wind farm projects may be available in the distance whilst travelling along the Cobb Highway between Hay and Booroorban. It is likely that the Project will be the dominant visual feature along the Cobb Highway.

The assessment found that no non-associated dwellings are located within 8,000 m of the three (3) wind farm projects (refer **Figure 32**). However, some receptor locations were identified within 8,000 m of up to two (2) wind farm projects. **Table 17** identifies that the majority of these dwellings have views of turbines associated with PWF and BWF. Dwellings NAD_19, NAD_19B, NAD_19C, and DAD_1 were the only receptors identified as having cumulative impacts as a result of the Project and PWF or the Project and BWF. It is noted that all of the above-mentioned dwellings are associated with the PWF project (DPE, 2023b).

The potential cumulative visual impact must also be assessed in relation to the potential visual impact when viewed sequentially. If a number of wind farms are viewed in succession as a traveller moves through the landscape (eg. motorist travel routes such as the Cobb Highway), this may result in a change in the overall perception of the broader landscape character. When travelling between Hay and Booroorban along the Cobb Highway, the existing visual character is defined by flat, generally treeless, expansive lands used for grazing and cropping. The existing landscape is associated with commercial agricultural activity and is a highly modified landscape with low scenic quality. The viewer may only see one wind farm at a time, but if each successive stretch of the road is dominated by views of a wind farm, then that can be argued to be a cumulative visual impact (EPHC, 2010).

As previously stated, it may be possible to view the Project along with the two (2) surrounding wind farms. However, the other two wind farms are likely to be visible in the distance with the Project remaining the dominant feature of views when travelling the Cobb Highway in proximity to the Project.

14

Associated Infrastructure Assessment

14.0 Associated Infrastructure Assessment

14.1 Overview of Associated Infrastructure

The Bulletin states: *"the assessment of visual impacts from all ancillary facilities and infrastructure will be required."*

In addition to the proposed wind turbines, the associated infrastructure (as described in **Section 3.4** of this report) has the potential to contrast with the existing visual landscape. The proposed wind farm and, access roads, transmission lines and other ancillary structures have the potential to alter the existing visual landscape due to their scale in combination with the featureless and flat surrounding landscape. An overview of the potential visual impact resulting from associated infrastructure and project components is provided in this section of the report.

14.2 Transmission Lines

14.2.1 High voltage transmission lines

A 330 kV high voltage (HV) internal overhead (OH) transmission line of approximately 11.3 km will be located adjacent to the existing 220 kV transmission line. The design of the 330 kV line will be confirmed in the detail design phase. The preliminary design for the 330 kV transmission line will include up to 60 m high poles or up to 50 m high lattice towers, which will appear similar to the lattice tower arrangement of the existing 220kV transmission line (See **Image 36**). For the purposes of this assessment and as a conservative approach, it is considered that the design will include 50 m high lattice towers. Access to the transmission line for construction will be via property access and farm tracks.

The proposed 330 kV transmission lines connect the Project to a new switchyard which will be located within the BESS Investigation Area in the south western part of the Project Area (refer to **Figure 35**). The overhead 330 kV transmission line will connect collector groups of turbines to the main substations and a switchyard for connection to Project Energy Connect (PEC).

Since HV transmission lines are an existing infrastructure element in the landscape (refer **Image 36**), the introduction of a new 330 kV transmission line would not be a significant or contrasting element in the landscape. The proposed HV transmission line is generally consistent with existing infrastructure. It is our opinion that visual impact of the proposed HV transmission lines will be low.

The following mitigation methods should be considered during detailed design phase for overhead transmission lines:

- *The route for any proposed overhead transmission lines should be chosen to reduce visibility from surrounding areas. Where possible, use non-reflective materials for overhead electrical cabling. Visual identification elements should be non-reflective to avoid visual interference.*
- *Plan route to minimise vegetation loss.*
- *Use of subtle colours and a low reflectivity surface treatment on power poles to ensure that glint is minimised.*

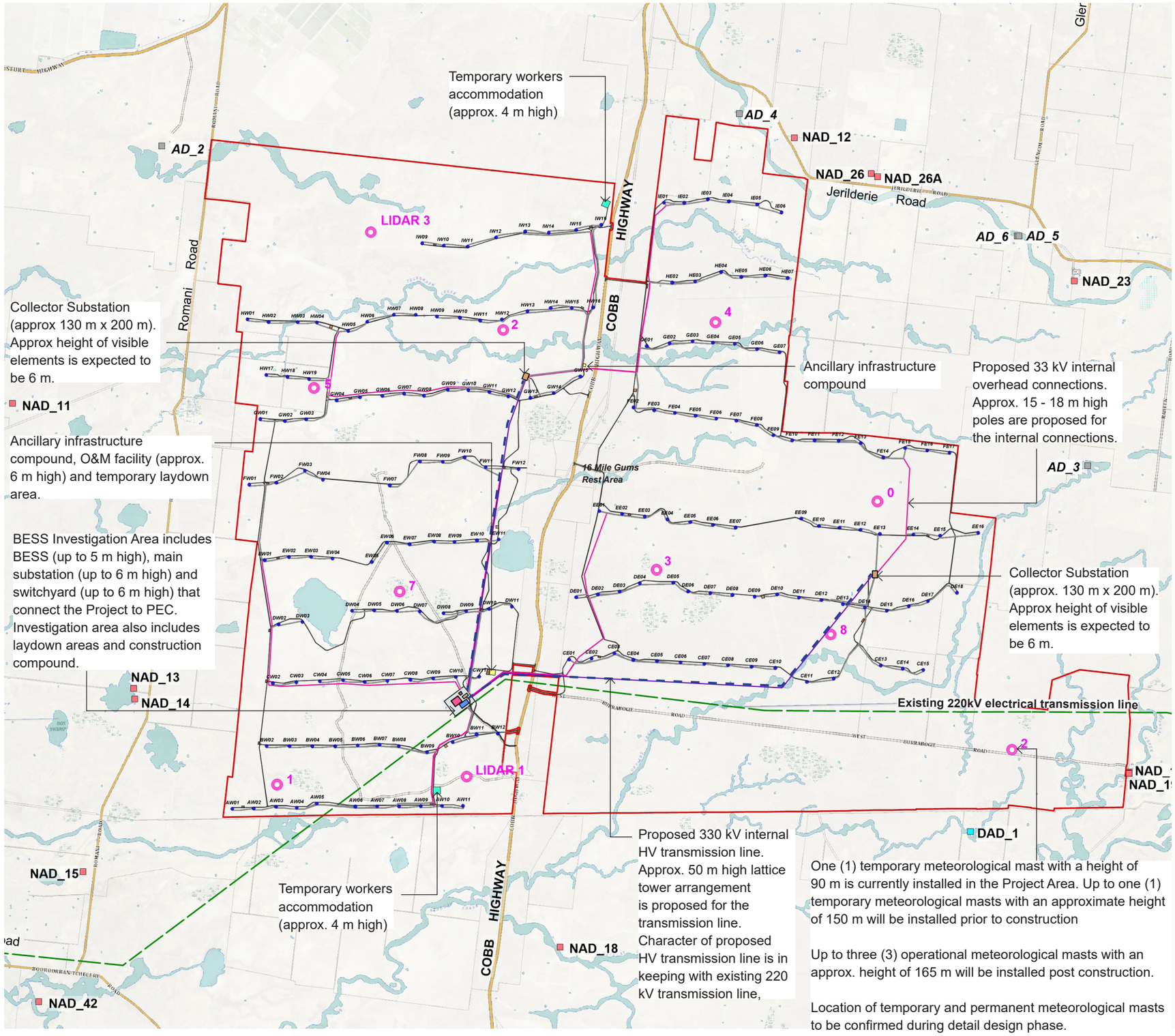
14.2.2 Medium voltage reticulation

The turbines will be connected via a system comprising a network of approximately 233 km long underground reticulation. Internal 33 kV OH electrical cables will connect the turbine clusters to the two (2) collector substations and the BESS Investigation Area as shown in **Figure 35**. It is proposed that the internal transmission lines will include 15 - 18 m high poles for electrical reticulation.

In addition to the existing 220 kV electrical transmission line, medium voltage electrical lines are visible in the existing landscape. Existing low and medium voltage transmission lines within and around the Project Area are of similar scale and appearance. The proposed 33 kV internal OH transmission network will, therefore, have a low impact on the existing landscape and visual character.



Image 36 Existing 220 kV transmission line is a visible element in the landscape



Associated Infrastructure

The Plains Wind Farm

LEGEND

- Project Area Boundary
- Proposed turbine location
- Associated Dwelling
- Non-associated Dwelling
- Approved DA locations
- Main Road
- Minor Road
- Access road
- Existing 220kV electrical transmission line
- Proposed 33 kV overhead lines
- Proposed 33 kV underground cabling
- Proposed 330 kV transmission line connection (HV)
- Meteorological Masts
- Temporary Laydown Areas
- Collector Substation
- Hardstand Areas
- Ancillary infrastructure compound
- Worker's accommodation

N

0 2 4 6 8 10km

Figure 35: Associated Infrastructure (Map Source: Six Maps 2020)

14.3 Internal Access Roads

Internal access roads will be constructed to provide access to the proposed turbines and other infrastructure including the transmission line. This includes upgrades to some existing access tracks within the Project Area and the establishment of new access roads such as the track between the Cobb Highway and the proposed BESS Investigation Area. Access to the Project Area is proposed via the Cobb Highway.

Generally, the access roads have been sited to reduce potential vegetation loss and limit earth work requirements. It is proposed that the internal access track network will connect to existing Council roads. Due to the existing agricultural land use of the Study Area, farm roads traversing the landscape form a significant part of the existing landscape character. The proposed access roads are likely to be viewed as part of the existing character of the landscape. Mitigation measures for reducing residual visual impact resulting from the construction of access roads include:

- *Where possible utilise or upgrade existing roads, trails or tracks to provide access to the proposed turbines to reduce the need for new roads.*
- *Allow for the provision for down sizing roads or restoring roads to existing condition following construction where possible.*
- *Any new roads must minimise cut and fill and avoid the loss of vegetation.*
- *Utilise local materials where possible and practical.*

14.4 On-site Substations

14.4.1 Substations

The Project will include one (1) 330 kV main substation (approximately 320 m x 180 m x 6 m high) to supply the electricity to the National Energy Market (NEM). The main substation is proposed within the BESS Investigation Area and the Project will share the main substation with The Plains Renewable Energy Park Solar Farm project. The main substation will include lightning poles of up to 25 m height, large power transformers, HV switchgear, storage units and potentially power quality control equipment. However, visually dominant elements within the substation equipment are likely to approximately 6 m high.

Two (2) collector substations (approximately 5 m high) are proposed in the northern and eastern parts of the Project Area (refer to **Figure 35**). These will be connected via the internal 33 kV electrical transmission lines and will have an overall HV connection via the internal 330 kV transmission lines which will feed into the existing 220 kV transmission line.

Wherever possible, the substation locations have been setback from roads and sited to avoid existing vegetation. The main substation compound within the BESS Investigation Area is located approximately 2 km west of the Cobb Highway, the northern substation compound is located approximately 2.37 km away from the Cobb Highway and the eastern substation is located approximately 5.7 km north of West Burrabogie Road.

The main substation and northern substation are likely to be visible for a short period when travelling along the Cobb Highway. However, the surrounding area is flat, treeless and no key features have been identified. As a result, the substation compounds will not impede upon views toward key features. This results in a low visual impact.

14.4.2 Switchyard

The main substation will be combined with PEC switchyard and these components are expected to cover a total area of 200 m x 400 m and approximately 6 m high elements that are likely to be visually distinct. The switchyard will connect the Project to the existing 220 kV transmission line and is proposed to be located within the BESS Investigation Area. Since the surrounding area is flat, treeless and no key features have been identified, the switchyard will not impede upon views toward key features. This results in a low visual impact on the surrounding landscape and visual character. It is likely that the switchyard will be visible for a short period while travelling along the Cobb Highway.

14.5 Meteorological Monitoring Masts

One (1) temporary meteorological mast with a height of 90 m is currently installed in the Project Area. Up to one (1) temporary meteorological mast with an approximate height of 150 m will be installed prior to construction and up to 10 operational meteorological masts with an approximate height of 165 m will be installed post-construction to record wind speed and other meteorological data. The location of temporary and permanent meteorological masts will be confirmed during detail design phase.



Image 37 Example of unsealed farm road typical of the landscape character in the area

Meteorological masts are generally difficult to discern due to their form. The proposed meteorological masts have been set back from nearby residences and public viewing locations. **Figure 35** shows that the nearest mast is located approximately 1.7 km from the Cobb Highway in the southern part of the Project Area. The nearest residences (ie, dwellings NAD_19, NAD_19B, NAD_19C) are located approximately 4.2 km west of the mast proposed along West Burrabogie Road. The scale and appearance of these masts will not be as dominant as the proposed turbines. Therefore, it is likely that the associated visual impacts will be low.

14.6 Operations and Maintenance (O&M) Facility

An O & M facility with carparks will be constructed to support the construction and operation of the Project. These will be located in proximity of the proposed main substation location in the central part of the Project Area (adjacent to the BESS). The proposed height of the O&M building is 6 m, which is similar to the height of the proposed substation. The O&M compound is set back from the Cobb Highway and located in close proximity of the BESS Investigation Area.

Maintenance lighting will be installed at the O & M facility for night work including emergency operations. **Section 11.0** provides recommendations for the night lighting fixtures.

14.7 Workers Accommodation Facility

A temporary workers accommodation facility with approximately 4 m high structures is proposed in the northern part of the Project Area near the Cobb Highway.

The facility will be temporary and will serve as accommodation for workers during the construction phase of the Project. It is expected that the form and design of the facility will be similar to farm infrastructure prevalent in the area. The visual impacts associated with the facility will be temporary and experienced along the Cobb Highway.

14.8 Other Temporary Infrastructure

In addition, temporary infrastructure elements such as:

- up to six (6) on-site batching plant laydown areas,
- up to one (1) construction compound.

The visual impacts associated with these facilities will be temporary and will occur during the construction phase. No scenic views will be impacted by the construction activity.

The smaller scale of ancillary structures including the proposed construction control room have the ability to be screened by existing vegetation or proposed screening vegetation. The following mitigation measures would assist in reducing any residual visual impacts:

- *Siting to ensure minimal vegetation loss.*
- *Consideration should be given to controlling the type and colour of building materials used. Where possible a recessive colour palette is to be used which blends into the existing landscape.*
- *Avoidance of unnecessary lighting, signage on fences, logos etc.*
- *Any proposed buildings to be sympathetic to existing architectural elements in the landscape.*
- *Minimise cut and fill and loss of existing vegetation throughout the construction process.*
- *Boundary screen planting is an effective mitigation method which could be utilised to ameliorate potential visual impacts resulting from the construction of ancillary structures with a small vertical scale such as collector substations, switching stations and the operations facilities building.*

15

Overview of Impact on Landscape Character

15.0 Overview of Impact on Landscape Character

15.1 Overview of Visual Impacts on Landscape Character

The proposed development is to be located within a predominantly rural landscape that has not been identified as significant or rare. The broad landscape character is dominated by established rural land which consists of modified vast plains with little topographical variation. Generally, the Scenic Quality Classes of the Landscape Character Units (LCU) within the Study Area have been rated as moderate or low (refer to **Section 5.0**).

Shallow depressions forming dry swamps, floodplains and creek corridors provide slight variations in topography and vegetation height, but these hydrological features do not occupy a large percentage of the Study Area and are, in most cases, ephemeral.

The assessment has determined that the proposed wind farm would become a feature of the visual landscape due to the addition of vertical turbines in a landscape offering unencumbered views across large flat expanses.

Regionally significant landscape features and recreational sites such as Bushy Bend Reserve Rest Area located in Hay (as identified in **Section 5.0** and **Appendix B** of this report) would remain intact as key landscape features of the area and it is unlikely the Project would interrupt the scenic value of these landscape features.

15.2 Overview of the Visual Impact on LCUs

Table 18 provides an overview of the assessment of the potential visual impacts on the existing landscape character of the local area for each LCU as defined in **Section 5.6** of this report. An evaluation of the potential visual impacts has been undertaken using the visual performance objectives as outlined in the Bulletin.

Of the six (6) LCU's identified and assessed, the Project is likely to be visible from all character areas to varying degrees. Due to the flat topography surrounding the Project Area, low vegetation typical of the region and the lack of built structures, there is little in the current landscape to impede views of the Project Area.

Overview of Impacts on Landscape Character Units

LCU:	Key Landscape Features:	Scenic Quality Rating:	Overview of Impact on Landscape Character:	Landscape Scenic Integrity and key features:
LCU01 Farmlands and Plains	**Flat, open expanses, sparse tree cover, large tracts of grass and bush, grazing lands**	Low	The LCU is characterised by flat, open, and generally treeless lands. Views of the Project are will be available from most locations within the LCU. The landscape is characterised by modified,and flat agricultural lands and as such has been identified as being of a low scenic quality. Key viewpoints identified in the LCU include the 16 Mile Gums Rest Area which is a rest stop on the Cobb Highway. The location was identified as a key viewpoint location during community consultation in the scoping phase. The LCU has low scenic quality.	The Project is located within this LCU. Views are generally open with minimal obtrusive elements. Due to the flat and treeless nature to the LCU, the Project is likely to be the dominant feature within the LCU. However, the surrounding landscape is a heavily modified landscape. As such, the impacts to the scenic integrity of this LCU are anticipated to be low.
LCU02 Creek Corridors	**Seasonal creeks and waterways, grasses and shrubs with groupings of trees, flat with topographical depressions**	Moderate	The LCU is characterised by gentle undulations that typically carry seasonal water. Grassy, low-storey bush species are prominent in creek corridors located on the northern side of the Project Area and mid-storey shrubs are prominent along creek corridors in the southern part of the Project Area. The LCU has some human intervention however it provides a natural relief to views within a homogenous landscape. The LCU has moderate scenic quality.	Views towards the Project will be partially available within this LCU because of the relatively flat topographic character. Patches of vegetation along creek corridors, however, may help screen views in certain areas on the southern side of the Project Area. No key viewpoints were identified within the Creek Corridors LCU. It is likely that where open views towards the Project are available, the Project will be the dominant element of the view.
LCU03 Dry Swamps and Floodplains	**Gentle, shallow depressions acting as a refuge for seasonal water, sparse tree cover, areas of bush and grass, grazing areas**	Low	The LCU is characterised by gentle, shallow depressions covered in saltbush, grasses and scattered mid-storey shrubs that act as a refuge for excess water. Some areas are used for grazing. The LCU has not been modified extensively by human intervention. The LCU has been determined to be of low scenic quality.	Views of the Project are likely to be available from most locations within the LCU. Due to the flat and treeless nature to the LCU, the Project is likely to be the dominant feature within the LCU. However, the surrounding landscape is a heavily modified landscape. As such, the impacts to the scenic integrity of this LCU are anticipated to be low. The Project is likely to have a moderate to low impact on the existing character of the LCU. Scattered mid-storey shrubs may help reduce the visual impact in certain areas. It is likely that the Project will have a moderate to low impact on the landscape scenic integrity of this LCU. No key viewpoints were identified within the LCU.
LCU04 Hay	**Highly modified landscape with flat topographical character, historic buildings, low density residential dwellings and agricultural heritage**	Low	The LCU comprises of the town of Hay and its rural surrounds. It is located outside the Study Area. The LCU is defined by low density residential dwellings and agricultural heritage. The topography is generally flat and the landscape is highly modified. Key viewpoints identified within the LCU include the Shear Outback Visitor Centre.	Existing intervening vegetation is likely to screen the majority of views toward the Project from this LCU. Where views may be available they will be distant. The surrounding landscape is a highly modified landscape and the scenic quality has been deemed to be low. As a result the key elements and scenic integrity of the LCU will remain intact.
LCU05 Booroorban	**Small number of rural dwellings, patchy to dense tree cover, flat topography**	Low	The LCU comprises of the rural locality of Booroorban and is located on the southern side of the Project Area. The LCU consists of a small number of rural dwellings located along the Cobb Highway. The topography is generally flat. Vegetation associated with the dwellings acts as intervening elements in the LCU.	The landscape is heavily modified and has been deemed to be low scenic quality. Partial views of the Project are likely to be available from locations within the LCU. Intervening elements such as vegetation associated with dwellings would limit views in the rural locality. No key viewpoints were identified within the LCU. As a result the key elements and scenic integrity of the LCU will remain intact.
LCU06 Murrumbidgee River	**Main water corridor in the region, cultural and recreation areas, dense clumps of trees grouped on banks**	Moderate	The LCU consists of the Murrumbidgee River and its associated floodplains. Vegetation is dense and typical of the Riverina Bioregion. Topographic character varies from gentle to steep undulations along the river bank. The Murrumbidgee River is a prominent water corridor in the region. Key viewpoints identified in the LCU include the Bushy Bend Reserve Rest Area.	The character of the Murrumbidgiee River LCU is dominated by the main water corridor. Due to the existing riparian vegetation associated with the river, views toward the Project are largely screened. As a result the river will remain as the dominant feature of views from within the LCU and the scenic integrity will remain intact.

Table 18 Overview of Impact on Landscape Character Units

16
Mitigation Measures

16.0 Mitigation Measures

16.1 Overview of Mitigation Measures

This section of the report provides recommendations that seek to achieve a better visual integration of the Project and the existing visual character at both local and regional scales. The mitigation measures attempt to lessen the visual impact of the Project whilst enhancing the visual character of the surrounding environment.

Mitigation measures are best considered as two separate phases. These include:

- Primary measures that form part of the development of the wind farm design through an interactive process; and
- Secondary measures designed to specifically address the remaining (residual) negative (adverse) effects of the final development proposals (The Landscape Institute et al 2008).

It is important to note that the mitigation methods proposed in this report are made notwithstanding those relating to other aspects that have been assessed to inform the EIS for the Project. During the planning and design phase of a wind farm mitigation strategies should also be considered to lessen the visual impact of the proposal. This is by no means an exhaustive list; however, the adoption of these recommendations will assist considerably in ensuring the proposal contributes positively to the visual quality and character of the area.

Mitigation methods considered for associated infrastructure has been included in **Section 14.0**.

16.2 Project Layout and Design

The design of the Project is a primary measure of mitigation. The general principles employed through the project design phase can significantly reduce the visual impact. These include siting, access, layout and other principles which directly impact the appearance of the proposed development. General guidelines for the design development of the Project have been outlined in the following section.

16.2.1 Wind Farm Layout and Size

The layout and size of the wind farm is a significant factor in the visual impact on the landscape. It is important to note that as a result of community consultation during the development period, the Project has undergone many changes. The following design principles have been considered in the siting of the proposed turbines to provide a balanced appearance.

- Controlling the location of different turbine types, densities and layout geometry to minimise the visual impacts.
- The lines of turbines reflect the flat topographic landscape as best as possible.
- Turbines are evenly spaced to give a regular pattern creating a better balance within the landscape.

16.2.2 Wind Turbine Design and Colouring

Turbine design and colouring are an important factor. The turbines will have a matte white finish and consist of three blades.

The important factors to achieving a visual consistency through the landscape include:

- Uniformity in the colour, design, height and rotor diameter.
- The use of simple muted colours and non-reflective materials to reduce distant visibility and avoid drawing the eye.
- Blades, nacelle and tower to appear as the same colour.
- Avoidance of unnecessary lighting, signage, logos etc.

16.3 Mitigation Measures - Residences

In accordance with the Bulletin: "*a detailed assessment of dwellings identified within the visual catchment has been undertaken and (where possible) mitigation methods have been recommended to assist in reducing any residual impacts*." (DPE, 2016).

Of the eight (8) non-associated dwellings assessed within 8,000 m from the nearest turbine, a total of five (5) non-associated dwellings were identified through the visual assessment as having the potential for a moderate visual impact (dwellings NAD_26, NAD_26A, NAD_12, NAD_13, NAD_14). Mitigation measures have been suggested for these five (5) non-associated dwellings.

Proposed mitigation measures have been included in **Appendix E** and will be undertaken in consultation with the relevant landowners. Principles for screen planting and supplementary planting have been included below. These principles can be implemented to reduce the potential visual impacts at dwellings in excess of 5,300 m of the nearest turbine post-construction if deemed necessary.

16.3.1 Residence Screen Planting

In circumstances where residences are subject to moderate or high levels of visual impact, screen planting is an option proposed to assist in mitigating views of turbines. As the viewing location of the Project would be generally fixed there is opportunity to significantly reduce potential visual impact from the Project.

In order to achieve visual screening planting between the intrusive element and a homestead, tree planting could be undertaken in consultation with the relevant landowners to ensure that desirable views are not inadvertently eroded or lost in the effort to mitigate views of the turbines.

16.3.2 Residence Supplementary Planting

Due to the lack of intervening vegetation in areas surrounding dwellings NAD_26 and NAD_26A views to the majority of the Project are likely to be available. Existing vegetation around dwellings NAD_12, NAD_13 and NAD_14 is fragmented or located further from the dwelling, thus allowing views of the nearest Project-related turbine. Where turbines are located close to the dwelling or existing intervening vegetation is thin, provision of supplementary planting has been identified as a mitigation method.

For example, the existing vegetation around dwelling NAD_14 helps limit views of turbines in up to one (1) 60 degree sector. Provision of supplementary planting in keeping with the existing landscape character and along the dwelling's fenceline would further reduce potential visibility of turbines in the south easterly direction (refer to Appendix E.5.).

Dense vegetation is located to the west, south and north west of NAD_13. Dense stands of vegetation are located to the south east, and contain some views in this direction. However, the introduction of supplementary planting to the east, along the driveway would further screen views toward turbines in this direction (refer to Appendix E.4.).

16.4 Landscaping Principles

The existing character of the landscape allows for a variety of methods of landscaping and visual screening which will remain in keeping with the landscape character. For example, the existing windbreak vegetation around the dwellings can be strengthened and additional screen planting can help limit views at dwellings. Generally, no key landscape features or views have been identified from dwellings.

General guidelines to adhere to when planning for landscaping and visual screening include:

- Planting is recommended post construction in consultation with the landowner.
- Planting should remain in keeping with existing landscape character.
- Species selection is to be typical of the area.
- Planting layout should avoid screening views of the broader landscape.
- Avoid the clearing of existing vegetation. Where appropriate reinstate any lost vegetation.
- Allow natural vegetation to regrow over any areas of disturbance.

Locally native plant species are preferred, as they help to preserve the landscape character and scenic quality of the area as well as building habitat for local fauna. Native species are also well-suited to local conditions (ie. soil, climate, etc.) and will build on the existing vegetation assemblages in the area.

17

Evaluation of Visual Performance Objectives

17.0 Evaluation of Visual Performance Objectives

17.1 Overview of Visual Performance Objectives

In accordance with the Bulletin: *"the visual assessment requires an evaluation of the proposed wind energy project and its various components, turbines and ancillary facilities against the visual performance objectives of the Project (refer to Table 2 of the Bulletin), using a combination of desktop and field evaluations. The visual performance objectives are used as a framework for evaluation that enables potential impacts and management options to be considered objectively, against the varying levels of landscape significance established by the baseline study. Application of the visual performance objectives will allow for a transparent and robust assessment process."* (DPE, 2016).

The following tables provides a summary of the evaluation of each of the visual performance objectives and identifies the relevant sections of the LVIA where visual performance objectives are addressed.

Visual Magnitude - Visual Performance Objectives		
Visual Influence Zone 1 Objectives:	**Visual Influence Zone 2 Objectives:**	**Visual Influence Zone 3 Objectives:**
Avoid turbines or provide detailed justification of turbines below the blue line (5,300 m for The Plains Wind Farm).	Manage impacts as far as practicable, justify residual impacts, and describe proposed mitigation measures below the black line (3,500 m for The Plains Wind Farm). Consider screening between the blue line and the black line.	Consider screening below the black line (within 3,500 m).
Summary of LVIA Evaluation		
Two (2) non-associated dwellings identified within 3,500 m of the nearest turbine were assessed as being 'Visual Influence Zone 2'. One (1) non-associated dwelling identified between 3,500 - 5,300 m of the nearest turbine was assessed as being 'Visual Influence Zone 2' and two (2) non-associated dwellings were assessed as being 'Visual Influence Zone 3'. **Dwellings within 3,500 m (below the black line):** • Two (2) non-associated dwellings were identified within 3,500 m of a proposed turbine. • All non-associated dwellings within 3,500 m of the nearest turbine were assessed as being Visual Influence Zone 2 (VIZ2). • The two (2) identified non-associated dwellings were rated as having a moderate visual impact rating. Screen planting has been proposed in accordance with the Bulletin to reduce the potential visual impacts from these dwellings. • The objectives for VIZ2 receptors within 3,500 m of the nearest turbine are to: *Manage impacts as far as practicable, justify residual impacts.* **Dwellings within 5,300 m (between the blue and black line):** • Three (3) non-associated dwellings were identified between 3,500 - 5,300 m of a proposed turbine. • One (1) non-associated dwelling was assessed as being Visual Influence Zone 2 (VIZ2) and two (2) non-associated dwellings were assessed as being Visual Influence Zone 3 (VIZ3). • In accordance with the Bulletin, objectives for VIZ2 receptors between the black line (4,000 m) and blue line (5,900 m) of the nearest turbine are to: *Consider screening between the blue line and the black line.* Therefore, screen planting has been proposed to reduce potential visual impacts from the dwelling. • In accordance with the Bulletin, there are no requirements for screening for VIZ3 receptors between the black line (3,500 m) and blue line (5,300 m) of the nearest turbine. However, due to the flat terrain and open views characteristic of the area, screen planting has been recommended. **Refer to Section 6.0: Preliminary Assessment Tools and Appendix E: Mitigation Measures.**		

Table 19 Evaluation of Visual Performance Objectives - Visual Magnitude

Landscape Scenic Integrity		
Visual Influence Zone 1 Objectives:	**Visual Influence Zone 2 Objectives:**	**Visual Influence Zone 3 Objectives:**
Wind turbines should not cause more than a low level modification of the visual catchment. Turbines are seen as either very small and/ or faint, or as of a size and colour contrast (under clear, haze-free atmospheric conditions) that they would not compete with major elements of the existing visual catchment.	Wind turbines should not cause significant modification of the visual catchment. Turbines may be visually apparent and could become a major element in the landscape but should not dominate the existing visual catchment.	No Visual Performance objective applies.

Summary of LVIA Evaluation

The landscape scenic integrity was assessed in Section 15.0, Appendix B and Appendix C of the report. The following provides a summary of the findings:

Public Viewpoint Analysis:

- The Visual Influence Zone (VIZ) was identified for 15 public viewpoint locations within the Study Area and, where required, the landscape scenic integrity was assessed in accordance with the relevant visual performance objectives. Of the 15 viewpoint locations assessed, 12 public viewpoint locations were rated as being Visual Influence Zone 3 (VIZ3) and in accordance with the Bulletin, no visual performance objectives apply.
- Three (3) public viewpoints were assessed as being Visual Influence Zone 2 (VIZ2). The following provides an overview of the assessment:
  - The Project was assessed as being a visible element in the landscape from these three (3) public viewpoint locations (VP02, VP03 and VP04). Photomontages and viewpoint assessments have been prepared for these locations demonstrating that the turbines will dominate the existing visual catchment. It should be noted that these viewpoints are located in close proximity of the Project on the Cobb Highway. No key landscape features were identified at these locations and the surrounding character is defined by flat, highly modified open farmlands of low scenic quality.

Refer to Section 8.0, Appendix B: Public Viewpoint Analysis and Appendix D: Photomontages (Public Receptors)

Dwelling Assessments:

- The two (2) non-associated dwellings assessed within 3,500 m of the nearest turbine are rated as Visual Influence Zone 2 (VIZ2). The potential impacts on the scenic integrity for each of the dwellings has been assessed in accordance with the objectives of the Bulletin.
- The assessment found the Project would have a moderate impact on the scenic integrity of the landscape character at these dwelling locations. The turbines have the potential to become a major element in the landscape when viewed from dwellings NAD_26 and NAD_12. Mitigation measures have been proposed for these non-associated dwellings which were assessed as having a moderate visual impact. Proposed screening will assist in reducing the potential visual impact.

Refer to Section 9.0 and Appendix C: Detailed Dwelling Assessment

Landscape Character:

The potential for the Project to affect the scenic integrity of the existing landscape character was summarised for each Landscape Character Unit in Section 15.0 of the LVIA. The existing character of the region is predominantly defined by vast tracts of open, flat agricultural land that is generally treeless and the land use is driven by commercial agricultural operations. No scenic or key landscape features were identified within the Study Area.

The Project has the ability to dramatically transform the existing visual character of the Study Area since the turbines will be a visually prominent element in the flat, open landscape. However, it should be noted that once constructed, the Project will allow the continuation of the existing character of agricultural production with the addition of a new productive land use, ie., energy production.

Refer to Section 15.0: Overview of Impact on Landscape Character.

Table 20 Landscape Scenic Integrity - Evaluation of Visual Performance Objectives

Multiple Wind Turbine Effects

Objectives (Applies to all Visual Influence Zones)

- Avoid views to the proposed, existing and approved turbines within eight kilometres from Level 1 and Level 2 viewpoints, exceeding the following thresholds, or provide detailed justification:
- Level 1: (High Sensitivity) - Wind Turbines visible within the effective horizontal views of two or more 60º sectors.
- Level 2: (Moderate Sensitivity) - Wind Turbines visible within the effective horizontal views in three or more 60º sectors.

Summary of LVIA Evaluation

- All viewers identified using the MWTT (based on 2D plan assessment) are Level 2 Sensitivity (Rural Dwelling). The Bulletin recommends further assessment to Rural Dwellings (Level 2 Sensitivity) identified as having the potential to view more than two (2) 60º sectors when using the MWTT.
- As discussed in Section 6.5 of this report, all dwellings within 8,000 m of the Project are likely to have views of turbines in up to two (2) 60 degree sectors, which is deemed acceptable in accordance with the Bulletin.

Refer to Section 6.0: Preliminary Assessment Tools

Shadow Flicker and Blade Glint - Visual Performance Objectives

Objectives (Applies to all Visual Influence Zones)

- Minimise shadow flicker to not more than 30 hours per year and utilise available mitigation options to minimise shadow flicker.
- Finish turbine blades with a low reflectivity surface treatment to ensure that blade glint is minimised.

Summary of LVIA Evaluation

A Shadow Flicker Assessment was undertaken.

The Report concluded no non-associated dwellings will be subject to shadow flicker exceeding 30 hours per year.

The shadow flicker at 16 Mile Gums Rest Area is likely to be 10 - <30 hours per year which is deemed acceptable for non-associated dwellings in accordance with the Bulletin. No limitations have been identified for public areas that are likely to experience shadow flicker over 30 hours per year.

Refer to Section 12.0: Shadow Flicker Assessment

Table 21 Multiple Wind Turbine Effects - Evaluation of Visual Performance Objectives

Table 22 Shadow Flicker & Blade Glint - Evaluation of Visual Performance Objectives

Aviation Hazard Lighting
Objectives (Applies to all Visual Influence Zones) Objective Applies to all Visual Influence Zones • Aviation Hazard Lighting (AHL) must meet the requirements of Australian Standard AS 4282 - 1997 and any prescribed or notified CASA requirement. Shield all AHL within 2 kilometres of any dwellings. Avoid strobe lighting.
Summary of LVIA Evaluation
• The visual effect from night lighting has the potential to have a visual impact on receptors including motorists and residents in the area. • Night lighting is proposed to be installed on meteorological masts located in proximity of the turbines. No AHL has been proposed for the turbines. • Mitigation methods for other ancillary infrastructure have been outlined in Section 14.0.

Refer to Section 11.0 Night Lighting Assessment and Section 14.0 Associated Infrastructure Assessment.

Table 23 Aviation Hazard Lighting - Evaluation of Visual Performance Objectives

18

Conclusion

18.0 Conclusion

The NSW Government has identified five (5) Renewable Energy Zones (REZ) in regional areas of NSW and the Project is located within the SW REZ. The Project contrasts with the existing landscape character of the region which is typically rural, grazing land which is highly modified and lacks key landscape and scenic features. It is inevitable that the placement of large scale wind turbines in a rural landscape will dramatically alter the existing landscape character of the area, particularly when the landscape is flat and lacks landscape features such as prominent vegetation groups or undulating topography.

With all visual impact assessments, the objective is not to determine whether the Project is visible or not visible, but to determine how the Project will impact on the existing visual amenity, landscape character and scenic quality. It has been identified that although the Project will be a visually prominent element in the landscape, views to key scenic or landscape features will not be impacted because the predominant character of the region is defined by highly modified lands of low scenic quality. Once operational, the Project will allow the continuation of existing agricultural activity and add another land use, i.e., wind energy production.

Although this LVIA quantifies the visual impact of the turbines and ancillary infrastructure, the overall visual impact of the Project will vary greatly depending on the individual viewer's sensitivity to and acceptance of change. The sensitivity towards change varies greatly depending on the user's connection with the landscape. For example, visitors to the area may perceive the wind farm as an interesting feature of the landscape which is otherwise defined by flat, large expanses that lack key features. This may contrast with a resident who passes the wind farm daily who may have a more critical perception of the visual presence of the wind farm.

The visual impact of the turbines reduces as one moves further away from the turbines. Despite the expansive, flat, treeless character of the landscape, the reduction in visibility has been established through the preparation of photomontages from locations at varying distances.

The LVIA concludes there are some opportunities to view the Project from non-associated dwellings within 8,000 m of the Project. However, the degree to which the Project integrates into the surrounding landscape varies between these locations depending upon the existing vegetation coverage surrounding the dwellings. The greatest visual effect is most likely to be felt by residents in the immediate vicinity of the Project. Of the eight (8) non-associated dwellings within 8,000 m of the Project that were assessed, three (3) are likely to have a low visual impact. The remaining five (5) non-associated dwellings are likely to have a moderate visual impact rating. One (1) DA location was identified within 8,000 m of the Project and it is likely that the visual impact at this location will be low.

Mitigation methods incorporated into the design process in conjunction with landscape and visual screening will potentially reduce visual impacts at the non-associated dwellings identified as having a moderate visual impact. However, it should be noted that the provision of additional screen planting as a mitigation method requires further consultation with the landowner.

Overall, the 16 Mile Gums Rest Area was identified as a key viewpoint location within the Study Area. The Rest Area serves as a rest stop along the Cobb Highway and does not offer views to any key landscape or scenic features. Although the Project will be a dominant feature in the views from this location, the existing character of the surrounds are defined by large tracts of open, flat agricultural lands will continue to co-exist with the Project. Other key viewpoint locations identified in the area include the Shear Outback Visitor Centre and the Bushy Bend Reserve Rest Area which are located approximately 15 km north of the Project. The assessment identified that these key viewpoint locations will experience low - nil visual impacts due to intervening vegetation.

It was also identified that the Project will impact the overall and broader landscape character. Although the Project will be visually prominent in the landscape, the landscape has been determined to be of low scenic quality and devoid of significant landscape features. The modification and clearing of the plains for agricultural use combined with the flat topography the landscape is in essence a 'blank canvas' where any contrasting addition, particularly one of the scale of a wind farm, is likely to become a defining character element. This however will not diminish the existing agricultural character.

The potential cumulative visual impact assessment of the proposed renewable energy projects in the area concluded that it is likely that the re-occurrence of wind farms within this region has the potential to alter the perception of the overall landscape character irrespective of being viewed in a single viewshed. Since the Project is located in SW REZ, it is likely that the region will be developed for wind energy production due to conditions that favour wind energy harvesting. The Project is located in an area of low scenic quality that offers no key features in the landscape. It should also be noted that the development of wind farms will allow the continuation of the existing primary production activities, as well as provide opportunity for energy production.

Wind turbines can be considered a temporary installation in the landscape due to their modular construction and relatively low impact during the construction phase. When implemented with appropriate environmental management, the development of wind farms can be undertaken with low impact on the surrounding environment whilst providing positive local, regional and national benefits.

On evaluation, it is the opinion of Moir LA that with mitigation measures implemented, the Project is compliant with the performance objectives of the Bulletin.

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A

Visual Influence Zone Study Method

VIEWER SENSITIVITY LEVEL

Level 1 Sensitivity: High	• Residential areas and rural villages • Recreation, cultural or scenic sites and viewpoints of National or State significance. • Any buildings, historic rural homesteads/residences on the State or local Government Heritage List
Level 2 Sensitivity: Moderate	• Rural dwelling • Tourist and visitor accommodation (definition in Standard Instrument Local Environmental Plan) • Recreation, cultural or scenic sites and viewpoints of regional significance
Level 3 Sensitivity: Low	• Interstate and state passenger rail lines with daily daylight services • State highways, freeways and classified main roads, classified tourist roads • Land management roads with occasional recreation traffic • Walking tracks of moderate local significance or infrequent recreation usage • Other low use and low concern viewpoints and travel routes • Navigable waterways

VISIBILITY DISTANCE ZONES

0 – 500 m	Near Foreground (**NF**)	Zone of Greatest Visual Influence
500 m – 1 km	Mid Foreground (**MF**)	
1 – 2 km	Far Foreground (**FF**)	
2 – 4 km	Near Middleground (**NM**)	
4 – 8 km	Far Middleground (**FM**)	
8 – 12 km	Near Background (**NB**)	
12 – 20 km	Mid Background (**MB**)	
20 – 32+ km	Far Background (**FB**)	Zone of Least Visual Influence

SCENIC QUALITY CLASS

LOW MODERATE HIGH

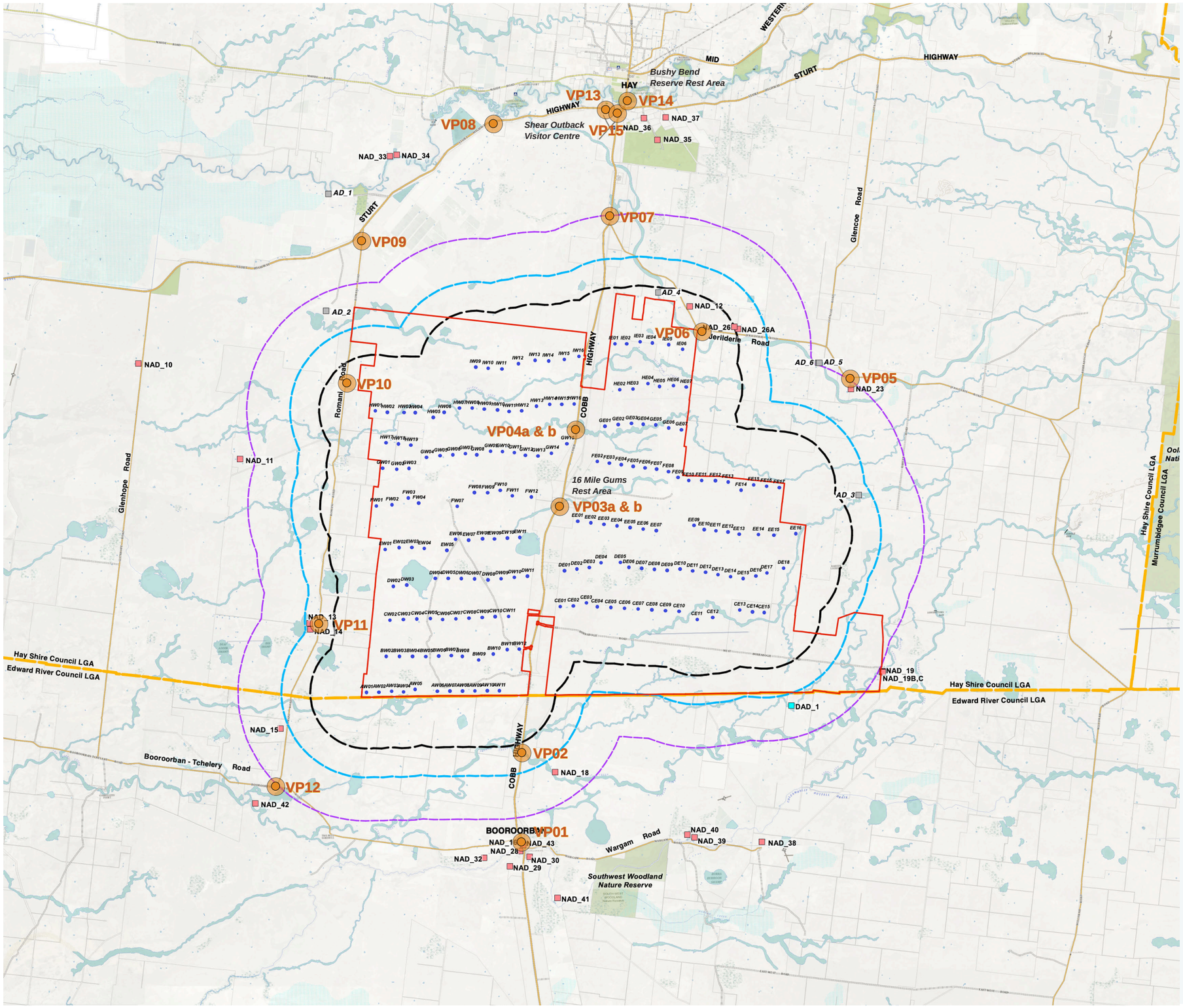
Landform
Waterbodies
Vegetation
Human Influence
Activity
Rarity
Relationship with adjoining landscapes

VISUAL INFLUENCE ZONE MATRIX

VIEWER SENSITIVITY LEVEL - VISIBILITY DISTANCE ZONE		**SCENIC QUALITY CLASS** HIGH	MODERATE	LOW
LEVEL 1 HIGH SENSITIVITY VIEWPOINTS				
Near Foreground (**NF**)	0 – 500 m	VIZ1	VIZ1	VIZ1
Mid Foreground (**MF**)	500 m – 1 km	VIZ1	VIZ1	VIZ1
Far Foreground (**FF**)	1 – 2 km	VIZ1	VIZ1	VIZ1
Near Middleground (**NM**)	2 – 4 km	VIZ1	VIZ2	VIZ2
Far Middleground (**FM**)	4 – 8 km	VIZ2	VIZ2	VIZ2
Near Background (**NB**)	8 – 12 km	VIZ2	VIZ2	VIZ2
Mid Background (**MB**)	12 – 20 km	VIZ2	VIZ2	VIZ3
Far Background (**FB**)	20 – 32+ km	VIZ2	VIZ2	VIZ3
LEVEL 2 MODERATE SENSITIVITY VIEWPOINTS				
Near Foreground (**NF**)	0 – 500 m	VIZ1	VIZ1	VIZ1
Mid Foreground (**MF**)	500 m – 1 km	VIZ1	VIZ1	VIZ1
Far Foreground (**FF**)	1 – 2 km	VIZ1	VIZ1	VIZ2
Near Middleground (**NM**)	2 – 4 km	VIZ2	VIZ2	VIZ2
Far Middleground (**FM**)	4 – 8 km	VIZ2	VIZ2	VIZ3
Near Background (**NB**)	8 – 12 km	VIZ2	VIZ3	VIZ3
Mid Background (**MB**)	12 – 20 km	VIZ2	VIZ3	VIZ3
Far Background (**FB**)	20 – 32+ km	VIZ3	VIZ3	VIZ3
LEVEL 3 LOW SENSITIVITY VIEWPOINTS				
Near Foreground (**NF**)	0 – 500 m	VIZ1	VIZ1	VIZ2
Mid Foreground (**MF**)	500 m – 1 km	VIZ2	VIZ2	VIZ2
Far Foreground (**FF**)	1 – 2 km	VIZ2	VIZ2	VIZ3
Near Middleground (**NM**)	2 – 4 km	VIZ2	VIZ3	VIZ3
Far Middleground (**FM**)	4 – 8 km	VIZ2	VIZ3	VIZ3
Near Background (**NB**)	8 – 12 km	VIZ3	VIZ3	VIZ3
Mid Background (**MB**)	12 – 20 km	VIZ3	VIZ3	VIZ3
Far Background (**FB**)	20 – 32+ km	VIZ3	VIZ3	VIZ3
Areas not visible		VIZ3	VIZ3	VIZ3

B

Public Viewpoint Analysis



Public Viewpoint Analysis Locations

The Plains Renewable Energy Park Wind Farm

- Project Area
- Proposed Turbine Locations
- Associated Dwellings
- Non-associated Dwellings
- DA Locations
- 3,500 m from turbine (black line of visual magnitude)
- 5,300 m from turbine (blue line of visual magnitude)
- 8,000 m from turbine (extent of Study Area)
- Main Road
- Minor Road
- LGA Boundary
- Public Viewpoint Analysis Location

N

0 4 8 12 16km

Appendix B Public Viewpoint Analysis Locations (Map Source: Six Maps 2011)

VP01 Cobb Highway, Booroorban

Approximate extent of potentially visible turbines



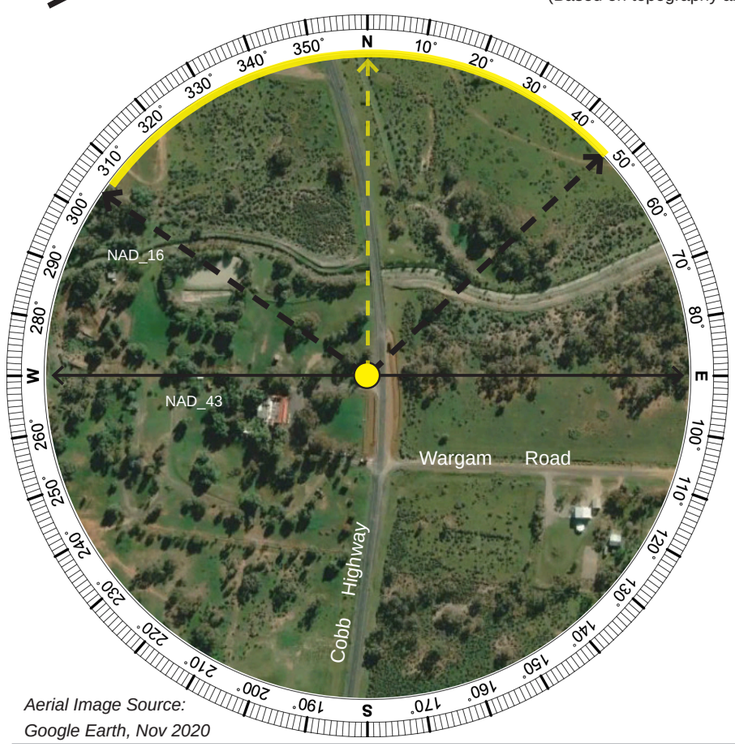
LEGEND

Viewing direction and centre of panorama

Extent of panorama

Direction of potentially visible turbines

Extent of visible turbines
(Based on topography alone)



Aerial Image Source:
Google Earth, Nov 2020

VIEWPOINT VP01

Viewpoint Summary:	
Location:	Elevation:
Cobb Hwy, Booroorban	84 m
Coordinates:	Viewing Direction:
34°55'53.24"S 144°45'46.42"E	North
Distance to nearest WTG:	Visibility Distance Zone:
9.68 km	**Near Background (NB)**
Land Use:	Viewer Sensitivity Level:
Major Road	**Level 3 (Low)**
LCU:	Scenic Quality Rating:
LCU05: Booroorban	**Low**

Visual Influence Zone:

VIZ3

Existing Landscape Character Description:

The viewpoint is located on the Cobb Highway within the rural locality of Booroorban, near NAD_43 which has been identified as the Royal Mail Hotel. The viewpoint represents views from the rural locality.

Surrounding areas include rural dwellings.

Vegetation around the dwellings is generally dense. Patches of riparian trees and shrubs associated with Coleambally Outfall Drain are visible to the north, north west and east.

The terrain is generally flat with minor undulations.

Potential Visual Impact:

Turbines are likely to be visible in up to one (1) 60 degree sector at this location generally to the north. It is likely that existing vegetation will screen views to the north west.

Refer to Appendix D, PM03.

Visual Performance Objectives:

No visual performance objectives apply to this viewpoint due to the VIZ3 Rating.

VP02 Cobb Highway, Booroorban

Approximate extent of potentially visible turbines



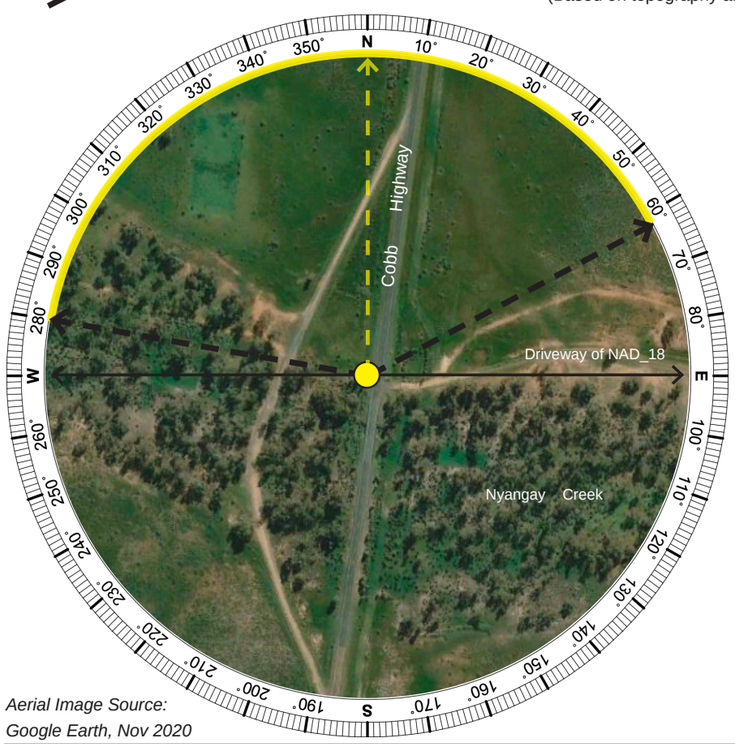
LEGEND

Viewing direction and centre of panorama

Extent of panorama

Direction of potentially visible turbines

Extent of visible turbines
(Based on topography alone)



Aerial Image Source:
Google Earth, Nov 2020

VIEWPOINT VP02

Viewpoint Summary:

Location:	Elevation:
Cobb Highway, Booroorban	86 m
Coordinates:	**Viewing Direction:**
34°52'47.23"S 144°45'43.85"E	North
Distance to nearest WTG:	**Visibility Distance Zone:**
4.07 km	**Far Foreground (FF)**
Land Use:	**Viewer Sensitivity Level:**
Major Road	**Level 3 (Low)**
LCU:	**Scenic Quality Rating:**
LCU02: Creek Corridors	**Moderate**

Visual Influence Zone:

VIZ2

Existing Landscape Character Description:

The viewpoint is located on the Cobb Highway near the entrance gate of 'Nyangay, East Loddon Merino Stud' (NAD_18) and near the Nyangay Creek corridor.

Surrounding lands are used for grazing. The terrain is generally flat with minor undulations.

Grasses and saltbush communities are prevalent on the eastern side of the highway. Trees and mid-storey shrubs associated with Nyangay Creek are visible in the foreground to the west of the viewpoint. However, views to the north are generally open. Mid-storey shrubs associated with Curtains Creek are visible generally in the middleground in the north west.

Patchy groupings of trees are visible along the horizon.

Potential Visual Impact:

Due to the flat and expansive nature of the existing landscape, the majority of the Project is likely to be visible to the north. Existing vegetation in the middleground partially limits views to the turbines.

Refer to Appendix D, PM08.

Visual Performance Objectives (VIZ2):

Visual Magnitude: The viewpoint is located within the 'black line' of visual magnitude (3,850m).

Landscape Scenic Integrity: The Project is likely to alter the existing visual and landscape character at this location. Turbines are likely to be a major element in the landscape due to their proximity.

Key Feature Disruption: Key landscape features in this view include vegetation associated with Nyangay Creek. Although the vegetation will continue to be visible, the Project will become a defining element and character in the view.

VP03a 16 Mile Gums Rest Area, Cobb Highway, Booroorban

Approximate extent of potentially visible turbines



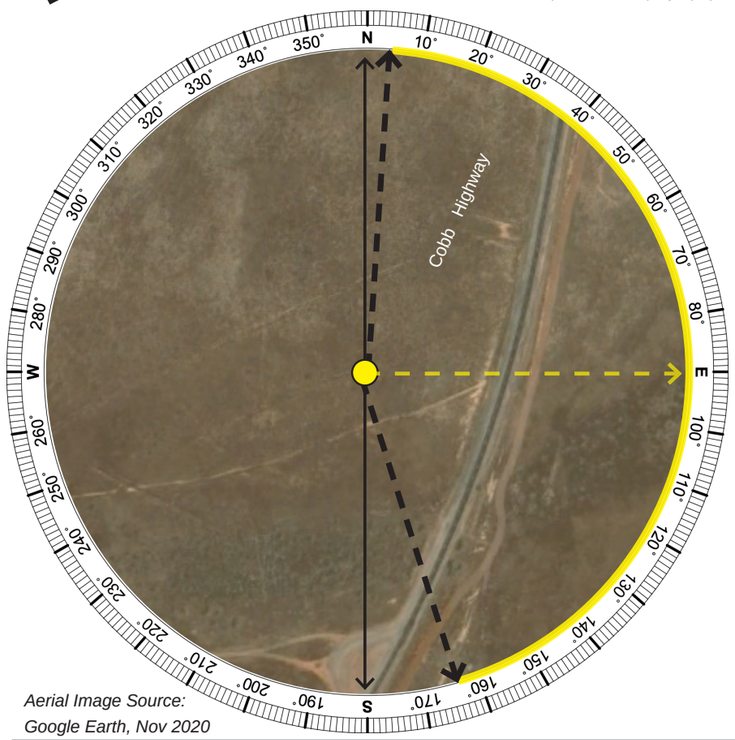
LEGEND

Viewing direction and centre of panorama

Extent of panorama

Direction of potentially visible turbines

Extent of visible turbines
(Based on topography alone)



Aerial Image Source:
Google Earth, Nov 2020

VIEWPOINT VP03a

Viewpoint Summary:	
Location:	Elevation:
16 Mile Gums, Cobb Highway, Booroorban	88 m
Coordinates:	Viewing Direction:
34°44'30.02"S 144°47'30.21"E	East
Distance to nearest WTG:	Visibility Distance Zone:
1.50 km	**Far Foreground (FF)**
Land Use:	Viewer Sensitivity Level:
Rest Area	**Level 3 (Low)**
LCU:	Scenic Quality Rating:
LCU01: Farmlands and Plains	**Low**

Visual Influence Zone:

VIZ2

Existing Landscape Character Description:

This viewpoint was taken looking east at the 16 Mile Gums Rest Area located on the Cobb Highway in Booroorban. The Rest Area forms part of the 'The Long Paddock' touring route. The rest stop is frequently used by motorists travelling between Hay and Deniliquin on the Cobb Highway.

The terrain is generally flat with open, clear views in the easterly direction. Surrounding land is used for grazing. Low shrub and grassy vegetation is visible in the background of the view. Scattered stands of trees are visible to the north of the view.

The location was identified as a key viewpoint location during community consultation in the scoping phase. Viewer sensitivity of this viewpoint has been rated as Level 3 (Low) in accordance with the Bulletin.

Potential Visual Impact:

Views across flat, expansive grasslands define the character of this viewpoint. The majority of the Project is likely to be visible in the foreground at this location due to the distance to the proximity of the Project and lack of intervening elements.

Refer to Appendix D, PM02.

Visual Performance Objectives:

Visual Magnitude: The viewpoint is located within the 'black line' of visual magnitude (3,850m).

Landscape Scenic Integrity: The Project is likely to alter the existing visual and landscape character at this location. Turbines are likely to be a major element in the landscape due to their proximity.

Key Feature Disruption: Due to the flat terrain and absence of any significant vegetation, the character of the view lacks key landscape features. Subsequently, the Project will become a defining character element in the view.

VP03b 16 Mile Gums Rest Area, Cobb Highway, Booroorban

Approximate extent of potentially visible turbines



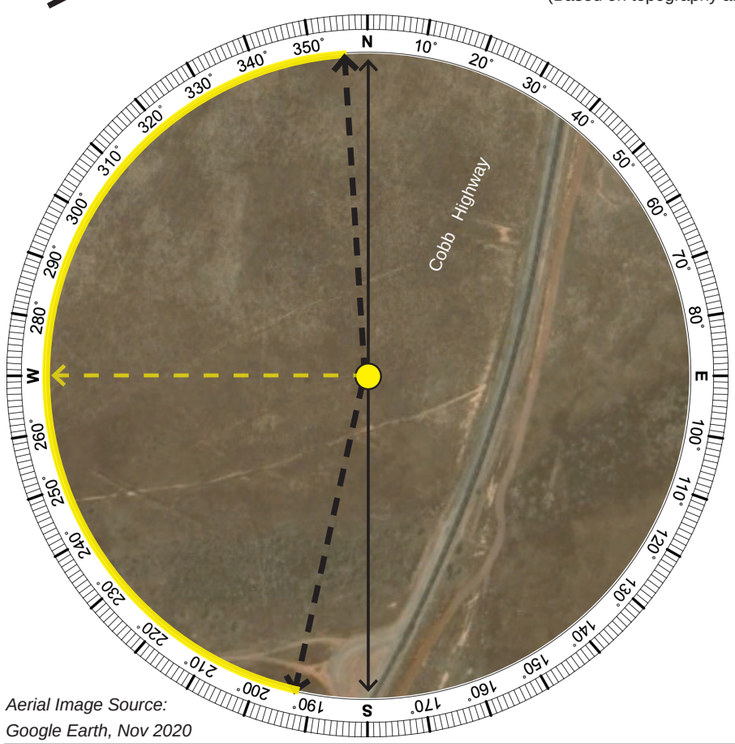
LEGEND

Viewing direction and centre of panorama

Extent of panorama

Direction of potentially visible turbines

Extent of visible turbines
(Based on topography alone)



Aerial Image Source:
Google Earth, Nov 2020

VIEWPOINT VP03b

Viewpoint Summary:	
Location:	Elevation:
16 Mile Gums, Cobb Highway, Booroorban	88 m
Coordinates:	Viewing Direction:
34°44'30.02"S 144°47'30.21"E	West
Distance to nearest WTG:	Visibility Distance Zone:
1.50 km	**Far Foreground (FF)**
Land Use:	Viewer Sensitivity Level:
Rest Area	**Level 3 (Low)**
LCU:	Scenic Quality Rating:
LCU01: Farmlands and Plains	**Low**

Visual Influence Zone:

VIZ2

Existing Landscape Character Description:

This viewpoint was taken looking west at the 16 Mile Gums Rest Area located on the Cobb Highway in Booroorban. The Rest Area forms part of the 'The Long Paddock' touring route. The rest stop is frequently used by motorists travelling between Hay and Deniliquin on the Cobb Highway.

The terrain is generally flat with partially fragmented views in the westerly direction. Surrounding land is used for grazing. Vegetation is predominantly grassy and groupings of native trees are visible in the middleground of the view.

The location was identified as a key viewpoint location during community consultation in the scoping phase. Viewer sensitivity of this viewpoint has been rated as Level 3 (Low) in accordance with the Bulletin.

Potential Visual Impact:

Views across flat grasslands define the character of this viewpoint. The majority of the Project is likely to be visible in the foreground at this location due to the distance to the proximity of the Project and lack of intervening elements.

Refer to Appendix D, PM02.

Visual Performance Objectives:

Visual Magnitude: The viewpoint is located within the 'black line' of visual magnitude (3,850m).

Landscape Scenic Integrity: The Project is likely to alter the existing visual and landscape character at this location. Turbines are likely to be a major element in the landscape due to their proximity.

Key Feature Disruption: Due to the flat terrain and absence of any significant vegetation, the character of the view lacks key landscape features. Subsequently, the Project will become a defining character element in the view.

VP04a Cobb Highway, Booroorban

Approximate extent of potentially visible turbines



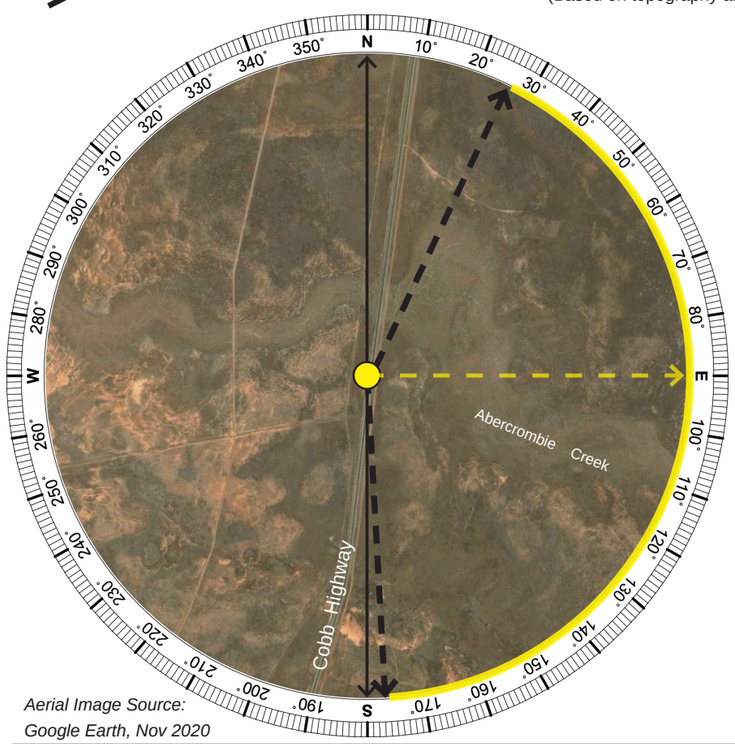
LEGEND

Viewing direction and centre of panorama

Extent of panorama

Direction of potentially visible turbines

Extent of visible turbines (Based on topography alone)



Aerial Image Source: Google Earth, Nov 2020

VIEWPOINT VP04a

Viewpoint Summary:

Location:	Elevation:
Cobb Highway, Booroorban	90 m
Coordinates:	Viewing Direction:
34°41'58.28"S 144°48'15.55"E	East
Distance to nearest WTG:	Visibility Distance Zone:
1.05 km	**Far Foreground (FF)**
Land Use:	Viewer Sensitivity Level:
Major Road	**Level 3 (Low)**
LCU:	Scenic Quality Rating:
LCU02: Creek Corridors	**Moderate**

Visual Influence Zone:

VIZ2

Existing Landscape Character Description:

The viewpoint was taken from Cobb Highway within the central part of the Project Area and near the Abercrombie Creek corridor. The viewpoint represents views for motorists travelling between Hay and Deniliquin.

The terrain is generally flat with minor undulations.

Surrounding land is used for grazing and covered in saltbush and grassy vegetation. The land parcels lack intervening elements in the easterly direction.

Potential Visual Impact:

Lack of intervening elements allows clear, open views of the surrounding land. The majority of the Project is likely to be visible in the foreground due to its proximity and lack of intervening elements.

Visual Performance Objectives:

Visual Magnitude: The viewpoint is located within the 'black line' of visual magnitude (3,850m).

Landscape Scenic Integrity: The Project is likely to alter the existing visual and landscape character at this location. Turbines are likely to be a major element in the landscape due to their proximity.

Key Feature Disruption: Due to the flat terrain and absence of any significant vegetation, the character of the view lacks key landscape features. Subsequently, the Project will become a defining character element in the view.

VP04b Cobb Highway, Booroorban

Approximate extent of potentially visible turbines



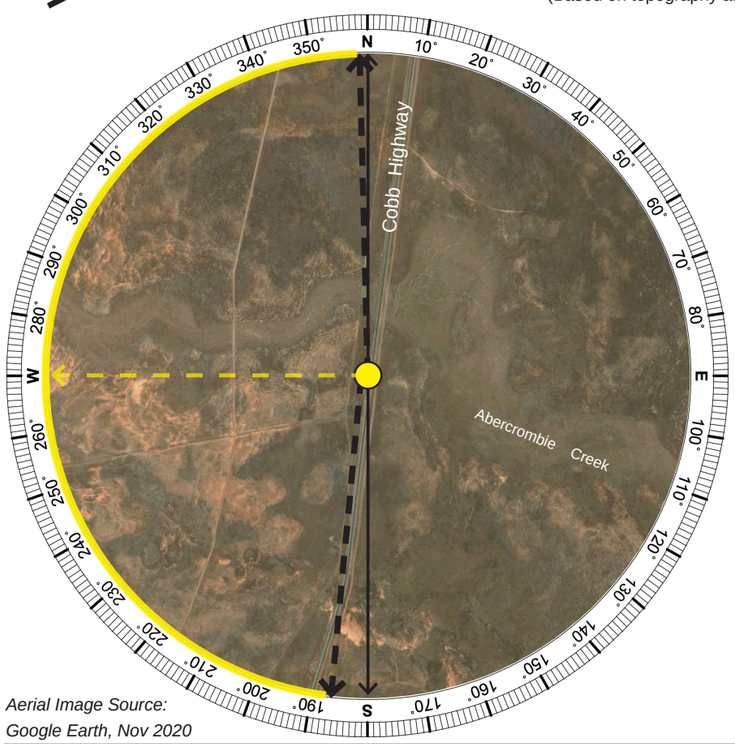
LEGEND

Viewing direction and centre of panorama

Extent of panorama

Direction of potentially visible turbines

Extent of visible turbines
(Based on topography alone)



Aerial Image Source:
Google Earth, Nov 2020

VIEWPOINT VP04b

Viewpoint Summary:

Location:	Elevation:
Cobb Highway, Booroorban	90 m
Coordinates:	**Viewing Direction:**
34°41’58.28”S 144°48’15.55”E	West
Distance to nearest WTG:	**Visibility Distance Zone:**
1.05 km	**Far Foreground (FF)**
Land Use:	**Viewer Sensitivity Level:**
Major Road	**Level 3 (Low)**
LCU:	**Scenic Quality Rating:**
LCU02: Creek Corridors	**Moderate**

Visual Influence Zone:

VIZ2

Existing Landscape Character Description:

The viewpoint was taken from Cobb Highway within the central part of the Project Area. The viewpoint represents views for motorists travelling between Hay and Deniliquin.

The terrain is generally flat with minor undulations.

Surrounding land is used for grazing. Vegetation groups include saltbush and grass species typical of the region. The land parcels lack intervening elements in the westerly direction.

Potential Visual Impact:

Lack of intervening elements allows clear, open views of the surrounding land. The majority of the Project is likely to be visible in the foreground due to its proximity and lack of intervening elements.

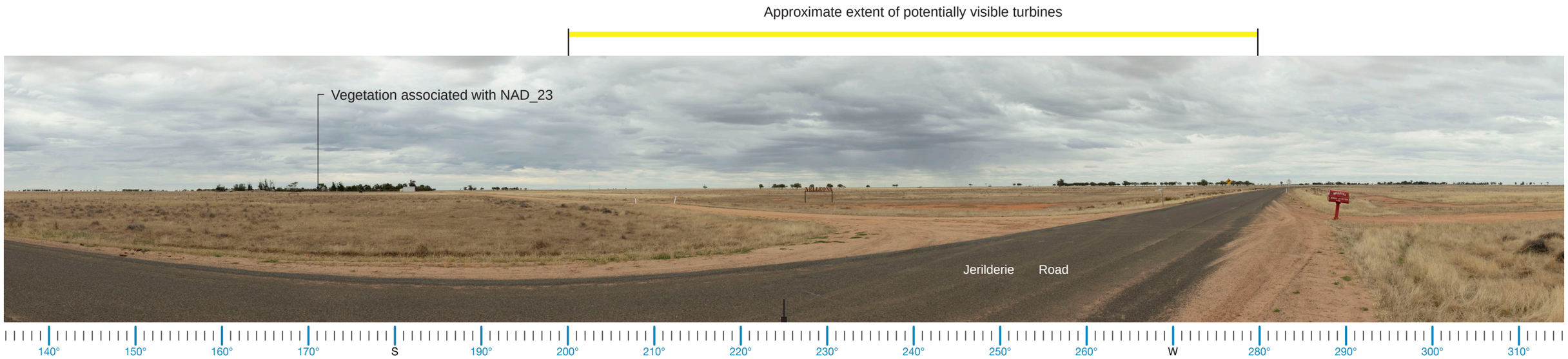
Visual Performance Objectives:

Visual Magnitude: The viewpoint is located within the ‘black line’ of visual magnitude (3,850m).

Landscape Scenic Integrity: The Project is likely to alter the existing visual and landscape character at this location. Turbines are likely to be a major element in the landscape due to their proximity.

Key Feature Disruption: Due to the flat terrain and absence of any significant vegetation, the character of the view lacks key landscape features. Subsequently, the Project will become a defining character element in the view.

VP05 Jerilderie Road, Hay South



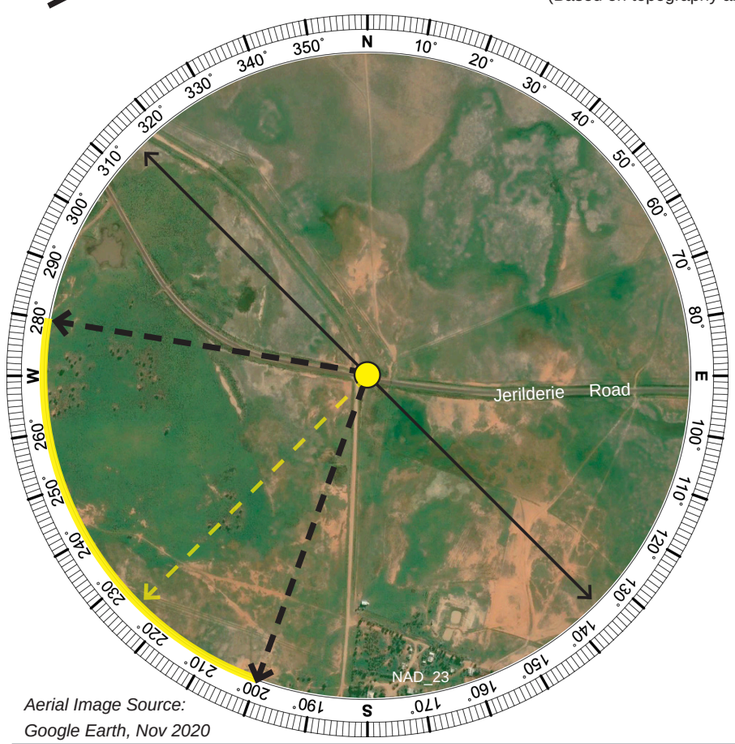
LEGEND

Viewing direction and centre of panorama

Extent of panorama

Direction of potentially visible turbines

Extent of visible turbines
(Based on topography alone)



Aerial Image Source:
Google Earth, Nov 2020

VIEWPOINT VP05

Viewpoint Summary:	
Location:	Elevation:
Jerilderie Road, Hay South	94 m
Coordinates:	Viewing Direction:
34°39'19.31"S 144°58'20.54"E	Southwest
Distance to nearest WTG:	Visibility Distance Zone:
8.21 km	**Near Background (NB)**
Land Use:	Viewer Sensitivity Level:
Low Use Road	**Level 3 (Low)**
LCU:	Scenic Quality Rating:
LCU01: Farmlands and Plains	**Low**

Visual Influence Zone:

VIZ3

Existing Landscape Character Description:

The viewpoint is located on Jerilderie Road near the entrance of dwelling NAD_23. Jerilderie Road is a low use road that provides access to rural dwellings in the area.

Surrounding lands are used for grazing and dryland cropping. Scattered rural dwellings are visible in the south.

The terrain is generally flat with minor undulations.

Vegetation in surrounding areas typically comprises of grasses and saltbush. Tree cover associated with the NAD_23 other dwellings further to the west are visible in the middleground.

Potential Visual Impact:

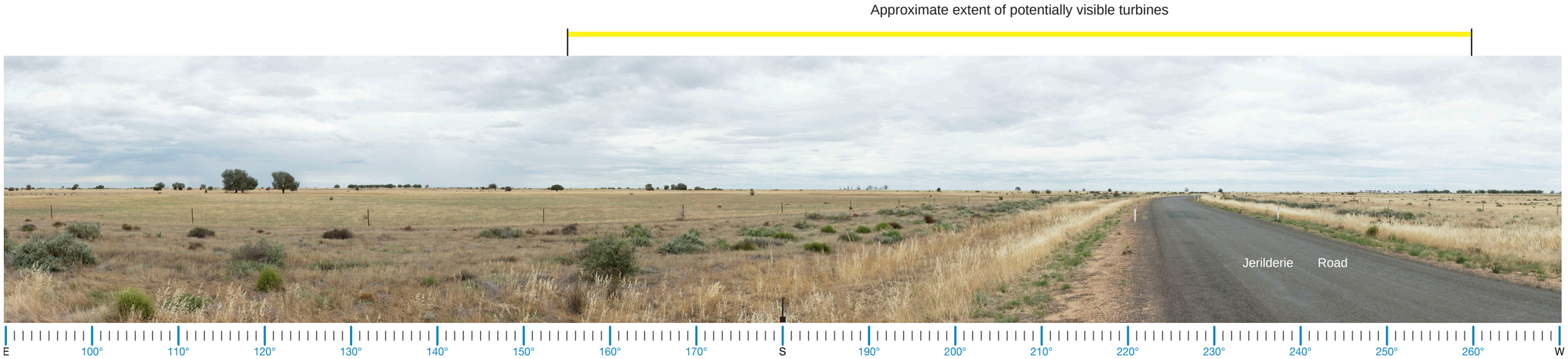
The existing visual character is defined by open and expansive views. The majority of the Project is likely to be visible to the south west in the background. Existing vegetation associated with dwellings is likely to partially limit views of the Project. It is likely that the Project will not dominate the visual character.

Refer to Appendix D, PM05.

Visual Performance Objectives:

No visual performance objectives apply to this viewpoint due to the VIZ3 Rating.

VP06 Jerilderie Road, Hay South



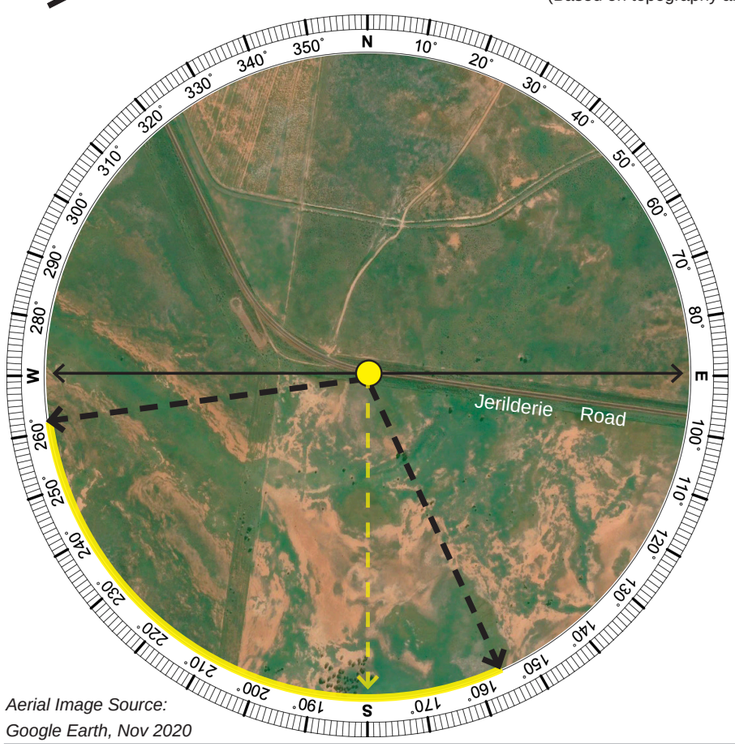
LEGEND

Viewing direction and centre of panorama

Extent of panorama

Direction of potentially visible turbines

Extent of visible turbines
(Based on topography alone)



Aerial Image Source:
Google Earth, Nov 2020

VIEWPOINT VP06

Viewpoint Summary:	
Location:	Elevation:
Jerilderie Rd, Hay South	94 m
Coordinates:	Viewing Direction:
34°39'19.31"S 144°58'20.54"E	Southwest
Distance to nearest WTG:	Visibility Distance Zone:
2.05 km	**Near Background (NB)**
Land Use:	Viewer Sensitivity Level:
Low Use Road	**Level 3 (Low)**
LCU:	Scenic Quality Rating:
LCU01: Farmlands and Plains	**Low**

Visual Influence Zone:

VIZ3

Existing Landscape Character Description:

The viewpoint is located on Jerilderie Road which is a low use road that provides access to rural dwellings in the area.

Surrounding lands are used for grazing and dryland cropping.

The terrain is generally flat with minor undulations.

Vegetation in surrounding areas typically comprises of grasses and saltbush. Scattered stands of tree cover associated with rural dwellings are visible in the middleground and background.

Potential Visual Impact:

Lack of intervening elements allows clear, open views of the surrounding land. The majority of the Project is likely to be visible in the foreground to the south west due to its proximity. It is likely that the Project will become a defining element of the visual character.

Visual Performance Objectives:

No visual performance objectives apply to this viewpoint due to the VIZ3 Rating.

VP07 Cobb Highway, Hay South

Approximate extent of potentially visible turbines



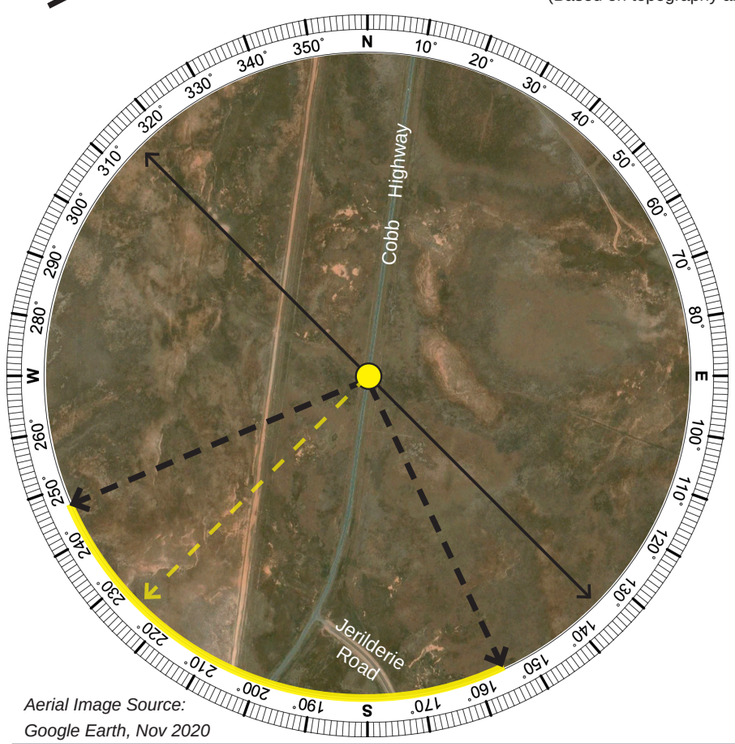
LEGEND

Viewing direction and centre of panorama

Extent of panorama

Direction of potentially visible turbines

Extent of visible turbines
(Based on topography alone)



Aerial Image Source: Google Earth, Nov 2020

VIEWPOINT VP07

Viewpoint Summary:	
Location:	Elevation:
Cobb Hwy, Hay South	92 m
Coordinates:	Viewing Direction:
34°34'47.47"S 144°49'50.24"E	South
Distance to nearest WTG:	Visibility Distance Zone:
8.14 km	**Near Background (NB)**
Land Use:	Viewer Sensitivity Level:
Major Road	**Level 3 (Low)**
LCU:	Scenic Quality Rating:
LCU01: Farmlands and Plains	**Low**

Visual Influence Zone:

VIZ3

Existing Landscape Character Description:

The viewpoint is located on the Cobb Highway on the northern side of the Project.

The terrain is generally flat with minor undulations.

Surrounding land is used for grazing and covered in saltbush and grassy vegetation. The land parcels lack intervening elements.

Visible infrastructure includes powerlines in the western direction.

Potential Visual Impact:

Lack of intervening elements allows clear, open views of the surrounding land. The majority of the Project is likely to be visible to the south. However, due to distance the Project is unlilkely to alter the character of the visual catchment.

Visual Performance Objectives:

No visual performance objectives apply to this viewpoint due to the VIZ3 Rating.

VP08 Sturt Highway, Hay

Approximate extent of potentially visible turbines



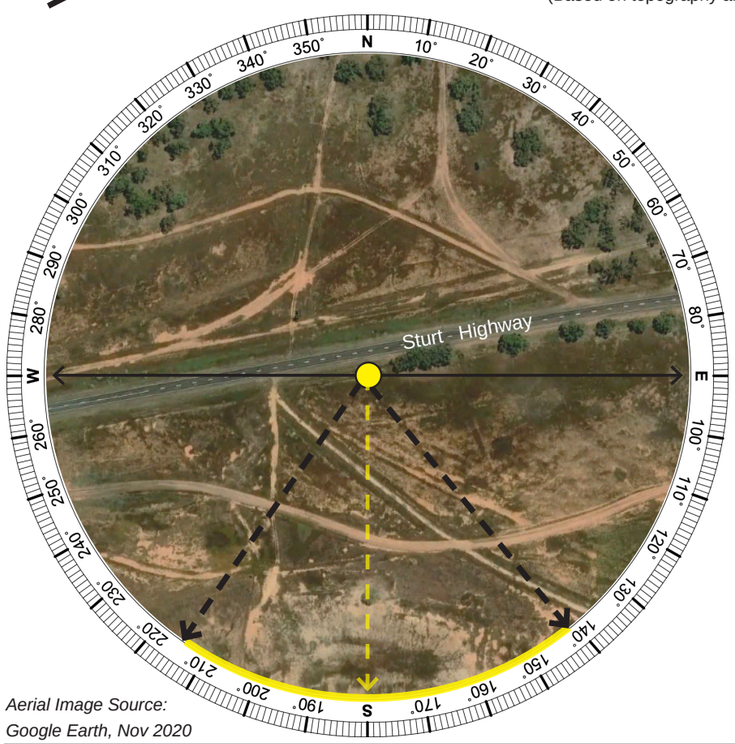
LEGEND

Viewing direction and centre of panorama

Extent of panorama

Direction of potentially visible turbines

Extent of visible turbines
(Based on topography alone)



Aerial Image Source:
Google Earth, Nov 2020

VIEWPOINT VP08

Viewpoint Summary:	
Location:	Elevation:
Sturt Highway, Hay	90 m
Coordinates:	Viewing Direction:
34°31'34.71"S 144°45'10.03"E	South
Distance to nearest WTG:	Visibility Distance Zone:
13.39 km	**Mid Background (MB)**
Land Use:	Viewer Sensitivity Level:
Major Road	**Level 3 (Low)**
LCU:	Scenic Quality Rating:
LCU01: Farmlands and Plains	**Low**

Visual Influence Zone:

VIZ3

Existing Landscape Character Description:

This viewpoint is located on the Sturt Highway and represents views from the southern side of Hay.

Surrounding lands are predominantly used for grazing and cropping.

The terrain is generally flat with minor undulations.

Vegetation character is defined by saltbush and grass species typical of the region. Scattered stands of tree cover visible in the middleground and background.

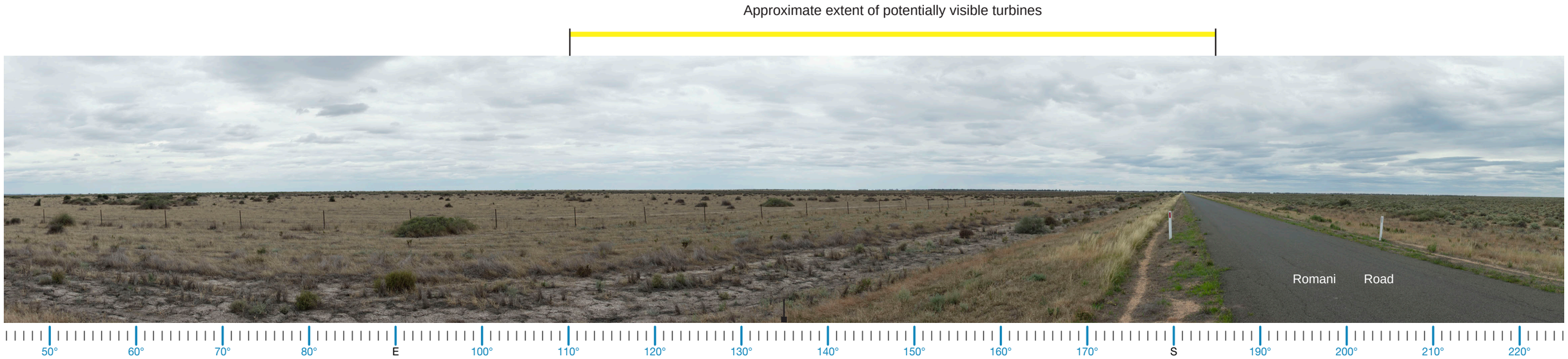
Potential Visual Impact:

Scattered stands of tree cover partially limit views in the southern direction. The majority of the Project is likely to be visible to the south. However, due to distance the Project is unlilkely to alter the visual character.

Visual Performance Objectives:

No visual performance objectives apply to this viewpoint due to the VIZ3 Rating.

VP09 Romani Road, Hay South



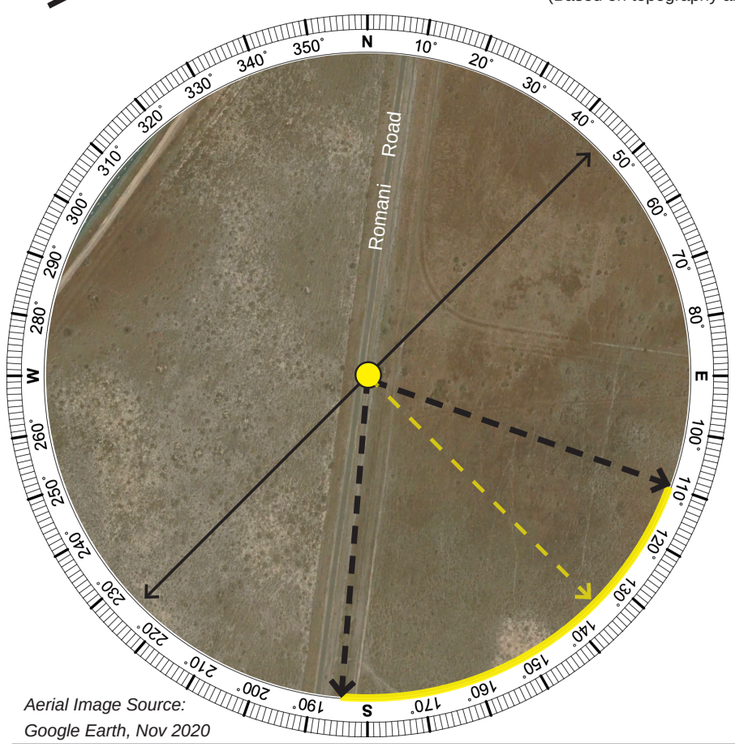
LEGEND

Viewing direction and centre of panorama

Extent of panorama

Direction of potentially visible turbines

Extent of visible turbines
(Based on topography alone)



Aerial Image Source:
Google Earth, Nov 2020

VIEWPOINT VP09

Viewpoint Summary:	
Location:	Elevation:
Romani Rd, Hay South	85 m
Coordinates:	Viewing Direction:
34°35'26.11"S 144°39'41.45"E	Southeast
Distance to nearest WTG:	Visibility Distance Zone:
6.03 km	**Far Middleground (FM)**
Land Use:	Viewer Sensitivity Level:
Low Use Road	**Level 3 (Low)**
LCU:	Scenic Quality Rating:
LCU01: Farmlands and Plains	**Low**

Visual Influence Zone:

VIZ3

Existing Landscape Character Description:

This viewpoint is located on Romani Road which is a low use road that provides access to rural dwellings in the area.

The terrain is generally flat with minor undulations.

Surrounding land is used for grazing and covered in saltbush and grassy vegetation. The land parcels lack intervening elements.

Potential Visual Impact:

Lack of intervening elements allows clear, open views of the surrounding land. The majority of the Project is likely to be visible to the south east. It is likely that the Project will become a defining element of the visual character.

Visual Performance Objectives:

No visual performance objectives apply to this viewpoint due to the VIZ3 Rating.

VP10 Romani Road, Hay South

Approximate extent of potentially visible turbines



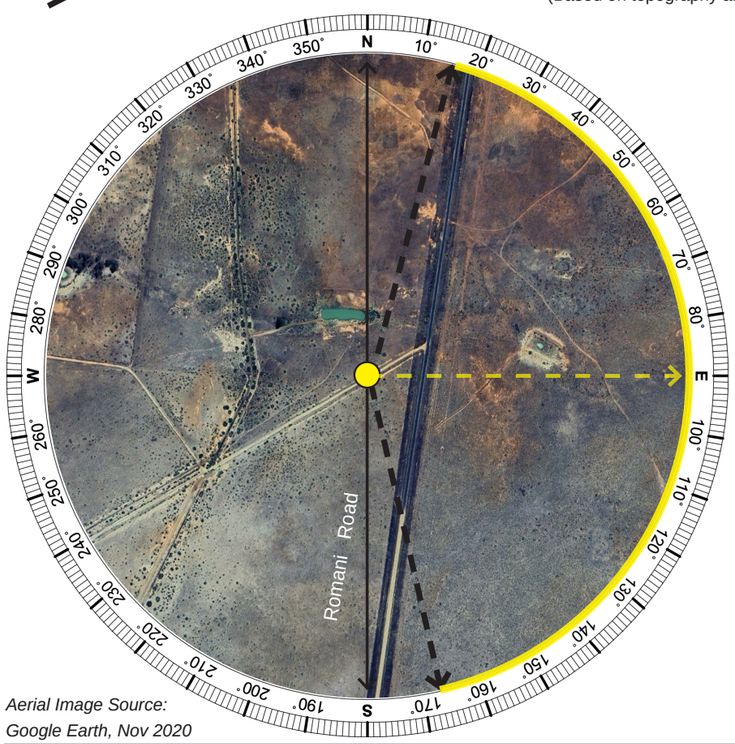
LEGEND

Viewing direction and centre of panorama

Extent of panorama

Direction of potentially visible turbines

Extent of visible turbines
(Based on topography alone)



Aerial Image Source:
Google Earth, Nov 2020

VIEWPOINT VP10

Viewpoint Summary:	
Location:	Elevation:
Romani Rd, Hay South	85 m
Coordinates:	Viewing Direction:
34°40'13.73"S 144°38'53.33"E	East
Distance to nearest WTG:	Visibility Distance Zone:
2.53 km	**Far Foreground (FF)**
Land Use:	Viewer Sensitivity Level:
Major Road	**Level 3 (Low)**
LCU:	Scenic Quality Rating:
LCU01: Farmlands and Plains	**Low**

Visual Influence Zone:

VIZ3

Existing Landscape Character Description:

This viewpoint is located on Romani Road with the view orientated towards the east.

Surrounding land is used for grazing and covered in saltbush and grassy vegetation.

Groupings of trees associated with a rural dwelling are visible generally in the north east in the viewpoint's background. The land parcels lack intervening elements in the foreground.

The terrain is generally flat with minor undulations.

Potential Visual Impact:

Lack of intervening elements allows clear, open views of the surrounding land. The majority of the Project is likely to be visible to the east. It is likely that the Project will become a defining element of the visual character.

Refer to Appendix D, PM07.

Visual Performance Objectives:

No visual performance objectives apply to this viewpoint due to the VIZ3 Rating.

VP11 Romani Road, Hay South

Approximate extent of potentially visible turbines



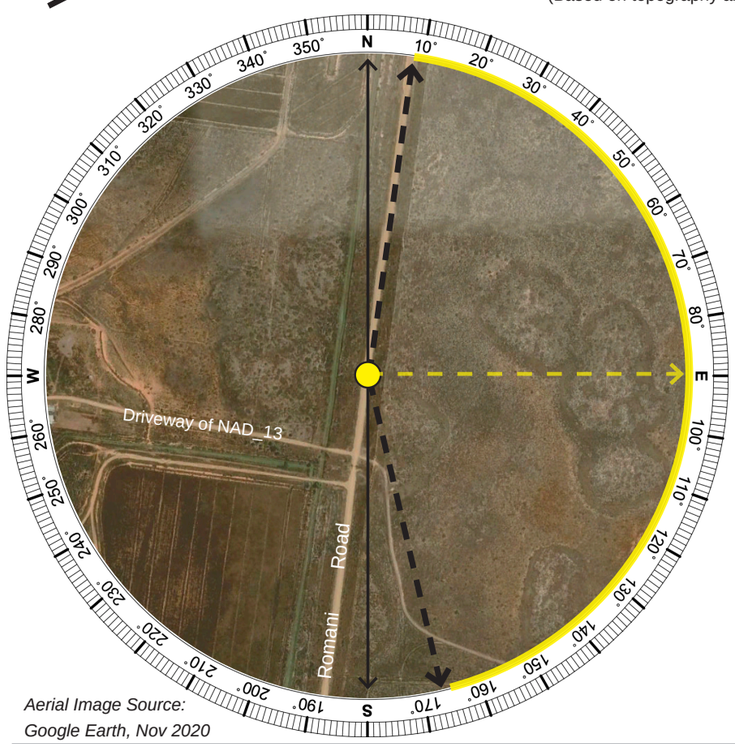
LEGEND

Viewing direction and centre of panorama

Extent of panorama

Direction of potentially visible turbines

Extent of visible turbines
(Based on topography alone)



Aerial Image Source: Google Earth, Nov 2020

VIEWPOINT VP11

Viewpoint Summary:	
Location:	Elevation:
Romani Rd, Hay South	84 m
Coordinates:	Viewing Direction:
34°48'17.10"S 144°37'35.69"E	East
Distance to nearest WTG:	Visibility Distance Zone:
3.55 km	**Near Middleground (NM)**
Land Use:	Viewer Sensitivity Level:
Low Use Road	**Level 3 (Low)**
LCU:	Scenic Quality Rating:
LCU01: Farmlands and Plains	**Low**

Visual Influence Zone:

VIZ3

Existing Landscape Character Description:

The viewpoint is located on Romani Road near the entrance of dwelling NAD_13.

Surrounding lands are used for grazing and irrigated cropping.

The terrain is generally flat with minor undulations.

Vegetation in surrounding areas typically comprises of grasses and saltbush. The land parcels lack intervening elements.

Potential Visual Impact:

Lack of intervening elements allows clear, open views of the surrounding land. The majority of the Project is likely to be visible to the east due to its proximity. It is likely that the Project will become a defining element of the visual character.

Visual Performance Objectives:

No visual performance objectives apply to this viewpoint due to the VIZ3 Rating.

VP12 Intersection of Booroorban - Tchelery road and Romani Road, Hay South

Approximate extent of potentially visible turbines



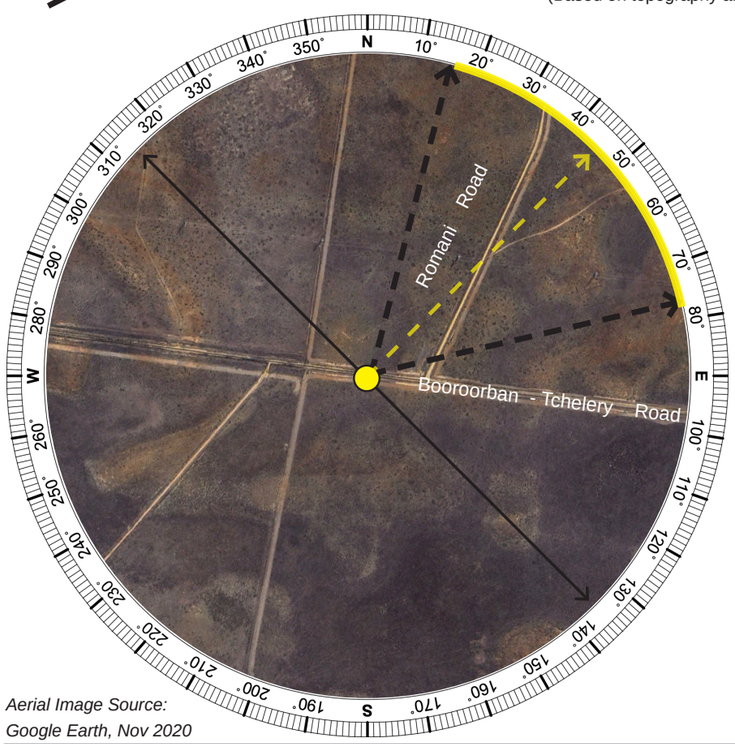
LEGEND

Viewing direction and centre of panorama

Extent of panorama

Direction of potentially visible turbines

Extent of visible turbines
(Based on topography alone)



Aerial Image Source:
Google Earth, Nov 2020

VIEWPOINT VP12

Viewpoint Summary:	
Location:	Elevation:
Intersection of Booroorban - Tchelery Rd & Romani Rd, Hay South	78 m
Coordinates:	Viewing Direction:
34°53'43.06"S 144°35'42.25"E	Northeast
Distance to nearest WTG:	Visibility Distance Zone:
8.04 km	**Far Middleground (FM)**
Land Use:	Viewer Sensitivity Level:
Low Use Road	**Level 3 (Low)**
LCU:	Scenic Quality Rating:
LCU02: Creek Corridors	**Moderate**

Visual Influence Zone:

VIZ3

Existing Landscape Character Description:

This viewpoint was taken at the intersection of Booroorban-Tchelery Road and Romani Road. Booroorban-Tchelery Road is a low use road located on the southern side of the Project.

Surrounding lands are used for grazing and cropping.

The terrain is generally flat with minor undulations.

Vegetation in surrounding areas typically comprises of grasses and saltbush. The land parcels lack intervening elements.

Visible infrastructure includes the existing 220 kV transmission line in the north east.

Potential Visual Impact:

Lack of intervening elements allows clear, open views of the surrounding land. The majority of the Project is likely to be visible to the north east. However, due to distance the Project is unlilkely to alter the character of the visual catchment.

Refer to Appendix D, PM06.

Visual Performance Objectives:

No visual performance objectives apply to this viewpoint due to the VIZ3 Rating.

VP13 Sturt Highway, Hay South

Approximate extent of potentially visible turbines



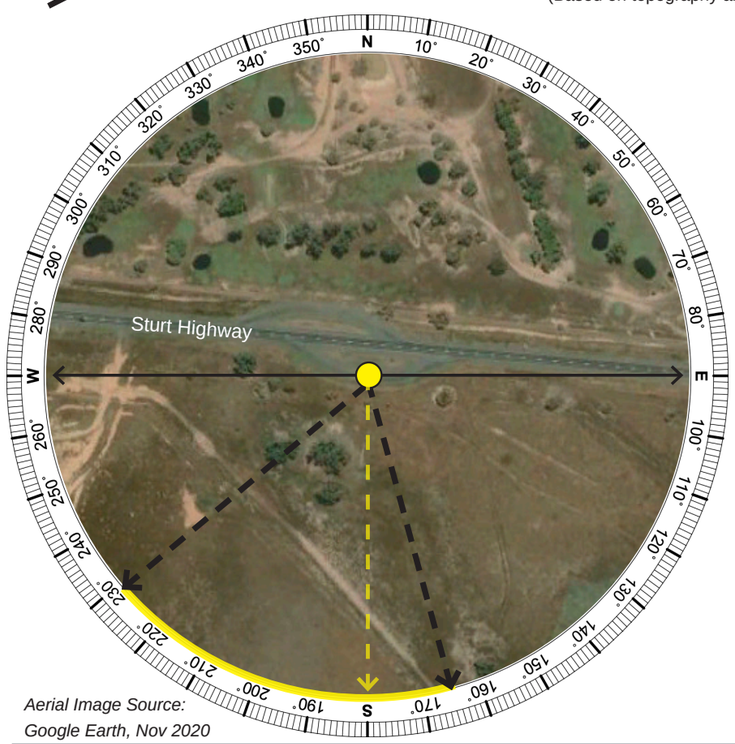
LEGEND

Viewing direction and centre of panorama

Extent of panorama

Direction of potentially visible turbines

Extent of visible turbines
(Based on topography alone)



Aerial Image Source:
Google Earth, Nov 2020

VIEWPOINT VP13

Viewpoint Summary:	
Location:	Elevation:
Sturt Hwy, Hay South	91 m
Coordinates:	Viewing Direction:
34°31'14.17"S 144°49'47.05"E	South
Distance to nearest WTG:	Visibility Distance Zone:
14.59 km	**Far Middleground (FM)**
Land Use:	Viewer Sensitivity Level:
Major Road	**Level 3 (Low)**
LCU:	Scenic Quality Rating:
LCU04: Hay	**Low**

Visual Influence Zone:

VIZ3

Existing Landscape Character Description:

The viewpoint is located at a roadside rest area on the Sturt Highway near the Hay Airport.

Surrounding lands are predominantly used for grazing and cropping.

The terrain is generally flat with minor undulations.

Patchy groups of trees are visible in the foreground to the south and south west. Lands are generally covered in grasses and saltbush species.

Potential Visual Impact:

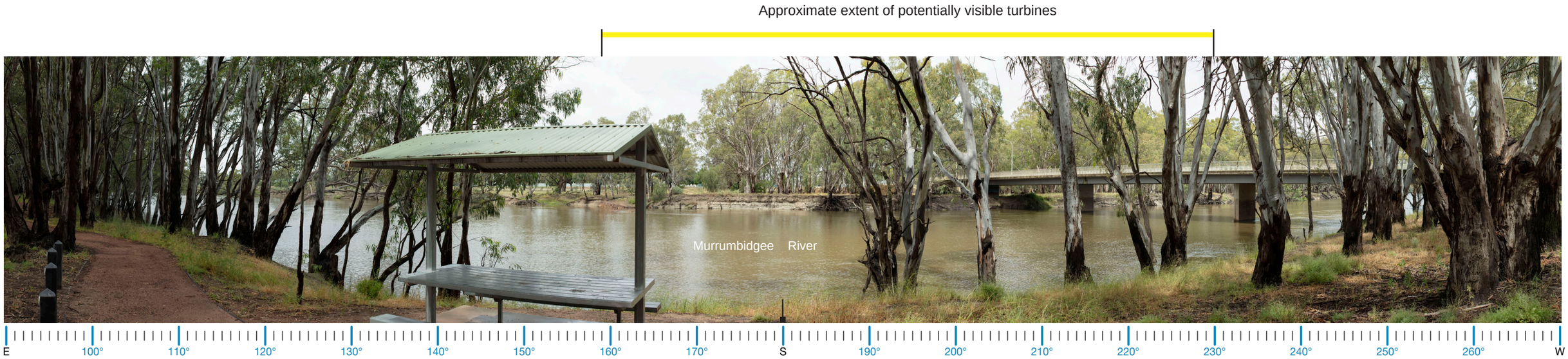
Existing vegetation in the foreground partially limits views to the turbines in the south. However, the views will be distant. It is likely that the Project will not dominate the visual character due to its distance from this location.

Refer to Appendix D, PM04.

Visual Performance Objectives:

No visual performance objectives apply to this viewpoint due to the VIZ3 Rating.

VP14 Bushy Bend Reserve Rest Area, Hay



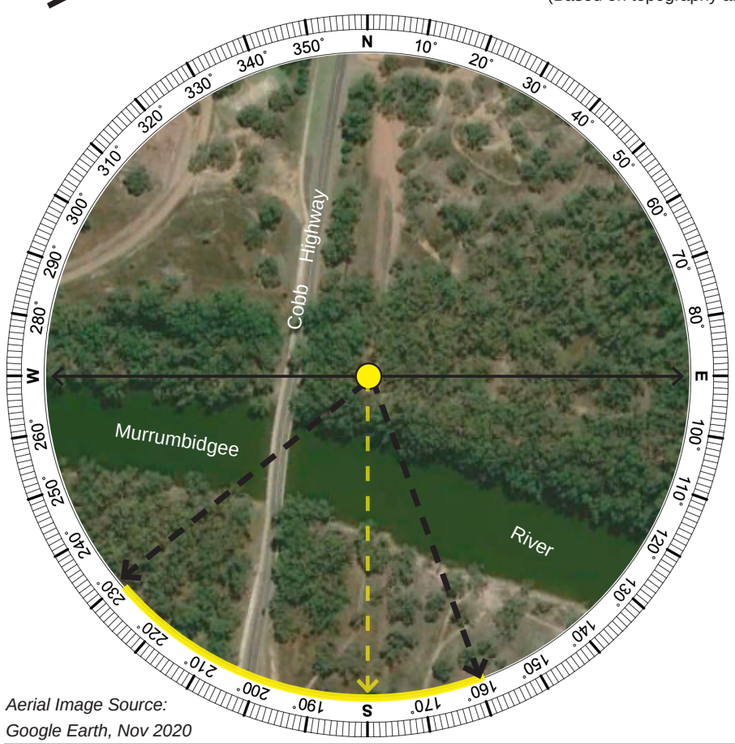
LEGEND

Viewing direction and centre of panorama

Extent of panorama

Direction of potentially visible turbines

Extent of visible turbines (Based on topography alone)



Aerial Image Source: Google Earth, Nov 2020

VIEWPOINT VP14

Viewpoint Summary:	
Location:	Elevation:
Murrumbidgee River Rest Area, Hay	97 m
Coordinates:	Viewing Direction:
34°30'57.26"S 144°50'35.24"E	South
Distance to nearest WTG:	Visibility Distance Zone:
15.27 km	**Mid Background (MB)**
Land Use:	Viewer Sensitivity Level:
Recreation Site	**Level 2 (Moderate)**
LCU:	Scenic Quality Rating:
LCU06: Murrumbidgee River	**Moderate**

Visual Influence Zone:

VIZ3

Existing Landscape Character Description:

This viewpoint was taken from the Bushy Bend Reserve Rest Area located along the Murrumbidgee River in the town of Hay.

The terrain gently undulates on the banks of the Murrumbidgee River. The picnic area is located on a flat terrain along a track that runs along the river.

Surrounding vegetation is dense and is typical of the Riverina Bioregion. It consists of mature river red gum trees that limit views.

The viewer sensitivity level of the viewpoint has been assessed as 'Level 2 (Moderate)' in accordance with the Bulletin.

Potential Visual Impact:

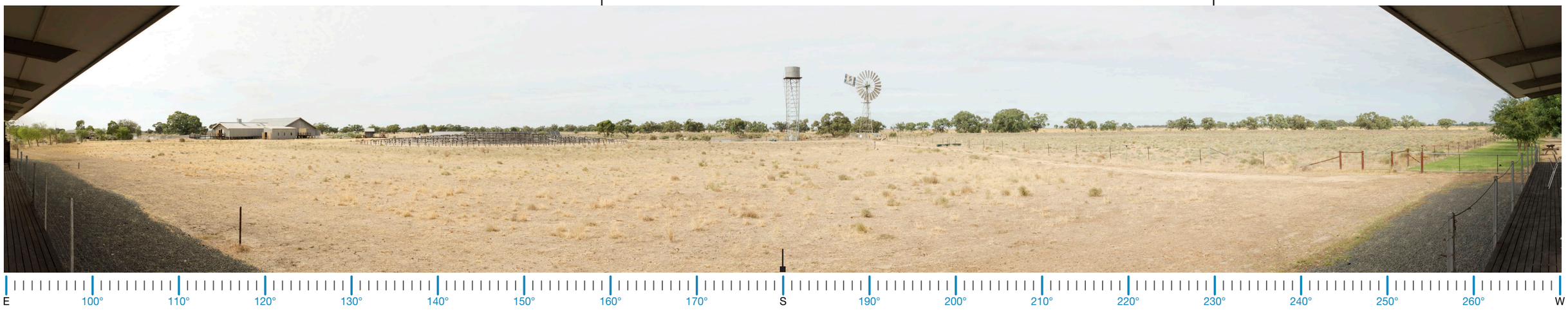
The existing vegetation plays an important role in limiting views to the foreground and middleground. Key landscape features in this view include the Murrumbidgee River and its associated vegetation. The Project is not likely to alter the existing visual and landscape character at this location. The Project is not likely to be visible due to existing intervening vegetation and the distance between the viewpoint and the Project.

Visual Performance Objectives:

No visual performance objectives apply to this viewpoint due to the VIZ3 Rating.

VP15 Shear Outback Visitor Centre, Sturt Highway, Hay South

Approximate extent of potentially visible turbines



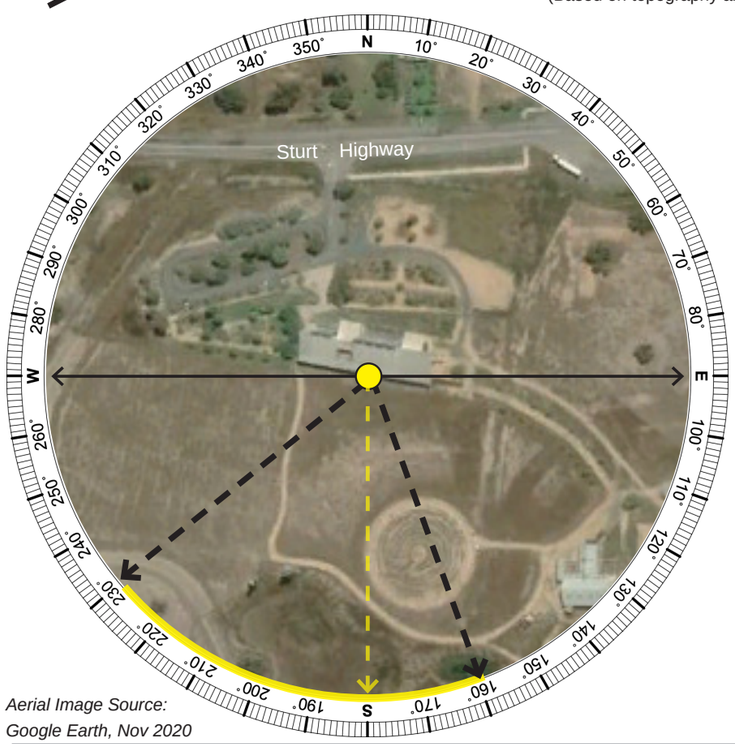
LEGEND

Viewing direction and centre of panorama

Extent of panorama

Direction of potentially visible turbines

Extent of visible turbines
(Based on topography alone)



Aerial Image Source: Google Earth, Nov 2020

VIEWPOINT VP15

Viewpoint Summary:	
Location:	Elevation:
Shear Outback, Sturt Highway, Hay South	91 m
Coordinates:	Viewing Direction:
34°31'18.74"S 144°50'9.89"E	South
Distance to nearest WTG:	Visibility Distance Zone:
14.35 km	**Near Background (NB)**
Land Use:	Viewer Sensitivity Level:
Tourist/Visitor Centre	**Level 2 (Moderate)**
LCU:	Scenic Quality Rating:
LCU04: Hay	**Low**

Visual Influence Zone:

VIZ3

Existing Landscape Character Description:

The viewpoint is located at the Shear Outback Visitor Centre located on the Sturt Highway on the southern side of the town of Hay.

Surrounding lands form part of the Hay township. Infrastructure associated with the Visitor Centre is visible in the middleground to the south.

The terrain is generally flat with minor undulations.

Tree cover associated with surrounding agricultural lands is visible along the horizon to the south of the viewpoint.

The viewer sensitivity level of the viewpoint has been assessed as 'Level 2 (Moderate)' in accordance with the Bulletin.

Potential Visual Impact:

Existing vegetation in the background partially limits views to the Project in the south. It is likely that the Project will not dominate the visual character. Turbines are likely to appear as minor objects in the view.

Refer to Appendix D, PM01.

Visual Performance Objectives:

No visual performance objectives apply to this viewpoint due to the VIZ3 Rating.

C

Detailed Dwelling Assessments

Detailed Dwelling Assessment Locations

The Plains Renewable Energy Park Wind Farm

- Project Area
- Proposed Turbine Location
- Associated Dwellings
- Non-associated Dwellings
- DA Locations
- 3,500 m from turbine (black line of visual magnitude)
- 5,300 m from turbine (black line of visual magnitude)
- 8,000 m from turbine (extent of Study Area)
- Main Road
- Minor Road
- LGA Boundary

DWELLING IMPACT RATINGS:

- Low Visual Impact Rating
- Moderate Visual Impact Rating

N

0 4 8 12 16km

Appendix C Detailed Dwelling Assessment Locations (Map Source: Six Maps 2011)

C.1. Dwelling Assessment **Dwelling NAD_12 Jerilderie Road, Hay South NSW**

DWELLING NAD_12			
Nearest proposed turbine (km):	**2.70 km**	**Visibility Distance Zone:**	**Near Middleground (NM)**
Number of proposed turbines within the Black Line of Visual Magnitude (3500 m):	**Three (3)**	**Viewer Sensitivity Zone:**	**Level 2 Moderate**
Number of theoretical 60º Sectors (Based on 2D Plan):	**Two (2)**	**Landscape Character Unit:**	**LCU01: Farmlands and Plains**
Number of visible 60º Sectors (Based on 3D Assessment):	**Two (2)**	**Scenic Quality Rating:**	**Low**
Number of potentially visible turbines (Based on topography alone)	**188 all at hub height**	**Visual Influence Zone:**	**VIZ2**

Visual Impact Rating: MODERATE

Assessment Notes:

Aerial imagery indicates that the dwelling is not surrounded by intervening elements such as vegetation or structures. The dwelling is located on generally flat terrain and is accessed via Jerilderie Road. Views from the dwelling are predominantly directed towards the north and the south. Moir LA attended the dwelling in March 2023. A viewpoint was selected in consultation with the owner and was taken from the southern side of the dwelling to represent views from the property. There are three (3) turbines within the black line of visual magnitude and five (5) within the blue line of visual magnitude from this dwelling.

Visual Impact Summary:

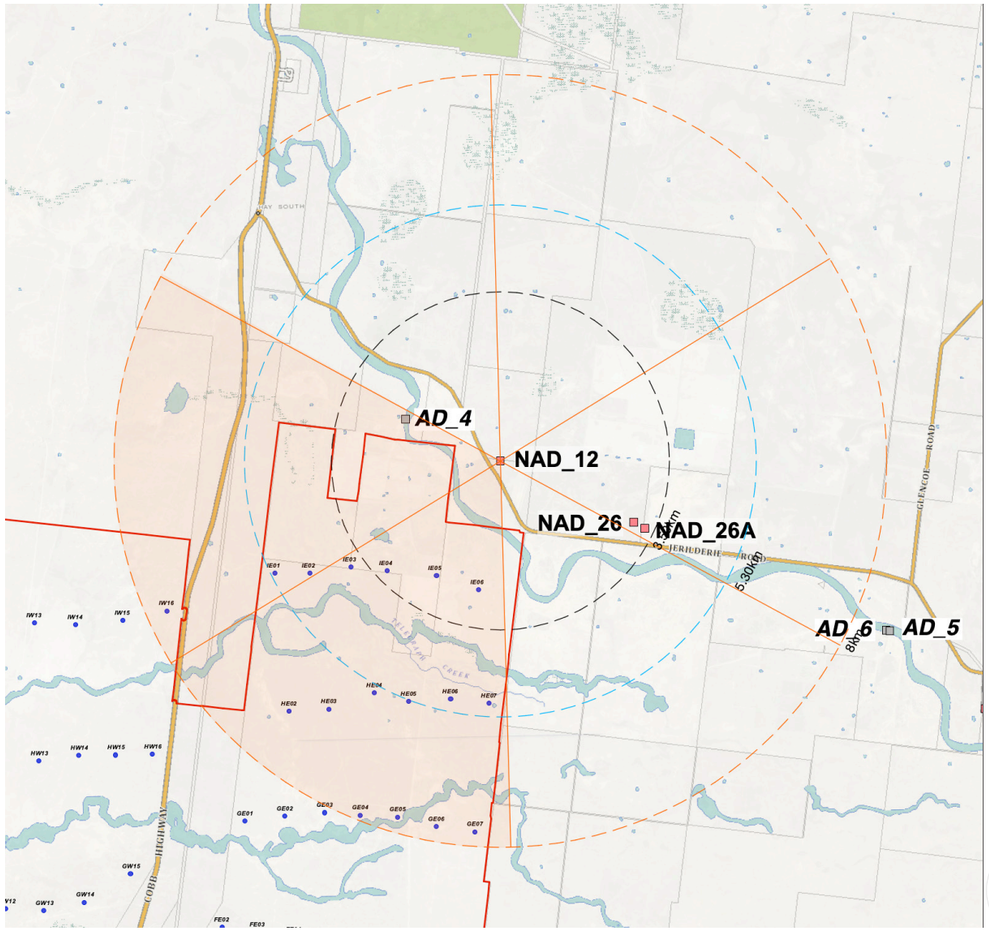
Based on topography alone, the dwelling has the potential to view turbines in up to two (2) 60 degree sectors which is deemed acceptable in accordance with the Bulletin. Existing scattered vegetation in the middleground is likely to limit views of some turbines located It is likely that the majority of the Project will be visible due to lack of intervening elements. The majority of the turbines are, however, are distant. There are no key landscape features impacted by the Project. It is determined that the Visual Impact Rating for this dwelling is **MODERATE.**

Visual Performance Objectives Evaluation (VIZ2):

Visual Magnitude: Three (3) turbines are located within the black line of visual magnitude. Five (5) turbines are located between the black and blue lines of visual magnitude.
Multiple Wind Turbine Effect: Based on topography alone, turbines have the potential to be visible in up to two (2) 60 degree sectors. It is likely that the majority of the Project will be visible due to lack of intervening elements.
Landscape Scenic Integrity: The majority of the Project is likely to be visible at this location. The turbines will have moderate impact on the landscape scenic integrity.
Key Feature Disruption: The turbines will be visible in the landscape, however there are no key landscape features impacted by the Project.

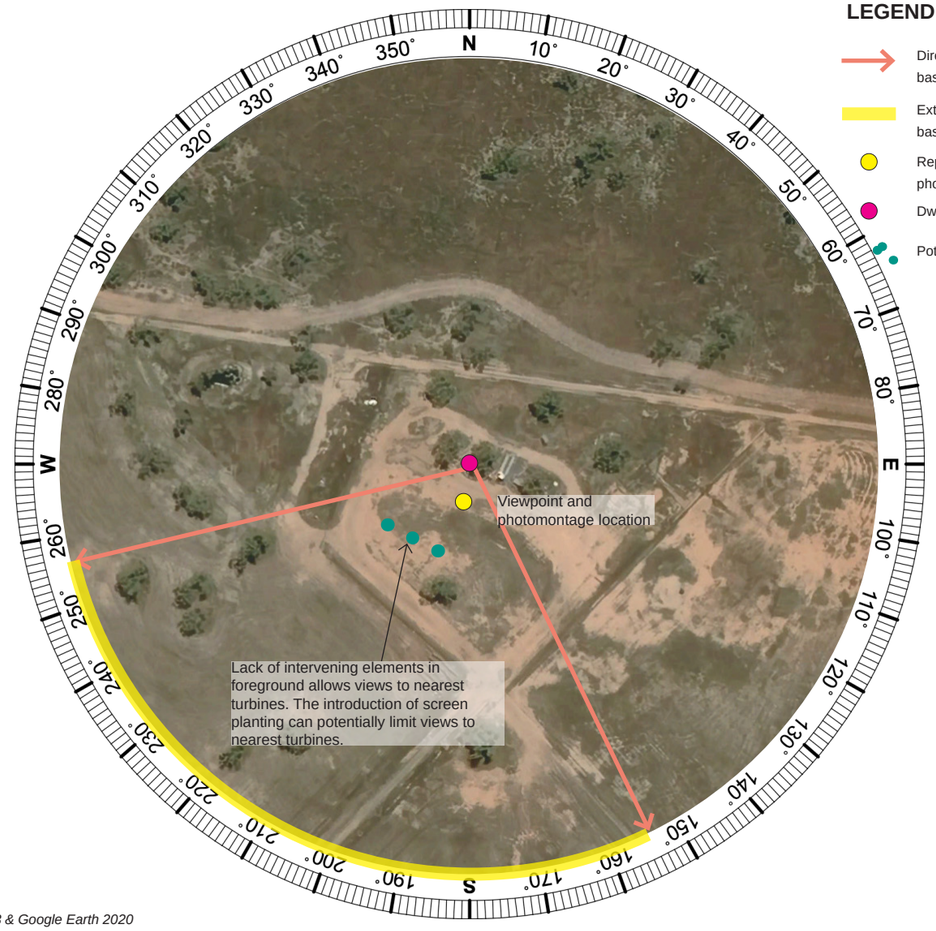
Mitigation Measures:

The introduction of screen planting on the south western side of the dwelling along the driveway can potentially limit views of the nearest turbines. Consultation with the landowner will be required to discuss appropriate mitigation methods.



LEGEND

- 270 m Turbine within 8,000 m
- Turbine located in excess of 8,000 m
- Non-associated Dwellings
- Associated Dwellings
- DA Locations
- 3,500 m from nearest turbine (Black Line)
- 5,300 m from nearest turbine (Blue Line)
- 8,000 m from nearest turbine
- 60º sector
- 60º sector with turbines

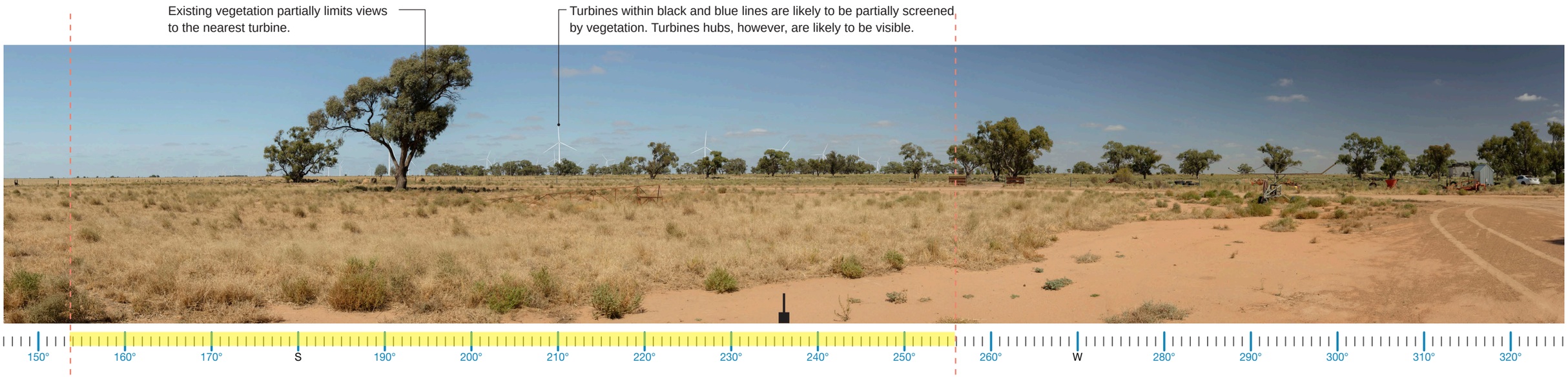


LEGEND

- Direction of visible turbines based on topography
- Extent of visible turbines based on topography
- Representative viewpoint & photomontage location
- Dwelling location
- Potential screen planting

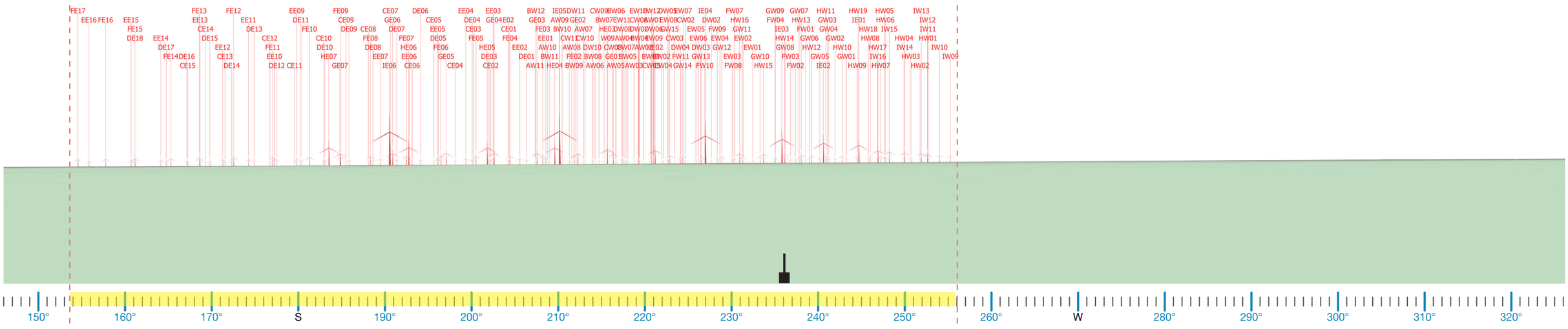
Aerial image sources: ESRI Topographic Maps 2023 & Google Earth 2020

C.1. Dwelling Assessment **Dwelling NAD_12 Jerilderie Road, Hay South NSW**



Proposed View - 180 degree field of view

Wire Frame Diagram indicates that all turbines will be visible generally in the south west (assessment based on topography alone). Views of the Project will be partially limited by existing vegetation and structures and it is likely that up to most turbines within black and blue lines of visual magnitude will be visible at the dwelling.



Proposed Wire Frame Diagram - 180 degree field of view

C.2. Dwelling Assessment **Dwelling NAD_26 Jerilderie Road, Hay South NSW**

DWELLING NAD_26			
Nearest proposed turbine (km):	**3.49 km**	**Visibility Distance Zone:**	**Near Middleground (NM)**
Number of proposed turbines within the Black Line of Visual Magnitude (3500 m):	**One (1)**	**Viewer Sensitivity Zone:**	**Level 2 Moderate**
Number of theoretical 60º Sectors (Based on 2D Plan):	**One (1)**	**Landscape Character Unit:**	**LCU01: Farmlands and Plains**
Number of visible 60º Sectors (Based on 3D Assessment):	**Two (2)**	**Scenic Quality Rating:**	**Low**
Number of potentially visible turbines (Based on topography alone)	**188 all at hub height**	**Visual Influence Zone:**	**VIZ2**

Visual Impact Rating: MODERATE

Assessment Notes:

Aerial imagery indicates that the dwelling is not surrounded by intervening elements such as vegetation or structures. The dwelling is located on generally flat terrain and is accessed via Jerilderie Road. Views from the dwelling are predominantly directed towards the north. Moir LA attended the dwelling in March 2023. A viewpoint was selected in consultation with the owner and was taken from the southern side of the dwelling to represent views from the property. There is one (1) turbine within the black line of visual magnitude and four (4) within the blue line of visual magnitude from this dwelling.

Visual Impact Summary:

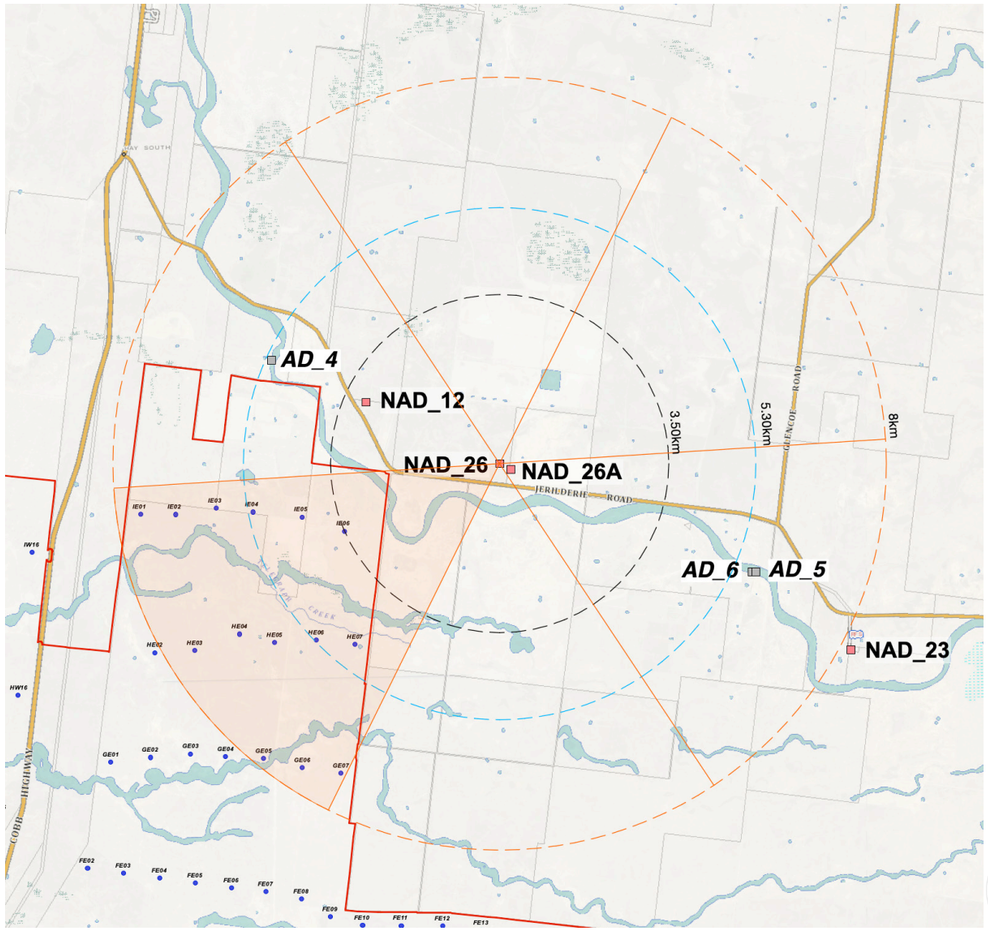
Based on topography alone, the dwelling has the potential to view turbines in up to two (2) 60 degree sectors which is deemed acceptable in accordance with the Bulletin. It is likely that the majority of the Project will be visible due to lack of intervening elements. The majority of the turbines are, however, are distant. There are no key landscape features impacted by the Project. It is determined that the Visual Impact Rating for this dwelling is **MODERATE.**

Visual Performance Objectives Evaluation (VIZ2):

Visual Magnitude: One (1) turbine is located within the black line of visual magnitude. Four (4) turbines are located between the black and blue lines of visual magnitude.
Multiple Wind Turbine Effect: Based on topography alone, turbines have the potential to be visible in up to two (2) 60 degree sectors. It is likely that the majority of the Project will be visible due to lack of intervening elements.
Landscape Scenic Integrity: The Project is likely to be visible in its entirety at this location. The turbines will have moderate impact on the landscape scenic integrity.
Key Feature Disruption: The turbines will be visible in the landscape, however there are no key landscape features impacted by the Project..

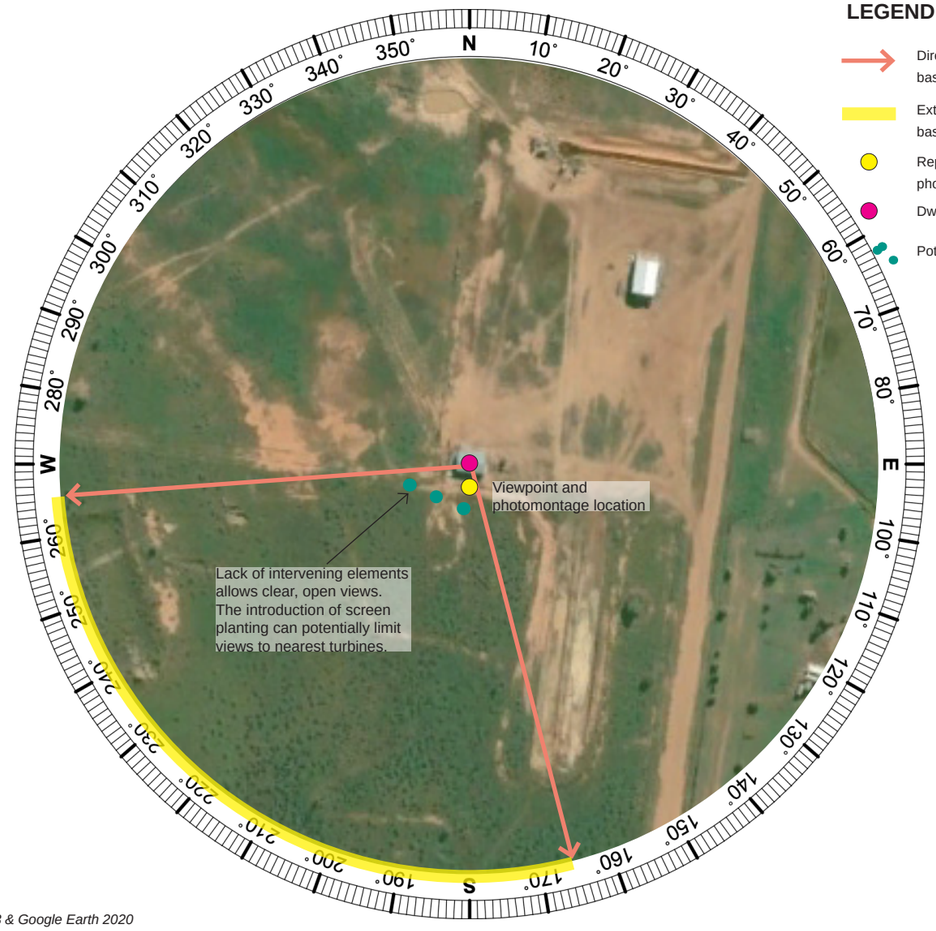
Mitigation Measures:

The introduction of screen planting on the south western side of the dwelling can potentially limit views of the nearest turbines. Consultation with the landowner will be required to discuss appropriate mitigation methods.



LEGEND

- 270 m Turbine within 8,000 m
- Turbine located in excess of 8,000 m
- Non-associated Dwellings
- Associated Dwellings
- DA Locations
- 3,500 m from nearest turbine (Black Line)
- 5,300 m from nearest turbine (Blue Line)
- 8,000 m from nearest turbine
- 60º sector
- 60º sector with turbines

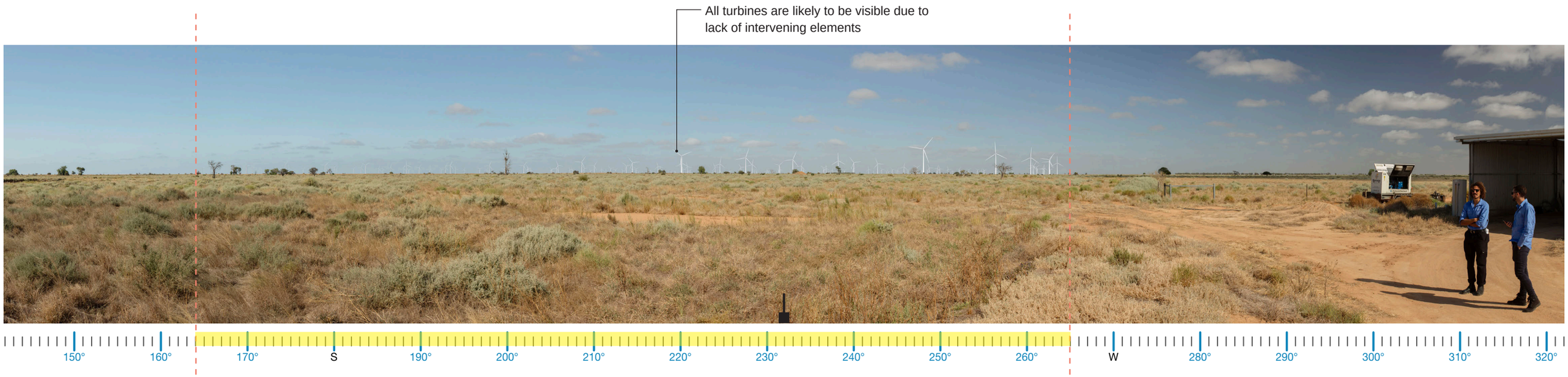


LEGEND

- Direction of visible turbines based on topography
- Extent of visible turbines based on topography
- Representative viewpoint & photomontage location
- Dwelling location
- Potential screen planting

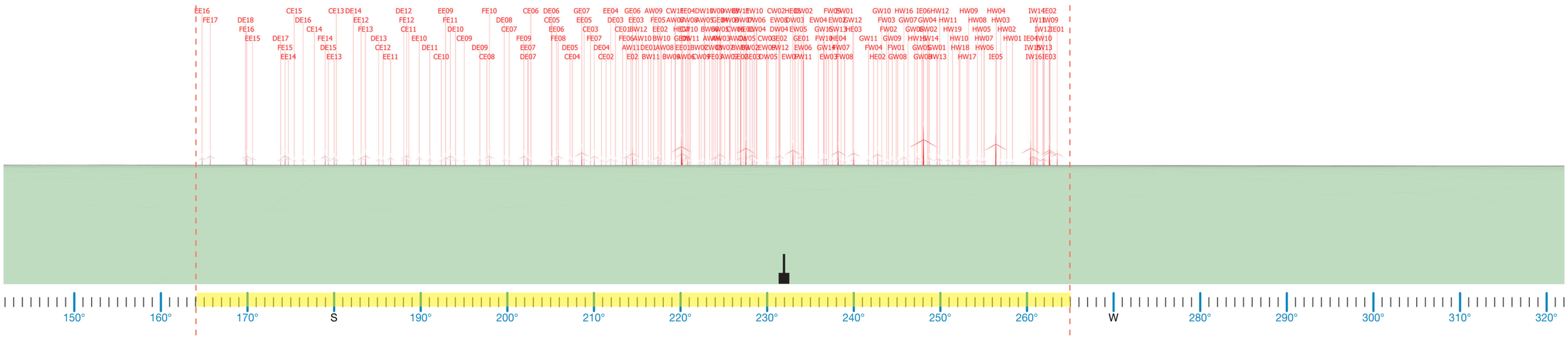
Aerial image sources: ESRI Topographic Maps 2023 & Google Earth 2020

C.2. Dwelling Assessment **Dwelling NAD_26 Jerilderie Road, Hay South NSW**



Proposed View - 180 degree field of view

Wire Frame Diagram indicates that all turbines will be visible generally in the southeast (assessment based on topography alone). Lack of existing intervening elements allows clear, open views of the Project from the dwelling. Additional screen planting can potentially limit views of turbines.



Proposed Wire Frame Diagram - 180 degree field of view

C.3. Dwelling Assessment **Dwelling NAD_26A Jerilderie Road, Hay South NSW**

DWELLING NAD_26A			
Nearest proposed turbine (km):	**3.66 km**	**Visibility Distance Zone:**	**Near Middleground (NM)**
Number of proposed turbines within the Blue Line of Visual Magnitude (5700 m):	**Three (3)**	**Viewer Sensitivity Zone:**	**Level 2 Moderate**
Number of theoretical 60º Sectors (Based on 2D Plan):	**One (1)**	**Landscape Character Unit:**	**LCU01: Farmlands and Plains**
Number of visible 60º Sectors (Based on 3D Assessment):	**Two (2)**	**Scenic Quality Rating:**	**Low**
Number of potentially visible turbines (Based on topography alone)	**188 all at hub height**	**Visual Influence Zone:**	**VIZ2**

Visual Impact Rating: MODERATE

Assessment Notes:

Aerial imagery indicates that the dwelling is not surrounded by intervening elements of vegetation or structures. The dwelling is located on generally flat terrain and is accessed via Jerilderie Road. A wire frame diagram has been prepared to assess the potential impacts on the dwelling. Assessment based on topography alone suggests that all turbines will be visible at the dwelling. There are four (4) turbines within the blue line of visual magnitude from this dwelling.

Visual Impact Summary:

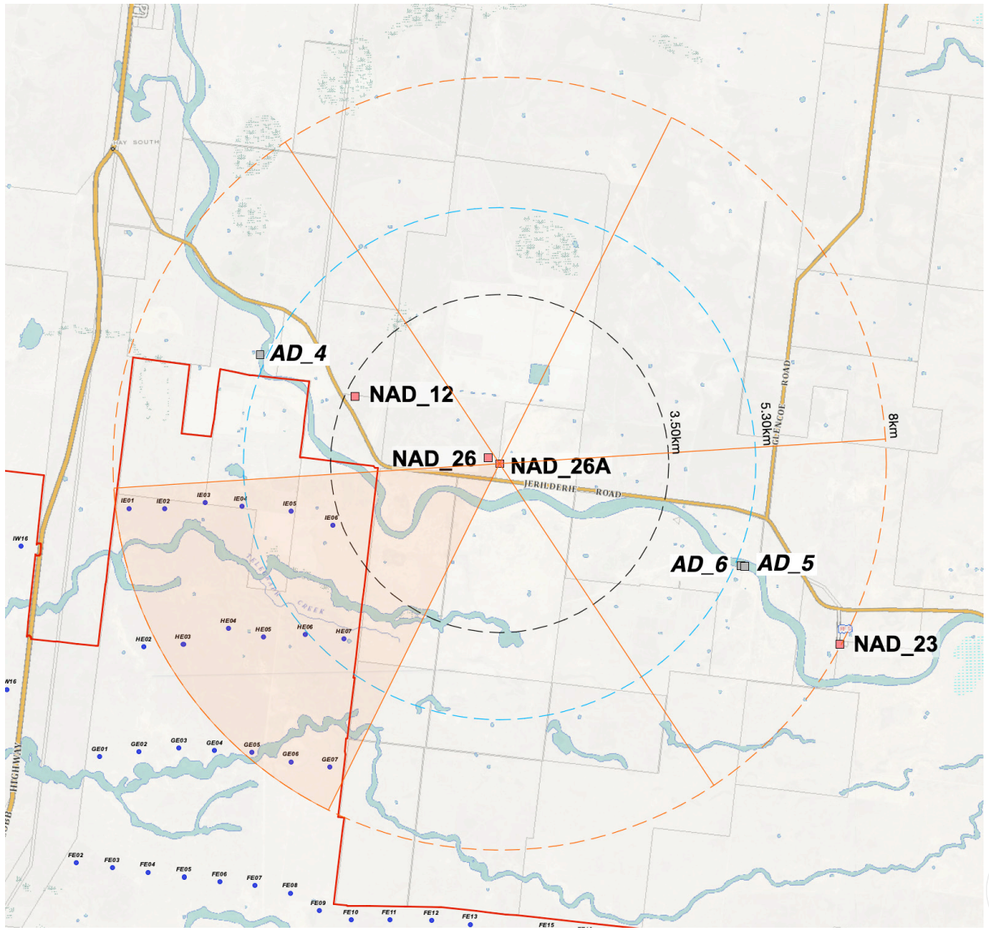
Based on topography alone, the dwelling has the potential to view turbines in up to two (2) 60 degree sectors which is deemed acceptable in accordance with the Bulletin. It is likely that the majority of the Project will be visible due to lack of intervening elements. There are no key landscape features impacted by the Project. It is determined that the Visual Impact Rating for this dwelling is **MODERATE.**

Visual Performance Objectives Evaluation (VIZ2):

Visual Magnitude: Four (4) turbines are located between the black and blue lines of visual magnitude.
Multiple Wind Turbine Effect: Based on topography alone, turbines have the potential to be visible in up to two (2) 60 degree sectors. It is likely that the majority of the Project will be visible due to lack of intervening elements.
Landscape Scenic Integrity: The Project is likely to be visible in its entirety at this location. The turbines will have moderate impact on the landscape scenic integrity.
Key Feature Disruption: The turbines will be visible in the landscape, however there are no key landscape features impacted by the Project..

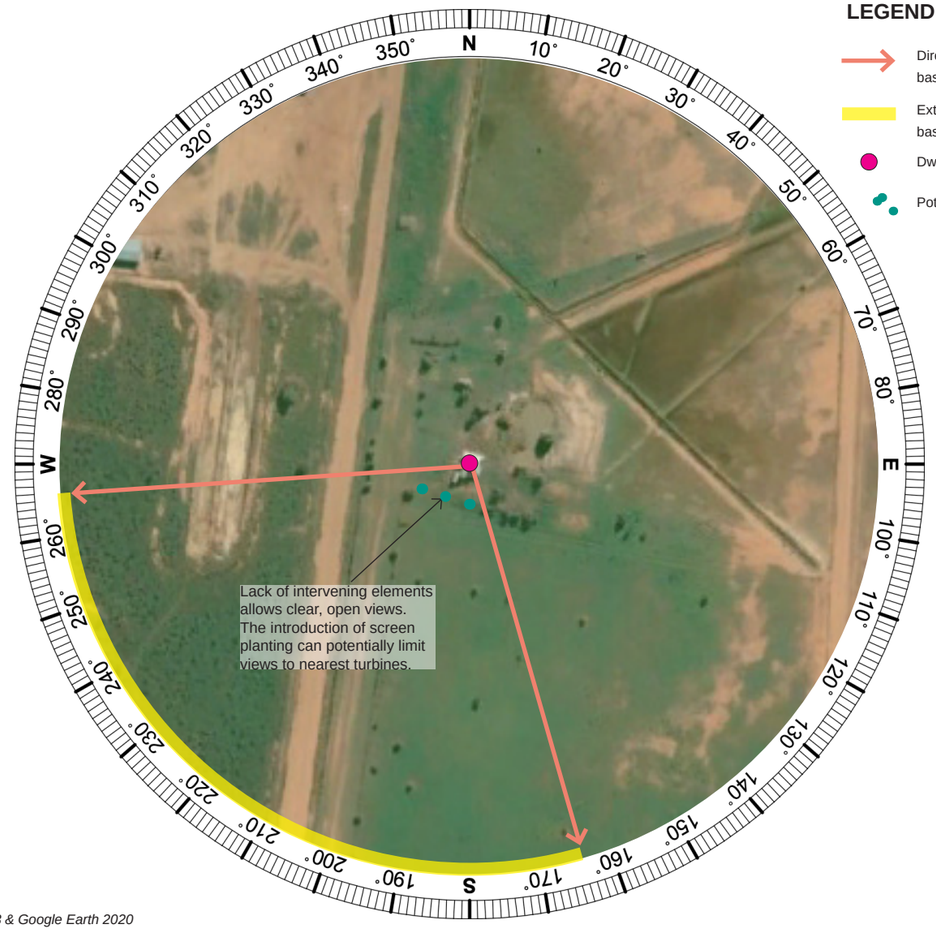
Mitigation Measures:

The introduction of screen planting on the south western side of the dwelling can potentially limit views of the nearest turbines. Consultation with the landowner will be required to discuss appropriate mitigation methods.



LEGEND

- 270 m Turbine within 8,000 m
- Turbine located in excess of 8,000 m
- Non-associated Dwellings
- Associated Dwellings
- DA Locations
- 3,500 m from nearest turbine (Black Line)
- 5,300 m from nearest turbine (Blue Line)
- 8,000 m from nearest turbine
- 60º sector
- 60º sector with turbines



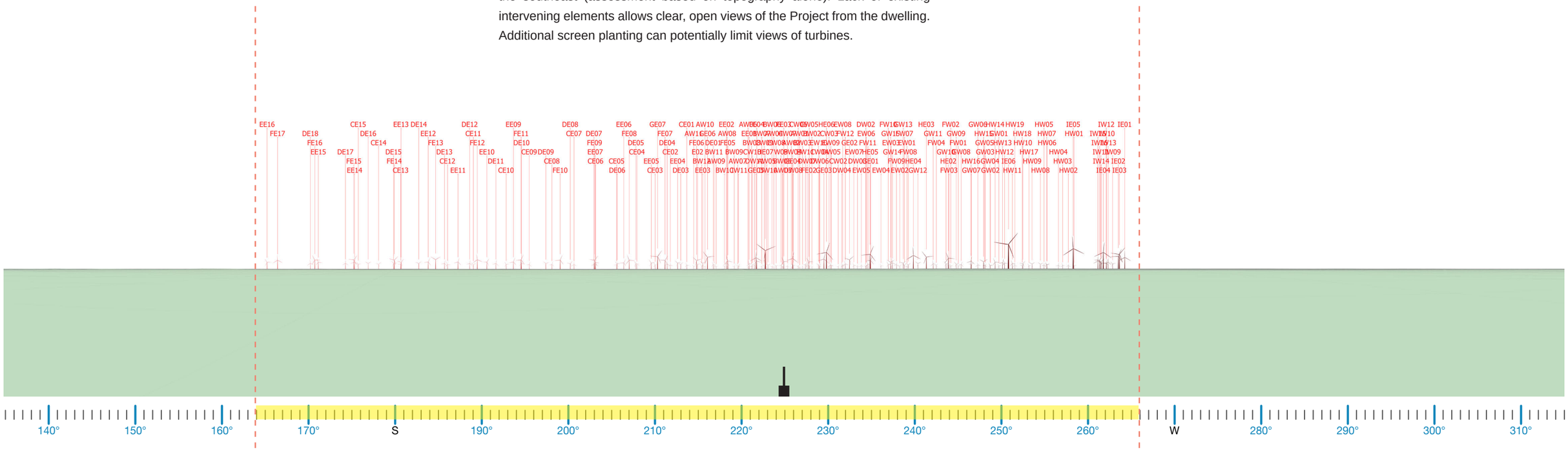
LEGEND

- Direction of visible turbines based on topography
- Extent of visible turbines based on topography
- Dwelling location
- Potential screen planting

Aerial image sources: ESRI Topographic Maps 2023 & Google Earth 2020

C.3. Dwelling Assessment **Dwelling NAD_26A Jerilderie Road, Hay South NSW**

Wire Frame Diagram indicates that all turbines will be visible generally in the southeast (assessment based on topography alone). Lack of existing intervening elements allows clear, open views of the Project from the dwelling. Additional screen planting can potentially limit views of turbines.



Proposed Wire Frame Diagram - 180 degree field of view

C.4. Dwelling Assessment **Dwelling NAD_13 Romani Road, Hay South NSW**

DWELLING NAD_13			
Nearest proposed turbine (km):	**4.97 km**	**Visibility Distance Zone:**	**Far Middleground (FM)**
Number of proposed turbines within the Blue Line of Visual Magnitude (5700 m):	**Two (2)**	**Viewer Sensitivity Zone:**	**Level 2 Moderate**
Number of theoretical 60º Sectors (Based on 2D Plan):	**Two (2)**	**Landscape Character Unit:**	**LCU01: Farmlands and Plains**
Number of visible 60º Sectors (Based on 3D Assessment):	**Three (3)**	**Scenic Quality Rating:**	**Low**
Number of potentially visible turbines (Based on topography alone)	**188 all at hub height**	**Visual Influence Zone:**	**VIZ3**

Visual Impact Rating: MODERATE

Assessment Notes:

Aerial imagery indicates that the dwelling is partially surrounded by vegetation. The dwelling is located on a generally flat terrain and is accessed via Romani Road. Moir LA attended the dwelling in March 2023. A viewpoint was selected in consultation with the owner and was taken from the northern side of the dwelling to represent views from the property. There are two (2) turbines within the blue line of visual magnitude from this dwelling.

Visual Impact Summary:

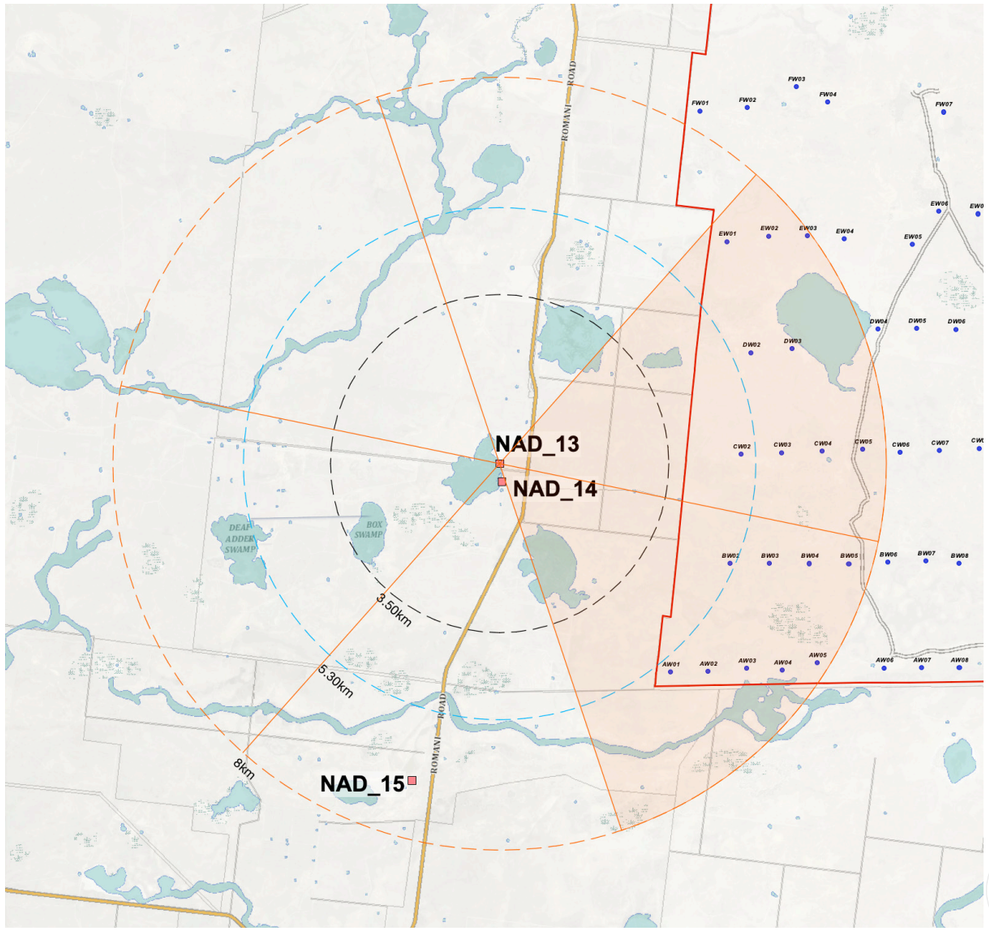
Based on topography alone, the dwelling has the potential to view turbines in up to three (3) 60 degree sectors. However, existing vegetation and structures around the dwelling will limit views of turbines in up to two (2) 60 degree sectors which is deemed acceptable in accordance with the Bulletin. The turbines will be visible in the landscape, however there are no key landscape features impacted by the Project. It is determined that the Visual Impact Rating for this dwelling is **MODERATE.**

Visual Performance Objectives Evaluation (VIZ3):

No visual performance objectives apply to this dwelling due to the rating (VIZ3).

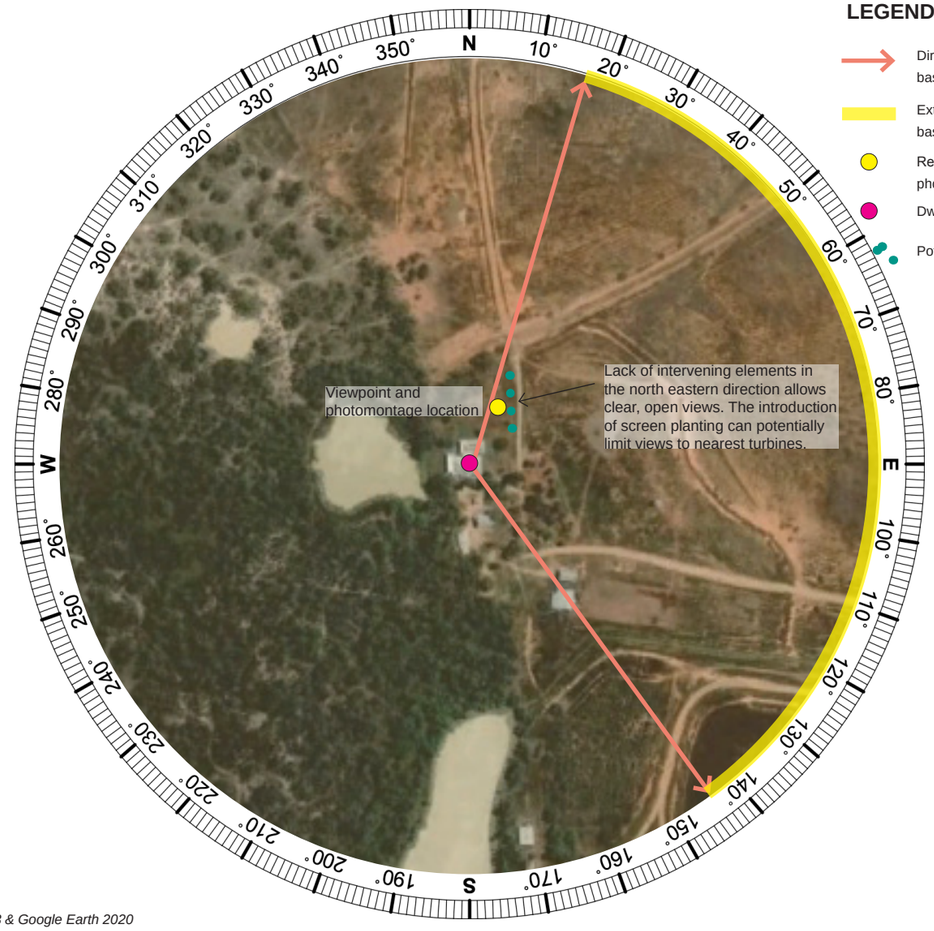
Mitigation Measures:

The introduction of screen planting on the north eastern side of the dwelling can potentially limit views of the nearest turbines. Consultation with the landowner will be required to discuss appropriate mitigation methods.



LEGEND

- 270 m Turbine within 8,000 m
- Turbine located in excess of 8,000 m
- Non-associated Dwellings
- Associated Dwellings
- DA Locations
- 3,500 m from nearest turbine (Black Line)
- 5,300 m from nearest turbine (Blue Line)
- 8,000 m from nearest turbine
- 60º sector
- 60º sector with turbines

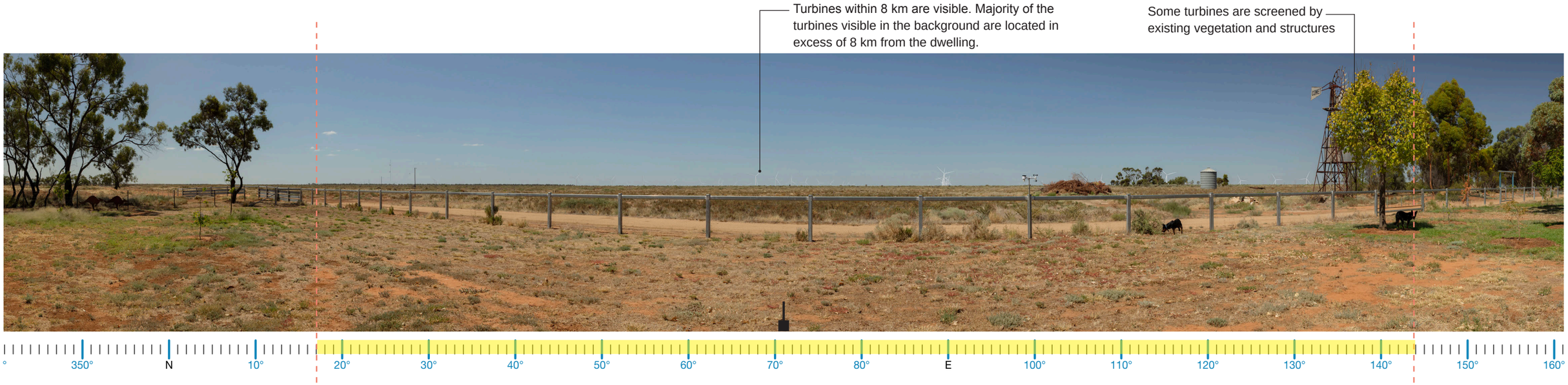


LEGEND

- Direction of visible turbines based on topography
- Extent of visible turbines based on topography
- Representative viewpoint & photomontage location
- Dwelling location
- Potential screen planting

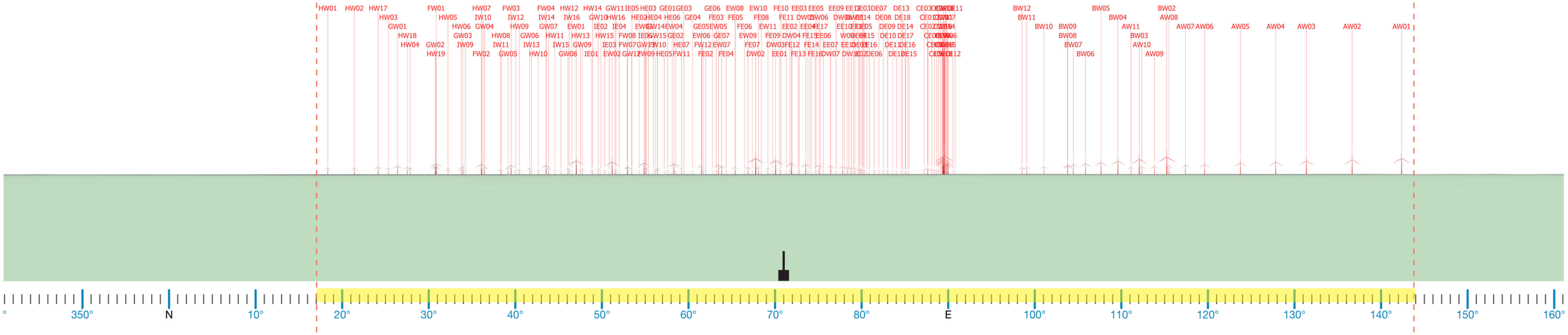
Aerial image sources: ESRI Topographic Maps 2023 & Google Earth 2020

C.4. Dwelling Assessment **Dwelling NAD_13 Romani Road, Hay South NSW**



Proposed View - 180 degree field of view

Wire Frame Diagram indicates that all turbines will be visible generally in the east (assessment based on topography alone). Views of the Project will be partially limited by existing vegetation and structures to the south east. However, majority of the Project is likely to be visible. Additional screen planting is recommended to limit views.



Proposed Wire Frame Diagram - 180 degree field of view

C.5. Dwelling Assessment **Dwelling NAD_14 Romani Road, Hay South NSW**

DWELLING NAD_14			
Nearest proposed turbine (km):	**4.75 km**	**Visibility Distance Zone:**	**Far Middleground (FM)**
Number of proposed turbines within the Blue Line of Visual Magnitude (5700 m):	**Three (3)**	**Viewer Sensitivity Zone:**	**Level 2 Moderate**
Number of theoretical 60º Sectors (Based on 2D Plan):	**Two (2)**	**Landscape Character Unit:**	**LCU01: Farmlands and Plains**
Number of visible 60º Sectors (Based on 3D Assessment):	**Three (3)**	**Scenic Quality Rating:**	**Low**
Number of potentially visible turbines (Based on topography alone)	**188 all at hub height**	**Visual Influence Zone:**	**VIZ3**

Visual Impact Rating: MODERATE

Assessment Notes:

Aerial imagery indicates that the dwelling is surrounded by patchy to dense vegetation. The dwelling is located on a generally flat terrain and is accessed via Romani Road. Moir LA attended the dwelling in March 2023. A viewpoint was selected in consultation with the owner and was taken from the eastern side of the dwelling to represent views from the property. There are three (3) turbines within the blue line of visual magnitude from this dwelling.

Visual Impact Summary:

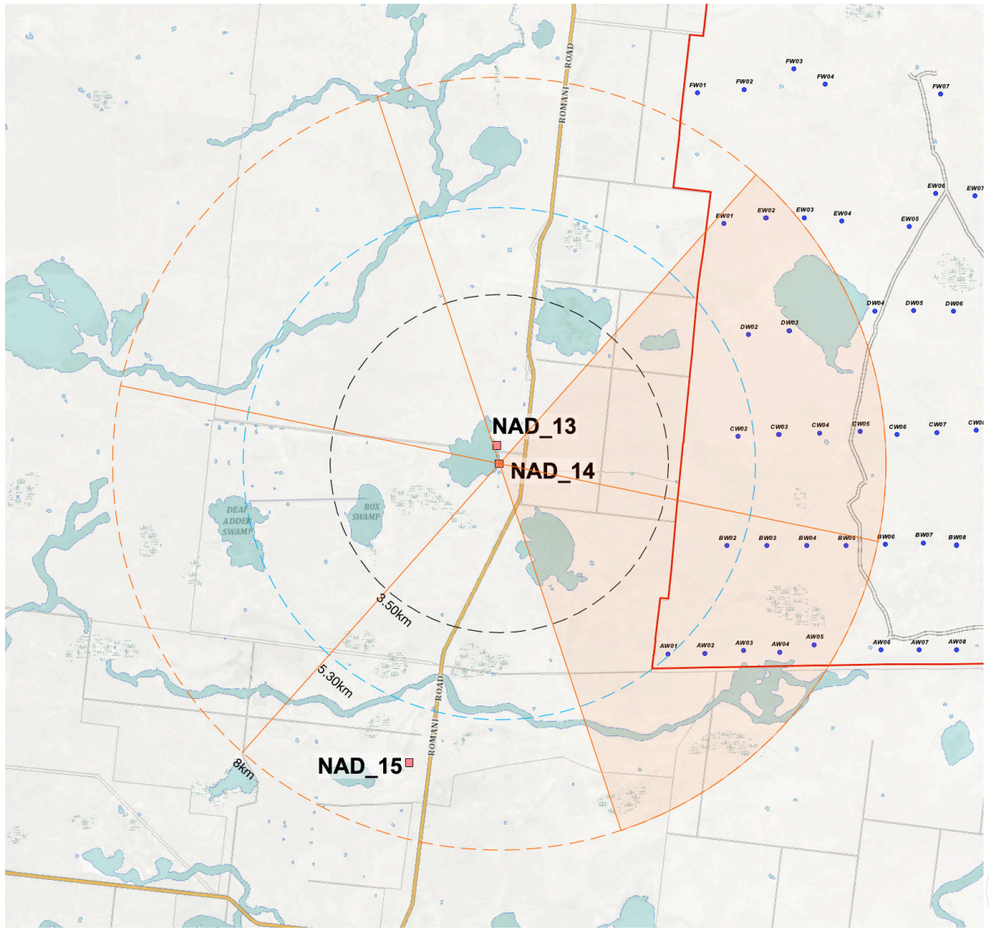
Based on topography alone, the dwelling has the potential to view turbines in up to three (3) 60 degree sectors. However, existing vegetation around the dwelling will limit views of turbines in up to two (2) 60 degree sectors which is deemed acceptable in accordance with the Bulletin. Additional screen planting in keeping with the existing vegetation character around the dwelling can potentially limit views to other turbines. The turbines will be visible in the landscape, however there are no key landscape features impacted by the Project. It is determined that the Visual Impact Rating for this dwelling is **MODERATE.**

Visual Performance Objectives Evaluation (VIZ3):

No visual performance objectives apply to this dwelling due to the rating (VIZ3).

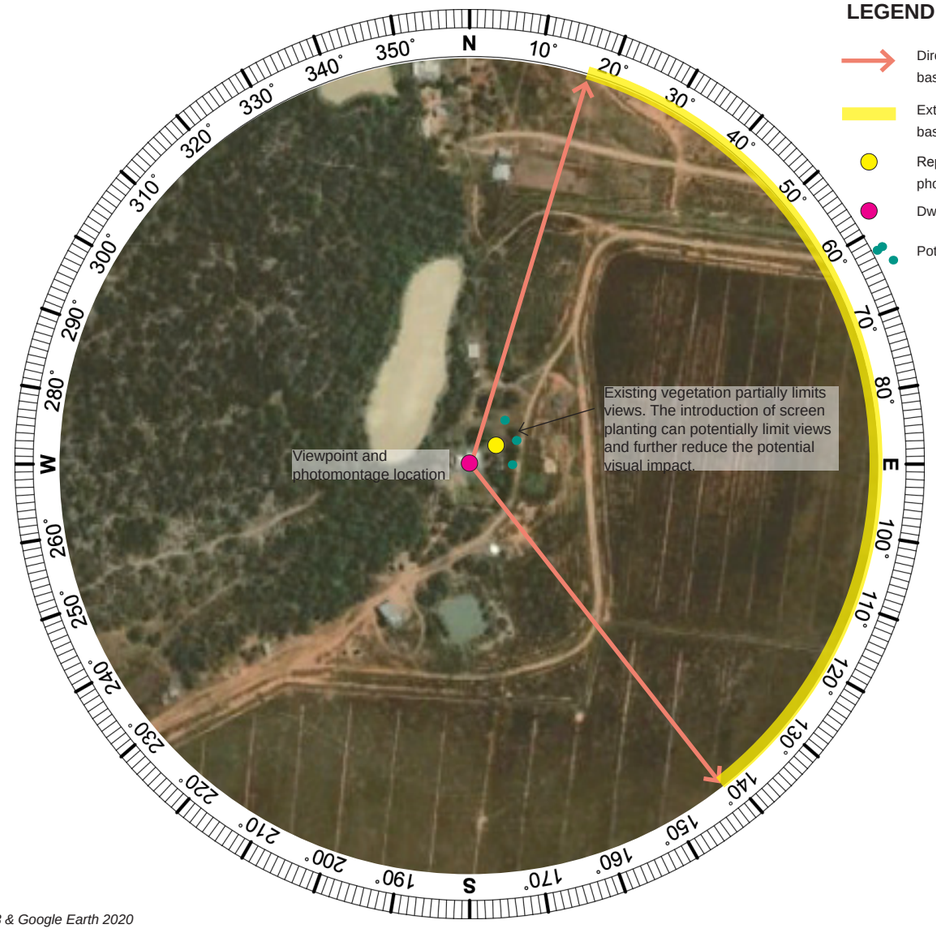
Mitigation Measures:

The introduction of screen planting on the eastern side of the dwelling can potentially limit views of the nearest turbines. Consultation with the landowner will be required to discuss appropriate mitigation methods.



LEGEND

- 270 m Turbine within 8,000 m
- Turbine located in excess of 8,000 m
- Non-associated Dwellings
- Associated Dwellings
- DA Locations
- 3,500 m from nearest turbine (Black Line)
- 5,300 m from nearest turbine (Blue Line)
- 8,000 m from nearest turbine
- 60º sector
- 60º sector with turbines

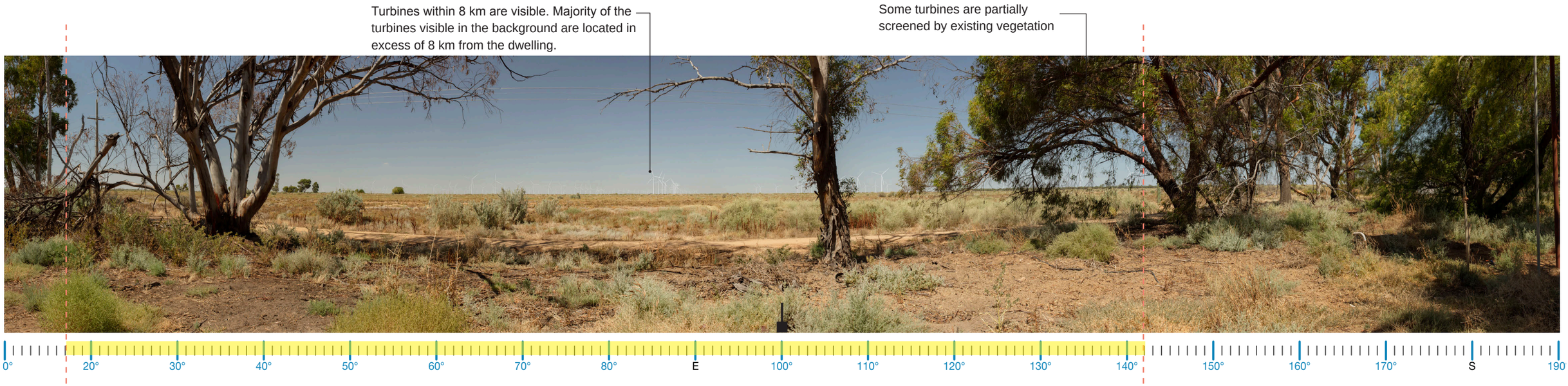


LEGEND

- Direction of visible turbines based on topography
- Extent of visible turbines based on topography
- Representative viewpoint & photomontage location
- Dwelling location
- Potential screen planting

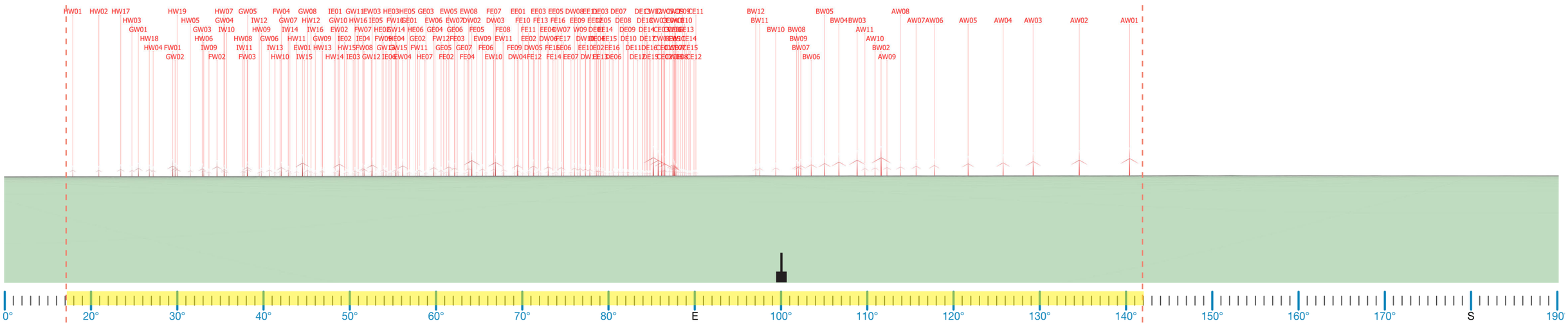
Aerial image sources: ESRI Topographic Maps 2023 & Google Earth 2020

C.5. Dwelling Assessment **Dwelling NAD_14 Romani Road, Hay South NSW**



Proposed View - 180 degree field of view

Wire Frame Diagram indicates that all turbines will be visible generally in the east (assessment based on topography alone). Views of the Project will be partially limited by existing vegetation to the south east. However, majority of the Project is likely to be visible. Additional screen planting is recommended to limit views.



Proposed Wire Frame Diagram - 180 degree field of view

C.6. Dwelling Assessment **Dwelling NAD_15 Romani Road, Booroorban NSW**

DWELLING NAD_15			
Nearest proposed turbine (km):	**5.79 km**	**Visibility Distance Zone:**	**Far Middleground (FM)**
Number of proposed turbines within 8000m of the nearest turbine:	**Five (5)**	**Viewer Sensitivity Zone:**	**Level 2 Moderate**
Number of theoretical 60º Sectors (Based on 2D Plan):	**One (1)**	**Landscape Character Unit:**	**LCU01: Farmlands and Plains**
Number of visible 60º Sectors (Based on 3D Assessment):	**Two (2)**	**Scenic Quality Rating:**	**Low**
Number of potentially visible turbines (Based on topography alone)	**188 all at hub height**	**Visual Influence Zone:**	**VIZ3**

Visual Impact Rating: LOW

Assessment Notes:

Aerial imagery indicates that the dwelling is surrounded by dense vegetation. The dwelling is located on a generally flat terrain and is accessed via Romani Road. Moir LA attended the dwelling in March 2023. A viewpoint was selected in consultation with the owner and was taken from the eastern side of the dwelling to represent views from the property. There are five (5) turbines within 8 km of this dwelling.

Visual Impact Summary:

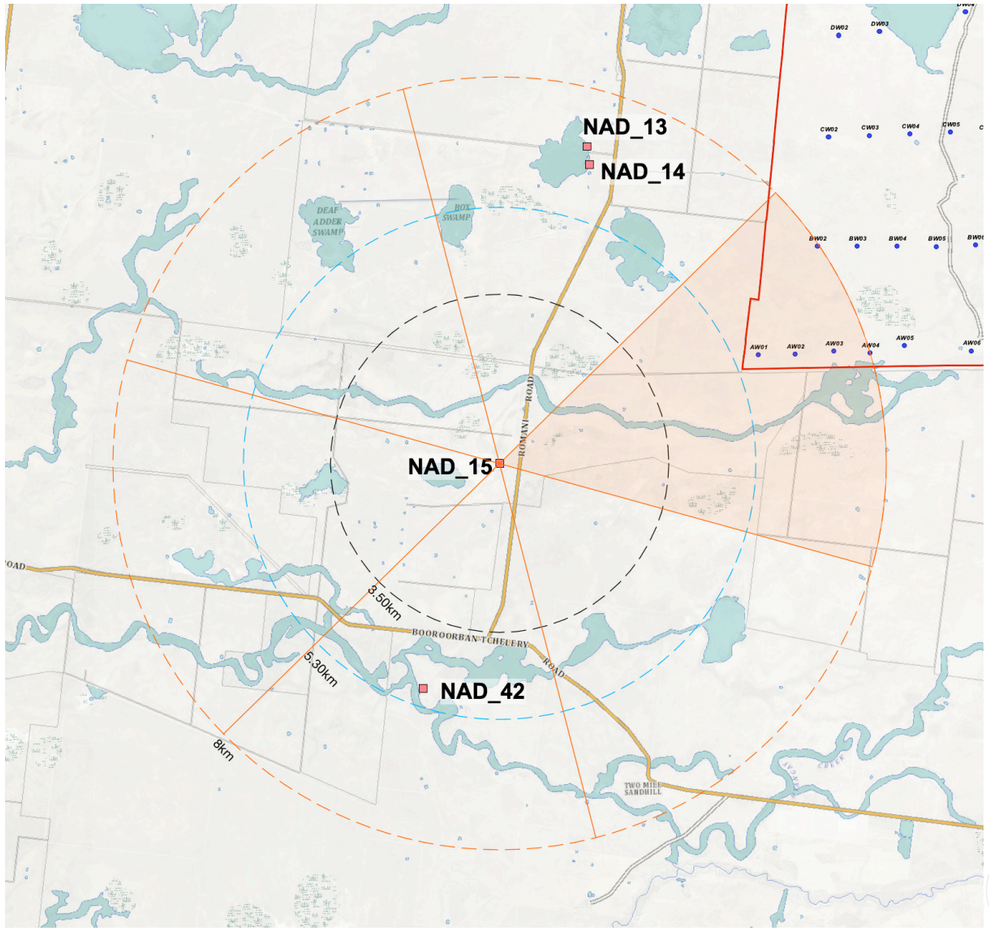
Based on topography alone, the dwelling has the potential to view turbines in up to two (2) 60 degree sectors. However, existing vegetation around the dwelling will limit views of turbines in up to one (1) 60 degree sector which is deemed acceptable in accordance with the Bulletin. Existing vegetation limits views to the majority of the turbines. Few turbines will be partially visible in the landscape. No key landscape features impacted by the Project. It is determined that the Visual Impact Rating for this dwelling is **LOW.**

Visual Performance Objectives Evaluation (VIZ3):

No visual performance objectives apply to this dwelling due to the rating (VIZ3).

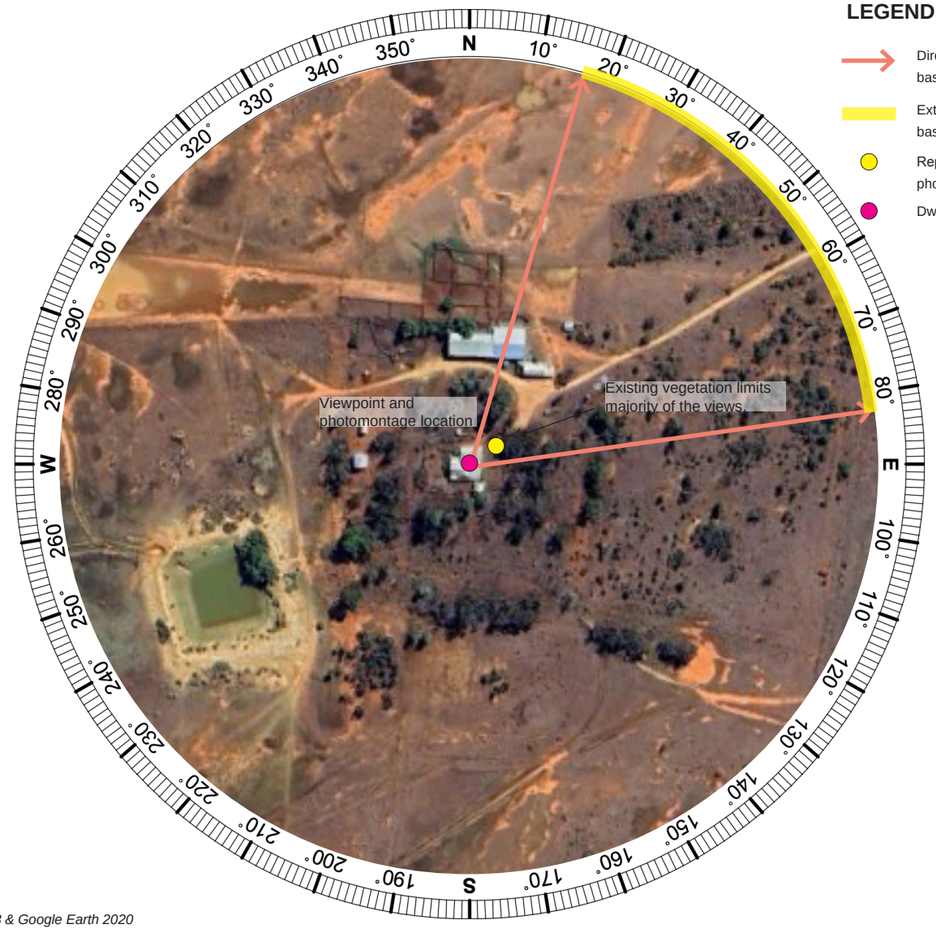
Mitigation Measures:

No mitigation is required.



LEGEND

- 270 m Turbine within 8,000 m
- Turbine located in excess of 8,000 m
- Non-associated Dwellings
- Associated Dwellings
- DA Locations
- 3,500 m from nearest turbine (Black Line)
- 5,300 m from nearest turbine (Blue Line)
- 8,000 m from nearest turbine
- 60º sector
- 60º sector with turbines

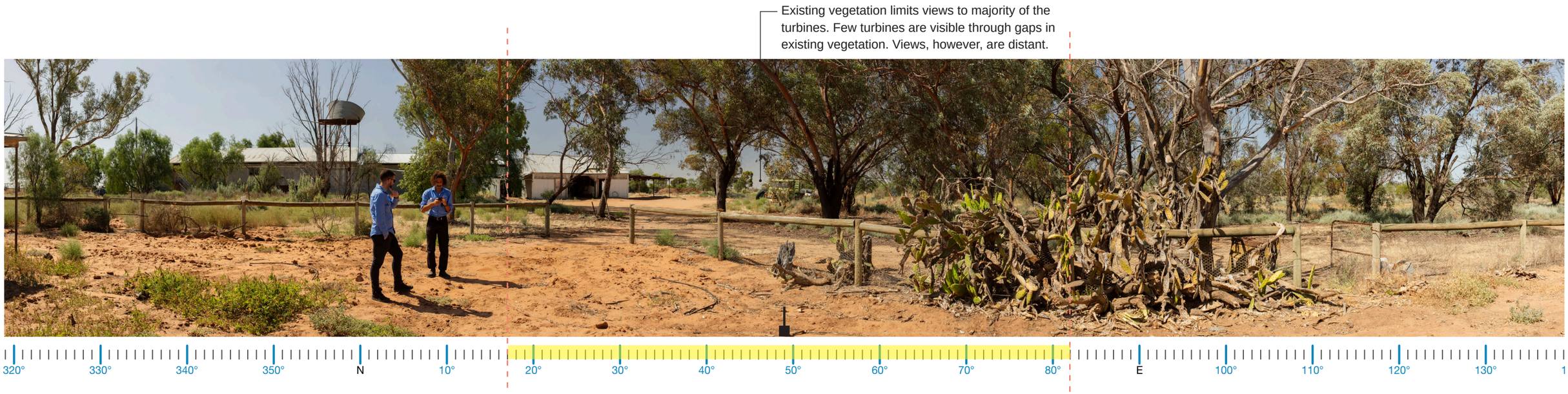


LEGEND

- Direction of visible turbines based on topography
- Extent of visible turbines based on topography
- Representative viewpoint & photomontage location
- Dwelling location

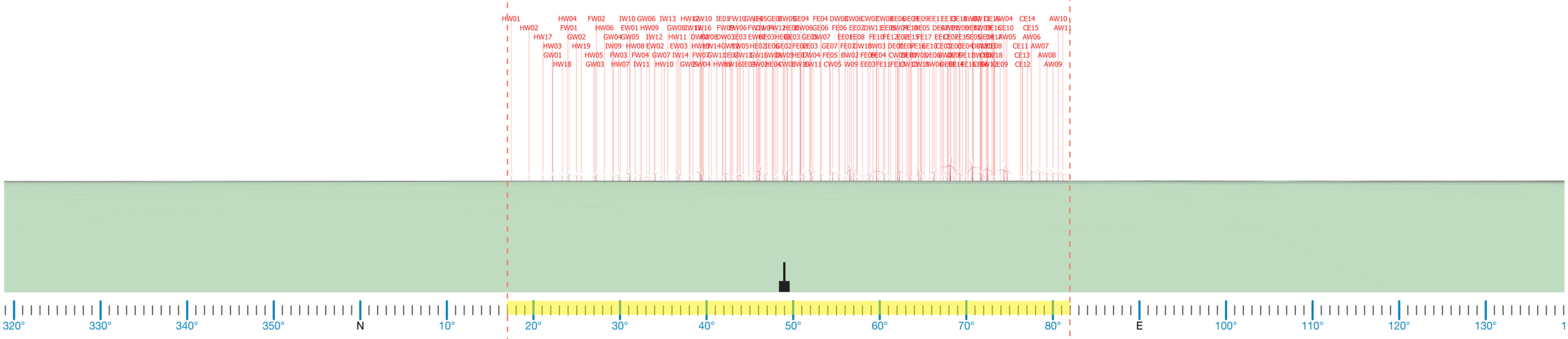
Aerial image sources: ESRI Topographic Maps 2023 & Google Earth 2020

C.6. Dwelling Assessment **Dwelling NAD_15 Romani Road, Booroorban NSW**



Proposed View - 180 degree field of view

Wire Frame Diagram indicates that all turbines will be visible generally in the north east (assessment based on topography alone). Majority of the views of the Project will be limited by existing vegetation at this dwelling. Some turbines will be potentially visible through gaps in existing vegetation. These views, however, are likely to be distant.



Proposed Wire Frame Diagram - 180 degree field of view

C.7. Dwelling Assessment **Dwelling NAD_18 Cobb Highway, Booroorban NSW**

DWELLING NAD_18			
Nearest proposed turbine (km):	**6.13 km**	**Visibility Distance Zone:**	**Far Middleground (FM)**
Number of proposed turbines within 8000m of the nearest turbine:	**Five (5)**	**Viewer Sensitivity Zone:**	**Level 2 Moderate**
Number of theoretical 60º Sectors (Based on 2D Plan):	**One (1)**	**Landscape Character Unit:**	**LCU01: Farmlands and Plains**
Number of visible 60º Sectors (Based on 3D Assessment):	**Two (2)**	**Scenic Quality Rating:**	**Low**
Number of potentially visible turbines (Based on topography alone)	**188 all at hub height**	**Visual Influence Zone:**	**VIZ3**

Visual Impact Rating: LOW

Assessment Notes:

Aerial imagery indicates that the dwelling is surrounded by patchy vegetation. The dwelling is located on a generally flat terrain and is accessed via the Cobb Highway. Moir LA attended the dwelling in March 2023. A viewpoint was selected in consultation with the owner and was taken from the northern side of the dwelling to represent views from the property. There are five (5) turbines within 8 km of this dwelling.

Visual Impact Summary:

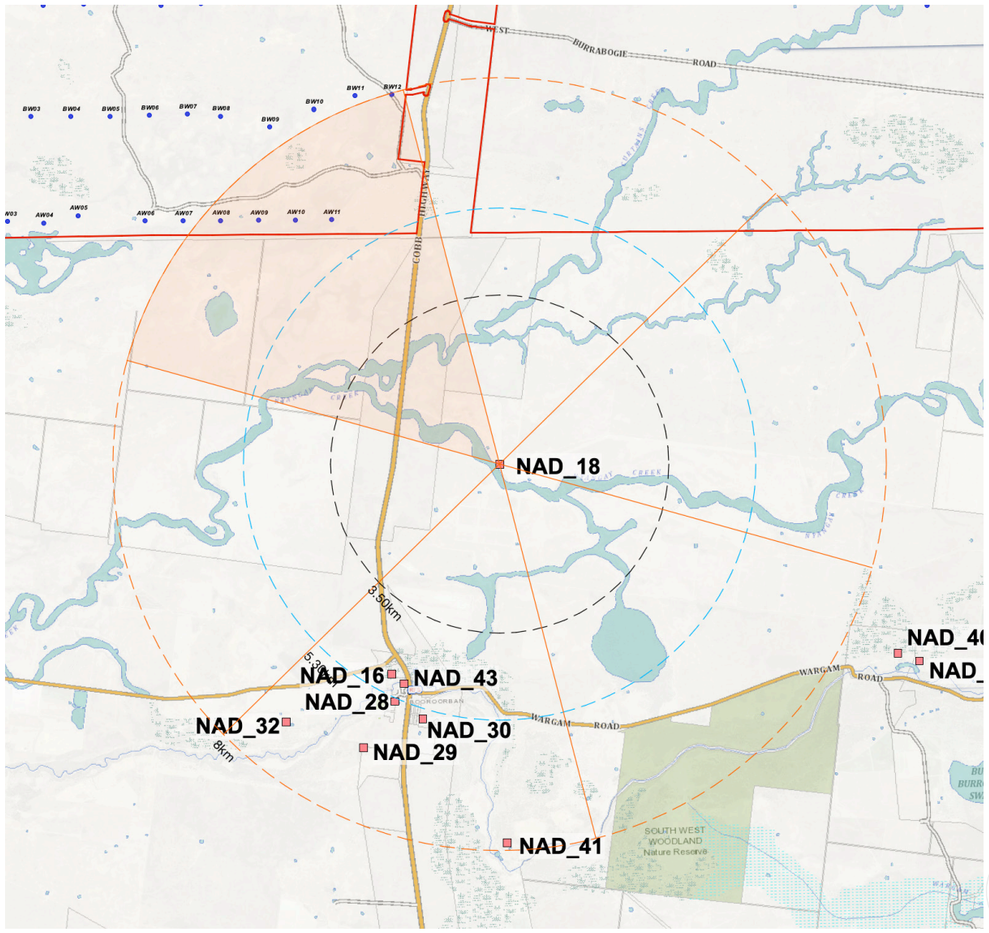
Based on topography alone, the dwelling has the potential to view turbines in up to two (2) 60 degree sectors which is deemed acceptable in accordance with the Bulletin. Existing vegetation partially limits views to some of the turbines. No key landscape features impacted by the Project. It is determined that the Visual Impact Rating for this dwelling is **LOW.**

Visual Performance Objectives Evaluation (VIZ3):

No visual performance objectives apply to this dwelling due to the rating (VIZ3).

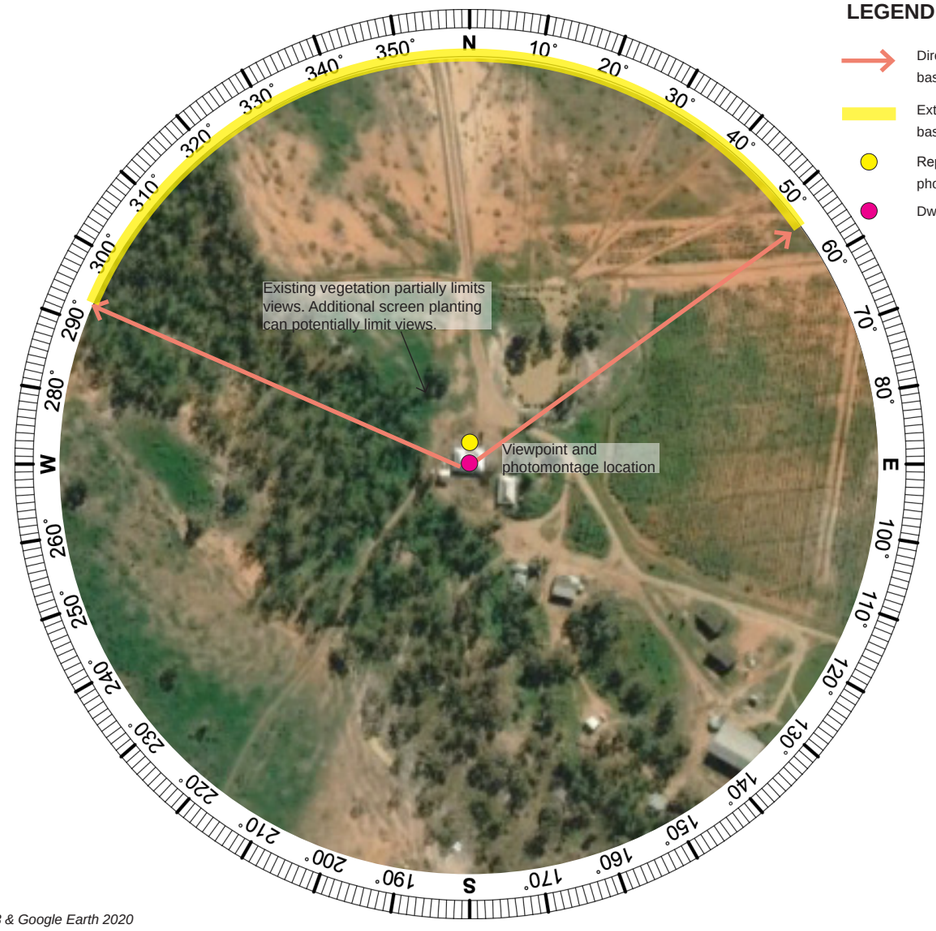
Mitigation Measures:

No mitigation is required.



LEGEND

- 270 m Turbine within 8,000 m
- Turbine located in excess of 8,000 m
- Non-associated Dwellings
- Associated Dwellings
- DA Locations
- 3,500 m from nearest turbine (Black Line)
- 5,300 m from nearest turbine (Blue Line)
- 8,000 m from nearest turbine
- 60º sector
- 60º sector with turbines

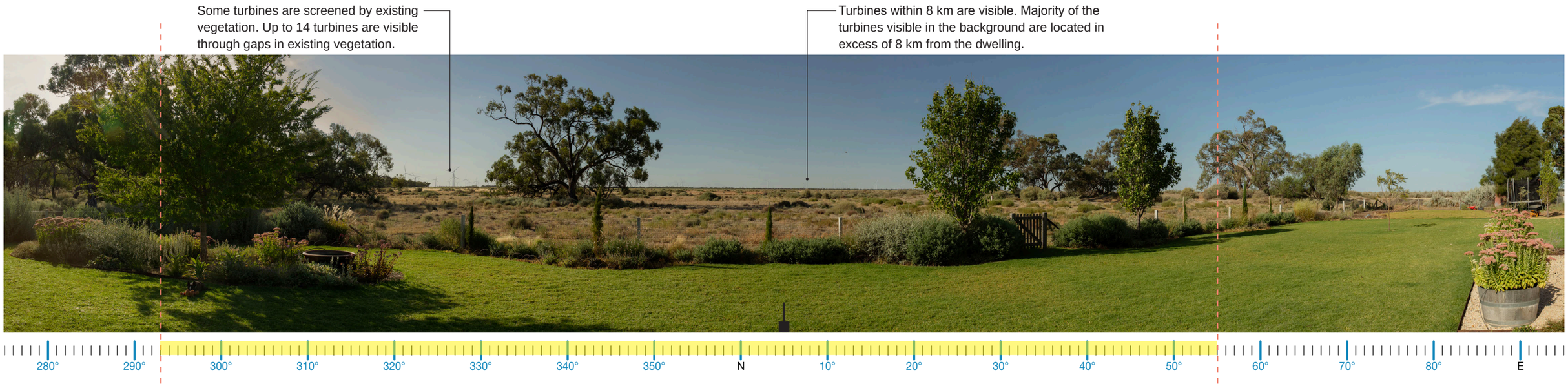


LEGEND

- Direction of visible turbines based on topography
- Extent of visible turbines based on topography
- Representative viewpoint & photomontage location
- Dwelling location

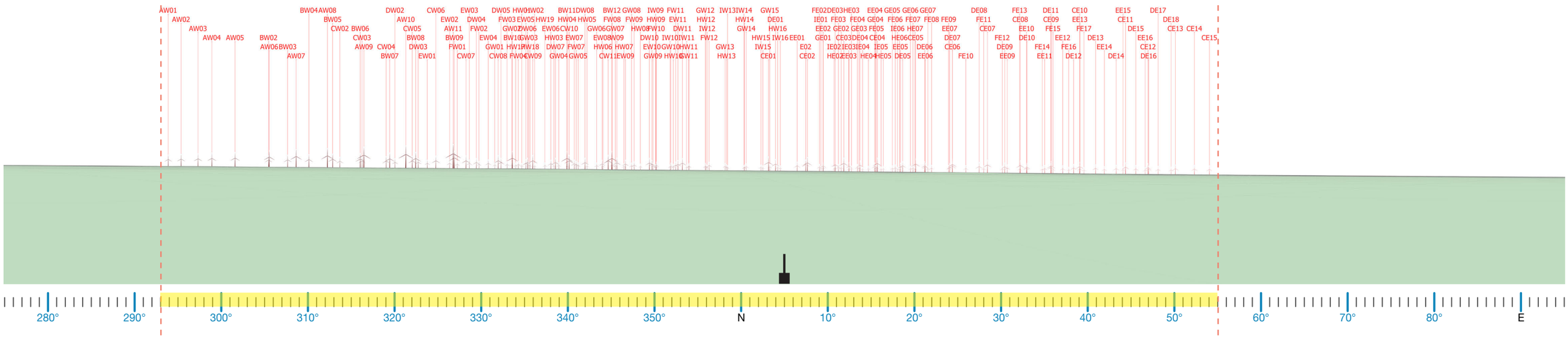
Aerial image sources: ESRI Topographic Maps 2023 & Google Earth 2020

C.7. Dwelling Assessment **Dwelling NAD_18 Cobb Highway, Booroorban NSW**



Proposed View - 180 degree field of view

Wire Frame Diagram indicates that all turbines will be visible generally in the southeast (assessment based on topography alone). Views of the Project will be limited by existing vegetation and structures and it is likely that up to 16 turbines will be visible at the dwelling. Additional screen planting can further help limit views of the Project.



Proposed Wire Frame Diagram - 180 degree field of view

C.8. Dwelling Assessment **Dwelling NAD_23 Jerilderie Road, Hay South NSW**

DWELLING NAD_23			
Nearest proposed turbine (km):	**7.60 km**	**Visibility Distance Zone:**	**Far Middleground (FM)**
Number of proposed turbines within 8000m of the nearest turbine:	**Two (2)**	**Viewer Sensitivity Zone:**	**Level 2 Moderate**
Number of theoretical 60º Sectors (Based on 2D Plan):	**One (1)**	**Landscape Character Unit:**	**LCU01: Farmlands and Plains**
Number of visible 60º Sectors (Based on 3D Assessment):	**Two (2)**	**Scenic Quality Rating:**	**Low**
Number of potentially visible turbines (Based on topography alone)	**188 all at hub height**	**Visual Influence Zone:**	**VIZ3**

Visual Impact Rating: LOW

Assessment Notes:

Aerial imagery indicates that the dwelling is surrounded by patchy to dense vegetation. The dwelling is located on generally flat terrain and is accessed via Jerilderie Road. Moir LA attended the dwelling in March 2023. A viewpoint was selected in consultation with the owner and was taken from the western side of the dwelling to represent views from the property. There are two (2) turbines within 8 km of this dwelling.

Visual Impact Summary:

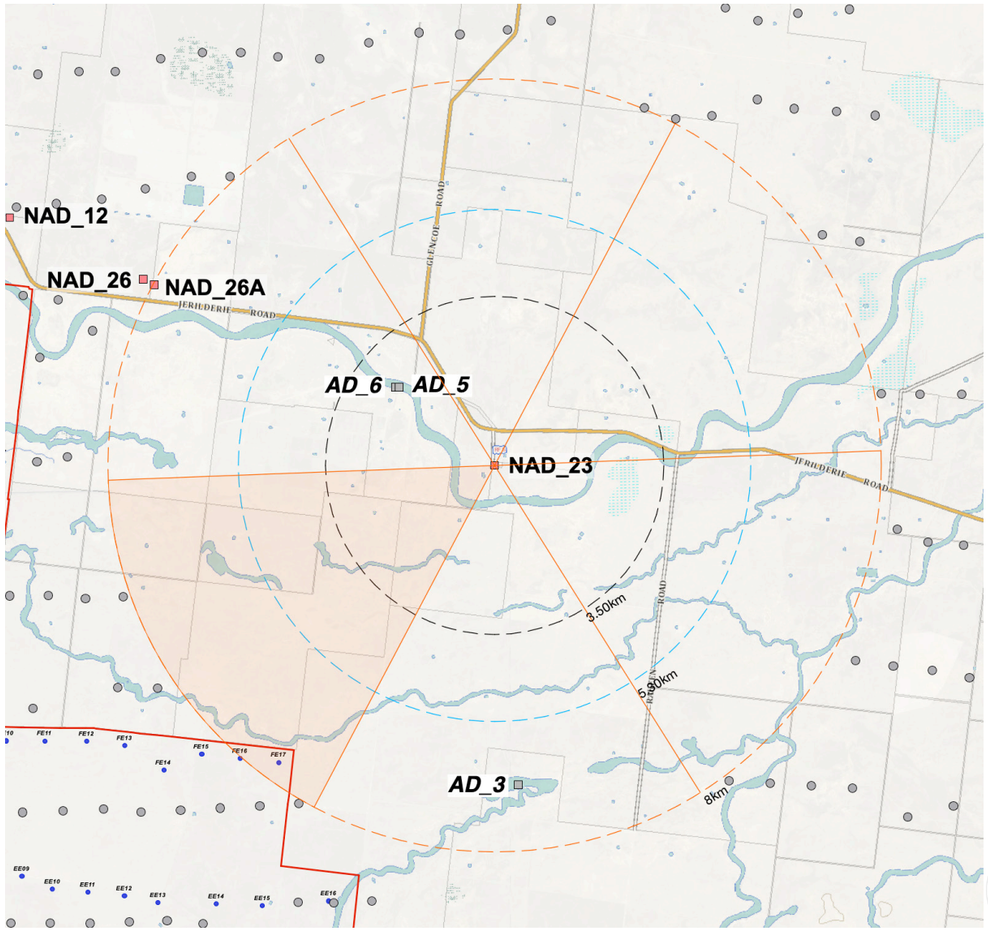
Based on topography alone, the dwelling has the potential to view turbines in up to two (6) 60 degree sectors. However, existing vegetation and structures around the dwelling will limit views of turbines in up to one (1) 60 degree sector which is deemed acceptable in accordance with the Bulletin. Visible turbines are located in excess of 8 km from the dwelling and these are not likely to be dominant in the visual catchment. There are no key landscape features impacted by the Project. It is determined that the Visual Impact Rating for this dwelling is **LOW.**

Visual Performance Objectives Evaluation (VIZ3):

No visual performance objectives apply to this dwelling due to the rating (VIZ3).

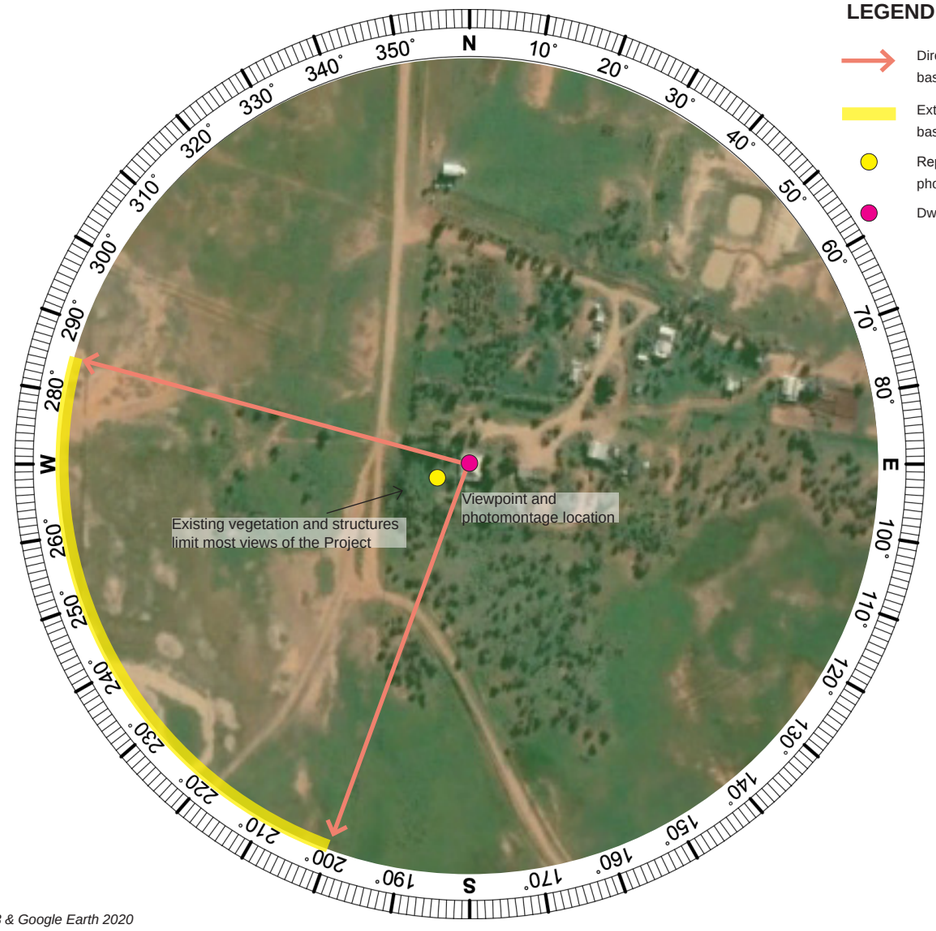
Mitigation Measures:

No mitigation is required.



LEGEND

- 270 m Turbine within 8,000 m
- Turbine located in excess of 8,000 m
- Non-associated Dwellings
- Associated Dwellings
- DA Locations
- 3,500 m from nearest turbine (Black Line)
- 5,300 m from nearest turbine (Blue Line)
- 8,000 m from nearest turbine
- 60º sector
- 60º sector with turbines

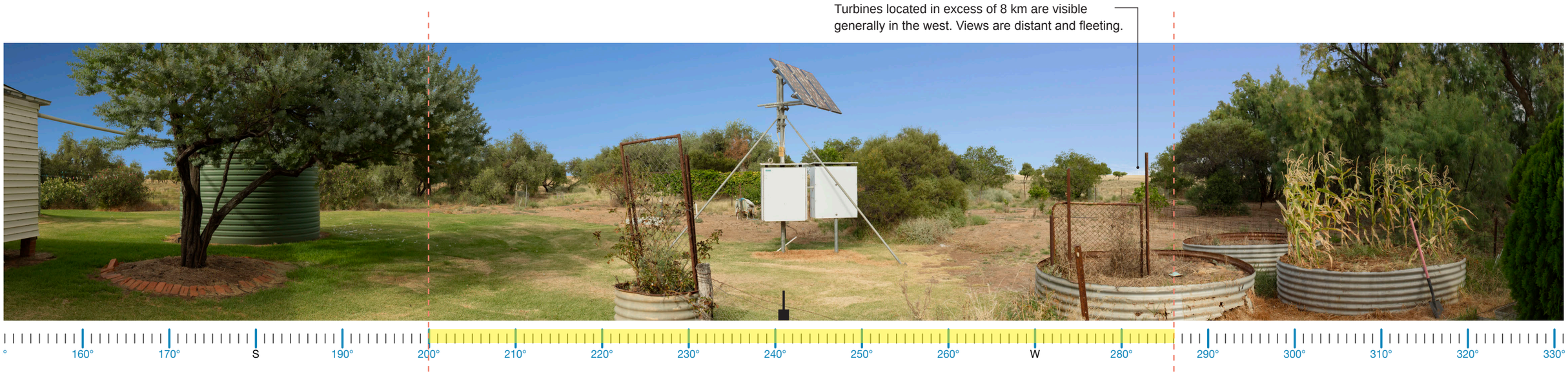


LEGEND

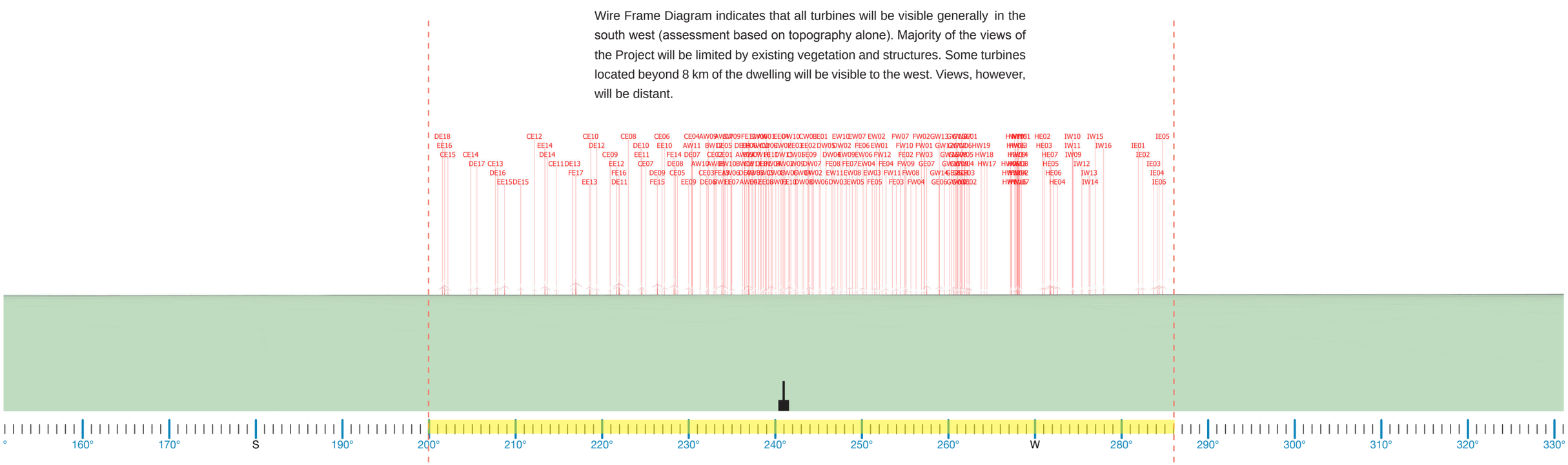
- Direction of visible turbines based on topography
- Extent of visible turbines based on topography
- Representative viewpoint & photomontage location
- Dwelling location

Aerial image sources: ESRI Topographic Maps 2023 & Google Earth 2020

C.8. Dwelling Assessment **Dwelling NAD_23 Jerilderie Road, Hay South NSW**



Proposed View - 180 degree field of view



Proposed Wire Frame Diagram - 180 degree field of view

C.9. Dwelling Assessment **Dwelling DAD_1 West Burrabogie Road, Booroorban NSW**

DWELLING NAD_23			
Nearest proposed turbine (km):	**6.08 km**	**Visibility Distance Zone:**	**Far Middleground (FM)**
Number of proposed turbines within 8000m of the nearest turbine:	**Five (5)**	**Viewer Sensitivity Zone:**	**Level 2 Moderate**
Number of theoretical 60º Sectors (Based on 2D Plan):	**One (1)**	**Landscape Character Unit:**	**LCU01: Farmlands and Plains**
Number of visible 60º Sectors (Based on 3D Assessment):	**Two (2)**	**Scenic Quality Rating:**	**Low**
Number of potentially visible turbines (Based on topography alone)	**188 all at hub height**	**Visual Influence Zone:**	**VIZ3**

Visual Impact Rating: LOW

Assessment Notes:

Aerial imagery indicates that the potential dwelling location is surrounded by patchy to dense vegetation associated with the unnamed creek corridor that emerges from the Nyangay Creek corridor. The approved dwelling will be potentially built on generally flat terrain and is accessed via West Burrabogie Road. Moir LA attended the site in March 2023. A viewpoint was selected in consultation with the owner and was taken from the southern side of the DA location to represent views from the property. There are five (5) turbines within 8 km of this dwelling.

Visual Impact Summary:

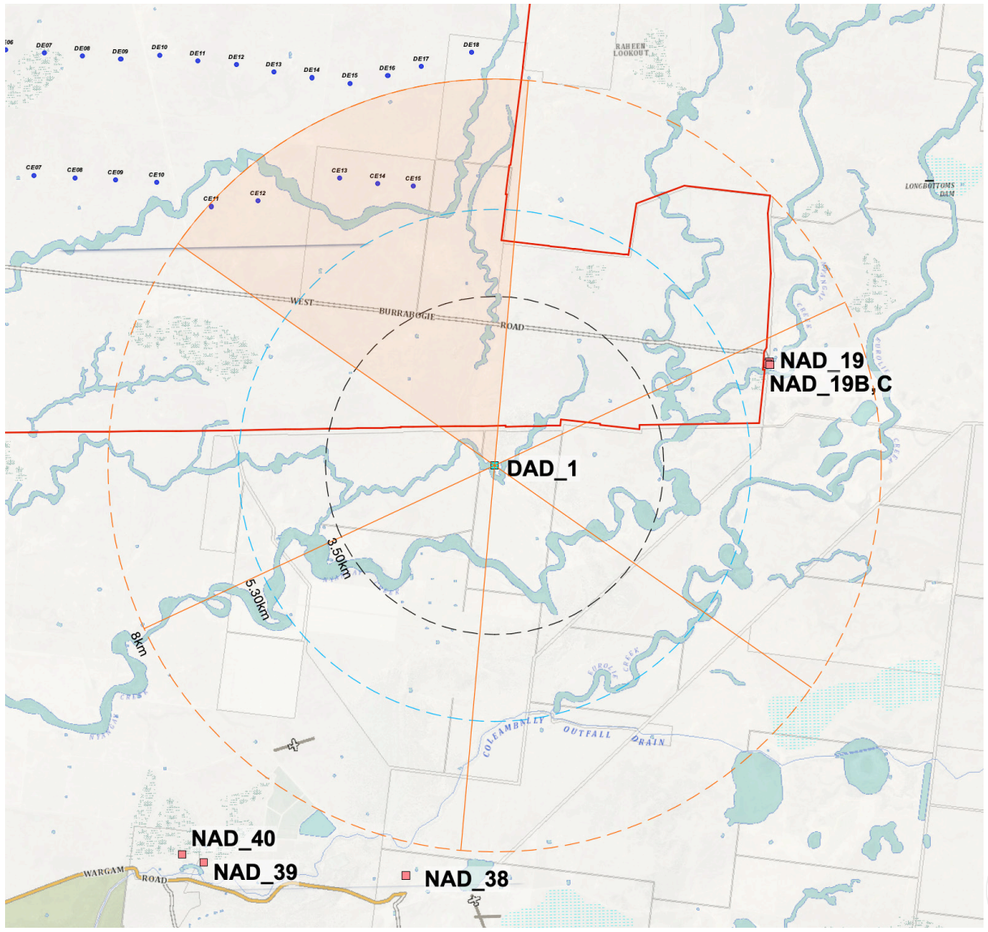
Based on topography alone, the dwelling will have the potential to view turbines in up to two (2) 60 degree sectors. However, existing vegetation associated with the unnamed creek corridor will limit views of the majority of the Project and it is likely that up to two (2) turbines and four (4) blade tips will be visible at the location. No key landscape features impacted by the Project. It is determined that the Visual Impact Rating for this DA location is **LOW.**

Visual Performance Objectives Evaluation (VIZ3):

No visual performance objectives apply to this dwelling due to the rating (VIZ3).

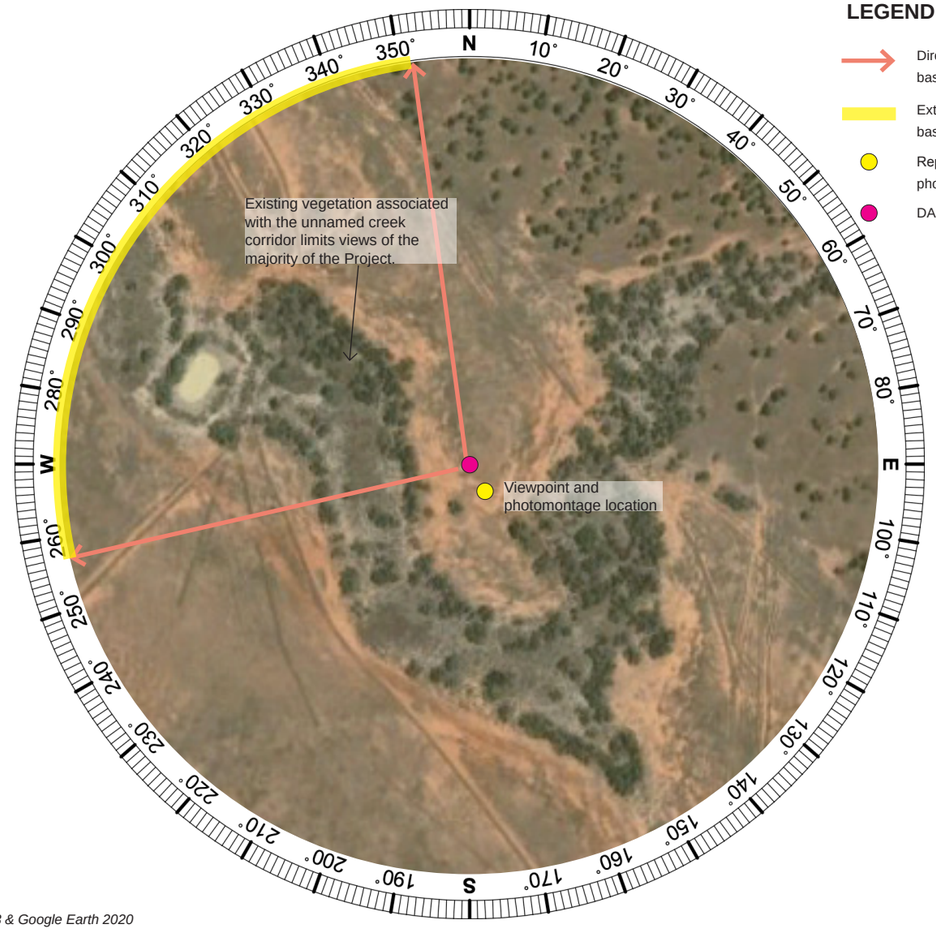
Mitigation Measures:

No mitigation is required.



LEGEND

- 270 m Turbine within 8,000 m
- Turbine located in excess of 8,000 m
- Non-associated Dwellings
- Associated Dwellings
- DA Locations
- 3,500 m from nearest turbine (Black Line)
- 5,300 m from nearest turbine (Blue Line)
- 8,000 m from nearest turbine
- 60º sector
- 60º sector with turbines

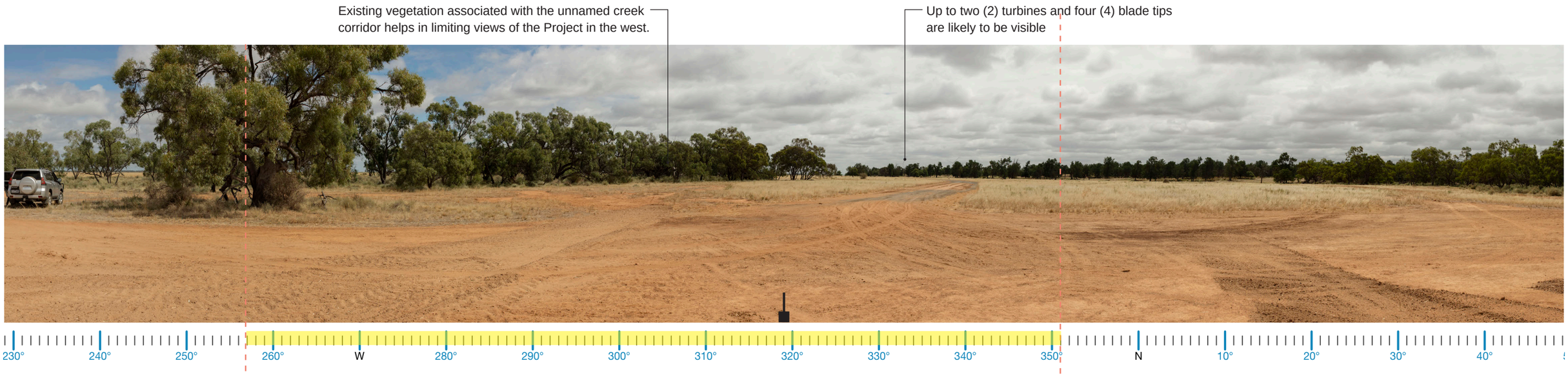


LEGEND

- Direction of visible turbines based on topography
- Extent of visible turbines based on topography
- Representative viewpoint & photomontage location
- DA Location

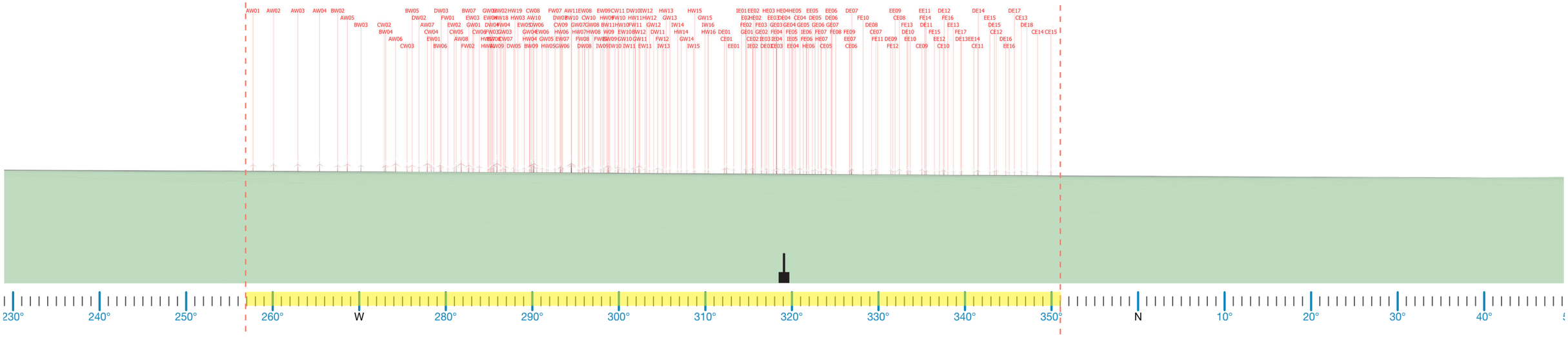
Aerial image sources: ESRI Topographic Maps 2023 & Google Earth 2020

C.9. Dwelling Assessment **Dwelling DAD_1 West Burrabogie Rd, Booroorban NSW**



Proposed View - 180 degree field of view

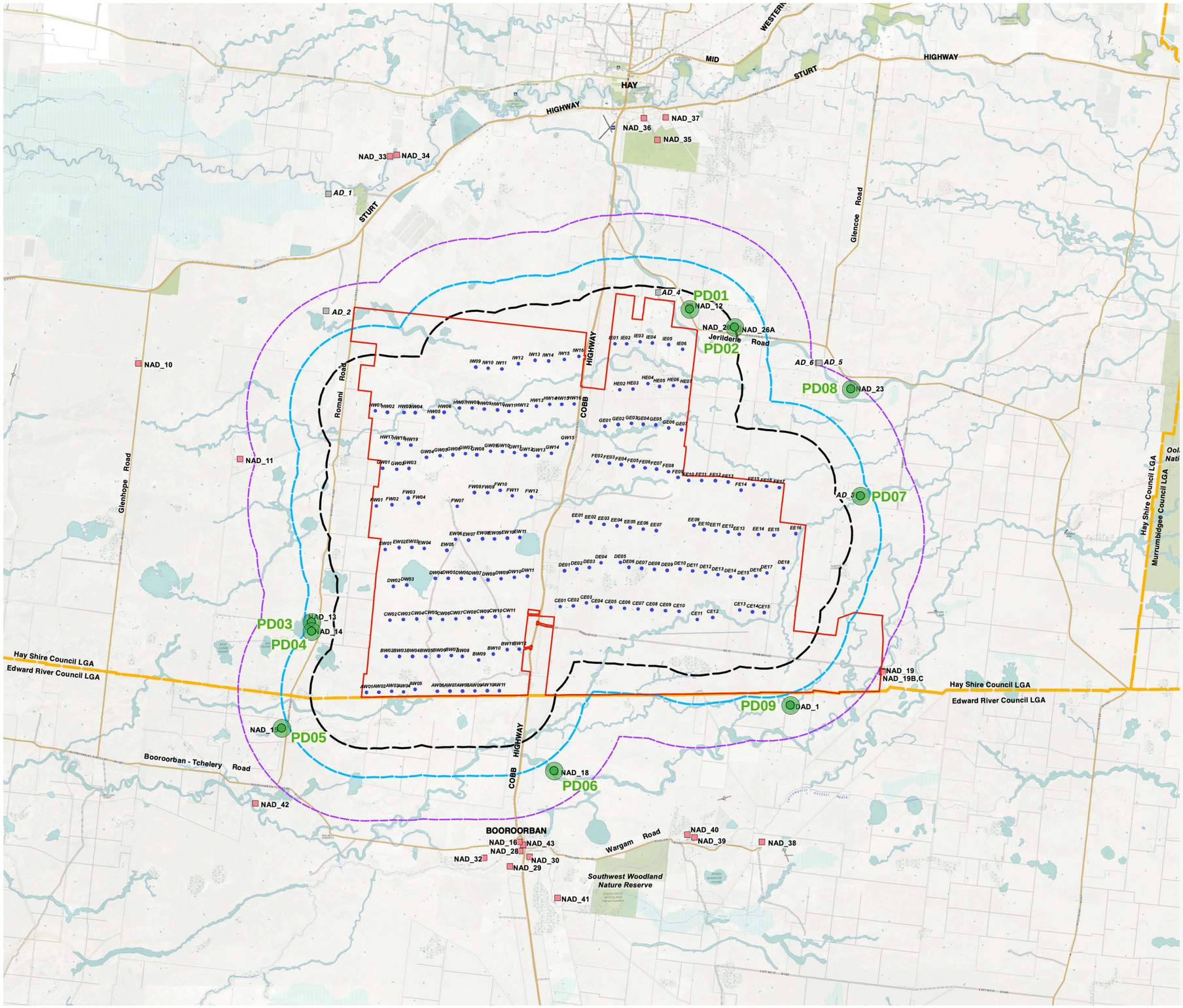
Wire Frame Diagram indicates that all turbines will be visible generally in the north west (assessment based on topography alone). As represented in the photomontage, views of the majority of the Project will be limited by existing vegetation associated with the unnamed creek.



Proposed Wire Frame Diagram - 180 degree field of view

D

Photomontages & Wireframe Diagrams (Private Receptors)



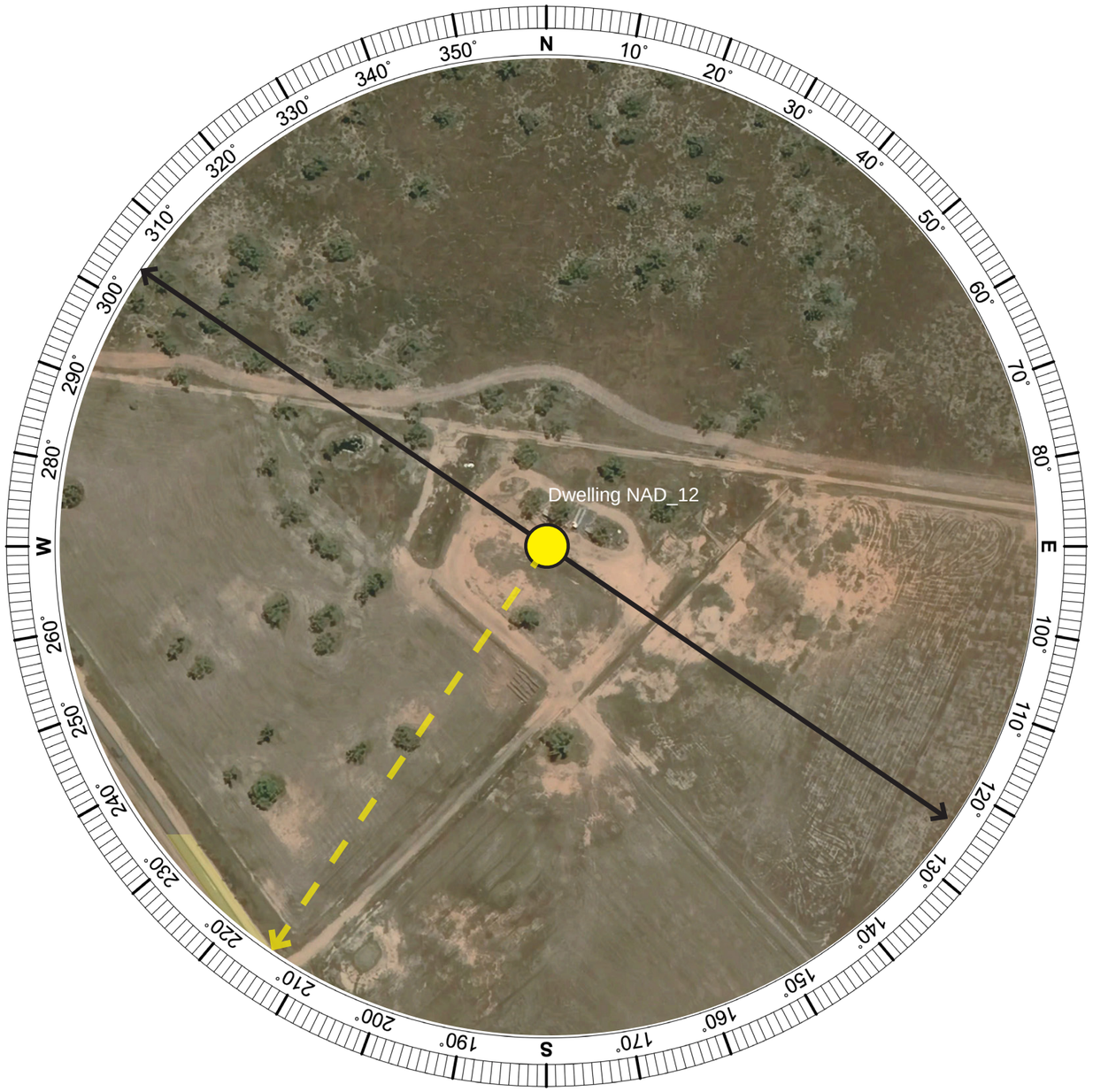
Photomontage Locations (Private Receptors)

The Plains Renewable Energy Park Wind Farm

- Project Area boundary
- Proposed Turbine Location
- Associated Dwellings
- Non-associated Dwellings
- DA Locations
- 3,500 m from turbine (black line of visual magnitude)
- 5,300 m from turbine (blue line of visual magnitude)
- 8,000 m from turbine (extent of Study Area)
- Main Road
- Minor Road
- LGA Boundary
- Photomontage Location (private receptors)

Appendix D Photomontage Locations - Private Receptors (Map Source: Six Maps 2020)

Photomontage 01 Private Viewpoint PD01

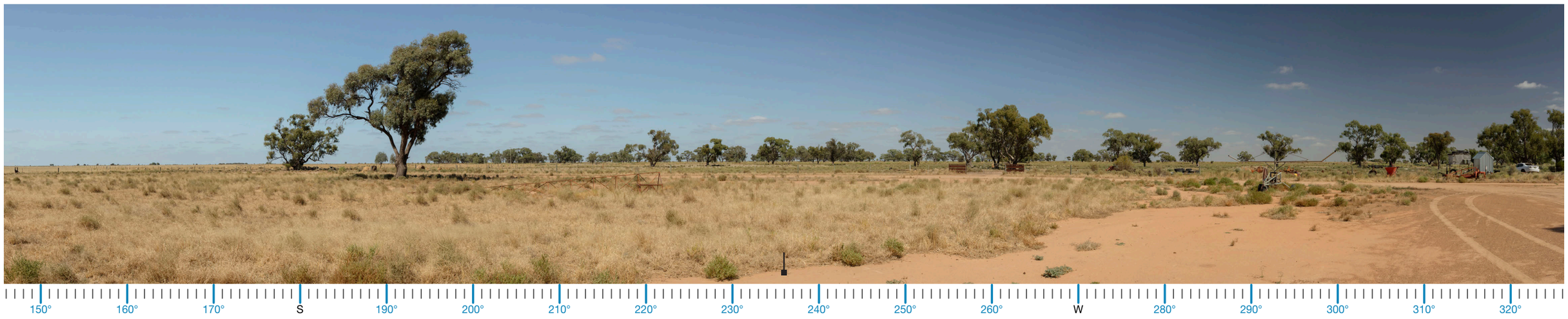


Aerial Image - Photomontage Location (Aerial Image Source: Google Earth 2020)

Photomontage 01

Dwelling ID	Dwelling NAD_12
Photograph Date and Time:	07/03/2023 11:35 am
Coordinates:	34°37’54.71”S 144°52’59.53”E
Distance to Nearest Visible WTG:	2.70 km
Viewing Direction:	Southwest
Elevation:	98 m

Photomontage 01 Private Viewpoint PD01



Existing View | 180º Baseline Panorama

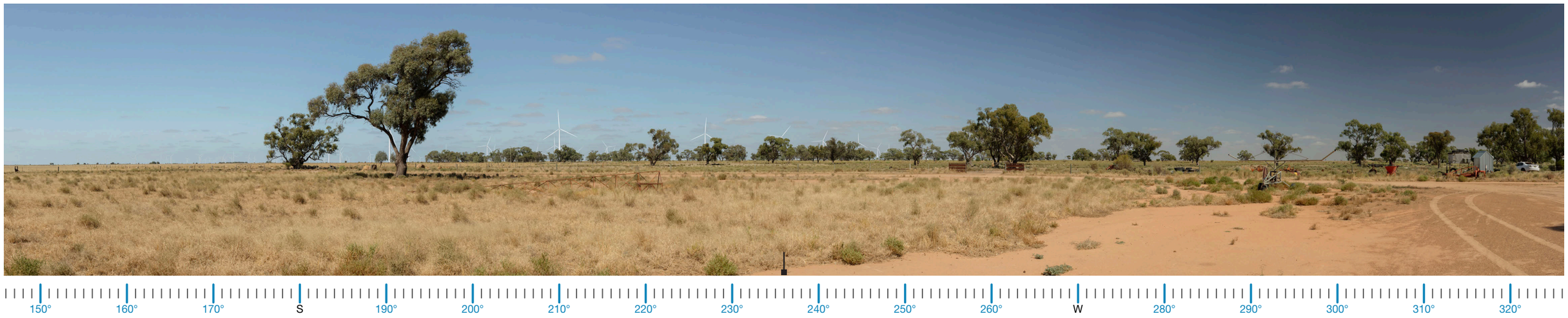


Proposed View | 180º Photomontage

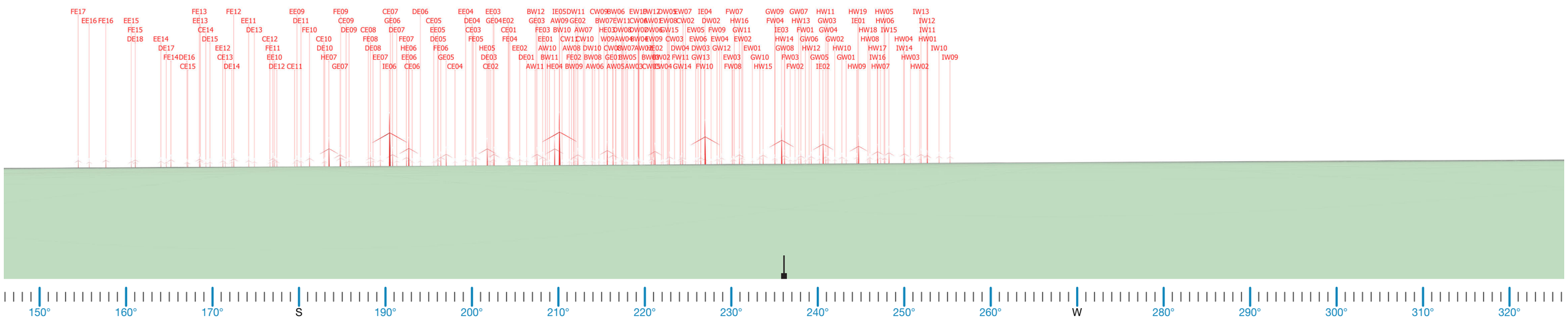
Photomontage 01 Private Viewpoint PD01

Refer to 60 Degree Photomontage 01 Cropped 01

Refer to 60 Degree Photomontage 01 Cropped 02



Proposed View | 180º Photomontage



Wireframe Diagram

Photomontage 01 Private Viewpoint PD01



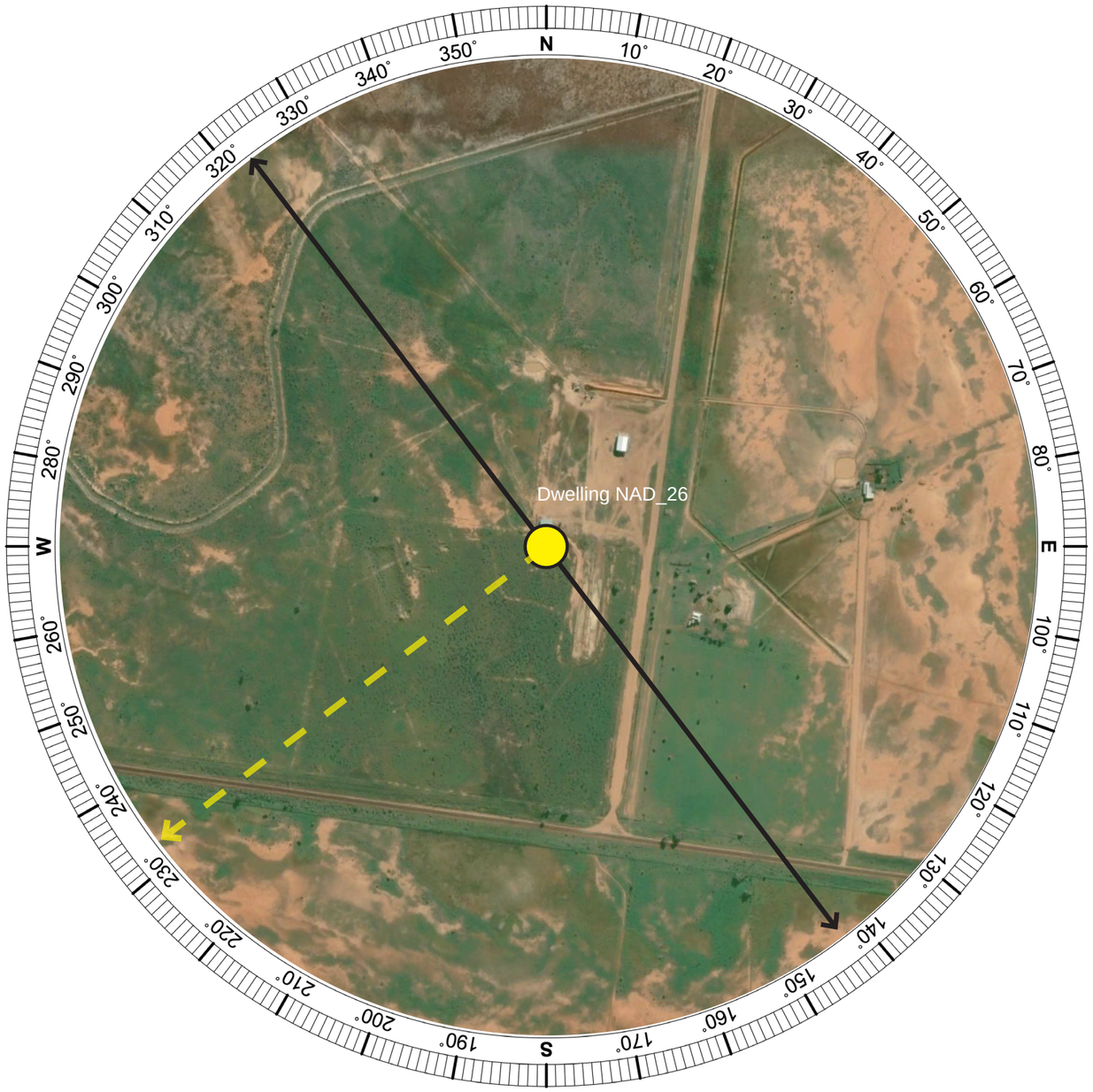
60º Photomontage 01 Cropped 01

Photomontage 01 Private Viewpoint PD01



60º Photomontage 01 Cropped 02

Photomontage 02 Private Viewpoint PD02



Aerial Image - Photomontage Location (Aerial Image Source: Google Earth 2020)

Photomontage 02

Dwelling ID

Dwelling NAD_26

Photograph Date and Time:

07/03/2023 10:26 am

Coordinates:

34°38’37.49”S 144°54’46.91”E

Distance to Nearest Visible WTG:

3.49 km

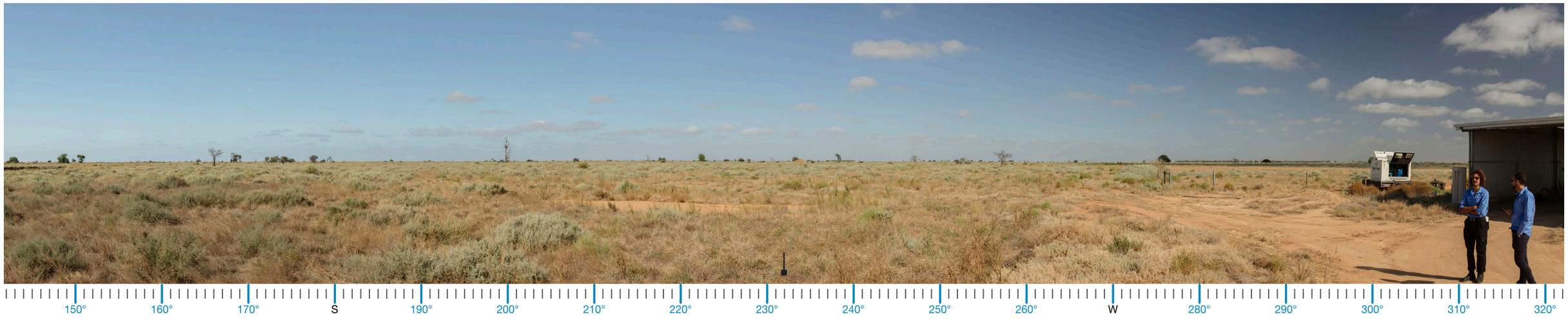
Viewing Direction:

Southwest

Elevation:

91 m

Photomontage 02 Private Viewpoint PD02



Existing View | 180º Baseline Panorama

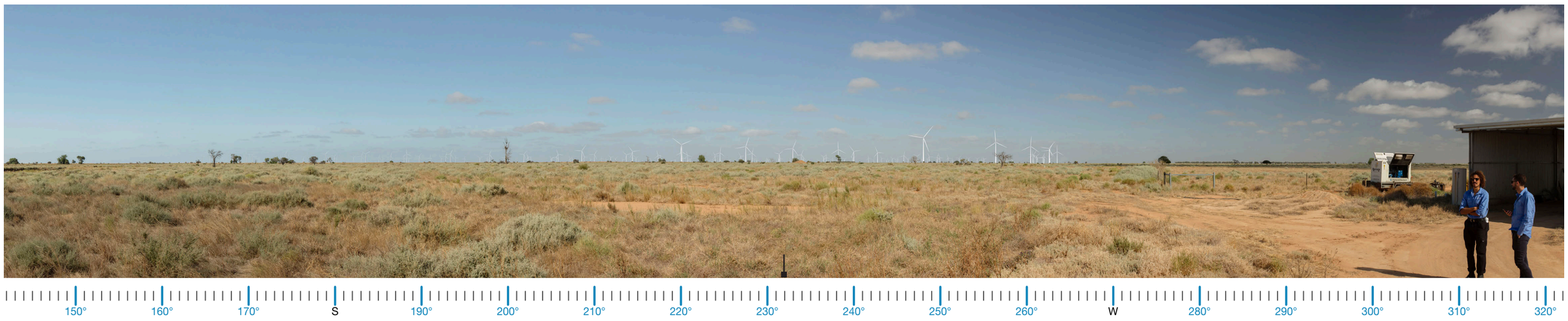


Proposed View | 180º Photomontage

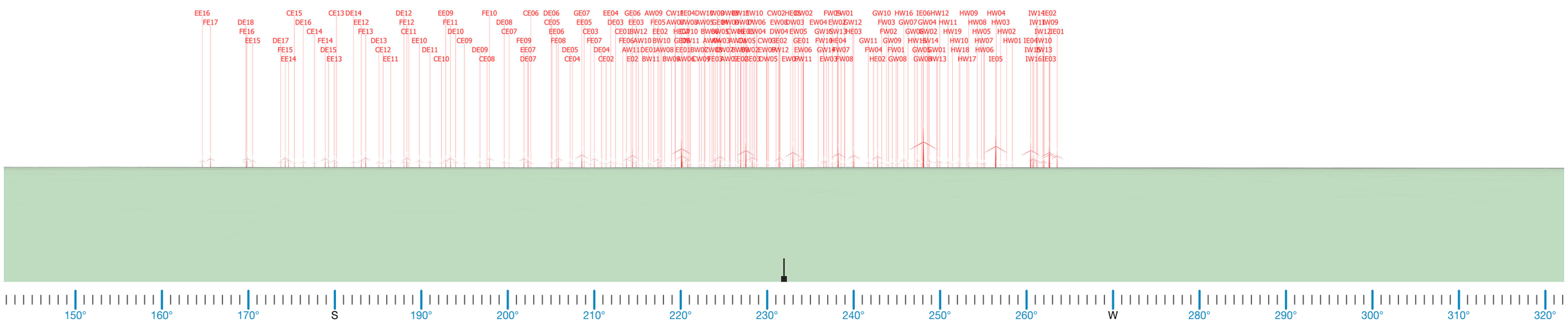
Photomontage 02 Private Viewpoint PD02

Refer to 60 Degree Photomontage 02 Cropped 01

Refer to 60 Degree Photomontage 02 Cropped 02



Proposed View | 180º Photomontage



Wireframe Diagram

Photomontage 02 Private Viewpoint PD02



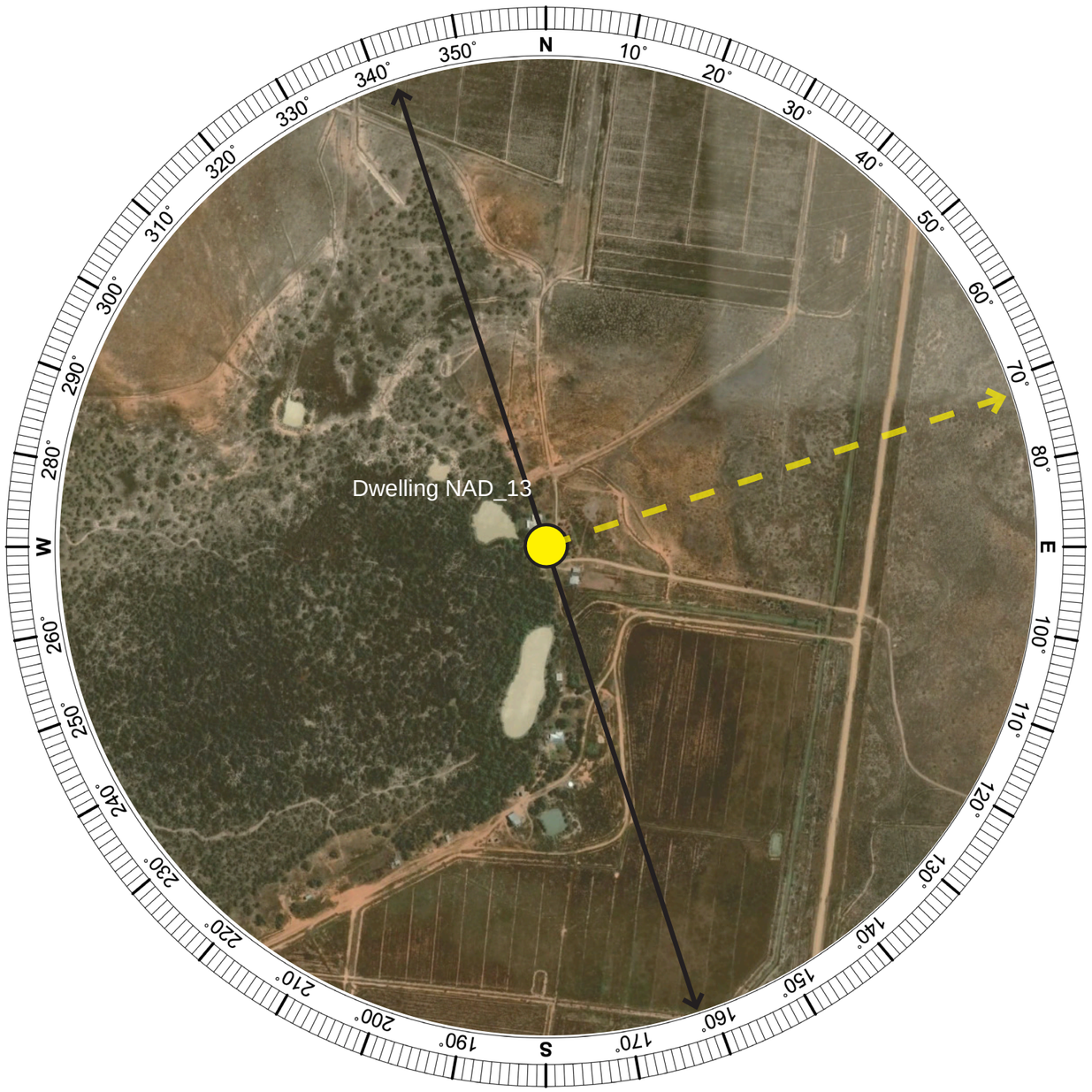
60º Photomontage 02 Cropped 01

Photomontage 02 Private Viewpoint PD02



60º Photomontage 02 Cropped 02

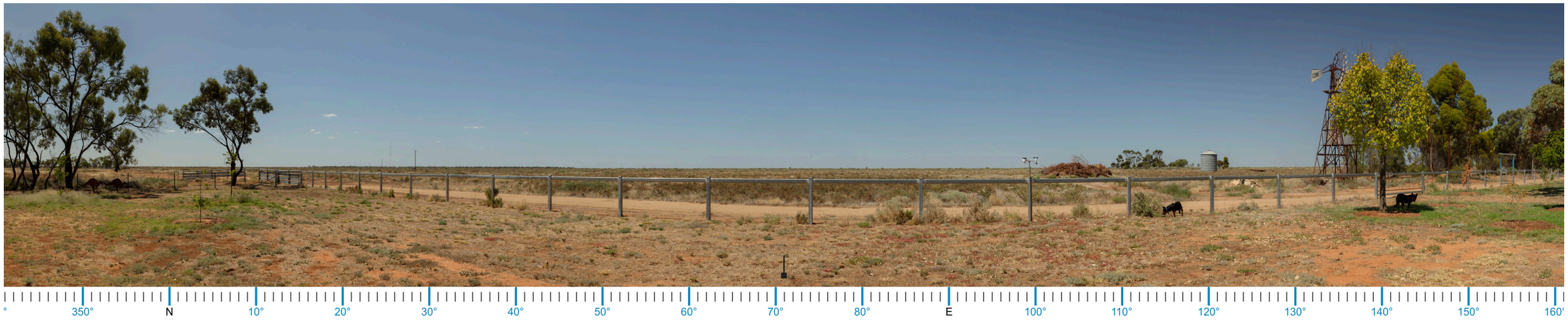
Photomontage 03 Private Viewpoint PD03



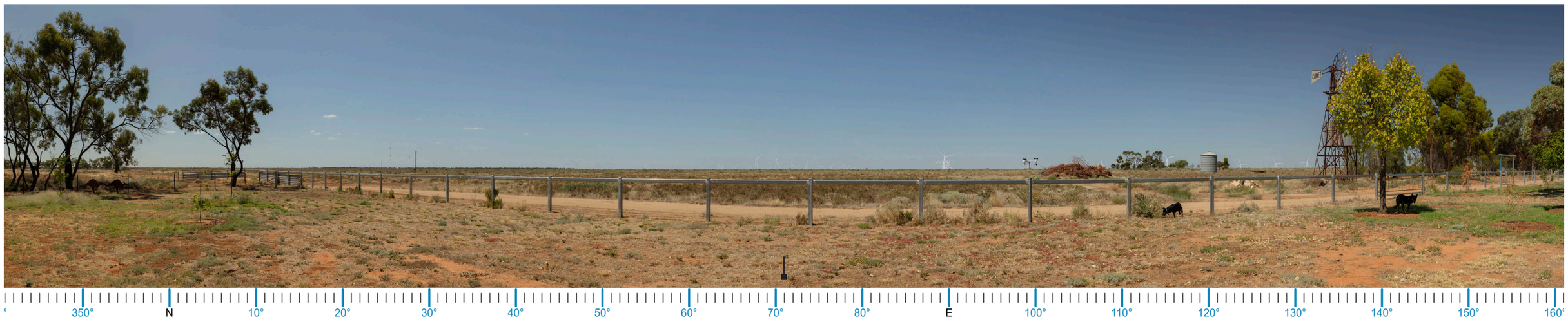
Photomontage 03
Dwelling ID
Dwelling NAD_13
Photograph Date and Time:
07/03/2023 2:28 pm
Coordinates:
34°48’15.34”S 144°37’12.79”E
Distance to Nearest Visible WTG:
4.97 m
Viewing Direction:
East
Elevation:
83 m

Aerial Image - Photomontage Location (Aerial Image Source: Google Earth 2020)

Photomontage 03 Private Viewpoint PD03

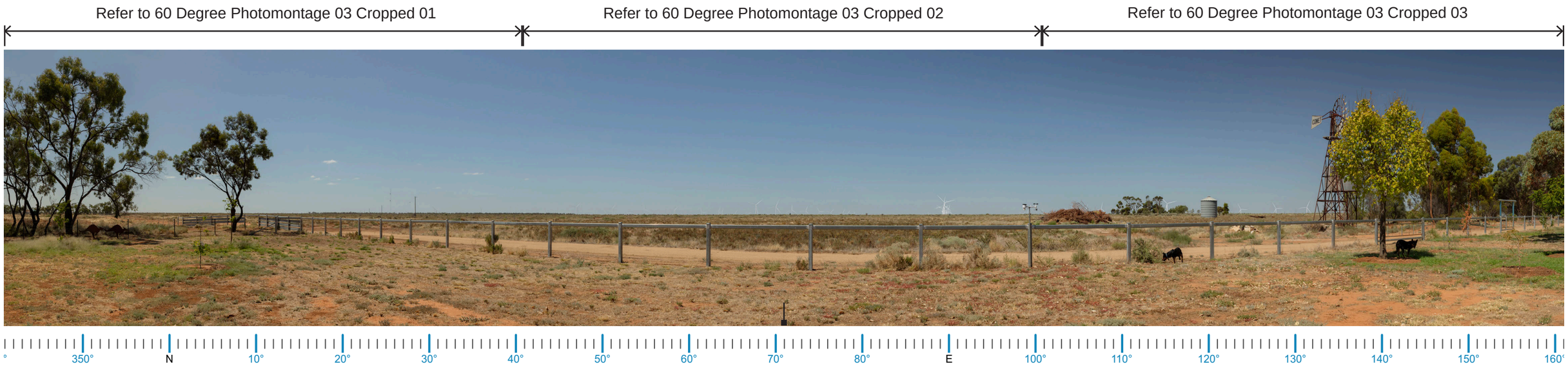


Existing View | 180º Baseline Panorama

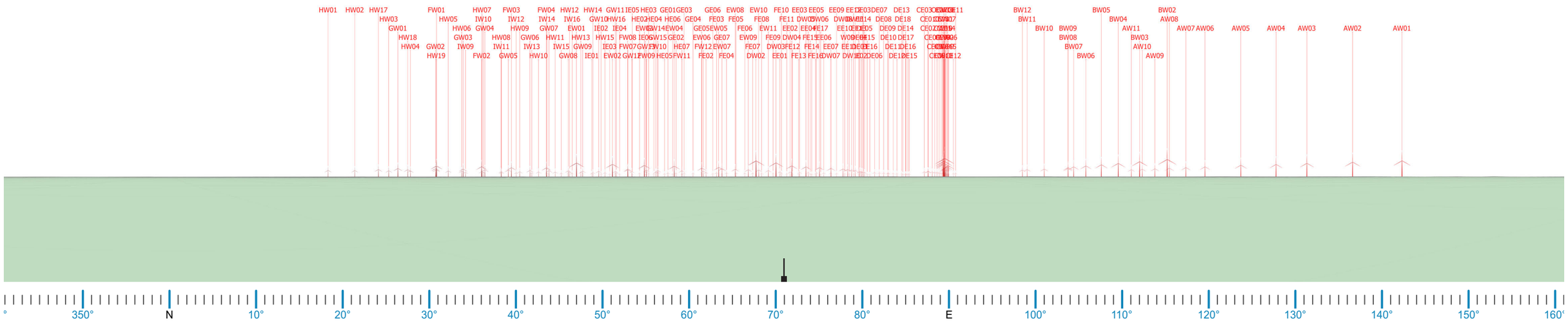


Proposed View | 180º Photomontage

Photomontage 03 Private Viewpoint PD03



Proposed View | 180º Photomontage



Wireframe Diagram

Photomontage 03 Private Viewpoint PD03



60º Photomontage 03 Cropped 01

Photomontage 03 Private Viewpoint PD03



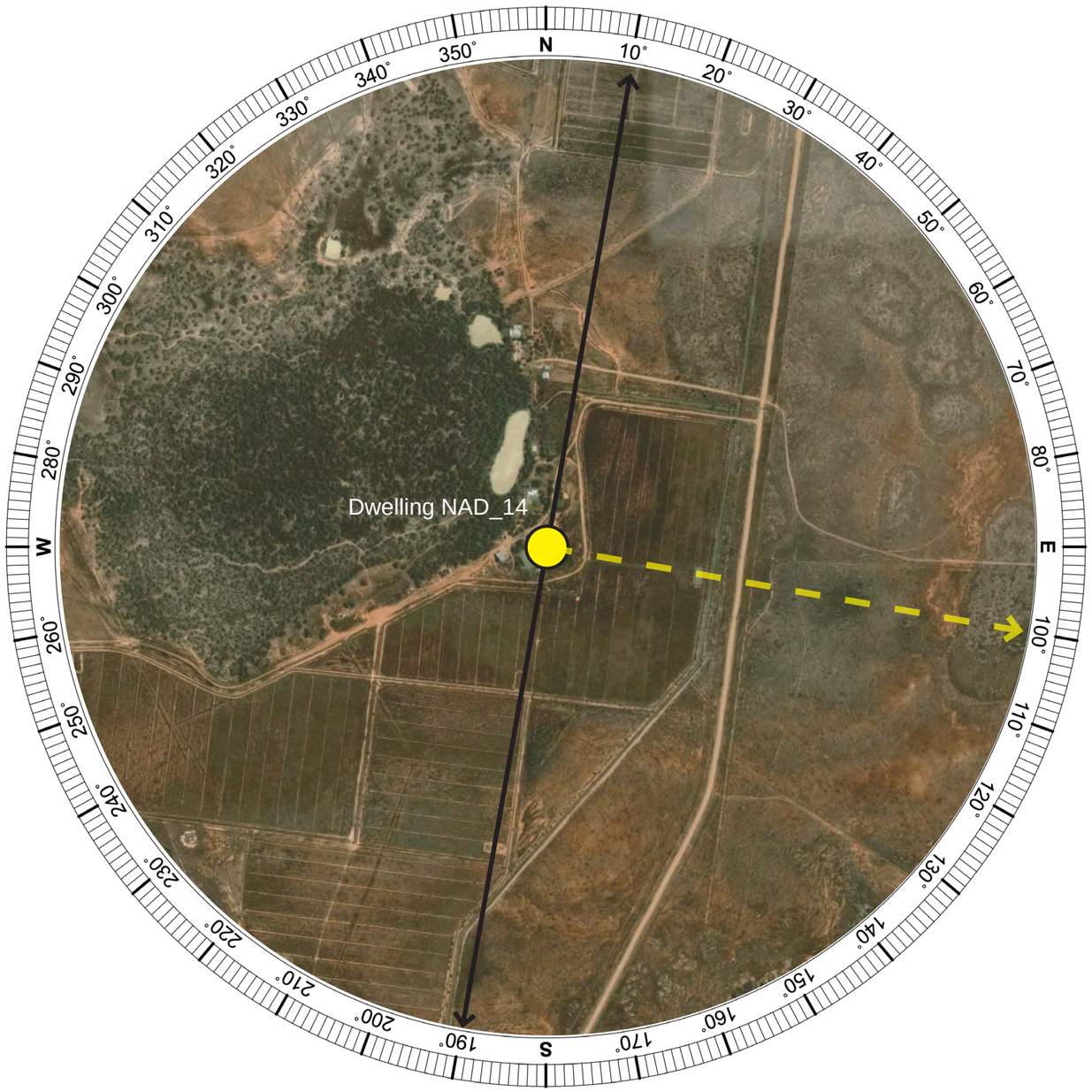
60º Photomontage 03 Cropped 02

Photomontage 03 Private Viewpoint PD03



60º Photomontage 03 Cropped 03

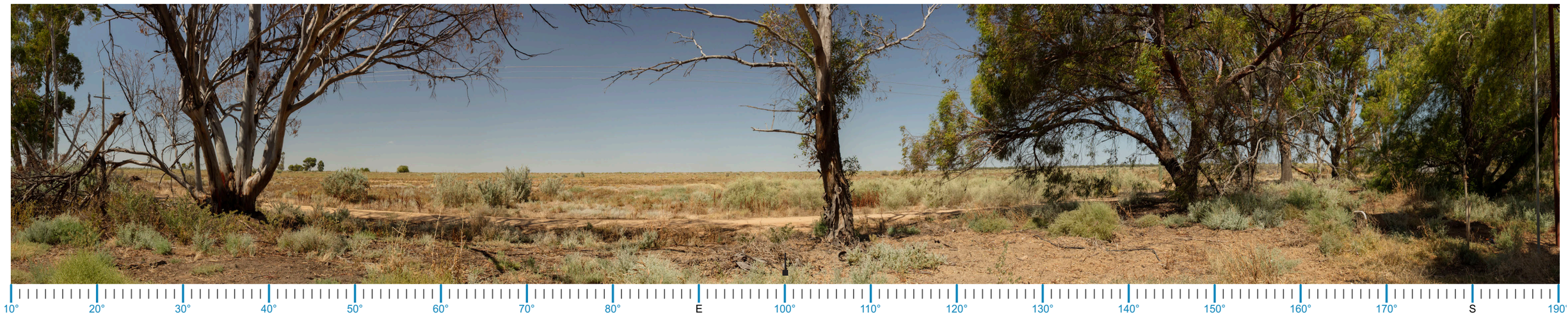
Photomontage 04 Private Viewpoint PD04



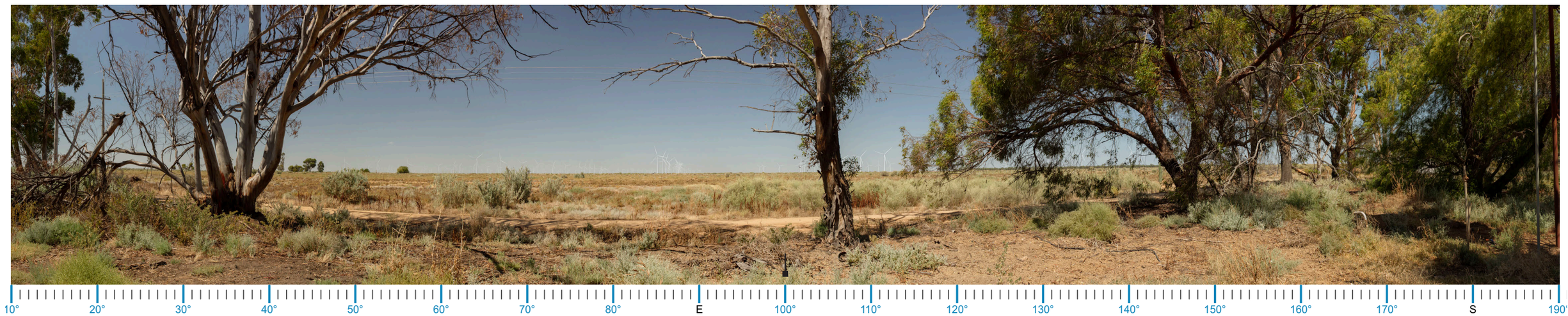
Photomontage 04
Dwelling ID
Dwelling NAD_14
Photograph Date and Time:
07/03/2023 2:55 pm
Coordinates:
34°48’28.34”S 144°37’14.80”E
Distance to Nearest Visible WTG:
4.75 km
Viewing Direction:
East
Elevation:
84 m

Aerial Image - Photomontage Location (Aerial Image Source: Google Earth 2020)

Photomontage 04 Private Viewpoint PD04

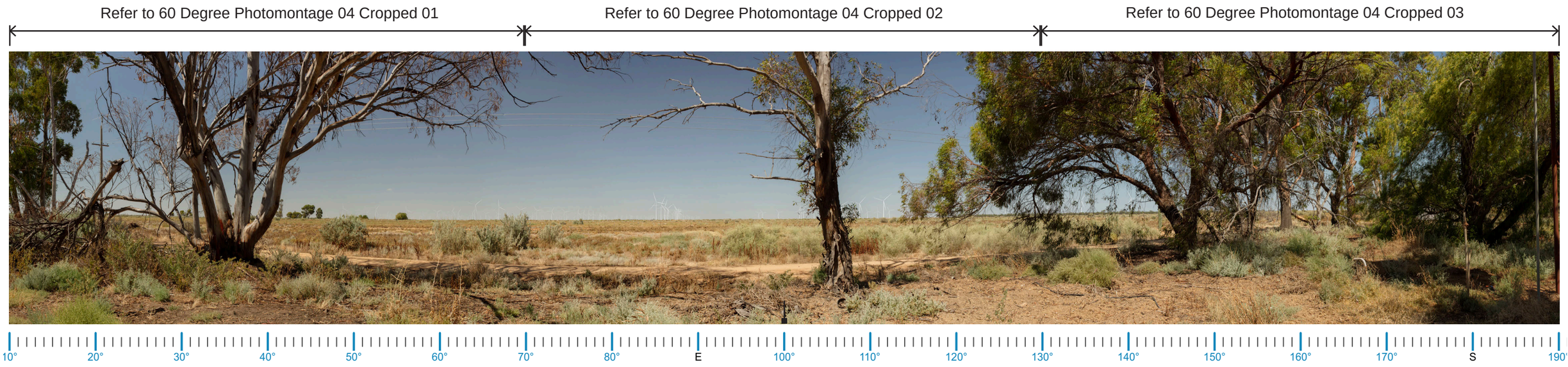


Existing View | 180º Baseline Panorama

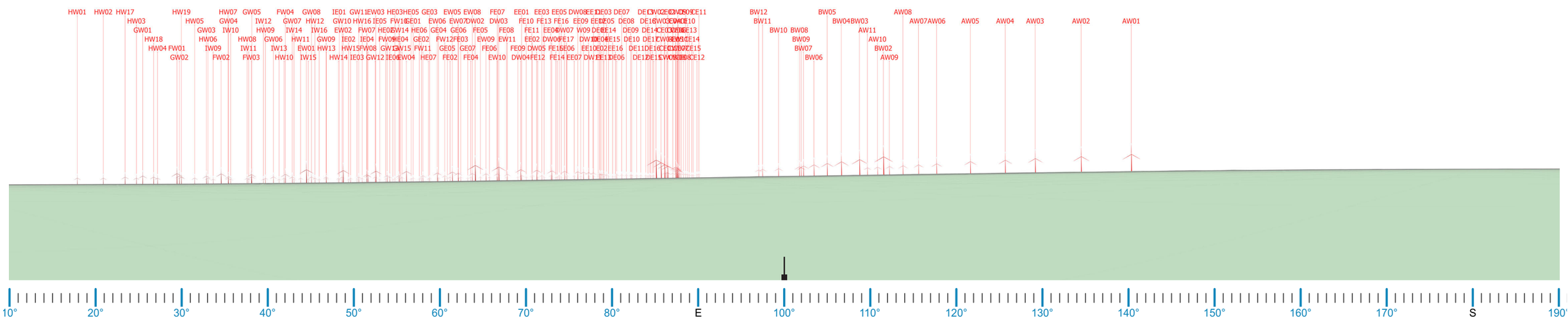


Proposed View | 180º Photomontage

Photomontage 04 Private Viewpoint PD04



Proposed View | 180º Photomontage



Wireframe Diagram

Photomontage 04 Private Viewpoint PD04



10° 20° 30° 40° 50° 60° 70°

60º Photomontage 04 Cropped 01

Photomontage 04 Private Viewpoint PD04



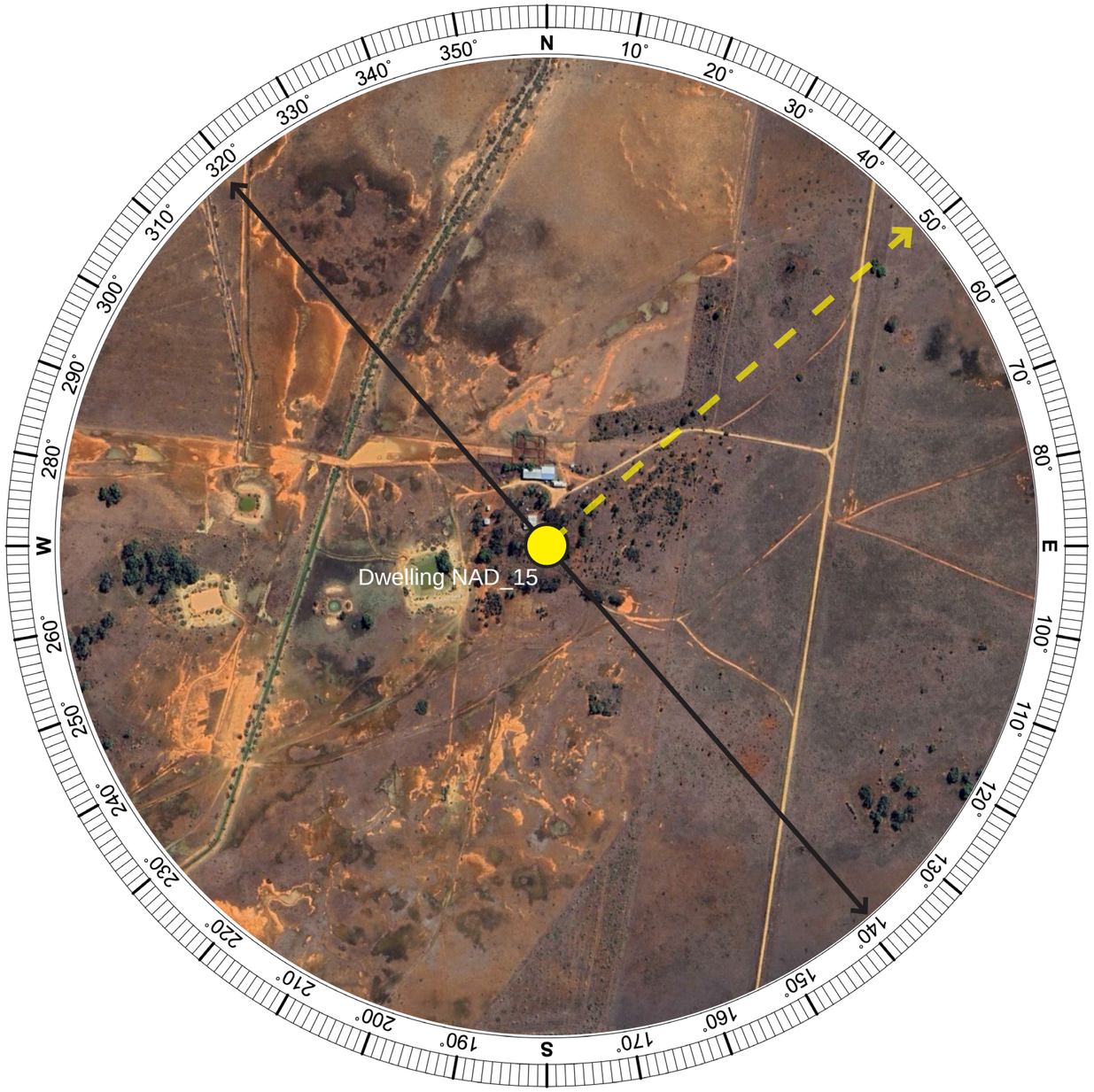
60º Photomontage 04 Cropped 02

Photomontage 04 Private Viewpoint PD04



60º Photomontage 04 Cropped 03

Photomontage 05 Private Viewpoint PD05



Photomontage 05
Dwelling ID
Dwelling NAD_15
Photograph Date and Time:
07/03/2023 3:29 pm
Coordinates:
34°51’47.89”S 144°35’55.44”E
Distance to Nearest Visible WTG:
4.29 km
Viewing Direction:
Northeast
Elevation:
83 m

Aerial Image - Photomontage Location (Aerial Image Source: Google Earth 2022)

Photomontage 05 Private Viewpoint PD05



Existing View | 180º Baseline Panorama



Proposed View | 180º Photomontage

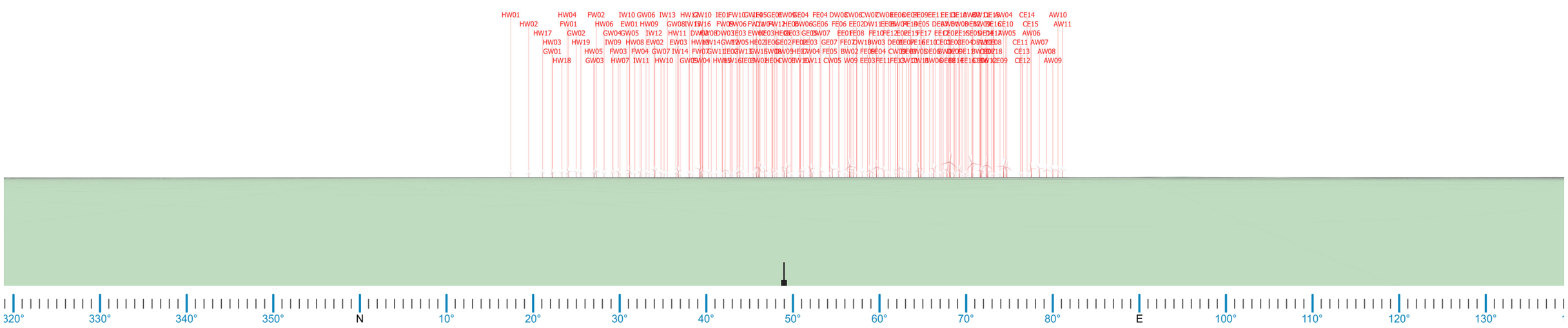
Photomontage 05 Private Viewpoint PD05

Refer to 60 Degree Photomontage 05 Cropped 01

Refer to 60 Degree Photomontage 05 Cropped 02



Proposed View | 180º Photomontage



Wireframe Diagram

Photomontage 05 Private Viewpoint PD05



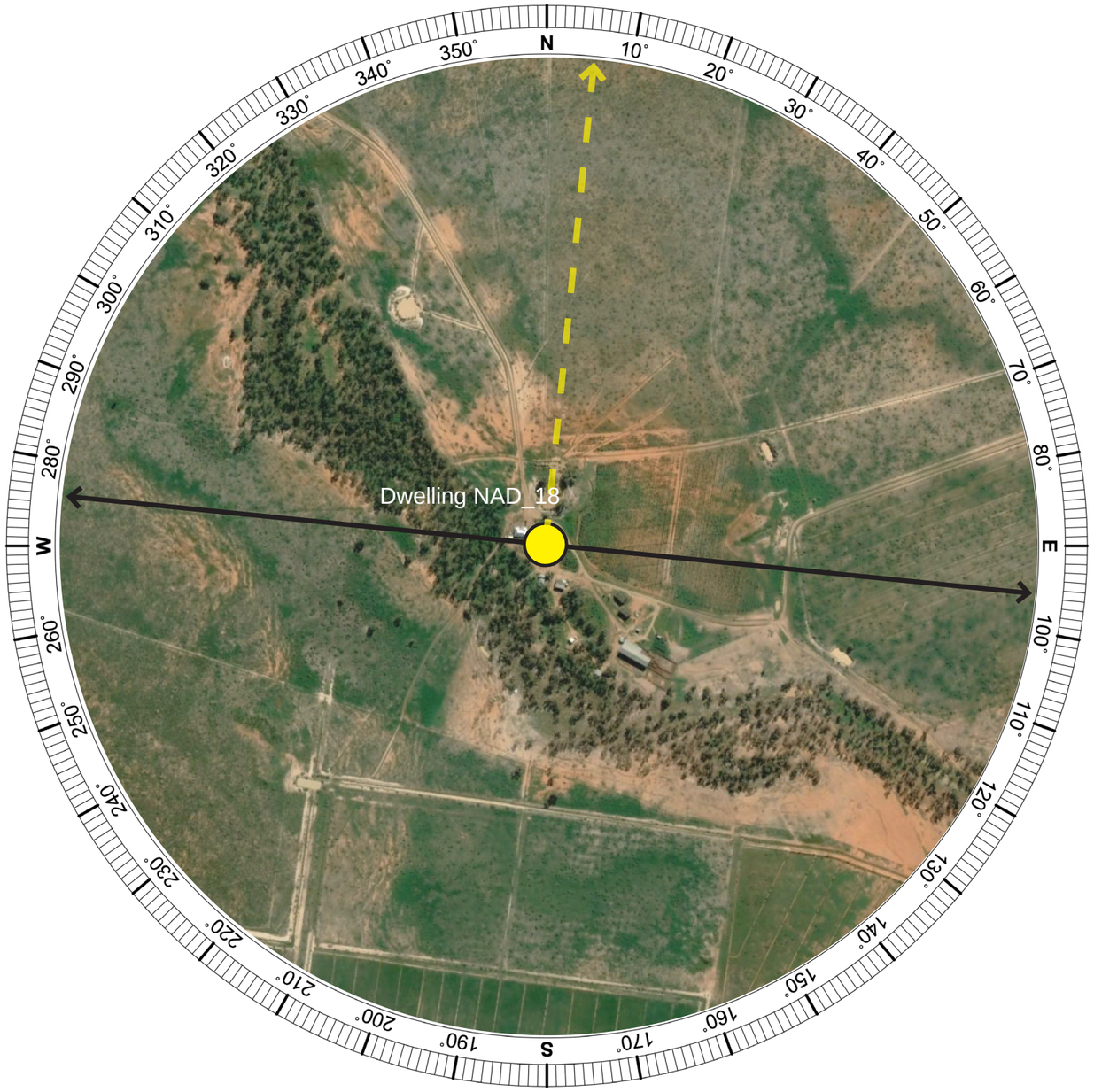
60º Photomontage 05 Cropped 01

Photomontage 05 Private Viewpoint PD05



60º Photomontage 05 Cropped 02

Photomontage 06 Private Viewpoint PD06



Aerial Image - Photomontage Location (Aerial Image Source: Google Earth 2020)

Photomontage 06

Dwelling ID

Dwelling NAD_18

Photograph Date and Time:

07/03/2023 5:36 pm

Coordinates:

34°53’27.62”S 144°47’3.78”E

Distance to Nearest Visible WTG:

4.21 km

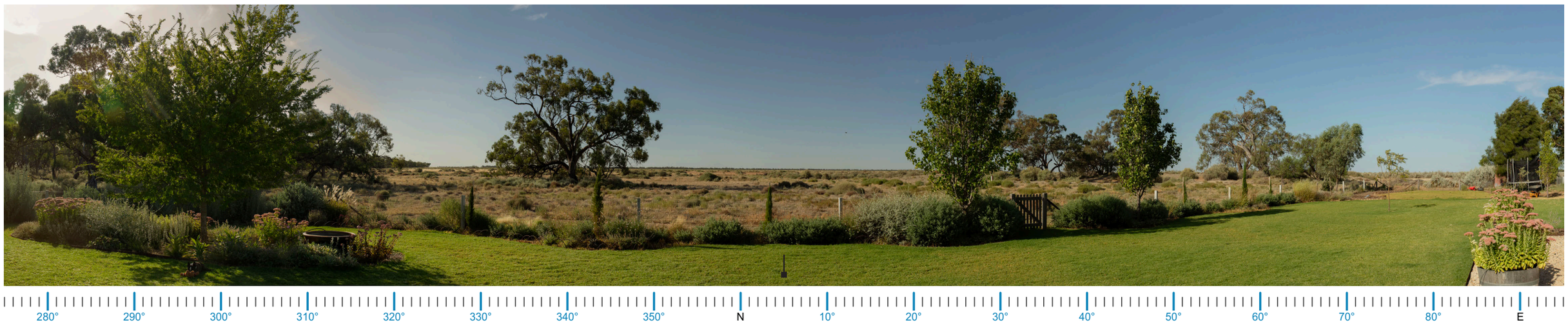
Viewing Direction:

North

Elevation:

84 m

Photomontage 06 Private Viewpoint PD06



Existing View | 180º Baseline Panorama



Proposed View | 180º Photomontage

Photomontage 06 Private Viewpoint PD06

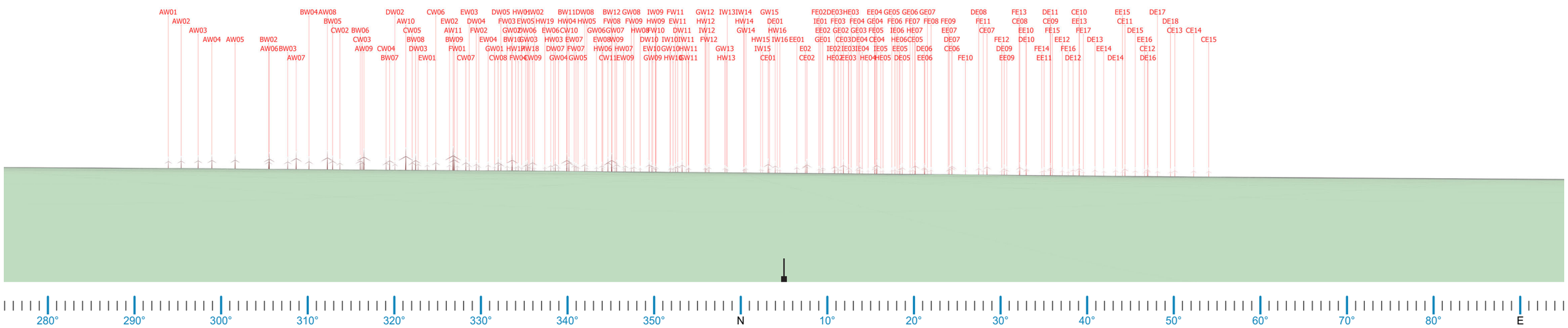
Refer to 60 Degree Photomontage 06 Cropped 01

Refer to 60 Degree Photomontage 06 Cropped 02

Refer to 60 Degree Photomontage 06 Cropped 03



Proposed View | 180º Photomontage



Wireframe Diagram

Photomontage 06 Private Viewpoint PD06



60º Photomontage 06 Cropped 01

Photomontage 06 Private Viewpoint PD06



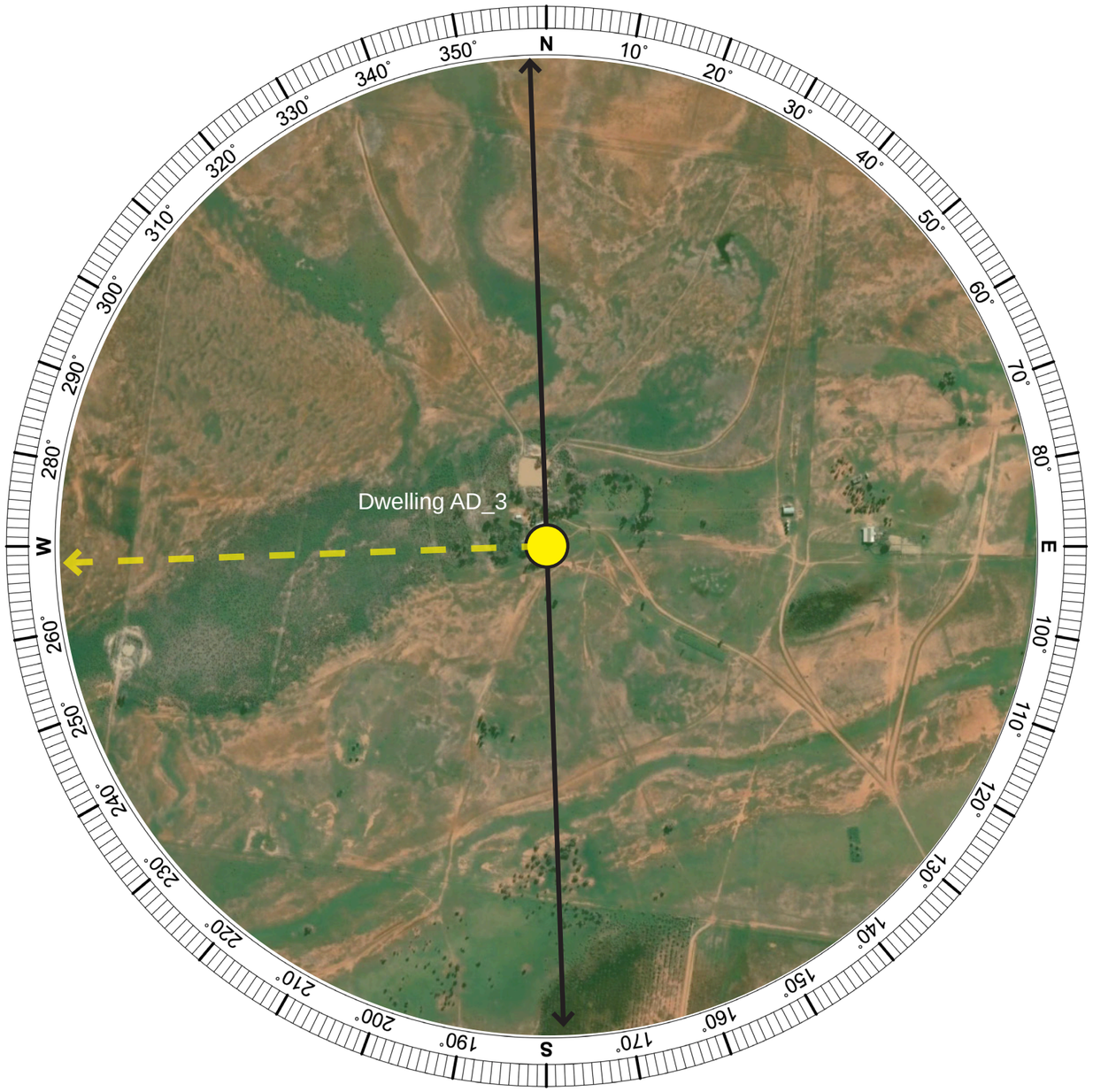
60º Photomontage 06 Cropped 02

Photomontage 06 Private Viewpoint PD06



60º Photomontage 06 Cropped 03

Photomontage 07 Private Viewpoint PD07



Aerial Image - Photomontage Location (Aerial Image Source: Google Earth 2020)

Photomontage 07

Dwelling ID

Dwelling AD_3

Photograph Date and Time:

07/03/2023 8:41am

Coordinates:

34°44’22.26”S 144°59’42.68”E

Distance to Nearest Visible WTG:

4.58 km

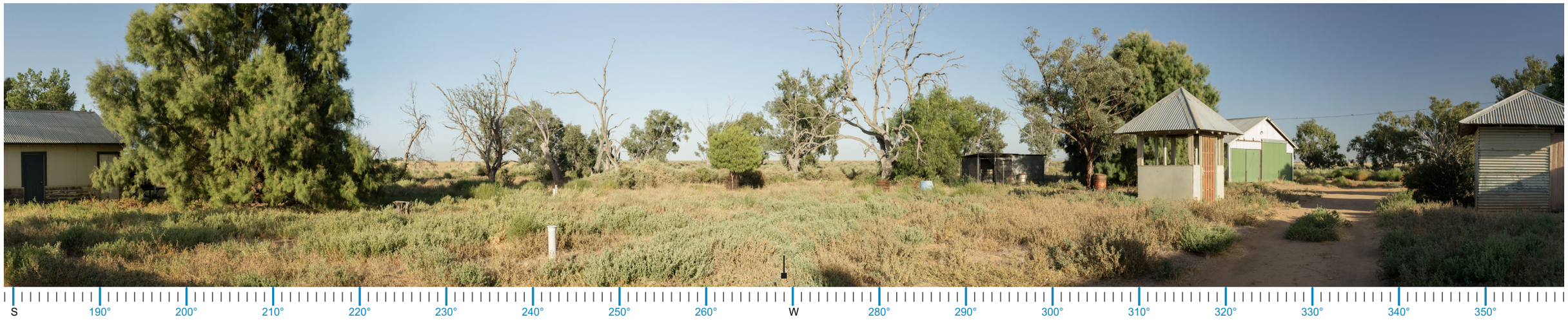
Viewing Direction:

West

Elevation:

92 m

Photomontage 07 Private Viewpoint PD07

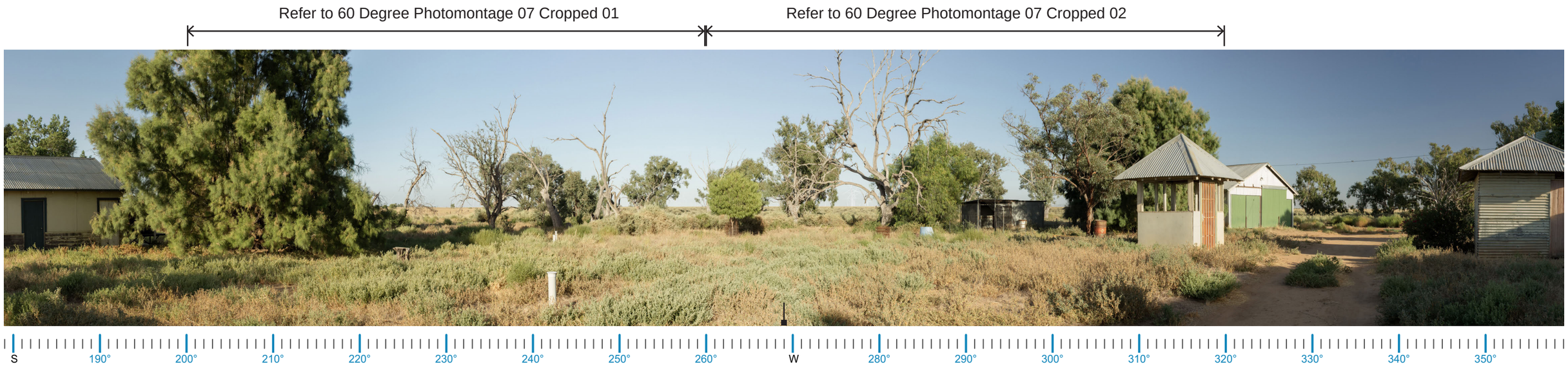


Existing View | 180º Baseline Panorama

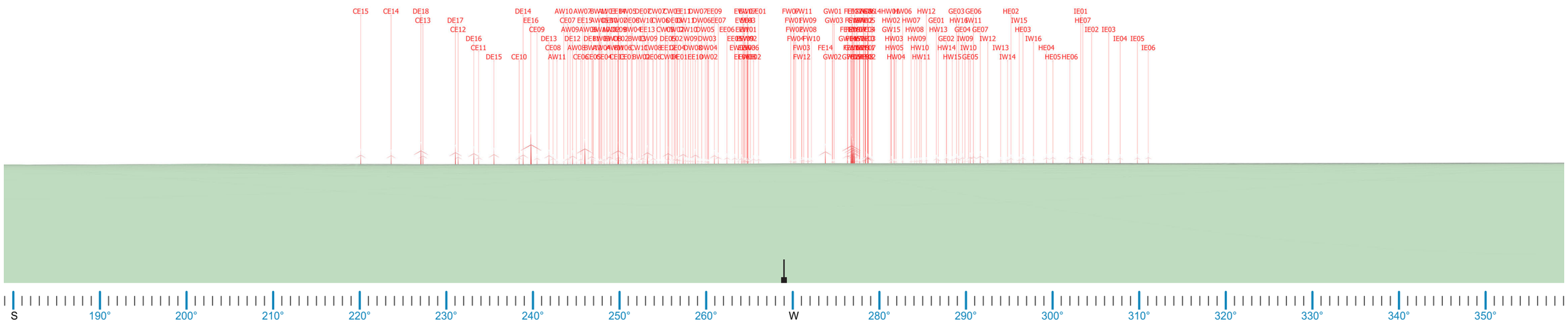


Proposed View | 180º Photomontage

Photomontage 07 Private Viewpoint PD07



Proposed View | 180º Photomontage



Wireframe Diagram

Photomontage 07 Private Viewpoint PD07



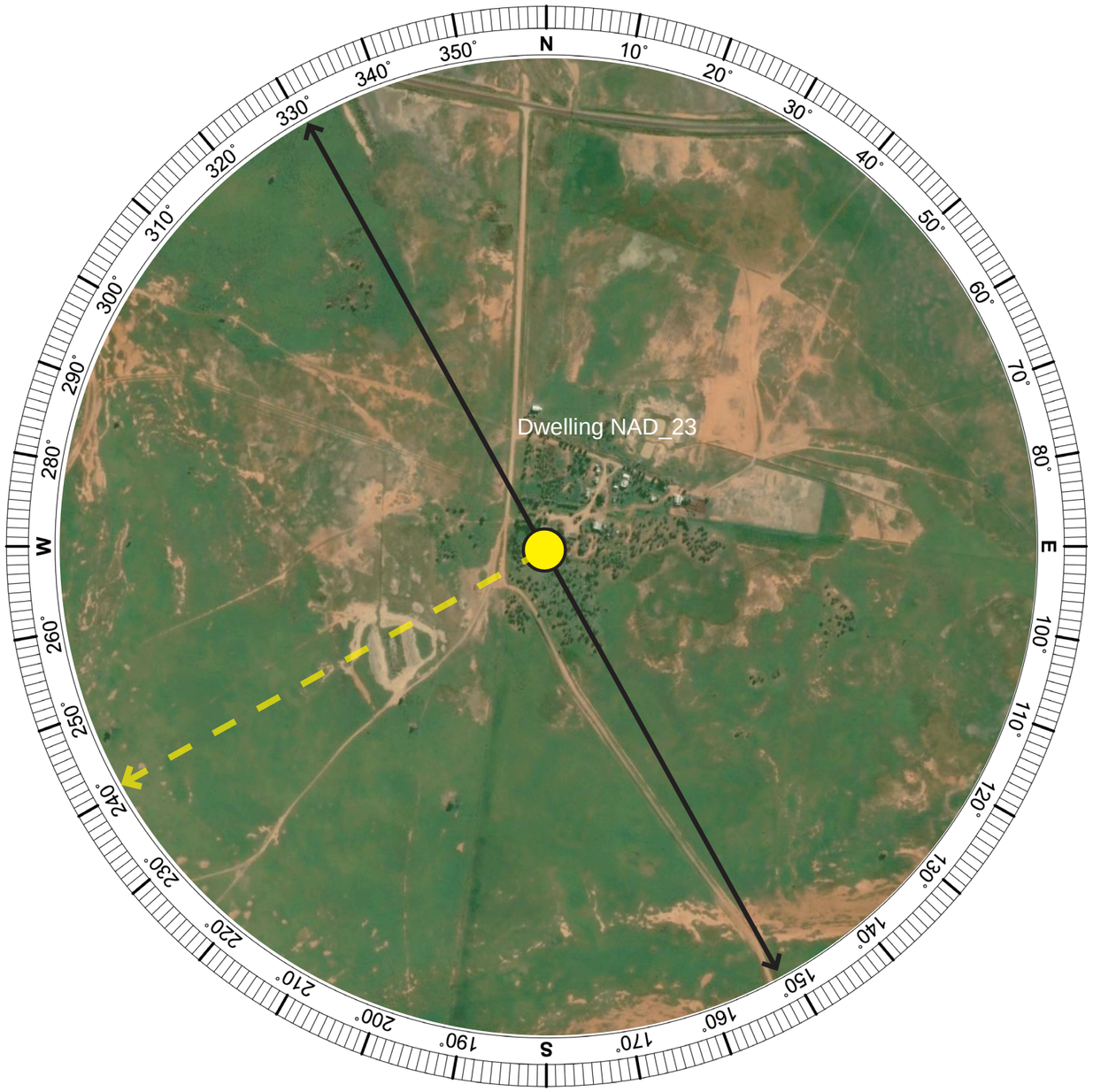
60º Photomontage 07 Cropped 01

Photomontage 07 Private Viewpoint PD07



60º Photomontage 07 Cropped 02

Photomontage 08 Private Viewpoint PD08 (with blue sky)



Aerial Image - Photomontage Location (Aerial Image Source: Google Earth 2020)

Photomontage 8

Dwelling ID

Dwelling NAD_23

Photograph Date and Time:

08/03/2023 9:48 am

Coordinates:

34°40’47.30”S 144°59’29.32”E

Distance to Nearest Visible WTG:

7.60 km

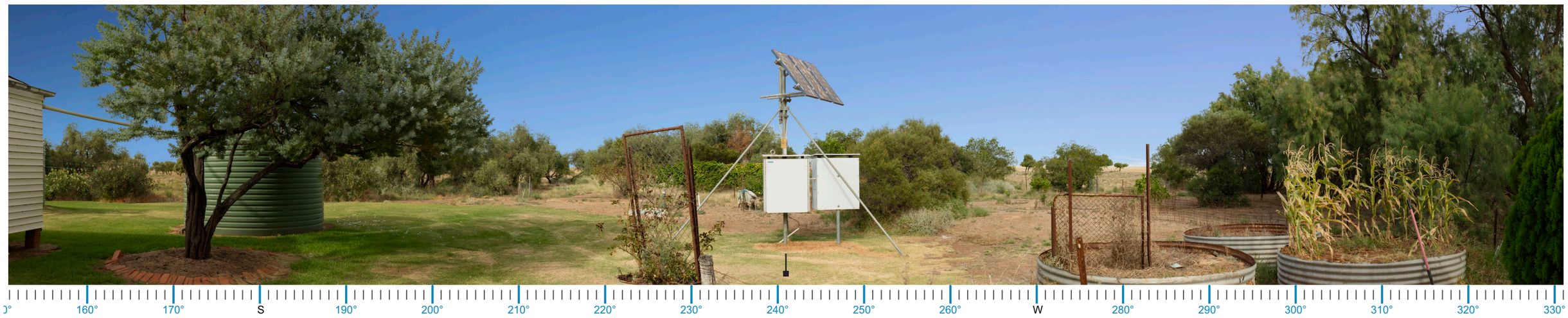
Viewing Direction:

Southwest

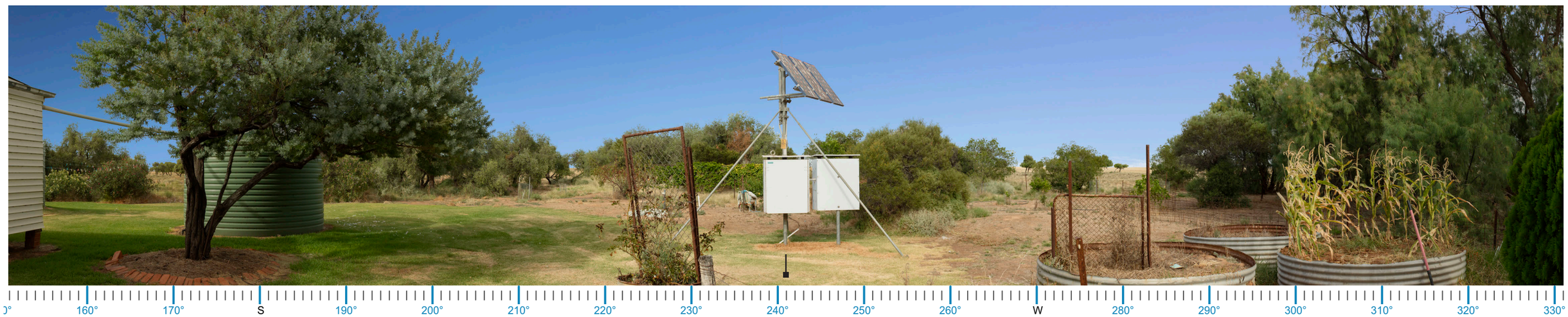
Elevation:

95 m

Photomontage 08 Private Viewpoint PD08 (with blue sky)



Existing View | 180º Baseline Panorama

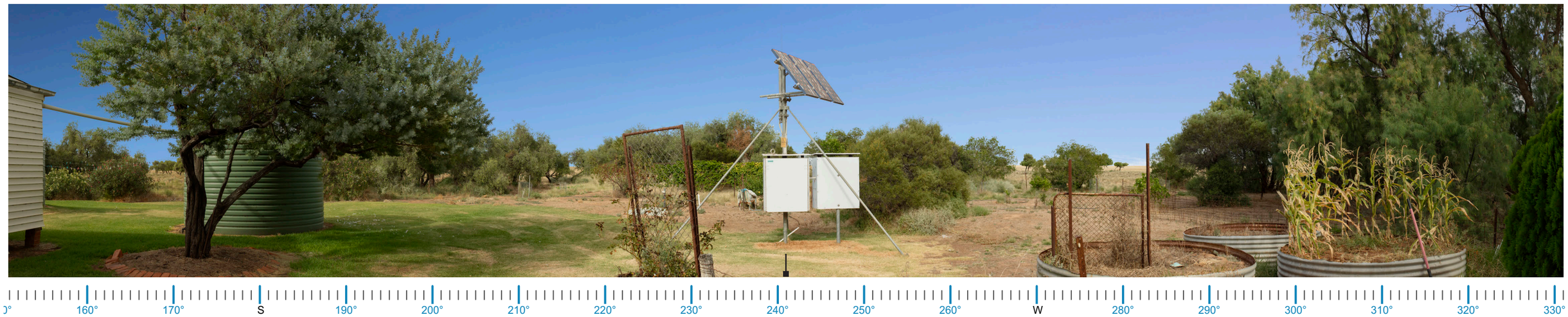


Proposed View | 180º Photomontage (Modified Sky)

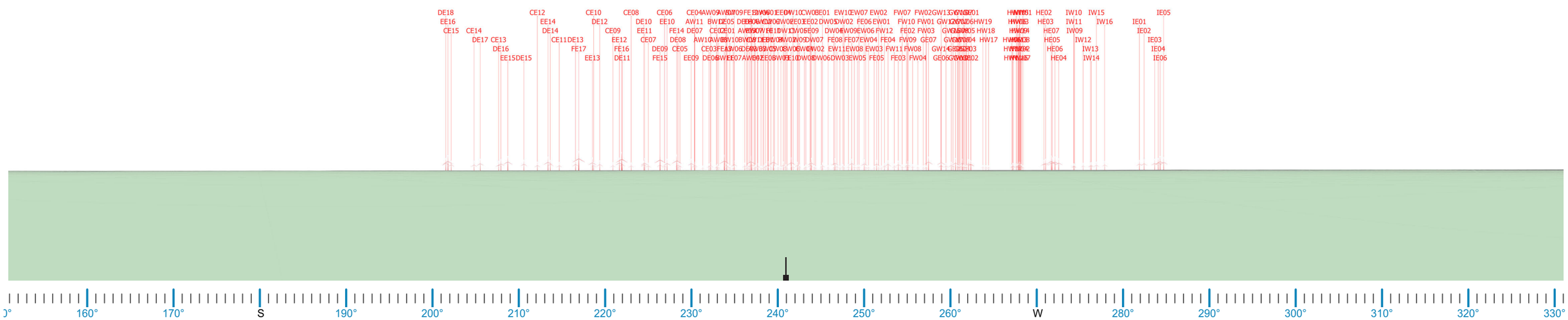
Photomontage 08 Private Viewpoint PD08 (with blue sky)

Refer to 60 Degree Photomontage 08 Cropped 01

Refer to 60 Degree Photomontage 08 Cropped 02



Proposed View | 180º Photomontage



Wireframe Diagram

Photomontage 08 Private Viewpoint PD08 (with blue sky)



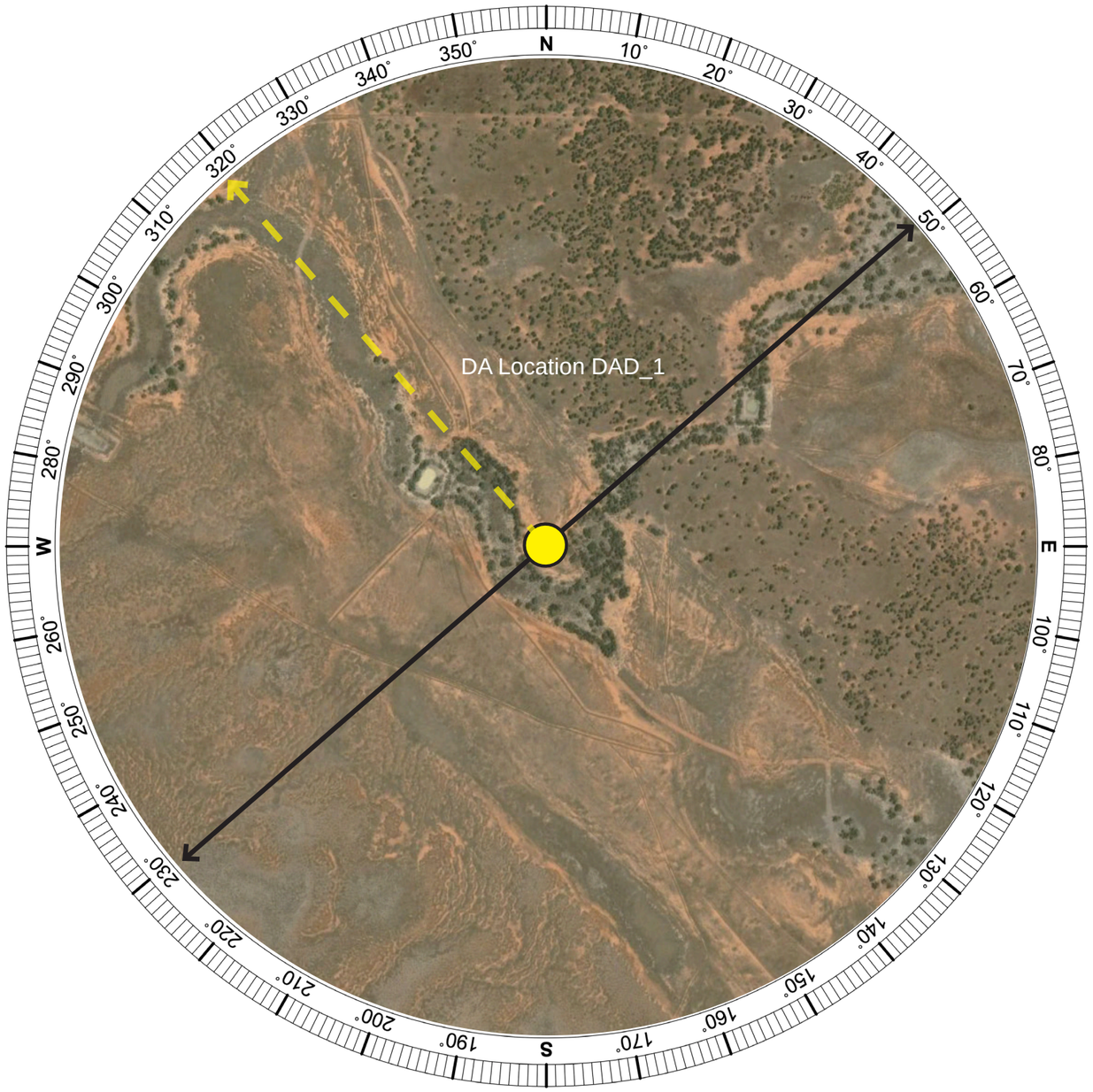
60º Photomontage 08 Cropped 01

Photomontage 08 Private Viewpoint PD08 (with blue sky)



60º Photomontage 08 Cropped 02

Photomontage 09 Private Viewpoint PD09



Aerial Image - Photomontage Location (Aerial Image Source: Google Earth 2020)

Photomontage 09

Dwelling ID

DA Location DAD_1

Photograph Date and Time:

08/03/2023 1:00 pm

Coordinates:

34°51’25.47”S 144°56’47.77”E

Distance to Nearest Visible WTG:

6.08 km

Viewing Direction:

Northwest

Elevation:

92 m

Photomontage 09 Private Viewpoint PD09

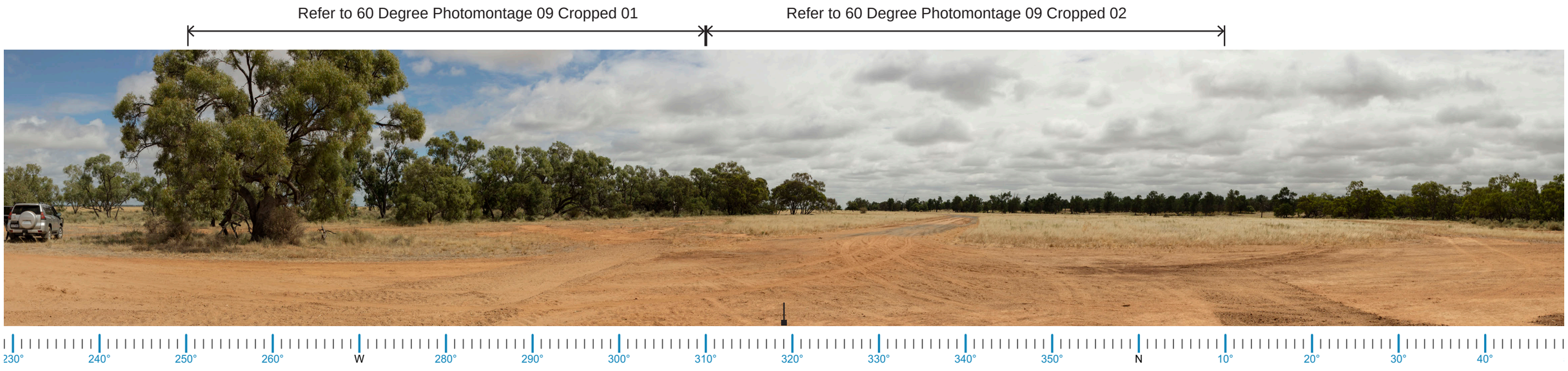


Existing View | 180º Baseline Panorama

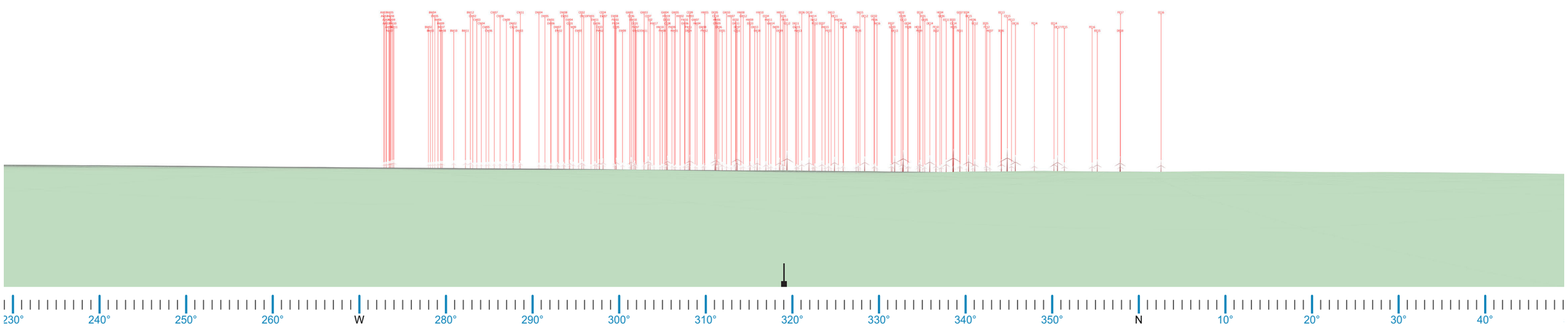


Proposed View | 180º Photomontage

Photomontage 09 Private Viewpoint PD09



Proposed View | 180º Photomontage



Wireframe Diagram

Photomontage 09 Private Viewpoint PD09



60º Photomontage 09 Cropped 01

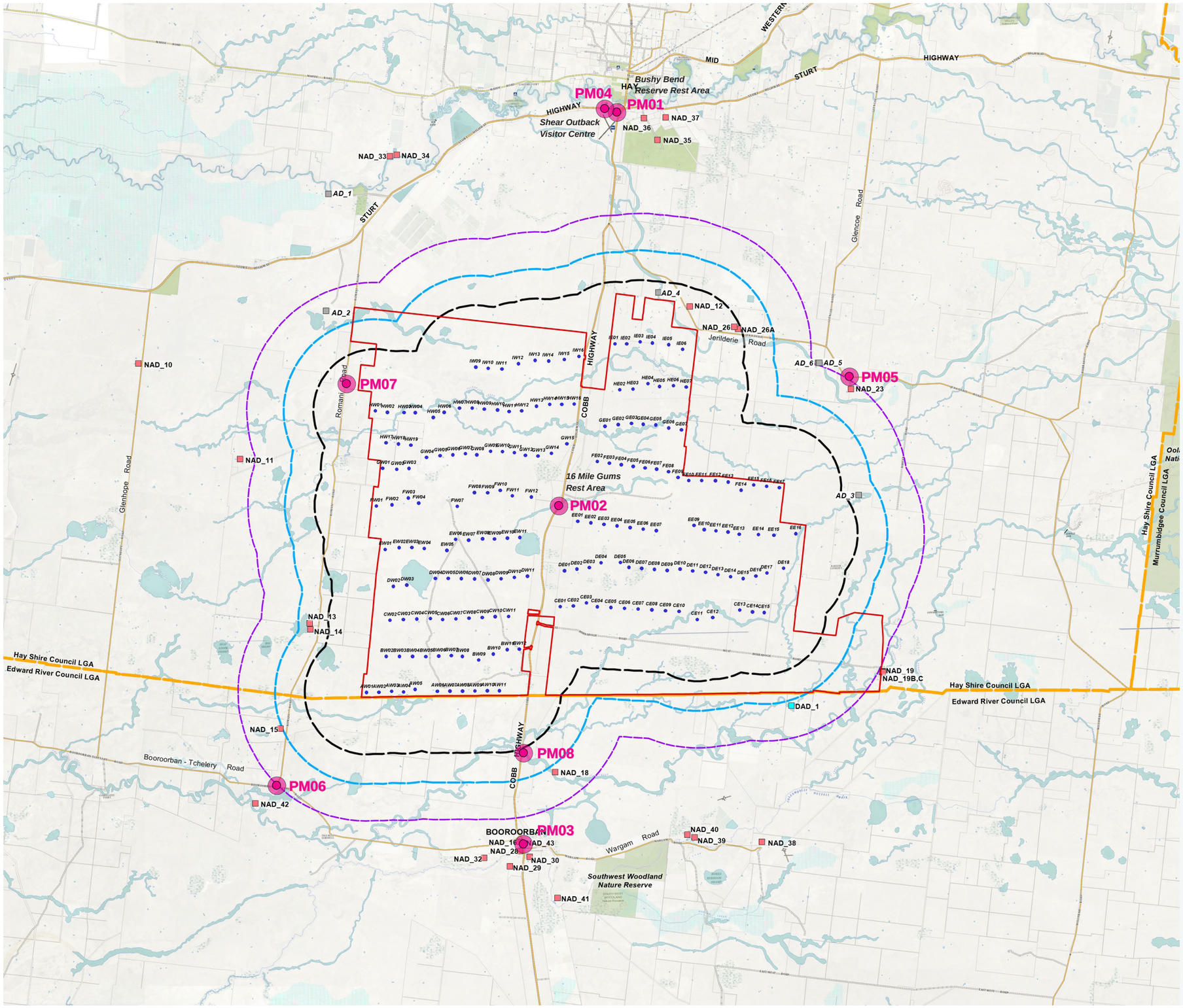
Photomontage 09 Private Viewpoint PD09



60º Photomontage 09 Cropped 02

D

Photomontages & Wireframe Diagrams (Public Receptors)



Photomontage Locations (Public Receptors)

The Plains Renewable Energy Park Wind Farm

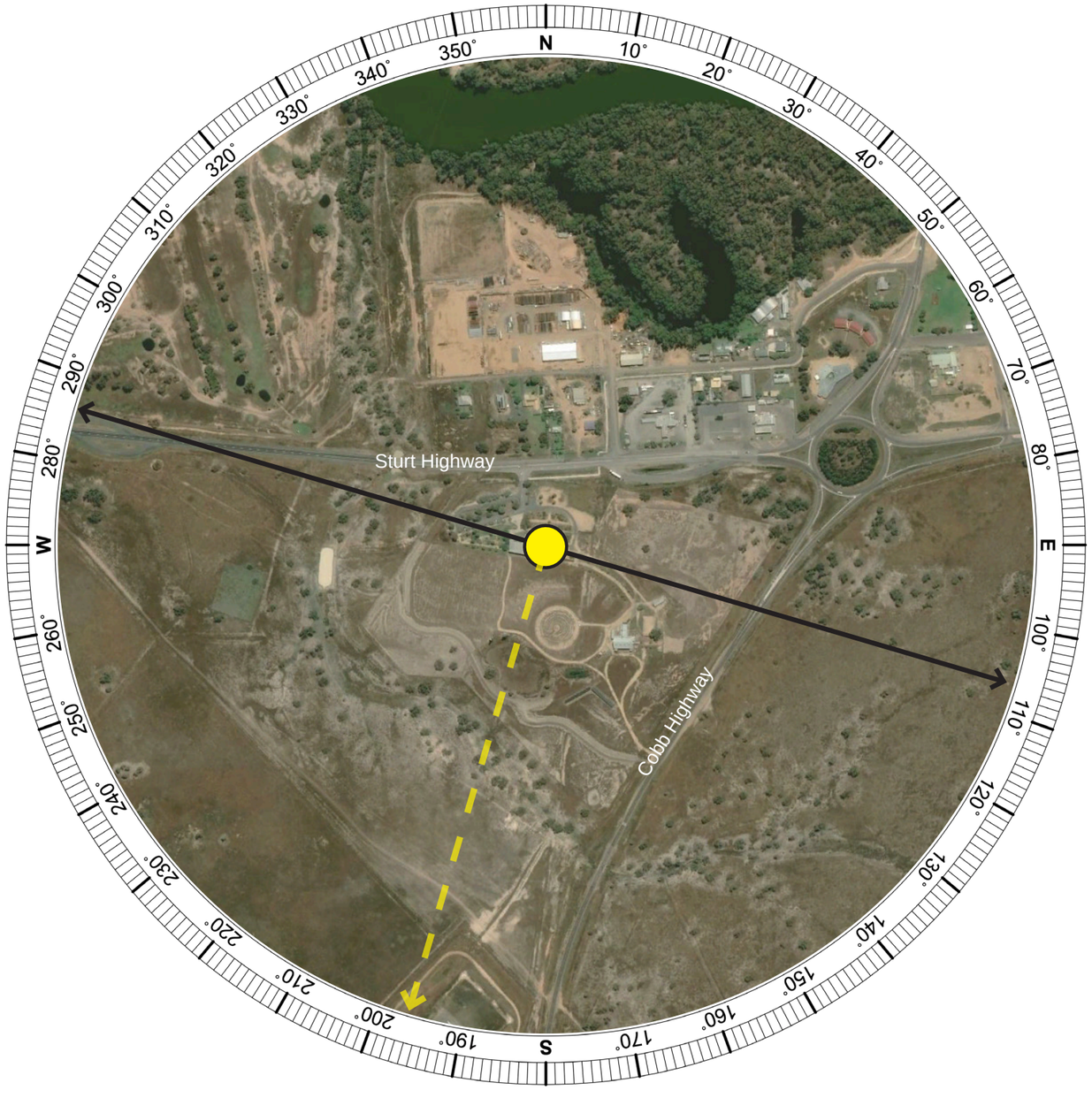
- Project Area boundary
- Proposed Turbine Location
- Associated Dwellings
- Non-associated Dwellings
- DA Locations
- 3,850 m from turbine (black line of visual magnitude)
- 5,700 m from turbine (blue line of visual magnitude)
- 8,000 m from turbine (extent of Study Area)
- Main Road
- Minor Road
- LGA Boundary
- Photomontage Location (public receptors)

N

0 4 8 12 16km

Appendix D Photomontage Locations - Public Receptors (Map Source: Six Maps 2020)

Photomontage 01 Public Viewpoint PM01



Aerial Image - Photomontage Location (Aerial Image Source: Google Earth 2020)

Photomontage 01

Location:

Shear Outback Visitor Centre, Sturt Highway, Hay South NSW

Photograph Date and Time:

8th March 2023 10:27 am

Coordinates:

34°31’18.74”S 144°50’9.89”E

Distance to Nearest Visible WTG:

14.35 km

Viewing Direction:

South

Elevation:

91 m

Photomontage 01 Public Viewpoint PM01 (with blue sky)

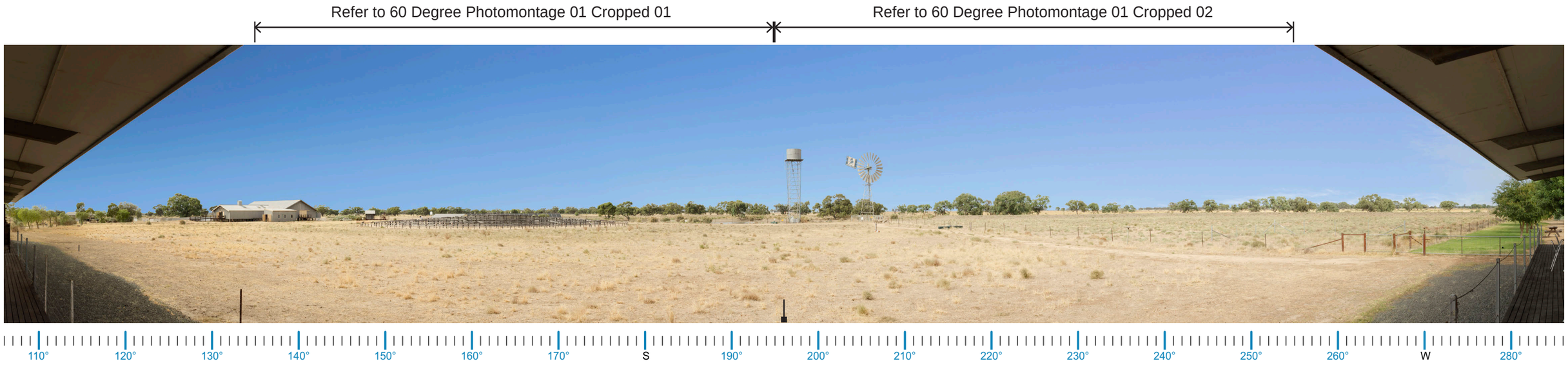


Existing View | 180º Baseline Panorama

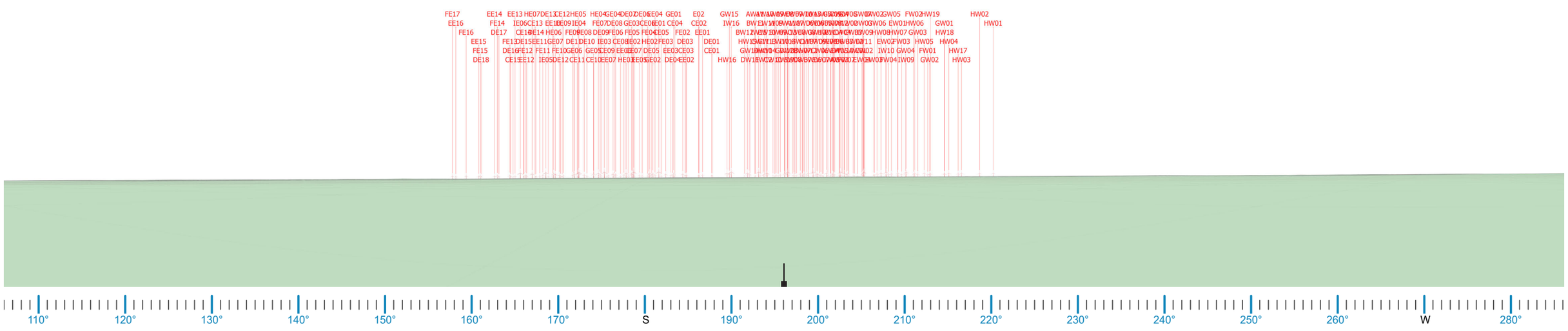


Proposed View | 180º Photomontage (Modified Sky)

Photomontage 01 Public Viewpoint PM01 (with blue sky)



Proposed View | 180º Photomontage (Modified Sky)



Wireframe Diagram

Photomontage 01 Public Viewpoint PM01 (with blue sky)



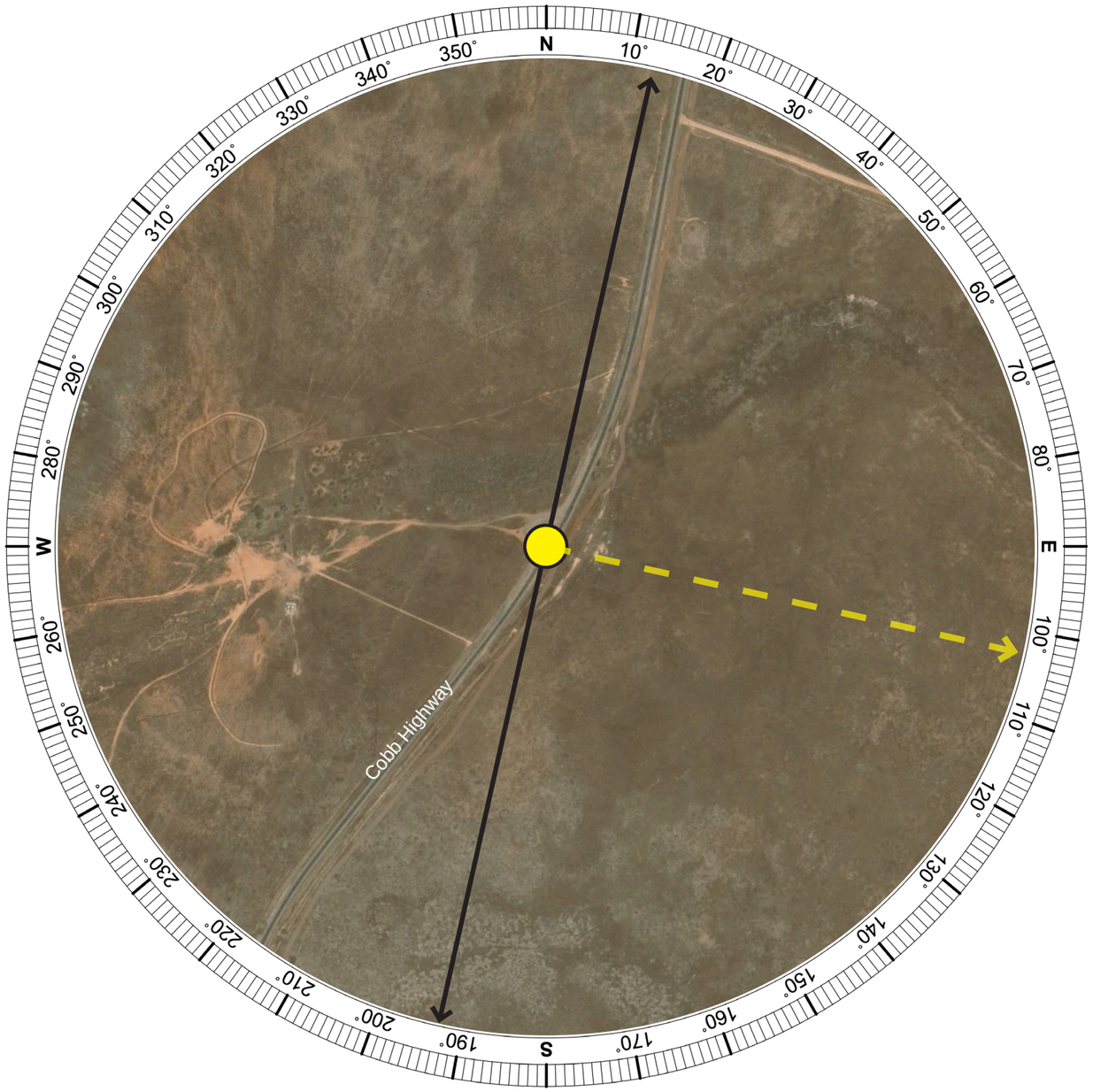
60º Photomontage 01 Cropped 01

Photomontage 01 Public Viewpoint PM01 (with blue sky)



60º Photomontage 01 Cropped 02

Photomontage 02 East Public Viewpoint PM02



Aerial Image - Photomontage Location (Aerial Image Source: Google Earth 2020)

Photomontage 02

Location:

16 Mile Gums Rest Area, Cobb Hwy, Booroorban NSW

Photograph Date and Time:

11th November 2021 01:40 pm

Coordinates:

34°44’30.02”S 144°47’30.21”E

Distance to Nearest Visible WTG:

1.50 km

Viewing Direction:

East

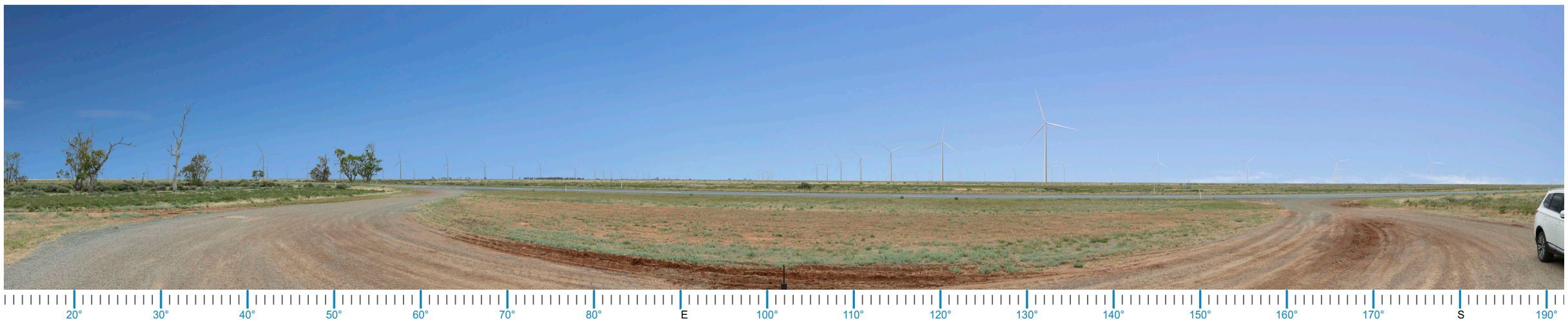
Elevation:

88 m

Photomontage 02 East Public Viewpoint PM02 (with blue sky)

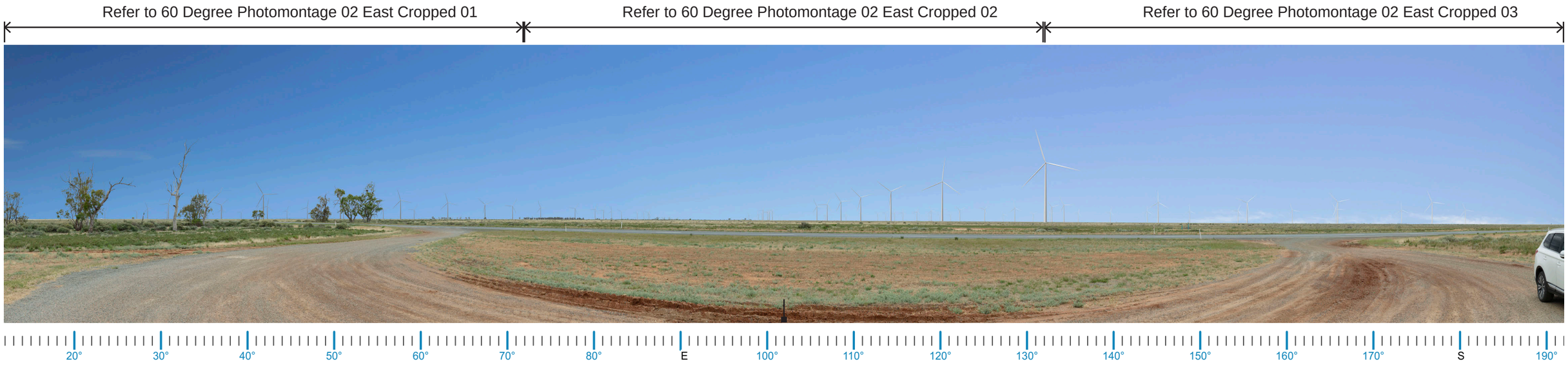


Existing View | 180º Baseline Panorama

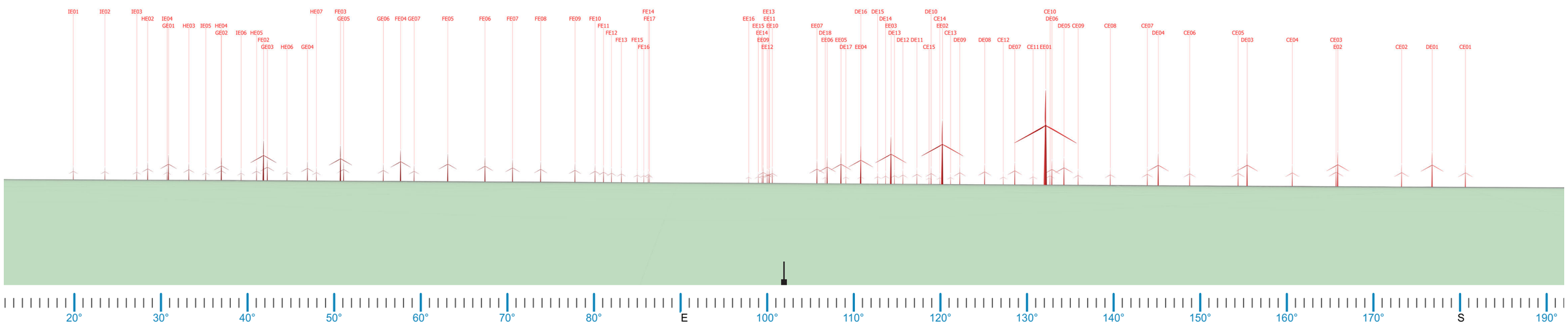


Proposed View | 180º Photomontage (Modified sky)

Photomontage 02 East Public Viewpoint PM02 (with blue sky)



Proposed View | 180º Photomontage (Modified sky)



Wireframe Diagram

Photomontage 02 East Public Viewpoint PM02 (with blue sky)



60º Photomontage 02 East Cropped 01

Photomontage 02 East Public Viewpoint PM02 (with blue sky)



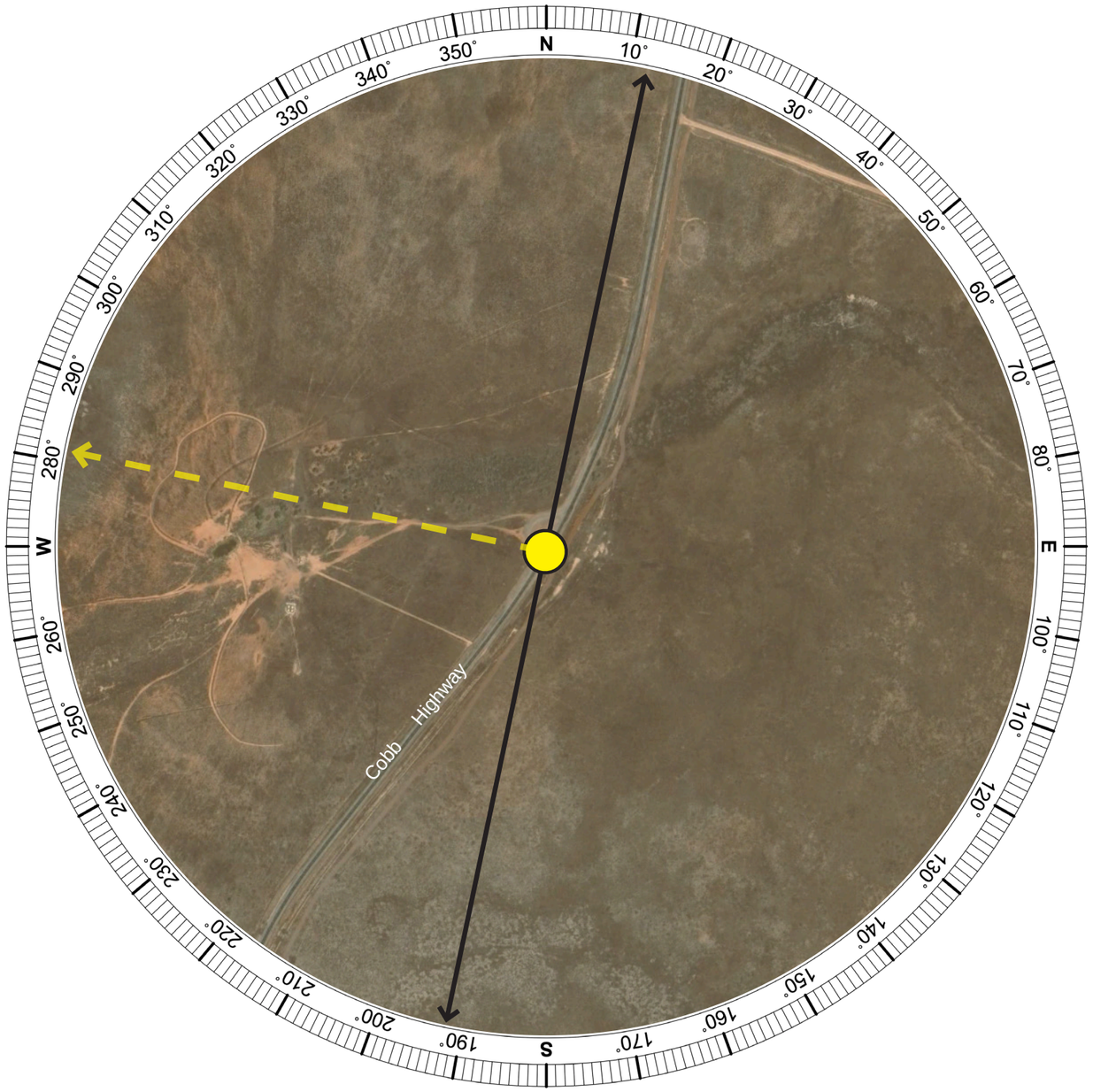
60º Photomontage 02 East Cropped 02

Photomontage 02 East Public Viewpoint PM02 (with blue sky)



60º Photomontage 02 East Cropped 03

Photomontage 02 West Public Viewpoint PM02



Aerial Image - Photomontage Location (Aerial Image Source: Google Earth 2020)

Photomontage 02

Location:

16 Mile Gums Rest Area, Cobb Hwy, Booroorban NSW

Photograph Date and Time:

11th November 2021 01:40 pm

Coordinates:

34°44’30.02”S 144°47’30.21”E

Distance to Nearest Visible WTG:

1.50 km

Viewing Direction:

West

Elevation:

88 m

Photomontage 02 West Public Viewpoint PM02 (with blue sky)

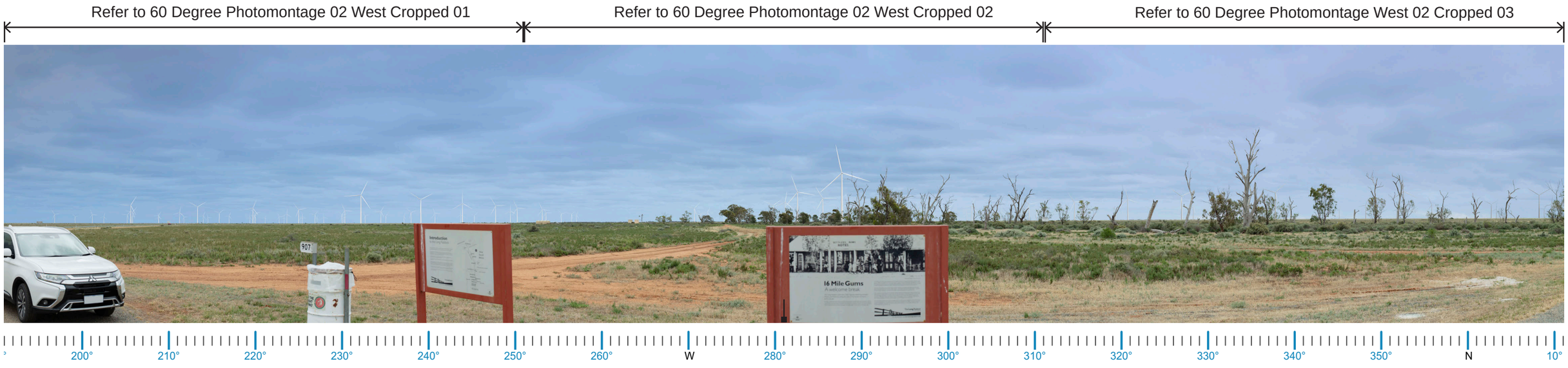


Existing View | 180º Baseline Panorama

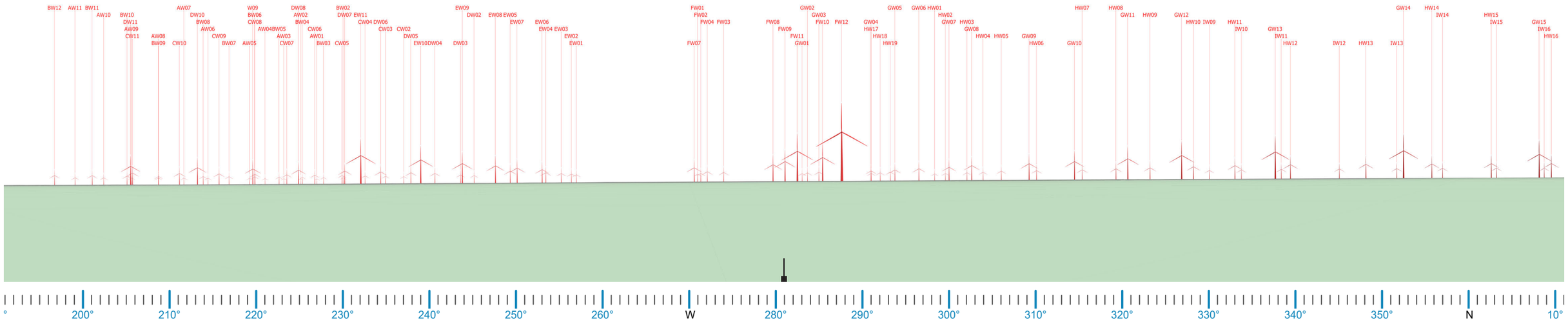


Proposed View | 180º Photomontage (Modified sky)

Photomontage 02 West Public Viewpoint PM02 (with blue sky)



Proposed View | 180º Photomontage (Modified sky)



Wireframe Diagram

Photomontage 02 West Public Viewpoint PM02 (with blue sky)



60º Photomontage 02 West Cropped 01

Photomontage 02 West Public Viewpoint PM02 (with blue sky)



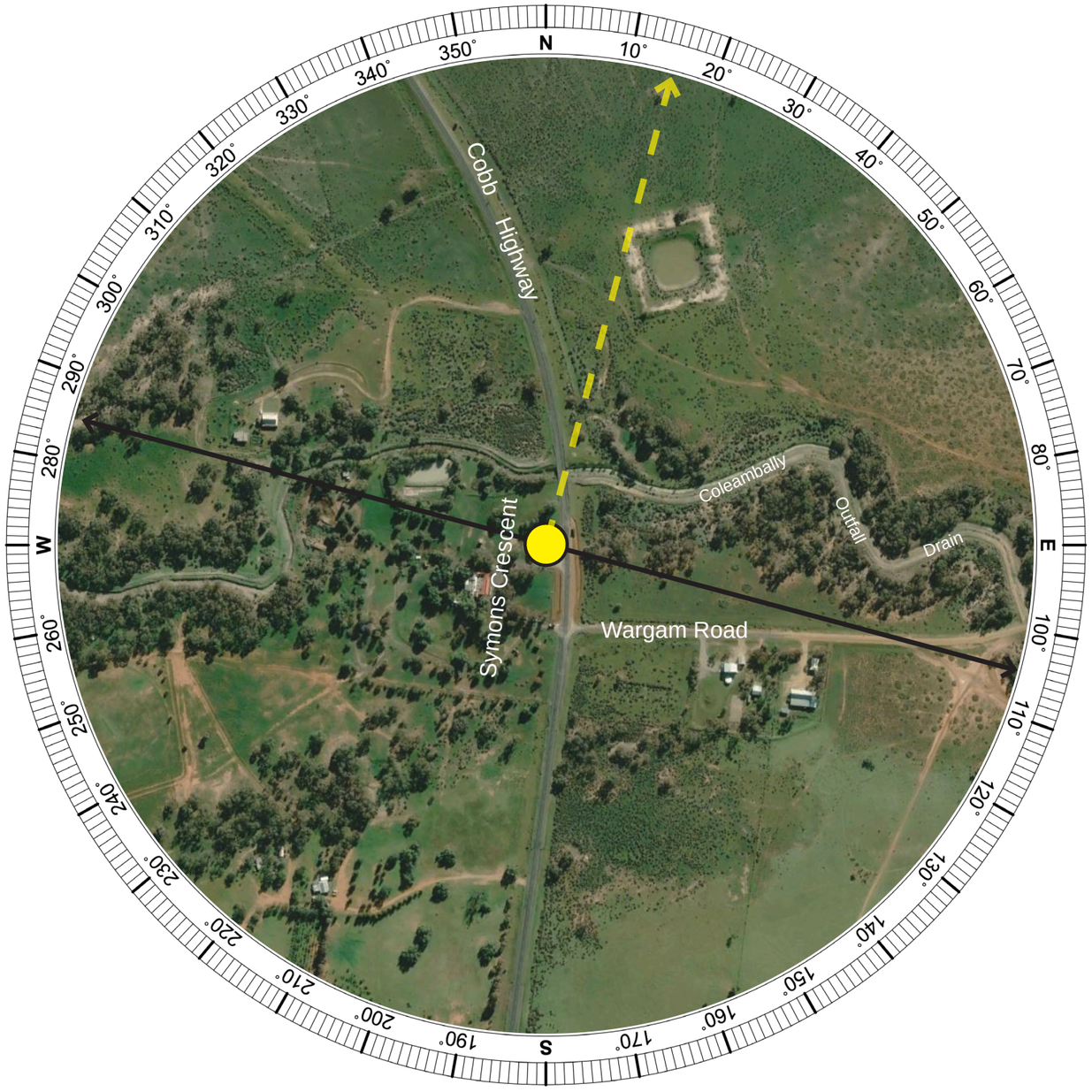
60º Photomontage 02 West Cropped 02

Photomontage 02 West Public Viewpoint PM02 (with blue sky)



60º Photomontage 02 West Cropped 03

Photomontage 03 Public Viewpoint PM03



Aerial Image - Photomontage Location (Aerial Image Source: Google Earth 2020)

Photomontage 03

Location:

Intersection of Cobb Highway and Symons Crescent, Booroorban

Photograph Date and Time:

23/11/2021 1:00 pm

Coordinates:

34°55’53.31”S 144°45’47.20”E

Distance to Nearest Visible WTG:

7.53 km

Viewing Direction:

North

Elevation:

84 m

Photomontage 03 Public Viewpoint PM03 (with blue sky)

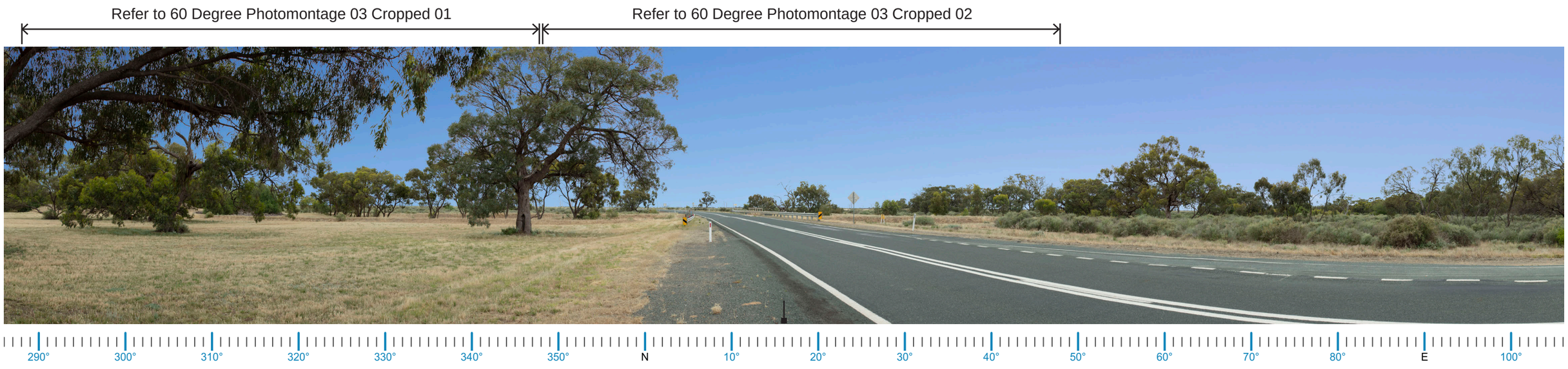


Existing View | 180º Baseline Panorama

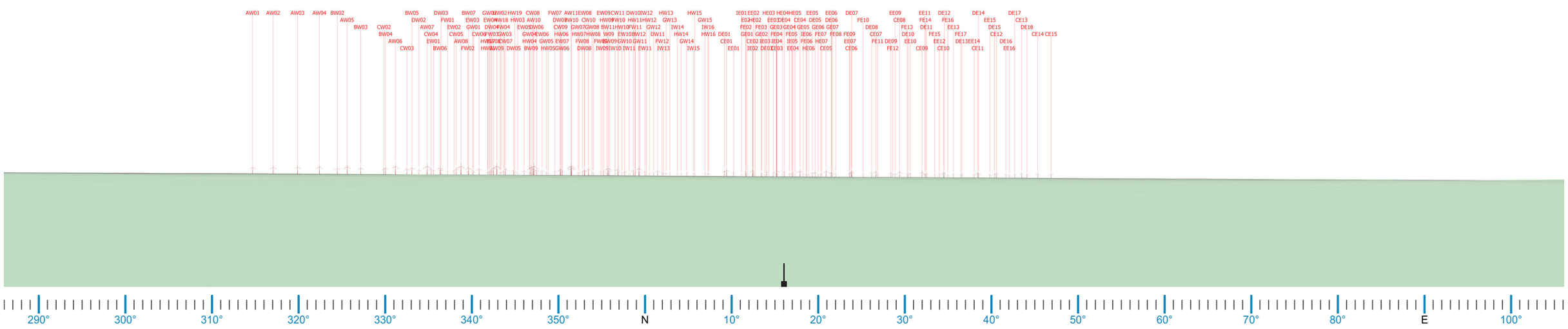


Proposed View | 180º Photomontage (Modified Sky)

Photomontage 03 Public Viewpoint PM03 (with blue sky)



Proposed View | 180º Photomontage (Modified Sky)



Wireframe Diagram

Photomontage 03 Public Viewpoint PM03 (with blue sky)



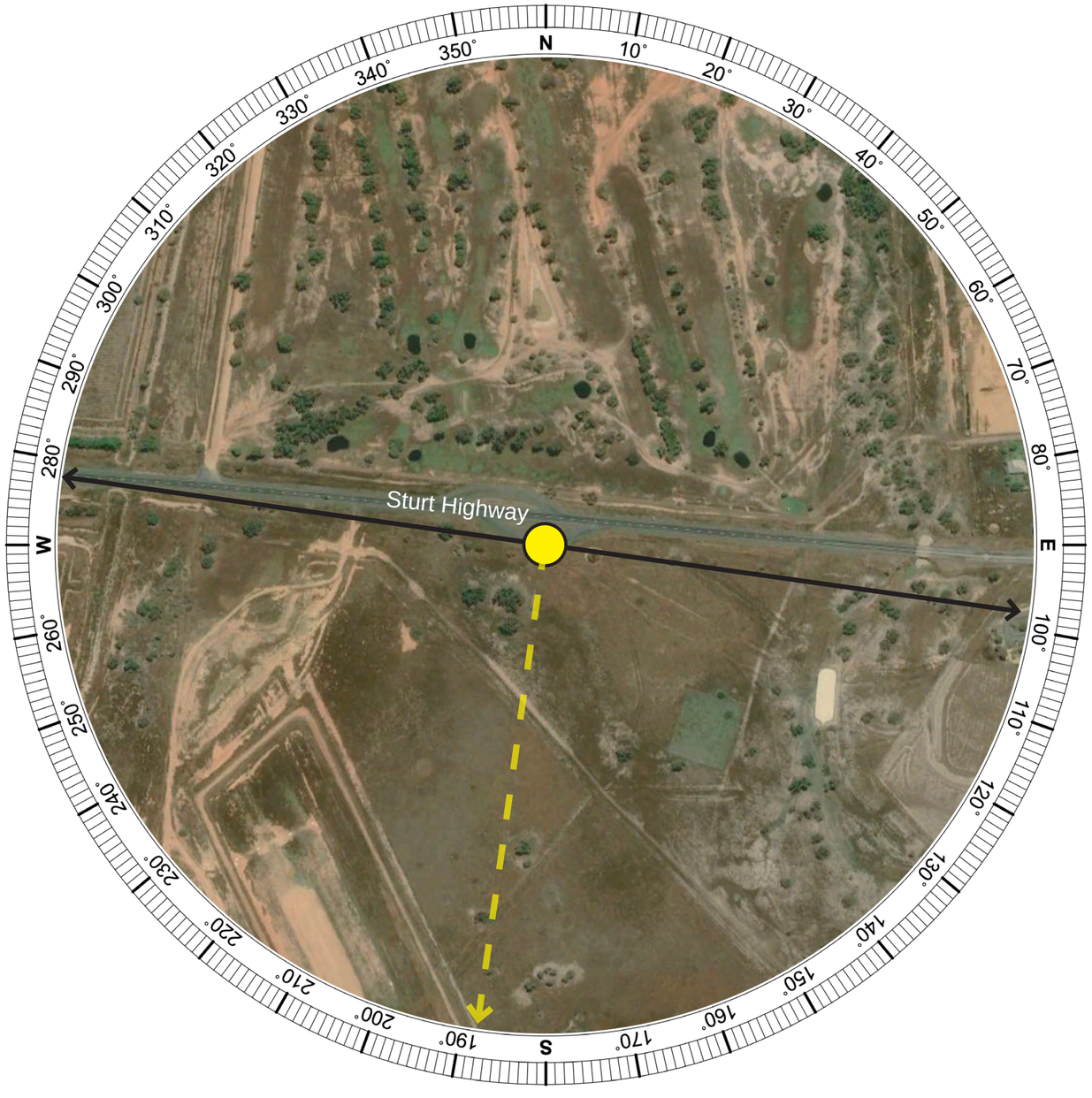
60º Photomontage 03 Cropped 01

Photomontage 03 Public Viewpoint PM03 (with blue sky)



60º Photomontage 03 Cropped 02

Photomontage 04 Public Viewpoint PM04



Aerial Image - Photomontage Location (Aerial Image Source: Google Earth 2020)

Photomontage 04

Location:

Rest Area near Hay, Sturt Highway, Hay

Photograph Date and Time:

24/11/2021 12:00 pm

Coordinates:

34°31’14.17”S 144°49’47.05”E

Distance to Nearest Visible WTG:

14.59 km

Viewing Direction:

South

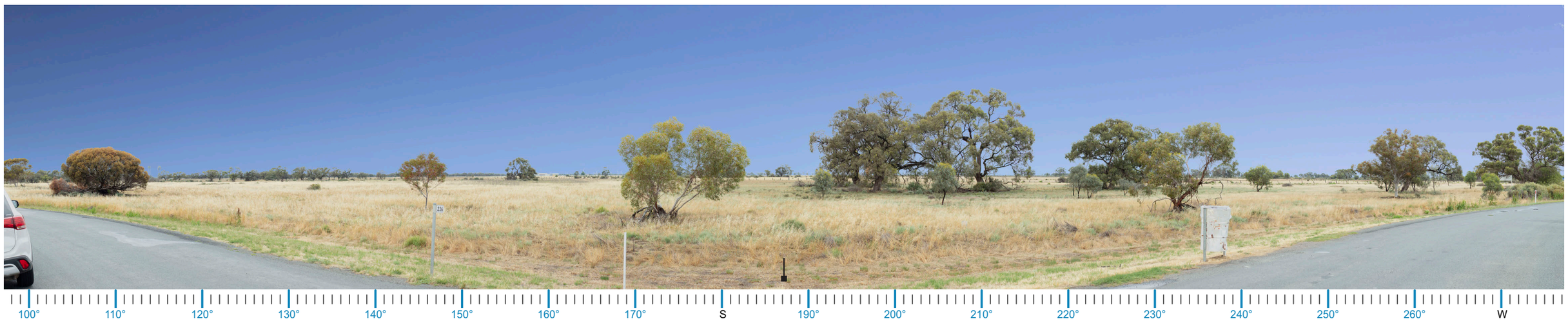
Elevation:

90 m

Photomontage 04 Public Viewpoint PM04 (with blue sky)

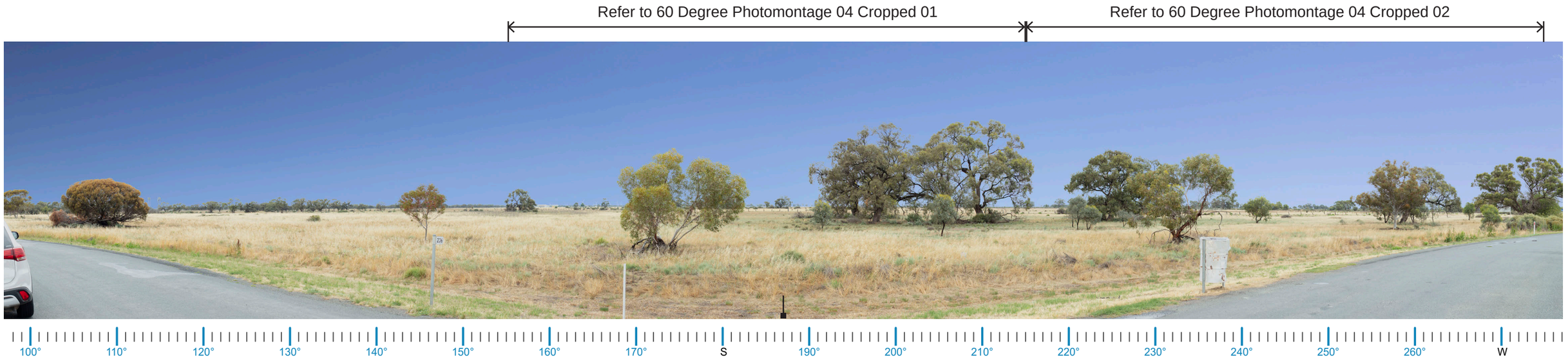


Existing View | 180º Baseline Panorama

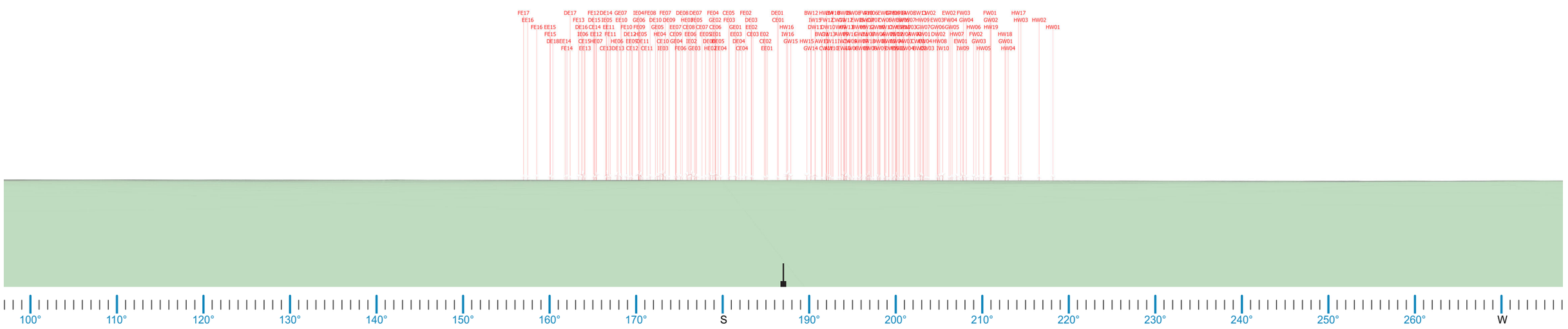


Proposed View | 180º Photomontage (Modified Sky)

Photomontage 04 Public Viewpoint PM04 (with blue sky)



Proposed View | 180º Photomontage (Modified Sky)



Wireframe Diagram

Photomontage 04 Public Viewpoint PM04 (with blue sky)



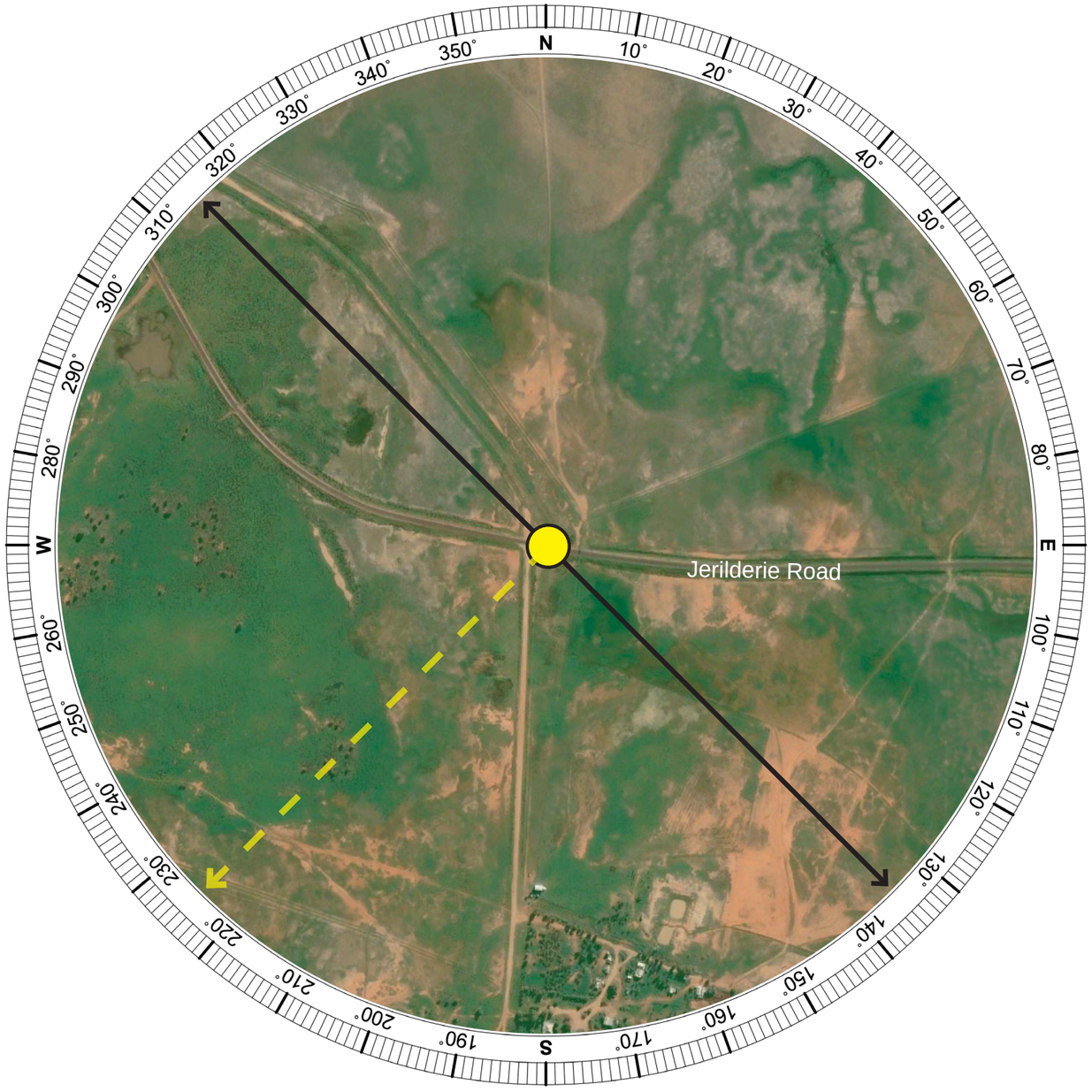
60º Photomontage 04 Cropped 01

Photomontage 04 Public Viewpoint PM04 (with blue sky)



60º Photomontage 04 Cropped 02

Photomontage 05 Public Viewpoint PM05



Aerial Image - Photomontage Location (Aerial Image Source: Google Earth 2020)

Photomontage 05

Location:

Jerilderie Road, Hay South

Photograph Date and Time:

23/11/2021 2:15 pm

Coordinates:

34°40’23.43”S 144°59’29.23”E

Distance to Nearest Visible WTG:

8.21 km

Viewing Direction:

Southwest

Elevation:

94 m

Photomontage 05 Public Viewpoint PM05 (with blue sky)

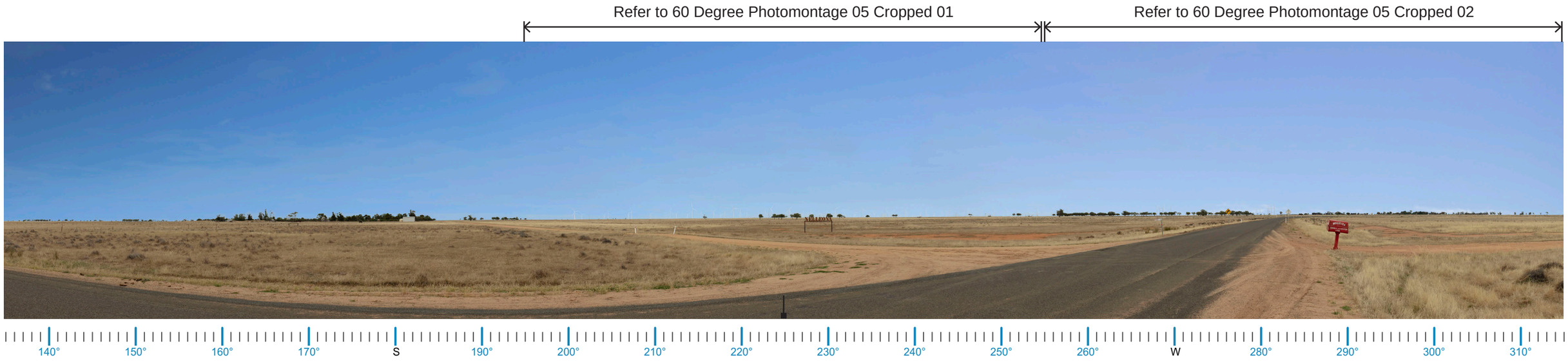


Existing View | 180º Baseline Panorama

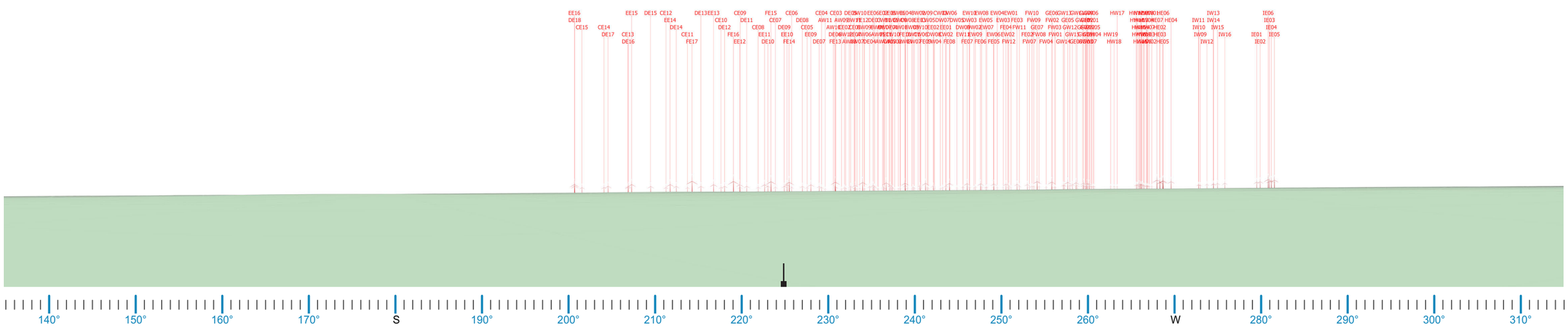


Proposed View | 180º Photomontage (Modified Sky)

Photomontage 05 Public Viewpoint PM05 (with blue sky)



Proposed View | 180º Photomontage (Modified Sky)



Wireframe Diagram

Photomontage 05 Public Viewpoint PM05 (with blue sky)



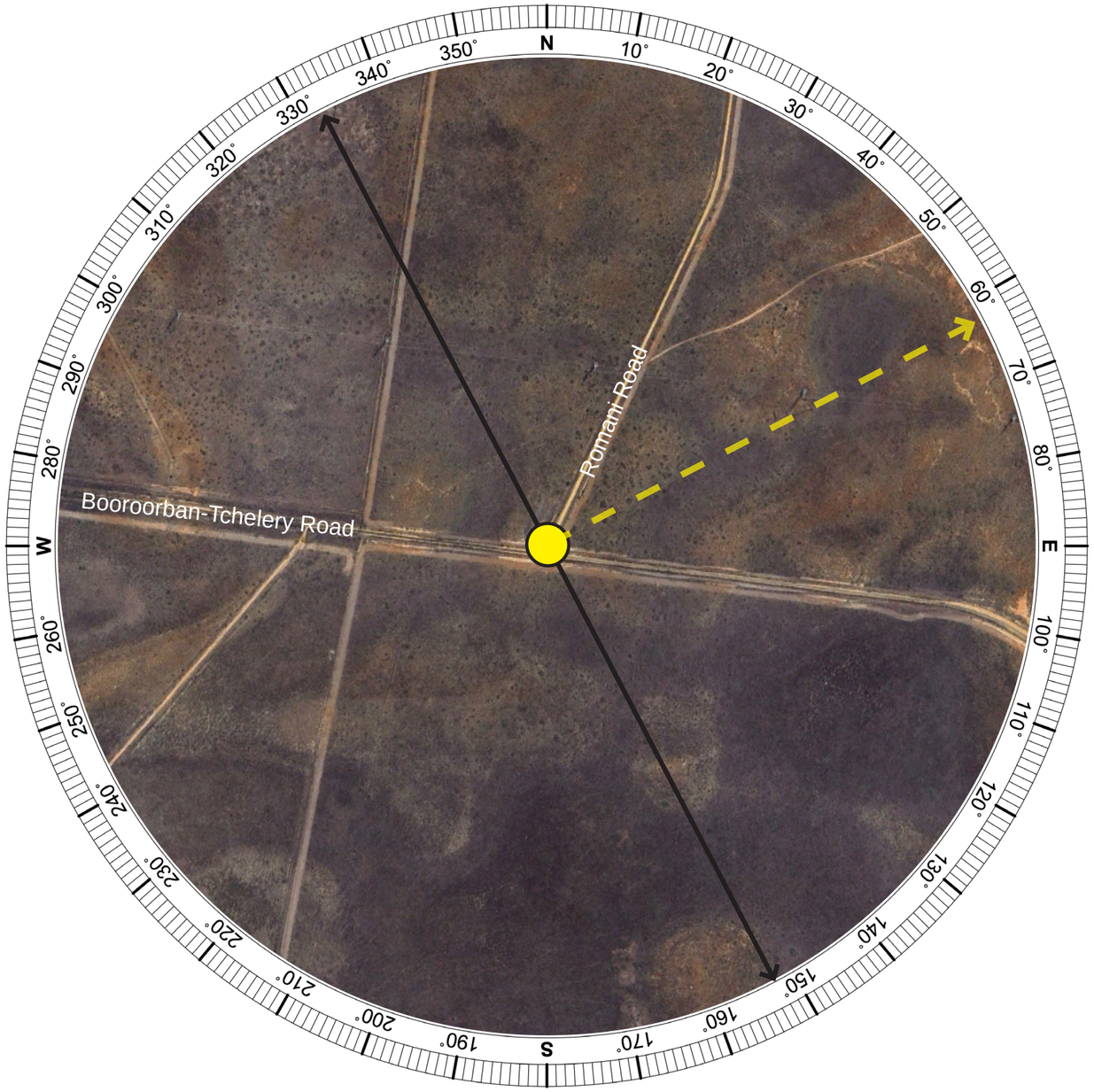
60º Photomontage 05 Cropped 01

Photomontage 05 Public Viewpoint PM05 (with blue sky)



60º Photomontage 05 Cropped 02

Photomontage 06 Public Viewpoint PM06



Aerial Image - Photomontage Location (Aerial Image Source: Google Earth 2022)

Photomontage 06

Location:

Intersection of Romani Road and Booroorban-Tchelery Road, Booroorban

Photograph Date and Time:

23/11/2021 4:00 pm

Coordinates:

34°53’43.06”S 144°35’42.25”E

Distance to Nearest Visible WTG:

5.92 km

Viewing Direction:

Northeast

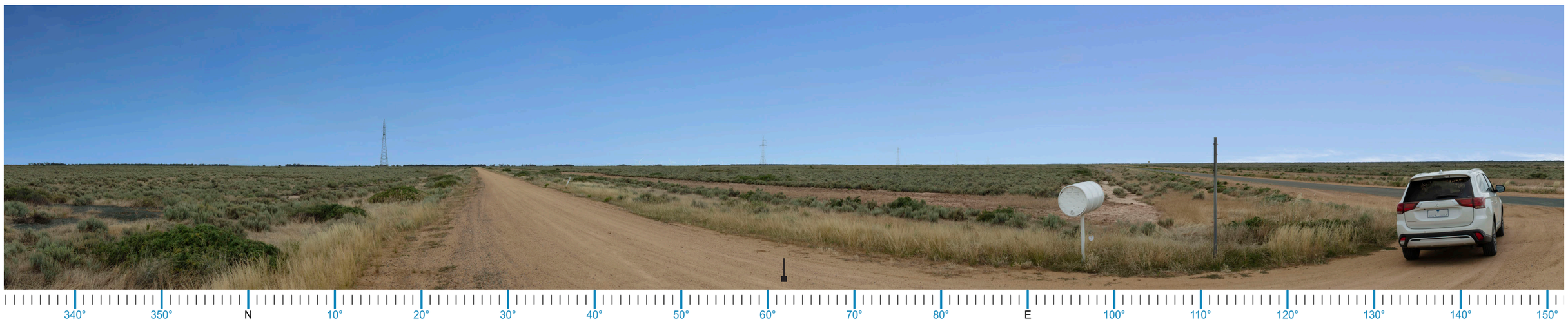
Elevation:

79 m

Photomontage 06 Public Viewpoint PM06 (with blue sky)

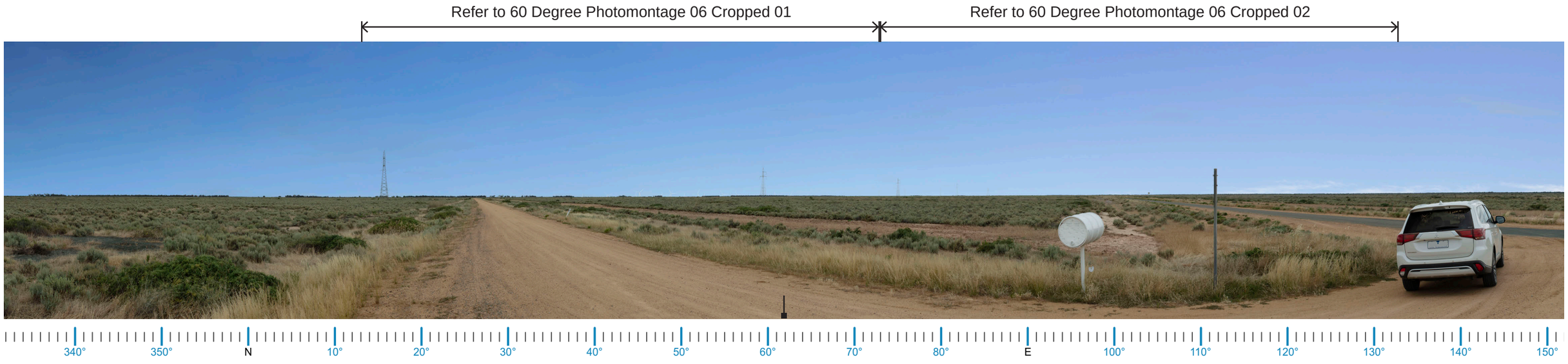


Existing View | 180º Baseline Panorama

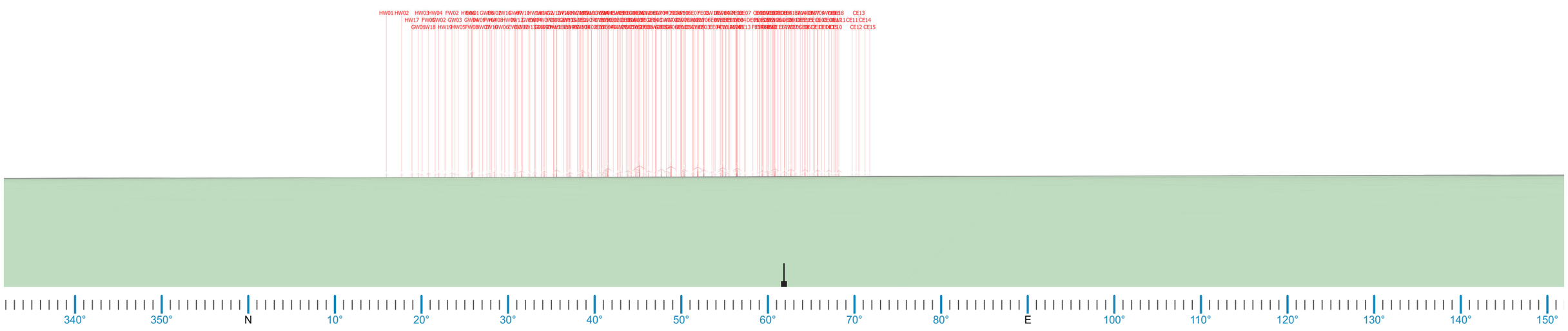


Proposed View | 180º Photomontage (Modified Sky)

Photomontage 06 Public Viewpoint PM06 (with blue sky)



Proposed View | 180º Photomontage (Modified Sky)



Wireframe Diagram

Photomontage 06 Public Viewpoint PM06 (with blue sky)



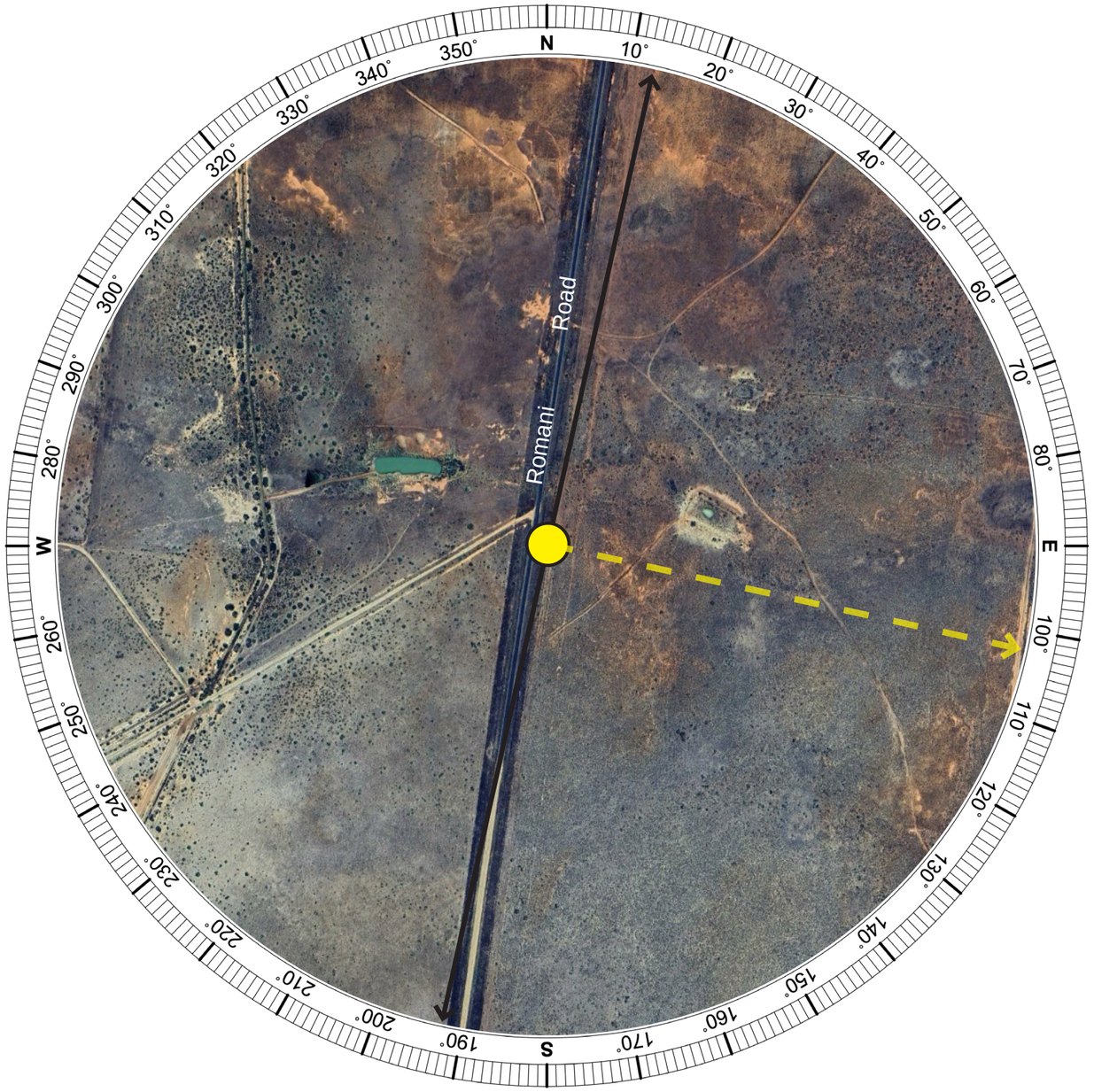
60º Photomontage 06 Cropped 01

Photomontage 06 Public Viewpoint PM06 (with blue sky)



60º Photomontage 06 Cropped 02

Photomontage 07 Public Viewpoint PM07



Aerial Image - Photomontage Location (Aerial Image Source: Google Earth 2020)

Photomontage 07

Location:

Romani Road, Hay

Photograph Date and Time:

23/11/2021 12:07 pm

Coordinates:

34°40’13.73”S 144°38’53.33”E

Distance to Nearest Visible WTG:

2.53 km

Viewing Direction:

South east

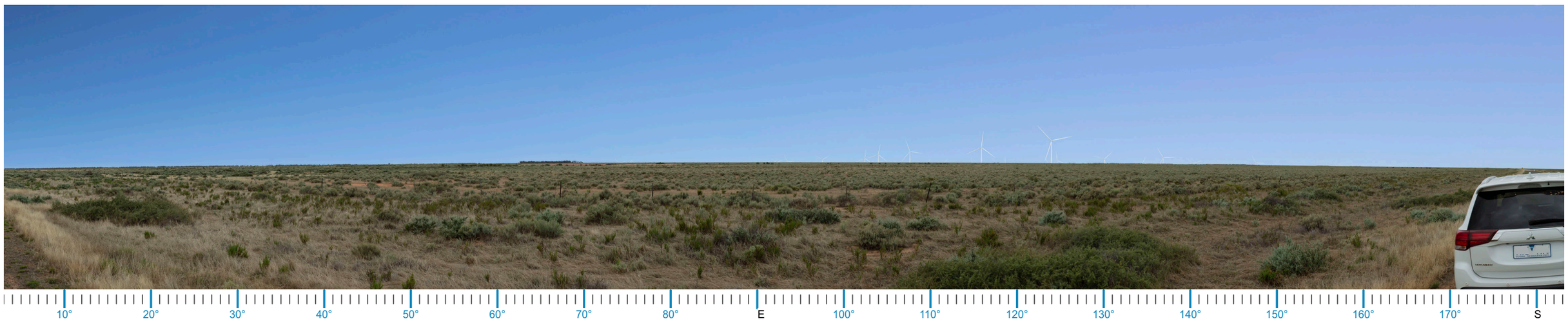
Elevation:

106 m

Photomontage 07 Public Viewpoint PM07 (with blue sky)

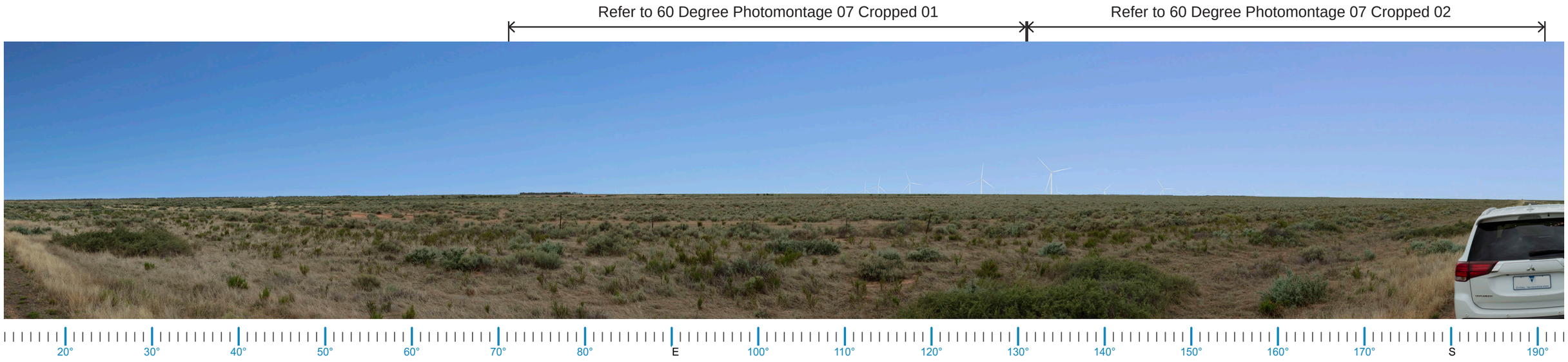


Existing View | 180º Baseline Panorama

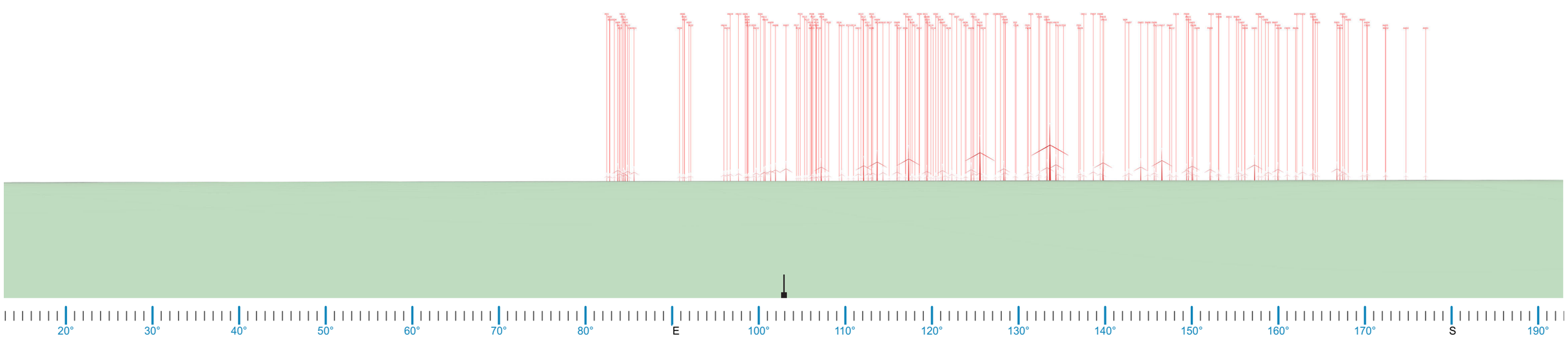


Proposed View | 180º Photomontage (Modified Sky)

Photomontage 07 Public Viewpoint PM07 (with blue sky)



Proposed View | 180º Photomontage (Modified Sky)



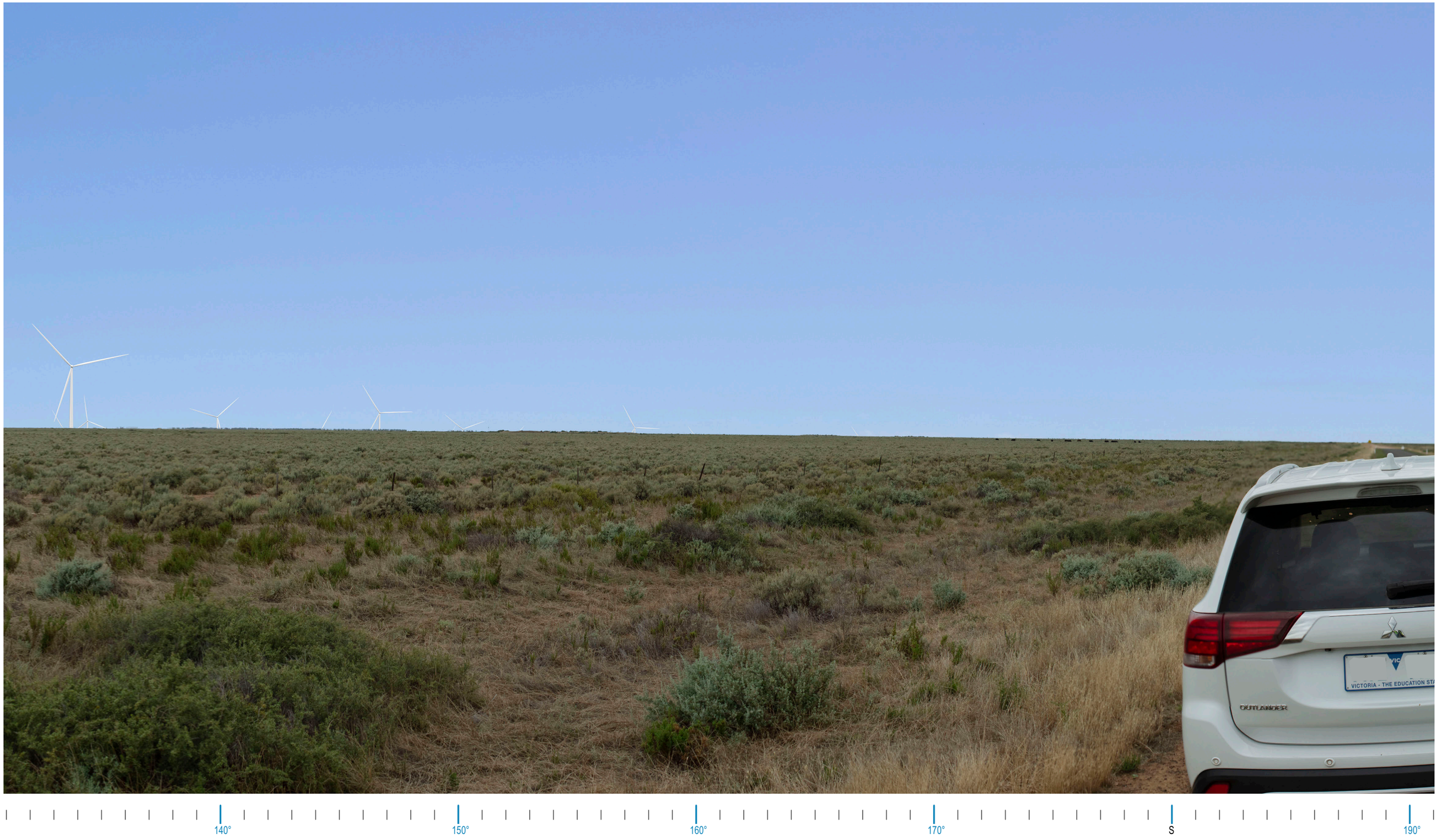
Wireframe Diagram

Photomontage 07 Public Viewpoint PM07 (with blue sky)



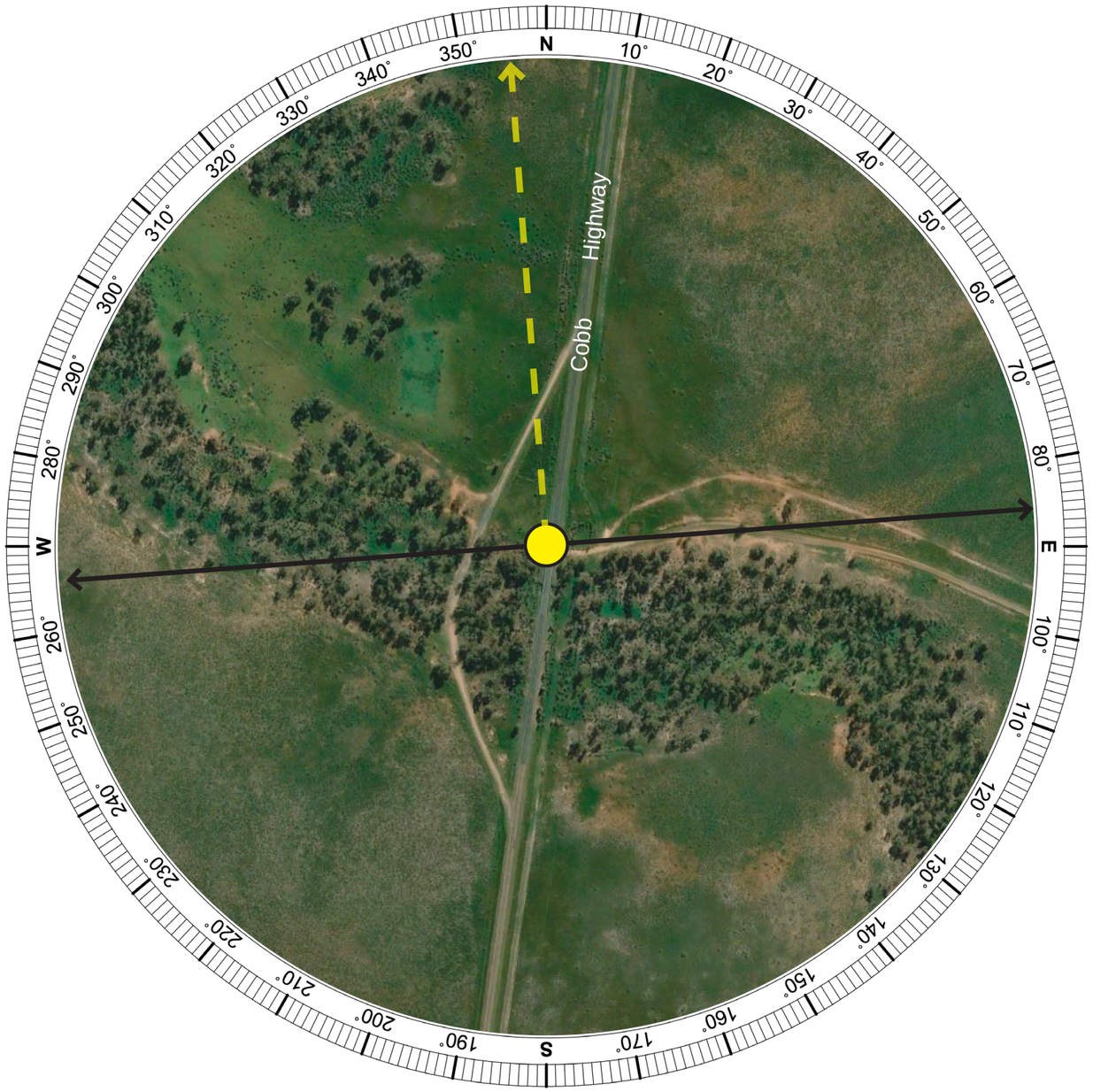
60º Photomontage 07 Cropped 01

Photomontage 07 Public Viewpoint PM07 (with blue sky)



60º Photomontage 07 Cropped 02

Photomontage 08 Public Viewpoint PM08



Aerial Image - Photomontage Location (Aerial Image Source: Google Earth 2020)

Photomontage 08

Location:

Cobb Highway, Booroorban

Photograph Date and Time:

23/11/2021 12:28 pm

Coordinates:

34°52’47.23”S 144°45’43.85”E

Distance to Nearest Visible WTG:

1.96 km

Viewing Direction:

North

Elevation:

79 m

Photomontage 08 Public Viewpoint PM08 (with blue sky)

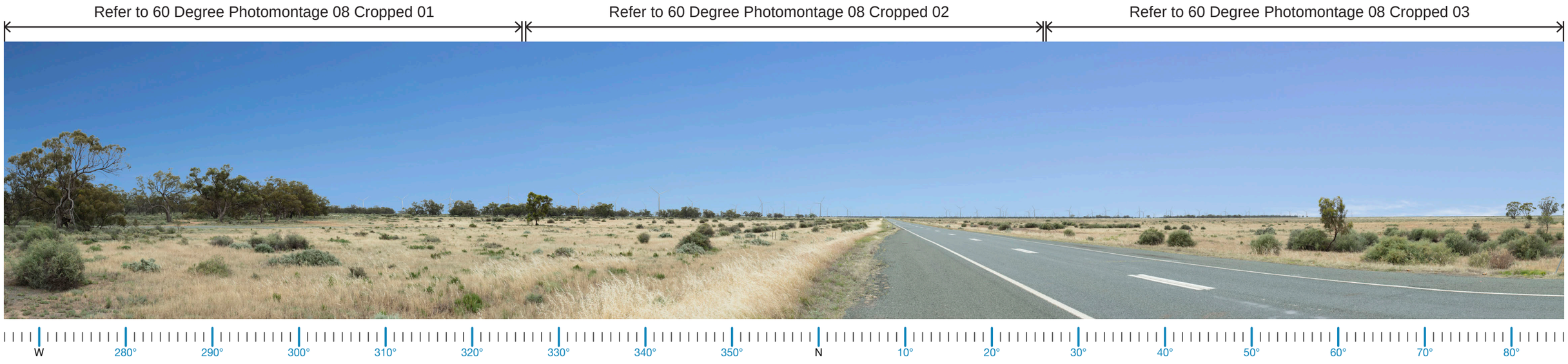


Existing View | 180º Baseline Panorama

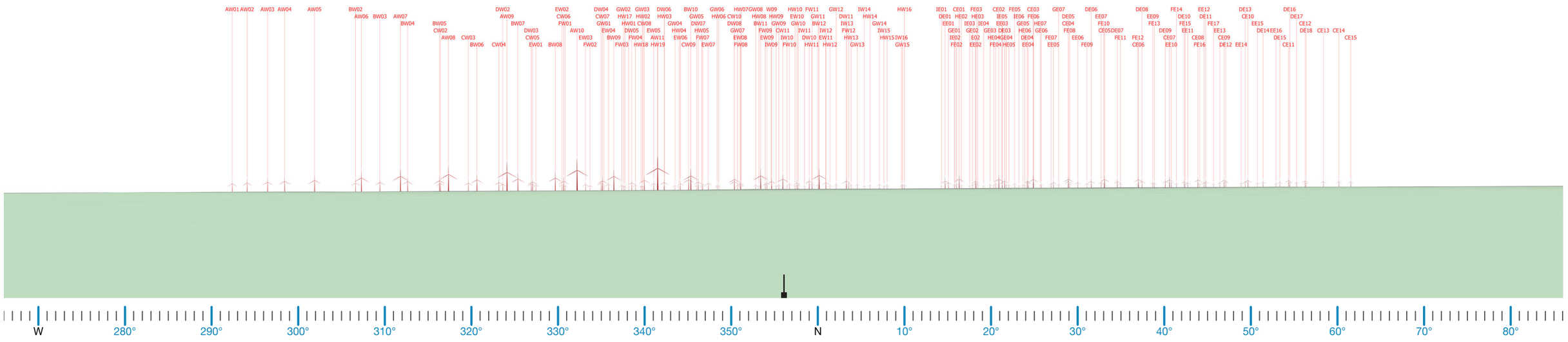


Proposed View | 180º Photomontage (Modified Sky)

Photomontage 08 Public Viewpoint PM08 (with blue sky)



Proposed View | 180º Photomontage (Modified Sky)



Wireframe Diagram

Photomontage 08 Public Viewpoint PM08 (with blue sky)



60º Photomontage 08 Cropped 01

Photomontage 08 Public Viewpoint PM08 (with blue sky)



60º Photomontage 08 Cropped 02

Photomontage 08 Public Viewpoint PM08 (with blue sky)



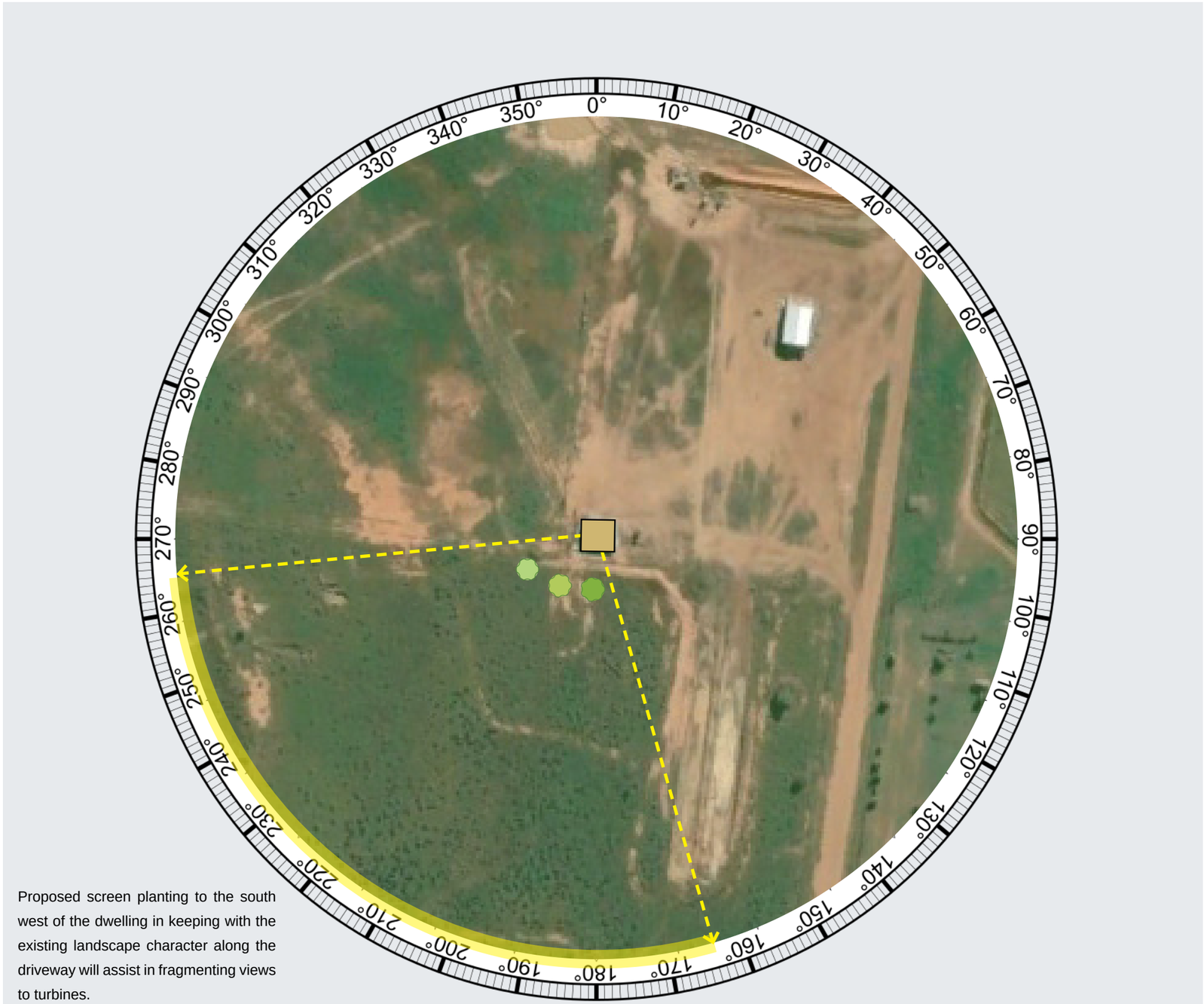
60º Photomontage 08 Cropped 03

E

Mitigation Measures
Non-associated Dwellings

E.1. Dwelling NAD_26

Recommended Mitigation Measures



Proposed screen planting to the south west of the dwelling in keeping with the existing landscape character along the driveway will assist in fragmenting views to turbines.

Visual Screening Notes:

The example is presented solely to illustrate the effectiveness of on-site screen planting from a dwelling with a moderate or high visual impact rating.

The same principles can be applied to dwellings with a low visual impact if deemed necessary.

Where access was granted through previous site visits, assessments have been undertaken from the dwelling / curtilage. Where access was not permitted, assumptions have been made based on aerial imagery alone.

Where possible, screen planting has been shown as far as practically possible from the dwelling to maintain desirable outlooks whilst ensuring adequate screening.

Visual screening location is indicative only and is proposed to be undertaken in consultation with the landowner post construction.

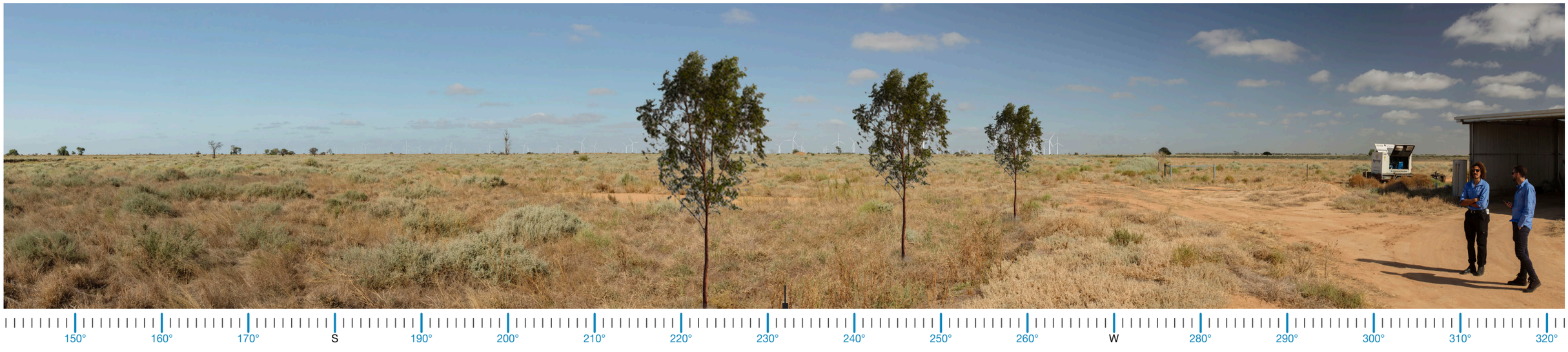
LEGEND

- Dwelling Location
- Intervening Structure
- Existing intervening vegetation
- Extent of visible turbines (within 8,000 m)
- Direction and extent of visible turbines
- Indicative location of proposed vegetation for visual screening

E.1. Dwelling NAD_26

Proposed View | 180º Photomontage - Without Mitigation Measures Implemented

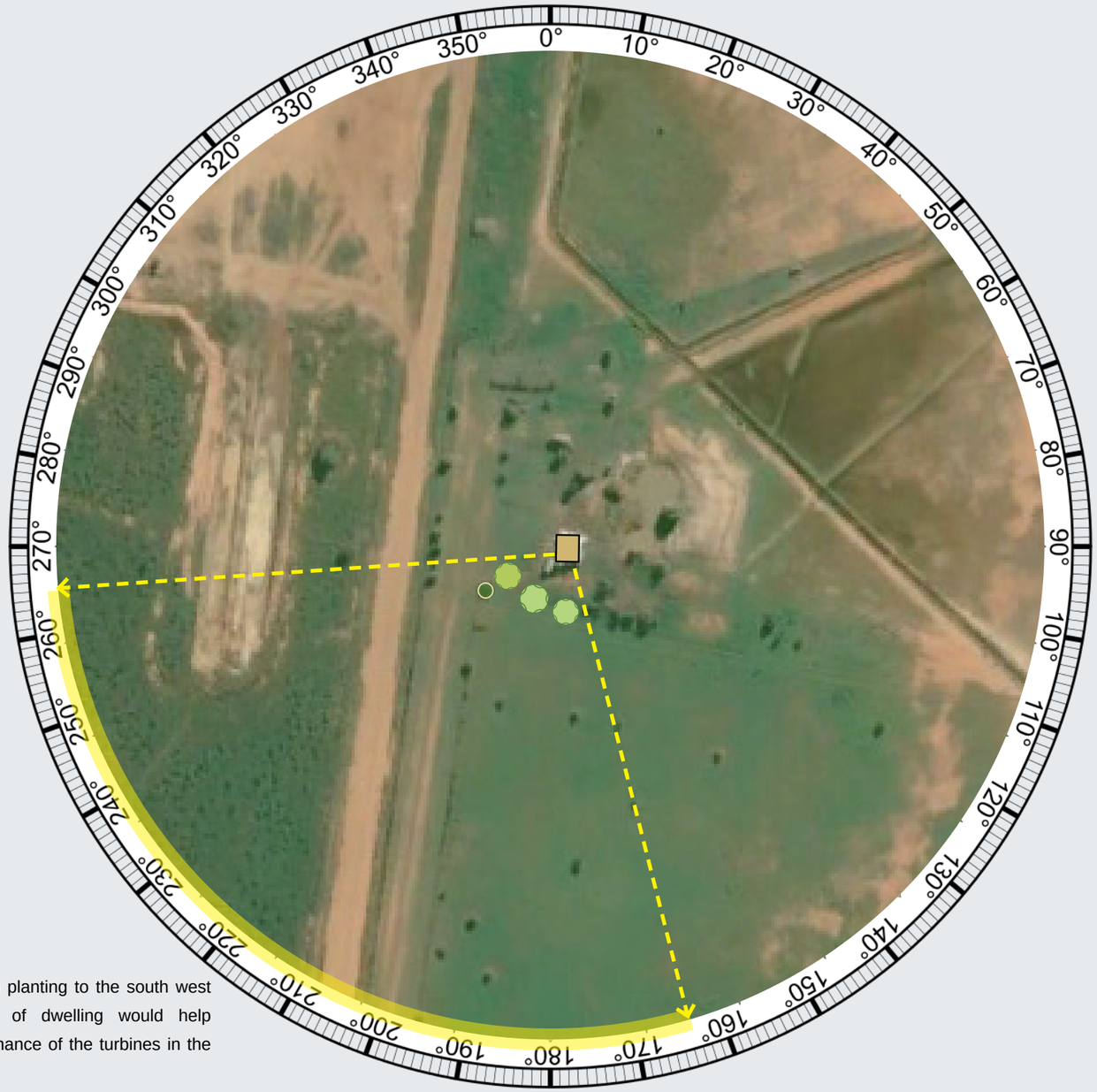




Proposed View | 180º Photomontage - With Mitigation Measures Implemented

E.2. Dwelling NAD_26A

Recommended Mitigation Measures



Proposed screen planting to the south west along boundary of dwelling would help reduce the dominance of the turbines in the landscape.

Visual Screening Notes:

The example is presented solely to illustrate the effectiveness of on-site screen planting from a dwelling with a moderate or high visual impact rating.

The same principles can be applied to dwellings with a low visual impact if deemed necessary.

Where access was granted through previous site visits, assessments have been undertaken from the dwelling / curtilage. Where access was not permitted, assumptions have been made based on aerial imagery alone.

Where possible, screen planting has been shown as far as practically possible from the dwelling to maintain desirable outlooks whilst ensuring adequate screening.

Visual screening location is indicative only and is proposed to be undertaken in consultation with the landowner post construction.

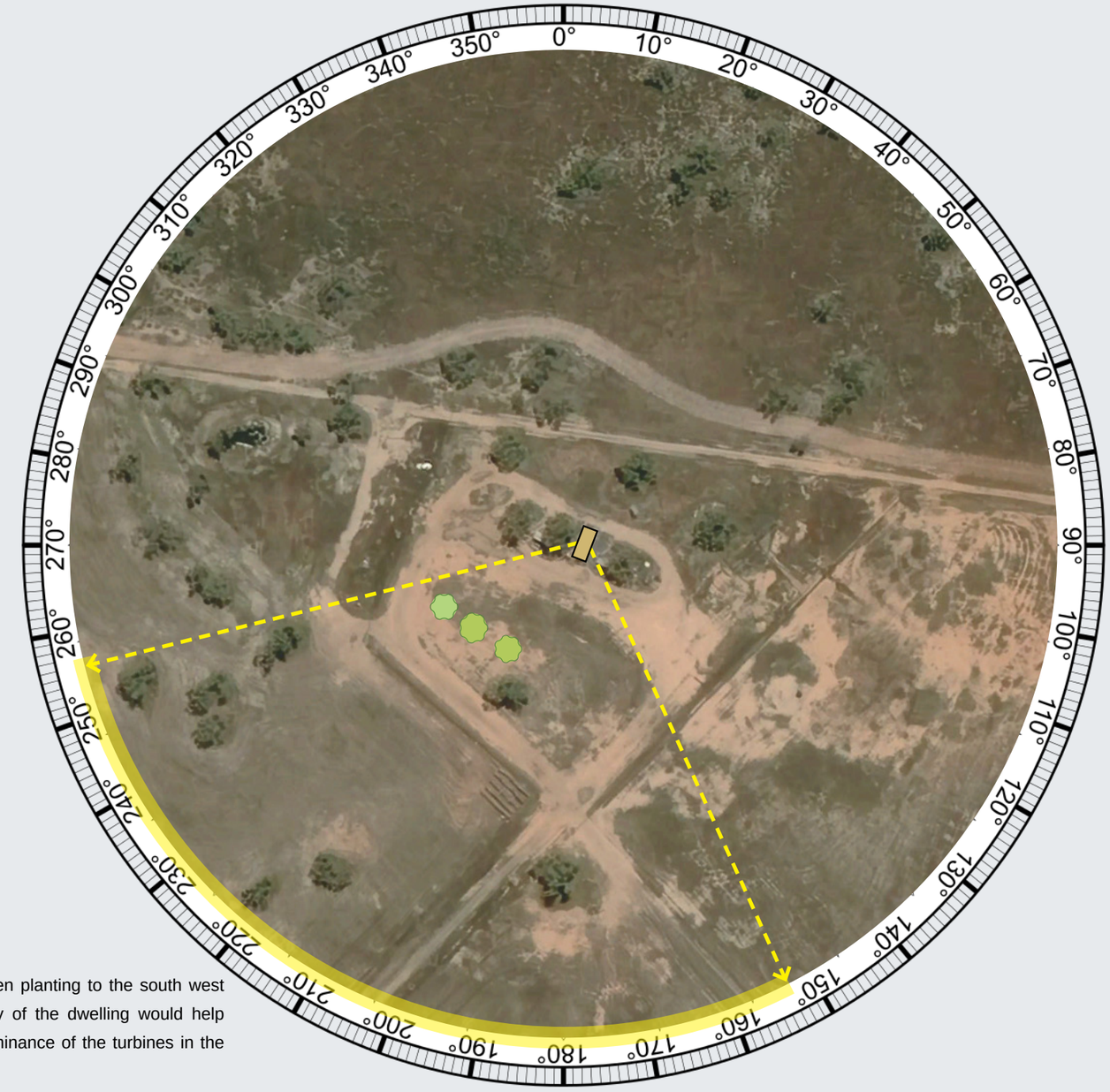
Note: Access to dwelling was not available. A desktop assessment of potential visual impacts has been included in Appendix C.

LEGEND

- Dwelling Location
- Intervening Structure
- Existing intervening vegetation
- Extent of visible turbines (within 8,000 m)
- Direction and extent of visible turbines
- Indicative location of proposed vegetation for visual screening

E.3. Dwelling NAD_12

Recommended Mitigation Measures



Proposed screen planting to the south west along boundary of the dwelling would help reduce the dominance of the turbines in the landscape.

Visual Screening Notes:

The example is presented solely to illustrate the effectiveness of on-site screen planting from a dwelling with a moderate or high visual impact rating.

The same principles can be applied to dwellings with a low visual impact if deemed necessary.

Where access was granted through previous site visits, assessments have been undertaken from the dwelling / curtilage. Where access was not permitted, assumptions have been made based on aerial imagery alone.

Where possible, screen planting has been shown as far as practically possible from the dwelling to maintain desirable outlooks whilst ensuring adequate screening.

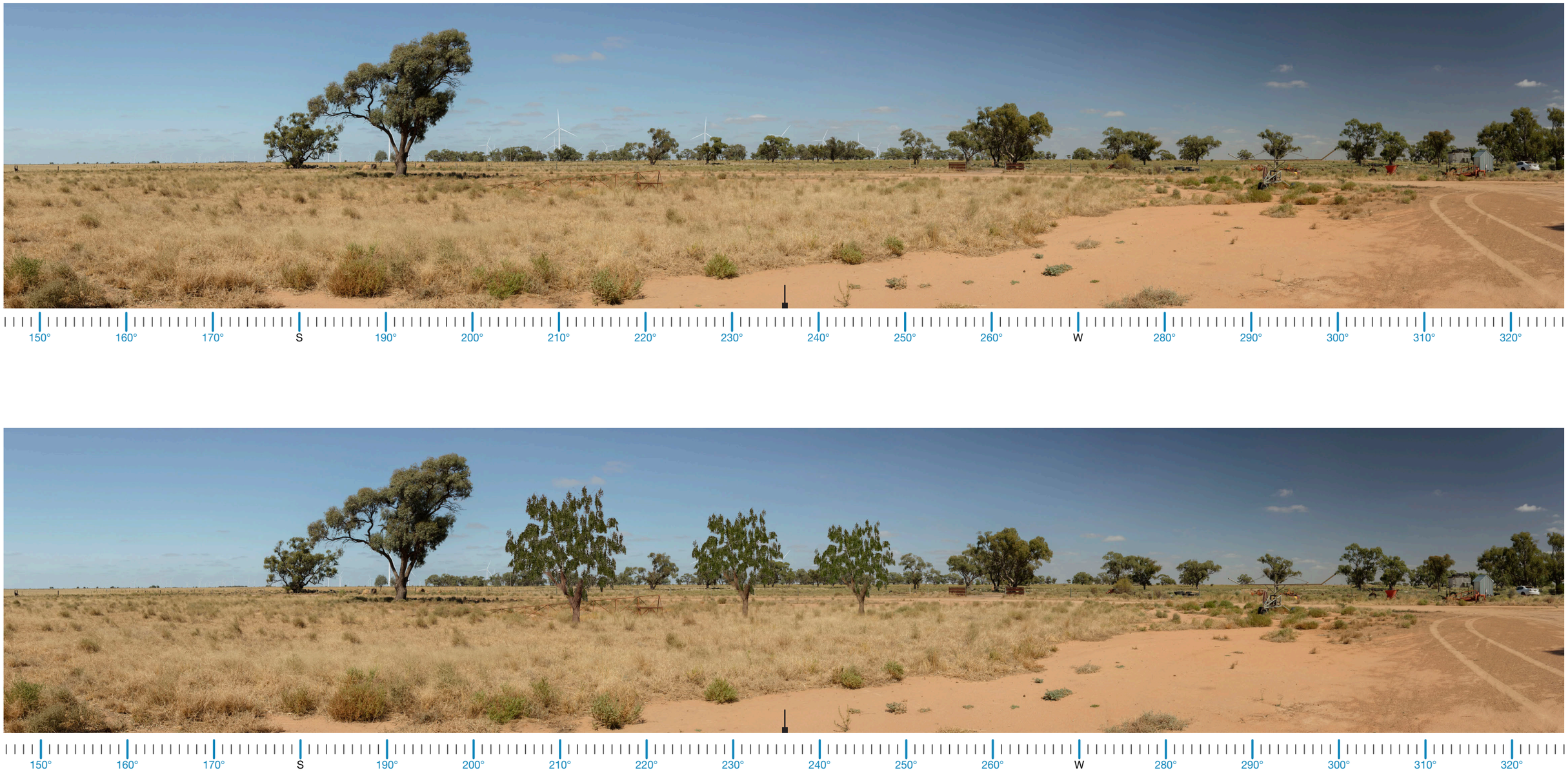
Visual screening location is indicative only and is proposed to be undertaken in consultation with the landowner post construction.

LEGEND

- Dwelling Location
- Intervening Structure
- Existing intervening vegetation
- Extent of visible turbines (within 8,000 m)
- Direction and extent of visible turbines
- Indicative location of proposed vegetation for visual screening

E.3. Dwelling NAD_12

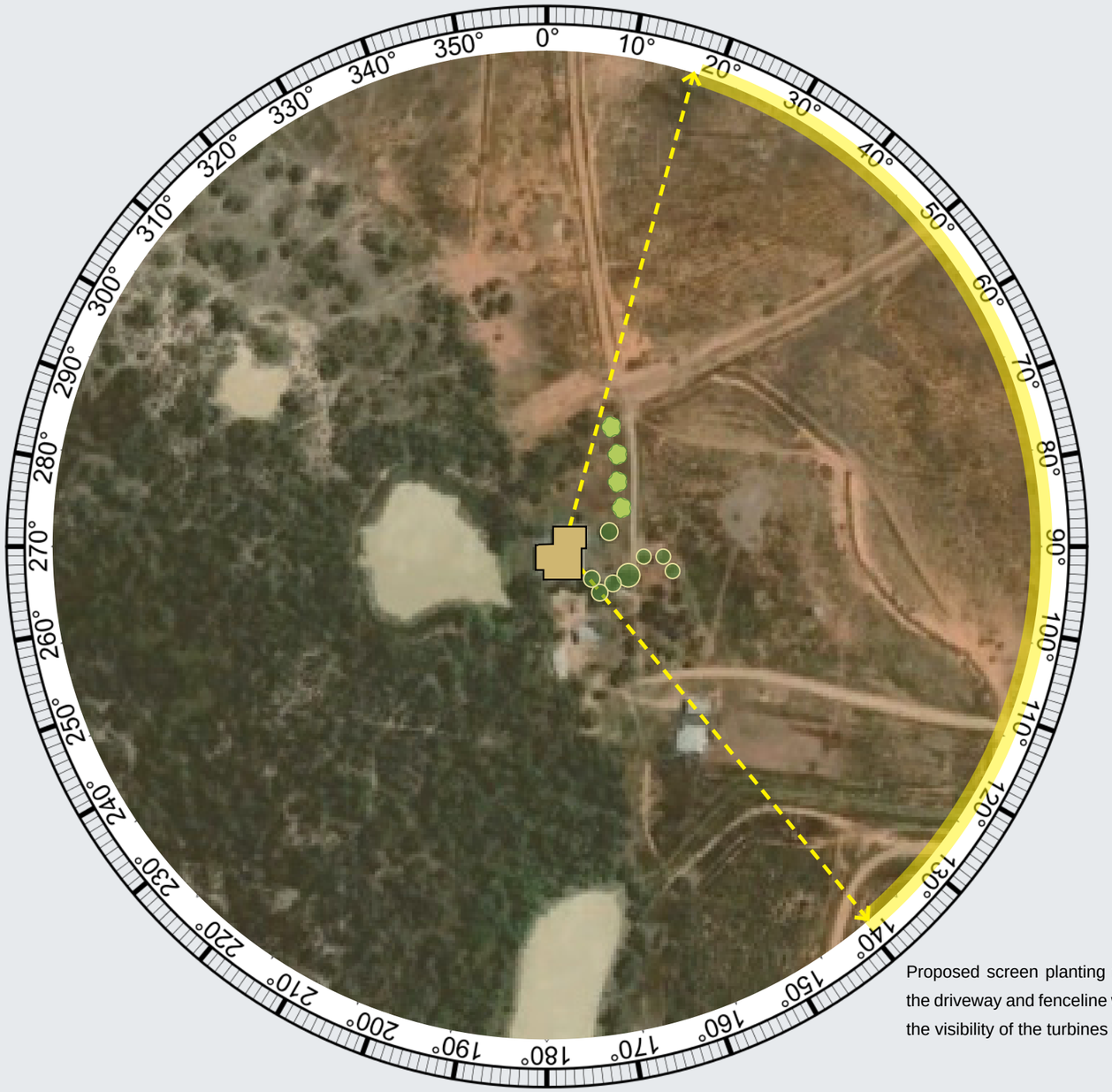
Proposed View | 180º Photomontage - Without Mitigation Measures Implemented



Proposed View | 180º Photomontage - With Mitigation Measures Implemented

E.4. Dwelling NAD_13

Recommended Mitigation Measures



Proposed screen planting to the west along the driveway and fenceline would help reduce the visibility of the turbines in the landscape.

Visual Screening Notes:

The example is presented solely to illustrate the effectiveness of on-site screen planting from a dwelling with a moderate or high visual impact rating.

The same principles can be applied to dwellings with a low visual impact if deemed necessary.

Where access was granted through previous site visits, assessments have been undertaken from the dwelling / curtilage. Where access was not permitted, assumptions have been made based on aerial imagery alone.

Where possible, screen planting has been shown as far as practically possible from the dwelling to maintain desirable outlooks whilst ensuring adequate screening.

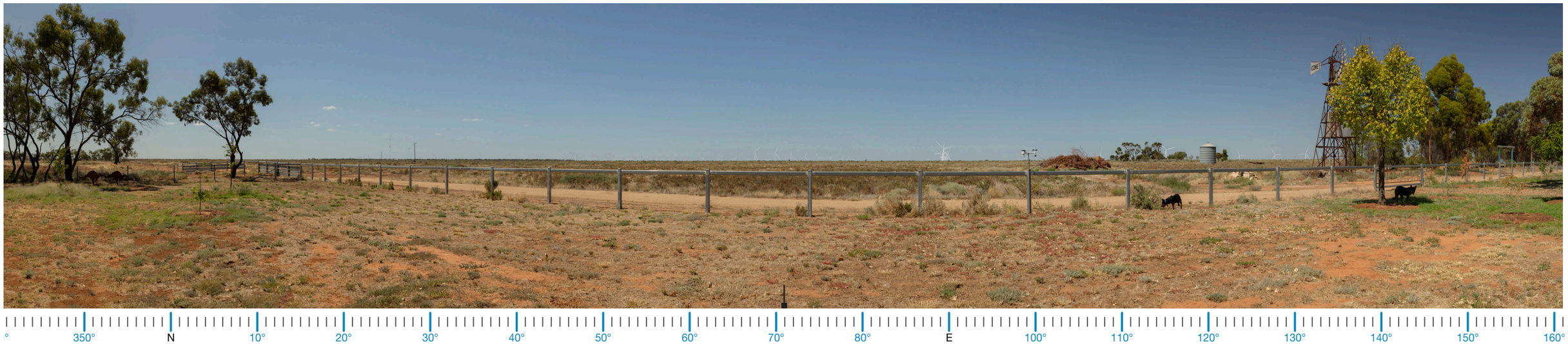
Visual screening location is indicative only and is proposed to be undertaken in consultation with the landowner post construction.

LEGEND

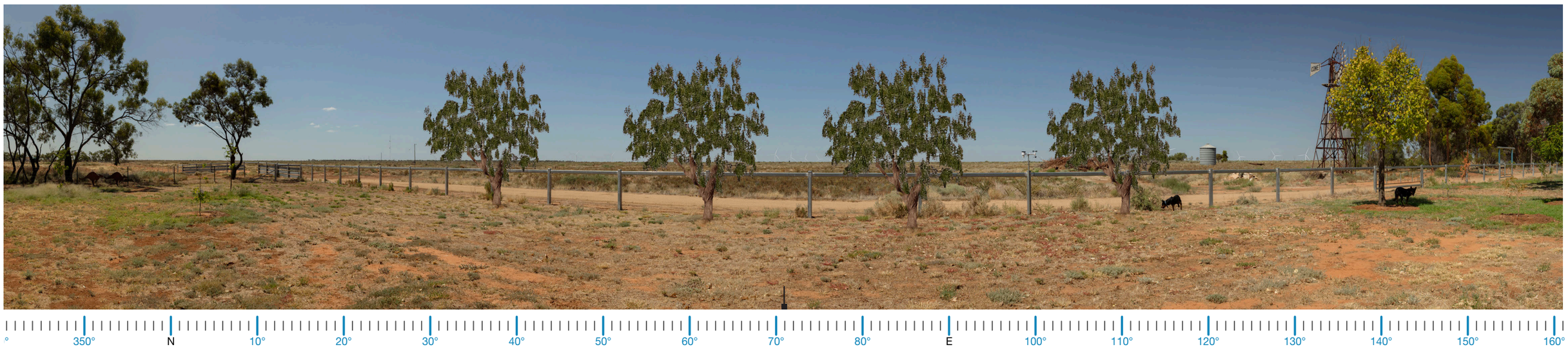
- Dwelling Location
- Intervening Structure
- Existing intervening vegetation
- Extent of visible turbines (within 8,000 m)
- Direction and extent of visible turbines
- Indicative location of proposed vegetation for visual screening

E.4. Dwelling NAD_13

Proposed View | 180º Photomontage - Without Mitigation Measures Implemented

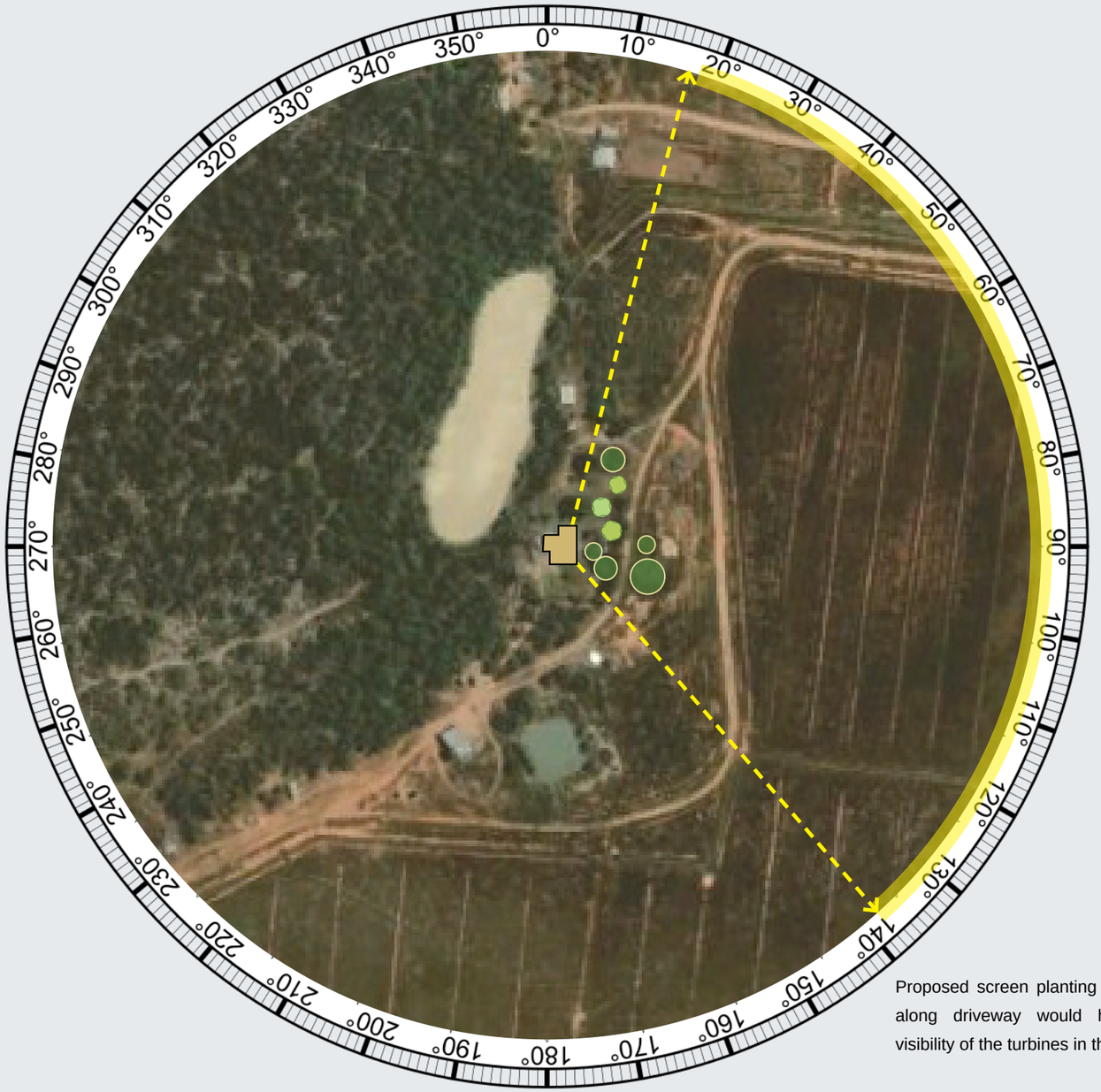


Proposed View | 180º Photomontage - With Mitigation Measures Implemented



E.5. Dwelling NAD_14

Recommended Mitigation Measures



Proposed screen planting to the north east along driveway would help reduce the visibility of the turbines in the landscape.

Visual Screening Notes:

The example is presented solely to illustrate the effectiveness of on-site screen planting from a dwelling with a moderate or high visual impact rating.

The same principles can be applied to dwellings with a low visual impact if deemed necessary.

Where access was granted through previous site visits, assessments have been undertaken from the dwelling / curtilage. Where access was not permitted, assumptions have been made based on aerial imagery alone.

Where possible, screen planting has been shown as far as practically possible from the dwelling to maintain desirable outlooks whilst ensuring adequate screening.

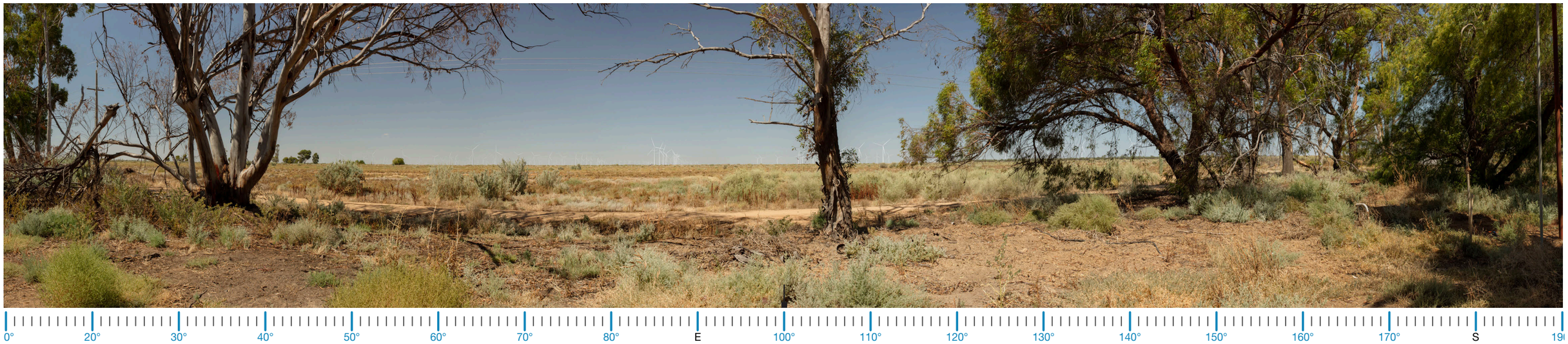
Visual screening location is indicative only and is proposed to be undertaken in consultation with the landowner post construction.

LEGEND

- Dwelling Location
- Intervening Structure
- Existing intervening vegetation
- Extent of visible turbines (within 8,000 m)
- Direction and extent of visible turbines
- Indicative location of proposed vegetation for visual screening

E.5. Dwelling NAD_14

Proposed View | 180º Photomontage - Without Mitigation Measures Implemented





Proposed View | 180º Photomontage - With Mitigation Measures Implemented