Department of Planning and Environment

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NSW GOVERNMENT

Draft Wind Energy Guideline

Technical Supplement for Landscape and Visual Impact Assessment

November 2023

Acknowledgement of Country

The Department of Planning and Environment acknowledges that it stands on Aboriginal land. We acknowledge the Traditional Custodians of the land and we show our respect for Elders past, present and emerging through thoughtful and collaborative approaches to our work, seeking to demonstrate our ongoing commitment to providing places in which Aboriginal people are included socially, culturally and economically.

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Contents

Table of Figures

Glossary of Terms

Applicant	The applicant of an SSD project seeking consent for a development application or modification application.
Dwelling	A dwelling has the same meaning as the *Standard Instrument – Local Environmental Plan* (a room or suite of rooms occupied or used as a separate domicile) as well as where it meets the criteria outlined in Section 1.3.
Landscape	A holistic area comprised of its various parts including landform, vegetation, buildings, villages, towns, cities and infrastructure.
Magnitude	The apparent size of a wind energy project in the landscape or when viewed from a given viewpoint.
Private receiver	A privately owned or used viewpoint type identified in **Table 2**
Public viewpoint	A publicly owned or used viewpoint type identified in **Table 2**
Rural dwelling	A dwelling that is located within a rural zoned area (RU1, RU2, RU3, RU4 and RU6), large lot residential zoned area (R5), or environmental or conservation area zone (C2, C3 and C4).
Sensitivity	The capacity of a landscape or viewpoint to absorb the impacts from a proposed land use change and/or built form.
Sensitive viewpoints	Viewpoints that are more sensitive to change than others including dwellings, historic homesteads, tourist accommodation, places of worship, town centres and central business districts.
Swept area	The area of the circle created by turbine blades as they spin.
View	The sight of a landscape or scene.
Visual impact	The impact on views from private and public places. It is determined by considering the visual magnitude sensitivity.
Wind energy development	Works, infrastructure and buildings for the purpose of generating electricity using wind turbines that are state significant developments (SSD).

1 Introduction

This technical supplement provides additional guidance for applicants, consent authorities and the community using the Wind Energy Guideline to understand the process and requirements for assessing visual and landscape character impacts of wind energy development in NSW.

1.1 Purpose

This technical supplement provides a detailed description of the landscape character and visual impact assessment process.

It ensures that all applications for large-scale wind energy developments are accompanied by an assessment that is proportionate to the scale and impacts of the development, is easy to understand and considers community views and values of the surrounding landscape.

The technical supplement identifies information that must be provided in a landscape character and visual impact assessment and includes assessment tools and requirements that must be used to produce consistent and comparable results.

The technical supplement also aims to:

- facilitate good site selection, layout, and design of wind energy projects early in the planning process
- guide the relevant identification, mitigation, and management of significant impacts on the surrounding landscape and viewpoints from the private and public realm
- recognise that changes to our landscapes will be necessary to facilitate the transition to renewable energy, and balance the need for this change with the need to protect unique and high-quality landscapes
- strengthen the landscape and visual impact assessment process to ensure consistent decision making and to reduce delays in the assessment process
- encourage the appropriate development of the wind industry in NSW.

1.2 General requirements

The applicant must prepare a detailed landscape and visual impact assessment as part of an environmental impact statement (EIS).

The assessment must include a full description of the proposed wind energy project design and use maps to show the location of the project in relation to public viewpoints, private receivers and surrounding landscapes identified for analysis.

It must include details of:

- the most recent and highest resolution satellite imagery, aerial photography and available orthophotos at a scale of 1:25,000 (where used the applicant should provide the date the imagery was captured)
- topographic mapping, zoning and other land use information available on the NSW Planning Portal or SEED
- Google Earth™ or a similar mapping service and the most recent vegetation mapping, particularly vegetation information that gives an idea of the structure and height of vegetative cover.

The applicant must engage with the community, including the indigenous community, as early as possible and throughout the preparation of the assessment to verify the outcomes and to consult on any measures proposed to mitigate impacts.

Importantly, the assessment process should be undertaken alongside the design and siting of a wind energy project so that the design can be effectively informed by the community's input.

The assessment must be informed by field visits to establish and ground truth important inputs into the assessment process including the scenic quality and sensitivity of the area. These site visits can include visiting private property where access is granted or public areas surrounding the project footprint.

Professional assessment skills

Professional assessment skills are critical to an effective landscape character and visual impact assessment. The applicant is expected to engage relevant professionals (for example, landscape architects, architects, environmental planners, geographers, or other visual assessment specialists) with demonstrated experience and capabilities. Experts should follow the guidance in this document to perform an effective and consistent assessment for wind energy development.

1.3 Approach to assessment

The technical supplement differentiates between:

- landscape character impact assessment (the assessment of the potential impact on an area's cumulative built, natural, and cultural character or sense of place), and
- visual impact (the assessment of the potential impact on views).

The two assessments should be clear and discrete as it is likely the design response and mitigation measures to address landscape character impact will be different to those for visual impact.

Landscape character assessment

This is the process for determining the overall impact of a project on an area's character and sense of place including what people think and feel about it and how society values it.

Visual impact assessment

This is the process for determining the day-to-day visual effects of a project on people's views (what people see at a place, when they are there) from the private and public domain.

In both cases, the likely impacts of a wind energy development can only be determined by understanding the sensitivity of an area or view to change and the magnitude of a proposed development in that area or view.

This technical supplement recognises that visual amenity should be afforded some protections and provides a range of tools to achieve this outcome. However, it also recognises the fundamental principle that landowners do not have a proprietary right or ownership of a view[1] and a visible wind turbine or ancillary infrastructure does not necessarily constitute a visual impact.

Sensitivity

Sensitivity refers to how sensitive the landscape or view is to the proposed change. For example, a pristine natural environment is likely to be more sensitive to change than an industrial area. A view from a residence is also likely to be more sensitive to change than from a local road where views are more intermittent and less frequent.

Magnitude

Magnitude refers to the physical scale of the wind energy development and is influenced by a range of factors including:

- the apparent size of a wind energy development decreases significantly as the distance from the viewer increases
- the apparent size of a wind energy development increases with the physical scale and dimensions of a wind turbine and the number of turbines that would be visible, although these factors are less discernible as distance from the viewer increases.

Dwellings

In assessing the visual impacts on dwellings, the assessment must focus only on views from the dwelling and not from the property boundary or other parts of the property. Furthermore, the assessment should consider the potential worst-case views that have the greatest potential to impact on the residential amenity. Residential amenity encompasses the overall quality, experience and nature of views and outlooks available to occupants of a dwelling and its immediate surrounds including pool areas and gardens.

For the purpose of this document, a dwelling has the same meaning as the *Standard Instrument - Local Environmental Plan* (Standard Instrument) *(*a room or suite of rooms occupied or used as a separate domicile) and also includes any of the following:

- dwellings that have development consent, but have yet to commence or complete construction

[1] *Tenacity Consulting v Warringah Council* (2004) NSWLEC 140 and *Victoria Park Racing & Recreation Grounds Co Ltd v Taylor* [1937] HCA 45

- proposed dwellings that are subject to a development application that has been lodged prior the wind energy development application but is yet to be determined.

For the avoidance of doubt, a dwelling does not include:

- moveable dwellings as defined in the Standard Instrument including tents, caravans, or other portable devices used for human habitation
- any dwelling that been built illegally (as confirmed by the relevant council)
- a derelict dwelling (that is officially declared by the relevant council).

Private Agreements

If a private receiver is subject to a private agreement to accept the nature of visual impacts then an assessment is not required. These receivers should be identified as associated in the scoping report and EIS, where this is known, including on any relevant maps.

Should an applicant enter into a private agreement after an EIS is submitted but prior a project's determination then this information should be provided to the consent authority at the earliest opportunity.

Further guidance on private agreements is provided in the Private Agreements Guideline.

2 Landscape character assessment

The EIS must include an assessment of how the project will affect the elements that make up the landscape, the aesthetic and perceptual aspects of the landscape and its distinctive character. Landscape character assessment can help the community, applicants and consent authorities understand the sensitivities of a landscape and to determine the overall impact of a project on an area's character and sense of place.

This process is distinctly different from visual impact assessment which is solely focused on individual views. Consequently, landscape character assessment can help to understand the cumulative effect of a project on a much broader area.

The key tasks to be undertaken in assessing landscape character impacts are described below.

The level of assessment should be appropriate for the context in which the development is proposed and should be proportionate to the likely impacts, including cumulative impacts, of the development.

The applicant is encouraged to consult with the department in scoping its project to determine the level of detail that may be required in the landscape character assessment.

The study area for the landscape character assessment should generally be approximately 25 km from the proposed development. However, the character of landscapes can vary significantly, and justification may be provided for analysing a smaller area.

2.1 Baseline analysis

Applicants must undertake a baseline study to establish the existing landscape character of the area and its sensitivity. This should be based on desktop analysis and field visits and should provide a descriptive and illustrative analysis of the qualities of the place, what makes it valued and any challenges that could arise in relation to the proposed development.

It is important that applicants engage with the community (including the indigenous community), local council and potentially affected landowners as early as possible to identify and establish the importance of particular landscape values and characteristics. Gauging these values can provide a firm basis for siting and designing a wind energy project that seeks to avoid or minimise impacts.

In undertaking consultation, applicants must adopt the approaches and objectives outlined in the NSW Government's Undertaking Engagement Guidelines for State Significant Projects.

The baseline analysis should identify and describe the elements that make up the landscape in the study area, including:

- physical influences (such as geology, soils, landform, natural drainage and water bodies)
- ecological characteristics and land cover of an area (such as whether it is forested, wetland, scrub, grass etc.) and the quality and type of vegetation cover
- the influence of human activity, including land use and management and the character of any settlements and buildings
- key landscape features or attributes of the landscape associated with high visual interest or quality that stand out visually in the landscape, including natural features (such as a distinctive mountain peak or hilltop), cultural or agricultural features
- the aesthetic and perceptual aspects of the landscape, particularly emphasising those that are key characteristics contributing to the distinctive character of the landscape (such as its scale, complexity, openness, tranquillity or wildness)
- aspects of the landscape that have important aboriginal cultural heritage value with the exception of artefacts and tangible values that would be assessed in detail as part of an Aboriginal Cultural Heritage Assessment), including why they are valuable to the community
- the overall character of the landscape in the study area, including any distinctive landscape character types or areas that can be identified (see further guidance below)
- the condition of the landscape, including the condition of elements or features such as buildings or vegetation
- the planning designations of an area relating to landscape character, including sensitive land use designations, zonings and heritage listings
- the location of any proposed, operational or approved wind energy developments within a regional and local context, including projects which may have the potential to create direct or indirect cumulative impacts with the project.

Applicants should use a combination of descriptive text and photographs to assign scenic quality values and provide a visual profile in the region, including what types of landscape features are typical, less common, rare or unusual and outstanding. The outcomes of this baseline analysis should be used to inform the visual impact assessment of assessable viewpoints.

Applicants are encouraged to utilise existing scenic quality mapping that has been published by the relevant local council or by the NSW Government when undertaking the baseline analysis.

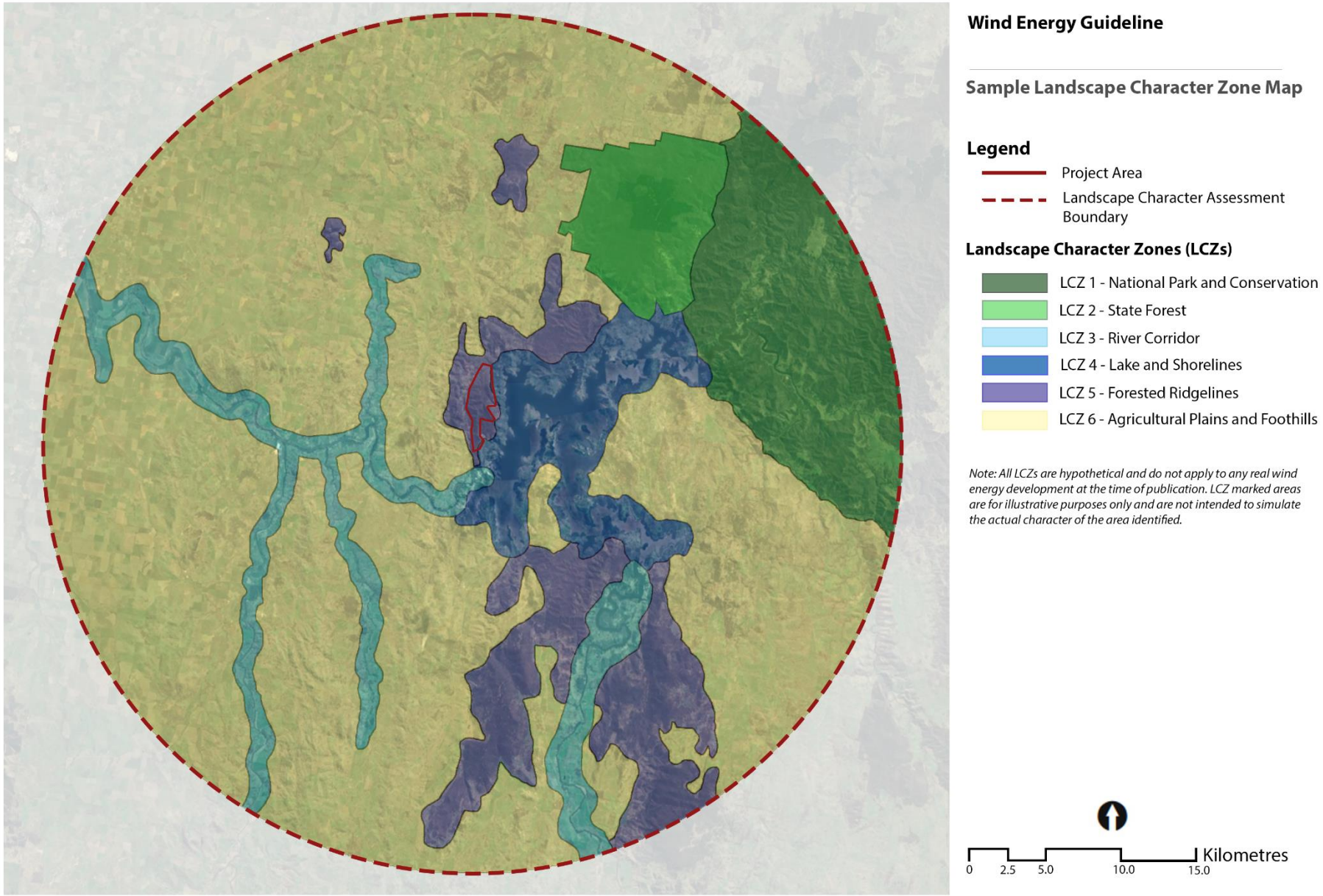


Figure 1. Example landscape character zone map for a wind energy development

2.2 Identify landscape character zones

If the landscape includes distinct areas that have different qualities, the study area should be broken down into different character zones (see **Figure 1**).

Landscape character zones should divide the landscape based on common distinguishing visual characteristics including landforms and major land cover patterns. These patterns are formed by combinations of vegetation, water bodies, landforms and land use, from which the key landscape features can also be identified.

Dividing the landscape into zones will make the assessment of likely impacts (as described further below) simpler, easier to understand and more accurate.

Sources to use in identifying and establishing the type of regional landscape character zones include:

- Learmonth, Nancy and Andrew (1971) Regional Landscape of Australia: Form, Function and Change, Angus and Robertson Publishers, Sydney
- Mitchell, Peter (2022) Descriptions for NSW (Mitchell) Landscapes Version 2, NSW National Parks and Wildlife Service
- Tudor, C. (2019) An approach to landscape sensitivity assessment – to inform spatial planning and land management. Natural England: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/817928/landscape-sensitivity-assessment-2019.pdf
- Australia's bioregional framework as delineated via the Interim Biogeographic Regionalisation for Australia (IBRA): https://www.dcceew.gov.au/environment/land/nrs/science/ibra/australias-bioregions-maps
- eSPADE Spatial viewer for soil landscape mapping, NSW Environment, Energy and Science: https://www.environment.nsw.gov.au/eSpade2WebApp

2.3 Assess the landscape character impact

Applicants should determine the impact of the proposal on each landscape character zone by evaluating the sensitivity of the landscape and the magnitude of the project's effects in that area.

The sensitivity and magnitude should be assigned a rating (low, moderate or high) that can be used to determine the overall landscape character impact on any given zone. Rationale for the ratings must be provided as part of the assessment.

Applicants should consider the following matters when analysing and rating the magnitude of the project:

- size and scale including:
    - the extent of existing landscape elements that may be lost and the contribution of that element to the character of the landscape

    - the extent to which the project becomes a minor or major element in the landscape and its dominance in the visual catchment
    - the extent to which the project changes the key characteristics of the landscape, which are critical to its distinctive character
- geographical area – the area of the landscape over which the effects will be experienced, having regard to the nature and scale of the project's effects. This could vary from the immediate setting of the site to larger scales where the project may influence several landscape character zones.

The sensitivity of the landscape character type should be rated based on the inherent capability of the area to absorb changes from the project.

Where impacts are expected to be high, the assessment should propose measures to avoid or mitigate these impacts including re-siting and re-sizing elements of the project. Any significant residual impacts on the landscape remaining after mitigation should then be summarised as the final step in the process. Where aviation hazard lighting is proposed, the magnitude and impacts of the lighting should also be considered in the landscape character assessment.

An example landscape character assessment is provided in **Appendix A.**

3 Visual impact assessment framework

Proposals for wind energy development must be accompanied by a visual impact assessment that considers the likely impacts of the development on public viewpoints and private receivers.

The method for determining the visual impact of wind energy development is generally based on a combination of the sensitivity of a view to change and the magnitude of the proposal. However, in some settings, wind turbines can be visually dominating despite the sensitivity of the view. Consequently, the visual assessment framework is broken into two key parts – a setback to prevent turbines from being located close to sensitive receivers and an assessment process for all other public viewpoints and private receivers. A separate process is also set out for the assessment of dwelling entitlements. These are described in detail throughout this section.

3.1 Setback

Wind turbines close to sensitive receivers including dwellings, historic homesteads, tourist accommodation, places of worship, town centres and central business districts, can be visually dominating despite the scenic quality or importance of the view. For example, a single 250 m turbine will generally have a dominant appearance if located within 2 km of a sensitive receiver and is completely visible.

Figure 2 prescribes a setback for turbines that are likely to have a dominant appearance. This setback applies from sensitive receivers and scales depending on the height of the turbines being proposed. If a sensitive receiver is located within the setback distance it will trigger a high visual impact unless the turbine(s) would be largely screened by topography or vegetation as shown in **Figure 3**.

> The setback is equivalent to 7 degrees of a person's vertical field of view. This can be measured and visualised in real world settings using the tools described in **Section 3.2.**

If a sensitive receiver is eligible for a setback exemption, a visual impact assessment must be undertaken in accordance with the process outlined in **Section 3.2**. In all other circumstances, receivers should be assessed against the high impact performance criteria in **Table 8** which generally require the impact to be avoided. Consequently, applicants should generally avoid siting turbines within the setback unless there would be significant mitigating factors, or it has a private agreement with the affected landowner.

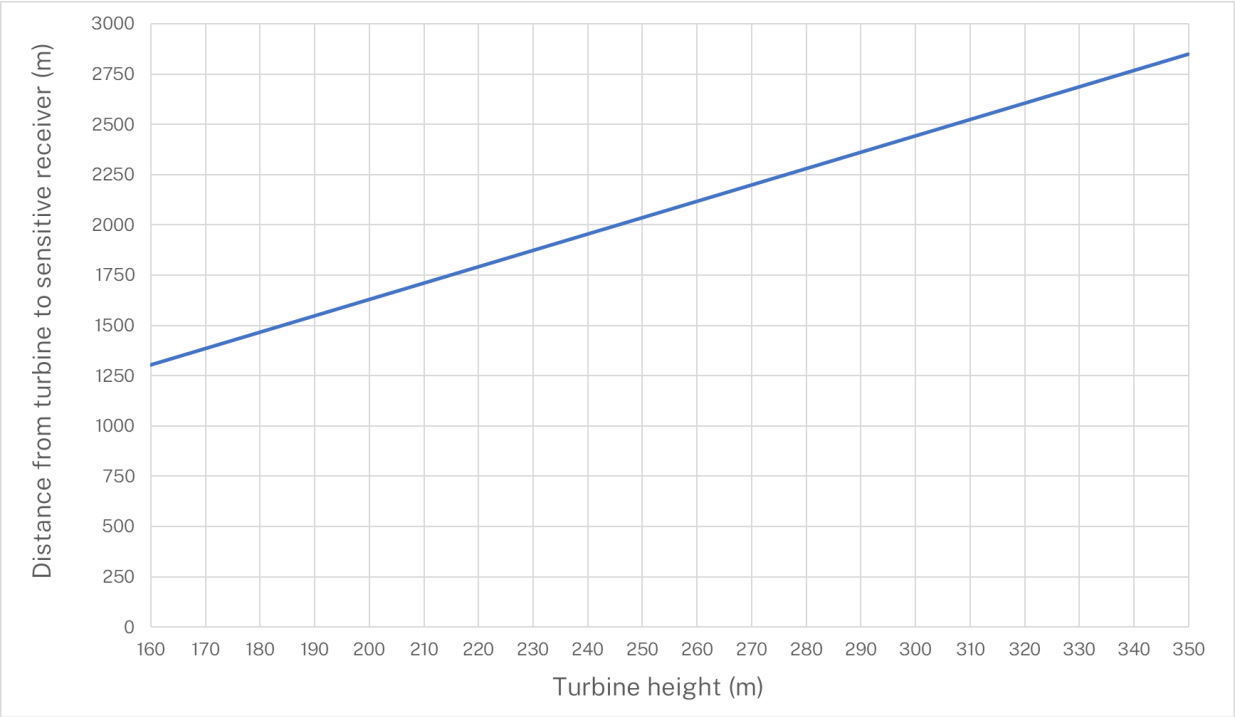


Figure 2. Setback from sensitive receivers

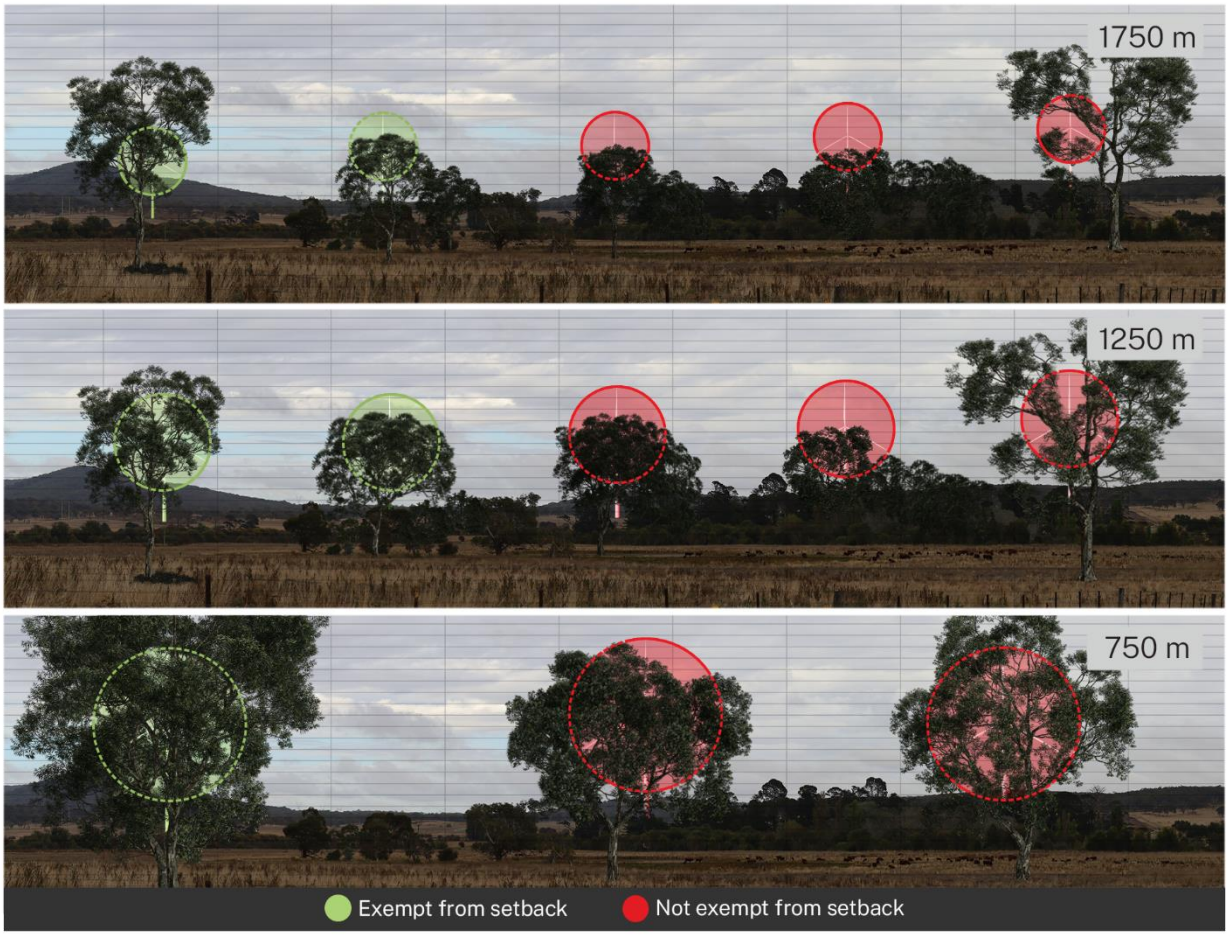


Figure 3. Setback exemptions

3.2 Visual impact assessment process

Applicants must undertake a visual impact assessment for all other public viewpoints and private receivers in accordance with best practice and by considering visual magnitude and visual sensitivity. This assessment must be undertaken in accordance with the process outlined in **Figure 4** and described below. The level of assessment should be proportionate to the likely impacts of the development which is described in detail in **Section 3.3**.

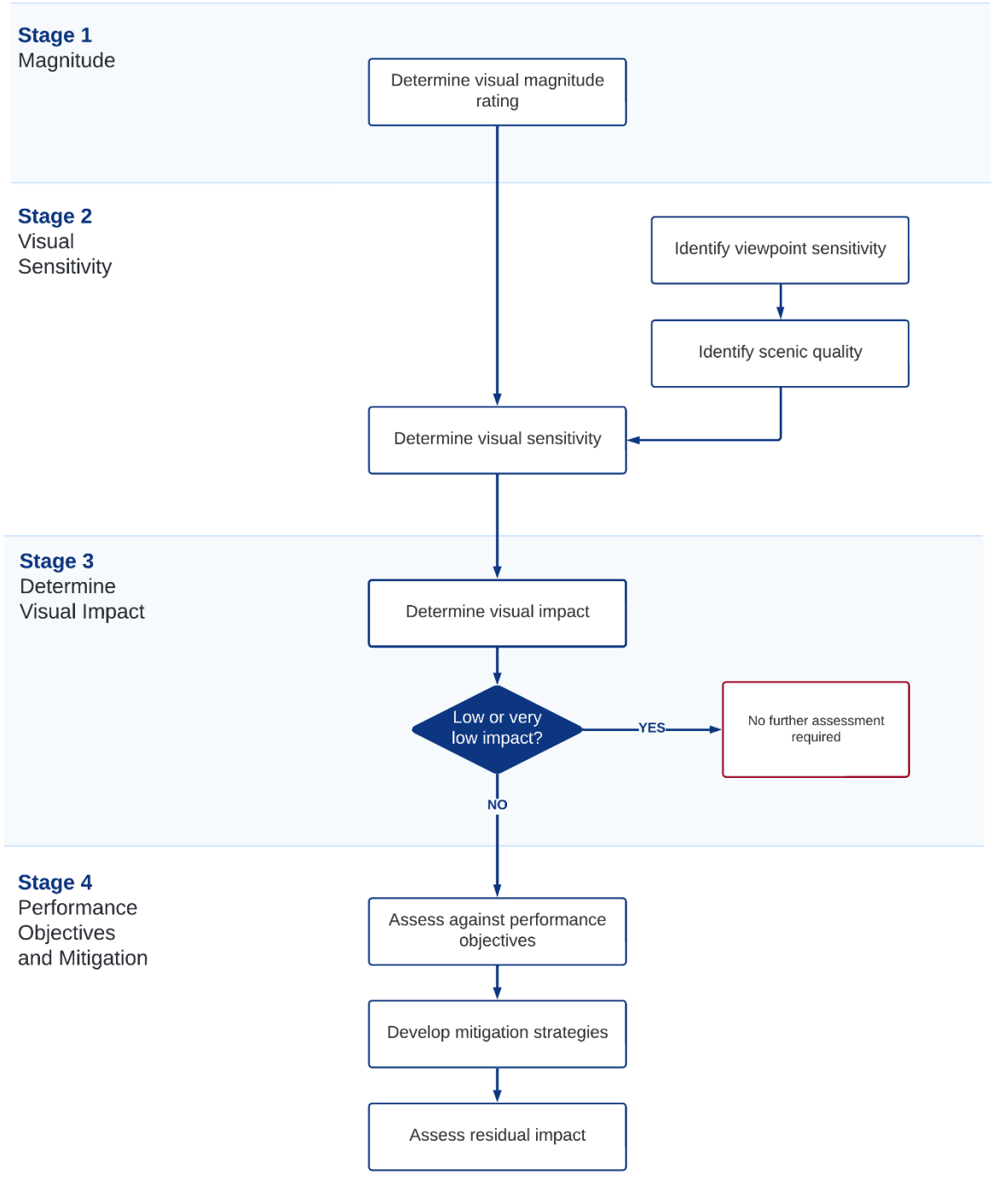


Figure 4. Visual impact assessment process

Visual magnitude

The visual magnitude of a project is its apparent size within the viewshed and is a key factor in determining the overall visual impact. The typical design and layout of a wind energy development is relatively standard. Assumptions have been made and incorporated into the following methodology to improve the efficiency and consistency of determining the visual magnitude of these projects. For example, almost all wind energy developments are comprised of similar infrastructure that exhibit common characteristics including colour, texture, movement and contrast with the rural landscapes in which they are typically located.

Visual magnitude methodology

Visual magnitude should be determined by analysing the volume of the field of view that a project would occupy. This can be determined by splitting any view into a grid comprising cells 1 degree high and 10 degrees wide (see **Figure 5**) and essentially counting the number of cells that would be occupied by a project.

Figure 5 - Determining visual magnitude

The total number of cells can then be compared to the visual magnitude thresholds in **Table 1** to determine the visual magnitude rating. The visual magnitude is classified into one of five ratings (very high, high, moderate, low and very low) and provides an indication of the apparent size of the wind energy development from each public viewpoint or private receiver. Examples of each magnitude rating are provided in **Appendix B.**

This method is designed to weight vertical changes in magnitude more than horizontal changes. This reflects best practice understanding of visual impacts, including the concept that vertical changes to the field of view are perceived to be much greater or more impactful than horizontal changes.

For example, a 10 m high development that is 100 m wide is likely to have less impact on a viewpoint than if it were 10 m wide and 100 m high. This is particularly the case in low-lying regional and pastoral areas where landscapes do not commonly contain natural and built features that occupy large portions of the vertical field of view.

Table 1. Visual magnitude thresholds

Number of occupied cells	Visual magnitude rating
1 – 5	Very low
6 - 11	Low
12 – 19	Moderate
20 - 27	High
28+	Very High

Using this concept, there are several ways that magnitude can be calculated for different purposes and with varying levels of accuracy. These include:

- a practical approach that can be used on location to visualise likely outcomes in real world settings (see rule of thumb in **Figure 6** below)
- conservative desktop estimates that can be calculated by measuring the worst-case horizontal field of view and determining an indicative vertical field of view using basic trigonometry
- detailed analysis that can be undertaken using 3D visualisations of the proposed development including basic 3D models (wireframes) and photomontages which can account for influencing factors including topography and vegetation screening.

The method used, including the process for counting occupied cells, should depend on the use case and be proportionate to the likely impact at each location (see **Section 4.2**).

Since the magnitude of wind turbines decreases over distance, there is a point at which they become inconsequential to the overall visual impact and become difficult to discern against the background. Similarly, private landowners do not have a proprietary right or ownership of a view and any assessment should be limited to a reasonable distance. Consequently, any turbine that would be less than 2 degrees in vertical field of view should not be counted when calculating magnitude.

Rule of thumb for measuring magnitude

It is possible to roughly measure the field of view that objects occupy in landscapes and our day-to-day lives using nothing more than your hand and fingers. This can provide a practical approach for visualising how the magnitude ratings would appear, and how they might compare to other features in the landscape.

To measure a part of your field of view, first hold your hand at arm's length and close one eye. Make a fist with the back of your hand facing upwards. The width of your fist is approximately 10 degrees, or once cell wide. The height of your little finger is approximately 1 degree, or the equivalent of one cell, high.

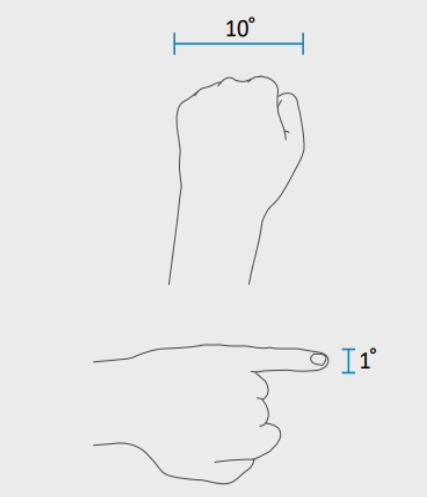


Figure 6. Rule of thumb for measuring magnitude

Visual sensitivity

Visual sensitivity refers to the quality of the existing view and how sensitive the view is to the proposed change. In some cases, visual sensitivity is also related to the direction of the view and where it can be viewed from (such as resident's living room).

The visual sensitivity is determined by identifying the sensitivity of each viewpoint and receiver and categorising the scenic quality of the area in view.

Viewpoint sensitivity

Viewpoint sensitivity relates to the relative importance of viewpoints and the value that the community or visitors may place on landscapes viewed from public use areas, public travel ways and private receivers such as dwellings.

The applicant must classify the sensitivity of each viewpoint into one of four sensitivity ratings (very low, low, moderate, high) considering the examples in **Table 2**, the baseline landscape study, and consultation with the community and individual landholders. While **Table 2** is a good guide, it is not determinative, and the other inputs must be considered in arriving at the final rating.

The view from a rural dwelling should be categorised according to their importance. Primary views are considered more sensitive than secondary views (see **Table 3** for guidance and the Land and Environment Court planning principle related to views[2]). The applicant must identify how each of the residential viewpoints has been classified in the EIS.

Scenic quality

Scenic quality refers to the relative scenic, cultural or aesthetic value of the landscape within the viewshed based on the presence or absence of key landscape features known to be associated with community perceptions of low, moderate or high scenic quality. It is typically a complex process undertaken by experts in visual impact assessment and must take community values into consideration.

The baseline analysis and landscape character assessment should be used to inform the classification of scenic quality values, including aerial photos, topographic maps and any relevant information from field visits.

The suggested scenic quality classification criteria in **Table 4** can be used as a guide, however, the EIS should consider whether a combination of landscape features influences the overall scenic quality of the setting as well as any community values.

In other words, the presence of just one, or even two high quality features (such as a visually prominent stream) may not be sufficient justification for the landscape to considered of high quality. On the other hand, the presence of one highly valued feature (such as a world heritage area) may be significant in and of itself irrespective of other features.

Table 5 provides a visual reference to assist applicants, the community and consent authorities in understanding how scenic quality values may present across the different categories.

[2] *Tenacity Consulting v Warringah Council* [2004] NSWLEC140 at 25-29

Table 2. Viewpoint sensitivity levels and examples

Viewpoint type	Very low viewpoint sensitivity	Low viewpoint sensitivity	Moderate viewpoint sensitivity	High viewpoint sensitivity
Private receiver	Private recreation areas and sporting fields (defined as land zoned R2)	Secondary view from dwelling rural area (zoned RU1, RU2, RU3, RU4 and RU6), large lot residential areas (zoned R5) and in environmental or conservation areas (zoned C2, C3 and C4)	Primary view from dwellings in rural areas (zoned RU1, RU2, RU3, RU4 and RU6), large lot residential areas (zoned R5) and in environmental or conservation areas (zoned C2, C3 and C4) Tourist and visitor accommodation (bed and breakfasts, motels, hotels) and places of worship.	Dwellings in residential and rural villages (land zoned R1, R2, R3, R4 and RU5). Historic rural homesteads / residences on the national, state or local heritage list
Public viewpoint	State highways, freeways and classified main roads	Cemeteries, memorial parks Tourist roads and scenic drives[3]. Significant entry ways to regional towns and cities	Tourist uses in tourist areas (zoned SP3). Publicly accessible green and open spaces including picnic areas, parks, public recreation areas, lookouts. Town centres and central business districts	N/A

Table 3. Primary and secondary viewpoints from rural dwellings

Primary viewpoint	Secondary viewpoint
Principal/frequented living spaces (e.g. living rooms, kitchens, dining areas)	Less frequented living and service areas (e.g. bedrooms, laundries, bathrooms, garages, studies)
Front and rear views from a dwelling, particularly from any porch, balcony, veranda, entertainment area, garden, deck or patio	Side views from a dwelling

[3] Tourist road locations are available on the Transport for NSW (TfNSW) OpenData platform.

Table 4. Frame of reference for scenic quality values

Viewpoint type	Low scenic quality	Moderate scenic quality	High scenic quality
Landform	Large expanses of flat or gently undulating terrain Indistinct, dissected or broken landforms that provide little illusion of spatial definition or landmarks with which to orient	Steep, hilly and undulating ranges that are not visually dominant Board shallow valleys Moderately deep gorges or moderately steep valley walls Minor rock outcrops	Isolated peaks, steep rocky ridges, cones or escarpments with distinctive form and/colour contrast that become focal points Large areas of distinctive rock outcrops or boulders Well defined, steep sided valley gorges
Vegetation	Extensively cleared and cropped areas with very limited variation in colour and texture Pastoral areas, human created paddocks, pastures or grasslands and associated buildings typical or grazing lands	Predominantly open forest or woodland combined with some natural openings in patterns that offer some visual relief Vegetative stands in a range of size, form, colour, texture and spacing including human influenced vegetation (e.g. vineyards, plantation forests and orchards)	Strongly defined natural patterns with combinations of native forest, naturally appearing openings, streamside vegetation and/or scattered exotics Distinctive stands of vegetation that may create unusual forms, colours or textures in comparison to surrounding vegetation
Waterbodies	Absence of natural waterbody Farm dams, irrigation canals or stormwater infrastructure	Intermittent streams, lakes, rivers, swamps and reservoirs	Visually prominent lakes, reservoirs, rivers, streams, wetlands and swamps Presence of harbour inlet, bay or open ocean
Social / cultural	Places of worship, cemeteries/memorial parks, private open spaces	Local heritage sites Distinguishable entry ways to a regional city identified in the Transport and Infrastructure SEPP	Cultural important sites, world heritage areas, national parks/reserves Commonwealth and state heritage sites
Human presence	Dominating presence of infrastructure, human settlements, highly modified landscapes and higher density populations such as regional cities, industrial areas, agricultural transport or electricity infrastructure	Dispersed yet evident presence of human settlement such as villages, small towns, isolated pockets of production and industry, lower scale and trafficked transport infrastructure	Natural/undisturbed landscape Minimal evidence of human presence and production

Table 5. Visual reference for scenic quality values

Viewpoint type	Low scenic quality	Moderate scenic quality	High scenic quality
Landform			
Vegetation			
Waterbodies			
Social / cultural			
Human presence			

Visual Sensitivity

Once the viewpoint sensitivity and scenic quality are determined, these can be combined using the visual sensitivity matrix in **Table 6** to determine the overall visual sensitivity of each assessable viewpoint.

Table 6. Visual sensitivity matrix

	High scenic quality	Moderate scenic quality	Low scenic quality
High viewpoint sensitivity	High	High	Moderate
Moderate viewpoint sensitivity	High	Moderate	Moderate
Low viewpoint sensitivity	Moderate	Low	Low
Very low viewpoint sensitivity	Very low	Very low	Very low

Visual impact

The overall visual impact rating of each viewpoint must be determined for each assessable viewpoint by combining the visual magnitude and visual sensitivity using the matrix in **Table 7**.

Examples of difference visual impacts are provided in **Appendix C**.

Table 7. Visual impact matrix

	High visual sensitivity	Moderate visual sensitivity	Low visual sensitivity	Very low visual sensitivity
Very high magnitude	High	High	Moderate	Moderate
High magnitude	High	Moderate	Moderate	Low
Moderate magnitude	Moderate	Moderate	Low	Low
Low magnitude	Moderate	Low	Low	Very low
Very low magnitude	Low	Low	Very low	Very low

Performance objectives and mitigation

Performance objectives

Applicants must address the relevant performance objective for each assessable viewpoint and the level of impact identified (see **Table 8**).

Table 8. Visual performance objectives

High visual impact	This level of impact should be avoided unless the applicant can justify that: • all reasonable efforts have been made to avoid the impact and alternative project designs are not feasible or would be unlikely to materially reduce the impact • all reasonable mitigation options have been considered • the proposed mitigation measures would effectively mitigate the impact and would not result in a significant obstruction of views • the project site is strategically important because of its location, and • the project is in the public interest.
Moderate visual impact	**Road viewpoints** As far as is reasonable and feasible, the applicant should seek to reduce moderate visual impacts to road users. Appropriate mitigation options include vegetation or other screening. Mitigation should only be considered if it would not obstruct important views and sight lines, could be confined to a relatively small area (i.e. vegetation screening would not be required for several hundred meters along a transport corridor) and where agreed with the relevant road or rail authority. **All other viewpoints and receivers** Visual impact mitigation is required in consultation with the affected landowner and should be proportionate to the scale of impact. There is no expectation this mitigation should eliminate the view of the development entirely but it must reduce the impact to an acceptable level. Appropriate mitigation options include re-siting/micro siting, resizing, re-orienting turbine as well as vegetation screening or project landscaping to reduce impacts. If the available mitigation options would not be effective in reducing impact or are unsuitable due to the nature of the impact (e.g. screening would result in the obstruction of views), then project redesign and/or impact agreements should be considered.
Low and very low visual impact	No mitigation required

Avoidance and mitigation

Several different avoidance and mitigation options may be considered as potential methods of minimising visual impacts.

Re-sizing, re-siting or removing infrastructure

Turbines and other associated wind energy infrastructure (roads, buildings, electricity transmission) can be resized to reduce visual magnitude and to reduce impacts from sensitivity viewpoints. Alternatively, turbines and other project infrastructure could be re-sited to locations where they will have less visual impact. Removal of turbines should also be considered if there are limited options available to re-site parts of the project. This should be the first measure applicants should consider and may also be considered by the consent authority during the assessment of the project.

Vegetation screening and landscaping plans

Vegetation screening, or the planting of trees and shrubs, may be a useful option to visually screen wind energy developments or other potential visual impacts (such as night lighting). On-site screening, such as perimeter planting, should be considered in the first instance. If this unlikely to be effective, screening can be considered at affected public viewpoints and private receivers.

However, there are several limitations to the use of vegetation screening that must be considered. Vegetation screening can obstruct views of the landscape resulting in further impacts to particular views. Vegetation screening can also take many years to establish and during drought or other unfavourable conditions may not achieve optimal growth or have the desired screening effect.

Given these considerations, vegetation screening should not result in significant impacts on the amenity of private receivers (such as the obstruction of scenic views) and should be designed in consultation with the affected landowner.

Applicants should select appropriate plant species that are suited to the environmental conditions (for example, drought-tolerant native species if relevant) and if possible, of suitable maturity to provide maximum screening effectiveness in the shortest possible time. A mix of vegetation of various heights should be employed to ensure the most effective screening coverage. Vegetation should be planted as soon as possible to reduce the time that impacts would be unmitigated.

At-receiver mitigation

As an alternative to other mitigation options, the applicant may consider the use of at-source treatments at an affected public viewpoints and private receivers in consultation with the landowner. These options could include other structural or built features (for example a shed) that could be constructed to screen views. Any agreed mitigation must be subject to an impact agreement.

Impact agreements

Applicants may consider impact agreements with specific landowners as a form of mitigation when all other options have been exhausted. Further information about these agreements is provided in the Private Agreements Guideline for Energy Projects.

Residual impact assessment

Applicants should also assess the visual impact that would remain after the adoption of mitigation measures to determine whether the overall visual magnitude rating of the project would decrease.

3.3 Dwelling Entitlements

In addition to public viewpoints and private receivers, the relevant consent authority is obligated to consider visual impacts on dwelling entitlements[4,5]. A dwelling entitlement refers to any parcel of land for which a development application could be made for a dwelling. Environmental planning instruments dictate whether a dwelling entitlement exists. Relevant criteria include the zoning of the land and minimum lot sizes.

Whilst impacts to dwelling entitlements must be considered, their uncertain nature including where and when a dwelling may be constructed, if at all, make the application of the visual assessment tools challenging.

Consequently, the visual impact assessment of a dwelling entitlements should be qualitative in nature and instead focus on whether the proposed development would unduly impact on the ability for a landowner to act on a dwelling entitlement.

This assessment should:

- be confined to dwelling entitlements located within the setback as it is likely that any future dwelling outside this area could be located to avoid significant impacts
- consider the ability for a future dwelling to be designed, sited and oriented to avoid or reduce the potential for a significant impact to the visual amenity from the project, and
- consider the mitigating effects of existing topography and vegetation.

[4] Section 4.15 of the *Environmental Planning and Assessment Act 1979*

[5] See, for instance, *King & anor v Minister for Planning; Parkesbourne-Mummel landscape Guardians; Gullen Range Wind Farm Pty Limited v Minister for Planning* [2010] NSWLEC 1102

4 Level of Assessment

Applicants are required to undertake an assessment that is proportionate to the likely impacts on each viewpoint and receiver. This section identifies the level of assessment required in the Scoping Report and in the Environmental Impact Statement.

4.1 Scoping Report

The scoping stage presents an opportunity for applicants to select sites, designs and layouts to avoid and mitigate significant visual impacts. Consequently, the applicant should have regard to the visual impact assessment process and tools in scoping and designing a project.

The scoping report must include a visual impact analysis that identifies public viewpoints and private receivers that will require assessment in the EIS. Applicants should also use this process to identify where consultation with landowners and the local community should be focused.

As part of this process, applicants must undertake a mapping exercise that is informed by the following steps. Further guidance on the contents and form of a scoping report can be found in the department's State Significant Development Guidelines – Preparing a Scoping Report.

Study Area

The first step of the scoping stage is for the applicant to identify a visual study area. The extent of the study area can be determined using the maximum height of the proposed wind turbines and the distances set out in **Figure 7**. The study area differs between public viewpoints and private receivers to recognise different values the community places on these locations and the reasons for their use. These differing areas also reflect the treatment of both types of viewpoints in the NSW Land and Environment Court[6,7]. As an example, the extent of the study area for 250 m turbines is 9.6 km for public viewpoints and 7.2 km for other private receivers.

Viewshed mapping

Once the study area has been defined, the applicant must undertake viewshed mapping to identify areas from which the project could be visible. This process will be used to eliminate the need to assess viewpoints within the study area that do not have a line of sight to the wind energy development. Viewshed mapping should be based on the maximum height of the proposed wind turbines, use geographic information systems (GIS) to account for topography and must not account for other intervening factors, including built structures and vegetation screening.

[6] Tenacity Consulting v Warringah Council [2004] NSWLEC 140 at 25-29

[7] Rose Bay Marina Pty Limited v Woollahra Municipal Council and anor [2013] NSWLEC 1046 at 39 - 49

Figure 7. Extent of the scoping study area

Identification of potentially affected viewpoints and receivers

The last step of the scoping stage is to identify public viewpoints and private receivers that would have line of sight to the project and are located within the study area. Table 2 should be used to help identify potential viewpoints, however, the precise category of each viewpoint does not need to be identified at this stage. Additional viewpoints should be considered if ancillary infrastructure, such as substations, have the potential to cause impacts. All viewpoints should be labelled for identification purposes and remain consistent through the assessment process.

Scoping map

The results of the scoping analysis should be presented on a map (see Figure 8) and included in the scoping report. The map should identify:

- proposed turbine locations
- the study area for public viewpoints and private receivers
- the results of the viewshed mapping analysis
- the relevant setback area calculated in accordance with Figure 2
- the location of public viewpoints and private receivers (including whether they are subject to any host or other impact agreement and are therefore associated with the development).

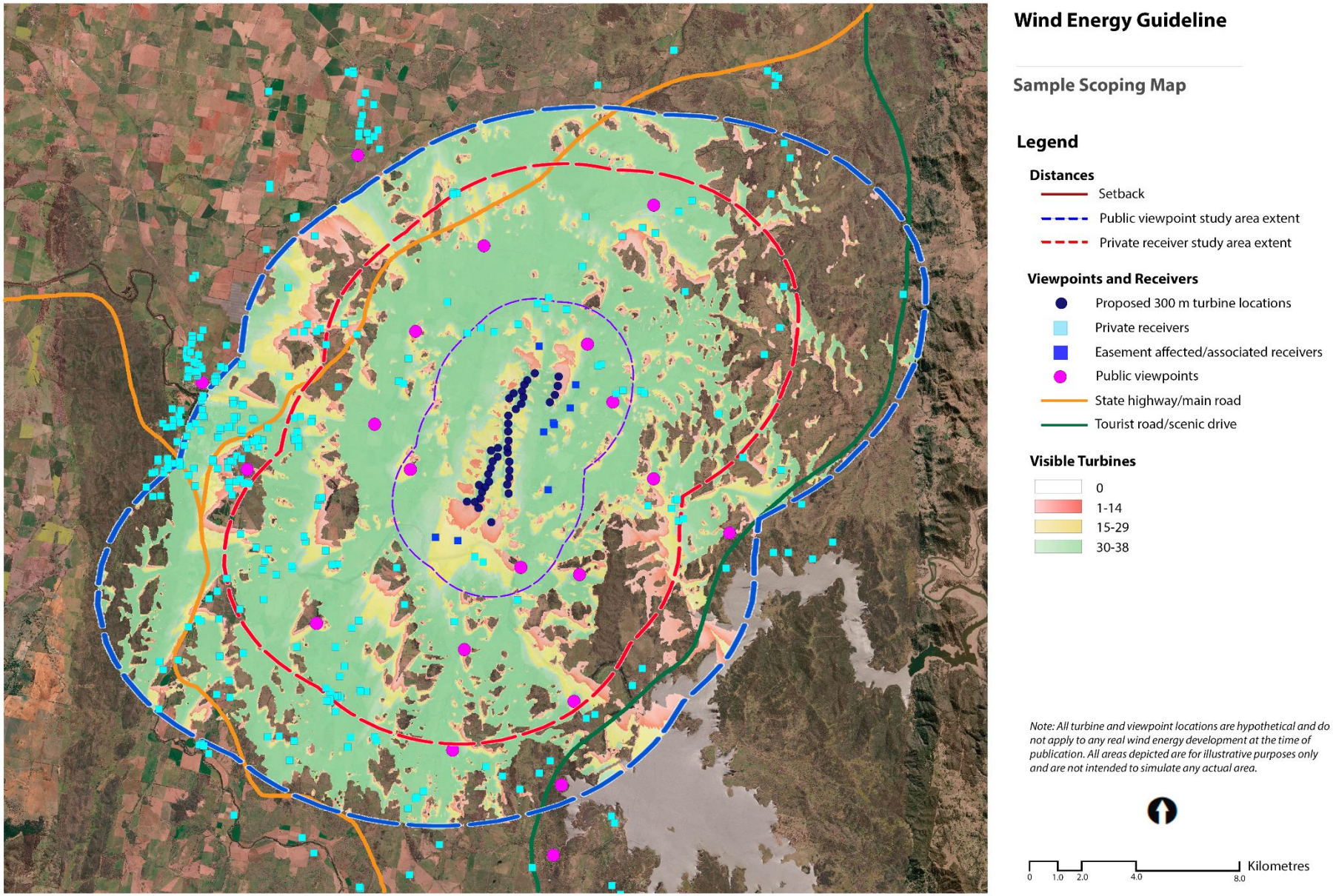


Figure 8. Sample scoping map

4.2 Environmental Impact Statement

General requirements

All public viewpoints and private receivers identified in the scoping report need to be assessed in some level in the EIS. A full visual impact assessment does not need to be completed where existing features completely obstruct the view of the project. In such cases, the applicant must provide evidence that intervening topography, screening, or structures would eliminate any impact.

Representative receivers and viewpoints

While it is preferred that each private receiver be assessed individually, representative viewpoints may be selected and assessed in lieu of multiple dwellings. This can be an appropriate form of assessment when private receivers are clustered close together or when a view is representative, or represents a worst case than views located nearby or further away. The types of private receivers that can be assessed by representative views include:

- rural residential areas
- rural villages
- urban residential.

When utilising representative viewpoints, the applicant must:

- clearly identify the number and location of dwellings that are the subject of the selected representative viewpoint
- carefully assess the topography and vegetation of the selected viewpoint area to identify the most sensitive viewpoint with the highest visibility of the proposed project (i.e. worst case) location in the selected areas as the representative viewpoint.

Representative viewpoints should only be used for views from the public domain along public roads. Representative viewpoints should not be used for dwellings within the setback.

Setback assessment

If a sensitive receiver is located within the setback (and not subject to a private agreement), a photomontage should be prepared in accordance with the requirements in Appendix D. A photomontage is a composite image generated by overlaying a panoramic photograph with a computer-generated model of the proposed development (see examples in Appendix C).

When produced consistently, panoramic photomontages provide a highly effective means of assisting stakeholders and consent authorities in appreciating the scale and scope of a proposed wind energy development's visual presence in context with the landform, land uses and existing vegetation.

It may not be possible to prepare photomontages in all scenarios (e.g. a landowner does not grant consent for photographs to be taken from privately owned land). Applicants should use best endeavours to gain access to private land and to prepare photomontages, however, alterative tools

can be used in lieu of a photomontage in these circumstances (see Appendix D). The photomontage should be used to either:

- demonstrate that the private receiver is eligible for an exemption from the setback (see Figure 3), or
- support the applicant's justification for a high visual impact having regard to the performance objectives in Table 8.

If the private receiver is eligible for an exemption from the setback, then a visual impact assessment should also be undertaken in accordance with the following sections and the process described in Section 3.2.

Proportionate visual impact assessment

A visual impact assessment must be undertaken for all individual viewpoints and private receivers identified in the scoping report (in accordance with the process outlined in Section 3.2) unless:

- there is no line of sight to the project and evidence can be provided that mitigating factors would eliminate any impact from the project
- the impacts can be assessed by a representative viewpoint/receiver
- a private receiver is located within the setback and would not be eligible for an exemption.

The level of assessment required should be proportionate to the likely impacts. Applicants can begin by carrying out a simple assessment based on desktop data and high-level assumptions. Further assessment should then be undertaken if impacts are likely to be moderate or higher. This process is summarised in Figure 9 and described below. The assessment should also be prepared in accordance with the requirements and examples in Appendix E – Imagery Requirements.

Simple assessment

Conduct a basic assessment using worst-case assumptions about the likely magnitude and visual sensitivity. Proceed to undertake an intermediate assessment if impacts could be moderate or higher.

Intermediate assessment

Produce wireframes to more accurately determine magnitude rating. Proceed to undertake a detailed assessment if impacts continue to be moderate or higher.

Detailed assessment

Prepare photomontages and undertake field visits to accurately assess scenic quality and determine the effectiveness of existing or proposed screening.

Figure 9. Proportionate visual impact assessment

Simple assessment

The simple assessment provides a relatively streamlined methodology to eliminate the need to undertake detailed assessment of public viewpoints and private receivers that are likely to experience low and very low impacts. The simple assessment can generally be undertaken at a desktop level using the methods described below.

If the simple assessment indicates that a moderate or high impact is likely, then the applicant must proceed to undertake an intermediate assessment. The outcomes of the simple assessment must be presented in the EIS for each viewpoint and receiver (or representative location), unless an intermediate or detailed assessment is undertaken.

Determining visual sensitivity

At this stage, the characterisation of viewpoint sensitivity and scenic quality can be informed by conservative assumptions. For example, it could be assumed that all views from rural dwellings are primary views to avoid extensive field work and site visits. This information can later be refined as part of an intermediate or detailed assessment if moderate or high impacts could be expected. Scenic quality can also be derived using desktop analysis. However, it should be supported by information and site visits that have been undertaken to inform the landscape character assessment (see **Section 2**).

Calculating potential magnitude

The simple assessment can rely on a theoretical calculation of the likely magnitude using simple parameters including the height of the proposed turbines and the distance of the nearest turbine from each viewpoint. This potential magnitude is a conservative and worst-case scenario that ignores mitigating factors including topography, vegetation and buildings.

To calculate the potential magnitude:

1. determine the worst-case vertical field of view from the viewpoint using trigonometry, or use **Figure 10**, to determine a conservative number of vertical cells that could be occupied.
2. measure the horizontal field of view of the project and any proposed or approved wind energy projects from each viewpoint (not considering vegetation). This can be done conservatively by measuring the absolute width of the project or more accurately by measuring clusters of turbines. Divide the resulting measurement by 10 to determine the approximate number of horizontal cells that would be occupied.
3. multiply the vertical and horizontal cells and compare to the magnitude thresholds in **Table 1** to determine the potential magnitude.

$$vertical\ field\ of\ view\ (degrees) = \tan^{-1}\left(\frac{height\ of\ turbine\ (m)}{distance\ to\ nearest\ turbine\ (m)}\right)$$

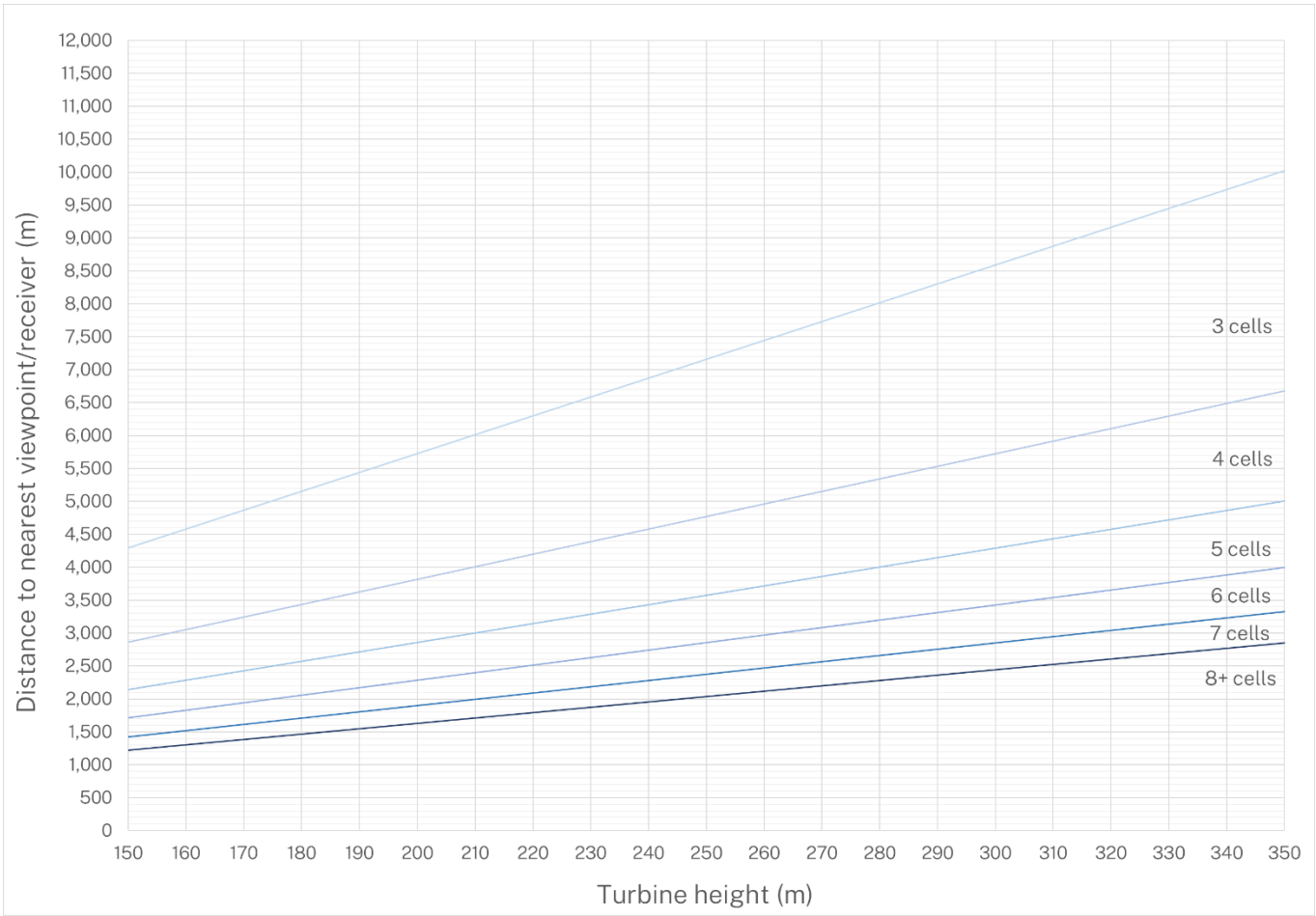


Figure 10. Potential vertical magnitude

Intermediate assessment

The intermediate assessment provides an opportunity to determine the visual magnitude of a proposal more accurately. This involves the use of 3D modelling which can account for many of the factors that influence magnitude including intervening topography, the different distances at which turbines will be visible, and spacing between individual and clusters of turbines.

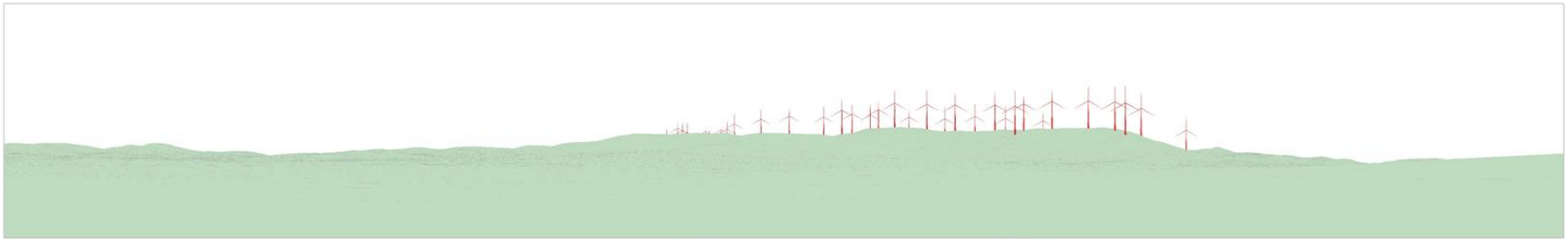
If the intermediate assessment indicates that a moderate or high impact continues to be likely, then the applicant must proceed to undertake a detailed assessment. The outcomes of the intermediate assessment must be presented in the EIS for each public viewpoint and private receiver (or representative location) unless a detailed assessment is undertaken.

Calculating magnitude

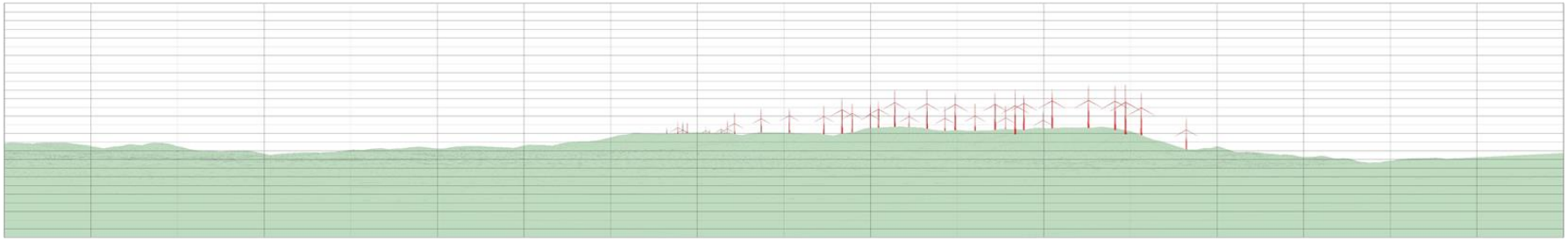
Building on top of the assessment outputs from the simple assessment, applicants can replace the calculation of the potential magnitude with the use of a Visual Magnitude Grid tool to achieve a more certain calculation of a project's bulk and scale relative to a view.

This tool is a transparent grid that, when overlayed with an accurate 3D representation of a proposed project, can ensure a consistent method for understanding the visual magnitude of a project. The process is summarised in **Figure 11** and described in further detail below.

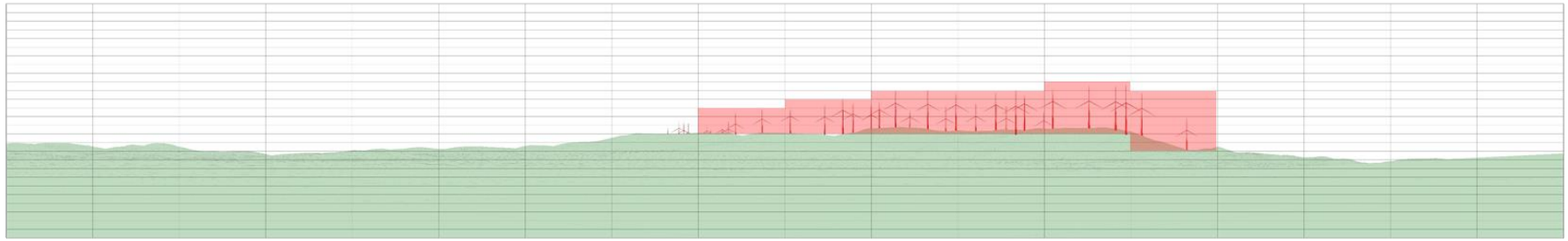
1 Produce wireframe



2 Overlay visual magnitude grid tool



3 Identify occupied cells



4 Determine magnitude rating

Magnitude Rating	Very Low	Low	Moderate	High	Very High
No. Cells	1-5	6-11	12-19	20-27	28+

Figure 11. Steps to determine visual magnitude for an intermediate assessment

To calculate visual magnitude for an intermediate assessment:

1. produce a 3D model (such as wireframe or wireline model) that:
   - comprises 180 degrees of horizontal field of view and
   - is generated using a bare earth digital terrain model
   - includes proposed wind turbines at full vertical alignment (blade tip at highest point in rotation) and fully facing the viewer
   - identifies the number of each turbine
   - includes any visible proposed or approved wind energy projects
2. overlay the Visual Magnitude Grid Tool on the wireframe image
3. identify and count the number of grid cells that the project would occupy
4. determine the magnitude rating based on the number of cells and the thresholds in **Table 1**.

When overlaying the grid, it should be scaled (so the aspect ratio remains unchanged) to ensure that the width matches the wireframe. The grid is available in various file formats on the Department's website.

Once scaled appropriately, the visual magnitude grid tool should be moved incrementally to accurately cover the number of cells that would be occupied by the project and to reduce partly occupied cells. In particular, the grid should be positioned to avoid vertical grid lines aligning with turbine masts, as far as is practicable.

Once the grid has been applied to the wireframe, the applicant must identify the number of cells that are occupied by the built form of the project. The full vertical extent of all visible turbines within the field of view must be accounted for (unless 2 degrees or less). A cell is occupied if it contains any part of a turbine except if the swept area of a turbine occupies less than 25% of a cell. To determine the swept area of a turbine, place a circle centred at the turbine hub around the circumference of the blade's fill potential rotation for each wind turbine in the panoramic image.

Examples of occupied and unoccupied cells are provided in **Figure 12.**

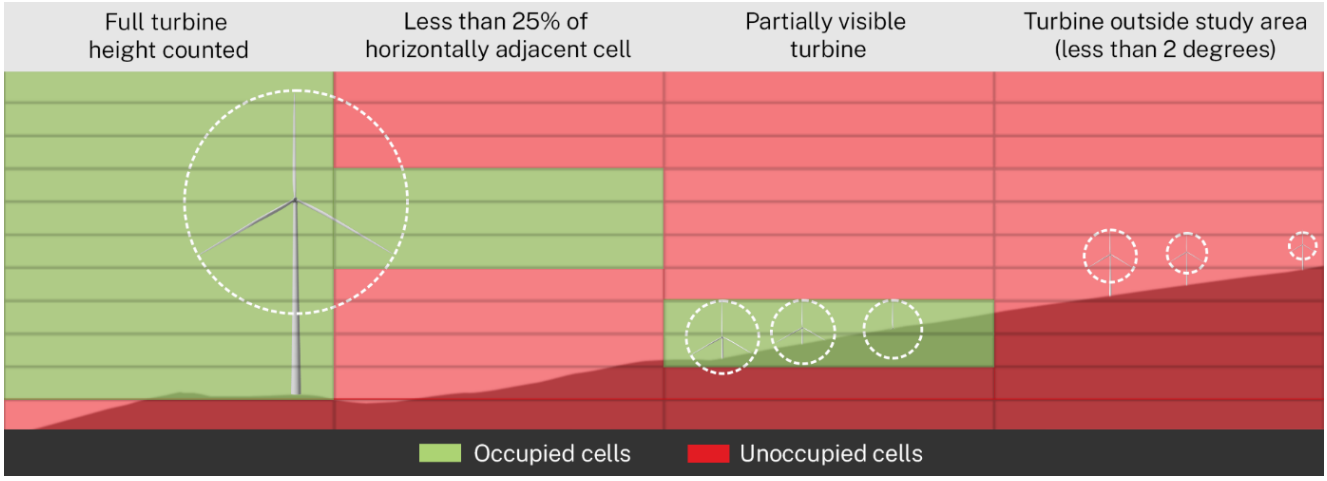


Figure 12. Visual reference for identifying occupied cells

Detailed assessment

The detailed assessment provides an opportunity to refine the magnitude and visual sensitivity inputs using panoramic photomontages and field visits. Photomontages can be used to refine the visual magnitude, by considering the mitigating effects of existing vegetation, and scenic quality by considering very specific attributes of individual views.

Consequently, if a detailed assessment is required, it should be supported by a panoramic photomontage that is prepared in accordance with Appendix D – Photomontage requirements and alternatives. Notwithstanding, it may not be possible to prepare montages in all scenarios. For example, a landowner may not grant consent for photographs to be taken from privately owned land. Applicants should use best endeavours to prepare photomontages, however, alternative tools can be used in lieu of a photomontage in these circumstances (see Appendix D).

While photomontages are highly effective visual communication tools, they can underrepresent the view when compressed on a small page. For this reason, the assessment of each viewpoint must also include a full-size 50 mm image of the area of the photomontage with the highest magnitude that more appropriately represents the view of the development from the human eye.

Refining visual sensitivity

As part of a detailed assessment, applicants should refine elements of visual sensitivity through field visits. These should be used to verify information about scenic quality, having regard to specific features within the view from each public viewpoint and private receiver, and viewpoint sensitivity, particularly whether views from rural dwellings are classified as primary or secondary (see Table 3).

Refining visual magnitude

Building on top of the assessment outputs from an intermediate assessment, applicants can refine the calculation of magnitude to account for the mitigating factors of existing vegetation or other screening.

To refine the magnitude:

1. capture a panoramic photograph from the viewpoint that comprises 180 degrees of horizontal field of view towards the project.
2. superimpose a 3D rendered model and the magnitude grid tool on the panoramic photograph.
3. verify whether any elements of the project would be obstructed by existing vegetation or built elements.
4. recalculate the magnitude rating based on the number of cells occupied and the thresholds in Table 1.

Existing screening should be considered effective, and a cell unoccupied if:

- existing vegetation would substantially screen (to the point where moving blades are barely discernible through vegetation) elements of the project such that any residual view would be very intermittent

- any existing screening would effectively mitigate the view of the project such that moving the viewpoint a few metres in any direction would not significantly change the amount of screening provided
- the vegetation referred to above is not temporary, seasonal or identified as a common weed.

Examples of effective and ineffective vegetation screening are provided in **Figure 13**.

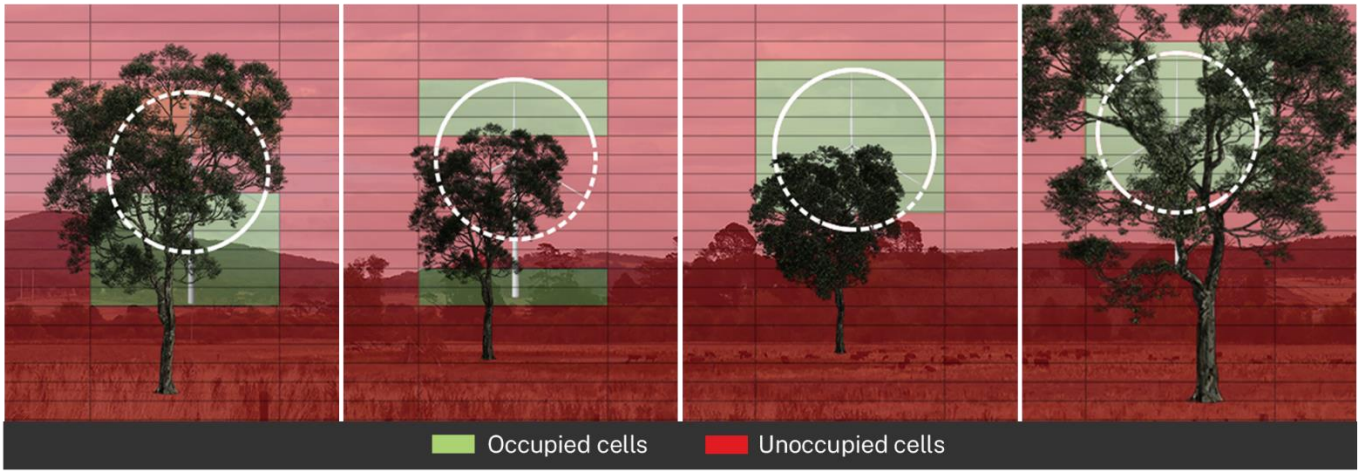


Figure 13. Visual reference for considering existing vegetation screening

Assessment against performance objectives

If after the above analysis, the visual impact is moderate or higher, the impact must be assessed in accordance with the performance objectives provided in **Table 8**.

If screening is proposed to mitigate an impact, a photomontage must be prepared to visualise the effectiveness of the vegetation (see **Figure 14**). This should be presented with and without an overlay of the Visual Magnitude Grid Tool.

Where screening is proposed, the EIS must also include a draft landscaping plan to provide details about the proposed landscape treatments. This plan must:

- be prepared by a suitable qualified landscape expert
- be developed in consultation with the community, including affected landowners, and include evidence of how any feedback has been addressed
- include a map of the project site that identifies important features, including roads (including access roads), infrastructure (turbines, substations, inverters, transmission lines, building areas, hardstands, site fencing), site boundaries, landscape features (rivers, dams), existing vegetation and tree cover and adjacent receivers
- include details of the proposed landscaping including an indicative planting schedule which specifies the type, species and location of any trees, shrubs and/or grasses and groundcovers to be used, the mature height of the species (in metres) and the mature spread of the species (in metres)
- include indicative timeframes for the establishment of vegetation, including an estimate of vegetation, including an estimate for when desired level of mitigation would be achieved

- include evidence that any landscaping would be consistent with the general native vegetation profile of the local area and can be supported by local landform, geology and soil type
- verify that the proposed planting can achieve the mitigation outcomes within a reasonable timeframe.

Figure 14. Photomontage with mitigation

Applicants should also consider including sectional illustrations in the draft landscaping plan that show the indicative growth of proposed vegetation in comparison to the height of roads, site infrastructure and residential properties.

Appendix A – Example landscape character assessment

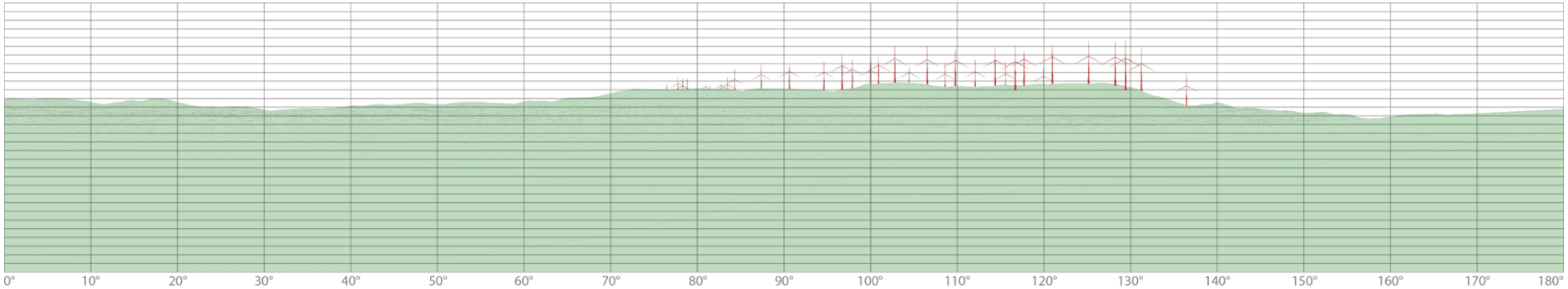
Landscape character zone	Sensitivity	Magnitude	Landscape character impact
LCZ1 Undulating farmlands	**Low** • The landscape has been highly modified from its natural state to support grazing and cultivation. • Human modifications are clearly evident through widespread clearance of native vegetation and the presence of roadways, dwellings, ancillary agricultural buildings and domestic scale electricity infrastructure. As such, it is considered to have some capacity to absorb the type of change envisaged by the proposed wind energy development. • No specific planning controls attribute special value to this landscape. • The landscape elements that contribute to its quality will remain unchanged. • The wind energy development would not disrupt any key landscape features.	**Low** • Some elements of the project, predominantly ancillary infrastructure are proposed within this LCZ. • The proposed project infrastructure in this LCZ will have a minor evident change in landscape characteristics in close range. However, the extent of this change is considered minor in relation to the extent and use of this LCZ. • Supporting project infrastructure is of a scale and form that is commensurate with the existing built form typology of the rural landscape and could be adequately absorbed by the landscape.	**Low**
LCZ 2 Forested mountain range/ridgeline	**Moderate** • This LCZ is generally heavily vegetated and relatively unmodified particularly along ridgelines.	**Moderate** • When viewed from afar, the project is expected to complete visually with the landform and associated	**Moderate**

Landscape character zone	Sensitivity	Magnitude	Landscape character impact
	• It consists of conservation areas and is characterised by forested ridgelines that form a prominent landscape feature. • Some clearing and lightly modified landscapes are present in the lower foothills and fringes of the LCZ including some large lot residential uses. • Some existing high voltage transmission line transect across part of the LCZ.	vegetation. Its position along the ridgeline will disrupt the skyline of this prominent landscape feature. • When viewed from within the LCZ, views toward the project are expected to occupy a small portion of the horizontal and vertical fields of view, often through the gaps of existing vegetation and topography. This will minimise their ability to indirectly impact upon the character of this LCZ.	

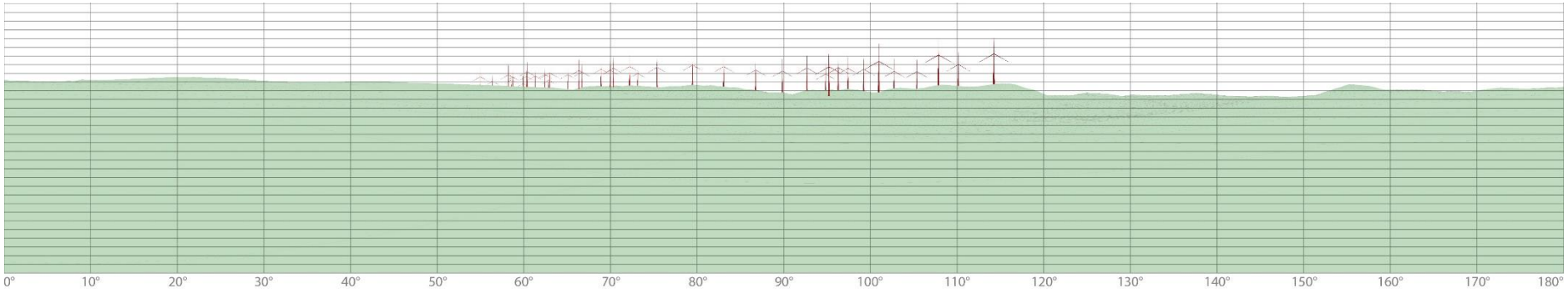
Appendix B – Visual magnitude examples

The following examples depicts the magnitude of wind energy development approximately with 300 m high turbines. These are highly conservative examples that do not consider intervening vegetation or other mitigating factors.

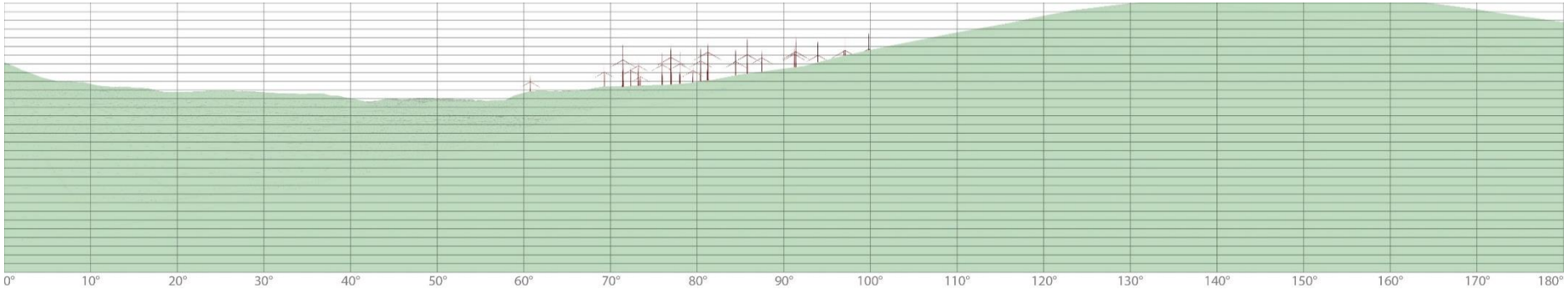
3-5km from development



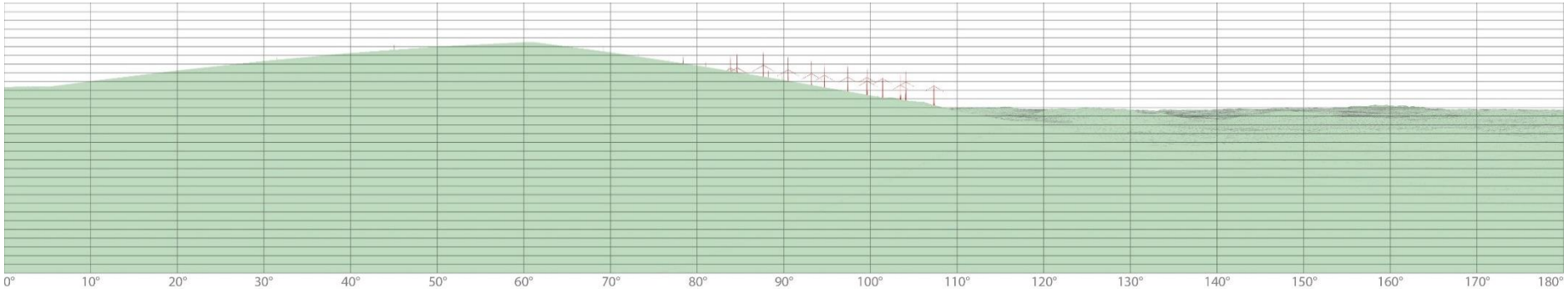
Very high magnitude



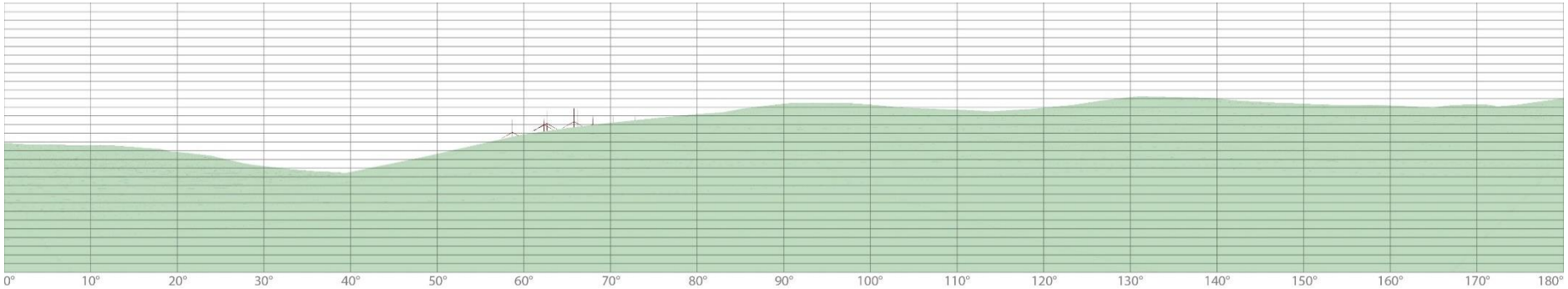
Very high magnitude



High magnitude

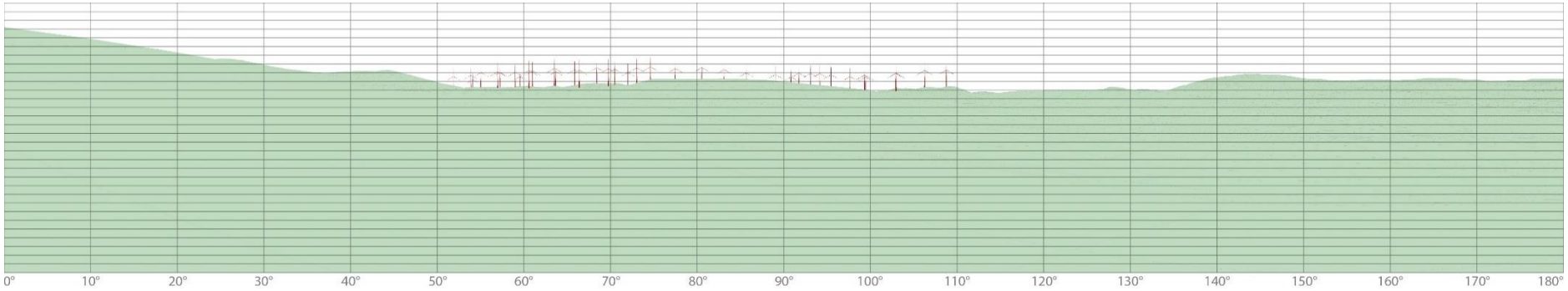


Moderate magnitude

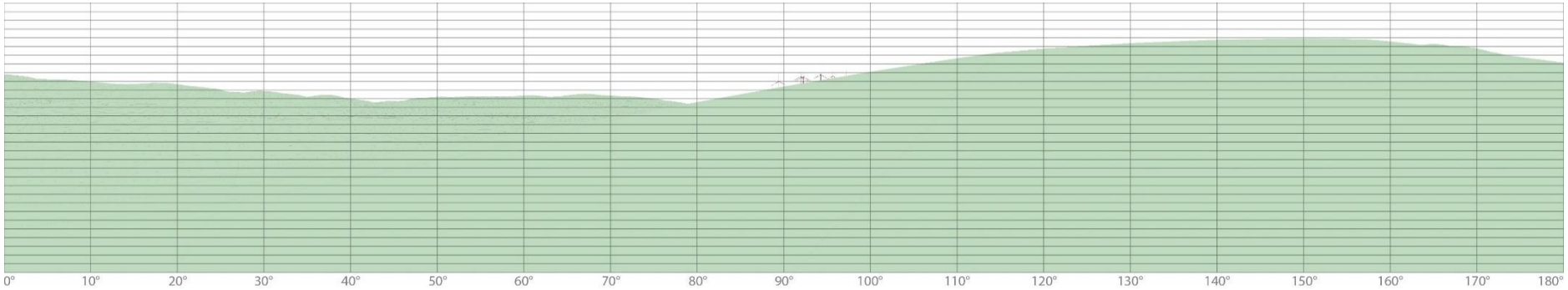


Low magnitude

5-9km from development

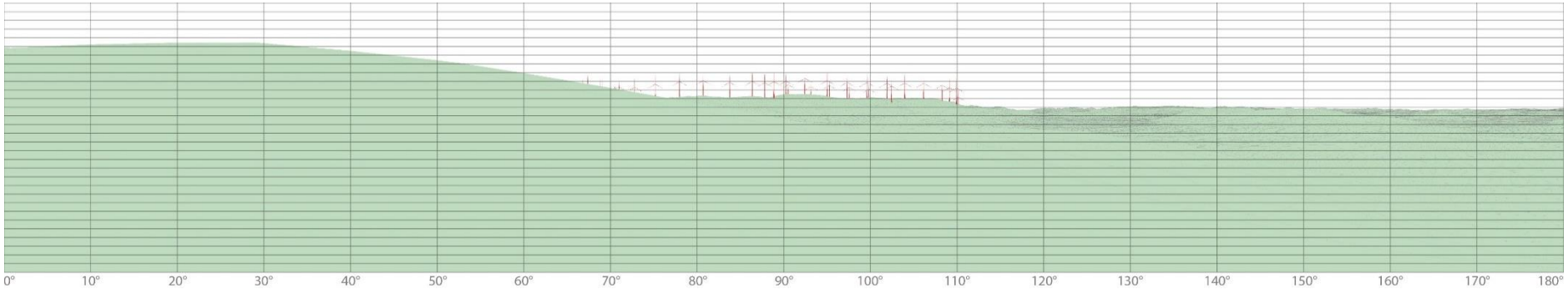


Moderate magnitude

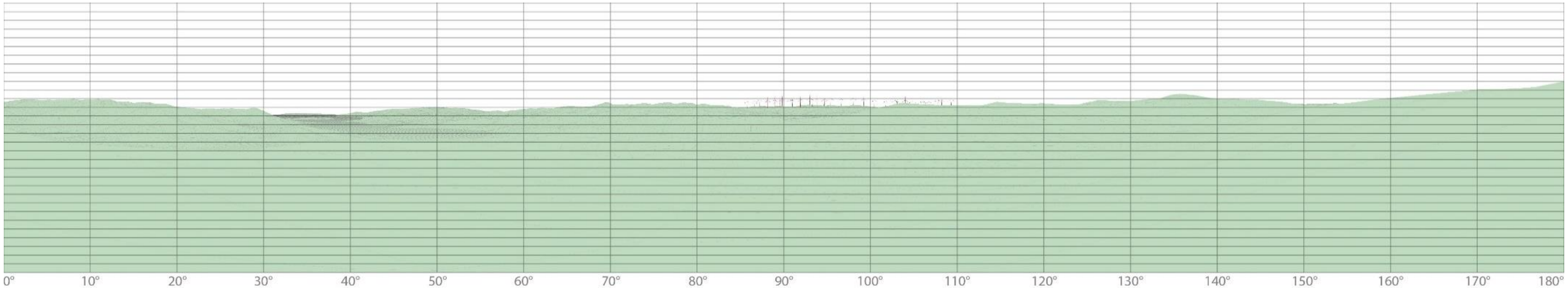


Very low magnitude

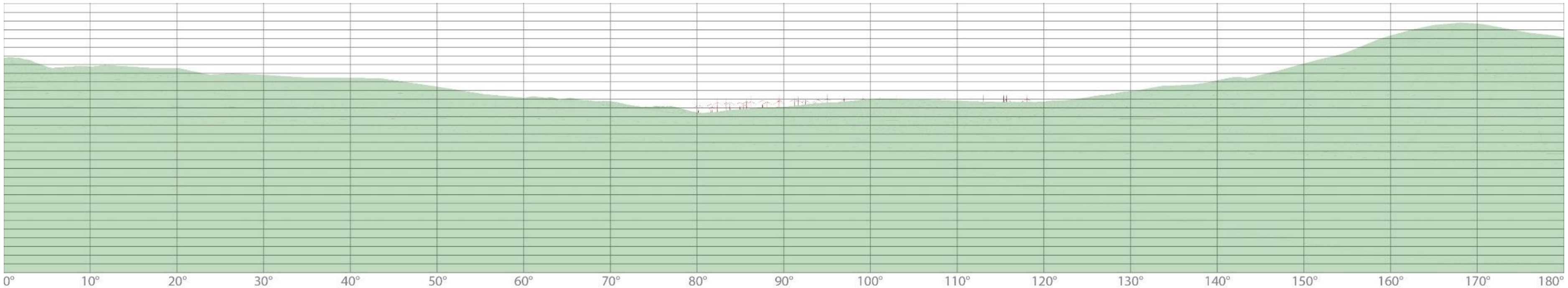
9-15km from development



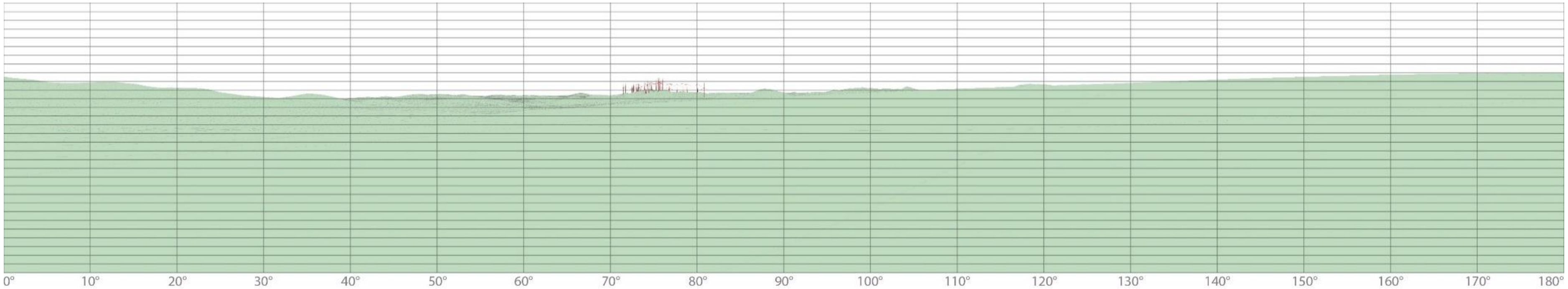
Moderate magnitude



Very low magnitude

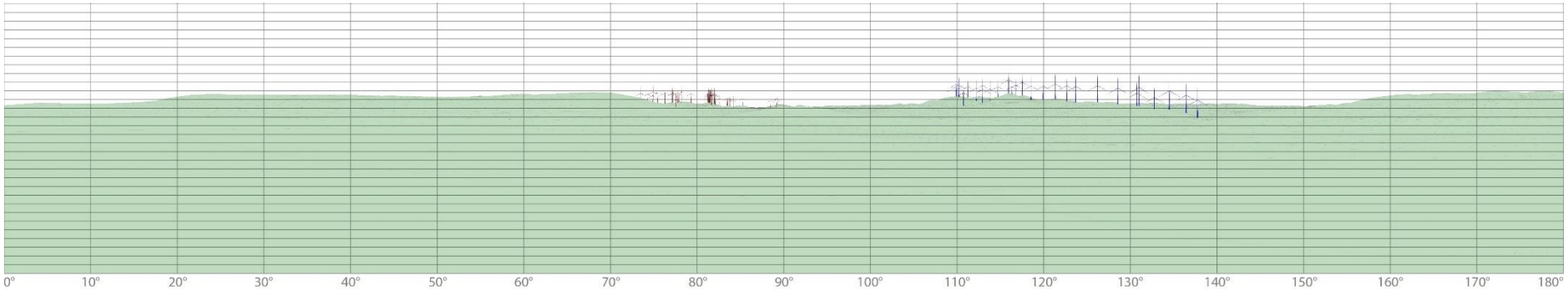


Very low magnitude

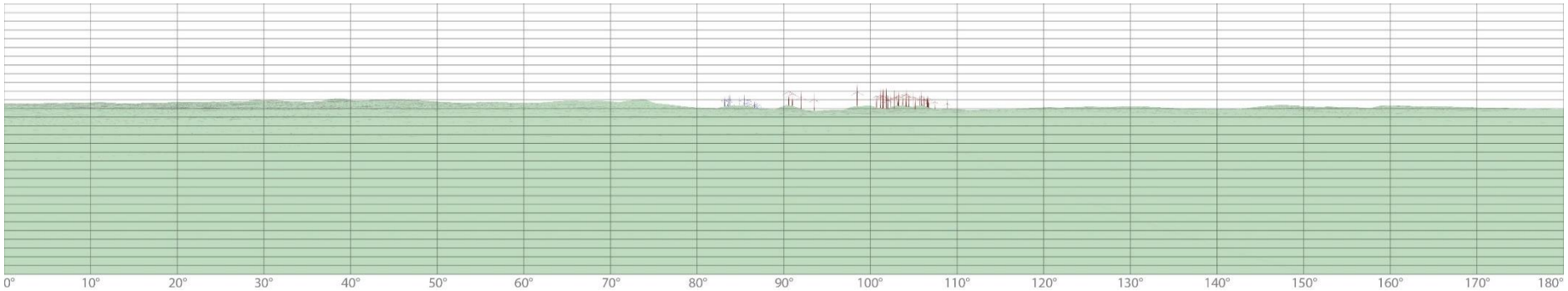


Very low magnitude

Cumulative magnitude examples



High magnitude



Low magnitude

Appendix C – Visual impact examples

Private receivers

Distance to development	Viewpoint type	Viewpoint sensitivity	Scenic quality	Overall sensitivity	Occupied cells	Magnitude rating	Impact rating
2,780 m	Rural dwelling primary view	Moderate	High	High	14	High	High

Distance to development	Viewpoint type	Viewpoint sensitivity	Scenic quality	Overall sensitivity	Occupied cells	Magnitude rating	Impact rating
1,871 m	Rural dwelling primary view	Moderate	Low	Moderate	59	Very high	High

Distance to development	Viewpoint type	Viewpoint sensitivity	Scenic quality	Overall sensitivity	Occupied cells	Magnitude rating	Impact rating
2,674 m	Historic homestead	High	Moderate	High	13	Moderate	Moderate

Distance to development	Viewpoint type	Viewpoint sensitivity	Scenic quality	Overall sensitivity	Occupied cells	Magnitude rating	Impact rating
4,724 m	Rural dwelling primary view	Moderate	Low	Moderate	18	Moderate	Moderate

Distance to development	Viewpoint type	Viewpoint sensitivity	Scenic quality	Overall sensitivity	Occupied cells	Magnitude rating	Impact rating
2,744 m	Rural dwelling primary view	Moderate	Moderate	Moderate	4	Very low	Low

Distance to development	Viewpoint type	Viewpoint sensitivity	Scenic quality	Overall sensitivity	Occupied cells	Magnitude rating	Impact rating
1,932 m	Tourist accommodation	Moderate	Moderate	Moderate	10	Low	Low

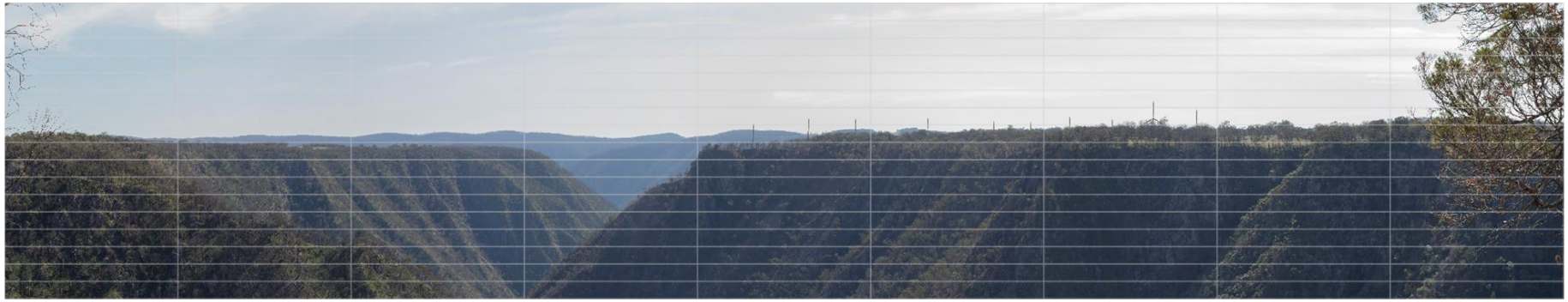
Distance to development	Viewpoint type	Viewpoint sensitivity	Scenic quality	Overall sensitivity	Occupied cells	Magnitude rating	Impact rating
3,043 m	Rural dwelling secondary view	Low	Low	Low	4	Very low	Very low

Public viewpoints

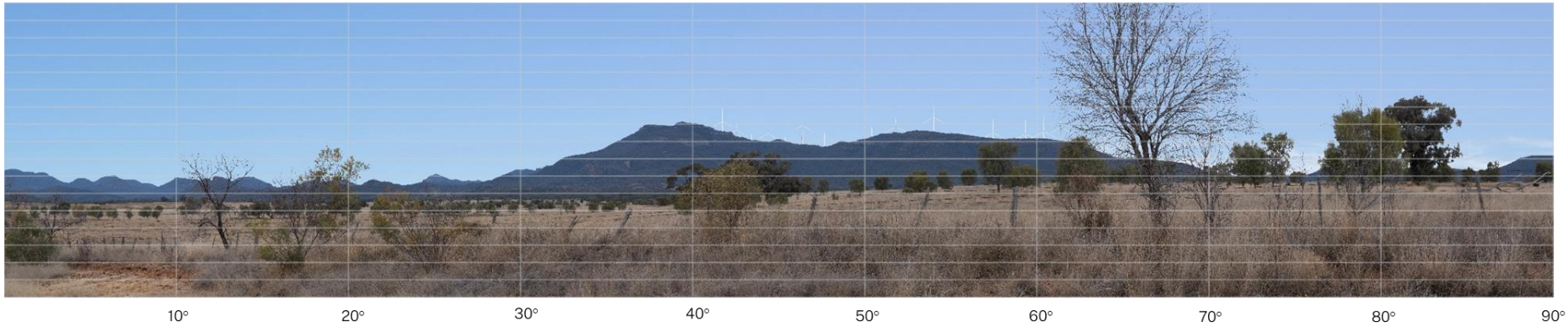
Distance to development	Viewpoint type	Viewpoint sensitivity	Scenic quality	Overall sensitivity	Occupied cells	Magnitude rating	Impact rating
2,406 m	State highway	Very low	Low	Very low	29	Very high	Moderate

Distance to development	Viewpoint type	Viewpoint sensitivity	Scenic quality	Overall sensitivity	Occupied cells	Magnitude rating	Impact rating
1,351 m	Tourist road	Low	Moderate	Low	43	Very high	Moderate

Distance to development	Viewpoint type	Viewpoint sensitivity	Scenic quality	Overall sensitivity	Occupied cells	Magnitude rating	Impact rating
1,714 m	Classified main road	Very low	Low	Very low	14	Moderate	Low



Distance to development	Viewpoint type	Viewpoint sensitivity	Scenic quality	Overall sensitivity	Occupied cells	Magnitude rating	Impact rating
4,633 m	Lookout	Moderate	High	High	0 (less than 2 cells)	Very low	Low



Distance to development	Viewpoint type	Viewpoint sensitivity	Scenic quality	Overall sensitivity	Occupied cells	Magnitude rating	Impact rating
6,708 m	Entry to regional city	Low	High	Moderate	0 (less than 2 cells)	Very low	Low

Distance to development	Viewpoint type	Viewpoint sensitivity	Scenic quality	Overall sensitivity	Occupied cells	Magnitude rating	Impact rating
3,355 m	State highway	Very low	Low	Very low	11	Low	Very low

Distance to development	Viewpoint type	Viewpoint sensitivity	Scenic quality	Overall sensitivity	Occupied cells	Magnitude rating	Impact rating
10,157 m	Classified main roads	Very low	Low	Very low	0 (less than 2 cells)	Very low	Very low

Appendix D – Photomontage requirements and alternatives

Photomontages

Panoramic photographs must be constructed by merging a series of photographs together to form a single image with a horizontal field of view of 180 degrees. To ensure consistency and accuracy, these montages must be prepared in accordance with the requirements below.

If the applicant is unable to take a photograph from a viewpoint and cannot choose an appropriate representative viewpoint, it may capture other photography to show the characteristics of the view and landscape. However, the applicant should make all reasonable efforts to take representative panoramic photos to ensure the assessment is as accurate as possible.

Parameter	Requirement
Camera	• Full frame camera • 50 mm focal length of lens • Camera positioned 1.5 m above the ground • Use of tripod (with levelling tools) and panoramic head
Composition	• Horizon positioned at the midpoint of the photographs • Multiple photographs taken every 15 degrees or at such frequency to provide adequate overlap (approximately 30%) between images
Location and conditions	• Where possible, photographs should be taken with no or minimal cloud cover and when the sun is positioned high in the sky (generally between the hours of 9 am and 3 pm) • Clear skies should be superimposed over any imagery that would otherwise contain overcast skies
Merging photographs	• Photographs merged to achieve a panoramic photograph with 180 degrees horizontal field of view • Merged panoramic photographs avoid distortion or warping of the individual images

Photomontage alternatives

Whilst photomontages are the preferred tool for communicating the potential magnitude and overall impact to visual amenity, access to take the photographic components of the process can sometimes be intermittent or unachievable.

Applicants should use best endeavours to obtain permission to access private property for the purpose of preparing photo montages. However, if the applicant is unable to obtain access, then it may use one of the following alternatives:

- select another point near the view location that is representative of the view and use the resulting imagery to prepare a montage
- use LiDAR combined with 3D modelling to clearly communicate the location and density of screening elements in the viewshed from the viewpoint, or
- rely on wireframes and worst-case assumptions about vegetation or other built elements in the viewshed that could screen the project. Where this option is used, the applicant should provide as much supporting evidence as possible.

Appendix E – Imagery Requirements

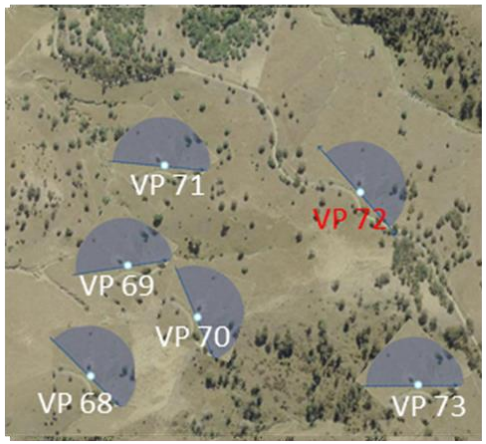
The visual impact assessment should be presented in accordance with the requirements outlined in the table below and generally in accordance with the following examples.

Assessment Component	Requirements
Viewpoint information and imagery	• reference to the viewpoint name/number • baseline panoramic image (using requirements in **Appendix D** • viewpoint location and GPS coordinates • distance to the development • direction of view towards the project • identification of any turbine, including partially visible turbines, that is within the setback from a sensitive viewpoint • numeric identification of wind turbines consistent with information in the EIS • identification of any wind turbines from other visible proposed or approved wind energy developments • identification of any turbines that are subject to an agreement with a host or neighbouring landholder
Sensitivity analysis	• identification of viewpoint type • identification of viewpoint sensitivity (see **Table 2**) • identification of scenic quality (see **Table 4** and **Table 5**) • overall sensitivity (using **Table 6**) • relevant commentary on how the scenic quality has been derived
Magnitude analysis	• identification of the total number of cells that would be occupied by the project • identification of the magnitude rating (using **Table 1**)
Visual impact rating	• identification of the visual impact rating (using **Table 7**) • excerpt(s) of the relevant photomontage (if required) displayed at a size representative of the actual view showing areas with the greatest impact
Performance objectives, mitigation and residual impact	• commentary on the visual impact including relevant performance objectives (see **Table 8**) and any proposed mitigation measures • detailed justification for high visual impacts that cannot be avoided • panoramic photomontage with inclusion of proposed mitigation with and without the magnitude grid tool • age/timing for the development of vegetation used in montages

Simple assessment example

Representative Viewpoint Zone 4

Viewpoint Location



Potential Sensitivity

Viewpoint Type	Rural dwellings
Viewpoint Sensitivity	Moderate
Scenic Quality	Low
Landscape Character Zone	Agricultural Plains
Overall Potential Sensitivity	Moderate

Potential magnitude

Maximum vertical field of view	3°	3 cells
Maximum horizontal field of view	20°	2 cells
Maximum occupied cells	6 cells	
Potential magnitude	Low	

Scenic Quality Analysis and Evidence

The north easterly outlook from this dwelling toward the project are dominated by agricultural plains over a relatively flat landscape.
The vegetation in the view is sparse, with a mix of native and exotic species.
The surrounding agricultural plains are largely pastoral in nature and used for grazing.
There are no dominant landscape features in the areas and evidence of human presence is moderate with the presence of farming infrastructure.
No waterbodies are present within the viewshed between the viewpoint and the proposed turbine layout.
The LCA also confirms the agricultural value of the landscape character zone.
As a result of this analysis and of the information on from the LCA, the scenic quality is considered low.

Potential Impact Rating

Viewpoint in setback?	No
Impact Rating	Low

Viewpoint 114

Viewpoint Location

Potential Sensitivity

Viewpoint Type	Rural dwellings
Viewpoint Sensitivity	Moderate
Scenic Quality	Low
Landscape Character Zone	Agricultural Plains
Overall Potential Sensitivity	Moderate

Potential magnitude

Maximum vertical field of view	3°	3 cells
Maximum horizontal field of view	30°	3 cells
Maximum occupied cells	9 cells	
Potential magnitude	Low	

Scenic Quality Analysis and Evidence

The north easterly outlook from this dwelling toward the project are dominated by agricultural plains over a relatively flat landscape.
The vegetation in the view is sparse, with a mix of native and exotic species.
The surrounding agricultural plains are largely pastoral in nature and used for grazing.
There are no dominant landscape features in the areas and evidence of human presence is moderate with the presence of farming infrastructure.
No waterbodies are present within the viewshed between the viewpoint and the proposed turbine layout.
The LCA also confirms the agricultural value of the landscape character zone.
As a result of this analysis and of the information on from the LCA, the scenic quality is considered low.

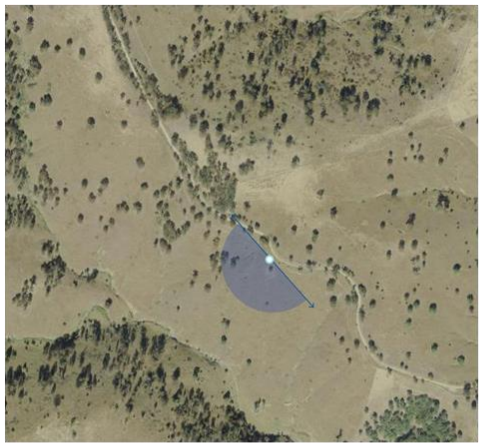
Potential Impact Rating

Viewpoint in setback?	No
Impact Rating	Low

Intermediate assessment example

Viewpoint 017

Viewpoint Location



Potential Sensitivity

Viewpoint Type	Rural Dwelling
Viewpoint Sensitivity	Moderate
Scenic Quality	Low
Landscape Character Zone	Agricultural Plains
Overall Potential Sensitivity	Moderate

Scenic Quality Analysis and Evidence

The surrounding area of the viewpoint contains sparse and inconsistent patches of native and exotic vegetation within a highly modified agricultural landscape. Pastoral elements dominate the viewshed and there is a high human presence evident in the potential viewshed.
Some farm dams are present however no significant waterbodies are apparent in the potential viewshed nor are their unique or prominent landscape features such as ridgelines or gorges.
The landscape is common in the area and not considered rare.
The LCA also confirms the there are no remarkable important landscape values from within the agricultural plains landscape character zone.
As a result of this analysis and of the information on from the LCA, the scenic quality is considered low.

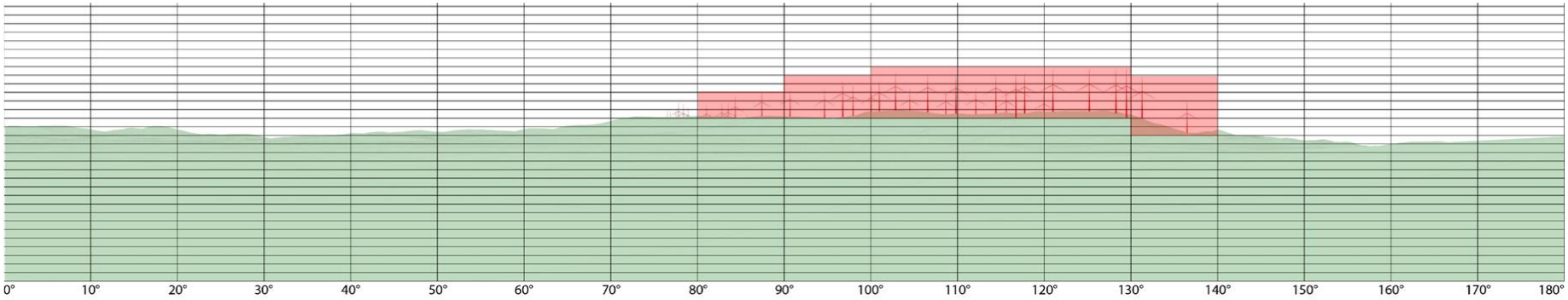
Magnitude

Occupied cells	33 cells
Magnitude	Very High

Impact Rating

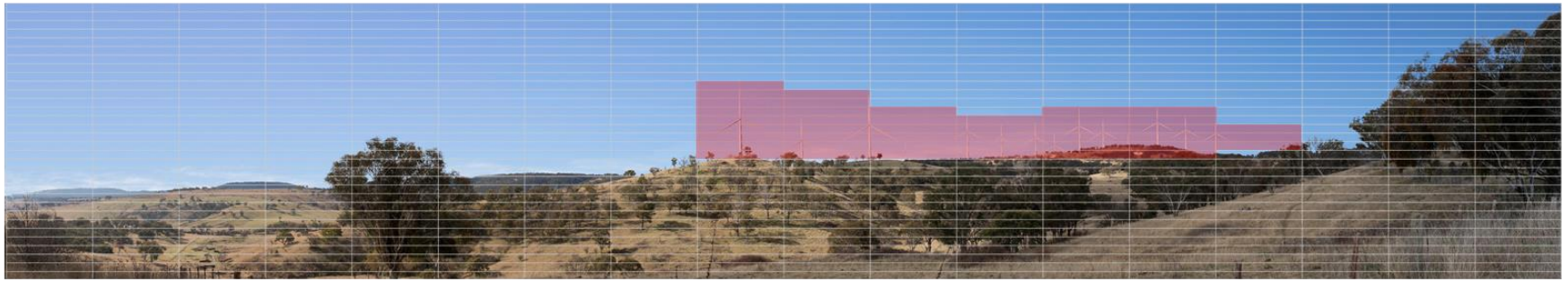
Viewpoint in setback?	No
Impact Rating	High

Wireframe Assessment



Detailed assessment example

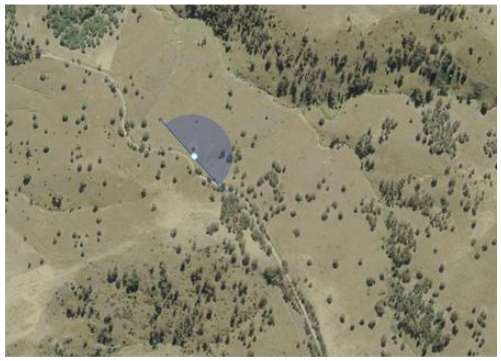
Viewpoint 074



Scenic Quality Discussion

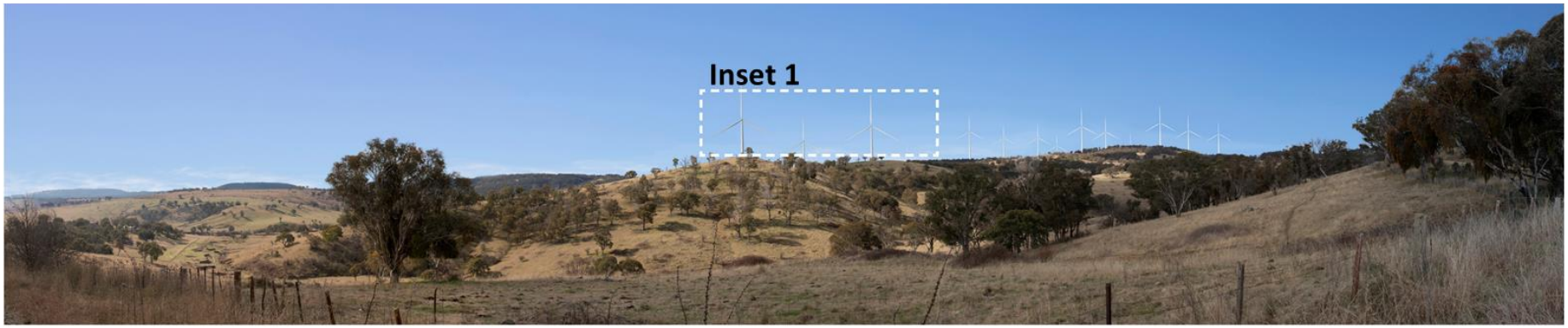
The surrounding area of the viewpoint contains sporadic native vegetation across foothills and undulating land. Some pastoral elements are evident however human presence is not dominant. The viewshed includes distant forested ridgelines that are valued as a landscape feature. No significant waterbodies are apparent. As a result of this analysis and of the information on from the LCA, the scenic quality is considered moderate. There are minimal built or natural vertical elements in the landscape and no other feature protrudes above the foothills and ridgeline in the viewshed.

Distance to development	Viewpoint type	Viewpoint sensitivity	Scenic quality	Overall sensitivity	Occupied cells	Magnitude rating	Impact rating
450 m	Rural dwelling (primary)	Moderate	Moderate	Moderate	43	Very high	High



Viewpoint 074

Visual Impact Rating: High



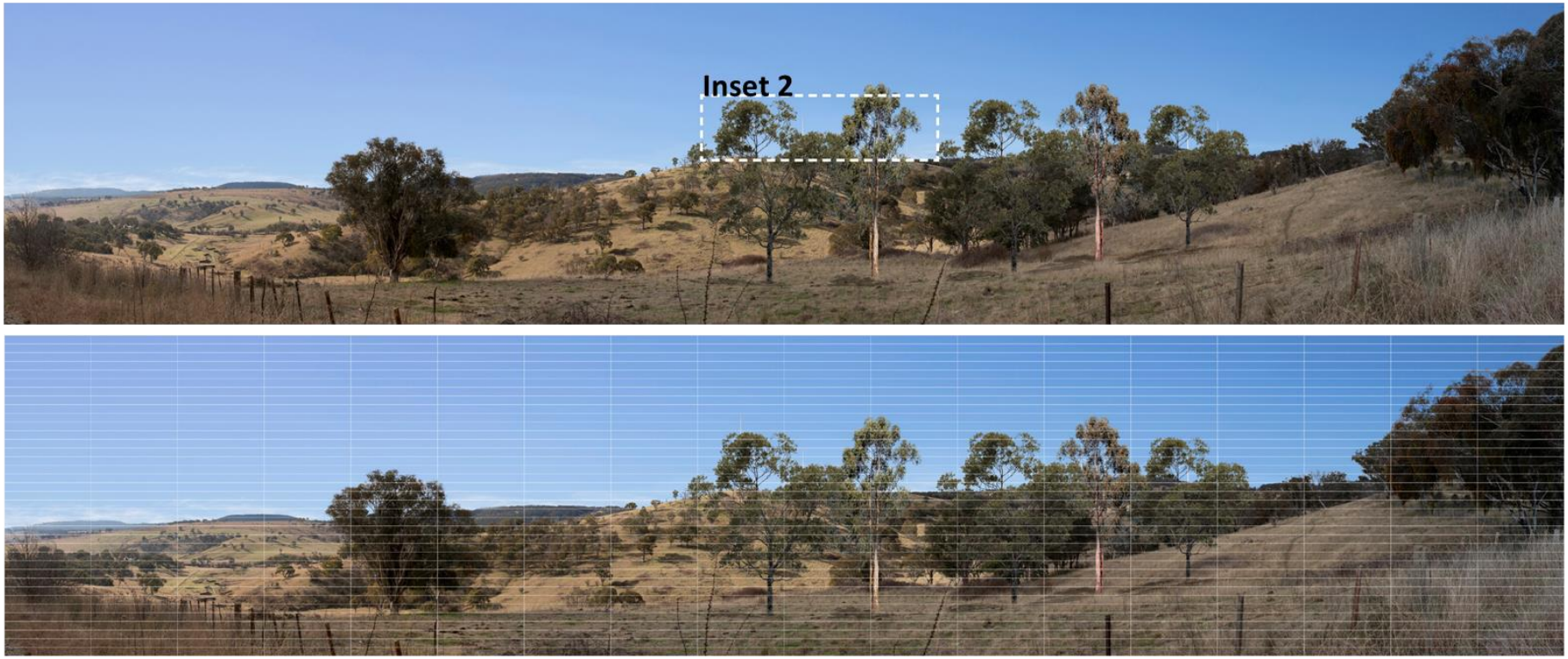
Inset 1

Note: The inset image(s) provide an accurate representation of the view when the document is viewed at 100% zoom and at arm's length from the screen

Viewpoint 074

Mitigation

Vegetation screening at 5 years



Mitigation and Residual Impact Discussion

The high impact to the rural dwelling has been carefully considered in the siting and layout of the proposed turbines. Turbines 16 and 23 have been removed from the proposed design and consultation has been undertaken and is ongoing with the resident. An impact agreement has been offered and is considered favourable by the resident. In addition, proposed mitigation includes the planting of native and drought tolerant eucalypts endemic to the region as vegetative screening on the site of the impacted dwelling. After five years these trees will effectively screen a large portion of the refined turbine layout. In addition this screening will not interrupt sight lines to the important distant ridge lines to the left in the above image. Overall, it is expected that with the removal or turbines and mitigation measures, the residual impact will be low. As such, whilst the turbines are located within the setback from this residence, the project remains justified and in the public interested whilst adequately dealing with the visual impact to an agreeable level with the resident. A review of any agreement entered into has been offered after 5 years should the above planting establishment not be in line with expectations presented in this EIS.

Viewpoint 074

Mitigation

Inset 2

Note: The inset image(s) provide an accurate representation of the view when the document is viewed at 100% zoom and at arm's length from the scree