YINDJIBARNDI ENERGY PROJECT BARU AND MARNDA

VISUAL IMPACT ASSESSMENT

Yindjibarndi Energy Corporation

ecoscape

Revision	Author	QA Reviewer	Approved	Date
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TABLE OF CONTENTS

FIGURES

PLATES

TABLES

MAPS

ACKNOWLEDGEMENTS

Ecoscape acknowledges the Yindjibarndi People as the Traditional Custodians of the land on which the Yindjibarndi Energy Project is located. We recognise their continuing connection to land, and community and pay respect to Elders past, present and emerging.

Ecoscape would also like to thank the following personnel for their assistance in the preparation of this Visual Impact Assessment report:

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EXECUTIVE SUMMARY

Yindjibarndi Energy Corporation (YEC) has engaged Ecoscape to prepare a technical report to describe the potential visual impacts of Project Baru Marnda, a proposed renewable energy project (hereafter referred to as the Project) located on Yindjibarndi Country in the Pilbara Region of Western Australia (WA).

The report will support consultation with key stakeholders, including the Yindjibarndi community, and support the environmental assessment of the Project at both State and Federal levels under the EP Act and EPBC Act.

The focus for the Visual Impact Assessment (VIA) is on the wind turbine component which can be seen from a substantial distance.

Ecoscape applied the methodology described in the *Visual Landscape Planning in Western Australia: a manual for evaluation, assessment, siting and design* (WAPC, 2007) to undertake the visual impact assessment (VIA) of the proposed development. The manual specifies a two-stage process to the visual assessment:

1. visual landscape evaluation
2. visual impact assessment.

The Visual Landscape Evaluation (VLE) stage is undertaken to understand the context of the project and the surrounding landscape. It is also undertaken to set objectives for managing the visual landscape character. The Visual Impact Assessment (VIA) describes the potential impacts in context of the landscape evaluation. The stages of the assessment are outlined below:

- A description of the proposed project and visual elements of proposed infrastructure (**Section 1**)
- Landscape Character Analysis: The identification and evaluation of the existing landscape and Landscape Character Types based on desktop and site analysis (**Section 3**)
- View Experience: The assessment of viewing locations, view experience and valued landscape characteristics to identify appropriate visual management objectives for the Study Area for the purpose of assessing visual impacts (**Section 3**)
- Visual Management Objectives: used as criteria for assessing visual impacts on the landscape (**Section 3**)
- Visual Impact Analysis: an assessment of viewsheds and photo montages to identify the level of visibility and potential visual impacts on the landscape (**Section 4**)
- Visual Impact Summary: a summary of impacts regarding the visual management objectives and visual management recommendations (**Section 5**).

BACKGROUND

YEC is a partnership between Yindjibarndi Aboriginal Corporation (YAC) and ACEN Corporation (ACEN) that was formed in 2023.

YEC is progressing the feasibility of an initial pipeline of up to 3GW of renewable energy projects on Yindjibarndi Ngurra, an area covering approximately 13,000km2 south of Karratha and Port Hedland. YEC currently has two green field site projects under development within the Local Government Area (LGA) of Shire of Ashburton:

- Project Jinbi: 75MW solar array, with the ability to expand to 150MW and an option to include Battery Energy Storage System (BESS)
- Project Baru Marnda: up to 1000MW wind, plus solar and BESS.

The focus of the VIA is the combined renewable energy hubs of Baru and Marnda that consists of up to 1000 MWac of wind energy generating infrastructure and up to 500 MWac of solar energy generating infrastructure to be installed within Yindjibarndi native title determination area.

The wind turbine generators (WTGs) will be a total height of 236 m (blade tip height) above ground level (AGL) from base to blade tip, with a rotor hub height of 150 m AGL and a blade diameter of 172 m.

VISUAL LANDSCAPE EVALUATION

To assess visual impact, a visual landscape evaluation was undertaken to understand the landscape values of an area and the significance level of viewing locations.. The way a landscape is perceived will differ amongst observers, but general valued characteristics can be categorised from the extensive desktop research undertaken by CALM (1994) and WAPC (2007). Understanding the visual landscape is an integral part to developing strategies to manage landscape character.

Landscape Character

The predominant character of the study area is a natural undulating landscape covered in spinifex grasses. Infrastructure is visible within the Study area, notably the Rio Tinto rail line that occurs next to the Manuwarra Red Dog Highway with several level crossings.

Four broad Landscape Character Units (LCUs) were identified within the Study Area:

- LCU 1 – Spinifex Hills
- LCU 2 – Undulating Grassland Plain
- LCU 3 – Tall Shrubland Plain
- LCU 4 – Drainage Lines

Landscape Values

The landscape values or character preferences found within the Study Area are:

- rugged terrain – this landscape feature forms striking horizon lines in the distance and an enclosed view when traversing through steep undulating landforms that occur within the foreground. Distinctive colours are also apparent such as the bright orange to deep orange rock forms contrasting with the pale green to yellow spinifex dotted across the landscape. The Hamersley Range is a distinctive feature and that is visible on the southern horizon line.
- distinctive landscape features – in particular the exposed dark orange basalt hills that are visible from the Manuwarra Red Dog Highway. These areas generally coincide with the Rocklea land system.
- expansive landforms – expansive views across undulating terrain.
- high degree of perceived naturalness – expansive areas that have no visible modification
- distinctive displays of colour: deep orange rocky hills that contrast with the surrounding landscape, contrasts between vibrant orange stony soils and green/yellow spinifex grasses.
- structural vegetation diversity –stands of white barked Snappy Gums and taller grasses and scattered shrubs provide visual diversity compared to the extensive cover of low spinifex grasses and scattered shrubs that is associated with the Spinifex Hills LCU.
- drainage lines: this landscape feature dissects the landscape and is visually expressed as dense green vegetation meandering between the undulating terrain.
- waterforms - inundated creeks and rivers (seasonal), rocky pools.

Least preferred characteristics also occur within the Study Area, such as:

- Extractive industry (gravel pits, mining).
- Linear infrastructure (water pipeline, low and high voltage transmission lines, transmission line substation).

Visual Receptors

The WAPC (2007) have categorised viewing locations into three significance levels: national/state, regional and local. Some viewing locations, views and areas visible in views will be considered more important than others by those experiencing the landscape, and some viewers will be more aware of the landscape and more concerned about its appearance depending on their reasons for being in the landscape.

The visual receptors assessed within the Study Area are listed in the table below.

Table 1: Significance of visual receptors within the Study Area

Visual Receptor	Significance Level	Comments	View Locations
Manuwarra Red Dog Highway	1	State Highway with a range of viewers including tourists and workers. The road is promoted as part of the Warlu Way (ANW Toursim, 2023) which is a north west drive trail. This section connects Karratha and Tom Price and traverses the Millstream Chichester National Park (MCNP)	9-13, 21-34
Millstream Road	1	The section of road is part of the Warlu Way as it is the access route to the MCNP camping and recreation sites.	5-8
Roebourne-Wittenoom Road	1	This section is part of the Warlu Way drive trail and is the main access route to designated recreation sites within the MCNP namely, Mount Herbert and Python Pool.	11 - 20
Ngurrawaana Community	1	A residential community, views would be long and frequent from this location	3
Ngurrawaana Access Track	3	Unsealed access track used by workers and residents.	4
Jinbi Springs	2	A site of local significance, views would be long and frequent from this location.	1, 2
Radio Hill	2	Promoted as a local lookout in the Karratha region, access is along 5.8 kms of unsealed track that is best suited to 4WD vehicles.	35

View Experience and Key Views

The Study Area contains a variety of view types experience along travel routes and recreation sites. View experience is determined by the position of the observer within the landscape and the presence of undulating terrain and to a lesser extent, vegetation.

Key views identified within the Study Area are listed below:

- elevated expansive views (particularly from Roebourne-Wittenoom Road, Mount Herbert and Radio Hill)
- views of the Chichester Range (rugged terrain)
- views of the Hamersley Range (rugged terrain)
- views of the basalt hills (distinctive landscape features):
- enclosed foreground views of rugged terrain which is experienced along Manuwarra Red Dog Highway. This section of the highway is considered a distinctive view within the study area that provides an atypical view experience.

VISUAL MANAGEMENT OBJECTIVES

The Visual Management Objectives (VMOs) assigned to the Study Area are:

- best practice siting and design, which should be the baseline objective for all landscapes
- protection and maintenance.

Best Practice Siting and Design (BPS&D) has been identified as the most appropriate VMO for the majority of the visual landscape within the Study Area. To meet this VMO, it is expected that any proposed development is blending; that is, development may be evident but generally not prominent in that it borrows from the existing landscape setting.

Protection and Maintenance is the maximum retention of existing visual character which is likely to apply to highly valued visual landscapes. This VMO has been assigned to the following landscape values and view experiences within the Study Area:

- views of the Hamersley Range
- feature views of the basalt hills
- feature views of the Chichester Range
- panoramic views from designated lookouts (Mt Herbert)
- enclosed foreground views of rugged terrain along Manuwarra Red Dog Highway
- views from the Millstream Road and Roebourne-Wittenoom Road within the MCNP to align with the objectives in the MCNP and MRNR Management Plan (DEC, 2011), which are to *protect and enhance the visual qualities within the MCNP and MRNR planning area*.

VISUAL IMPACT ASSESSMENT

Site Analysis

A total of 35 view locations were subject to the site analysis which intersected with the viewsheds generated from the WTG's. 11 view locations were then selected for photo montage analysis in consultation with YEC. These locations intersected with the composite viewshed from the WTGs and may have views of the Project, further justification for site selection is provided in (**Table 2**). Subsequent to the site analysis, YEC added two view locations, Lore Ceremony and Weymul Community, that required viewshed analysis to determine if the Project is potentially visible from these locations.

Table 2: Photo Montage Locations (GDA2020 MGA 50)

View Location	Site Name	Elevation (m AHD)	Easting	Northing	Justification for site selection
1	Jinbi Springs	178.9	497296	7651308	Culturally Significant site
2	Jinbi Springs powerline track	189.2	497237	7651109	Near culturally significant site
3	Ngurrawaana Community	287.1	498340	7632416	Local community 2 km south of the Project
4	Ngurrawaana Access Track	354.6	508003	7635709	Main access to Ngurrawaana Community which has open views of the Project
6	Millstream Road	315.7	505966	7608389	Main access to MCNP sites
10	Manuwarra Red Dog Highway (South)	325.6	517160	7620613	Main road that has open views
16	Mount Herbert	349.3	522425	7641796	Designated lookout within MCNP with panoramic views
19	Roebourne-Wittenoom Road	371.7	518697	7636017	Main access to MCNP sites
22	Manuwarra Red Dog Highway (Central)	342.9	510571	7640089	Main road that has open views
33	Manuwarra Red Dog Highway (North)	89.8	490161	7676569	Main road that has open views
35	Radio Hill	183.9	487117	7678672	Lookout with panoramic views

Photo Montages

Photo montages were prepared from the 11 view locations that were that were identified using a combination of desktop and site analysis and confirmed by YEC. The photo montages show an indicative view of the Project consisting of 236 m high wind turbines.

Viewshed Analysis

Two composite viewsheds were generated from the WTGs, one from hub height (150 m AGL) and another from the height of the lower blade tip (64 m AGL). The output was used to identify the areas in the landscape that may have views of the development. These areas were assessed during the site visit with representative views further analysed with photo montages to assess the visibility of the Project.

Viewsheds were also generated from the two additional sites which were not subject to a site analysis, the sites are:

- Lore Ceremony – this site is located on terrain that is 297 m AHD and occurs 0.56 km southeast of the closest WTG. The WTG viewshed from this site extends up to 14 km from the site, therefore the Project is theoretically visible from this site.
- Weymul Community - This is a residential area located on terrain that is 61.5 m AHD and occurs 25.45 km north northwest of the closest WTG. The WTG composite viewsheds show that the Project is potentially visible from this site.

Visual Impact Level

A Visual Impact Assessment (VIA) was undertaken of the YEC Baru and Marnda Projects in the Shire of Ashburton, located directly west of the Millstream Chichester National Park (MCNP). The VIA was undertaken from with the 11 locations selected for photo montage analysis, representing the range of view experiences within the Study Area. The focus of the assessment was on public accessible areas, particularly areas classified as Significance Level 1 and sites that are of local importance to the Ngurrawaana Community.

The analysis has revealed that the impacts to Landscape Character and the Landscape values is expected to be minimal due to the location of the Project within the background zone (6.5 km and beyond) from most view locations which will reduce the visible scale and prominence of the WTGs. Therefore, the location of the Project is expected to meet the VMOs that seek to retain the landscape character and landscape values of the Study Area. However, some locations will experience potential impacts where the visibility of the WTGs may alter the view experience with the addition of a new modified element to the horizon. The view locations that may be at variance with the VMO due to the modification of views are:

- View Location 3 - Ngurrawaana Community (Level 1 impact).
- View Location 4 – Ngurrawaana access track (Level 2 impact).
- View Location 6 – Millstream Road – (Level 2 impact).
- View Location 16 – Mount Hebert – (Level 2 impact).
- View Location 19 – Roebourne-Wittenoom Road – (Level 2 impact).

It is recommended that the acceptability of visual impacts is discussed with the Ngurrawaana Community and relevant stakeholders for views which may not meet the assigned VMOs. The following factors should be considered when discussing the acceptability of impacts:

- Location – the Project is located within the background zone (6.5 kms and beyond) from most view locations which reduces the visible scale and prominence of the WTGs.
- Development design – although the Project is a large scale development, it can be considered an appropriate design for a natural landscape, as it exhibits a simple design and repetitive pattern, as opposed to a more complex and detailed development that consists of a variety of forms, lines, colours and textures.
- Topography - the undulating terrain from many view locations along the main Highway restricts long range views, which further reduces open views of the Project. From most of the sites assessed along the main roads, only a portion of the Project is likely to be visible where landform screens the lower portion of the WTGs.
- Landscape setting – the expansive Spinifex Hills and Undulating Grassland Plain LCUs are considered an appropriate landscape for a large scale wind farm

- Landscape sensitivity – the vast majority of the landscape is classified as Significance Level 3, the assessment has focused on mostly Significance Level 1 view locations and areas of high local significance.
- Retention of landscape character – the natural character is retained as the WTGs do not dominate the view.
- Retention of landscape values and key views – views to the Hamersley Range are retained from the assessed view locations and are the expansive views of the Chichester Range. View of the distinctive basalt hills are retained as are enclosed views of landform along the Manuwarra Red Dog Highway.
- Duration of view - most views are transient not static with the exception of the lookout views. The panoramic view from lookouts accommodates some change as the Project does not occupy the majority of space from these expansive views.
- Direction of view – the alignment of the Manuwarra Red Dog Highway is not aligned towards the Project, therefore observers are more likely to experience short and transient views where the Project is visible.

ACRONYMS AND ABBREVIATIONS

Table 3: Acronyms and abbreviations

Acronyms	
AGL	Above Ground Level
AHD	Australian Height Datum
BPS&D	Best Practice Siting and Design
CALM	Western Australian Department of Conservation and Land Management (1985-2006, now DBCA)
DBCA	Western Australian Department of Biodiversity, Conservation and Attractions
DE	Development Envelope
DEC	Western Australian Department of Environment and Conservation (2006-2013, now DBCA)
DPaW	Western Australian Department of Parks and Wildlife (2013-2017, now DBCA)
EPA	Environmental Protection Authority
EP Act	Environmental Protection Act 1986
GDA 94	Geographic Datum of Australia 1994
GIS	Geographic Information System
GPS	Global Positioning System
ha	hectare/hectares
km	kilometre/kilometres
LCT	Landscape Character Type
LCU	Landscape Character Unit
m	metre/metres
MCNP	Millstream Chichester National Park
MRNR	Mungaroona Range Nature Reserve
MGA	Map Grid of Australia
MW	megawatt
NTD	Native Title Determination
SoW	Scope of Works
sp.	Species (generally referring to an unidentified taxon or when a phrase name has been applied)
UTM	Universal Transverse Mercator
VAC	Visual Absorbance Capacity
VIA	Visual Impact Assessment
VLE	Visual Landscape Evaluation
VMO	Visual Management Objective
VP	View Point
WAPC	Western Australian Planning Commission
YEC	Yindjibarndi Energy Corporation

1 INTRODUCTION

1.1 PROJECT DESCRIPTION

Yindjibarndi Energy Corporation (YEC) has engaged Ecoscape to prepare a technical report to describe the potential visual impacts of Project Baru Marnda, a proposed renewable energy project (hereafter referred to as the Project) located on Yindjibarndi Country in the Pilbara Region of Western Australia (WA). (**Map 1**).

The nearest key visual receptors to the project are:

- Ngurrawanna Community – 600 m south of the Marnda Project Boundary
- Manuwarra Red Dog Highway – 6.5 km to the east of the Marnda Project Boundary at the closest point
- Roebourne Wittenoom Road – 11 km to the east of the Marda Project Boundary

The proposed site is located within the Yindjibarndi Determination Area on a mixture of exclusive possession, non-exclusive possession, and native title extinguished land.

The Project consists of the following:

1.1.1 PROJECT BARU

The Baru Renewable Energy Hub will consist of wind and solar energy generation and storage infrastructure on a greenfield site, in summary:

- 19,839 ha
- 400MW wind generation
- 250MW solar generation
- Options for a Battery Energy Storage System (BESS)
- Construction of 55-70 km transmission line for connection into WA Government Pilbara Strategic Industrial Areas

The location of road access and transmission infrastructure to and from the Hub being determined in due course in consultation with Main Roads and Horizon Power. At the detailed survey stage, the survey scope will be refined to areas that provide the greatest flexibility of turbine locations, and based on reconnaissance survey advice, to an area of approximately 9,000 ha.

1.1.2 PROJECT MARNDA

The Marnda Renewable Energy Hub will consist of wind and solar energy generation and storage infrastructure on a greenfield site, in summary:

- 16,969 ha
- up to 600MW wind generation
- 250MW solar generation
- Options for a Battery Energy Storage System (BESS)
- Connection into existing infrastructure and /or new common user transmission interface

1.1.3 PROJECT JINBI

Project Jinbi is a solar generation hub, in summary:

- 716 ha
- 75 – 150MW solar generation
- Option for BESS
- Connection into existing transmission infrastructure

1.1.4 WIND TURBINE GENERATORS (WTG'S)

The proposed WTG's will be a total height of 236 m above ground level (AGL) from base to blade tip, with rotor hub height of 150 m AGL and a blade diameter of 172 m (**Figure 1**).

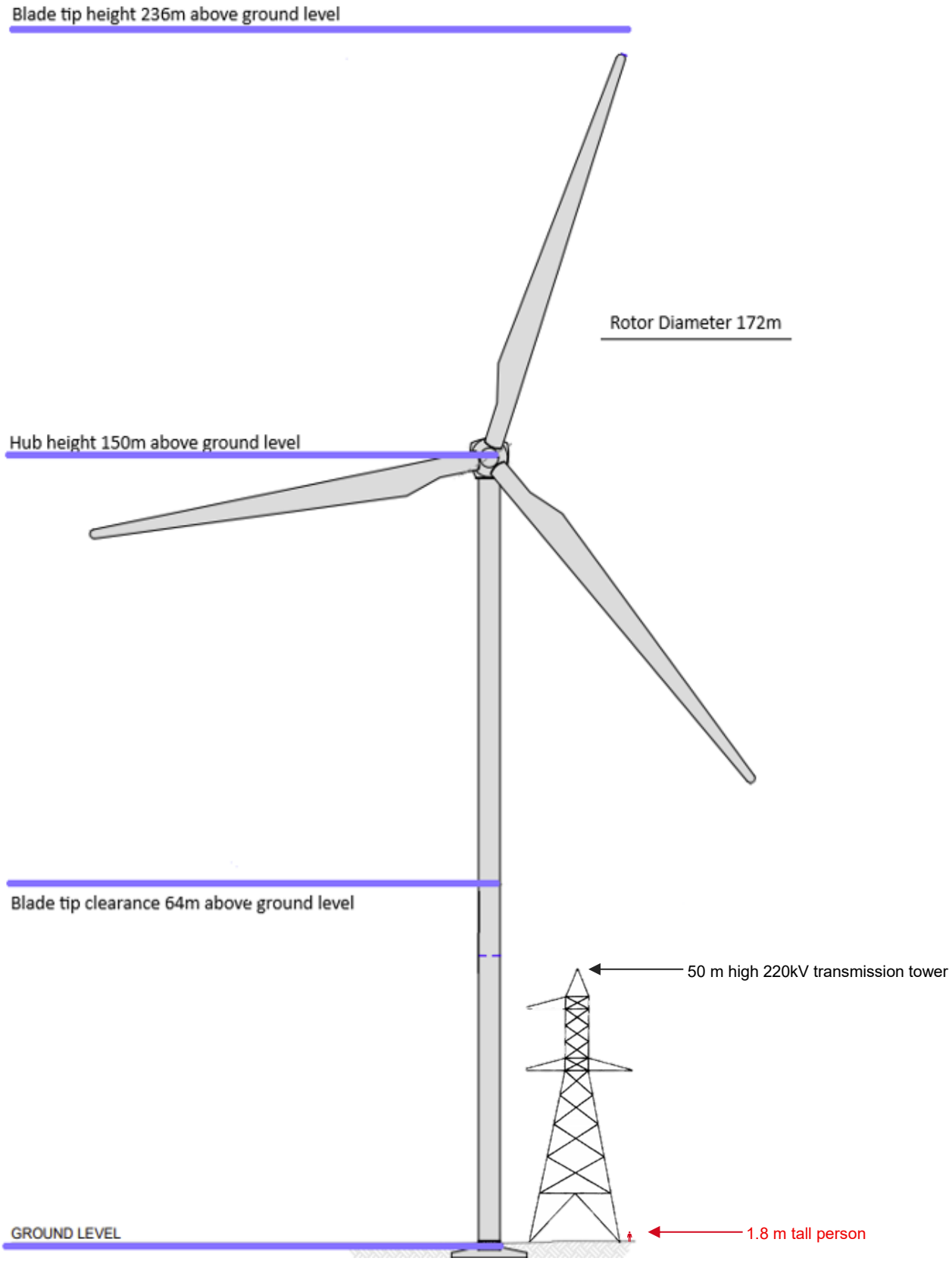


Figure 1: Wind Turbine Generator dimensions

1.2 PROJECT SCOPE

Project Baru and Project Marnda are the focus of this visual impact assessment. Project Jinbi has already been the subject of detailed assessments and is now in the detailed design and delivery phase.

1.3 VISUAL STUDY AREA

The Study Area extends to a 30 km radius area around the Project. The majority of the Study area is located on the Karratha Coastal Plain Landscape Character Type (LCT) but also occurs on the fringes of the Hamersley Range, Fortescue Valley and Chichester Range LCT's. The terrain is predominately undulating with low hills dissected by low lying drainage lines. The steep and rugged terrain of the Hamersley Range occurs to the south of the Study Area. Elevation range within the Study Area is 40 – 590 metres Australian Height Datum (AHD), with most of the Study Area occurring between 230 – 280 m AHD. The dominant vegetation cover (from a visual perspective) are spinifex grasses, scattered acacia shrubs and isolated trees. Some areas contain a moderate to dense cover of shrubland/woodland vegetation that is associated with drainage lines. Also occurring a visually distinctive exposed rocky (dolerite/basalt) hills devoid of vegetation.

1.4 VISUAL RECEPTORS

The focus of the assessment within this area were along frequently used main roads (Significance Level 1), designated lookouts and sites of local significance as outlined in the **Table 4** below.

Manuwarra Red Dog Highway, and the sections of Millstream Road and Roebourne-Wittenoom Road that lead to sites with the MCNP form part of the Warlu Way (the Red Dog Route). This section of the Warlu Way is a tourist drive route that starts in Dampier and traverses the MCNP and concludes and the town of Tom Price.

Table 4: Visual Receptors within the Study Area

Visual Receptor	Justification for site selection
Manuwarra Red Dog Highway (Warlu Way)	Main road that has open views
Roebourne-Wittenoom Road (Warlu Way)	Main access road to MCNP sites
Millstream Road (Warlu Way)	Main access road to MCNP sites
Mount Herbert	Designated lookout within MCNP with panoramic views
Radio Hill	Local lookout with panoramic views
Ngurrawaana Community	Local community 2 km south of the Project
Ngurrawaana Access Track	Main access to Ngurrawaana Community which has open views of the Project
Jinbi Springs	Culturally Significant site

1.5 VISUAL PLANNING CONTEXT

The following documents provide guidance on visual landscape planning in Western Australia.

1.5.1 NATIONAL PLANNING POLICY AND GUIDELINES

1.5.1.1 EPBC Act Policy Statement 2.3 Wind Farm Industry

The purpose of this policy statement is to assist operators in the wind farm industry to decide whether proposed actions require referral under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). It is recognised that aesthetic values of Heritage Places may be impacted by the presence of a wind farm. According to the Heritage databases the Project does not intersect with a World Heritage Property (DCCEEW, 2024) or any listed National Heritage Places (DCCEEW, 2023).

1.5.1.2 Onshore Wind Farm Guidance Draft May 2024

This guidance document has been published by the Department of Climate Change, Energy, the Environment and Water (DCCEEW) and is currently a Draft for consultation. The guidance aims to support proponents to develop appropriate documentation for the environmental impact assessment process by the Minister for Environment. The focus of this guidance is on protected matters, particularly bird and bats. Reference to visual impact is not specifically detailed in this guideline. However, it is recommended that proponents provide viewshed analysis results for the referral and assessment stages to assist in identifying impacts to visual amenity values.

1.5.2 STATE PLANNING POLICY AND GUIDELINES

1.5.2.1 Western Australian Environmental Protection Act 1986

The Western Australian *Environmental Protection Act 1986* (EP Act) was established to provide for:

+ the prevention, control and abatement of pollution and environmental harm
+ the conservation, preservation, protection, enhancement, and management of the environment
+ matters incidental to or connected with the above.

The EPA is responsible for providing the guidance and policy under which environmental assessments are conducted. It conducts environmental impact assessments (based on the information provided by the proponent), initiates measures to protect the environment and provides advice to the Minister responsible for environmental matters.

The EP Act includes **social surroundings** in the definition of what constitutes 'Environment'. Further guidance on social surroundings is provided in the EPA's *Environmental Factor Guideline – Social Surroundings* (2023).

1.5.2.2 State Planning Policy No 2 Environment and Natural Resources

The *Environment and Natural Resources Policy* (WAPC, 2003) defines the principles and considerations that represent good and responsible planning in terms of environment and natural resource issues within the framework of the State Planning Strategy.

The objectives of the policy are to:

+ integrate environment and natural resource management with broader land use planning and decision-making
+ protect, conserve and enhance the natural environment
+ promote and assist in the wise and sustainable use and management of natural resources.

This policy also identifies the importance of protecting and enhancing landscapes and states the need:

+ to identify and protect landscapes with high natural resource value
+ for careful planning, siting and design of development proposals in a way that is sensitive to the landscape character
+ for landscape or visual impact assessment for proposals that may impact on sensitive landscapes.

1.5.2.3 Environmental Factor Guideline: Social Surroundings (EPA, 2023)

The EPA's objective for the social surroundings environmental factor is, *"To protect social surroundings from significant harm"*

For social surroundings to be considered in Environmental Impact Assessment (EIA) there must be there must be a clear direct link between a proposal or scheme's impact on the physical or biological surroundings and the subsequent effect on a person's aesthetic, cultural, economic or other social surroundings.

Furthermore, *for the EPA to consider social surroundings as a factor in EIA, a proposal's or scheme's impacts on the physical or biological environment, must directly and significantly affect or be affected by those social surroundings*.

The EPA is also required to consider potential impacts to Aboriginal cultural heritage (ACH) values which includes *significant visual impacts to ACH cultural landscapes*.

The guideline recognises that *natural landscapes and views often contribute to visual amenity, such as areas of high heritage, cultural or social significance due to their natural features or scenic quality*. Although, *amenity values can be highly subjective.*

The EPA recognises that development activities may impact aesthetic values such as:

+ *large scale quarry or mining activities on landscapes of significant aesthetic value*
+ *major tourism or other developments in or adjacent to natural areas with significant aesthetic values.*

The EPA may require information from the proponent where there is the potential to significantly impact the social surroundings, in the case of visual amenity a landscape and visual impact assessment may be required.

1.5.2.4 Environmental Factor Guideline: Landforms (EPA, 2018)

The EPA's environmental objective for the factor Landforms is: "To maintain the variety and integrity of significant physical landforms so that environmental values are protected."

This objective recognises that the geology and morphology of a landform can have value in their own right, as well as the important role significant landforms often have in supporting environmental values.

Landforms can also embody social and cultural values, such as strong historical and cultural associations and also provide enjoyment through aesthetics or active use (e.g. tourism, climbing, hiking, etc.).

Consistent with this objective, the EPA will firstly determine whether the landform to be impacted is a significant landform. If the EPA determines that the landform is significant, further assessment regarding the impacts of the proposal or scheme may be required to demonstrate whether the environmental objective for Landforms can be met.

To determine whether a landform is significant, the EPA may consider criteria such as *variety, integrity, ecological and scientific importance, rarity and social importance*. Concerning the latter, *the landform would support significant amenity, cultural or heritage values.*

1.5.2.5 Technical Guidance: EIA of Social Surroundings – Aboriginal Cultural Heritage (EPA, 2023)

The EPA acknowledges the repealed Aboriginal Cultural Heritage Act 2021 and has adjusted its Environmental Factor Guideline (EFG) - Social Surroundings and related Technical Guidance to reflect the role of the amended and restored Aboriginal Heritage Act 1972.

The Technical Guidance provides additional information on procedures and the EPA's environmental impact assessment process for Social Surroundings under the Environmental Protection Act 1986. This has been updated to support the latest changes made to the EFG and to ensure alignment with the restored AH Act 1972.

Under the EP Act, the EPA is required to consider social surroundings to the extent to which they directly affect or are affected by physical or biological surroundings. This may include significant visual impacts to ACH cultural landscapes.

1.5.2.6 Position Statement: Renewable Energy Facilities (DPLH, 2020)

This document outlines to requirements of the Western Australian Planning Commission (WAPC) to support the consistent consideration and provision of renewable energy facilities in Western Australia. It supersedes *Planning Bulletin 67: Guidelines for Wind Farm Development (2004)*. Renewable energy developments are identified as primarily wind farms and solar arrays but also geothermal, biogas, ocean power and hydro-electric power. The position statement recommends that proponents undertake early consultation with relevant stakeholders and various impact assessments which includes visual and landscape impact. It is recommended that the visual impact assessment identify and address the following aspects:

- landscape significance and sensitivity to change
- land use character and community values
- likely impact to views using viewshed analysis and simulation of proposed views from key view locations
- the proposed layout of the development and specification
- mitigation recommendations.

The following documents are referred to which provide more detailed guidance on visual landscape impact assessments:

- *Visual Landscape Planning in WA: a manual for evaluation, assessment, siting and design* (WAPC 2007)
- *Wind Farms and Landscape Values: National Assessment Framework* (AusWEA and ACNT 2007)

1.5.3 REGIONAL PLANNING DOCUMENTS

1.5.3.1 Millstream Chichester National Park (MCNP) and Mungaroona Range Nature Reserve (MRNR) Management Plan 2011

This management plan was prepared by the DEC on behalf of the Conservation Commission in collaboration with the Traditional Owners of the Millstream area. The MCNP and MRNR contain natural and recreational values and has very significant cultural values for the Yindjibarndi and Ngarluma people. The visual landscape is integral to these values, subsequently all activities need to be appropriately planned and managed to ensure they do not detract from the visual quality of the area.

The plan has identified that the main access routes into the national park would be classified as high sensitivity i.e. Significance Level 1, these are:

- Roebourne-Wittenoom Road which leads to the Python Pool precinct
- Millstream Road which leads to the Deep Reach Pool and other sites.

The plan also identified significant landform features such as:

- deep gorges and pools found in the Chichester Range Landscape Character Type (LCT)
- permanent pools, springs, unusual wetland flora found in the Fortescue Valley LCT.

The objectives for managing the visual landscape in the area are:

- to protect and enhance the visual landscape qualities; and
- to plan all activities to complement the area's landscape value.

In order to achieve these objectives, the plan states that visual landscape management should be considered prior to any development or management activities in the planning area. Although the Project is not within the planning area, it is directly adjacent to it as shown on **Map 1**.

1.5.4 GUIDELINES FOR WIND FARM DEVELOPMENT

1.5.4.1 Best Practice Guidelines for Implementation of Wind Energy Projects in Australia (CEC, 2018)

This document is aimed to help proponents of onshore wind farms, the community and stakeholders understand the planning process for wind farm proposals. It recommends that a comprehensive landscape and visual assessment is undertaken to identify:

- landscape values
- community values
- potential impacts
- mitigation measures.

1.5.4.2 Siting and Designing Wind Farms in the Landscape (SNH, 2017)

This document provides siting and design guidance for wind farms in order to minimise potential visual impacts on the landscape. It recognises that there are many variables which affect the visibility of wind farms such as:

- the nature of the background such as the horizon type and sky conditions
- prevailing weather conditions
- seasonal variation in the landscape colours
- viewing direction
- distance from the development
- proposed layout
- other windfarms in the vicinity that may contribute to a cumulative visual impact
- turbine colour and texture.

This document provides best practice siting and design strategies to ensure proposed wind farm developments relate to their landscape setting and minimise visual impacts on landscape values.

1.5.4.3 National Wind Farm Development Guidelines (EPHC, 2010)

Although these guidelines are not maintained past their release date, they are still considered a useful reference document for wind farm development proposals. The aim of the guidelines was to provide a consistent best practice approach for assessing the impacts of wind farm developments in Australia. It is recognised that there are many significant landscapes that are valued by the community which do not have statutory protection. These landscape values can be identified through consultation and the landscape assessment process which provides management recommendations to manage the visual landscape appropriately. The following sources were primarily used in the development of these guidelines:

- *Wind Farms and Landscape Values: National Assessment Framework (AusWEA and ACNT, 2007)*
- *Visual Landscape Planning in WA: a manual for evaluation, assessment, siting and design* (WAPC 2007)

Regarding Indigenous heritage it is recommend that assessments not only look at physical landscapes but also cultural landscapes which include stories and song lines, hunting and gathering places and the effects on the bush and animals.

1.5.4.4 Wind Farms and Landscape Values: A National Assessment Framework (AusWEA and ACNT, 2007)

Auswind (Clean Energy Council's predecessor) in partnership with the Australian Council of National Trusts developed this framework to provide guidance on assessing, evaluating and managing the impact of wind farms on the Australian landscape. The framework recommends a similar assessment approach to WAPC (2007) as follows:

- undertake a landscape assessment and community consultation
- describe and model the wind farm in the landscape
- assess the visual impacts on the landscape values
- respond to the proposed visual impacts through mitigation strategies.

1.5.5 GUIDELINES FOR VISUAL IMPACT ASSESSMENT IN WESTERN AUSTRALIA

1.5.5.1 Visual Landscape Planning in Western Australia 2007

This comprehensive manual has been developed by the WAPC (2007) to help public and private sector planners address visual landscape in the planning process. The manual explains the fundamental planning tools of visual landscape evaluation and visual impact assessment. It provides guidelines for siting and design in relation to a range of landscape types and land uses. It has been developed through extensive research, workshops and also draws on previous visual methodologies. The manual has been developed specifically for Western Australian landscapes and presents a systematic method for undertaking visual assessments in

Western Australia. The process of assessing the visual landscape set out in this manual is generally consistent with other methodologies, however it provides added detail on landscape preferences and specific land uses.

It is recognised by the EPA (2023) that amenity values may be highly subjective, therefore, Ecoscape has adopted the WAPC (2007) methodology to provide a clear and systematic approach to assessing the visual landscape.

2 METHOD

Ecoscape applied the methodology outlined in the Visual Landscape Planning Manual (WAPC, 2007) to undertake the visual impact assessment (VIA) of the proposed development. The manual specifies a two-stage process to the visual assessment:

1. visual landscape evaluation
2. visual impact assessment.

The Visual Landscape Evaluation (VLE) stage is undertaken to understand the context of the project and the surrounding landscape. It is also undertaken to set objectives for managing the visual landscape character. The Visual Impact Assessment (VIA) describes the potential impacts in context of the landscape evaluation. The stages of the assessment are outlined below:

- A description of the proposed project and visual elements of proposed infrastructure (**Section 1**)
- Landscape Character Analysis: The identification and evaluation of the existing landscape and Landscape Character Types based on desktop and site analysis (**Section 3**)
- View Experience: The assessment of viewing locations, view experience and valued landscape characteristics to identify appropriate visual management objectives for the Study Area for the purpose of assessing visual impacts (**Section 3**)
- Visual Management Objectives: used as criteria for assessing visual impacts on the landscape (**Section 3**)
- Visual Impact Analysis: an assessment of viewsheds and photo montages to identify the level of visibility and potential visual impacts on the landscape (**Section 4**)
- Visual Impact Summary: a summary of impacts regarding the visual management objectives and visual management recommendations (**Section 5**).
-

2.1 DESKTOP ANALYSIS

A desktop investigation was undertaken before the site assessment to understand the landscape context of the Study Area. The following information was analysed in ArcGIS, which is Geographic Information System (GIS) software for working with maps and geographic information:

- surface elevation (Geoscience, 2010)
- soil landscape units (DPIRD, 2017)
- pre-European vegetation (DPIRD, 2017)
- Landscape Character Types (CALM, 1994)
- viewsheds from infrastructure (wind turbines).

The viewshed analysis is used to target areas to assess in the field. The parameters that are set are target height and eye height of the observer. A 30 km buffer around the Project was considered suitable for the wind farm development as beyond this distance the structures are not likely to be a dominant feature in the field of view. A further explanation of the viewshed analysis is provided in **Section 4.2**.

A simple landform classification was also undertaken using the Topographic Position Index (TPI) tool in ArcGIS Pro 3.2. This tool was used to identify hilltop areas to help delineate the Landscape Character Units (LCUs), specifically the Spinifex Hills LCU.

TPI is the difference between a cell elevation value and the average elevation of the neighbourhood around that cell. Positive values mean the cell is higher than its surroundings while negative values mean it is lower. TPI units are in elevation units, such that a TPI value of 10 would mean that this particular cell is 10 units (generally metres) higher than the average elevation of the neighbourhood. The magnitude of this difference can be used to classify the cell according to topographic position (Jenness, 2006). A generalised illustration of what TPI values indicate is provided in **Figure 2**.

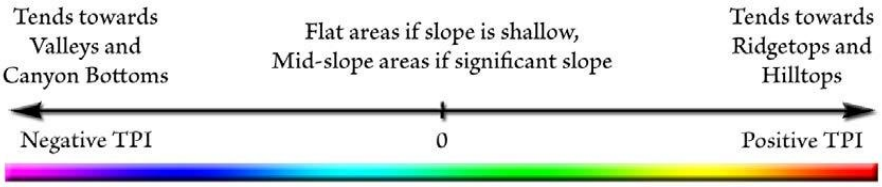


Figure 2: Illustrative Scale of TPI categorised into topographic position (Jenness, 2006).

2.2 SITE ANALYSIS

A site analysis was undertaken by Ecoscape on 5-6 March 2025 from the visual receptors within the Study Area (**Section 1.4**). A 360 degree view was photographed from each view location and details on the landscape character, view experience and landscape values were recorded.

For each of the viewpoints the visual landscape was described using terminology that have been adapted from CALM (1994), WAPC (2007) and The Landscape Institute (2013).

- view description: general description of view
- topography: flat, undulating, rugged
- vegetation: description of vegetation type and form
- waterform: evident or not evident, type of waterform
- colours: monochrome, muted, colourful, type of colours
- texture: smooth, textured, rough
- line: straight, angular, curved, sinuous
- form: vertical, sloping, rolling, horizontal.

Visual terminology such as line, form, colour and texture are used to describe Landscape character (**Figure 3**). This description allows for the comparison of the visual elements of a proposed development with the surrounding landscape to assist in the visual impact analysis.

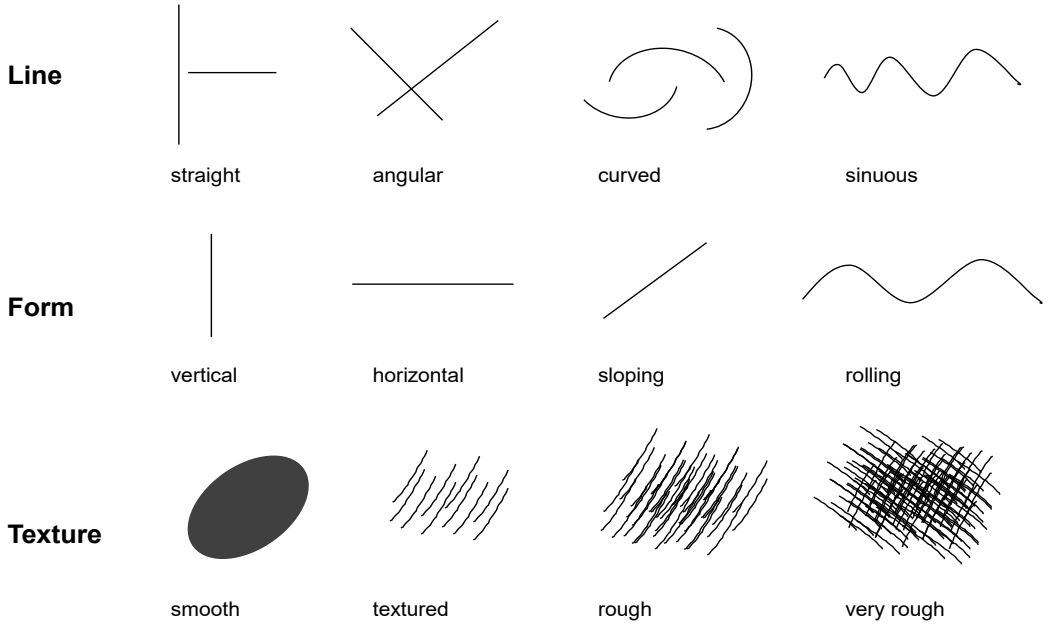


Figure 3: Visual terminology to describe landscape character

2.3 VIEW LOCATIONS

A total of 35 view locations (**Maps 2-13**) were subject to the site analysis which intersected with the viewsheds generated from the WTG's. 11 view locations were then selected for photo montage analysis in consultation with YEC. Subsequent to the site analysis, YEC added two view locations that required viewshed analysis to determine if the Project is potentially visible from these locations which are discussed in **Section 4.2**.

2.4 PHOTO MONTAGE ANALYSIS

A key component of visual impact analysis is the preparation and analysis of photo montages. The preparation of photo montages requires the following steps:

+ **Site photography:** photos are taken on site at each of the nominated viewpoints with a Canon 7D Mark II digital SLR. At each viewpoint, the GPS location, viewer orientation (compass bearing) and number of photos are recorded to assist with the 3D modelling and photo montaging process. The photographs were taken using a 35mm focal length to represent what the human eye can see.
+ **Data collation:** to produce a 3D model of the existing conditions. Topographic contours and viewpoint locations are converted to 3D GIS files in ArcGIS Pro. The surface terrain used to create the 3D data in was the hydrologically enforced surface elevation derived from the SRTM 1 second digital elevation model acquired from Geoscience Australia (Geoscience Australia, 2011). The 3D files are then converted to AutoCAD drawing files that are imported into 3DS Max.
+ **3D modelling:** the existing terrain data is imported into 3DS Max and combined with a 3D model of the proposed wind turbines. Virtual cameras in the 3D model are aligned with GPS locations and bearings recorded on site to produce representative views of each identified viewpoint. The photos taken on site are imported into 3DS Max and the combined model of the terrain and development is aligned with the terrain on the photo to fine tune the alignment of the camera view. The viewshed analysis is used to determine how much of the development should be visible and assist with camera alignmnent. The resulting photo montages provide an illustrative representation of future development within an estimated +/- 5 degrees of orientation from the viewpoint.
+ **Photo montages:** the output of the 3D model is a rendered 3D image of the proposed development, matching date and the time of day that the photograph was taken. This is overlaid on a photograph which results in a photo montage of the proposed development area.

Photo montages were analysed using visual impact criteria to determine dominant visual elements, which include visibility, line, form, colour and texture. The outcome of this analysis is a percentage score that determines the level of visual impact (magnitude of change), either being not visible, moderately visible (blending) or highly visible (prominent). To determine the overall impact level or the significance of the impact, the result of the visual impact analysis is combined with the visual sensitivity factors, that is, the Significance Level and the Visual Management Objective (VMO) of the Study Area.

Photo montages were prepared from 11 view locations that were that were identified using a combination of desktop and site analysis and confirmed by YEC. The photo montages show an indicative view of the Project consisting of 236 m high wind turbines.

2.5 VISUAL ASSESSMENT CRITERIA

To assess visual impact, a visual landscape evaluation must be undertaken to understand the landscape values of an area and the significance level of viewing locations. The Landscape Institute (2013) developed criteria to determine the level of impact which were based on landscape values and viewer sensitivity. The criteria are 'sensitivity' and 'magnitude' which are categorised into high, medium and low. Sensitivity being the significance of the viewing location and the landscape value. Depending on the sensitivity of the landscape and magnitude of change, the impact can be described as either slight, moderate or substantial. The principle of this criteria is similar to the visual impact levels used in this assessment which are Level 1, 2 and 3. These impact levels are based on:

+ Visibility rating which relates to the magnitude of change and the visual prominence of the development

- Significance Level which refers to the significance of the viewing location and degree of public sensitivity (**Appendix One**)
- Visual Management Objective (VMO) which reflects both landscape sensitivity (landscape values) and public sensitivity.

These assessment criteria are further discussed below.

2.5.1 VISIBILITY RATING

The visibility rating is identified through the analysis of photo montages (**Section 4.3**)

Table 5: Visibility Rating

Visibility Rating	Description
Prominent	The development is a dominant feature in the field of view and contrasts with the surrounding landscape. Subsequently there is a significant change to the view experience and may also change the landscape character depending on the nature of the development.
Blending	The development is visible but does not dominant the view or draw attention to itself, visual elements of the development do not contrast with the surrounding landscape.
None	The development is not visible.

2.5.2 SIGNIFICANCE LEVEL

Significance level refers to the level of use of an area which is outlined in **Appendix One**. Other factors which may increase the significance of a route include the importance of views and the duration of view (WAPC, 2007).

Table 6: Significance Levels

Significance Level	Description
S1	High use areas such as State Highways, designated tourist routes and sites, designated recreation sites and trails of national or state significance, residential areas.
S2	Moderate use areas such as main roads with moderate vehicle use (sealed or unsealed), recreation sites and trails of regional or high local significance.
S3	Low use areas, locally significance roads or tracks, locally significant recreation sites and trails.

2.5.3 VISUAL MANAGEMENT OBJECTIVES

Visual Management Objectives (VMOs) are assigned to manage the visual landscape. A proposed development is assessed against these VMOs to identify if the visual change will be appropriate for the landscape setting. The VMOs developed by the WAPC (2007) are listed in **Table 7**.

Table 7: Visual Management Objectives (WAPC, 2007)

VMO	Description
Protection and Maintenance	This objective is the maximum retention of the existing visual character and applies to highly valued landscapes.
Best Practice Siting and Design	This is the baseline objective for all landscapes, therefore a prominent impact may not meet this objective. Mitigation strategies may deem the impact acceptable such as: + the application of practical and sensitive siting and design techniques + retaining dominant landscape features and characteristics + enhancing or restoring landscape features.
Restoration and Enhancement	This objective applies to degraded landscapes that require rehabilitation to restore visual amenity. Enhancement may also refer to identifying opportunities to improve key views e.g. providing roadside lookouts to take advantage of a scenic view, clearing overgrown vegetation to enhance a view corridor etc.

2.6 VISUAL IMPACT ANALYSIS

The visual impact levels outlined in **Table 8** have been developed by Ecoscape using the assessment criteria to reflect current assessment guidelines with the aim of providing a clear interpretation of visual impact. The visual assessment matrix table (**Table 9**) has been developed conservatively and should be used as a guide for further investigation and discussion of the acceptability of impacts with stakeholders, particularly for areas identified as a Level 1 impact.

Table 8: Visual Impact Levels

Impact Level	Description
1	A Level 1 impact occurs where the proposed development is 'prominent' at all view locations that have been assigned the Protection and Maintenance VMO and at Significance Level 1 view locations that have been assigned the Best Practice Siting and Design VMO. The visual impact is considered a prominent change that may not adhere to the assigned VMOs as the development is a dominant feature that contrasts with the surrounding landscape. Subsequently, a Level 1 impact results in an obvious change to the view and may also impact and alter key views and landscape character.
2	A Level 2 impact occurs where the proposed development is visible but not dominant i.e. 'blending' for landscapes and views that have been assigned a VMO of Protection and Maintenance. Subsequently, the visual impact may be at variance with the VMO of Protection and Maintenance, particularly if the objective is to ensure that development is not evident. A Level 2 impact also occurs where proposed development is visually prominent from view locations that are lower in sensitivity i.e. Significance Level 2 and 3 sites that have been assigned the Best Practice Siting and Design (BPS&D) VMO. The impact may not adhere to BPS&D VMO depending on the nature of the development. A Level 2 impact also occurs where proposed development is visually prominent from view locations that have been assigned the Restoration and Enhancement VMO.
3	The visual impact is unlikely to be at variance with the VMO as the development is not a dominant feature in the view but blends in with the landscape setting. It is assumed that 'blending' developments are more likely to meet the Best Practice Siting and Design VMO and the Restoration and Enhancement VMO.
No impact	The development is not visible, therefore no visual impact to landscape character or view experience is expected.

Table 9: Visual impact level matrix table

	Visibility rating	Prominent			Blending			Not Visible
	Significance Level rating	S1	S2	S3	S1	S2	S3	S1-3
Visual Management Objective	Protection and Maintenance	L1	L1	L1	L2	L2	L2	No impact
	Best Practice Siting and Design	L1	L2	L2	L3	L3	L3	No impact
	Restoration and Enhancement	L2	L2	L2	L3	L3	L3	No impact
		VISUAL IMPACT LEVEL						

2.7 VISUAL ABSORBANCE CAPACITY

The Visual Absorbance Capacity (VAC) of a landscape will affect the visual impact level of the Project. VAC is the ability of the landscape to absorb a visual change, which is associated with the dominance and variable elements which have been used to assess the impact from each viewpoint. Views with simple form and line may be more sensitive to change compared to views that are more detailed in form, line and colour, such as varied and undulating landform and variable vegetation structure (FPA, 1990). In the latter example, infrastructure can be strategically placed within the landscape using the topography and vegetation to minimise its visual impact. Other factors that affect the level of VAC are listed in **Table 10** (FPA, 1990).

Table 10: Factors that influence the Visual Absorbance Capacity (VAC) of a landscape

Factor	Increased VAC	Decreased VAC
Biophysical	+ Landform: variable, undulating landform + Vegetation: greater vegetation diversity in structure, colour and form	+ Slope: increased slope + Soil: greater contrasting soil colour with surrounding vegetation + Site recovery: slower site recovery rate
Perception	+ Increased distance from site + Slope facing away from observer + Lower public sensitivity level + Short view duration (e.g. from moving vehicle)	+ Close distance to site + Slope facing the observer + Greater public sensitivity level + Long view duration + Development in direct line of sight
Proposed Development	+ Similar visual elements to surrounding landscape, i.e. shape, colour, texture + Short term activity	+ Large scale development + Longer duration activity

2.8 DISTANCE ZONES

The distance between the observer and the proposed development can affect the level of visual impact. The further the distance the less space the target occupies in the observer's field of view and therefore the visual impact may not be as significant (WAPC, 2007). The WAPC (2007) guidelines adopt the following categories which have been based on the amount of colour and textural detail that is visible:

+ Foreground zone: 0-500 metres
+ Mid-ground zone: 0.5-6.5 kilometres
+ Background zone: beyond 6.5 kilometres.

3 VISUAL LANDSCAPE EVALUATION

This section documents how the landscape is viewed and valued, both of which are related to the community's 'sense of place'. The way a landscape is perceived will differ amongst observers, but general valued characteristics can be categorised from the extensive desktop research undertaken by CALM (1994) and WAPC (2007). Understanding the visual landscape is an integral part to developing strategies to manage landscape character.

3.1 LANDFORM AND VEGETATION

3.1.1 ELEVATION

The terrain is predominately undulating with low hills dissected by low lying drainage lines. The steep and rugged terrain of the Hamersley Range occurs to the south of the Study Area. Elevation range within the Study Area is 40 – 590 metres Australian Height Datum (AHD), with most of the Study Area occurring between 230 – 280 m AHD. Terrain greater than 367 m AHD has the lowest count, which is associated with the Hamersley Range to the south of the Study Area. The Project is situated on terrain that ranges from 130 – 360 m AHD. The elevation of the Study Area is shown on **Map 2.**

3.1.2 LANDFORM

The visual landscape character is closely aligned with the land systems (**Table 11**). 43% of the Study Area is covered by the Rocklea land system which is dominated by spinifex covered hills and ridges, basalt hills and undulating stony plains. The Capricorn land system is the next most common covering an area of 12% which also consists of spinifex covered hills and ridges and undulating stony plains (**Map 3**).

Table 11: Land Systems within the Study Area (DPIRD, 2017)

Land System	Description	Extent of Study Area (%)	Visual Receptor	View Location
Boolaloo system	Granite hills, domes, tor fields and sandy plains supporting spinifex grasslands with scattered shrubs.	1.3		
Boolgeeda system	Stony lower slopes and gently undulating plains below hill systems supporting hard and soft spinifex grasslands or mulga shrublands.	5.0	Millstream Road	
Brockman system	Gilgai alluvial plains with cracking clay soils supporting tussock grasslands and low woodlands.	1.7	Millstream Road	
Calcrete system	Low calcrete platforms and flat to gently undulating plains supporting shrubby hard spinifex grasslands, scattered Acacia shrubs and occasional trees.	1.7	Manuwarra Red Dog Highway, Millstream Road	6, 7, 8
Capricorn system	Rugged sandstone hills, ridges, stony footslopes and interfluves supporting low acacia shrublands or hard spinifex grasslands with scattered shrubs. Occasional gently undulating stony plain with hummock grasslands.	11.9	Manuwarra Red Dog Highway, Radio Hill Track, Jinbi Springs Track, Ngurrawaana, Roebourne Wittenoom Road	1, 2, 15, 16, 17, 22, 23, 24, 25, 27
Hooley system	Alluvial clay plains supporting a mosaic of snakewood shrublands and tussock grasslands	0.2		
Horseflat system	Gilgaied clay plains supporting tussock grasslands and minor grassy snakewood shrublands	3.2	Manuwarra Red Dog Highway	
Kanjenjie system	Stony clay plains supporting snakewood shrublands with tussock grasses	1.2	Millstream Road	5
Macroy system	Gently undulating stony plains and occasional tor fields based on granite supporting hard and soft spinifex shrubby grasslands. Occasional isolated hills and ridges.	1.4		

Land System	Description	Extent of Study Area (%)	Visual Receptor	View Location
Mallina system	Sandy surfaced alluvial plains supporting soft spinifex grasslands and minor hard spinifex and tussock grasslands and very scattered acacia shrubs.	1.1		
McKay system	Rounded hill and ridge crests to gently inclined plateaus, moderate to very steep slopes with spinifex hummock grasslands and isolated acacia shrubs and/or snappy gums (*Eucalyptus leucophloia*). Also stony plains and lower footslopes supporting hummock grasslands with scattered acacia shrubs and occasional eucalypt trees.	5.3	Manuwarra Red Dog Highway, Millstream Road	
Newman system	Rugged jaspilite plateaux, ridges and mountains supporting hard spinifex grasslands, scattered shrubs and eucalypt trees.	0.6		
Oakover system	Breakaways, mesas, plateaux and gently undulating stony plains of calcrete supporting hard spinifex shrubby grasslands and isolated shrubs.	0.9		
Paraburdoo system	Basalt derived stony gilgai plains and gently undulating stony plains supporting snakewood and mulga shrublands with spinifex, chenopods and tussock grasses.	0.9	Manuwarra Red Dog Highway	
Platform system	Dissected slopes and raised plains supporting spinifex hummock grasslands and isolated acacia shrubs or snappy gums.	0.3		
Pyramid system	Stony gilgai plains supporting hard spinifex grasslands and minor tussock grasslands with isolated acacia shrubs.	2.1	Manuwarra Red Dog Highway	
River system	Narrow, seasonally active flood plains and major river channels supporting moderately close, tall shrublands or woodlands of acacias and fringing communities of eucalypts (Eucalyptus vitrix, E. camaldulensis) sometimes with tussock grasses or spinifex hummock grasslands.	3.2	Manuwarra Red Dog Highway, Millstream Road	
Robe system	Low plateaux, mesas and buttes of nmoderate to steep slopes supporting soft spinifex and occasionally hard spinifex grasslands, scattered shrubs and occassional snappy gums. Some gentle slopes supporting hummock grasslands and scattered shrubs.	0.6	Manuwarra Red Dog Highwa	
Rocklea system	Basalt hills, plateaux, lower slopes and minor stony plains supporting hard spinifex and occasionally soft spinifex grasslands with scattered shrubs. Some areas of gently undulating stony plains with hummock grasslands and scattered shrubs.	43.4	Manuwarra Red Dog Highway Jinbi Springs Track, Ngurrawaana & access track, Roebourne Wittenoom Road	4, 14, 19, 21, 29, 30, 31, 35 9, 10, 26 3
Ruth system	Hills and ridges of volcanic and other rocks supporting shrubby hard spinifex and occasionally soft spinifex grasslands. To a lesser extent, lower slopes and stony plains with hummock grasslands and isolated shrubs.	5.7	Manuwarra Red Dog Highway	34 28, 32, 33
Satirist system	Stony plains and low rises supporting hard spinifex grasslands, and gilgai plains supporting tussock grasslands	0.1		
Sherlock system	Stony alluvial plains supporting snakewood shrublands with patchy tussock grasses and spinifex grasslands	0.9		
Uaroo system	Broad sandy plains, pebbly plains and drainage tracts supporting hard and soft spinifex hummock grasslands with scattered acacia shrubs	0.3		
Wona system	Stony upland gilgai plains supporting tussock grasslands, minor hard spinifex grasslands or annual grasslands/herbfields and patches of snakewood shrublands (Acacia xiphopylla).	6.9	Manuwarra Red Dog Highway, Ngurrawaana access track, Roebourne Wittenoom Road	11, 12, 13, 18, 20

3.1.3 VEGETATION

The dominant vegetation cover (from a visual perspective) are spinifex grasses, scattered acacia shrubs and isolated trees. Some areas contain a moderate to dense cover of shrubland/woodland vegetation that is

associated with drainage lines. Also occurring a visually distinctive exposed rocky (dolerite/basalt) hills devoid of vegetation. The Pre-European Vegetation Types that intersect with the visual receptors within the Study Area are listed in the **Table 12**.

Table 12: Pre-European Vegetation

Vegetation Association	Broad Vegetation Description	Extent of Study Area (%)	Visual Receptor	View Location
93	Hummock grasslands, shrub steppe; kanji over soft spinifex	11.3	Manuwarra Red Dog Hwy, Jinbi Springs Track	26
152	Hummock grasslands, grass steppe; soft & hard spinifex soft spinifex	11.8	Manuwarra Red Dog Hwy, Jinbi Springs Track	27-33
173	Hummock grasslands, shrub steppe; kanji over soft spinifex & *Triodia wiseana* on basalt	18.8	Manuwarra Red Dog Hwy, Ngurrawaana access tracks	3, 4, 9, 10, 18, 19, 21
175	Short bunch grassland - savanna/grass plain (Pilbara)	10.6	Manuwarra Red Dog Hwy	11-13, 20
587	Mosaic: Hummock grasslands, open low tree-steppe; snappy gum over *Triodia wiseana* / Hummock grasslands, shrub-steppe; kanji over *Triodia pungens*	30.0	Manuwarra Red Dog Hwy, Roebourne-Wittenoom Rd, Jinbi Springs Track, Ngurrawaana north access track	1, 2, 14-17, 22-25
589	Mosaic: Short bunch grassland - savanna / grass plain (Pilbara) / Hummock grasslands, grass steppe; soft spinifex	7.4	Manuwarra Red Dog Hwy, Roebourne-Wittenoom Rd	34, 35
607	Hummock grasslands, low tree steppe; snappy gum & bloodwood over soft spinifex & *Triodia wiseana*	4.6	Manuwarra Red Dog Hwy, Millstream Road	8
629	Mosaic: Short bunch grassland - savanna / grass plain (Pilbara) / Hummock grasslands, grass steppe; hard spinifex, *Triodia wiseana*	0.5	Millstream Road	
641	Medium woodland; coolabah & river gum	0.4	Millstream Road	
645	Hummock grasslands, shrub steppe; kanji & snakewood over soft spinifex & *Triodia wiseana*	1.6	Millstream Road	5
646	Hummock grasslands, shrub steppe; snakewood over *Triodia basedowii*	2.5	Millstream Road, Ngurrawaana east access track	6, 7

3.2 LANDSCAPE CHARACTER

3.2.1 LANDSCAPE CHARACTER TYPES

The purpose of characterising the landscape for a visual impact assessment is to understand the visual setting of the landscape surrounding the proposed Project to determine if the proposed infrastructure will visually fit within the landscape. Landscape character is derived from a combination of biophysical and social characteristics.

A Landscape Study undertaken by the former Department of Conservation and Land Management (CALM, 1994) classified Western Australian landscapes into broad Character Types. The main objective was to provide a reference guide to assess the representation and significance of WA's visual landscape to develop appropriate planning and design guidelines and polices to protect and enhance the visual landscape. The term landscape is defined as a combination of physical and cultural features. A Landscape Character Type (LCT) is where there is a common combination of these characteristics such as landform, waterform, vegetation and land use (CALM, 1994).

The Project and the majority of the Study Area occurs within the Karratha Coastal Plain LCT. The Karratha Coastal Plain extends from Roebourne along the coastline to Cape Preston, west of Dampier. Along the western boundary it goes south to Pannawonica where it meets the Hamersley Range LCT. To the east is goes down to the MCNP and meets the Chichester Range and Fortescue Valley LCTs (**Map 1**).

The Study Area also occurs on the fringes of the Fortescue Valley, Chichester Range and Hamersley Range LCT's. The LCT's are described in **Table 13** below.

Table 13: Landscape Character Types within the Study Area (CALM 1994)

LCT	Landform	Vegetation	Waterform
Karratha Coastal Plain	Gently undulating coastal plain with low rocky hills further inland near the Project Area.	Grasslands, scattered shrubs and isolated low trees.	A series of creeklines and rivers dissect the plain
Fortescue Valley	Follows the Fortescue River in a northwest to southeast direction for about 330 kilometres. It is a broad U-Shaped valley with wide open sandy plains.	Dense cover of hummock grasses with scattered trees and shrubs, dense areas of shrubland and woodland also occur.	The Fortescue River is the dominant waterform which remains intermittent until it reaches the MCNP at the western boundary of the valley. Gorges and deep permanent pools such as Deep Reach Pool in MCNP.
Chichester Range	A long, narrow range which transitions from gently undulating to rugged near the boundaries.	Hummock grasslands on rocky slopes with scattered shrubs and trees.	Several rivers dissect the landscape. Gorges and Pools occur at the Western End such as Python Pool.
Hamersley Range	Rugged ranges, steep gorges and valleys that dissect the landscape.	Expansive hummock grasslands with scattered shrublands and distinctive white barked Snappy Gums (*Eucalyptus leucophloia*).	Several major intermittent creeklines. Incised creeks and gorges are also present such as Karijini National Park.

3.2.2 LANDSCAPE CHARACTER UNITS

A Landscape Character Unit (LCU) is a smaller unit than a Landscape Character Type (LCT). While the LCT has common characteristics at a regional scale, there will be variations within an LCT that can be identified at a local scale. An LCU is a geographic area sharing common characteristics such as landform, vegetation, waterform and cultural land use patterns relevant to human interaction and experience.

The predominant character of the Study Area is a natural undulating landscape covered in spinifex grasses. Infrastructure is visible within the Study area, notably the Rio Tinto rail line that occurs next to the Manuwarra Red Dog Highway with several level crossings. The rail occurs discretely within the landscape but is most noticeable when in use. High voltage transmission lines also occur to the west of the highway, also present are telecommunication poles, a pipeline, other low voltage transmission lines and the Karratha weather station that is located on a high hill. A small scale mine is also visible near the base of the weather station. Examples of the various infrastructure present within the Study Area are shown on **Plate 1 - Plate 8**.

Plate 1: Rio Tinto Rail line near view point 24

Plate 2: Pipeline and rail at view point 33

Plate 3: Transmission tower at view point 28

Plate 4: Transmission line at view point 34

Plate 5: Communication poles at view point 22

Plate 6: Weather station visible at Radio Hill (view point 35)

Plate 7: Small scale mine near base of Radio Hill (view point 35)

Plate 8: Rail Crossing (view point 13)

Four broad LCUs were identified within the Study Area which are listed in **Table 14** and described in the following section. To delineate the Spinifex Hills LCU from the Undulating Grassland Plain LCU, the landform classification tool - Topographic Position Index (TPI) (Jenness, 2006) was used to calculate landform position, areas with a position TPI were identified as hill tops which were attributed to the Spinifex Hills LCU. Large areas without hill tops were mapped as the Undulating Grassland Plain LCU. The LCUs are shown on **Map 4**.

Table 14: Landscape Character Units within the Study Area

Landscape Character Unit	Summary Description / Land System	Extent of Study Area (%)	View Locations
LCU 1 – Spinifex Hills	**Description**: undulating to rugged terrain covered in spinifex grasses. **Dominant Land Systems**: Rocklea, Capricorn	55.6	1, 2, 4, 14-17, 19, 21-25, 27, 29-31, 34-35
LCU 2 – Undulating Grassland Plain	**Description**: gently undulating terrain covered in spinifex grasses and sparsely scattered shrubs and trees **Dominant Land Systems**: Rocklea, Wona, Boolgeeda	35.8	6-10, 12,13, 18, 20, 26, 28, 32, 33
LCU 3 – Tall Shrubland Plain	**Description**: flat plain covered in spinifex grasses and tall moderately dense shrublands. **Dominant Land Systems**: Brockman, Boolgeeda, Kanjenjie	5.3	3, 5, 11
LCU 4 – Drainage Lines	**Description**: bands of moderate to dense cover of muted to dark green shrubland/woodland vegetation denote the presence of drainage lines amongst the spinifex dominant landscape **Dominant Land Systems**: River System	3.4	

3.2.3 LCU 1 – SPINIFEX HILLS

The Spinifex Hills LCU covers the widest extent within the Study Area (55.5%) and is characterised by undulating to rugged terrain that is covered in spinifex grasses with scattered tall shrubs (**Plate 9** and **Plate 10**). The terrain is dissected by drainage lines, including creeklines that are incised through steep terrain (**Plate 11**) and interspersed by areas of gently undulating grasslands (Undulating Grassland Plain LCU). The horizon line consists of curved and sinuous lines to angular and occasionally straight and horizontal mesa forms. The exposed basalt hills are a distinctive feature of this LCU which are visible from the Manuwarra Red Dog Highway, the bare dark orange rocks contrast with the pale yellow/green spinifex grasses and the pale blue sky background (**Plate 12**).

A summary of the visual characteristics is provided below:

- Scale: this is an expansive landscape, however the sense of scale varies depending on the location of the viewer, when surrounding by undulating landform the scale is enclosed, however from high vantage points the sense of scale is open and expansive.
- Texture: at a close viewing range, the hills have a textured appearance which is created by the stony soils and spikey spinifex clumps, although textures become less apparent in the distance.
- Form: the terrain has variable forms that range from gently rolling horizon lines to more dramatic sloping steep sided hills and flat top mesas. At a close viewing distance, more variation in form such as sloping hill faces are apparent.
- Line: the hills are a sinuous line on the horizon and at a closer viewing distance the line is also angular and curved.
- Colour: this LCU consists of vibrant orange stony soils and dark orange exposed rocks which contrast with pale yellow/green spinifex grasses and muted grey/green shrubland. Colour variation is less apparent where the hills are visible on the distant horizon.

Plate 9: North view of the Spinifex Hills at view point 4

Plate 10: Northeast view of the Spinifex Hills LCU at view point 32

Plate 11: Northeast view of an incised creekline through hilly terrain at view point 15

Plate 12: East view of exposed basalt hills at view point 31

3.2.4 LCU 2 – UNDULATING GRASSLAND PLAIN

This LCU is a vast open landscape covered in spinifex grasses, scattered shrubs and isolated trees such as white barked snappy gums (*Eucalyptus leucophloia*) and Hamersley bloodwoods (*Corymbia Hamersleyana*) (**Plate 13**). The Undulating Grassland Plain is visually similar to the Spinifex Hills LCU but with less variation in elevation. Drainage lines dissect this landscape and there are some areas of low lying shrublands containing snakewood (*Acacia xiphophylla*).

A summary of the visual characteristics is provided below:

- Scale: generally a large sense of scale due to the open nature and large area that is covered by this LCU.
- Texture: the overall impression is a textured landscape which is created by the variety of textures present in the natural landscape, such as areas of rough stony soils, smooth sandy areas and rock formations, spikey spinifex clumps with soft and wispy flower stalks and rough barked tall shrubs.
- Form: the undulating grassland plain is characterised by a horizontal landform that is punctuated by vertical and sloping tall shrubs / low trees with the rolling hills on the distant horizon line. Other forms are the rolling spinifex canopy at ground level and the rolling shrub/tree canopy where present.
- Line: the line of the landform is straight and the horizon line is sinuous where hills are present. Curved spinifex clumps are a dominant feature at ground level. The scattered tall shrubs have angular and straight branches and a curved canopy.
- Colour: this LCU consists of a simple colour palette of pale greens, pale yellow, browns and oranges. While the colour pallet is simple, the colour contrast is striking between the pale spinifex grass and rich orange stony soils.

Plate 13: West view of the Undulating Grassland Plain LCU view point 9

3.2.5 LCU 3 - TALL SHRUBLAND PLAIN

The Tall Shrubland Plain is mostly in southern portion of the Study Area which is visible from Manuwarra Red Dog Highway (**Plate 14**) and Millstream Road. The defining characteristic of this LCU is the flat topography, stony rich red brown soil and muted green shrubland vegetation in various densities and scattered trees which contrast with the rolling form of the Hamersley Range on the southern horizon line (from Millstream Road) (**Plate 15**).

A summary of the visual characteristics is provided below:

- Scale: the scale is closely related to the level of vegetation screening on the Tall Shrubland Plain LCU. Where views are open the sense of scale is large, whereas filtered views through taller vegetation create a smaller sense of scale.
- Texture: the overall impression is a textured landscape which is created by the variety of textures present in the natural landscape, such as areas of rough stony soils, spikey spinifex clumps with soft and wispy flower stalks and a textured shrubland canopy with rough bark.
- Form: the Tall Shrubland Plain is characterised by a horizontal landform that is punctuated by vertical and sloping tall shrubs / low trees with the rolling hills on the distant horizon line.
- Line: the line of the landform is straight and the horizon line is sinuous where hills are present. The scattered tall shrubs have angular and straight branches and a curved canopy. Grasses consist of straight to angular flower stalks and curved hummock forms.
- Colour: this LCU consists of a simple colour palette of pale greens, pale yellow, browns and oranges. Green/yellow grasses contrast with the rich red brown stony soils.

Plate 14: West view of a snakewood shrubland at view point 11

Plate 15: South view of the Tall Shrubland Plain with Hamersley Range on the Horizon at view point 5

3.2.6 LCU 4 – DRAINAGE LINES

The landscape of the Study Area is dissected by the Drainage Lines LCU. This LCU is visually evident as green bands of dense vegetation which contrast with the surrounding pale coloured low spinifex grasses (**Plate 16**). The drainage lines can be varied depending on the landscape setting, at Jinbi Springs (view location 1) the creekline is incised through the Spinifex Hills LCU resulting in steep-sided rocky banks (**Plate 17**). The Drainage Lines LCU also contains rocky pools such as Python Pool in the Millstream Chichester National Park which are distinctive yet discrete landscape features within the Study Area (**Plate 18**).

A summary of the visual characteristics is provided below:

- Scale: the Drainage Line LCU is a small unit that occurs as narrow bands of vegetation amongst the larger Spinifex Hills and Undulating Grassland LCUs. Within the Drainage Lines, taller vegetation and steep sided rock faces create an enclosed view and an intimate sense of scale
- Texture: this LCU can appear textured from a distance which is created by the vegetation canopy. Within the Drainage Line LCU, smooth and softer textures are also present consisting of water (if present), smooth rocks and soft vegetation foliage.
- Form: a rolling form of the dense vegetation canopy is evident from a distance with a variety of forms such as vertical and sloping branches when viewed at a closer range.
- Line: the vegetation canopy is curved with trees and shrubs consisting of angular and straight branches. From an aerial perspective, the Drainage Lines LCU dissect the landscape in a series of sinuous lines.
- Colour: at a distance this LCU consists of a simple colour palette of greens. At a closer viewing range, the colours are variable depending on the composition of plant species and can consist of various greens of the diverse vegetation foliage, white barked Eucalypt trees, orange rocks, grey/brown leaf litter and shrub branches, vibrant green tussock grasses and tannin coloured water (where present).

Plate 16: Dense band of vegetation indicating the presence of a Drainage Line at view point 25

Plate 17: Tall riparian vegetation and steep rocky banks at Jinbi Springs (view point 1)

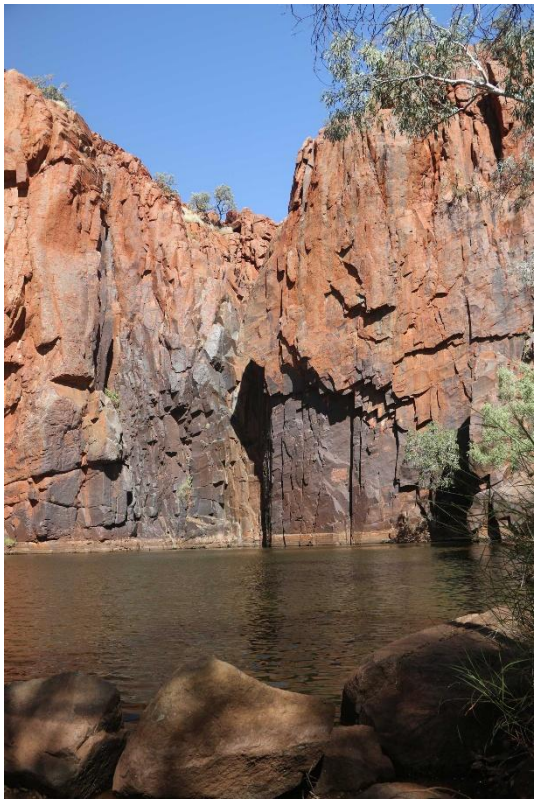


Plate 18: An enclosed and imitate sense of scale at Python Pool (view point 14)

3.3 LANDSCAPE VALUES

Visual quality is described in *Reading the Remote, Landscape Characters of Western Australia* (CALM, 1994) as "the relative visual character of a landscape, expressed as an overall visual impression or value held by society after perceiving and area of land / water." CALM (1994) identified that visual quality increases with greater:

- naturalness value, i.e. landscapes that have minimal modification and where natural features are prominent;
- topographic relief and ruggedness; and
- vegetation and landscape diversity.

The Visual Landscape Planning in Western Australia: a manual for evaluation, assessment, siting and design (WAPC, 2007) identified key character indicators that can be used as a basis for classifying the landscape into two preference categories; 'most' preferred and 'least' preferred landscapes. These preference categories were established for natural, rural and built landscapes. All landscape character units described above fall within the 'natural' category for preference indicators.

'Most' preferred characteristics are defined as landscape features that are highly valued by the community and contribute to the visual character. 'Least' preferred are features not valued by the community and detract from the visual character (WAPC, 2007). The preference indicators for natural environments are summarised in **Appendix Two**.

The character preferences found within the Study Area are:

- rugged terrain – this landscape feature forms striking horizon lines in the distance and an enclosed view when traversing through steep undulating landforms that occur within the foreground. Distinctive colours are also apparent such as the bright orange to deep orange rock forms contrasting with the pale green to yellow spinifex dotted across the landscape. The Hamersley Range is a distinctive feature that is visible on the southern horizon line (**Plate 19**, **Plate 20**).
- distinctive landscape features – in particular the exposed dark orange basalt hills that are visible from the Manuwarra Red Dog Highway. These areas generally coincide with the Rocklea land system (**Plate 21**).
- expansive landforms – expansive views across undulating terrain (**Plate 22**)
- high degree of perceived naturalness – expansive areas that have no visible modification (**Plate 22**).
- distinctive displays of colour: deep orange rocky hills that contrast with the surrounding landscape, contrasts between vibrant orange stony soils and green/yellow spinifex grasses.
- structural vegetation diversity –stands of white barked Snappy Gums and taller grasses and scattered shrubs provide visual diversity compared to the extensive cover of low spinifex grasses and scattered shrubs that is associated with the Spinifex Hills LCU (**Plate 23**).
- drainage lines: this landscape feature dissects the landscape and is visually expressed as dense green vegetation meandering between the undulating terrain (**Plate 16**).
- waterforms ‑ inundated creeks and rivers (seasonal), rocky pools (**Plate 24**).

As mentioned in **Section 3.2.2**, infrastructure is also visible within the Study Area, some of these uses are considered to be least preferred characteristics, such as:

- Extractive industry (gravel pits, mining).
- Linear infrastructure (water pipeline, low and high voltage transmission lines, transmission line substation).

Plate 19: Rugged terrain from Manuwarra Red Dog Highway (view location 23)

Plate 20: Rugged terrain of the Hamersley Ranged from Millstream Road (view location 5)

Plate 21: Distinctive landscape features – Basalt Hills (view location 32)

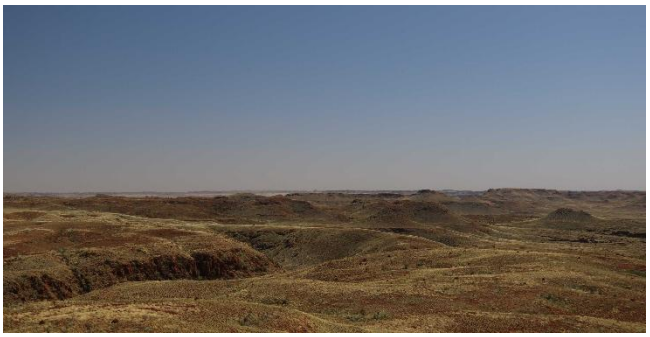


Plate 22: Expansive landforms – Chichester Range (view location 16)

Plate 23: Vegetation diversity – Millstream Road (view location 7)

Plate 24: Waterform – Python Pool (view location 14)

3.4 VIEW SIGNIFICANCE

How a landscape is viewed is of critical importance in understanding changes in the landscape and how people perceive them. Visual landscapes relate to peoples' sense of place and quality of life.

The *Visual Landscape Planning in Western Australia: a manual for evaluation, assessment, siting and design (*WAPC, 2007) identified components that can be used to document viewing experiences, the significance of the viewing location and specifically what is in the landscape that is valued to understand how people experience a landscape.

The document presents three levels of significance to categories views: national/state, regional and local. Some viewing locations, views and areas visible in views will be considered more important than others by those experiencing the landscape, and some viewers will be more aware of the landscape and more concerned about its appearance depending on their reasons for being in the landscape.

Further to this the WAPC (2007) notes that significance of a view increases with:

+ importance of views, including type, features and rarity
+ volume of use of roads, trails and navigable waterways
+ degree of sensitivity of viewers; those who are more likely to be more sensitive include wilderness users, other recreational users, tourists, people who choose to live in an area because of its landscape character and views
+ degree to which experiencing the landscape is integral to enjoyment of a travel route or site. For example, a specific tourist route is likely to be more sensitive than a commuting route.
+ length of duration of a view; range could include glimpses from a high-speed road, longer duration views obtained from roads used for sightseeing or from recreation sites and Lookouts and very long and frequent views from the main living areas of homes.

Table 15 provides a summary of the assessed view locations within the Study Area.

Table 15: Significance of visual receptors within the Study Area

Visual Receptor	Significance Level	Comments	View Locations
Manuwarra Red Dog Highway	1	State Highway with a range of viewers including tourists and workers. The road is promoted as part of the Warlu Way (ANW Toursim, 2023) which is a drive trail in the Pilbara region. This section connects Karratha and Tom Price and traverses the Millstream Chichester National Park (MCNP)	9-13, 21-34
Millstream Road	1	The section of road is part of the Warlu Way as it is the access route to the MCNP camping and recreation sites.	5-8
Roebourne-Wittenoom Road	1	This section is part of the Warlu Way drive trail and is the main access route to designated recreation sites within the MCNP namely, Mount Herbert and Python Pool.	11 - 20
Ngurrawaana Community	1	A residential community, views would be long and frequent from this location	3
Ngurrawaana Access Track	3	Unsealed access track used by workers and residents.	4
Jinbi Springs	2	A site of local significance, views would be long and frequent from this location.	1, 2
Radio Hill	2	Promoted as a local lookout in the Karratha region, access is along 5.8 kms of unsealed track that is best suited to 4WD vehicles.	35

3.5 VIEW EXPERIENCE

The Study Area contains a variety of view types experience along travel routes and recreation sites. View experience is determined by the position of the observer within the landscape and the presence of undulating terrain and to a lesser extent, vegetation.

The duration of view also impacts the view experience, an open view experience with minimal obstructions will allow the observer a longer view duration of a wider area compared to an enclosed view. The observer in a

vehicle is also likely to focus on the broader view and dominant landscape features. While observers who are walking or stopped at a viewpoint, can focus the broader view as well as the finer foreground details.

The following view types are present within the Study Area:

- enclosed – occurs where the road cuts through steep terrain and the view distance restricted to the immediate surrounding landform (**Plate 25**).
- focal - where surrounding landform either natural or man-made bunds create a focal view to the distant horizon (**Plate 26**).
- broadly enclosed – open views in the foreground and near mid-ground, undulating landform on the horizon in the mid-ground and beyond is restricts long distance views (**Plate 27**).
- open – broad and open views to the background, this view type generally occurs where the terrain is flat to gently undulating (**Plate 28**).
- filtered – views are filtered through trees and shrubs, this view was experienced along Millstream Road and at the Ngurrawaana Community (**Plate 29, Plate 30**).
- elevated – expansive views in most directions from high points such as Mt Herbert Lookout, roadside lookouts along Roebourne-Wittenoom Road and Radio Hill (**Plate 31**, **Plate 32**, **Plate 33**, **Plate 34**).

Plate 25: Enclosed north view from Manuwarra Red Dog Highway (view location 23)

Plate 26: Focal north view from Manuwarra Red Dog Highway (view location 25)

Plate 27: Broadly enclosed southwest view from Manuwarra Red Dog Highway (view location 26)

Plate 28: Open northwest view from Manuwarra Red Dog Highway (montage location 6)

Plate 29: Filtered south view from Millstream Road (view location 5)

Plate 30: Filtered northwest view from Ngurrawaana Community (view location 3)

Plate 31: Elevated north view of Chichester Range from Roebourne-Wittenoom Road (view location 15)

Plate 32: Elevated south view of Chichester Range from Mount Herbert (view location 14)

Plate 33: Elevated south view from Radio Hill (view location 35)

Plate 34: Elevated south view from Radio Hill (view location 35)

3.6 KEY VIEWS

Key views will encompass landscapes that the observer finds aesthetically pleasing and/or contributes to the 'sense of place'. The landscape values are intrinsic to view significance. As well as the physical characteristics of the landscape, other factors such as seasonal conditions, time of day, the position of the observer in the landscape and their own preferences will influence the enjoyment of a view.

The view types described in the previous section will also have an impact on view significance, for example an elevated view is often significant because of the vast area that is visible from a high perspective. A focal view with a landscape feature as the focal point may also form a key view.

Key views identified within the Study Area are listed below and displayed on **Map 5**:

- elevated expansive views (particularly from Roebourne-Wittenoom Road, Mount Herbert and Radio Hill)
- views of the Chichester Range (rugged terrain)
- views of the Hamersley Range (rugged terrain)
- views of the basalt hills (distinctive landscape features):
- enclosed foreground views of rugged terrain which is experienced along Manuwarra Red Dog Highway. This section of the highway is considered a distinctive view within the Study Area that provides an atypical view experience.

3.7 VISUAL MANAGEMENT OBJECTIVES

The aim of Visual Management Objectives (VMOs) is to provide criteria that enable the assessment of visual impacts for the visual landscape which is the landscape character, landscape values and view experience.

The VMOs adopted by WAPC (2007) to manage the visual landscape are:

- best practice siting and design, which should be the baseline objective for all landscapes
- protection and maintenance
- restoration of degraded character or enhancement of opportunities (not applicable to this study).

3.7.1 BEST PRACTICE SITING AND DESIGN

This VMO has been identified as the most appropriate VMO for the majority of the visual landscape within the Study Area. To meet this VMO, it is expected that any proposed development is blending; that is, development may be evident but generally not prominent in that it borrows from the existing landscape setting. Strategies to meet this objective may include:

- the application of practical and sensitive siting and design techniques
- retaining dominant landscape features and characteristics
- enhancing or restoring landscape features.

3.7.2 PROTECTION AND MAINTENANCE

Protection and maintenance is the maximum retention of existing visual character which is likely to apply to highly valued visual landscapes. Any alterations to the visual landscape character assigned this objective should be planned and designed to have minimal visual impact, in which development would either be not evident (i.e. development may be hidden, screened or not visible, from specified viewing locations) or blending (i.e. development may be evident, but generally not prominent in that it borrows from the existing landscape setting) (WAPC, 2007).

This VMO has been assigned to the following landscape values and view experiences (**Map 5**) within the Study Area:

- views of the Hamersley Range
- feature views of the basalt hills
- feature views of the Chichester Range
- panoramic views from designated lookouts (Mt Herbert)
- enclosed foreground views of rugged terrain along Manuwarra Red Dog Highway
- views from the Millstream Road and Roebourne-Wittenoom Road within the MCNP to align with the objectives in the MCNP and MRNR Management Plan (DEC, 2011), which are to *protect and enhance the visual qualities within the MCNP and MRNR planning area*.

4 VISUAL IMPACT ASSESSMENT

A Visual Landscape Evaluation (VLE) was undertaken which described landscape character, landscape values and view experience to understand the visual context of the landscape surrounding the proposed wind farm development and identify appropriate Visual Management Objectives (VMOs) to manage landscape character. The outcomes of the VLE also establishes landscape criteria to enable the assessment of visual impacts.

This section describes the potential visual impacts associated with the Project and assesses these against the recommended VMOs. Through this assessment, the visual impacts to view experience and landscape character can be identified and described.

The techniques used to identify the extent of potential visual impact of the Project were:

- viewshed analysis (**Section 4.2**) – to identify the theoretical visual extent of the Project
- photo montages (**Section 4.3**) – to show a visual representation of what the Project will look like in the existing landscape from a selection of view locations.

4.1 VISUAL IMPACT CRITERIA

To determine the level of visual impact of the development on the landscape, visual impact criteria are assessed at a selection of viewpoints within the landscape. These criteria were developed as a conceptual framework for analysing landscapes.

Ecoscape has adapted these criteria into an assessment table (**Table 9**) to categorise visual impacts into three levels. These visibility categories relate to how much the proposed change contrasts with the surrounding landscape:

- Not visible: development is hidden, screened or not visible, from specified viewing locations.
- Blending: development is evident, but not a dominant feature and blends with the existing landscape.
- Prominent: development is a dominant feature in the landscape, drawing attention to itself.

4.2 VIEWSHED ANALYSIS

The objective of the viewshed analysis was to determine the potential visible area from the VIA locations. Seen area or viewshed analysis is a tool performed using a GIS computer program, in this case ArcGIS Pro. It is a conceptual desktop method best complemented by a site visit to confirm the results of the analysis as it does not account for features such as vegetation. A viewshed analysis calculates the areas that are visible from an observation point using a set of user defined parameters such as height of observer and target height. The analysis used a 30 m resolution smoothed digital elevation model (DEM-S) derived from the Shuttle Radar Topography Mission (SRTM) 1 second digital elevation model (Geoscience Australia, 2010).

4.2.1 WIND TURBINES

Two composite viewsheds were generated from the WTGs, one from hub height (150 m AGL) and another from the height of the lower blade tip (64 m AGL). The output was used to identify the areas in the landscape that may have views of the development. These areas were assessed during the site visit with representative views further analysed with photo montages to assess the visibility of the Project.

The WTGs are located on terrain that ranges from 259 - 356 m AHD. The average elevation of the Study Area ranges between 230-280 m AHD, subsequently both viewsheds extend to many view locations, with the hub height extending to a wider area. Areas that did not intersect with the viewshed have restricted long range views due to undulating landform. The composite viewsheds are shown on **Map 6** and **Map 7**.

The 11 view locations that were selected for photo montage analysis intersected with both viewsheds. **Table 16** below lists the potential number of turbines visible from these locations for both viewshed scenarios.

Table 16: Viewshed Analysis – Potential WTG's visible at Photo Montage Locations

View Location	Site Name	Distance & Direction to closest visible WTG	Distance Zone	WTGs visible (64 m high)	WTGs visible (150 m high)
1	Jinbi Springs	3.55 km SW	Mid-ground	0	2
2	Jinbi Springs powerline track	3.36 km SW	Mid-ground	2	5
3	Ngurrawaana Community	2.75 km N	Mid-ground	51	76
4	Ngurrawaana Access Track	4.88 km WSW	Mid-ground	50	103
6	Millstream Road	25.24 km N	Background	45	104
10	Manuwarra Red Dog Highway (South)	19.02 km NW	Background	34	91
16	Mount Herbert	20.45 km WSW	Background	13	75
19	Roebourne-Wittenoom Road	15.49 km W	Background	67	133
22	Manuwarra Red Dog Highway (Central)	8.95 km SW	Background	65	130
33	Manuwarra Red Dog Highway (North)	25.61 km S	Background	34	91
35	Radio Hill	27.33 km S	Background	100	133

4.2.2 SIGNIFICANCE LEVEL 1 ROADS

Composite viewsheds were generated from Significance Level 1 roads to identify the extent of visibility from these roads. The viewsheds were used to identify potential visibility from main travel routes (**Table 17**) and to help illustrate view experience (**Map 8** - **Map 10**).

Table 17: Viewshed Analysis from Significance Level 1 roads

Location	Elevation Range (m AHD)	Viewshed Analysis
Manuwarra Red Dog Highway	51 - 347	A diverse viewshed that is generally restricted to the mid-ground by undulating terrain. Some expansive viewsheds occur at the northern end where the road traverses terrain of low variability. Areas of high elevation in the background are also visible in sections. Most of the terrain within the Project Area is not visible from the highway.
Roebourne Wittenoom Road	177 - 374	This viewshed extents to the surrounding undulating terrain of the Chichester Range and also to the Hamersley Range which is due to the higher elevation of the Road. However, most of the terrain within the Project Area is not visible from Roebourne-Wittenoom Road.
Millstream Road	297 - 337	A generally expansive viewshed that extends into the background from sections which is due to the gradual terrain that does not restrict views. The viewshed also extends to the Hamersley Range. However, the majority of the terrain within the Project Area is not visible from Millstream Road.

4.2.3 ADDITIONAL VIEW LOCATIONS – VIEWSHED ASSESSMENT ONLY

The following two view locations are significant local sites and were assessed using viewshed analysis, they have not been subject to site analysis.

Lore Ceremony Site

This site is located on terrain that is 297 m AHD and occurs 0.56 km southeast of the closest WTG. The ground surface viewshed is generally restricted to the mid-ground due to the surrounding undulating terrain. However, an area of higher elevation is potentially visible 14 km to the south. As shown on **Map 11**, both viewshed scenarios from the Lore Ceremony site extend to the WTGs up to 14 km from the view point. The viewshed does not account for any screening objects such as vegetation which may restrict views.

Weymul Community

This is a residential area located on terrain that is 61.5 m AHD and occurs 25.45 km north northwest of the closest WTG. The ground surface viewshed extends higher terrain in the background zone due to the gentle relief of the landscape within the foreground and mid-ground. The viewshed also extends to the northernmost part of the Project Area. As shown on **Map 12**, both viewshed scenarios show that the WTGs are potentially visible from Weymul. The viewshed does not account for any screening objects such as buildings and vegetation which may restrict views.

4.3 PHOTO MONTAGE ANALYSIS

This section presents a visual summary and impact analysis at each view location with images from each view location depicting the existing view and proposed view (photo montage).

Photo montages were prepared for a selection of view locations that were representative of views experiences along main travel routes that intersected with the composite viewshed analysis from the Project Area. Sites 1-4 were selected in consultation with YEC as representative views for the Ngurrawaana Community (**Table 18**).

Photo montages were analysed using visual impact criteria to determine dominant visual elements, which include visibility, line, form, colour and texture. The outcome of this analysis is a percentage score that determines the level of visual impact (magnitude of change), either being not visible, moderately visible (blending) or highly visible (prominent). To determine the overall impact level or the significance of the impact, the result of the visual impact analysis is combined with the visual sensitivity factors, that is, the Significance Level and the Visual Management Objective (VMO) of the Study Area.

Table 18: Photo Montage Locations (GDA2020 MGA 50)

View Location	Site Name	Elevation (m AHD)	Easting	Northing	Justification for site selection
1	Jinbi Springs	178.9	497296	7651308	Culturally Significant site
2	Jinbi Springs powerline track	189.2	497237	7651109	Near culturally significant site
3	Ngurrawaana Community	287.1	498340	7632416	Local community 2 km south of the Project
4	Ngurrawaana Access Track	354.6	508003	7635709	Main access to Ngurrawaana Community which has open views of the Project
6	Millstream Road	315.7	505966	7608389	Main access to MCNP sites
10	Manuwarra Red Dog Highway (South)	325.6	517160	7620613	Main road that has open views
16	Mount Herbert	349.3	522425	7641796	Designated lookout within MCNP with panoramic views
19	Roebourne-Wittenoom Road	371.7	518697	7636017	Main access to MCNP sites
22	Manuwarra Red Dog Highway (Central)	342.9	510571	7640089	Main road that has open views
33	Manuwarra Red Dog Highway (North)	89.8	490161	7676569	Main road that has open views
35	Radio Hill	183.9	487117	7678672	Lookout with panoramic views

4.3.1 VIEW LOCATION 1 – JINBI SPRINGS

LOCATION AND VIEW DESCRIPTION				
Location and View Direction	Coordinates: 497296E, 7651308N Elevation: 178.9 m AHD Jinbi Springs is located within an incised creekline. The nearest wind turbines are located 3.55 km to the southwest.			
Landscape Character Unit	Spinifex Hills			
Existing view	This view location is located at a lower elevation near a creekline with steep rocky faces and hilly terrain surrounding the site. The view to the south and southwest consists of an exposed rock face with tall Melaleuca trees at the base where the creekline occurs (**Plate 35** and **Plate 37**). The colour palette consists of vibrant orange that contrast with bright green foliage of the tree canopy and spinifex grasses. On the ridgeline grey/silver lattice towers protrude above the horizon line which consists of angular and sloping line and form. The presence of the transmission line infrastructure adds a modified element to this otherwise natural landscape.			
VISU AL SENSITIVITY				
View Significance	+ Significance Level 2 - significant site to the local community.			
Most preferred characteristics (Landscape Values)	+ Presence of waterbodies and associated riparian vegetation + Distinctive displays of colour + Topographic variety and distinctive landscape features			
Least preferred characteristics	+ High voltage transmission line and substation.			
Visual Management Objective	+ Employ Best Practice Siting and Design to ensure that future development does not result in a cumulative visual impact considering the existing power line infrastructure.			
VISIBILITY ANALYSIS				
Visual descriptor	**Not Visible**	**Blending**	**Prominent**	**Comment**
Line	**x**			
Form	**x**			
Colour	**x**			
Texture	**x**			
Visibility Score	**100%**			**Not visible**
ANTICIPATED VISUAL IMPACT				
Anticipated visual change	The photo montage analysis has revealed that the WTGs are not visible from Jinbi Springs as they will be screened by the surrounding landform (**Plate 36** and **Plate 38**). As the observer leaves the site and moves into higher elevation, it is likely that the wind turbines will become visible as shown at View Location 2.			
Visual Impact Rating	No impact			
Response to Visual Management Objectives	No visual impact is expected and therefore the existing view experience is retained.			

Plate 35: View Location 1 – Existing south view

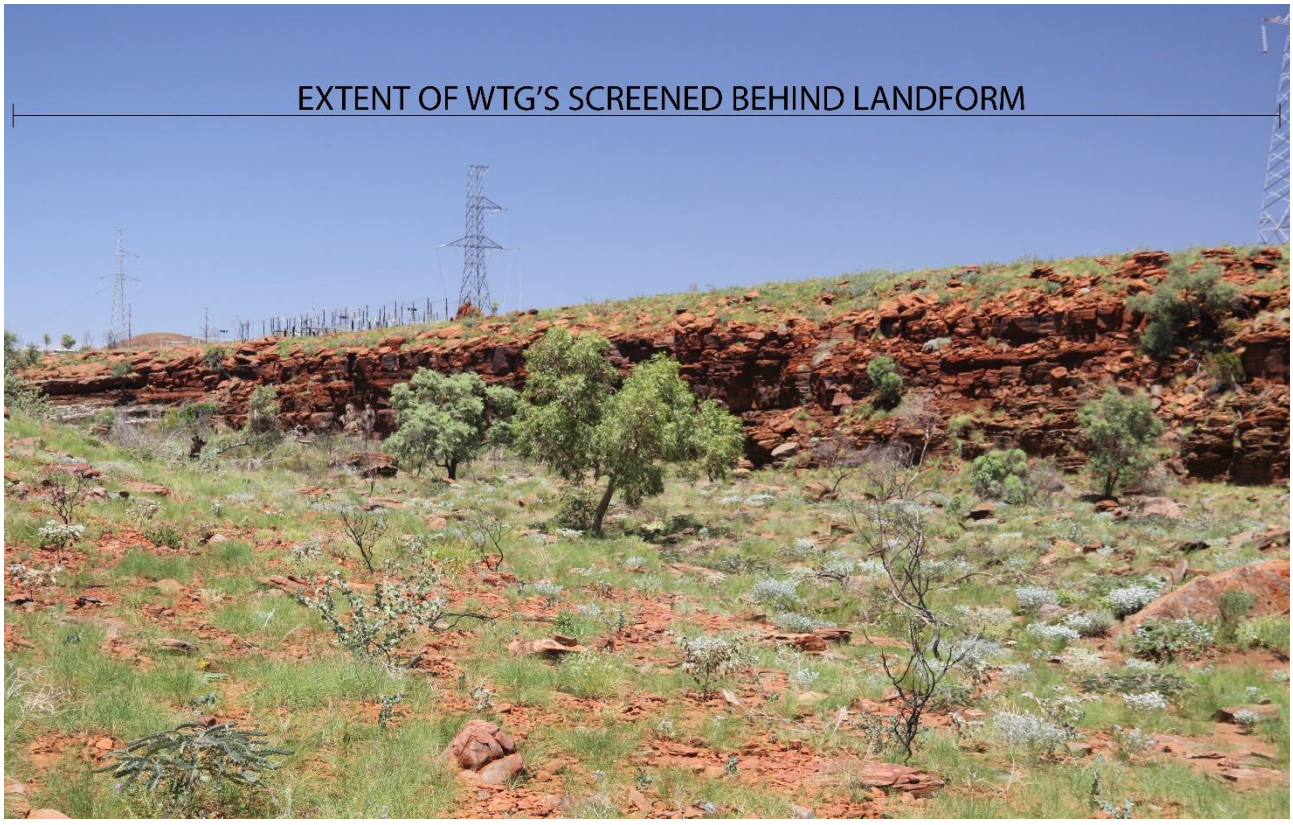


Plate 36: View Location 1 – Proposed south view – WTG's not visible

Plate 37: View Location 1 – Existing southwest view

Plate 38: View Location 1 – Proposed southwest view – WTG's not visible

4.3.2 VIEW LOCATION 2 – JINBI SPRINGS POWER LINE TRACK

LOCATION AND VIEW DESCRIPTION				
Location and View Direction	Coordinates: 497237E, 7651109N Elevation: 189.2 m AHD This view location is located on the ridgeline above Jinbi Springs on the power line track. The closest wind turbines are located 3.36 km to the southwest.			
Landscape Character Unit	Spinifex Hills			
Existing view	This view location is located on the power line track above Jinbi Springs to the southwest. From this higher vantage point there are open views across the undulating Spinifex Hills LCU. The dominant visual elements consist of curved and sinuous lines of the undulating landform. The deep orange rocky hills are covered in pale green/yellow spinifex grasses. On the lower terrain, there are vibrant green patches of spinifex grasses and scattered shrubs. The landscape has a textured appearance which is created by the rocky soils and vegetation foliage. (**Plate 39** and **Plate 41**). Light grey/silver high voltage transmission towers and a substation are visible in the view to the south (**Plate 39**). The smooth steel texture and angular forms contrast with the natural character and add a modified element to this otherwise natural landscape.			
VISUAL SENSITIVITY				
View Significance	+ Significance Level 3 - the view location is not a high use area by the general public although it is on route to Jinbi Springs (view location 1) which is a significant site to the local community.			
Most preferred characteristics (Landscape Values)	+ Topographic variety and distinctive landscape features			
Least preferred characteristics	+ High voltage transmission line and substation.			
Visual Management Objective	+ Employ Best Practice Siting and Design to ensure that future development does not contribute to significant cumulative visual impacts.			
VISIBILITY ANALYSIS				
Visual descriptor	**Not Visible**	**Blending**	**Prominent**	**Comment**
Line			**x**	Straight and angular lines contrast with the curved and sinuous horizon line.
Form			**x**	Vertical and sloping form contrasts with rolling landform.
Colour			**x**	White colour contrasts with the orange/greens of the landscape
Texture			**x**	Smooth surface contrasts with the textured appearance of the landscape
Visibility Score			**100%**	**Prominent**
ANTICIPATED VISUAL IMPACT				
Anticipated visual change	The photo montage illustrates that several wind turbines will be visible to the south (**Plate 42**) but most will be screened behind landform (**Plate 40**). The photo montage analysis has rated the visibility of the WTG's as prominent as their visual characteristics noticeably contrast with the surrounding natural landscape. As the existing view contains transmission line infrastructure, the WTG's add another modified element to this view although they are much less prominent that the existing transmission line.			
Visual Impact Rating	Level 2			

Response to Visual Management Objectives	From this view location, the low number of WTGs that are visible do not significantly contribute to a cumulative impact. As the majority of the Project is screened behind landform, the location of the WTG's is considered to follow the Best Practice Siting and Design objective as the majority are screened behind landform.

Plate 39: View Location 2 – Existing south southeast view

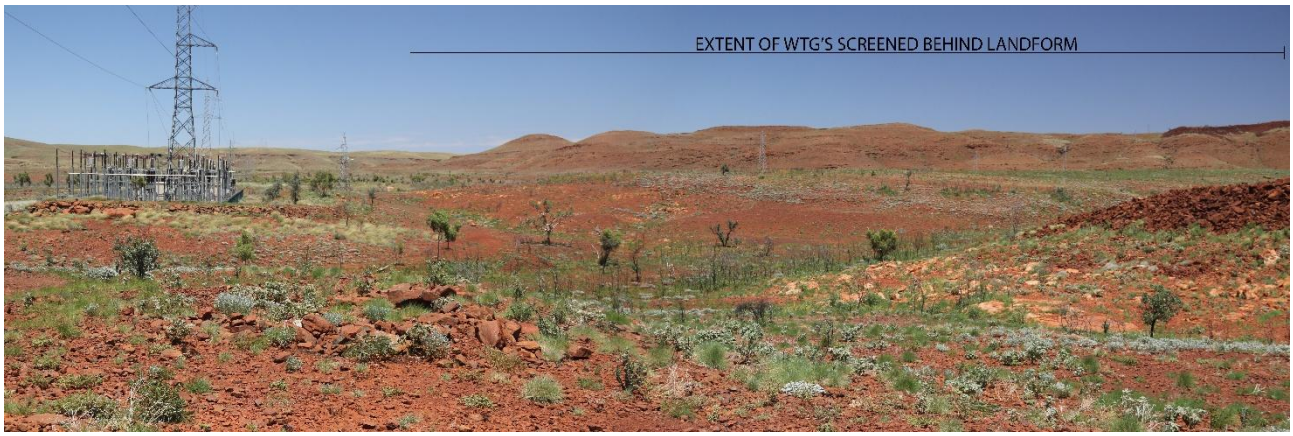


Plate 40: View Location 2 – Proposed south southeast view – WTGs not visible

Plate 41: View Location 2 – Existing southeast view

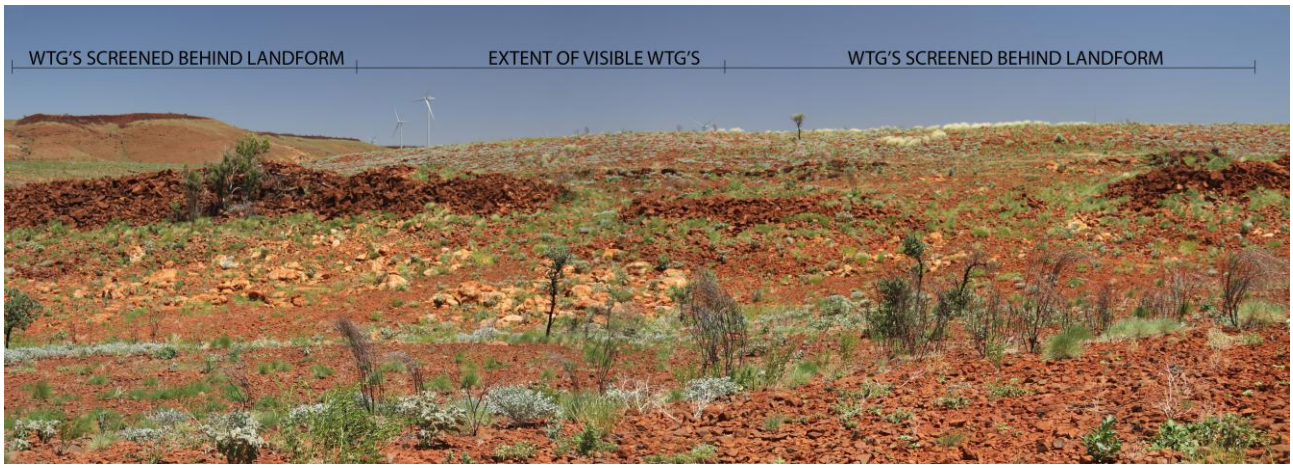


Plate 42: View Location 2 – Proposed south view – WTGs visually prominent

4.3.3 VIEW LOCATION 3 – NGURRAWAANA COMMUNITY

LOCATION AND VIEW DESCRIPTION	
Location and View Direction	Coordinates: 498340E, 7632416N Elevation: 287.1 m AHD This view location is located at the northern edge of the Ngurrawanna Community near the solar site. The closest wind turbines are located 2.75 km to the north.
Landscape Character Unit	Tall Shrubland Plain
Existing view	This view location is located on relatively flat to gently undulating terrain and is surrounded by tall shrubs and scattered trees. Built form is also visible to the south and consists of residential single storey dwellings, low voltage power lines, communication tower, solar panels, water tanks and other service infrastructure. The built form is located on flat terrain nestled amongst scattered low trees and shrubs (**Plate 43**). The undulating grassland plain LCU is visible to the west as the terrain rises in elevation. The view to the north consists of flatter terrain with the view filtered through scattered low trees and tall shrubs (**Plate 44, Plate 46, Plate 48**). The colours consist of dark green tree canopy with dark brown vertical and angular branches. The ground layer consists of stony orange brown soils and pale green and yellow soft grasses. The natural landscape surrounding the Ngurrawaana Community provides a varied view compared to the dominant Spinifex Hills and Undulating Grassland Plain LCUs.
VISUAL SENSITIVITY	
View Significance	+ Significance Level 1 - the view location is a residential community.
Most preferred characteristics (Landscape Values)	+ Vegetative diversity (diversity in species composition, height, colour and texture)
Least preferred characteristics	+ Service infrastructure.
Visual Management Objective	+ Best Practice Siting and Design to ensure future infrastructure is sited appropriately so that the natural character is retained.

VISIBILITY ANALYSIS

Visual descriptor	Not Visible	Blending	Prominent	Comment
Line			**x**	Straight and angular lines are not dissimilar from the straight and angled lines of the tree and shrub branches, although the angular blades contrast with the curved tree canopy.
Form			**x**	Vertical and sloping form is shared with vertical and sloping forms of the trees and shrubs, although the WTG's protrude above the distant horizon line.
Colour			**x**	White colour contrasts with the greens, dark browns, oranges of the vegetation and soil.
Texture			**x**	Smooth surface contrasts with the textured foliage and stony soils.
Visibility Score			**100%**	**Prominent**

ANTICIPATED VISUAL IMPACT	
Anticipated visual change	The photo montage illustrates that the WTGs will be visible to the north in the mid-ground (**Plate 45 - Plate 49**). The photo montage analysis has rated the visibility of the WTG's as prominent as the smooth white finish contrasts noticeably with the darker green and brown colours of the vegetation. Although there are some similarities in line and form, the large scale of the WTGs in addition to the movement of the turbine blades will likely result in a prominent visual change for the north view.
Visual Impact Rating	Level 1
Response to Visual Management Objectives	The prominent visibility results in a change to the existing view experience, subsequently the location of the visible WTG's may not meet Best Practice Siting and Design objectives from this Significance Level 1 view location.

Plate 43: View Location 3 – Existing south view of the Ngurrawaana Community

Plate 44: View Location 3 – Existing west northwest view

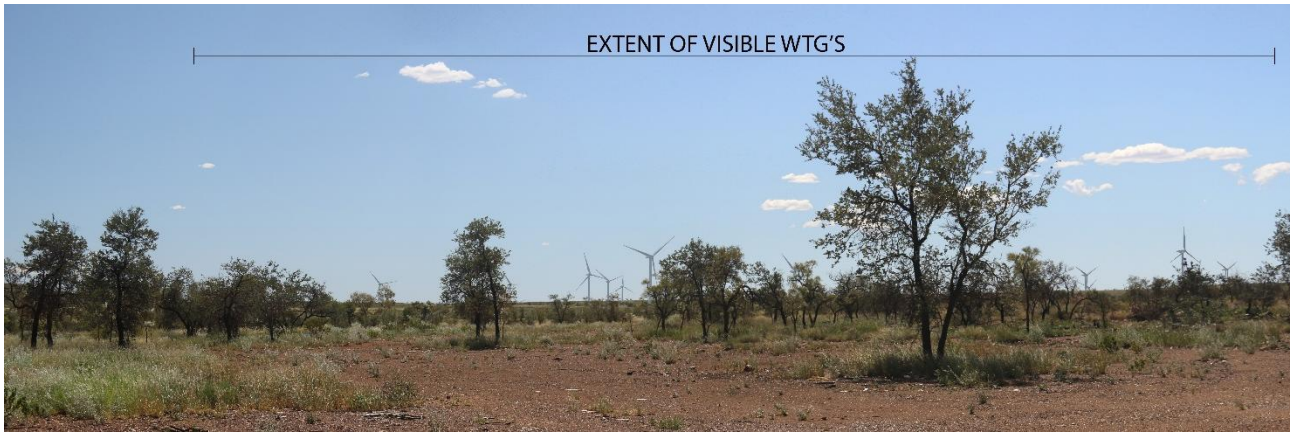


Plate 45: View Location 3 – Proposed west northwest view – WTGs visually prominent

Plate 46: View Location 3 – Existing northwest view

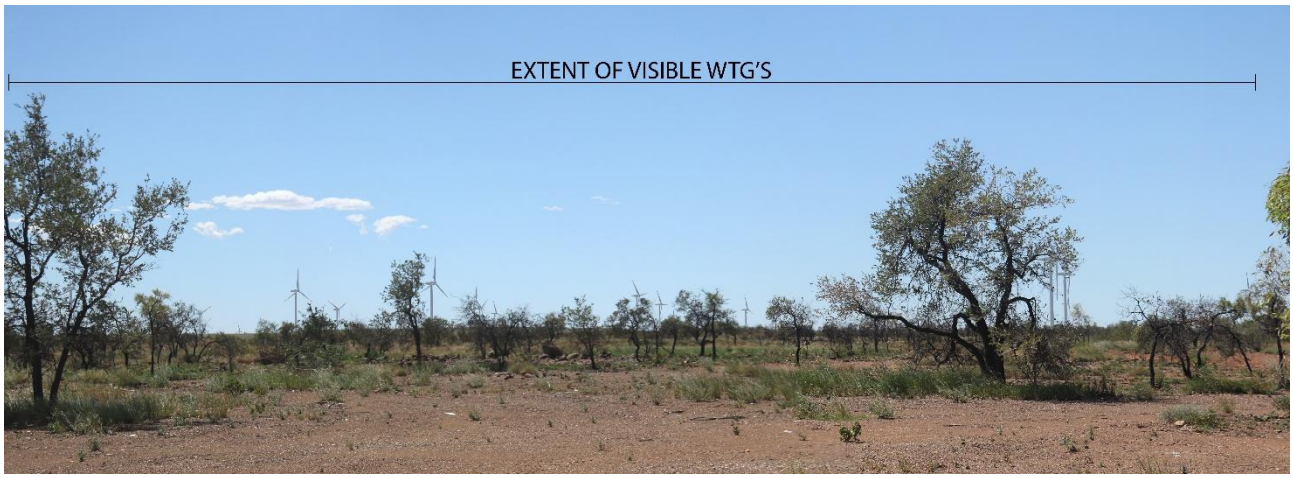


Plate 47: View Location 3 – Proposed northwest view – WTGs visually prominent

Plate 48: View Location 3 – Existing north view

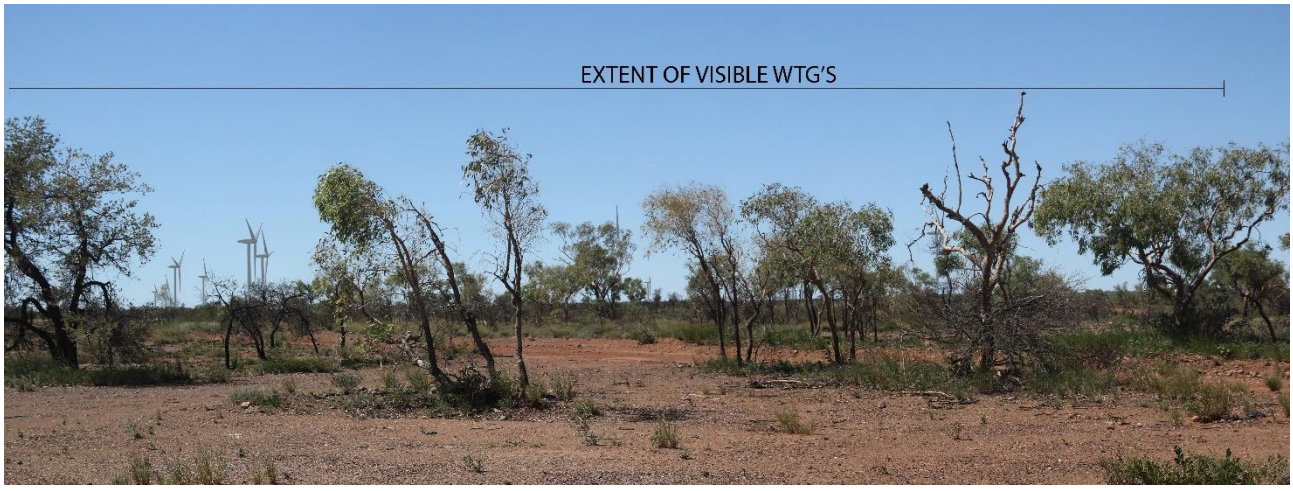


Plate 49: View Location 3 – Proposed north view – WTGs visually prominent

4.3.4 VIEW LOCATION 4 – NGURRAWAANA ACCESS TRACK

LOCATION AND VIEW DESCRIPTION				
Location and View Direction	Coordinates: 508003E, 7635709N Elevation: 354.6 m AHD This view location is located on the east west track that runs between the Highway and the Ngurrawaana Community. The view point is located on elevated terrain 10.2 km northeast from Ngurrawaana. The closest wind turbines are located 4.88 km to the west southwest.			
Landscape Character Unit	Spinifex Hills			
Existing view	This view location is located on elevated undulating terrain with expansive views across the Spinifex Hills LCU. This vast landscape is covered in a low ground layer of green to yellow spinifex grasses which contrast with vibrant orange stony soils. There are very scattered shrubs and low trees with a dark green canopy that contrast against the pale yellow grasses. The landform is gently curved with rolling form, to the south the Hamersley Range form a dramatic rugged horizon line. The view experience is predominantly natural in character with the only modification being the vertical transmission towers spaced at regular intervals on the distant western horizon line.			
VISUAL SENSITIVITY				
View Significance	+ Significance Level 3 – this is an unsealed access track which is used to access the Ngurrawaana Community.			
Most preferred characteristics (Landscape Values)	+ Rugged horizon line of the Hamersley Range 40-50 kms to the south + Expansive undulating landforms (Spinifex Hills LCU)			
Least preferred characteristics	+ High voltage transmission lines 4-5 kms to the southwest and west (**Plate 50**).			
Visual Management Objective	+ Protect and Maintain views of the Hamersley Range + Best Practice Siting and Design for remaining views to ensure proposed development is sited appropriately to minimise impacts to the natural character.			
VISIBILITY ANALYSIS				
Visual descriptor	**Not Visible**	**Blending**	**Prominent**	**Comment**
Line			**x**	Straight and angular lines contrast with the curved landform.
Form			**x**	Vertical and sloping form contrasts with the rolling terrain.
Colour			**x**	White colour contrasts with the dark orange soils and pale green/yellow spinifex grasses.
Texture			**x**	Smooth surface contrasts with the textured foliage and stony soils.
Visibility Score			**100%**	**Prominent**
ANTICIPATED VISUAL IMPACT				
Anticipated visual change	The photo montage illustrates that the WTGs will be visible to the west and northwest in the mid-ground (**Plate 51 - Plate 52**). The photo montage analysis has rated the visibility of the WTG's as prominent as the tall vertical structures protrude above the curved horizon line. The smooth white finish also contrasts with the colours and textures of the natural landscape. These factors combined will likely result in a prominent visual change for the western view.			
Visual Impact Rating	Level 2			

Response to Visual Management Objectives	The prominent visibility results in a change to the existing view experience to the west and northwest. Although the existing view contains high voltage transmission lines, the scale and design of the WTGs will be a noticeable change. Views to the Hamersley Range to the south are unlikely to be impacted and therefore the VMO to protect and maintain this landscape value and view experience should be achievable from this view location. Although the view experience is altered in the west view, the natural character remains prominent due to the expansive scale of the Spinifex Hills LCU.

Plate 50: View Location 4 – Existing west view

Plate 51: View Location 4 – Proposed west view – WTGs visually prominent

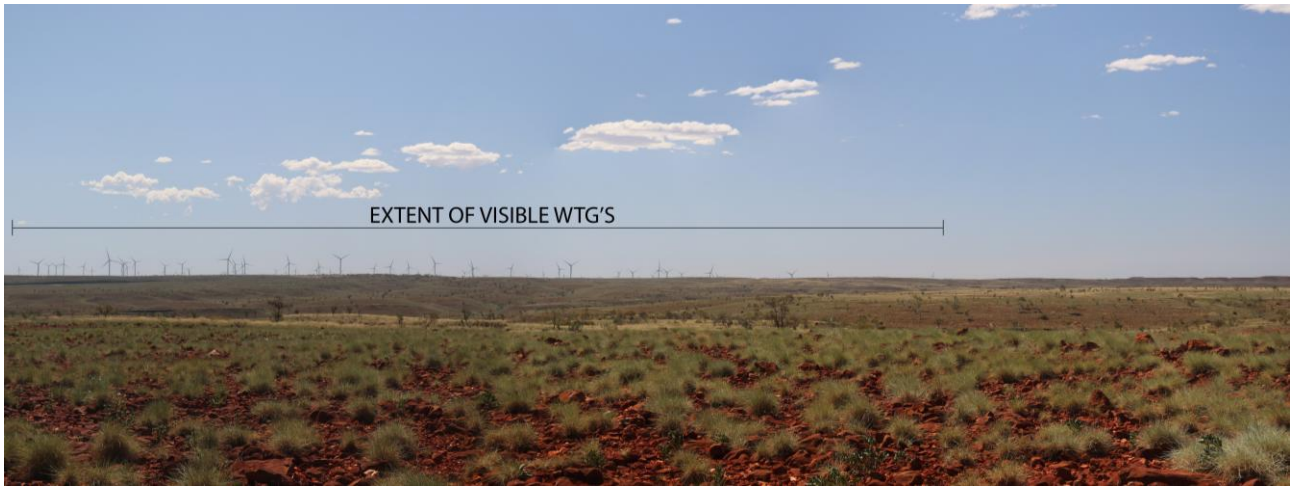


Plate 52: View Location 4 – Proposed west northwest view – WTGs visually prominent

4.3.5 VIEW LOCATION 6 – MILLSTREAM ROAD

LOCATION AND VIEW DESCRIPTION				
Location and View Direction	Coordinates: 505966E, 7608389N Elevation: 315.7 m AHD This view location is located on Millstream Road 4.8 kms west of the park entrance road. The closest wind turbines are located 25.25 km to the north.			
Landscape Character Unit	Undulating Grassland Plain			
Existing view	Millstream Road traverses a flat to gently undulating landscape covered in spinifex grasses and scattered shrubs and white barked trees. The increased cover of trees and shrubs provides a varied view experience compared to the Spinifex Hills LCU which has a much sparser cover of taller vegetation and smaller clumps of spinifex grasses. A distinctive landscape feature is the rugged horizon line of the Hamersley Range to the south forming a key view experience from Millstream Road (**Plate 53**). The northern view consists of horizontal landform with a dark green horizon line in the background. Within the mid-ground and foreground, taller trees consist of white straight and angular branches and curved green canopies that punctuate the straight horizon line. Scattered green shrubs contrast with the tall golden yellow spinifex grasses which have a soft appearance (**Plate 54**).			
VISUAL SENSITIVITY				
View Significance	+ Significance Level 1 – Millstream Road is the main route to access the Millstream Chichester National Park recreation sites and camp ground.			
Most preferred characteristics (Landscape Values)	+ Rugged horizon line of the Hamersley Range 15-20 kms to the south + High degree of perceived naturalness + Structural vegetation diversity and composition with the mix of grasses and scattered trees and shrubs.			
Least preferred characteristics	+ none.			
Visual Management Objective	+ Protect and Maintain view of Hamersley Range and natural landscape character to align with the objectives in MCNP Management Plan (DEC, 2011).			
VISIBILITY ANALYSIS				
Visual descriptor	**Not Visible**	**Blending**	**Prominent**	**Comment**
Line		**x**		Straight and angular lines contrast with the curved landform but at this scale they share similarities to the form of the trees and grasses in the foreground and mid-ground.
Form		**x**		Vertical form contrast with the horizontal horizon line but have similarities to the vertical form of the trees and grasses.
Colour			**x**	The WTGs appear as a darker silhouette against the light sky.
Texture		**x**		At this distance the texture does not noticeably contrast with the landscape.
Visibility Score		**75%**	**25%**	**Blending**

ANTICIPATED VISUAL IMPACT	
Anticipated visual change	The photo montage illustrates that the WTGs will be visible on the northern horizon line in the background (**Plate 55**). The photo montage analysis has rated the visibility of the WTG's as blending as their visual elements do not strongly contrast with the surrounding landscape which is due to their reduced scale as they are located 25 kms in the background. The darker colour of the WTG's appears prominent, but this is likely to vary depending on weather conditions and time of day.
Visual Impact Rating	Level 2
Response to Visual Management Objectives	The south view of the rugged horizon line is retained and the natural character remains a prominent feature from this view location. However, the modification of the northern horizon line, although blending, may not align with the visual management objectives that seek to *protect and enhance the visual qualities* within the MCNP.

Plate 53: View Location 6 – Existing south view of Hamersley Range

Plate 54: View Location 6 – Existing north view

Plate 55: View Location 6 – Proposed north view – WTGs visually blending

4.3.6 VIEW LOCATION 10 – MANUWARRA RED DOG HIGHWAY (SOUTH)

LOCATION AND VIEW DESCRIPTION	
Location and View Direction	Coordinates: 517160E, 7620613N Elevation: 325.6 m AHD This view location is on the Manuwarra Red Dog Highway, 8 km north of the Millstream Road intersection. The closest wind turbines are located 19 km to the northwest.
Landscape Character Unit	Undulating Grassland Plain
Existing view	This view location represents the north bound view for observers travelling on the Manuwarra Red Dog Highway. The character is predominantly natural with modified elements existing in the landscape such as the road infrastructure and vertical transmission towers that protrude above the horizon line 4.5 kms to the north. The north view is open and overlooks the Tall Shrubland Plain in the mid-ground to the undulating grassland plain in the background with a gently curved horizon line. The colour palette consist of vibrant orange rocky soils, bands of dark green shrubland vegetation and a golden yellow horizon line. Secondary colours consist of the white tree trunks, the white road markers and dark grey sealed road. In the foreground to mid-ground the landscape has a textured appearance created by the stony soils and vegetation foliage. The road is a smooth element that curves through the landscape (**Plate 56**).
VISUAL SENSITIVITY	
View Significance	+ Significance Level 1 – a State Highway that is used frequently by workers, residents and tourists.
Most preferred characteristics (Landscape Values)	+ High degree of perceived naturalness + Structural vegetation diversity (mix of grasses and scattered trees and shrubs).
Least preferred characteristics	+ High voltage transmission line
Visual Management Objective	+ Best Practice Siting and Design to ensure the natural character is retained.

VISIBILITY ANALYSIS				
Visual descriptor	**Not Visible**	**Blending**	**Prominent**	**Comment**
Line		**x**		From this distance the straight and angular lines are not a strong contrast with the existing view.
Form		**x**		Vertical form contrast with the horizontal horizon line but have similarities to the vertical form of the trees at this scale.
Colour		**x**		The white colour blends with the light sky.
Texture		**x**		At this distance the texture does not noticeably contrast with the landscape.
Visibility Score		**100%**		**Blending**

ANTICIPATED VISUAL IMPACT	
Anticipated visual change	The photo montage illustrates that the WTGs will be visible on the northwest horizon line in the distant background (**Plate 57**). For this section of the road the WTG's will almost be in the direct line of site for the observer. The photo montage analysis has rated the visibility of the WTG's as blending as their visual elements do not strongly contrast with the surrounding landscape which is due to their reduced scale as they are located 19 kms in the background. Furthermore, the WTG's share some similarities with the visual characteristics present in the existing view such as the white colour of the Snappy Gum tree trunks and white road markers.
Visual Impact Rating	Level 2
Response to Visual Management Objectives	The natural landscape character remains a prominent feature for north bound observers at this location. Although the WTGs are visible, they do not dominate the view or alter the natural character, therefore they are likely to meet the Best Practice Siting and Design objective for north bound observers on this section of the Highway.

Plate 56: View Location 10 – Existing northwest view

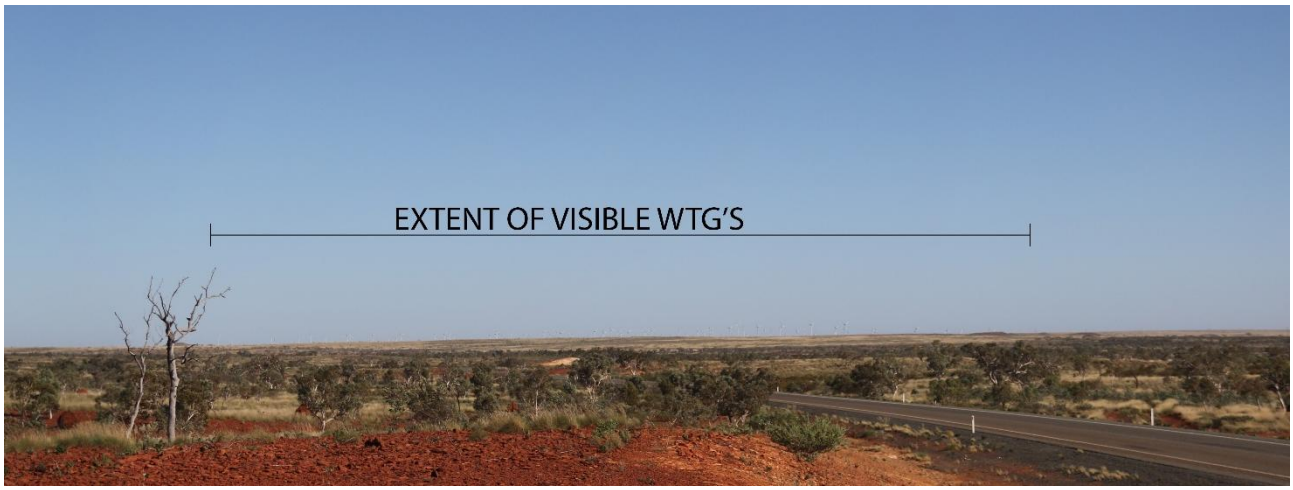


Plate 57: View Location 10 – Proposed northwest view – WTGs visually blending

4.3.7 VIEW LOCATION 16 – MOUNT HERBERT LOOKOUT

LOCATION AND VIEW DESCRIPTION	
Location and View Direction	Coordinates: 522425E, 7641796N Elevation: 349.3 m AHD This is a designated lookout within the Millstream Chichester National Park (MCNP). The closest wind turbines are located 20.45 km to the west southwest.
Landscape Character Unit	Spinifex Hills LCU
Existing view	From Mount Herbert there are panoramic and expansive views across the Chichester Range. The Hamersley Range are visible on the distant southern horizon about 50-60 kms in the background. There is no modification visible except for a sealed road (Roebourne-Wittenoom Road). The western view consists of the curved lines of undulating landform with the horizon line ranging from rolling to horizontal. The colours are golden yellow with an undertone of dark orange and patches of muted green (Error! Reference source not found.).
VISUAL SENSITIVITY	
View Significance	+ Significance Level 1 – designated lookout within a national park.
Most preferred characteristics (Landscape Values)	+ High degree of perceived naturalness + Expansive landforms (Chichester Range) + Topographic variety (Chichester Range and Hamersley Range).
Least preferred characteristics	+ None
Visual Management Objective	+ Protect and Maintain the panoramic view experience by ensuring that the natural landscape character and landscape values are retained which align with the objectives in MCNP Management Plan (DEC, 2011).

VISIBILITY ANALYSIS				
Visual descriptor	**Not Visible**	**Blending**	**Prominent**	**Comment**
Line		**x**		Due to the reduced visible scale of the WTGs, the lines are not an obvious contrast with the existing landscape.
Form		**x**		While the WTGs are visible, their form is not an obvious contrast with the existing landscape.
Colour			**x**	The white colour draws attention to itself.
Texture		**x**		At this distance the texture does not noticeably contrast with the landscape.
Visibility Score		**75%**	**25%**	**Blending**

ANTICIPATED VISUAL IMPACT	
Anticipated visual change	The photo montage illustrates that the WTGs will be visible on the west southwest horizon line in the distant background (**Plate 59**). The analysis has assessed the visibility of the WTGs as blending which is due to their reduced scale, however the white colour and moving blades may draw the viewer's eye to the WTGs that protrude above the horizon line. Although the WTGs are not a dominant feature, they add a modified element to the natural landscape.
Visual Impact Rating	Level 2
Response to Visual Management Objectives	Although the WTGs are visible, they do not dominate the view which is due to their distance from the view point and reduced visible scale. Furthermore, they occupy a relatively small portion of this expansive view. However, the modification of the horizon line, although blending, may not align with the visual management objectives that seek to *protect and enhance the visual qualities* within the MCNP.

Plate 58: View Location 16 – Existing west southwest view

Plate 59: View Location 16 – Proposed west southwest view – WTGs visually blending

4.3.8 VIEW LOCATION 19 – ROEBOURNE-WITTENOOM ROAD

LOCATION AND VIEW DESCRIPTION				
Location and View Direction	Coordinates: 518697E, 7636017N Elevation: 371.7 m AHD This road leads to recreation sites within the Millstream Chichester National Park (MCNP). The closest wind turbines are located 15.5 km to the west.			
Landscape Character Unit	Spinifex Hills			
Existing view	For west bound observers along this road the open view looks across an expansive undulating landscape with the Hamersley Range visible on the distant southern horizon about 50 kms in the background. The natural character is dominant with little to no modification visible. The dominant colours are the golden yellow spinifex grasses and the vibrant orange stony soils. Green shrubs are dotted amongst the spinifex and there are scattered straight and angular shrubs that filter views of the Hamersley Range to the south (**Plate 60**).			
VISUAL SENSITIVITY				
View Significance	+ Significance Level 1 –Roebourne-Wittenoom Road leads to designated recreation sites, lookouts and trails within the MCNP.			
Most preferred characteristics (Landscape Values)	+ High degree of perceived naturalness + Expansive landforms (Chichester Range) + Topographic variety (Hamersley Range).			
Least preferred characteristics	+ None			
Visual Management Objective	+ Protect and Maintain view of Hamersley Range and natural landscape character to align with the objectives in MCNP Management Plan (DEC, 2011).			
VISIBILITY ANALYSIS				
Visual descriptor	**Not Visible**	**Blending**	**Prominent**	**Comment**
Line		**x**		Due to the reduced visible scale of the WTGs, the lines are not an obvious contrast with the existing landscape.
Form		**x**		While the WTGs are visible, their form is not an obvious contrast with the existing landscape.
Colour			**x**	The white colour draws attention to itself.
Texture		**x**		At this distance the texture does not noticeably contrast with the landscape.
Visibility Score		**75%**	**25%**	**Blending**
ANTICIPATED VISUAL IMPACT				
Anticipated visual change	The photo montage illustrates that the WTGs will be visible on the western horizon line in the background (**Plate 62**). The photo montage analysis has assessed the visibility of the WTGs as blending. The white colour and moving blades may draw the viewer's eye, however at this distance they are unlikely to be prominent. Various atmospheric conditions such as heat haze will also impact the visibility of the WTGs at this distance. Although the WTGs are not a dominant feature, they add a modified element to the natural landscape.			
Visual Impact Rating	Level 2			

Response to Visual Management Objectives	Although the WTGs are visible, they do not dominate the view which is due to their distance from the view point and reduced visible scale. Furthermore, they occupy a relatively small portion of this expansive view. However, the modification of the horizon line, although blending, may not align with the visual management objectives that seek to *protect and enhance the visual qualities* within the MCNP.

Plate 60: View Location 19 – Filtered view of the Hamersley Range to the south

Plate 61: View Location 19 – Existing west view

Plate 62: View Location 19 – Proposed west south west view – WTGs visually blending

4.3.9 VIEW LOCATION 22 – MANUWARRA RED DOG HIGHWAY (CENTRAL)

LOCATION AND VIEW DESCRIPTION				
Location and View Direction	Coordinates: 510571E; 7640089N Elevation: 342.9 m AHD This view location is on the Manuwarra Red Dog Highway The closest wind turbines are located 8.9 km to the southwest and is the closest view location along the highway to the Project.			
Landscape Character Unit	Spinifex Hills			
Existing view	This view location has partially enclosed views from roadside bunds however a gap in the landform provides a framed view to the west. Although this section of highway generally has open views towards the west. The west view overlooks the expansive undulating Spinifex Hills that are covered by low clumps of pale green and yellow spinifex grasses and very scattered shrubs with a rich orange undertone of the stony soils. The line and forms are generally curved and rolling with occasional angular lines of the shrub branches. Tall vertical communication masts are visible to the northwest on top of low hills which add a modified element to the west view (**Plate 63**).			
VISUAL SENSITIVITY				
View Significance	+ Significance Level 1 – a State Highway that is used frequently by workers, residents and tourists.			
Most preferred characteristics (Landscape Values)	+ Expansive landforms (Spinifex Hills)			
Least preferred characteristics	+ None			
Visual Management Objective	+ Employ Best Practice Siting and Design to ensure that the natural landscape character and landscape values are retained.			
VISIBILITY ANALYSIS				
Visual descriptor	**Not Visible**	**Blending**	**Prominent**	**Comment**
Line		**x**		Due to the reduced visible scale of the WTGs, the lines are not an obvious contrast with the existing landscape.
Form		**x**		The vertical form is not an obvious contrast at this distance.
Colour			**x**	The white colour draws attention to itself.
Texture		**x**		At this distance the texture does not noticeably contrast with the landscape.
Visibility Score		**75%**	**25%**	**Blending**
ANTICIPATED VISUAL IMPACT				
Anticipated visual change	This section of the highway will have the closest views of the Project. The photo montage analysis has assessed the visibility of the WTGs as blending, where the white colour of the WTGs combined with the moving angular blades may draw the viewer's eye to the WTGs that protrude above the gently curved horizon line (**Plate 64**).			
Visual Impact Rating	Level 2			

Response to Visual Management Objectives	The WTG's have been assessed as visually blending for this open view location. The WTG's will add a modified element to the view, however due to the large expansive character of the Spinifex Hills LCU combined with the distance of the WTGs from the view point, the natural character is retained as the WTGs do not dominate the view. The observer from this view location will also be moving at highway speed which will reduce the time the WTGs are visible.

Plate 63: View Location 22 – Existing west view

Plate 64: View Location 22 – Proposed west view – WTGs visually blending

4.3.10 VIEW LOCATION 33 – MANUWARRA RED DOG HIGHWAY (NORTH)

LOCATION AND VIEW DESCRIPTION				
Location and View Direction	Coordinates: 490161E, 7676569N Elevation: 89.8 m AHD This view location is on the Manuwarra Red Dog Highway The closest wind turbines are located 25.6 km to the south.			
Landscape Character Unit	Spinifex Hills			
Existing view	This view location has views that are partially enclosed by the surrounding landform. The south view is layered and detailed where linear infrastructure occurs in the foreground consisting of a pipeline, railway and access track. In the mid-ground are rugged to undulating landforms which consist of curved and sinuous hills with exposed dark red rocks. The vegetation is a mosaic of golden yellow spinifex grasses and dark green shrubs. The view also extends to the distant background to a gentle undulating horizon line. The natural character and elevated landforms are a dominant feature of this view however it is modified by the presence of linear infrastructure (**Plate 65**).			
VISUAL SENSITIVITY				
View Significance	+ Significance Level 1 – a State Highway that is used frequently by workers, residents and tourists.			
Most preferred characteristics (Landscape Values)	+ Distinctive landscape features (Basalt Hills) + Topographic variety (rugged terrain)			
Least preferred characteristics	+ Linear infrastructure			
Visual Management Objective	+ Protect and Maintain views of distinctive landscape features (basalt hills) + For the remainder of landscape employ Best Practice Siting and Design to ensure that the natural landscape character is retained.			
VISIBILITY ANALYSIS				
Visual descriptor	**Not Visible**	**Blending**	**Prominent**	**Comment**
Line		**x**		The straight angular form contrasts with the sinuous horizon line, however the reduced scale of the WTGs reduces their prominence.
Form		**x**		The vertical form protrudes above the horizon line, however the reduced scale of the WTGs reduces their prominence.
Colour		**x**		The white colour may attract attention but does not appear to noticeably contrast in the montage.
Texture		**x**		At this distance the texture does not noticeably contrast with the landscape.
Visibility Score		**100%**		**Blending**
ANTICIPATED VISUAL IMPACT				
Anticipated visual change	For south bound observers along this section of the highway, the addition of the WTGs may be visible in the background. However, the elevated landforms in the mid-ground will screen a portion of the Project from view. The photo montage analysis has rated the visibility as blending due to the screening effect of landform and the distance of the Project from the view location which reduces the visible scale of the WTGs (**Plate 66**).			
Visual Impact Rating	Level 2			

Response to Visual Management Objectives	The WTG's have been assessed as visually blending which is a result of the reduced visible scale of the WTGs as they are located 25.6 km from the view point. The distinctive rugged landforms in the mid-ground also screen portion of the project and are prominent features in the view. Subsequently, the landscape values are retained from this view and the location of the WTGs are considered to meet the VMOs from this section of the Highway.

Plate 65: View Location 33 – Existing south view

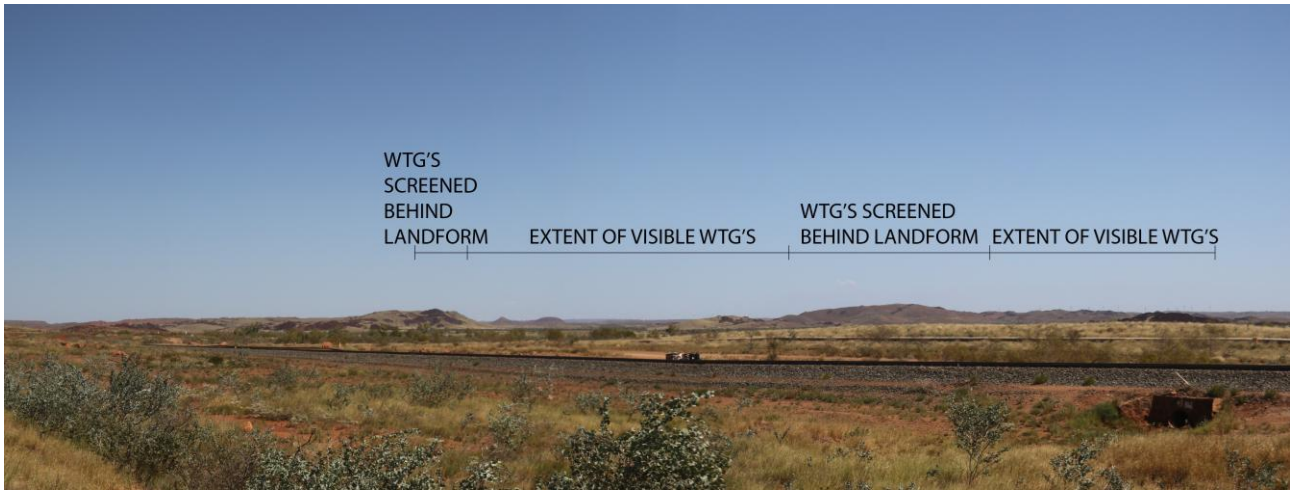


Plate 66: View Location 33 – Proposed south view – WTGs visually blending

4.3.11 VIEW LOCATION 35 – RADIO HILL

LOCATION AND VIEW DESCRIPTION				
Location and View Direction	Coordinates: 490161E, 7676569N Elevation: 89.8 m AHD Radio Hill is located 1.5 km due east of the Manuwarra Red Dog Highway, it is visible from the highway by the white weather station. Access to the site is via 5.8 kms of unsealed track. The closest wind turbines are located 27.3 km to the south.			
Landscape Character Unit	Spinifex Hills			
Existing view	From the top of Radio Hill there are panoramic views overlooking the expansive Spinifex Hills LCU (**Plate 67**). The site itself contains various infrastructure for the weather station and communication towers. To the north there are views of a small scale mine (**Plate 7**). The view to the south contains little modification and consists of vast undulating landforms of vast scale. The forms are generally rolling and sinuous although angular and sloping peaks also occur. In the mid-ground the colours are dominated by the golden yellow spinifex grasses with green dots of the shrubland vegetation. The dark red/brown basalt hills are a distinctive feature in the view. In the distant background the undulating horizon line is a muted orange with dust and heat haze affecting the visibility.			
VISUAL SENSITIVITY				
View Significance	+ Significance Level 2 – located off the highway along an unsealed track best suited to a 4WD vehicle. The lookout is promoted as a scenic lookout in the Karratha region and is therefore considered a site of high local significance.			
Most preferred characteristics (Landscape Values)	+ Distinctive landscape features (Basalt Hills) + Topographic variety (rugged terrain)			
Least preferred characteristics	+ Extractive industry (north view)			
Visual Management Objective	+ Protect and Maintain views of distinctive landscape features (basalt hills) + For the remainder of landscape employ Best Practice Siting and Design to ensure that the natural landscape character is retained.			
VISIBILITY ANALYSIS				
Visual descriptor	**Not Visible**	**Blending**	**Prominent**	**Comment**
Line		**x**		The straight angular form of the WTG does not noticeably contrast from this distance.
Form		**x**		The vertical form protrudes above the horizon line, the reduced scale due to distance reduces the prominence.
Colour			**x**	The colour of the WTGs are contrast against the pale sky, although this is likely to vary.
Texture		**x**		At this distance the texture does not noticeably contrast with the landscape.
Visibility Score		**75%**	**25%**	**Blending**
ANTICIPATED VISUAL IMPACT				
Anticipated visual change	The Photo montage analysis has rated the visibility of the WTGs as blending for the south view from Radio Hill (**Plate 68**) which is due to the distance of the Project from this viewpoint and the reduced scale of the WTGs. Although the dark silhouette of the turbines contrast with the light sky, it is likely that the visibility of the turbines from this view location will be highly variable depending on the weather and atmospheric conditions as well as the time of day. For the purpose of this assessment, the WTG's have been shown as darker forms to highlight their position in the landscape and therefore they appear prominent.			

Visual Impact Rating	Level 2
Response to Visual Management Objectives	The blending visibility of the WTGs may alter the view experience where they add a modified element to view, although they will not dominate the view due to the distance of the Project from the view point and the reduced visible scale of the WTGs. They will also occupy a small portion of the overall view. The distinctive landscape features (basalt hills) also remain a prominent feature from this elevated view location. Therefore, the siting of the Project is likely to meet the VMOs assigned to this view location.

Plate 67: View Location 35 – Existing south view

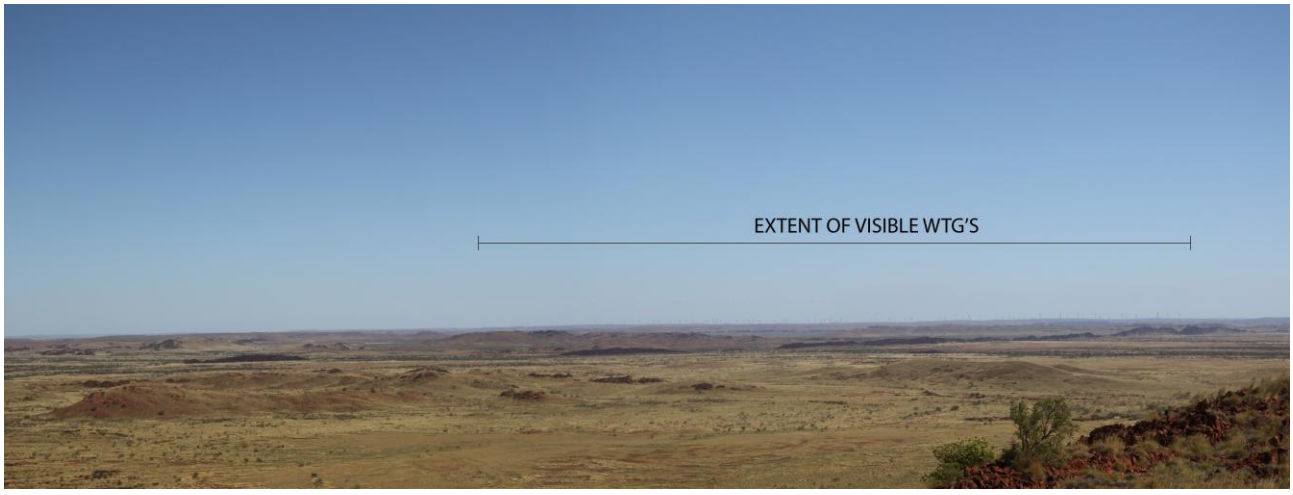


Plate 68: View Location 35 – Proposed south view – WTGs visually blending

5 VISUAL IMPACT SUMMARY

5.1 LANDSCAPE CHARACTER

The YEC Project and surrounding landscape occurs within the Karratha Coastal Plain Landscape Character Type (LCT) which is characterised by a gently undulating coastal plain with low rocky hills further inland (CALM, 1994). The study area also occurs on the fringes of the Fortescue Valley, Chichester Range and Hamersley Range LCT's. The Hamersley Range and Chichester Range consist of undulating to rugged terrain which is a feature of the Study Area. The landscape within the Fortescue Valley LCT contains a dense layer of grasses with scattered trees and shrubs with some areas of dense woodland and shrubland (CLAM, 1994). This LCT is noticeable from Millstream Road.

The general character of the Study Area is a natural landscape with modified elements that occur along road corridors such as a Railway used to transport iron ore, transmission lines, communication poles and pipelines. A small mine is also visible from the Manuwarra Red Dog Highway in the northern section of the study area near Radio Hill.

Four Landscape Character Units (LCU) have been identified within the Study Area:

- LCU 1 – Spinifex Hills: covers the widest extent within the study area (55.5%) and is characterised by undulating to rugged terrain that is covered in spinifex grasses with scattered tall shrubs. This LCU is visible from most view locations.
- LCU 2 – Undulating Grassland Plain: a vast open landscape covered in spinifex grasses, scattered shrubs and isolated trees such as white barked snappy gums (*Eucalyptus leucophloia*) and Hamersley bloodwoods (*Corymbia Hamersleyana*). This unit covers about 35.8% of the Study Area and is visible from many view locations. It is visually similar to the Spinifex Hills LCU but with less variation in elevation
- LCU3 – Tall Shrubland Plain: a flat plain covered in spinifex grasses and moderately dense shrublands which cover about 5.3% pf the Study Area.
- LCU 4 – Drainage Lines: this unit is evident as bands of dark green vegetation that meander through the landscape. Also present are rocky pools such as Python Pool in the Millstream Chichester National Park which are distinctive yet discrete landscape features within the study area The Drainage Lines LCU covers about 3.4% of the Study Area.

The Project is located within the Spinifex Hills LCU, therefore this unit will experience the most visual impact. However, the significance of this impact is expected to be minimal and the overall character of the Spinifex Hills should be retained due to the following factors:

- the distance of the Project from view locations - the Project located in the background zone (6.5 kms and beyond) from the view locations with the exception of the sites west of the Manuwarra Red Dog Highway (View Locations 1-4).
- the extent of the Spinifex Hills LCU covers a large proportion of the Study Area and is visually well represented in the region.
- the undulating terrain of the Spinifex Hills often restricts long range views.

5.2 LANDSCAPE VALUES

Visual quality is described in *Reading the Remote, Landscape Characters of Western Australia* (CALM, 1994) as "the relative visual character of a landscape, expressed as an overall visual impression or value held by society after perceiving and area of land / water." CALM (1994) identified that visual quality increases with greater:

- naturalness value, i.e. landscapes that have minimal modification and where natural features are prominent;
- topographic relief and ruggedness; and
- vegetation and landscape diversity.

The WAPC (2007) identified key character indicators that can be used as a basis for classifying the landscape into two preference categories; 'most' preferred and 'least' preferred landscapes which align with the description of visual quality provided by CALM (1994). The following key preference indicators are visible from the Study Area:

- rugged terrain – this landscape feature forms striking horizon lines in the distance and an enclosed view when traversing through steep undulating landform that occurs within the foreground.
- distinctive landscape features – in particular the exposed dark orange basalt hills that are visible from the Manuwarra Red Dog Highway.
- expansive landforms – expansive views across undulating terrain
- high degree of perceived naturalness – expansive areas that have no visible modification.
- distinctive displays of colour: deep orange rocky hills that contrast with the surrounding landscape, contrasts between vibrant orange stony soils and green/yellow spinifex grasses.
- structural vegetation diversity –stands of white barked Snappy Gums and taller grasses and scattered shrubs provide visual diversity, compared to the extensive cover of low spinifex grasses and scattered shrubs that is associated with the Spinifex Hills LCU
- drainage lines: this landscape feature dissects the landscape and is visually expressed as dense green vegetation meandering between the undulating terrain.
- waterforms - inundated creeks and rivers (seasonal), rocky pools.

Least preferred characteristics within the Study Area are:

- Extractive industry (gravel pits, mining).
- Linear infrastructure (water pipeline, low and high voltage transmission lines, transmission line substation).

The most visually distinctive landscape value within the Study Area is the ruggedness of the Spinifex Hills LCU which encompass the Chichester Range and Hamersley Range. The exposed basalt hills are also a distinctive landscape feature that occur within the Spinifex Hills LCU. These values are visible from many view locations within the Study Area.

The more discrete values such as drainage lines and waterforms are also a distinctive feature within the Study Area but are not always highly visible such as the waterholes and rocky pools within the MCNP. View location 14 occurs at Python Pool within the MCNP which does not have views to the Project.

The visual assessment from all view locations found that the visual impact associated with the Project would not significantly impact on the landscape values which is due to the following factors:

- the distance of the Project from view locations - the Project is located in the background zone from the view locations with the exception of the sites west of the Manuwarra Red Dog Highway (View Locations 1-4). As a result, the Project does not dominant the view and the landscape values remain a prominent feature within the Study Area.

5.3 VIEW EXPERIENCE

This section describes the impacts to view experience from the key visual receptors within the Study Area.

5.3.1 SIGNIFICANCE LEVEL 1 VIEW RECEPTORS

Manuwarra Red Dog Highway

This is a State Highway that connects Karratha and Tom Price and used to access MCNP. The road is also part of the Warlu Way, a drive trail that is promoted as a tourist destination of the Pilbara region. The natural landscape is a predominant feature along this road with linear infrastructure also visible along many parts of the road.

The view types experienced along this road include:

- enclosed views where the road cuts through steep terrain and the view distance is restricted to the immediate surrounding landform.
- focal views created by surrounding landform (natural or man-made bunds) which frames the view to a distant feature on the horizon.
- broadly enclosed views due to undulating terrain in the mid-ground which restricts long range views.
- open views to the background, this view type generally occurs where the terrain is flat to gently undulating.

These view types are retained from the Highway, due to the following factors:

- the distance of the Project from the Highway – the Project is located to the west of the Highway with the closest section of road occurring at 8.6 kms to the east, which is within the background zone.
- the undulating landform between the Project Area and Manuwarra Red Dog Highway prevents many open views to the Project. However, due the height of the WTGs they are likely to be visible from areas that have open views.
- The alignment of the Highway in relation to the Project – the road is aligned from northwest to southeast and is located to the east of the Project Area. The road alignment minimises the number of direct line of sight views to the Project. The exception is the section from the Millstream Road intersection for about 9 kms northwest, where northbound observers may experience a direct view of the Project. This section of road also has an open view experience which is depicted in the photo montage from view location 10.

The assessed views that represent the view experience from Manuwarra Red Dog Highway are:

- View location 10 – Level 2 impact
- View location 22 – Level 2 impact
- View location 33 – Level 2 impact

Roebourne-Wittenoom Road

This section of Roebourne-Wittenoom Road is part of the Warlu Way drive trail and is the main access route to designated recreation sites within the MCNP such as, Mount Herbert and Python Pool. The road is located in the background zone of the Project and runs in a southwest to northeast direction then curves east as it approaches Mount Herbert. There is little modification visible from this road except near the intersection of Manuwarra Red Dog Highway.

The road gradually climbs in elevation as it traverses the Chichester Range resulting in open and elevated views of the Chichester Range and the Hamersley Range to the south. Near the base of Mount Herbert there are pull over bays that provide expansive northwest to northeast views of the Chichester Range (view location 15).

The visual impacts will be limited to observers travelling southwest towards the highway or looking southwewst from the designated lookout of Mount Herbert. Although the Project will add a modified element to the horizon line, the natural character and landscape values are retained. This is due to the location of the Project in the background zone, where the closest WTG is located 13.65 kms to the east of the intersection with the Highway. Subsequently, the vertical and horizontal scale of the Project is visually reduced and does not dominate the field of view. However, as the WTGs are visible, the Project may not align with the VMOs that seek to retain the view experiences with the MCNP.

There will be no visual impact to Python Pool due to the surrounding landform restricting long range views.

The assessed views that represent the view experience from Roebourne-Wittenoom Road are:

- View location 16 (Mount Herbert Lookout) – Level 2 impact
- View location 19 – Level 2 impact

Millstream Road

This section of Millstream Road is part of the Warlu Way drive trail that is the main access route to the camping and recreation sites within this section of the MCNP. The views form this road vary from open to filtered through vegetation as taller trees and shrubs occur along this section. There are also feature views of the Hamersley Range on the southern horizon line.

The Project is 26 km north of Millstream Road at the MCNP Entrance Road intersection. As a result of the distance and screening effect of vegetation, the Project visibility was assessed as a blending impact for views to the north. Although the WTGs are not a prominent feature, they will add a modified element to the view.

The south view of the rugged horizon line is retained and the natural character remains a prominent feature from this view location.

The assessed view that represent the view experience from Millstream Road is:

+ View location 6 – Level 2 impact

5.3.2 SIGNIFICANCE LEVEL 1 RESIDENTIAL

Ngurrawaana Community

The Ngurrawaana Community will have views to the Project both open and filtered depending on the position of the observer. There are various built form including buildings and infrastructure that will filter and restrict views to the Project as well as tall shrubland.

This view location is within the mid-ground of the Project with the closest WTG located 2.75 km to the North. The photo montage analysis has assessed the visibility as prominent due to the high visibility of turbines and their large scale at this distance.

Although the form and line of the WTGs share some similarities the visual elements present in the existing view, their large scale contributes to the prominent impact on the existing view experience.

The assessed view that represent the view experience from Ngurrawaana is:

+ View location 3 – Level 1 impact

Weymul - Ngarluma Community

A Viewshed analysis was conducted from the Weymul Community which has shown that Project is potentially visible (**Map 12**), although this has not been confirmed by photo montage analysis. The viewshed analysis does not account for screening objects such as vegetation or built form which will affect the visibility to the Project if present.

The Project is located 25.45 km to the south southeast which may reduce the visibility of the WTGs from this view location.

5.3.3 SIGNIFICANCE LEVEL 2 SITES – LOCAL SIGNIFICANCE

Jinbi Springs

Jinbi Springs is a significant site to the Ngurrawaana Community. It is located within an incised drainage line overlooking a creekline area surrounded by Melealuca trees. The project is located within the mid-ground from this site with the closest WTG located at 3.55 km to the southwest. The photo montage analysis has shown that the Project will not be visible from this site as the surrounding steep landform screens open views to the south. As the observer leaves the site and moves into higher elevation, it is likely that the wind turbines will become visible as shown at View Location 2. The analysis of View Location 2 has shown that the WTGs are prominent however only a small number of the WTGs will be visible.

The assessed views that represent the view experience from Jinbi Springs are:

+ View location 1 – no impact
+ View location 2 – Level 2 impact

Lore Ceremony

A Viewshed analysis was conducted from the Lore Ceremony Site which has shown that Project is likely to be visible (**Map 11**), although this has not been confirmed by photo montage analysis. The viewshed analysis does not account for screening objects such as vegetation or built form which will impact the visibility to the Project if present.

This site is located within the mid-ground zone of the Project with the closest WTG located 563 metres to the northwest.

Radio Hill

Radio Hill is promoted as a scenic lookout in the Karratha region and is therefore considered a site of high local significance. It is located off the highway along an unsealed track best suited to a 4WD vehicle. The project is in the background from this view locations with the closest WTG located 27.3 km to the south.

From Radio Hill the view is expansive and panoramic overlooking the expansive undulating landforms of the Spinifex Hills LCU and the distinctive basalt hills. The site itself contains various infrastructure for the weather station and communication towers. To the north there are views of a small scale mine.

The photo montage analysis shown the WTGs will be visible on the distant southern horizon line but are a blending impact which is due to the effect of distance which reduces the visible scale of the WTGs. It is also likely that the visibility of the turbines will vary depending on the time of day and weather conditions.

The blending visibility of the WTGs may alter the view experience where they add a modified element to view, although they will not dominate the view due as they occupy a small portion of the overall view. The distinctive landscape features (basalt hills) also remain a prominent feature from this elevated view location.

The assessed views that represent the view experience from Radio Hill is:

+ View location 35 – Level 2 impact

5.4 VIEW LOCATIONS

The 11 view locations have been assessed for visual impacts through the analysis of viewshed mapping and photo montages. The outcome of this assessment is summarised in **Table 20** which provides a visual impact rating. These ratings are based on the significance level of the view location and the visual management objective (VMO) for managing the landscape character (**Table 19**). The visual impact level at each photo montage location is also shown on **Map 13**.

Table 19: Visual impact level matrix table

VISIBILITY RATING		PROMINENT			BLENDING			NOT VISIBLE
Significance Level rating		S1	S2	S3	S1	S2	S3	S1-3
Visual Management Objective	Protection and Maintenance	L1	L1	L1	L2	L2	L2	No impact
	Best Practice Siting and Design	L1	L2	L2	L3	L3	L3	No impact
	Restoration and Enhancement	L2	L2	L2	L3	L3	L3	No impact
		VISUAL IMPACT LEVEL						

Table 20: Visual impact level at View Locations

VIEW LOCATION	SIG. LEVEL	LCU	MOST PREFERRED CHARACTERISTICS (LANDSCAPE VALUES)	LEAST PREFERRED CHARACTERISTICS	VISUAL MANAGEMENT OBJECTIVE (VMO)	MINIMUM DISTANCE TO WTGS (KM)	VISIBILITY RATING	VISUAL IMPACT LEVEL	VMOS ACHIEVED?
1 Jinbi Springs	S2	Spinifex Hills	+ Presence of waterbodies and associated riparian vegetation + Distinctive displays of colour + Topographic variety and distinctive landscape features	+ High voltage transmission line and substation.	Best Practice Siting and Design	3.55	Not Visible	No impact	Yes
2 Jinbi springs powerline track	S3	Spinifex Hills	+ Topographic variety and distinctive landscape features	+ High voltage transmission line and substation.	Best Practice Siting and Design	3.36	Prominent	L2	Yes
3 Ngurrawaana Community	S1	Tall Shrubland Plain	+ Vegetative diversity (diversity in species composition, height, colour and texture)	+ Service infrastructure.	Best Practice Siting and Design	2.75	Prominent	L1	No
4 Ngurrawaana access track	S3	Spinifex Hills	+ Rugged horizon line of the Hamersley Range + Expansive undulating landforms (Spinifex Hills LCU)	+ High voltage transmission lines	Protection and Maintenance / Best Practice Siting and Design	4.88	Prominent	L2	May not align with VMOs
6 Millstream Road	S1	Undulating Grassland Plain	+ Rugged horizon line of the Hamersley Range + High degree of perceived naturalness + Structural vegetation diversity and composition with the mix of grasses and scattered trees and shrubs.	+ None	Protection and Maintenance	25.24	Blending	L2	May not align with VMOs
10 Manuwarra Red Dog Highway (South)	S1	Undulating Grassland Plain	+ High degree of perceived naturalness + Structural vegetation diversity (mix of grasses and scattered trees and shrubs).	+ High voltage transmission line	Best Practice Siting and Design	19.02	Blending	L2	Yes

VIEW LOCATION	SIG. LEVEL	LCU	MOST PREFERRED CHARACTERISTICS (LANDSCAPE VALUES)	LEAST PREFERRED CHARACTERISTICS	VISUAL MANAGEMENT OBJECTIVE (VMO)	MINIMUM DISTANCE TO WTGS (KM)	VISIBILITY RATING	VISUAL IMPACT LEVEL	VMOS ACHIEVED?
16 Mount Herbert	S1	Spinifex Hills	+ High degree of perceived naturalness + Expansive landforms (Chichester Range) + Topographic variety (Chichester Range and Hamersley Range).	+ None	Protection and Maintenance	20.45	Blending	L2	May not align with VMOs
19 Roebourne-Wittenoom Road	S1	Spinifex Hills	+ High degree of perceived naturalness + Expansive landforms (Chichester Range) + Topographic variety (Hamersley Range).	+ None	Protection and Maintenance	15.49	Prominent	L2	May not align with VMOs
22 Manuwarra Red Dog Highway (Central)	S1	Spinifex Hills	+ Expansive landforms (Spinifex Hills)	+ None	Best Practice Siting and Design	8.95	Prominent	L2	May not align with VMOs
33 Manuwarra Red Dog Highway (North)	S1	Spinifex Hills	+ Distinctive landscape features (Basalt Hills) + Topographic variety (rugged terrain)	+ Linear infrastructure	Protection and Maintenance / Best Practice Siting and Design	25.61	Blending	L2	Yes
35 Radio Hill	S2	Spinifex Hills	+ Distinctive landscape features (Basalt Hills) + Topographic variety (rugged terrain)	+ Extractive industry (north view)	Protection and Maintenance / Best Practice Siting and Design	27.33	Blending	L2	Yes

5.5 VISUAL MANAGEMENT OBJECTIVES

The following VMOs have been assigned to the visual receptors to manage the visual landscape within the Study Area which are discussed in **Section 3.7**:

- Protection and Maintenance of landscape values and key views
- Best Practice Siting and Design for the majority of the Study Area.

Table 21 below presents a summary of the visual impacts in response to the VMOs identified for the Study Area for each of the assessed view locations.

Table 21: Summary of visual impacts in response to the VMOs

View Location	Visual Impact Level	Response to Visual Management Objectives
1 **Jinbi Springs**	No impact	This view location has an enclosed view experience with transmission line infrastructure visible in the foreground on the ridge above the site. Landform will restrict views to the WTGs as shown in the photo montage analysis. The VMO of Best Practice Siting and Design has been assigned to this view with the preferred outcome that the natural landscape character remains prominent There is no visual impact associated with the WTGs from this site and therefore the VMO of **Best Practice Siting and Design is achieved**.
2 **Jinbi springs powerline track**	Level 2	This view is located on the power line track above Jinbi Springs and was selected to demonstrate the potential visual impact associated with the WTGs as observers travel to and from Jinbi Springs. It is an open view that is modified by the presence of a transmission line and sub-station in the foreground. The VMO of Best Practice Siting and Design has been assigned to this view with the preferred outcome that the natural landscape character remains prominent The WTGs are visible in the mid-ground with the closest visible turbine located 3.36 km to the southwest. The visual analysis has rated the impact as prominent although most of the WTGs will be screened behind the elevated landform. From this view location, the low number of WTGs that are visible do not significantly contribute to a cumulative impact. Therefore, the VMO of **Best Practice Siting and Design is achieved** from this view location.
3 **Ngurrawaana Community**	Level 1	This view location is located at the northern edge of the Ngurrawaana community which has filtered views through tall scattered shrubland vegetation. The VMO of Best Practice Siting and Design has been assigned to this view with the preferred outcome that the natural landscape character remains prominent The WTGs are visible in the mid-ground with the closest visible turbine located 2.75 km to the north. The visual analysis has rated the impact as prominent which will result in a noticeable change to the view. As a result, the location of the visible WTG's **may be at variance with Best Practice Siting and Design objectives**. It is recommended that the impacts to views are discussed with the community to identify if the visual change is acceptable

View Location	Visual Impact Level	Response to Visual Management Objectives
4 **Ngurrawaana access track**	Level 2	This view location is located on the track that runs from the Highway to the Ngurrawaana community and was selected to demonstrate the potential visual impacts for observers travelling to Ngurrawaana. It is an elevated and open view, where the Hamersley Range is visible on the southern horizon line. A transmission line is also visible on the distant western horizon line. The VMO of Best Practice Siting and Design has been assigned to this view with the preferred outcome that the natural landscape character remains prominent The VMO of Protection and Maintenance has been assigned to views to the Hamersley Range. The WTGs will be visible in the mid-ground with the closest turbine located 4.88 km to the west southwest. The visual analysis has rated the WTGs as a prominent as the tall vertical forms add a new element to the view. The Project location **will not impact the views to the Hamersley Range, therefore the Protection and Maintenance of this view experience is retained**. Best Practicing Siting and Design has been assigned to the remaining views with a preferred outcome of minimal impacts to the natural character. Although the view experience is altered in the west view, the natural character remains prominent due to the expansive scale of the Spinifex Hills LCU and the simple and repetitive pattern of the WTGs. However, as the view experience will be altered, the Project **may be at variance with the Best Practice Siting and Design VMO for the west view**. It is recommended that the impacts to views are discussed with the community to identify if the visual change is acceptable.
6 **Millstream Road**	Level 2	This view location was selected to demonstrate the potential visual impacts for observers travelling to the MCNP along Millstream Road. The view has open and filtered views that extend to the Hamersley Range on the southern horizon line. The VMO of Protection and Maintenance has been assigned to this view with the preferred outcome of retaining the views of the Hamersley Range and the natural landscape character. The WTGs have been assessed as visible in the background with the closest turbine located at 25.25 km to the north. The visibility of the WTG's have been assessed as visible but blending with the surrounding landscape which is due to the effect of distance and the reduced visible scale. As a result, the WTGs will not dominate the view but will add a modified element to distant northern horizon line where visible. The landscape character is not likely to be altered due to the blending visibility and the view to the Hamersley Range will retained. It is expected that **the Protection and Maintenance of landscape values and natural character is achieved but may not align with the objectives of the MCNP Management Plan (DEC, 2011) that seeks to retain the view experiences within the MCNP**. It is recommended that the impacts to view experience from Millstream Road are discussed with relevant stakeholders to identify if the visual change is acceptable.

View Location	Visual Impact Level	Response to Visual Management Objectives
10 **Manuwarra Red Dog Highway (South)**	Level 2	This view location was selected to demonstrate the potential visual impacts for north bound observers along the Highway that will have a direct line of sight to the Project. There are open north views across a predominately natural landscape but contains a transmission line that is visible 4.5 km to the north. The VMO of Best Practice Siting and Design has been assigned to this view with the preferred outcome that the natural landscape character remains prominent The WTGs have been assessed as visible in the background with the closest turbine located at 19 km to the northwest. The visibility of the WTG's have been assessed as visible but blending with the surrounding landscape which is due to the effect of distance and the reduced visible scale. Although the WTGs are visible for north bound observers, their blending visibility means that they do not dominate or alter the natural character. Therefore, the Project is **likely to meet Best Practice Siting and Design** objectives along this section of the Highway.
16 **Mount Herbert**	Level 2	This view location was selected as it represents an elevated panoramic view from a designated lookout that is easily accessible to the public. The panoramic views also extend to the Hamersley Range on the distant southern horizon line. The VMO of Protection and Maintenance has been assigned to this view with the preferred outcome of retaining the panoramic view experience, landscape values and landscape character. The WTGs have been assessed as visible in the background with the closest turbine located at 20.45 kms to the west southwest. The visibility of the WTG's have been assessed as visible but blending with the surrounding landscape which is due to the effect of distance and the reduced visible scale. However, the white colour and moving blades may attract the viewer's eye to the WTGs that protrude above the horizon line. Although the WTGs are not a dominant feature, they add a modified element to the natural landscape and **may not align with the Protection and Maintenance VMO** that seeks to retain view experiences within the MCNP. It is recommended that the impacts to view experience from Mount Herbert lookout are discussed with relevant stakeholders to identify if the visual change is acceptable.
19 **Roebourne-Wittenoom Road**	Level 2	This view location was selected to represent the views travelling southwest along Roebourne-Wittenoom Road. This section of road is part of the Warlu Way drive trail and is the main access route to sites within MCNP. The west view is open overlooking the undulating landscape with views to the Hamersley Range on the southern horizon line. The VMO of Protection and Maintenance has been assigned to this view with the preferred outcome of retaining the view experience, landscape values and landscape character. The WTGs have been assessed as visible in the background with the closest turbine located at 15.5 kms to the west. The visibility of the WTG's has been assessed as blending as the white colour draws the viewers's eye to the WTGs that protrude above the horizon line. The project will not impact on views to the Hamersley Range to the south. Although the WTGs are not a dominant feature, they add a modified element to the natural landscape and **may not align with the Protection and Maintenance VMO** that seeks to retain view experiences within the MCNP. It is recommended that the impacts to view experience for the southwest views from Roebourne-Wittenoom Road are discussed with relevant stakeholders to identify if the visual change is acceptable.

View Location	Visual Impact Level	Response to Visual Management Objectives
22 **Manuwarra Red Dog Highway (Central)**	Level 2	This view location was selected to represent the views travelling adjacent to the Project along the Highway. The WTGs are unlikely to be in the direct line of site as due to the alignment of the road. The photo montage depicts the west view for northbound observers. The VMO of Best Practice Siting and Design has been assigned to this section view with the preferred outcome of retaining the natural landscape character. The WTG's have been assessed as visually blending for this open view location. The closest turbines are located in the near background, 8.9 km to the southwest. The WTG's will add a modified element to the view, however due to the large expansive character of the Spinifex Hills LCU combined with the distance of the WTGs from the view point, the natural character is retained as the WTGs do not dominate the view. Therefore, the Project is **likely to meet Best Practice Siting and Design** objectives along this section of the Highway.
33 **Manuwarra Red Dog Highway (North)**	Level 2	This view location was selected to represent the view for observers travelling south along the Highway. The section of highway has key views of the exposed rocky basalt hills which are a distinctive landscape feature within the Study Area. This view also contains linear infrastructure consisting of a pipeline and railway which modifies the view. The presence of linear infrastructure is visible from many sections along the Highway. The VMO of Best Practice Siting and Design has been assigned to this view as the baseline objective for the landscape, with the preferred outcome of retaining the natural landscape character. The VMO of Protection and Maintenance assigned to the key views of the basalt hills. The WTG's have been assessed as visually blending which is a result of the reduced visible scale of the WTGs which are located 25.6 km south the view point. The distinctive rugged landforms in the mid-ground also screen portion of the project and are prominent features in the view. Subsequently, the landscape values are retained from this view and the location of the Project is **likely to meet the VMOs of Best Practice Siting and Design and the Protection and Maintenance of key views** from this section of the Highway.
35 **Radio Hill**	Level 2	This view location was selected to represent the elevated panoramic view from a locally significant informal lookout. The site is modified and contains infrastructure associated with a weather station. Also visible is a small mine to the north. Access to the site is best suited to 4WD via 5.8 kms of unsealed track. The VMO of Best Practice Siting and Design has been assigned to this view as the baseline objective for the landscape, with the preferred outcome of retaining the natural landscape character. The VMO of Protection and Maintenance assigned to the key views of the basalt hills. The assessment has rated the WTGs as visually blending where the closest turbines are located 27.3 kms to the south. The distance of the Project from this view point reduces the visible scale although variable weather conditions are likely to impact the visibility of the WTGs and may sometimes appear prominent on the distant horizon line. However, due to the reduced scale and panoramic view, the landscape character and landscape features remain prominent. Therefore, the location of the Project is **likely to meet the VMOs of Best Practice Siting and Design and the Protection and Maintenance of key views** from Radio Hill.

5.6 CONCLUSION

A Visual Impact Assessment (VIA) has been undertaken of the YEC Baru and Marnda Projects in the Shire of Ashburton, located directly west of the Millstream Chichester National Park (MCNP). The VIA was undertaken from key visual receptors within a 30 km Study Area. A total of 35 view locations were assessed during the site analysis with 11 of these locations selected for photo montage analysis, that represent the views experience within the Study Area. The focus of the assessment was on public accessibly areas, particularly areas classified as Significance Level 1 and sites that are of local importance to the Ngurrawaana Community.

The analysis has revealed that the impacts to Landscape Character and the Landscape values is expected to be minimal due to the location of the Project within the background zone (6.5 km and beyond) from most view locations which will reduce the visible scale and prominence of the WTGs. Therefore, the location of the Project is expected to meet the VMOs that seek to retain the landscape character and landscape values of the Study Area.

The impact to views are minimal from most view locations due to the location of the Project, and it is expected that the VMO objectives should be met for view experience along the Manuwarra Red Dog Highway. However, some locations will experience potential impacts where the visibility of the WTGs may alter the view experience with the addition of a new modified element to the horizon. The view locations that may be at variance with the VMO due to the modification of views are:

- View Location 3 - Ngurrawaana Community (Level 1 impact)
- View Location 4 – Ngurrawaana access track (Level 2 impact
- View Location 6 – Millstream Road (Level 2 impact)
- View Location 16 – Mount Hebert (Level 2 impact)
- View Location 19 – Roebourne-Wittenoom Road (Level 2 impact).

The Ngurrawaana sites are located in the mid-ground of the Project and therefore the WTGs are highly visible. View locations 6, 16 and 19 are located in the background zone but are within the MCNP where the objective is *to protect and enhance the visual qualities of the MCNP Planning Area* (DEC, 2011). While landscape values and landscape character were considered to remain a prominent feature from the MCNP sites, any development that is visible with the potential to alter existing views may result in significant visual impacts due to the high sensitivity and visual management objective for the MCNP landscape.

Regarding the Project development, it is important that wind farms are sited and designed in a way that minimises impacts to landscape character and allows the retention of landscape values as it is almost impossible to hide them within the landscape (SNH, 2018)

The Project has been sited within the Spinifex Hills LCU which is an extensive landscape within the Study Area, as is the Undulating Grassland Plain LCU which shares many similar characteristics to the Spinifex Hills. These landscapes are an appropriate scale for a wind farm of this size as landscape scale and openness are important characteristics for wind farm developments (SNH, 2018).

Visual Impact Analysis is complex as there are many factors that will contribute to visibility and impact. There are the physical factors such as siting and design of the development but also variable factors such as atmospheric conditions which can greatly affect visibility, and the observer's preferences. Subsequently the assessment has taken a conservative approach where the methodology seeks to identify potential red flags for further discussion with relevant stakeholders. Therefore, it is recommended that the acceptability of visual impacts are discussed with the Ngurrawaana Community and relevant stakeholders for views which may not meet the assigned VMOs. The following factors should be considered when discussing the acceptability of impacts:

- Location – the Project is located within the background zone (6.5 kms and beyond) from most view locations which reduces the visible scale and prominence of the WTGs.
- Development design – although the Project is a large scale development, it can be considered an appropriate design for a natural landscape, as it exhibits a simple design and repetitive pattern, as

opposed to a more complex and detailed development that consists of a variety of forms, lines, colours and textures.

+ Topography - the undulating terrain from many view locations along the main Highway restricts long range views, which further reduces open views of the Project. From most of the sites assessed along the, only a portion of the Project is likely to be visible where landform screens the lower portion of the WTGs.
+ Landscape setting – the expansive Spinifex Hills and Undulating Grassland Plain LCUs are considered an appropriate landscape for a large scale wind farm
+ Landscape sensitivity – the majority of the landscape within the Study Area is classified as Significance Level 3, the assessment has focused on mostly Significance Level 1 view locations and areas of high local significance.
+ Retention of landscape character – the natural character is retained as the WTGs do not dominate the view.
+ Retention of landscape values and key views – views to the Hamersley Range are retained from the assessed view locations and are the expansive views of the Chichester Range. View of the distinctive basalt hills are retained as are enclosed views of landform along the Manuwarra Red Dog Highway.
+ Duration of view - most views are transient not static with the exception of the lookout views. The panoramic view from lookouts accommodates some change as the Project does not occupy the majority of space from these expansive views.
+ Direction of view – the alignment of the Manuwarra Red Dog Highway is not aligned towards the Project, therefore observers are more likely to experience short and transient views where the Project is visible.

5.7 STUDY LIMITATIONS

The assessment includes the following limitations:

+ Visual Management Objectives - the assessment methodology follows the WAPC (2007) guidelines which aims to guide visual landscape evaluation and impact assessment in the public realm. These guidelines have also undertaken extensive research to ascertain landscape preferences, however the outcomes of the assessment should be taken into consideration with regard to stakeholder concerns.
+ Viewshed accuracy – viewsheds were generated using a 30 m resolution DEM which does not include vegetation, subsequently the viewshed presents the ‘worst case’ scenario.
+ Photo montage accuracy – the montages have used the available spatial data to depict the accurate location and scale of the development. The focus of assessment is on the wind turbines which are the largest pieces of infrastructure that will be the most visible in the landscape. The modelling of ancillary infrastructure associated with the wind farm is beyond the scope of this project.
+ Duration of view – the assessment of visibility has been conducted from a static view, therefore the impact may appear greater than in reality, particularly if the view point is located along a road where the duration of view may be fleeting and the direction of view may not be focused towards the proposed development.
+ Movement of wind turbine generators - the visual impact assessment is based on static photomontage images, whereas the blades of the constructed WTGs will be moving at times. When in motion, the movement of the blades may draw the viewers’ eye and make the WTGs more noticeable.
+ Atmospheric and weather conditions – these variable conditions can greatly alter the visibility of a development. For example, heat haze can distort and reduce the clarity of a development. Inclement weather conditions such as rain, fog and cloud cover may reduce or completely obscure the visibility of a development. Cloud cover can also change the appearance, where shadows from clouds can make white turbines appear grey. The colour of the sky and direction of the sun can also make a feature more prominent, for example a dark grey sky background with the sun shining towards the development will illuminate light coloured objects such as wind turbines.

+ Site Analysis – due to the large extent of the Study Area, it is not possible to visit all view locations within the timeframe of the site analysis. The view locations selected were considered the best representation of views available along highly used routes and sites that were likely to have views to the Project.
+ Night lighting –has not been assessed and is beyond the scope of this project. Some wind farms may require aviation lights which may be visible up to 30 km. If visibility sensors are installed, this can reduce the light intensity in clear weather conditions (Vestas, 2019).

REFERENCES

Australia's North West (ANW)Tourism (2023) Warlu Way Map: Available: https://warluway.com.au/

Australian Wind Energy Association (AusWEA) and the Australian Council of National Trusts (ACNT) (2007) *Wind Farms and Landscape Values: National Assessment Framework*. Final Version.

Clean Energy Council (CEC) (2018) *Best Practice Guidelines for Implementation of Wind Energy Projects in Australia*. Available: https://assets.cleanenergycouncil.org.au/documents/advocacy-initiatives/community-engagement/wind-best-practice-implementation-guidelines.pdf

Conservation and Land Management, Department of (CALM) (1994) *Reading the Remote: Landscape Characters of Western Australia*. CALM, Perth.

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2024) *Australia's World Heritage List*. Available: https://www.dcceew.gov.au/parks-heritage/heritage/places/world-heritage-list

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2023) *Australia's National Heritage List*. Available: https://www.dcceew.gov.au/parks-heritage/heritage/places/national-heritage-list

Department of Environment and Conservation (DEC) (2011) Millstream Chichester National Park and Mungaroona Range Nature Reserve – Management Plan No. 69. Available: Millstream Chichester National Park and Mungaroona Range Nature Reserve | Department of Biodiversity, Conservation and Attractions

Department of Planning Lands and Heritage (DPLH) (2020) *Position Statement: Renewable Energy Facilities*. Available: https://www.wa.gov.au/government/publications/planning-position-statement-renewable-energy-facilities

Department of Primary Industries and Regional Development (DPIRD) (2017) *Pre-European Vegetation* (DPIRD-006) [spatial dataset]. Available: Pre-European Vegetation (DPIRD-006) - Datasets - data.wa.gov.au

Department of Primary Industries and Regional Development (DPIRD) (2017) *Soil Landscape Mapping - Best Available* (DPIRD-027) [spatial dataset]. Available: Soil Landscape Mapping - Best Available (DPIRD-027) - Datasets - data.wa.gov.au.

EnVentus™ (no date) EnVentus™ Platform Brochure.

Environmental Protection Authority (EPA) (2023) *Environmental Factor Guideline: Social Surroundings*. EPA, Western Australia

Environment Protection and Heritage Council (EPHC) (2010) *Draft National Wind Farm Development Guidelines*: Available: https://www.nepc.gov.au/publications/archive/ephc-archive/ephc-archive-future-national-wind-farm-development-guidelines

Forestry Practice Authority Tasmania (FPA) (1990) *A Manual for Forest Landscape Management*. Updated 2006 FPA, Tasmania. Available: https://www.fpa.tas.gov.au/planning/visual_landscape_management

Geoscience Australia (2010). *SRTM-derived 1 Second Digital Elevation Model (DEM-S) Version 1.0*. Geoscience Australia, Canberra. Available: Product catalogue - Geoscience Australia (ga.gov.au)

Jenness J (2006) Topographic Position Index (TPI) v 1.2. Available: TPI_Documentation_online.pdf

The Landscape Institute and Institute of Environmental Management and Assessment (2013) *Guidelines for Landscape and Visual Impact Assessment* (3rd edition), Routledge, London.

Main Roads Western Australia (MRWA) (2023) *Road Hierarchy* [spatial dataset]. Available: https://catalogue.data.wa.gov.au/dataset/mrwa-road-hierarchy

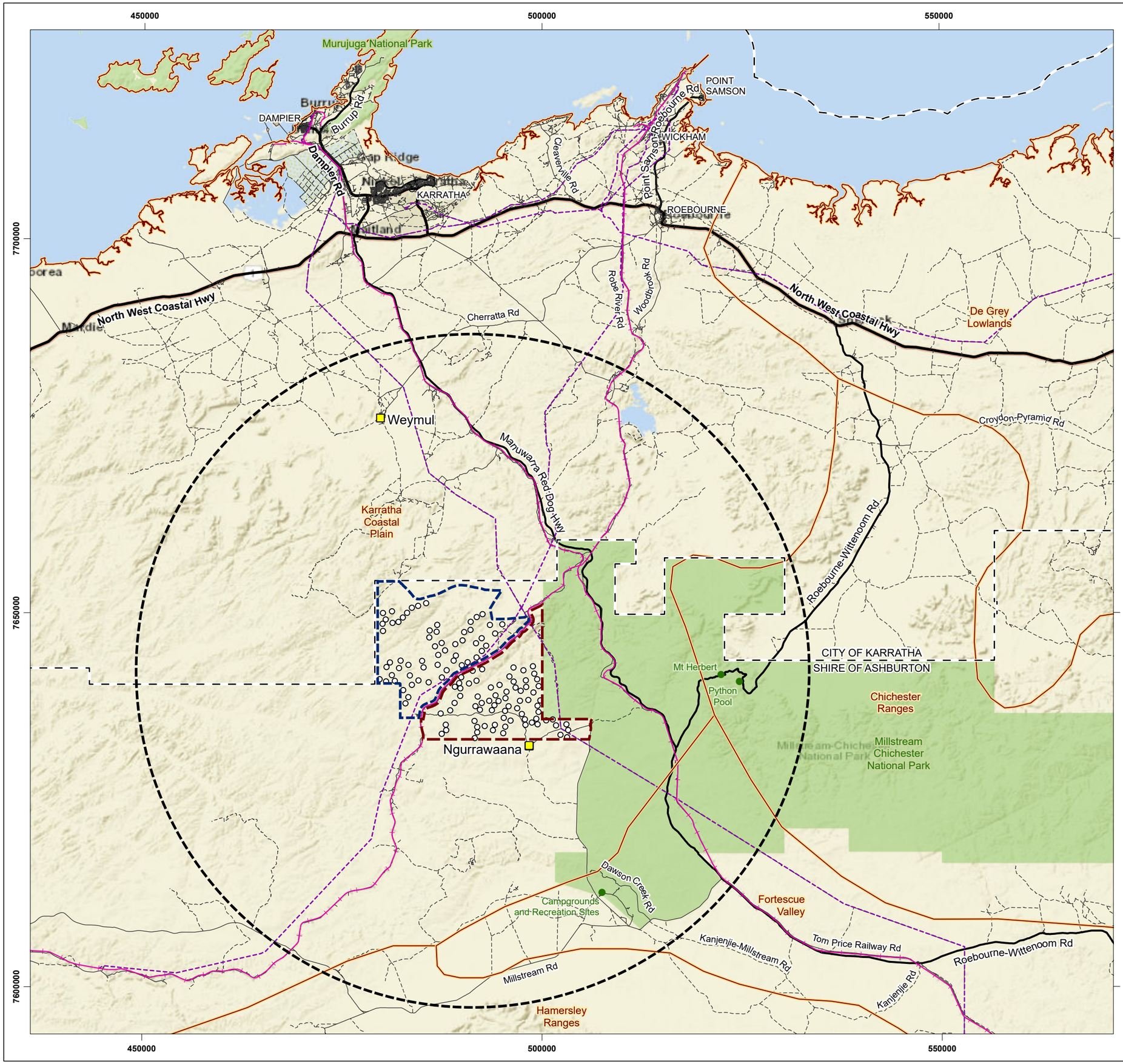
Scottish National Heritage (2017) *Siting and Designing Wind Farms in the Landscape,* Version 3a. Available: https://www.nature.scot/doc/siting-and-designing-wind-farms-landscape-version-3a.

Vestas (2019) Aviation Obstruction Lights Brochure: Available: Aviation_Obstruction_Lights.pdf.coredownload.inline.pdf

Western Australian Planning Commission (WAPC) (2003) *Statement of Planning Policy No. 2: Environment and Natural Resource Policy*. WAPC, Perth.

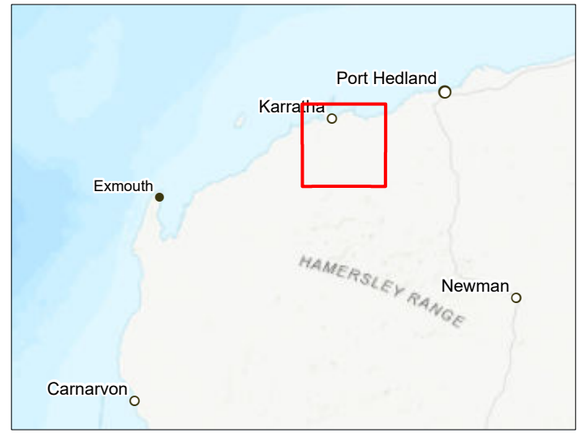
Western Australian Planning Commission (WAPC) (2007) *Visual Landscape Planning in Western Australia: a manual for evaluation, assessment, siting and design*. WAPC, Perth.

MAPS



LEGEND

- Community
- Wind Turbine Generator (WTG)
- Highway
- Main Road
- Minor Road
- Track
- Railway
- Transmission Line (220 kV)
- Study Area
- Baru Project
- Marnda Project
- Local Government Boundary
- Landscape Character Type
- DBCA Legislated Lands and Waters



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ecoscape

REGIONAL LOCATION

YINDJIBARNDI ENERGY PROJECT BARU AND MARNDA VISUAL IMPACT ASSESSMENT

Yindjibarndi Energy
A partnership with ACEN

COORDINATE SYSTEM: GDA2020
DATUM: GDA2020
UNITS: DEGREE

N

SCALE: 1:500,000 @ A3

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PROJECT NO: 5104-24

REV	AUTHOR	APPROVED	DATE
0	SB	PJ	09/06/2025

MAP 01

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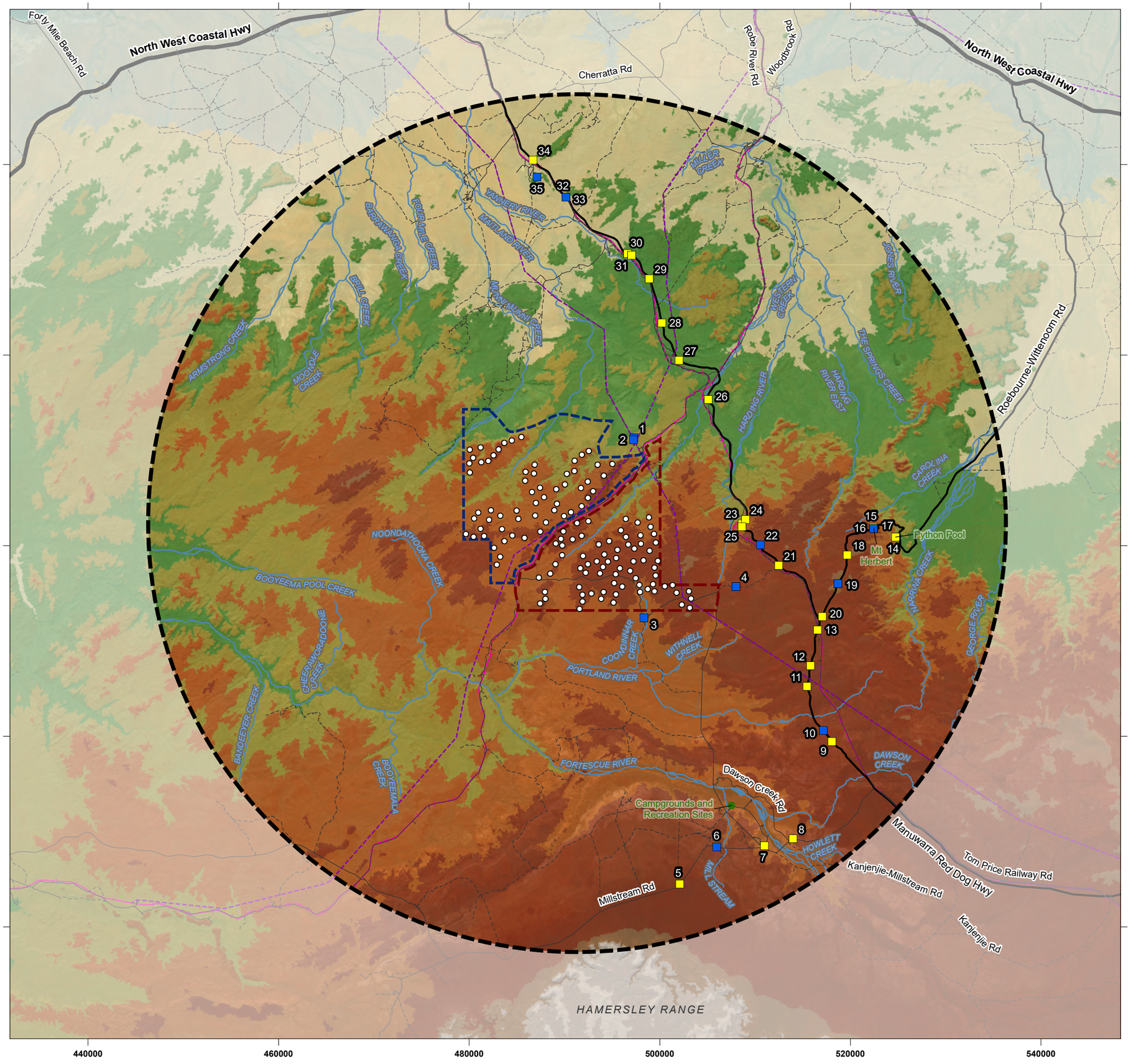

LEGEND

- Wind Turbine Generator (WTG)

View Locations

- General view location
- Photo Montage location
- Highway
- Main Road
- Minor Road
- Track
- Railway
- Transmission Lines (220 kV)
- Drainage Line
- Study Area
- Baru Project
- Marnda Project

Elevation (m) AHD

- -3 - 36
- 37 - 105
- 106 - 178
- 179 - 247
- 248 - 306
- 307 - 362
- 363 - 432
- 433 - 518
- 519 - 838

DATA SOURCES:
SOURCE DATA: PROJECT BOUNDARIES AND WTG LAYOUT (YEC, 2024). RAILWAY (GEOSCIENCE AUSTRALIA, 2021). ROADS SIMPLIFIED (LGATE-195). ELEVATION: SRTM-DERIVED 1 SECOND DIGITAL ELEVATION MODEL (DEM-S) VERSION 1.0 (GEOSCIENCE AUSTRALIA, 2010). SURFACE HYDROLOGY LINES (NATIONAL) (GEOSCIENCE AUSTRALIA 2015).
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ecoscape

ELEVATION

YINDJIBARNDI ENERGY PROJECT BARU AND MARNDA VISUAL IMPACT ASSESSMENT

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COORDINATE SYSTEM: GDA2020 MGA ZONE 50
PROJECTION: TRANSVERSE MERCATOR
DATUM: GDA2020
UNITS: METER

N

SCALE: 1:400,000 @ A3

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PROJECT NO: 5104-24

REV	AUTHOR	APPROVED	DATE
0	SB	PJ	09/06/2025

MAP 02

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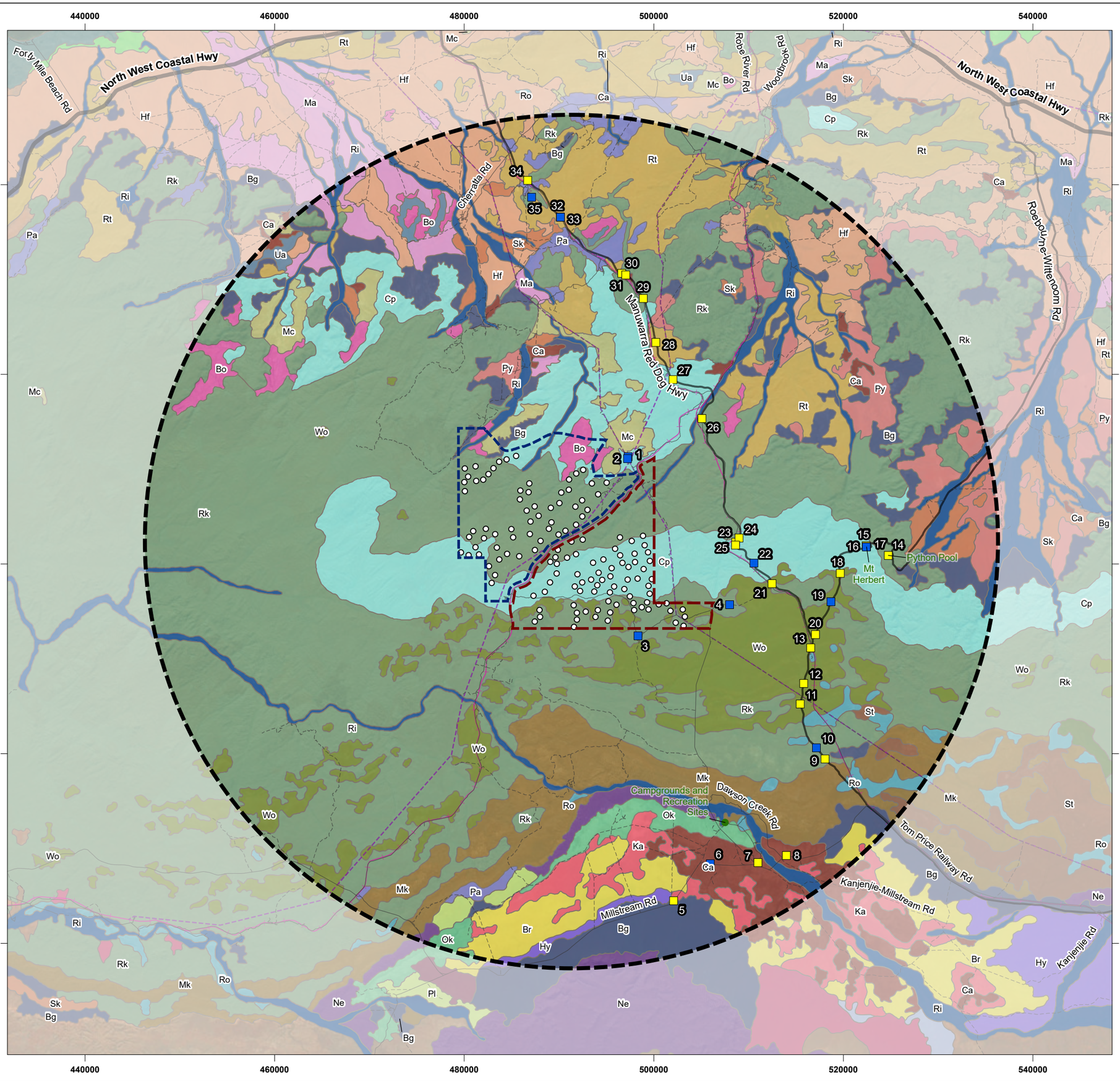

LEGEND

- Wind Turbine Generator (WTG)

View Locations

- General view location
- Photo Montage location
- Highway
- Main Road
- Minor Road
- Track
- Railway
- Transmission Lines (220 kV)
- Study Area
- Marnda Project
- Baru Project

Soil Landscape System

- Boolaloo system
- Boolgeeda system
- Brockman system
- Calcrete system
- Capricorn system
- Hooley system
- Horseflat system
- Kanjenjie system
- Macroy system
- Mallina system
- McKay system
- Newman system
- Oakover system
- Paraburdoo system
- Platform system
- Pyramid system
- River system
- Robe system
- Rocklea system
- Ruth system
- Satirist system
- Sherlock system
- Uaroo system
- Wona system

DATA SOURCES:
SOURCE DATA: PROJECT BOUNDARIES AND WTG LAYOUT (YEC, 2024). RAILWAY (GEOSCIENCE AUSTRALIA, 2021). ROADS SIMPLIFIED (LGATE-195). SOIL LANDSCAPE MAPPING - BEST AVAILABLE (DPIRD-027, 2022). SURFACE HYDROLOGY LINES (NATIONAL) (GEOSCIENCE AUSTRALIA 2015).
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ecoscape

SOIL LANDFORM UNITS

YINDJIBARNDI ENERGY PROJECT BARU AND MARNDA VISUAL IMPACT ASSESSMENT

Yindjibarndi Energy
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COORDINATE SYSTEM: GDA2020 MGA ZONE 50
PROJECTION: TRANSVERSE MERCATOR
DATUM: GDA2020
UNITS: METER

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SCALE: 1:400,000 @ A3
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PROJECT NO: 5104-24

REV	AUTHOR	APPROVED	DATE
0	SB	PJ	09/06/2025

MAP 03

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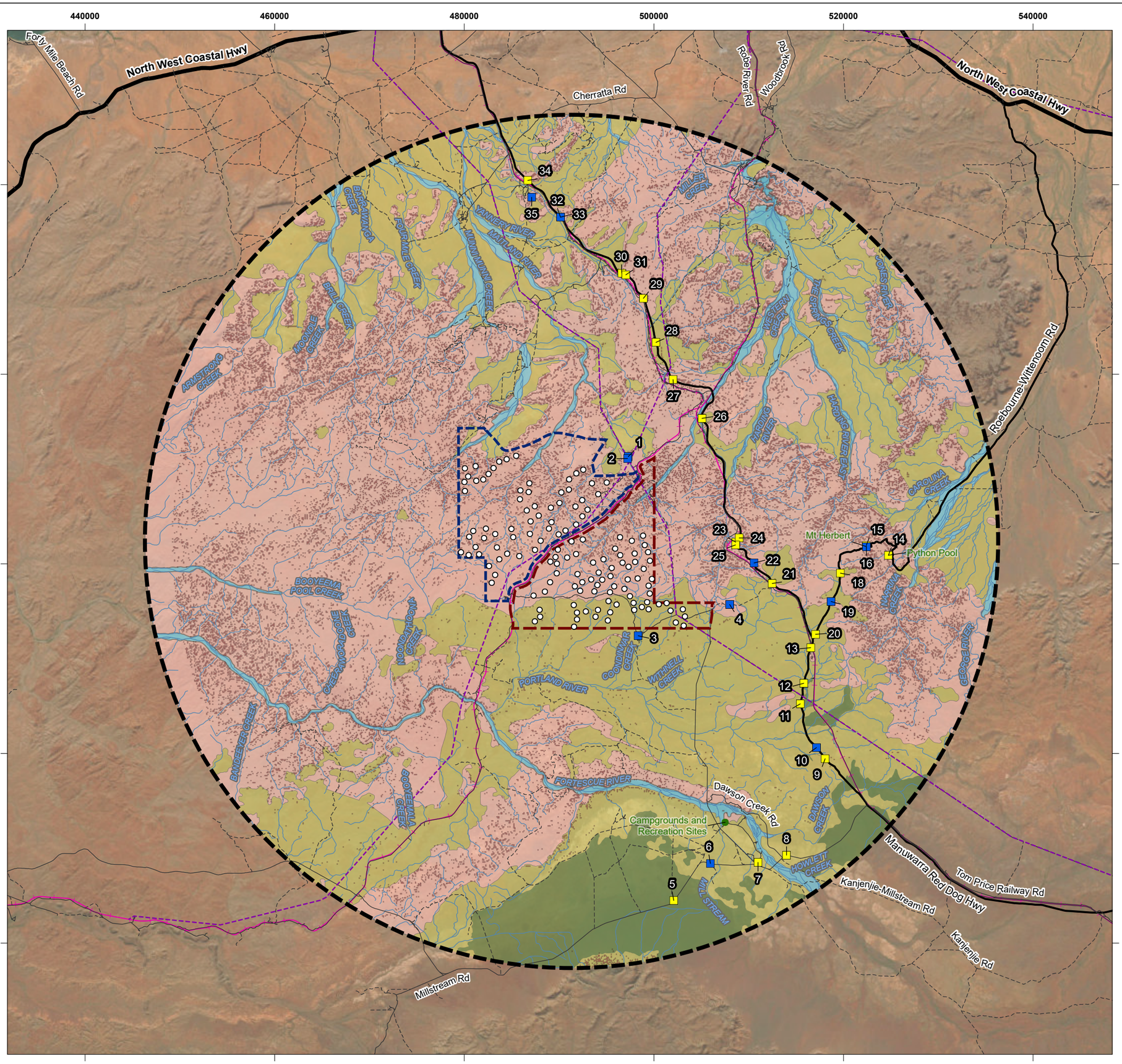

LEGEND

- Wind Turbine Generator (WTG)

View Locations

- General view location
- Photo Montage location
- Highway
- Main Road
- Minor Road
- Track
- Railway
- Transmission Lines (220 kV)
- Drainage Line
- Study Area
- Baru Project
- Marnda Project
- Hilltops

Landscape Character Unit (LCU)

- Drainage line
- Spinifex hills
- Undulating grassland plain
- Tall shrubland plain

DATA SOURCES:
SOURCE DATA: PROJECT BOUNDARIES AND WTG LAYOUT (YEC, 2024). RAILWAY (GEOSCIENCE AUSTRALIA, 2021). ROADS SIMPLIFIED (LGATE-195). SURFACE HYDROLOGY LINES (NATIONAL) (GEOSCIENCE AUSTRALIA 2015).
SERVICE LAYERS: WORLD TOPOGRAPHIC MAP: ESRI, HERE, GARMIN, FAO, NOAA, USGS
WORLD IMAGERY: EARTHSTAR GEOGRAPHICS

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LANDSCAPE CHARACTER

YINDJIBARNDI ENERGY PROJECT BARU AND MARNDA VISUAL IMPACT ASSESSMENT

Yindjibarndi Energy
A partnership with ACEN

COORDINATE SYSTEM: GDA2020 MGA ZONE 50
PROJECTION: TRANSVERSE MERCATOR
DATUM: GDA2020
UNITS: METER

N

SCALE: 1:400,000 @ A3

0 5 10 15 20 km

PROJECT NO: 5104-24

REV	AUTHOR	APPROVED	DATE
0	SB	PJ	09/06/2025

MAP 04

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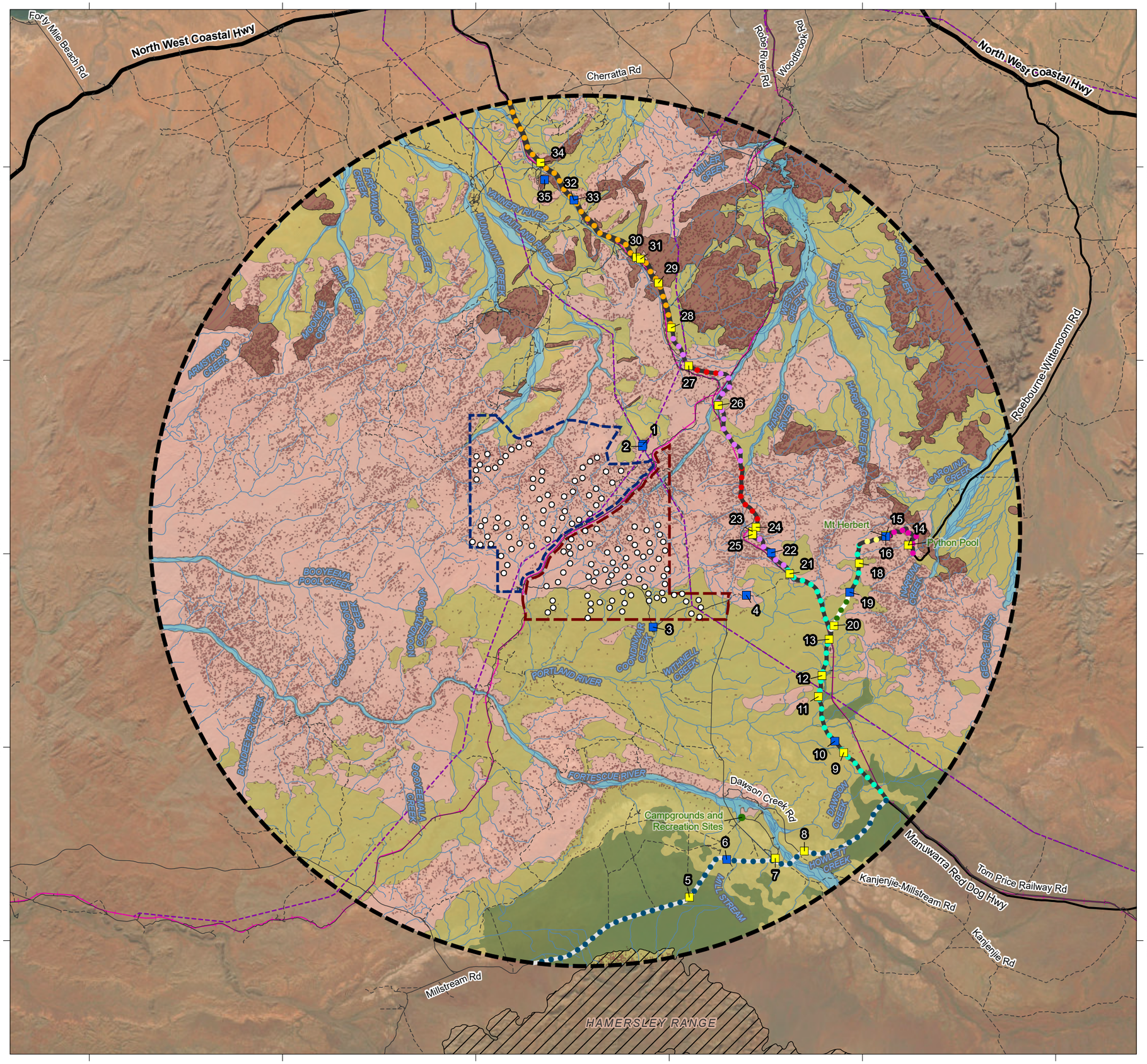

LEGEND

- Wind Turbine Generator (WTG)

View Locations

- General view location
- Photo Montage location
- Highway
- Main Road
- Minor Road
- Track
- Railway
- Transmission Lines (220 kV)
- Drainage Line
- Study Area
- Baru Project
- Marnda Project

View Experience

- Feature views of basalt hills (key view)
- Feature views of Chichester Range (key view)
- Enclosed foreground views of rugged terrain (key view)
- Broadly enclosed views
- Open views
- Elevated expansive views of Chichester Range (key view)
- Distant views to Hamersley Range (key view)
- Open to filtered views of Hamersley Range (key view)

Distinctive Landscape Features

- Basalt Hils
- Hamersley Range
- Hilltops

Landscape Character Unit (LCU)

- Drainage line
- Spinifex hills
- Undulating grassland plain
- Tall shrubland plain

DATA SOURCES:
SOURCE DATA: PROJECT BOUNDARIES AND WTG LAYOUT (YEC, 2024). RAILWAY (GEOSCIENCE AUSTRALIA, 2021). ROADS SIMPLIFIED (LGATE-195). SURFACE HYDROLOGY LINES (NATIONAL) (GEOSCIENCE AUSTRALIA 2015).
SERVICE LAYERS: WORLD TOPOGRAPHIC MAP: ESRI, HERE, GARMIN, FAO, NOAA, USGS
WORLD IMAGERY: EARTHSTAR GEOGRAPHICS

ecoscape

VIEW EXPERIENCE FROM SIGNIFICANCE LEVEL 1 ROADS

YINDJIBARNDI ENERGY PROJECT BARU AND MARNDA VISUAL IMPACT ASSESSMENT

Yindjibarndi Energy
A partnership with ACEN

COORDINATE SYSTEM: GDA2020 MGA ZONE 50
PROJECTION: TRANSVERSE MERCATOR
DATUM: GDA2020
UNITS: METER

N
SCALE: 1:400,000 @ A3
0 5 10 15 20 km

PROJECT NO: 5104-24

REV	AUTHOR	APPROVED	DATE
0	SB	PJ	09/06/2025

MAP 05

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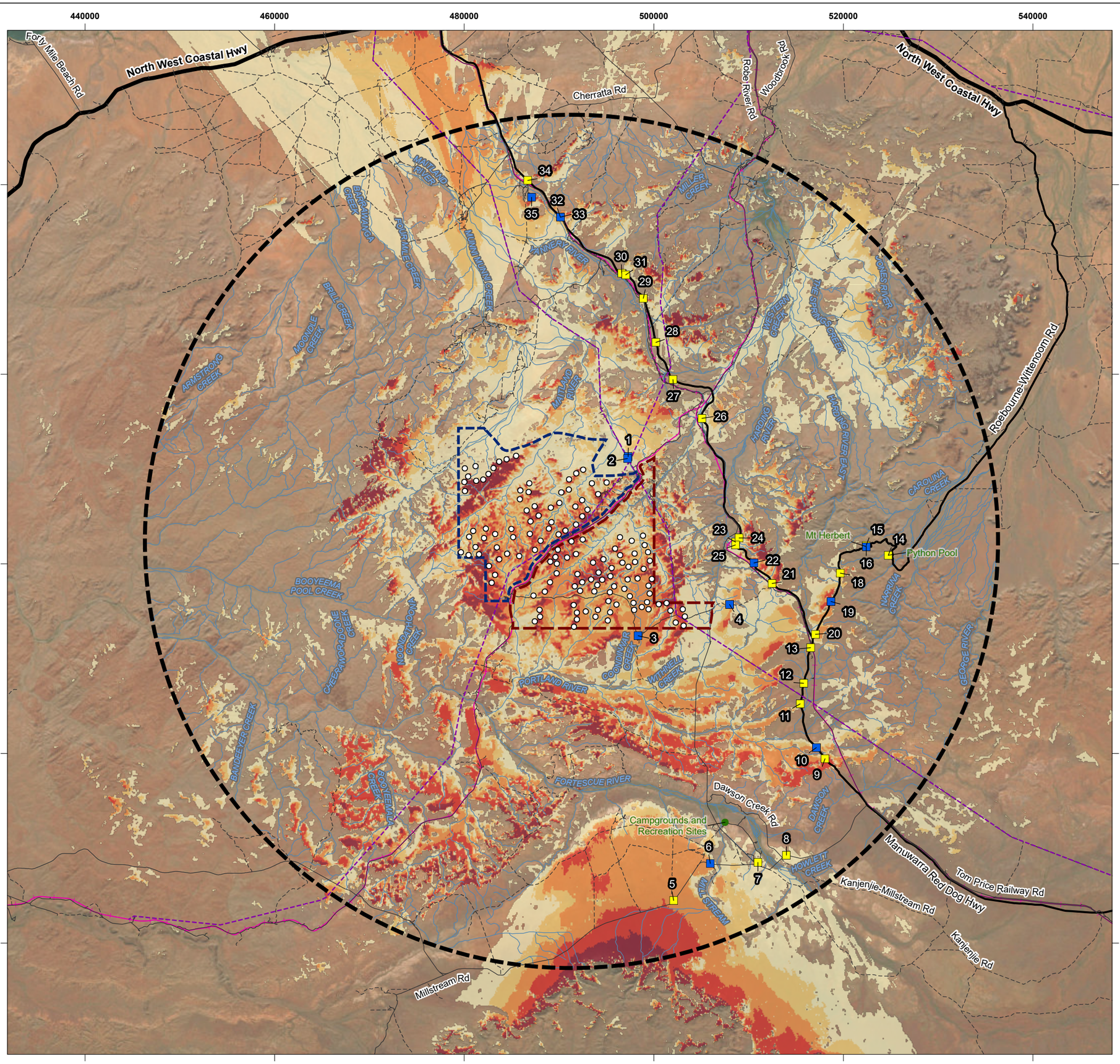


LEGEND

- Wind Turbine Generator (WTG)

View Locations

- General view location
- Photo Montage location
- Highway
- Main Road
- Minor Road
- Track
- Railway
- Transmission Lines (220 kV)
- Drainage Line
- Study Area
- Baru Project
- Marnda Project

Viewshed - Turbines all (64 m high)

Number of Turbines Visible

- 4 - 17
- 18 - 38
- 39 - 61
- 62 - 88
- 89 - 133

DATA SOURCES:
SOURCE DATA: PROJECT BOUNDARIES AND WTG LAYOUT (YEC, 2024). RAILWAY (GEOSCIENCE AUSTRALIA, 2021). ROADS SIMPLIFIED (LGATE-195). SURFACE HYDROLOGY LINES (NATIONAL) (GEOSCIENCE AUSTRALIA 2015). VIEWSHED GENERATED FROM GEOSCIENCE AUSTRALIA (2010) DEM-S.
SERVICE LAYERS: WORLD TOPOGRAPHIC MAP: ESRI, HERE, GARMIN, FAO, NOAA, USGS
WORLD IMAGERY: EARTHSTAR GEOGRAPHICS

ecoscape

VIEWSHED - WIND TURBINES LOWER BLADE TIP (64 M AGL)

YINDJIBARNDI ENERGY PROJECT BARU AND MARNDA VISUAL IMPACT ASSESSMENT

Yindjibarndi Energy
A partnership with ACEN

COORDINATE SYSTEM: GDA2020 MGA ZONE 50
PROJECTION: TRANSVERSE MERCATOR
DATUM: GDA2020
UNITS: METER

N

SCALE: 1:400,000 @ A3

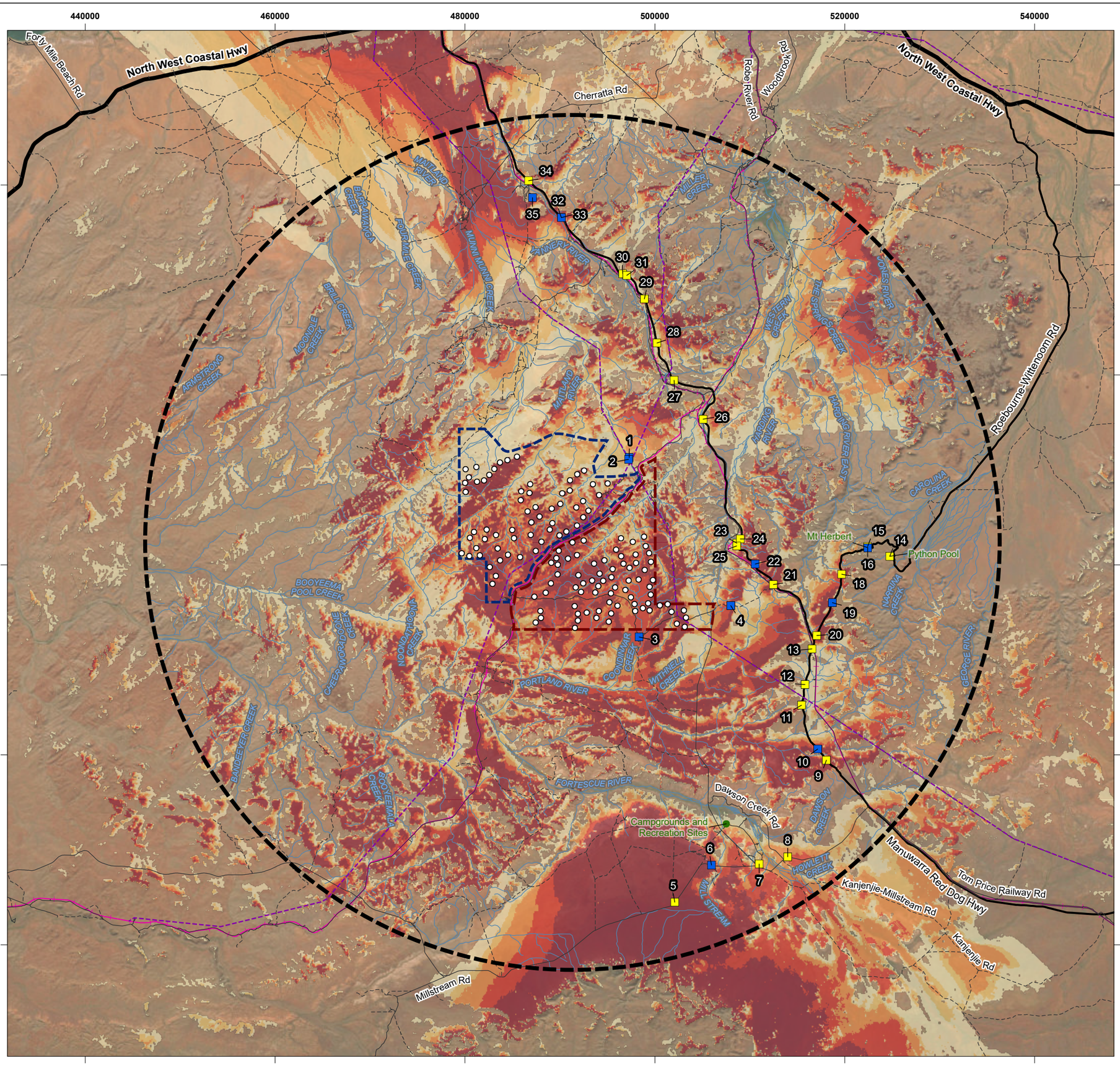
0 5 10 15 20 km

PROJECT NO: 5104-24

REV	AUTHOR	APPROVED	DATE
0	SB	PJ	09/06/2025

MAP 06

Path: C:_ECOSCAPE\5104-24 YEC VIA__Data to tranfer\Maps\APRXs\GDA_2020_Templates\Report_Maps_5104_GDA2020.aprx



LEGEND

- Wind Turbine Generator (WTG)

View Locations

- General view location
- Photo Montage location
- Highway
- Main Road
- Minor Road
- Track
- Railway
- Transmission Lines (220 kV)
- Drainage Line
- Study Area
- Baru Project
- Marnda Project

Viewshed - Turbines all (150 m high)

Number of Turbines Visible

- 4 - 17
- 18 - 38
- 39 - 61
- 62 - 88
- 89 - 133

DATA SOURCES:
SOURCE DATA: PROJECT BOUNDARIES AND WTG LAYOUT (YEC, 2024). RAILWAY (GEOSCIENCE AUSTRALIA, 2021). ROADS SIMPLIFIED (LGATE-195). SURFACE HYDROLOGY LINES (NATIONAL) (GEOSCIENCE AUSTRALIA 2015). VIEWSHED GENERATED FROM GEOSCIENCE AUSTRALIA (2010) DEM-S.
SERVICE LAYERS: WORLD TOPOGRAPHIC MAP: ESRI, HERE, GARMIN, FAO, NOAA, USGS
WORLD IMAGERY: EARTHSTAR GEOGRAPHICS

ecoscape

VIEWSHED - WIND TURBINES HUB HEIGHT (150 M)

YINDJIBARNDI ENERGY PROJECT BARU AND MARNDA VISUAL IMPACT ASSESSMENT

Yindjibarndi Energy
A partnership with ACEN

COORDINATE SYSTEM: GDA2020 MGA ZONE 50
PROJECTION: TRANSVERSE MERCATOR
DATUM: GDA2020
UNITS: METER

N

SCALE: 1:400,000 @ A3

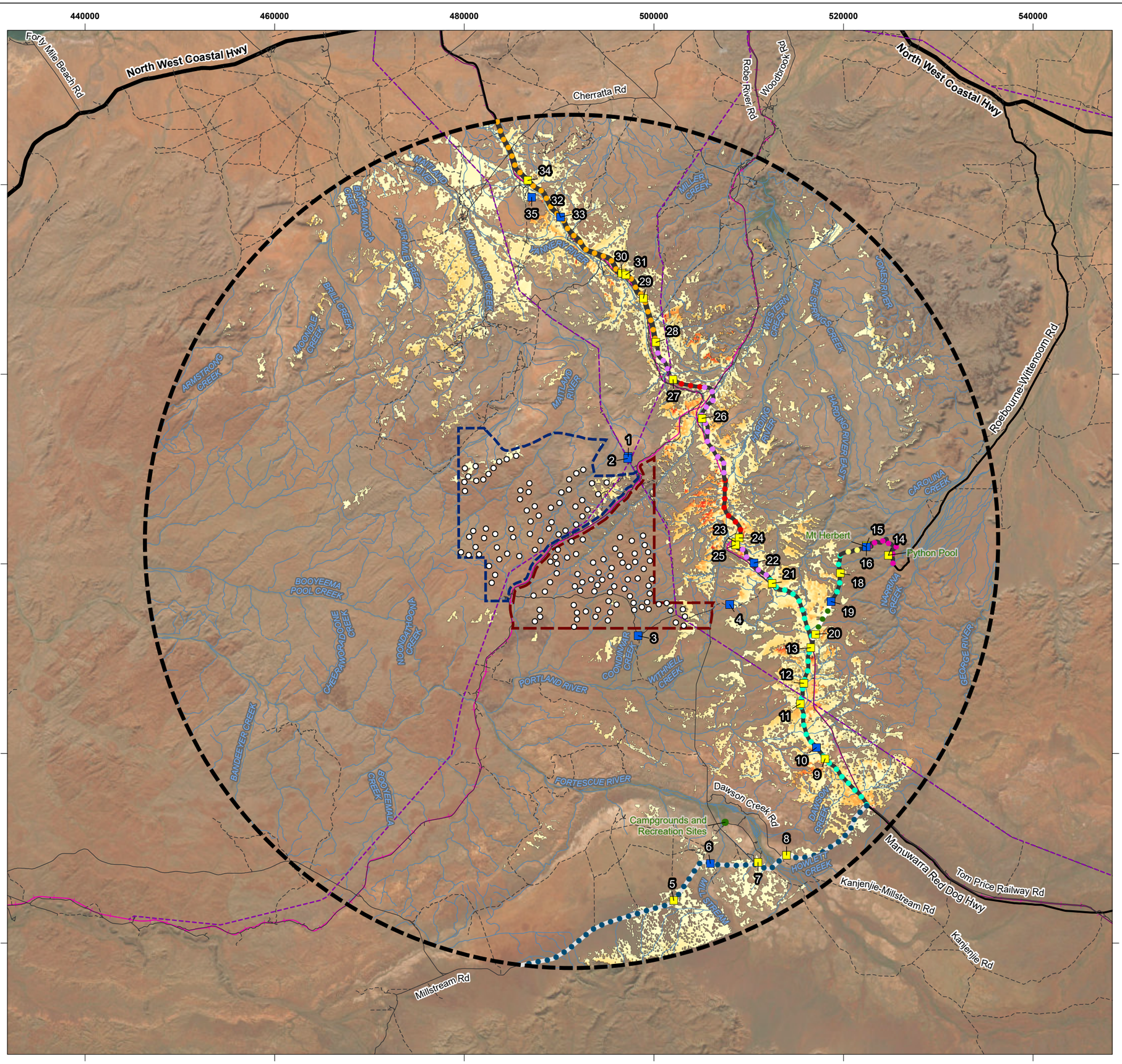
0 5 10 15 20 km

PROJECT NO: 5104-24

REV	AUTHOR	APPROVED	DATE
0	SB	PJ	09/06/2025

MAP 07

Path: C:_ECOSCAPE\5104-24 YEC VIA__Data to tranfer\Maps\APRXs\GDA_2020_Templates\Report_Maps_5104_GDA2020.aprx



LEGEND

- Wind Turbine Generator (WTG)

View Locations

- General view location
- Photo Montage location
- Highway
- Main Road
- Minor Road
- Track
- Railway
- Transmission Lines (220 kV)
- Drainage Line
- Study Area
- Baru Project
- Marnda Project

View Experience

- Feature views of basalt hills (key view)
- Feature views of Chichester Range (key view)
- Enclosed foreground views of rugged terrain (key view)
- Broadly enclosed views
- Open views
- Elevated expansive views of Chichester Range (key view)
- Distant views to Hamersley Range (key view)
- Open to filtered views of Hamersley Range (key view)

Viewshed (land surface height)

Manuwarra Red Dog Highway

- Most visible area
- Least visible area

DATA SOURCES:
SOURCE DATA: PROJECT BOUNDARIES AND WTG LAYOUT (YEC, 2024). RAILWAY (GEOSCIENCE AUSTRALIA, 2021). ROADS SIMPLIFIED (LGATE-195). SURFACE HYDROLOGY LINES (NATIONAL) (GEOSCIENCE AUSTRALIA 2015). VIEWSHED GENERATED FROM GEOSCIENCE AUSTRALIA (2010) DEM-S.
SERVICE LAYERS: WORLD TOPOGRAPHIC MAP: ESRI, HERE, GARMIN, FAO, NOAA, USGS
WORLD IMAGERY: EARTHSTAR GEOGRAPHICS

ecoscape

VIEWSHED - LAND SURFACE MANUWARRA RED DOG HWY

YINDJIBARNDI ENERGY PROJECT BARU AND MARNDA VISUAL IMPACT ASSESSMENT

Yindjibarndi Energy
A partnership with ACEN

COORDINATE SYSTEM: GDA2020 MGA ZONE 50
PROJECTION: TRANSVERSE MERCATOR
DATUM: GDA2020
UNITS: METER

N

SCALE: 1:400,000 @ A3

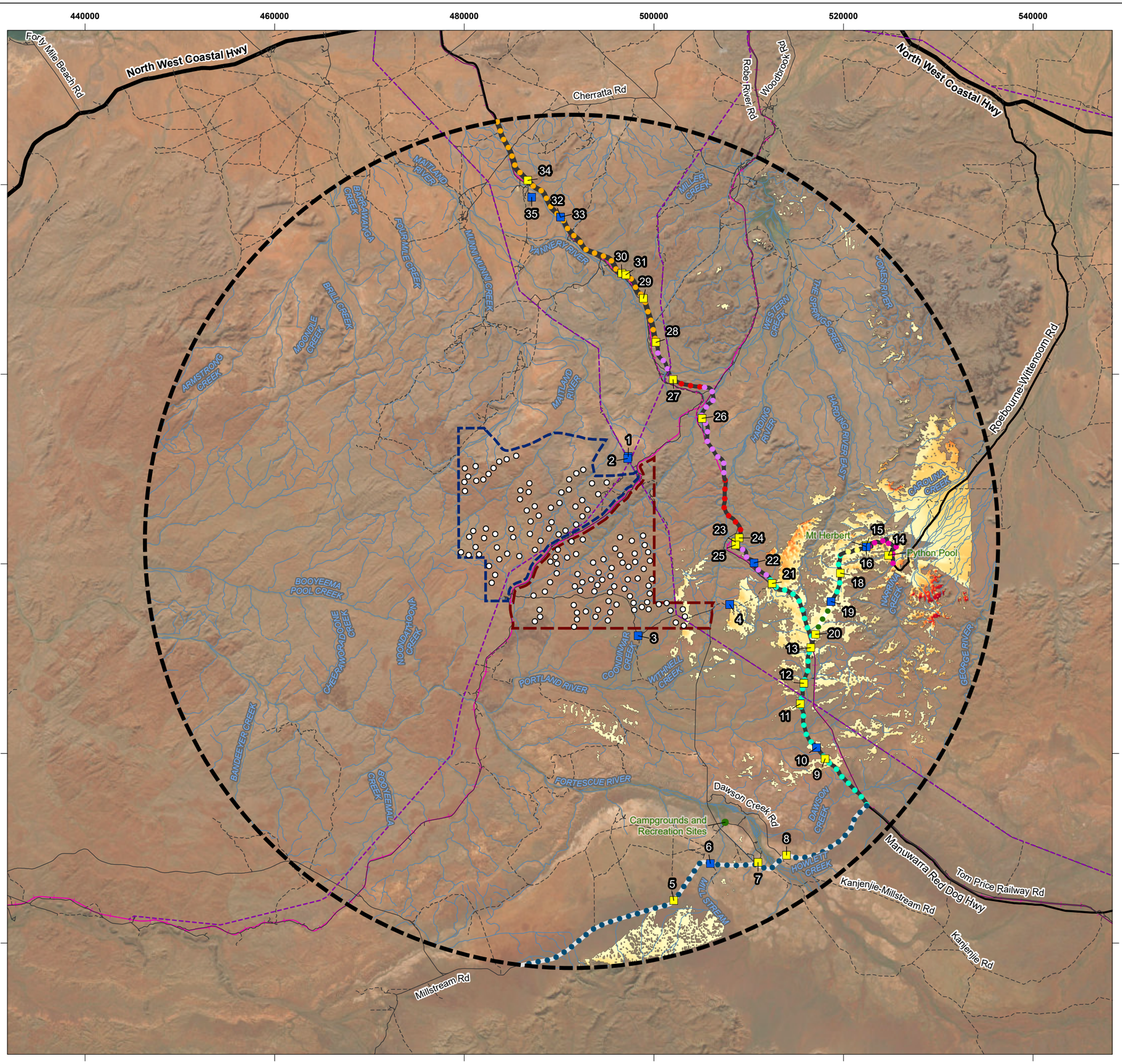
0 5 10 15 20 km

PROJECT NO: 5104-24

REV	AUTHOR	APPROVED	DATE
0	SB	PJ	09/06/2025

MAP 08

Path: C:_ECOSCAPE\5104-24 YEC VIA__Data to tranfer\Maps\APRXs\GDA_2020_Templates\Report_Maps_5104_GDA2020.aprx



LEGEND

- Wind Turbine Generator (WTG)

View Locations

- General view location
- Photo Montage location
- Highway
- Main Road
- Minor Road
- Track
- Railway
- Transmission Lines (220 kV)
- Drainage Line
- Study Area
- Baru Project
- Marnda Project

View Experience

- Feature views of basalt hills (key view)
- Feature views of Chichester Range (key view)
- Enclosed foreground views of rugged terrain (key view)
- Broadly enclosed views
- Open views
- Elevated expansive views of Chichester Range (key view)
- Distant views to Hamersley Range (key view)
- Open to filtered views of Hamersley Range (key view)

Viewshed (land surface height)

Roebourne-Wittenoom Road

- Most visible area
- Least visible area

DATA SOURCES:
SOURCE DATA: PROJECT BOUNDARIES AND WTG LAYOUT (YEC, 2024). RAILWAY (GEOSCIENCE AUSTRALIA, 2021). ROADS SIMPLIFIED (LGATE-195). VIEWSHED GENERATED FROM GEOSCIENCE AUSTRALIA (2010) DEM-S.
SERVICE LAYERS: WORLD TOPOGRAPHIC MAP: ESRI, HERE, GARMIN, FAO, NOAA, USGS
WORLD IMAGERY: EARTHSTAR GEOGRAPHICS

ecoscape

VIEWSHED - LAND SURFACE ROEBOURNE-WITTENOOM RD

YINDJIBARNDI ENERGY PROJECT BARU AND MARNDA VISUAL IMPACT ASSESSMENT

Yindjibarndi Energy
A partnership with ACEN

COORDINATE SYSTEM: GDA2020 MGA ZONE 50
PROJECTION: TRANSVERSE MERCATOR
DATUM: GDA2020
UNITS: METER

N

SCALE: 1:400,000 @ A3

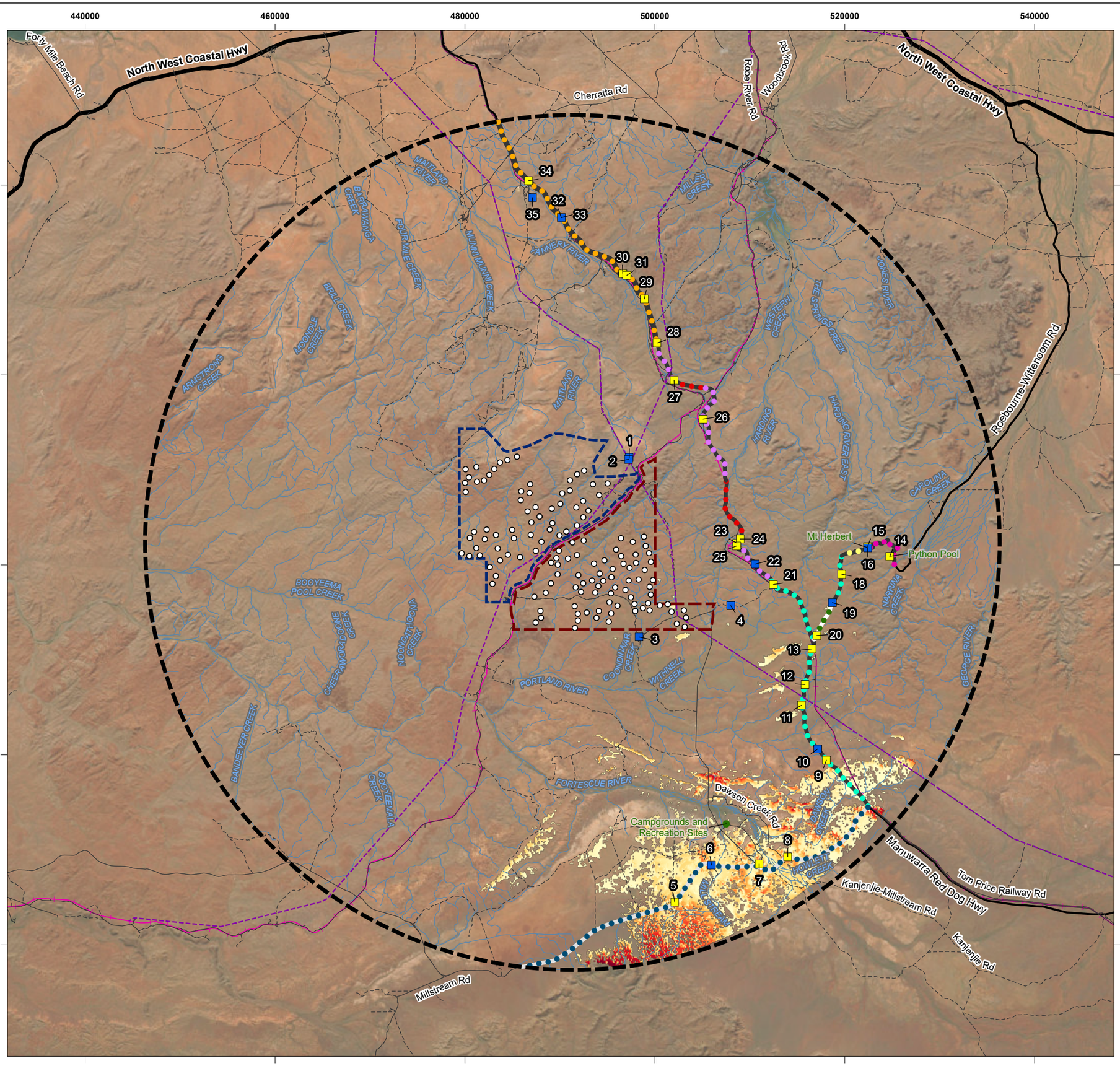
0 5 10 15 20 km

PROJECT NO: 5104-24

REV	AUTHOR	APPROVED	DATE
0	SB	PJ	09/06/2025

MAP 09

Path: C:_ECOSCAPE\5104-24 YEC VIA__Data to tranfer\Maps\APRXs\GDA_2020_Templates\Report_Maps_5104_GDA2020.aprx



LEGEND

- Wind Turbine Generator (WTG)

View Locations

- General view location
- Photo Montage location
- Highway
- Main Road
- Minor Road
- Track
- Railway
- Transmission Lines (220 kV)
- Drainage Line
- Study Area
- Baru Project
- Marnda Project

View Experience

- Feature views of basalt hills (key view)
- Feature views of Chichester Range (key view)
- Enclosed foreground views of rugged terrain (key view)
- Broadly enclosed views
- Open views
- Elevated expansive views of Chichester Range (key view)
- Distant views to Hamersley Range (key view)
- Open to filtered views of Hamersley Range (key view)

Viewshed (land surface height)

Millstream Road

- Most visible area
- Least visible area

DATA SOURCES:
SOURCE DATA: PROJECT BOUNDARIES AND WTG LAYOUT (YEC, 2024). RAILWAY (GEOSCIENCE AUSTRALIA, 2021). ROADS SIMPLIFIED (LGATE-195). RAILWAY (GEOSCIENCE AUSTRALIA, 2021). VIEWSHED GENERATED FROM GEOSCIENCE AUSTRALIA (2010) DEM-S. .
SERVICE LAYERS: WORLD TOPOGRAPHIC MAP: ESRI, HERE, GARMIN, FAO, NOAA, USGS
WORLD IMAGERY: EARTHSTAR GEOGRAPHICS

ecoscape

VIEWSHED - LAND SURFACE MILLSTREAM RD

YINDJIBARNDI ENERGY PROJECT BARU AND MARNDA VISUAL IMPACT ASSESSMENT

Yindjibarndi Energy
A partnership with ACEN

COORDINATE SYSTEM: GDA2020 MGA ZONE 50
PROJECTION: TRANSVERSE MERCATOR
DATUM: GDA2020
UNITS: METER

N

SCALE: 1:400,000 @ A3

0 5 10 15 20 km

PROJECT NO: 5104-24

REV	AUTHOR	APPROVED	DATE
0	SB	PJ	09/06/2025

MAP 10

Path: C:_ECOSCAPE\5104-24 YEC VIA__Data to tranfer\Maps\APRXs\GDA_2020_Templates\Report_Maps_5104_GDA2020.aprx

480000 500000 520000

7640000

7620000

MAITLAND RIVER
MUNNAMUNNI CREEK
NOONDATHOOM CREEK
WESTERN CREEK
HARDING RIVER
HARDING RIVER EAST
CAROLINA CREEK
Roebourne-Wittenoom Rd
GOONDIWARI CREEK
PORTLAND RIVER
WITHNELL CREEK
Manuwarra Red Dog Hwy
BOOYEMALA CREEK
FORTESCUE RIVER
Dawson Creek Rd
DAWSON CREEK
HOWLETT CREEK
WILLSTREAM
Millstream Rd
Kanjenjie-Millstream Rd

1 2 3 4 5 6 7 8 9 10 11 12 13 15 16 18 19 20 21 22 23 24 25 26

LEGEND

- Wind Turbine Generator (WTG)

View Locations

- General view location
- Photo Montage location
- Main Road
- Minor Road
- Track
- Railway
- Transmission Lines (220 kV)
- Drainage Line
- Study Area
- Baru Project
- Marnda Project

Viewshed - land surface

- Visible area

Viewshed - lower blade tip (64 m AGL)

- Visible area

Viewshed - rotor hub (150 m AGL)

- Visible area

Note: Lore Ceremony Site is not displayed on map to maintain confidentiality.

DATA SOURCES:
SOURCE DATA: PROJECT BOUNDARIES AND WTG LAYOUT (YEC, 2024). RAILWAY (GEOSCIENCE AUSTRALIA, 2021). ROADS SIMPLIFIED (LGATE-195). SURFACE HYDROLOGY LINES (NATIONAL) (GEOSCIENCE AUSTRALIA 2015). VIEWSHED GENERATED FROM GEOSCIENCE AUSTRALIA (2010) DEM-S.
SERVICE LAYERS: WORLD TOPOGRAPHIC MAP: ESRI, HERE, GARMIN, FAO, NOAA, USGS
WORLD IMAGERY: EARTHSTAR GEOGRAPHICS

ecoscape

VIEWSHED ANALYSIS LORE CEREMONY SITE

YINDJIBARNDI ENERGY PROJECT BARU AND MARNDA VISUAL IMPACT ASSESSMENT

Yindjibarndi Energy
A partnership with ACEN

COORDINATE SYSTEM: GDA2020 MGA ZONE 50
PROJECTION: TRANSVERSE MERCATOR
DATUM: GDA2020
UNITS: METER

N

SCALE: 1:200,000 @ A3

0 2 4 6 8 km

PROJECT NO: 5104-24

REV	AUTHOR	APPROVED	DATE
0	SB	PJ	09/06/2025

MAP 11

Path: C:_ECOSCAPE\5104-24 YEC VIA__Data to tranfer\Maps\APRXs\GDA_2020_Templates\Report_Maps_5104_GDA2020.aprx

480000
500000
520000
7680000
7660000
7640000

Weymul
Cherratta Rd
Manuwarra Red Dog Hwy
Cooya Pooya Rd
Roebourne-Wittenoom Rd
MAITLAND RIVER
YANNERY RIVER
MILLER CREEK
HARDING RIVER
WESTERN CREEK
HARDING RIVER EAST
CAROLINA CREEK
THE SPRINGS CREEK
CORRINGER CREEK
BARRAWANGA CREEK
FOUR MILE CREEK
ARMSTRONG CREEK
MOONDLE CREEK
BRILL CREEK
MUNNI MUNNI CREEK
NOONDATHOONA CREEK
CHEERAWORADOONE CREEK
GOONDIWAR CREEK
WITHNELL CREEK

1 2 3 4 13 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35

LEGEND

- Wind Turbine Generator (WTG)

View Locations

Montage

- General view location
- Photo Montage location
- Study Area
- Baru Project
- Marnda Project
- Main Road
- Minor Road
- Track
- Railway
- Transmission Lines (220 kV)
- Drainage Line

Viewshed - land surface

- Visible area

Viewshed - lower blade tip (64 m AGL)

- Visible area

Viewshed - rotor hub (150 m AGL)

- Visible area

DATA SOURCES:
SOURCE DATA: PROJECT BOUNDARIES AND WTG LAYOUT (YEC, 2024). RAILWAY (GEOSCIENCE AUSTRALIA, 2021). ROADS SIMPLIFIED (LGATE-195). SURFACE HYDROLOGY LINES (NATIONAL) (GEOSCIENCE AUSTRALIA 2015). VIEWSHED GENERATED FROM GEOSCIENCE AUSTRALIA (2010) DEM-S.
SERVICE LAYERS: WORLD TOPOGRAPHIC MAP: ESRI, HERE, GARMIN, FAO, NOAA, USGS
WORLD IMAGERY: EARTHSTAR GEOGRAPHICS

ecoscape

VIEWSHED ANALYSIS WEYMUL COMMUNITY

YINDJIBARNDI ENERGY PROJECT BARU AND MARNDA VISUAL IMPACT ASSESSMENT

Yindjibarndi Energy
A partnership with ACEN

COORDINATE SYSTEM: GDA2020 MGA ZONE 50
PROJECTION: TRANSVERSE MERCATOR
DATUM: GDA2020
UNITS: METER

N

SCALE: 1:200,000 @ A3

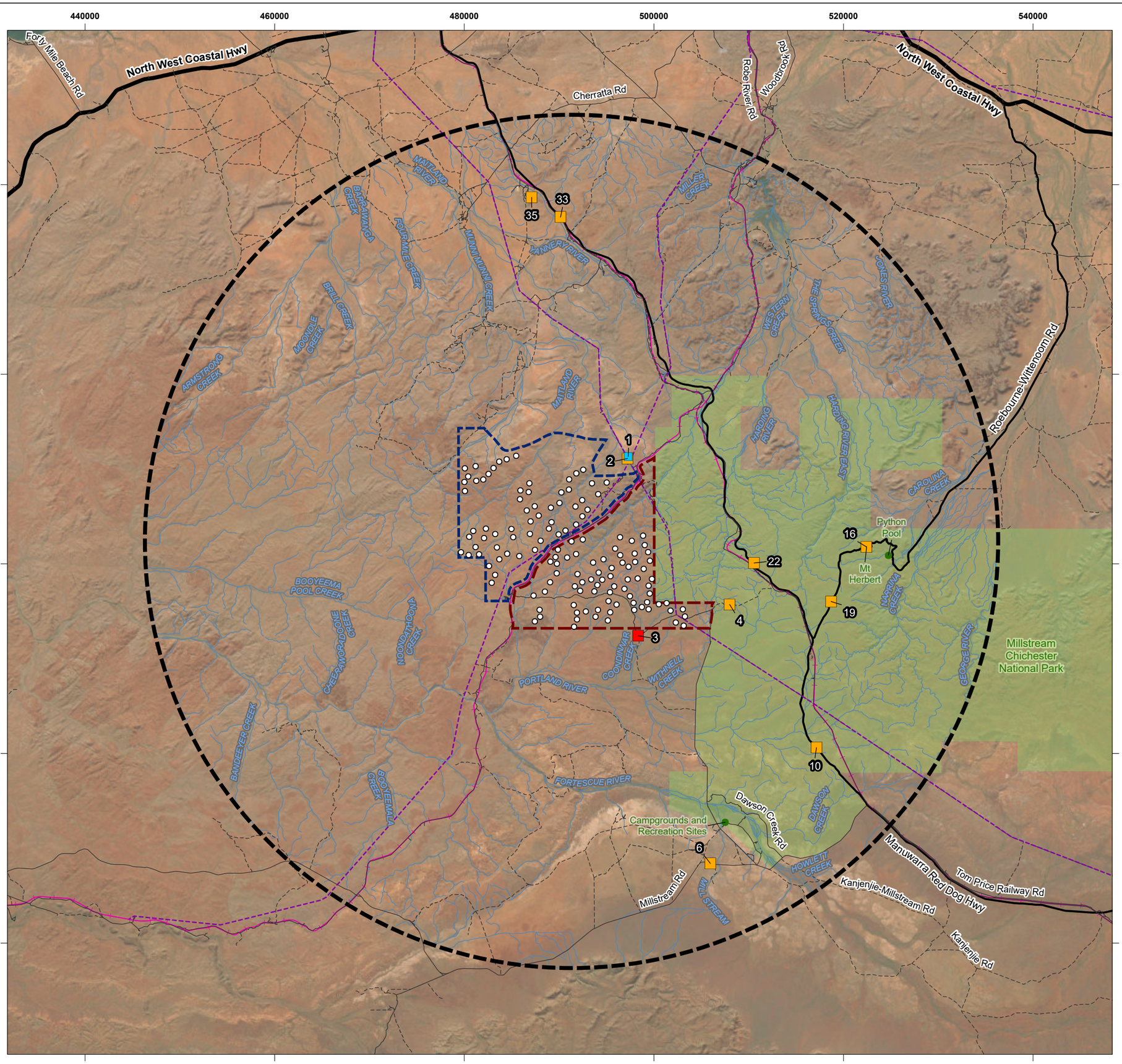
0 2 4 6 8 km

PROJECT NO: 5104-24

REV	AUTHOR	APPROVED	DATE
0	SB	PJ	09/06/2025

MAP 12

Path: C:_ECOSCAPE\5104-24 YEC VIA__Data to tranfer\Maps\APRXs\GDA_2020_Templates\Report_Maps_5104_GDA2020.aprx



LEGEND

- Wind Turbine Generator (WTG)

Montage Locations

Visual Impact Level

- Level 1
- Level 2
- No impact
- Study Area
- Baru Project
- Marnda Project
- DBCA Legislated Lands and Waters
- Highway
- Main Road
- Minor Road
- Track
- Railway
- Drainage Line
- Transmission Lines (220 kV)

DATA SOURCES:
SOURCE DATA: PROJECT BOUNDARIES AND WTG LAYOUT (YEC, 2024). RAILWAY (GEOSCIENCE AUSTRALIA, 2021). ROADS SIMPLIFIED (LGATE-195). SURFACE HYDROLOGY LINES (NATIONAL) (GEOSCIENCE AUSTRALIA 2015). VIEWSHED GENERATED FROM GEOSCIENCE AUSTRALIA (2010) DEM-S.
SERVICE LAYERS: WORLD TOPOGRAPHIC MAP: ESRI, HERE, GARMIN, FAO, NOAA, USGS
WORLD IMAGERY: EARTHSTAR GEOGRAPHICS

ecoscape

POTENTIAL VISUAL IMPACTS

YINDJIBARNDI ENERGY PROJECT BARU AND MARNDA VISUAL IMPACT ASSESSMENT

Yindjibarndi Energy
A partnership with ACEN

COORDINATE SYSTEM: GDA2020 MGA ZONE 50
PROJECTION: TRANSVERSE MERCATOR
DATUM: GDA2020
UNITS: METER

N

SCALE: 1:400,000 @ A3

0 5 10 15 20 km

PROJECT NO: 5104-24

REV	AUTHOR	APPROVED	DATE
0	SB	PJ	09/06/2025

MAP 13

Path: C:_ECOSCAPE\5104-24 YEC VIA__Data to tranfer\Maps\APRXs\GDA_2020_Templates\Report_Maps_5104_GDA2020.aprx

APPENDIX ONE SIGNIFICANCE LEVELS

The table below lists the significance levels which also refer to public sensitivity (WAPC, 2007).

Level 1: national / state significance
+ State highways and other main roads (sealed or unsealed) with high levels of vehicle usage + designated tourist routes, scenic drives + recreation, conservation, cultural or scenic sites, areas, viewpoints and Lookouts of state or national significance, including their access routes + walking, cycle or bridle Tracks of national or state significance + towns, settlements or residential areas + passenger rail lines + navigable waterways of national or state recreation importance + ocean sites of national or state recreation importance e.g. surf breaks + views of national or state importance.
Level 2: regional significance
+ main roads with moderate levels of vehicle usage (sealed or unsealed) + recreation, conservation, cultural or scenic sites, areas, viewpoint, and Lookouts of regional or high local significance (including their access routes) + navigable waterways of regional recreation significance + walk, cycle or bridle paths of regional significance + views of regional importance.
Level 3: local significance
+ all remaining roads with low levels of vehicle usage + locally significant roads or tracks + recreation and other use areas of local significance + navigable waterways of local recreational significance + walk, cycle or bridle paths of local significance + views of local importance.
Explanatory note - significance increases with the: + importance of views, including type, features and rarity + volume of use of roads, trails and navigable waterways + degree of sensitivity of viewers; those who are more likely to be more sensitive include wilderness users, other recreational users, tourists, people who choose to live in an area because of its landscape character and views (e.g. assessed by noting how vocal observers are about specific travel routes or use areas, indicated in letters, protests etc.) + degree to which experiencing the landscape is integral to enjoyment of a travel route or site Is it the focus of the use, as in recreational use, or just incidental, as is more likely with people using a route to work? + length of duration of a view; range could include glimpses from a high-speed road, longer duration views obtained from roads used for sightseeing or from recreation sites and Lookouts and very long and frequent views from the main living areas of homes.

APPENDIX TWO PREFERENCE INDICATORS

The table below lists the preference indicators for natural landscapes (WAPC, 2007).

Most preferred natural characteristics
+ high degrees of perceived naturalness
+ high degree of topographic variety (dramatic relief, ruggedness, rock outcrops, outstanding ridgelines and beach forms)
+ vegetative diversity (distinctive patterns, species composition, height, colour and texture)
+ diversity of vegetation age and density (structural complexity)
+ unusually expansive landforms or vast horizontal scale (desert landscapes, beach and dune fields, rolling hills)
+ presence of water bodies (waterfalls, rivers, estuaries, oceans, lakes, inundated areas)
+ distinctive displays of colour: soils, vegetation (often seasonal), topography, rock formations or water bodies
+ distinctive landscape features (waterfalls, unique plants, reefs, geological formations, cliff faces and granite outcrops)
+ outstanding combinations of landform, vegetation patterns and water features in one area
+ seascapes (combinations of ocean, reefs, beach, dune formation, coastal rocks, coastal vegetation)
+ areas frequently prone to ephemeral features (fauna, water or wave conditions, beach erosion scarps, climatic conditions).
Least preferred natural characteristics
+ disturbed areas with little evidence of naturalness
+ areas of diseased, dead or dying vegetation
+ areas with severe weed infestations in a natural landscape
+ areas of soil erosion (especially where human-induced)
+ water bodies with degraded banks, weed infestations, stagnation, eutrophication, algae or litter
+ evidence of mining (gravel pits, sand mines, limestone).