5.0 Landscape and Visual Assessment

5.1 Introduction

Visual impacts associated with wind farm developments are often among the greatest of concerns for nearby property owners and the wider community. It is therefore important to provide an effective and objective assessment that demonstrates the potential landscape and visual impacts have been taken into consideration.

This Landscape and Visual Impact Assessment (LVIA) chapter provides an assessment of the anticipated landscape and visual effects of the Project during construction, operation, and decommissioning / rehabilitation.

5.1.1 Project background

Prior to acquiring the Project in December 2008, AGL had commissioned a number of studies into the potential effects of the wind farm including landscape and visual effects. This included a previous LVIA which assessed a wind farm layout of up to 213 wind turbines.

In 2011, the turbine layout was modified and an LVIA prepared that assessed the landscape and visual impacts of the proposed Project Site, drawing on the findings of the previous LVIA study wherever relevant. Due to the time elapsed since 2011, the LVIA has been reviewed and updated to reflect changes, particularly to the legislative context and proposed layout. The revised Project Site assessed in this LVIA considers a turbine development scenario comprising up to 102 wind turbines and a blade tip height of up to a maximum of 180 m. For the purposes of this LVIA, a hub height of up to 117 m has also been used.

This chapter has been written to provide a consolidated LVIA addressing the current scheme layout. However, where relevant, the chapter draws on certain findings of the 2008 LVIA; particularly in relation to community perception. Where this is the case, the relevant information has been extracted and is included in the current chapter to avoid the need to refer to two separate documents. The approach and method used to clarify the potential landscape and visual impacts has been tailored to the current proposed scheme and current accepted LVIA practice for wind farms.

5.2 Scope of assessment

5.2.1 Definition of study area

For the purposes of this assessment, the Project encompasses all land within the Project Site illustrated on Figure 2.1 in Volume 2. An overall LVIA study area of 17 km radius for the Project has been established based on the boundaries of the Project Site. This is referred to as the ‘Project Study Area’ and is illustrated in Figure 5.1, Volume 2.

The Project Study Area aims to identify the area within which the Project may have an effect on landscape and/or visual receptors. It is unlikely that any visual receptors located beyond the boundary of the 17 km Project Study Area will be able to obtain clear/ significant views of the Project.

5.2.2 Approach to LVIA

Impacts on the landscape include physical changes to the fabric of the landscape, as well as perceptual changes in the character of the landscape. They also include impacts on areas designated for their scenic or landscape qualities, at a national, regional or local level e.g. Bunya Mountains National Park (BMNP). Visual impacts relate to changes in views and the appearance of a wind farm in those views. The approach of this LVIA is set out in Table 5.1.

Table 5.1 LVIA Approach

Project inception and clarification of the approach to the LVIA	
Step 1	Background documentation review including technical review of the previous initial LVIA (prepared by ERM in November 2008), previous LVIA (AECOM, March 2011) and review of relevant background documentation including accepted guidelines, such as the Draft National Wind Farm Development Guidelines (released in July 2010), and more importantly the Queensland Wind Farm State Code and Planning Guideline (July 2016).
Step 2	Clarification of further work required to undertake the LVIA for the current proposed layout.
Step 3	Finalisation of the LVIA approach and method.
Preparation of the LVIA	
Step 4	Field survey during November 2010 and January 2011 to: i. verify and refine landscape and visual resource ii. gain a full appreciation of the relationship between the proposal and the landscape iii. confirm the representative viewpoints in the field iv. take photographs for the LVIA, including to use as a base for the preparation of photomontages.
Step 5	Definition, description and illustration of the landscape and visual baseline, including spatial definition (based on a reassessment which resulted in a refinement of those Landscape Character Types originally identified in the 2008 LVIA, and identification of the landscape and visual sensitivity.
Step 6	Preparation of mapping to support the LVIA and compilation of illustrative photomontages/visualisations from selected viewpoints.
Step 7	Identification of the magnitude of change of the landscape resource during the construction, operation, and decommissioning phase.
Step 8	Evaluation of the significance of the proposed change on the landscape and visual resource.
Step 9	Preparation of the cumulative impact assessment.

5.3 Legislative context and standards

This section provides an overview of the key planning policies and guidance that have informed the LVIA process. Additional information on the legislative and policy context of the scheme is presented in Chapter 3 Legislative Framework and Chapter 11 Land Use and Planning.

The emphasis of this section is to identify those aspects of landscape or visual amenity that will require assessment under legislation or relevant planning schemes so that these can be appropriately analysed within the LVIA. The purpose of this is to determine the extent to which valued and protected aspects will be affected, rather than to make a formal assessment of the acceptability of the Project from a planning perspective; this aspect is considered in the Legislative Framework and Land Use and Planning Chapters but is ultimately the responsibility of those determining the application.

Assessment guidance for this LVIA has made reference to national and international assessment standards as well as other benchmarks including the Queensland Wind Farm State Code and Planning Guideline (July 2016) and the Draft National Wind Farm Development Guidelines (Environment Protection and Heritage Council, 2010). As a result of the consultations following production of the Draft National Wind Farm Development Guidelines it is noted that these will not be developed further to a final report but they are still considered to be useful as a reference document.

At a regional level, the Project falls within the Wide Bay, Burnett and Surat Basin Regional Plan areas. At the local level, the Project extends across two Local Government Areas – Western Downs and South Burnett Regional Councils. These local governments are in the process of producing consolidated planning schemes and Western Downs has produced a draft planning scheme, considered below. However, until these drafts are adopted the provisions of the Wambo Shire Planning Scheme and Kingaroy Shire Planning Scheme respectively still apply. The provisions of these planning schemes applicable to landscape and scenic amenity are described in Table 5.2:

Table 5.2 Review of key policy and guidance related to landscape character and visual amenity

NATIONAL	
Draft National Wind Farm Development Guidelines (Environment Protection and Heritage Council, 2010)	
Appendix C ("Landscape") of the 'Draft National Wind Farm Development Guidelines' provides guidance to ensure the impacts of wind farms on landscape values are fully understood and clearly reported.	
Issue/Concern	**Purpose/Intent**
Landscape character impacts	Advocates reporting on the anticipated *extent* a wind farm development may impact on the existing character of the landscape and its features. In particular, it recommends dividing the study area into "*character units for the purpose of evaluation; and developing strategies to manage and plan for each character unit*".
Landscape significance impacts	Recommends reporting on the *significance* of a landscape and clearly outlining which aspects of significance (if any) a wind farm would impact on. The significance of the impact is dependent on the landscape value and sensitivity (i.e. scenic, character, visual and community values) and the anticipated magnitude of change.
Impacts on viewsheds and views	Encourages reporting on the anticipated impact of the wind farm on visual amenity, through representative viewsheds and views (static and dynamic).
Impacts on community values	Advocates "*direct community input*" into the assessment of landscape and visual impacts, through definition of (predominantly subjective) community landscape values. For example, local people often have strong attachment to the outlook from a particular viewpoint, and this knowledge should inform choice of viewpoints for impact assessment.
Cumulative Impacts	Recommends reporting on the cumulative landscape and visual effects resulting from additional changes to the landscape or visual amenity caused by the proposed development in conjunction with other developments (associated with or separate to it). Cumulative impacts may occur where there are no other wind farms in the area, but by virtue of combination with other major infrastructure or large scale developments (e.g. industrial, urban, large-scale agricultural) and/or direct or indirect landscape changes (e.g. vegetation clearing) which may alter the overall character or values of an area.
Management and mitigation	Management and mitigation refers to recommended actions to reduce anticipated residual impacts, as a result of the full landscape assessment and visual impact assessment. However the onus should be on the siting, design and layout of the wind farm development, rather than relying on mitigation measures.
STATE	
Wind Farm State Code and Planning Guideline (July 2016)	
The Wind Farm State Code and associated Planning Guideline were released by the Department of Infrastructure, Local Government and Planning State Assessment and Referral Agency (SARA) in July 2016	
Policy / Objective	**Purpose / intent**
State Code Performance Outcomes: Character, scenic amenity and *Landscape Values*	
PO9 Development avoids, or minimises and mitigates, adverse impacts on the character, scenic amenity and landscape values of the locality and region through effective siting and design.	This Performance Outcome seeks to ensure that wind farm development minimises impacts on landscape and visual amenity values, particularly landscapes recognised as being of local importance. It also seeks to ensure that the wind farm and its component infrastructure are designed to minimise impact. No acceptable outcome is provided.

State Code Planning Guideline: *Section 3.6 Meeting acceptable outcomes and performance outcomes: character, scenic amenity and landscape values*	
Section 3.6.1 requires that compliance with the codes may include, but is not limited to, the following actions "*Undertake a visual impact assessment report that identifies and proposes measures to avoid or minimise adverse impacts from the development on significant landscape values and scenic amenity, including view corridors and viewpoints. The relevant local government planning scheme or regional plan may assist in identifying scenic amenity and/or landscape values to be addressed."*	Guidelines regarding a range of acceptable actions have been produced. The describes the methodology for undertaking a visual impact assessment which includes: - A description of the potential impacts on scenic amenity or landscape values - Visual simulations or photomontages demonstrating the anticipated visual impact of the development in the context of the surrounding area, and from key public view points - A landscaping plan that details any proposed measures such as materials, finish or colour which are intended to minimise visual impacts of associated wind farm structures. The guideline states that the assessment should take into consideration the Queensland Government's (2007) *Identifying and protecting scenic amenity values* and further information from the *Draft National Windfarm Development Guidelines*. It is noted that the LVIA methodology used in this assessment addresses the criteria of the code and guideline but does not use the specific methodology noted in the *Identifying and protecting scenic amenity values* guideline. It does take into consideration the Draft National Wind Farm Development Guidelines and internationally accepted guidelines for Landscape and Visual Impact Assessment of wind farms.
REGIONAL	
Darling Downs Regional Plan (October 2013)	
The Darling Downs Regional Plan (DDRP) states that the region has some of the State's best assets, with high value scenic and natural amenity, encompassing a variety of regional landscapes, including urban and rural holdings, agricultural production, resource and mine sites, and national and state parks (p.10). It is, however, noted that there are no further specific references to rural amenity, rural character, visual amenity or landscape character. Further, there are no Desired Regional Outcomes (DROs) within the Draft DDRP that are relevant to landscape character and visual amenity. The most relevant DRO for the LVIA are described below.	
Policy / Objective	**Purpose / intent**
DRO: *Providing certainty for the future of towns*	
Regional Outcome: The growth potential of towns within the Darling Downs region is enabled through the establishment of Priority Living Areas. Compatible resource activities within these areas which are in the communities' interest can be supported by local governments.	This DRO is identified as protecting the State Interest of *Liveable Communities*. The Regional Policies that support this DRO relate to protecting the growth of towns within the region from encroachment of incompatible resources projects rather than specifically protecting visual and landscape amenity. However, notes that "*Land uses such as… alternative energy production…have the potential to impact on the amenity of communities…*"
***Wide Bay Burnett Regional Plan* (September 2011)**	
Landscape protection is a key objective of the Wide Bay Burnett Regional Plan (WBBRP) (p. 9). DROs within the WBBRP that are relevant to landscape character and visual amenity are listed below.	
Policy / Objective	**Purpose / intent**
DRO: *Environmental and natural resources: Regional Landscapes*	
Regional Landscapes Objective 2.4	Principle 2.4.1 seeks to ensure that "*Regional landscape values and areas are managed to maintain or enhance their ability to contribute to the region's liveability, lifestyle, health and economy*". Values are noted to include "*scenic amenity*" (p. 64) The associated policies require that "*Development complements, protects and enhances landscape values and areas of significance, limiting impacts on these regional assets*"

	(2.4.2); and that "*Regional landscape areas are appropriately managed to optimise economic, social, recreational and ecosystem services to the region*" (2.4.3). The notes on the Regional Landscape and Rural Production Area recognise that "*Residents and visitors to the region value the extensive and diverse range of environmentally, culturally, socially and economically significant landscapes that underpin the region's many values. These values and landscapes can be some of the main reasons that people move to, and stay in, the region.*" (p. 153). They note that "*It is also important to recognise that landscape values are not limited only to natural environmental features. Rural towns and rural activities, such as cropping and grazing, contribute to the character of the region, and illustrate their importance, not only to the economy, but also to the regional landscape. The patchwork of greens and rich soil in the undulating landscape of the South Burnett, or the cane fields around Bundaberg, provide a backdrop to the picturesque region, as much as its natural environs*." With regards to Rural Futures (p. 82) the Regional Plan states the importance of appropriately protecting and managing the production lands in the region to preserve their heritage and landscape values "*while embracing changing circumstances*".
***Surat Basin Regional Planning Framework* (July 2011)**	
The Surat Basin Regional Planning Framework (SBRPF) sets out a framework for a prosperous and sustainable community. There are no specific references to rural character or amenity. A key objective of the Framework is to identify, protect and enhance manage the region's diverse landscapes of natural, cultural, social and economic value to meet current and future community and environmental needs (Principle 2, p. 45), including rural, natural and urban areas. In relation to the provision of infrastructure and services, the SBRPF seeks to avoid, minimise and mitigate potential impacts on "regional landscape values" as well as the "visual amenity of urban areas" (SBRPF, p.16). There are no specific references to rural amenity, but DROs within the SBRPF that are relevant to landscape character and visual amenity are listed below.	
Policy / Objective	**Purpose / intent**
Principle 2	
Landscape	Principle 2, (p 45.) states that "*Landscapes of natural, cultural, social and economic value within the region are identified, protected and managed to meet current and future community and environmental needs*."
LOCAL	
Wambo Shire Planning Scheme (April 2005)	
No specific scenic amenity values were identified for the portion of the study area that falls within the Wambo Shire boundaries. The Bunya Mountains are located approximately 17 km from the south-eastern boundary of the Project site and are identified as being of high scenic amenity value. The Wambo Shire Planning scheme does not specifically mention visual amenity of the Bunya Mountains however it does set out a number of more generic requirements in relation to scenic amenity as follows.	
Policy / Objective	**Purpose / intent**
Strategic Direction	
3.3 Community and Services	This states the requirement that development contributes to community wellbeing including a requirement that "*The built environment reflects community expectations and contributes to the amenity and rural character of Wambo Shire*"

Rural Zone Code Developments	
4.1.3.3 Code Purpose	(4)(d) requires that development "*Maintains the rural amenity*" (4)(h) requires that development within the rural zone "*protects areas and sites of conservation importance, including cultural and high landscape values*"

Amended Draft Western Downs Planning Scheme (August 2016)	
The Amended Draft Western Downs Planning Scheme (August 2016) has now been published and, when adopted, will supersede the Wambo Shire Planning Scheme. However, the Wambo Planning Scheme discussed above remains current. The Draft Western Downs scheme includes a number of provisions relevant to scenic amenity:	
Policy / Objective	**Purpose / intent**
Scenic Overlay	
A scenic overlay map has been prepared (OM-011). This includes a "High Landscape Value" overlay and definition of the Bunya Highway as a "Scenic Route" with an associated "Scenic Route Buffer" (100m) within the vicinity of the Project Site. The draft planning scheme has a section on Scenic Amenity (3.4.6) and a Scenic Amenity Overlay Code (8.2.9).	The purpose of the scenic amenity overlay code is to ensure that development does not adversely affect scenic amenity and landscape values within the Western Downs region. There is additional protection for High Landscape Value Areas as identified on the Scenic amenity overlay maps (OM-011), including in relation to landscape character, scenic amenity and tourism values of the locality and the Western Downs region, buildings or structures positioned on a ridgeline or skyline especially when viewed from a scenic route. The code includes provision for screening by landform and native vegetation. The code requires that a landscape assessment must be undertaken in accordance with SC6.4 – Planning Scheme Policy 3 – Landscape Character Analysis in satisfaction of a Performance Outcome.

Kingaroy Planning Scheme (2006) and Kingaroy Shire IPA Planning Scheme Amendment No. 1 (not dated) and Draft South Burnett Planning Scheme 2016	
The South Burnett SPA Planning Scheme is under development and a draft has t been published. However the Kingaroy Planning Scheme (2006) remains current. No specific scenic amenity values were identified for the portion of the study area that falls within the jurisdiction of the Kingaroy Planning Scheme. However, the following policies from the Kingaroy Planning Scheme have been noted. Additionally the Planning Scheme Amendment has a number of policies noted below.	
Policy / Objective	**Purpose / intent**
Kingaroy Shire Planning Scheme Desired Environmental Outcomes (DEO)	
Part 2: Outcomes: The nature, location, design and operation of development	This DEO requires that development: (f) *minimises conflicts between activities, traffic and infrastructure elements, and maintains the existing and planned character and amenity of the area in which development is located* (p) *protects the scenic values of the diverse rural and natural landscapes in the shire, particularly relative to these seen from major transport corridors and vantage points.*
Planning Scheme Amendment No. 1	
Character and Amenity	This includes a number of provisions in relation to Character and Amenity of the Rural Locality. Including in relation to the type, finish and scale of development to protect the open land extensive character of the rural area. This includes the provision that buildings or structures are not higher than 12 metres "*other than for a Telecommunication facility or a Major utility (Electricity works)*"

Draft South Burnett Planning Scheme (2016)	
The Draft South Burnett Planning Scheme has been published for public review and comment. No specific scenic amenity overlay or policy has been developed within the scheme. The Project Site falls within an area of land zoned Rural with an Infrastructure Corridor (relating to electricity transmission lines) passing through it. The Bunya Mountains are classified as Nature Conservation/Open Space within the Environmental Management and Conservation Zone. The following policies from the Draft South Burnett Planning Scheme have been noted with relevance to landscape and visual amenity.	
Policy / Objective	**Purpose / intent**
Strategic Objectives	
3.3 Rural Futures	This section considers the use of rural areas for non-rural activities stating that: "*Rural areas can provide suitable locations for non-rural activities – including major industries, clean energy projects or resource extraction enterprises – where they hold significant benefits to a local or wider community … The proviso is that due deference is given to overriding considerations relating to the viability of rural activities and the character of rural landscapes.*" It is noted that the Priority Infrastructure Plan Categories classifies Wind farms as 'Low Impact Rural' (Table 4.2.1)
Rural Zone Code	
6.2.13.2 Purpose	The purpose of the rural zone is to allow for rural uses and includes: *(b) provide opportunities for non-rural uses that are compatible with agriculture, the environmental features, and the landscape character of the rural area where they do not compromise the long-term use of the land for rural purposes*"… Relevant outcomes include contribution to the "*rural amenity and landscape of the area*" (g) development that is "*reflective of and responsive to the surrounding character of the area*" (h) and retains, manages and enhances "*natural features such as creeks, gullies, waterways, wetlands and bushland*" (l).

The Queensland Wind Farm State Code requires consideration of local codes (refer PO9 in previous section). As some of the local planning schemes are in draft, the LVIA has proceeded based on current adopted schemes and accepted national and international practice for wind farm assessment.

5.3.1 Relevant guideline and standards

The approach to the LVIA has been developed with reference to accepted guidelines from Australia and elsewhere, including:

- Queensland Wind Farm State Code and Planning Guideline (DILGP, 2016).
- Draft National Wind Farm Development Guidelines (Environment Protection and Heritage Council, 2010)
- The Guidelines for Landscape and Visual Impact Assessment, Third Edition (The Landscape Institute and the Institute of Environmental Management and Assessment, UK, 2013) and previous Second Edition (2002)

Other relevant guidance notes and documentation include:

- Landscape Institute Advice Note 01/09: Use of photography and photomontage in landscape and visual assessment (The Landscape Institute, UK, 2009)
- Topic Paper 6: Techniques and Criteria for Judging Capacity and Sensitivity (Scottish Natural Heritage and The Countryside Agency, UK, 2006)
- Visual Representation of Windfarms: Good Practice Guidance (Scottish Natural Heritage, 2006)
- Siting and Designing of Windfarms in the Landscape (Scottish Natural Heritage, 2009).

5.4 Methodology

5.4.1 Desktop analysis

Key information sources have been identified and reviewed as a component of the desktop analysis. These sources include:

- Relevant planning schemes, policies and guidelines from local councils and the State Government
- Publically available information on recreation spaces and public visitor areas
- Digital aerial photography (imagery dated 2012 from Google Earth)
- Cadastral data (showing roads, property boundaries and built areas)
- Queensland bioregion data
- Existing infrastructure
- Publically available LVIAs that have been prepared for similar projects within the State including the Coopers Gap Wind Farm visual amenity assessment prepared by ERM (2008).

A preliminary desktop analysis of existing landscape character and visual amenity, within the Project Study Area as well as the wider landscape, was undertaken to inform this LVIA. This included analysis of the underlying topography, land cover and high level landscape values. Findings of the desktop analysis were then field checked.

5.4.2 Identification of potential impacts

This component of the LVIA includes a description of infrastructure and exemplar imagery that is associated with the Project (e.g. the presence of wind turbines, substation, access tracks etc.). These potential impacts are further discussed in Section 5.6.

5.4.3 Preparation of zones of theoretical visibility

A ‘Zone of Theoretical Visibility’ (ZTV) comprises a mapped representation of the area within which a proposed development may have an influence or effect upon views and visual amenity. It is often used as a tool to select representative viewpoints for more detailed assessment.

ESRI ArgGIS x10 software has been used to model the ZTV. Using the *Viewshed* analysis tool in ArcGIS, the cells from the Digital Elevation Model (DEM) which are potentially visible from the observation features (wind turbines) and their known elevation heights were identified. Cells in the DEM that are in the theoretical visible line of sight of each wind farm feature are given the value of 1 (visible). Cells that are not in the line of sight of each wind farm feature are given the value of 0 (not visible). The DEM was derived from 5 m contours to produce a raster of 25 m cell size.

It should be noted that the calculation of the ZTVs does not take into account built development, which can locally reduce the availability of receptors views. However, based on field observations, it is considered that because built development within the Project area is generally minimal, it would be unlikely to significantly affect the extent of the ZTVs. ZTVs also do not account for vegetation which can significantly affect visibility locally and over large forested areas.

The ZTVs included in this EIS are based on the turbine layout within the Project Site shown on Figure 2.1 in Volume 2 that comprises up to 102 turbines with a hub height of up to 117 m and a height to blade tip of up to 180 m. It is considered that a layout with 115 turbines would not represent a material change to the ZTVs.

5.4.4 Field survey

Field visits were carried out on 4 November 2010 and 24 January 2011 by a qualified landscape planner with experience in LVIA accompanied by a visualisation professional. At that time footpaths to the Bunya Mountains National Park were closed due to weather conditions. Consequently an additional visit has been undertaken to the National Park over 2/3 April 2016. The field survey has been used to ground truth the findings of the desktop assessment and to undertake an on-site assessment of landscape character and visual amenity. Photographs were taken to:

- Portray landscape character
- Inform the viewpoint assessment from representative viewpoints

- Provide base images for the production of photographic simulations and visualisations.

The field visit focused on those aspects of the landscape with potential to be of the greatest sensitivity to the Project, and to gain an appreciation of those aspects of the Project most likely to affect landscape character and visual amenity.

5.4.5 Landscape character assessment

5.4.5.1 Description of existing landscape character

Landscape character assessment is a tool for identifying what makes one place different from another. It identifies what makes a place distinctive, without necessarily assigning a value to it. This approach has been used to establish the existing character of the landscape and to provide a framework for measuring the impact of the Project on landscape character. A number of 'landscape character types' have been defined that provide a framework for describing these areas methodically. The general character of the landscape is described in Section 5.5.1 whilst the identified landscape character types are described in Section 5.5.2.

The anticipated impact on landscape character has been based on the scale and layout of the Project and how this relates to the characteristics of the receiving landscape. For example, simple large-scale landscapes (such as Image A in Illustration 5.1) are likely to be less sensitive to large scale wind farm developments; while landscapes of small scale (e.g. characterised by relatively 'human scale' buildings and features, such as Image B in Illustration 5.2) would generally be less tolerable of such development proposals.

Image A: Turbines create a simple image in the landscape.

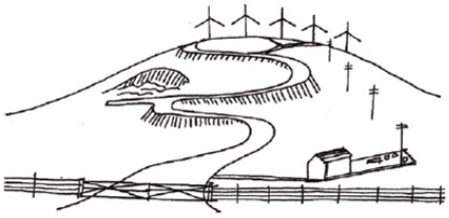

Image B: Turbines create a complex image and conflicts with the small scale landscape character.

[Image source: SNH (2009) *Siting and Designing of Windfarms in the Landscape*]

Illustration 5.1 Comparisons between siting turbines in landscapes of different scale and character

For the purposes of this assessment, the criteria used to define the landscape sensitivity slightly differ to the criteria used in the 2008 LVIA. Based on stakeholder feedback, it was considered that the original sensitivity thresholds may potentially appear to undervalue the scenic and amenity values of modified and/or cultural landscapes such as rural landscapes (judged originally as 'low' landscape sensitivity) and therefore may downplay the significance of the LVIA results.

Unlike other technical disciplines (such as noise) there are no established, measurable thresholds of significance that exist for landscape impacts. The significance of impact is therefore determined by considering the sensitivity of the landscape receptor and the magnitude of change expected as a result of the proposed development as shown in the process diagram in Illustration 5.2.

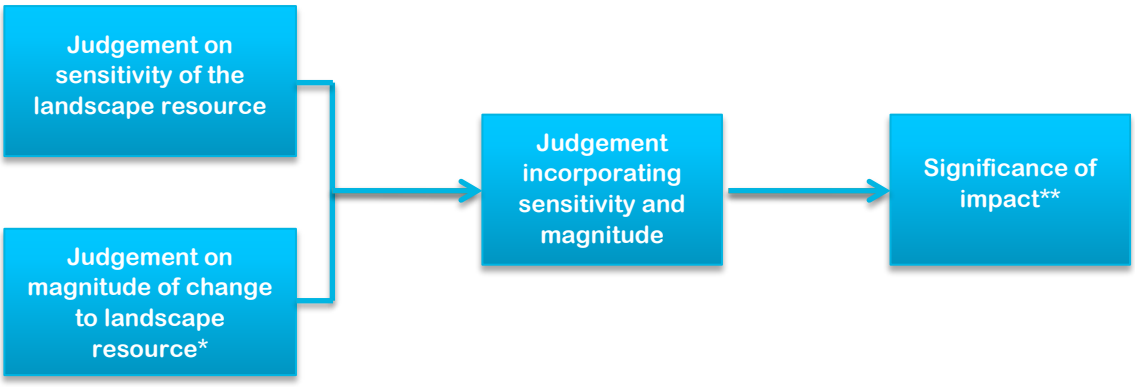

Illustration 5.2 Approach to evaluating the significance of landscape change

* There is no standard methodology for the quantification of the magnitude of effects; however, it is generally based on the scale or degree of change to the landscape resource, the nature of the effect and its duration.

** Overall landscape impact is determined by combining the sensitivity of the landscape resource with the magnitude of landscape change. Professional judgement used to determine the overall significance of impact based on these two elements.

5.4.5.2 Judgement of landscape sensitivity

The sensitivity of a landscape is judged on the extent to which it can accept change of a particular type and scale without adverse effects on existing landscape character. Levels of sensitivity, shown in Table 5.3, vary according to the type of development and the nature of the landscape. Key aspects that have been considered when identifying the level of sensitivity associated with each landscape character type include:

- The landscape's inherent values (e.g. perceptual qualities, cultural importance, and any specific values that may apply such as landscape planning designations, as described in Section 5.3).
- The landscape's ability to absorb changes associated with the Project (e.g. the extent to which the Project may fit or be absorbed into the landform, land use, pattern, scale or texture of the existing landscape).

Table 5.3 Defining landscape sensitivity

Sensitivity of landscape	Attributes of landscape sensitivity categories
High	A landscape protected by national designation and/ or widely acknowledged for its quality and value; a landscape with distinctive character and low capacity to accommodate the type of change envisaged.
Medium	A moderately valued landscape, perhaps a regionally important landscape and / or protected by regional/state designation, or where its character, land use, pattern and scale may have some capacity to accommodate a degree of the type of change envisaged.
Low	A landscape valued to a limited extent, perhaps a locally important landscape or where its character, land use, pattern and scale is likely to have the capacity to accommodate the type of change envisaged.
Negligible	A landscape which is not valued for its scenic quality or where its character, existing land use, pattern and scale are tolerant of the type of change envisaged, and the landscape has capacity to accommodate change.

5.4.5.3 Magnitude of change to landscape character

The magnitude of change to landscape character depends on the nature, scale and duration of the change that is expected to occur. The magnitude of change also depends on the loss, change or addition of any feature to the existing landscape and is based upon that part of the landscape character type which is likely to be impacted to the greatest extent by the Project before the application of any mitigation.

Magnitude of change is described as being Negligible (barely perceptible change), Low (noticeable change), Medium (considerable change) or High (dominant change), as illustrated in Table 5.4. The descriptions of magnitude and sensitivity are illustrative as there is no defined boundary between levels of impacts.

Table 5.4 Defining magnitude of change to landscape character

Magnitude of Change	Typical Examples
High	Dominant change: A clearly evident and frequent/continuous change in landscape characteristics affecting an extensive area, which is likely to fundamentally change the character of the landscape.
Medium	Considerable change: A considerable change in landscape characteristics, frequent or continuous and over a wide area or a clearly evident change, but over a restricted area.
Low	Noticeable change: A noticeable change in landscape characteristics over a wide area or a considerable change over a restricted area, but will not fundamentally change the character of the landscape.
Negligible	Barely perceptible change: An imperceptible, barely or rarely perceptible change in landscape characteristics.

5.4.5.4 Level of effect on landscape character

An evaluation of overall potential effects on landscape character is based on the sensitivity of the existing landscape to change and the magnitude of change that is likely to occur. No prescribed methods for assessment of significance of landscape impacts exist; therefore professional judgement and experience are applied in order to identify the level of significance. Each landscape character type is assessed on its own merits, as factors unique to each circumstance need to be considered. However, there are general principles which can be used as a guide to this process that provide transparency about how judgements have been made. The overall significance of change to landscape character is determined by using Table 5.5.

Table 5.5 Determining level of effect on landscape character

Level of effect		Magnitude of change in landscape			
		High (Dominant change)	**Medium (Considerable change)**	**Low (Noticeable change)**	**Negligible (Barely perceptible change)**
Sensitivity of landscape	**High**	**Major**	**Moderate to Major**	**Moderate**	**Minor to Moderate**
	Medium	**Moderate to Major**	**Moderate**	**Minor to Moderate**	**Minor**
	Low	**Moderate**	**Minor to Moderate**	**Minor**	**Minor to Negligible**
	Negligible	**Minor to Moderate**	**Minor**	**Minor to Negligible**	**Negligible**

Denotes a 'Significant' impact.

Denotes a 'Not Significant' impact.

5.4.6 Visual amenity assessment

5.4.6.1 Identification and description of visual receptor audiences and viewpoints

Visual receptor audiences are assessed and described in terms of the views which can be obtained from selected representative viewpoints within the Project Study Area. Representative viewpoints have been identified and described as part of the LVIA. Visual receptors have been identified based on a number of parameters, including:

- Proximity of the receptor, i.e. that the most effected visual receptors are anticipated to be located within a 5 km radius of the Project unless located at an elevated vantage point
- Type of visual receptor, i.e. that the visual receptor is a permanent resident of a residential dwelling or homestead

- Drivers or passengers of vehicles passing through, or alongside, the Project Study Area
- A member of the public accessing marked recreational areas (e.g. National Parks, cycle ways and footpaths)
- An industrial or commercial worker (excluding those employed as part of the Project).

These visual receptor audiences and representative viewpoints are discussed further in Section 5.5.5. Technical information on photographic techniques can be found alongside individual viewpoint images.

5.4.7 Preparation of photomontages

Photomontages are illustrations that aim to represent an observer's view of a proposed development. For the purposes of this assessment, photomontages have been compiled to appreciate the potential visual impact of the presence of the Project from a selection of the representative viewpoints, which are described in Section 5.5.7 and illustrated in A3 format (see Volume 2). Previous versions of these images have been available in A1 format at public consultation events (representing layout options that were current at the time of the display).

The methodology for the visualisation production has been based on the Draft National Wind Farm Development Guidelines (Environment Protection and Heritage Council, 2010) and International guidance including the Guidelines for Landscape and Visual Impact Assessment Second Edition (2002) and Third Edition (2013) and the Visual Representation of Windfarms: Good Practice Guidance (SNH, 2006).

The photomontages have been generated using digital photographs, ESRI ArcGIS software, 3D modelling software (Autodesk 3ds Max and/or Rhino 3d) to generate the wireline diagrams or 'wireframes', and rendering software (Adobe Photoshop). It should be noted that every reasonable effort has been made to ensure the images are representative and have not been manipulated to downplay the extent of impact. This has, for example, included ensuring that the rendering provides an adequate 'contrast' between the turbine and background elements (e.g. lighter rendering against a dark backdrop and vice versa).

To ensure the photomontages consistently present a view which is representative of the human eye, the majority of the assessment photographs were taken at average human viewing height with a very high quality extreme wide-angle lens on a digital single lens reflex (SLR) camera with a fixed focal length lens set to a 75° field of view allowing one frame per viewpoint (thus avoiding distortion by 'stitching' several images together to make a panorama). The only exception to this is the view from Mt Kiangarow that was taken using a 35° focal length on a cropped sensor digital camera – these images were photo-stitched to produce a field of vision of approximately 70°. Although the parameters of human vision when stationary is often quoted as falling between the 45-60°(SNH, 2006), humans generally move their eyes, heads and bodies as necessary to experience a view. Therefore, a wider field of view (75°) has been used for the photomontages, which is in line with good practice[1].

It is important that photomontages are viewed at the correct 'viewing distance'. Very simply, if the hard copy of the photomontage is held too close to the eye, the elements in the scene will appear too big; if it is held too far away, the elements will appear too small; and there is only one distance at which the photograph will match the real scene (the correct viewing distance). This concept is demonstrated in Illustration 5.3.

[1] The *Draft National Wind Farm Development Guidelines* (EPHC, 2010) states *"In creating a photomontage... depictions should not exceed 124º horizontal field of view"*. In addition, the *Visual Representation of Windfarms Good Practice Guidance* (SNH, 2006) notes that "*the size of photograph required to represent a view will vary for different projects and viewpoints, depending on the key characteristics of a view that need to be included within the image (defined by the landscape architect or experienced specialist assessor on site), and the extent of the proposed windfarm which needs to be included*".

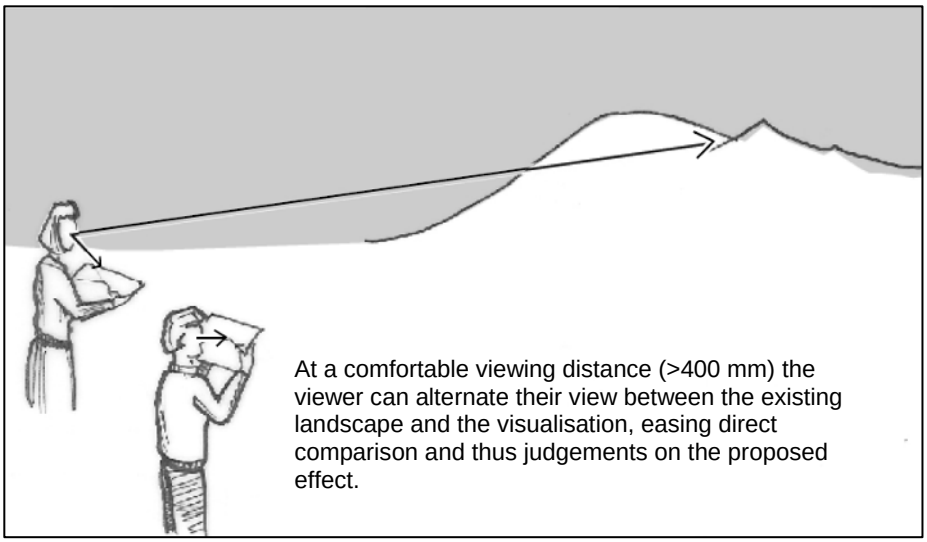

Illustration 5.3 Use of a comfortable viewing distance

Image source: Scottish Natural Heritage (2009) Siting and Designing Windfarms in the Landscape.

The photomontages have been illustrated on both A3 and A1 landscape pages cropped to a 3:1 aspect ratio. The recommended viewing distance for each photomontage is noted on the title block of the photomontages, and has been determined by the image size and field of view. Larger sized photomontages (A1) were developed to enable image clarity and a more comfortable viewing distance (528 mm), which is in line with good practice guidance, for community consultation. The A1 photomontages have not been included in this report.

Photomontages have been prepared to represent a nominal turbine layout comprising 102 turbines with a hub height of 117 m and a height to blade tip of 180 m.

5.4.7.1 Judgement of visual sensitivity

The sensitivity of each viewpoint, and the visual receptor audiences which it represents, is considered to be dependent upon:

- The importance of the view, its existing scenic qualities and the presence of other existing man-made elements in the view
- The type of the visual receptor audience and their likely interest in the view (e.g. residents, visitors to important/valued landscapes or visitors to non-designated areas, motorists)
- The volume of visual receptors and the duration of time that receptors spend experiencing the view.

The Guidelines for Landscape and Visual Impact Assessment (2002) states "*changes affecting large numbers of people are generally more significant than those affecting a relatively small group of users. However, in wilderness landscapes the sensitivity of the people who use these areas may be very high and this will be reflected in the significance of the change*." Similarly The Guidelines for Landscape and Visual Impact Assessment (2013) states the visual receptors most susceptible to change include "… *residents at home…people, whether residents or visitors who are engaged in outdoor recreation, including use of public rights of way whose attention or interest is likely to be focused on the landscape and on particular views; …communities where views contribute to the landscape setting enjoyed by residents in the area*". This guidance is reflected in the method used to assess the sensitivity of the viewpoints to the Project e.g. views from a regionally important location whose interest is specifically focussed on the landscape (such as views from BMNP) have been judged as having a *high* sensitivity to change as have large numbers of residential viewers.

Levels of sensitivity, shown in Table 5.6, vary according to the type of development and the visual receptor audience.

Table 5.6 Defining viewpoint sensitivity

Sensitivity of viewpoint	Attributes of viewpoint sensitivity categories
High	Large numbers of viewers or those with proprietary interest and prolonged viewing opportunities such as residents and users of attractive and/or well-used recreational facilities. Views from a regionally important location whose interest is specifically focussed on the landscape e.g. BMNP.
Medium	Medium numbers of residents (e.g. rural communities and townships) and moderate numbers of visitors with an interest in their environment e.g. visitors to State Forests, including bush walkers, horse riders, trail bikers. Larger numbers of travellers with an interest in their surroundings e.g. designated scenic routes.
Low	Small numbers of visitors with a passing interest in their surroundings e.g. those travelling along principal roads. Viewers whose interest is not specifically focussed on the landscape e.g. workers, commuters.
Negligible	Very occasional numbers of viewers with a passing interest in their surroundings e.g. those travelling along minor roads and views from the air.

5.4.7.2 Magnitude of change to visual amenity from representative viewpoints

The magnitude of change to views and visual amenity depends on the nature, scale and duration of the change that is expected to occur. The magnitude of change also depends on the loss, change or addition of any feature in the field of view of the receptor; or any change to the backdrop to, or outlook from, a viewpoint. The assessment assumes a worst case turbine height, without mitigation. The level of effects on a view depend on the extent of visibility, degree of obstruction of existing features, degree of contrast with the existing view, angle of view, duration of view and distance from the Project.

Magnitude of change is described as being Negligible (barely perceptible change), Low (noticeable change), Medium (considerable change) or High (dominant change), as illustrated in Table 5.6.

Table 5.6 Defining magnitude of change to visual amenity

Magnitude of change	Typical examples
High	Dominant change: Major changes in view at close distances, affecting a substantial part of the view, continuously visible for a long duration, or obstructing a substantial part or important elements of view. Generally <3 km* to the nearest turbine and one or more wind turbines visible in their entirety.
Medium	Considerable change: Clearly perceptible changes in views at intermediate distances, resulting in either a distinct new element in a significant part of the view, or a more wide-ranging, less concentrated change across a wider area. Generally 3 km - 8.5 km* to the nearest turbine and generally the entire swept path of the blades of one or more wind turbines visible.
Low	Noticeable change: Minor changes in views at long distances or visible for a short duration, and/or are expected to blend in with the existing view to a moderate extent. Generally 8.5 km - 17 km* to the nearest turbine and at least half the swept path of one or more wind turbines visible.
Negligible	Barely perceptible change: Change which is barely visible at a very long distance or visible for a very short duration, and/or is expected to blend with the existing view. Generally >17 km* to the nearest turbine and only a small part of one or more wind turbines visible.

* These distances are based on the 2008 LVIA (ERM,2008) which were established through the zones of visual influence.

5.4.7.3 Overall significance of impact on visual amenity from representative viewpoints

The evaluation of overall potential impacts on visual amenity is based on the sensitivity of existing views to change and the magnitude of change that is likely to occur. No prescribed methods for assessment of significance of impacts on visual amenity exist; therefore professional judgement and experience are applied in order to identify the level of significance. Each viewpoint is assessed on its own merits, as factors unique to each circumstance need to be considered. However, there are general principles which can be used as a guide to this

process; which provides transparency about how judgements have been made. The overall significance of change to visual amenity and individual viewpoints is determined by using Table 5.7.

Table 5.7 Determining level of effect on visual amenity

Level of effect		Magnitude of change in landscape			
		High (Dominant change)	**Medium (Considerable change)**	**Low (Noticeable change)**	**Negligible (Barely perceptible change)**
Sensitivity of landscape	**High**	**Major**	**Moderate to Major**	**Moderate**	**Minor to Moderate**
	Medium	**Moderate to Major**	**Moderate**	**Minor to Moderate**	**Minor**
	Low	**Moderate**	**Minor to Moderate**	**Minor**	**Minor to Negligible**
	Negligible	**Minor to Moderate**	**Minor**	**Minor to Negligible**	**Negligible**

Denotes a 'Significant' impact.

Denotes a 'Not Significant' impact.

Impacts which are graded as being 'Moderate', 'Moderate to Major' or 'Major' are those which are given greatest weight, relative to other levels of landscape impact, in decision making. They usually concern immediate landscapes around proposed wind farm sites and close views seen by sensitive viewers. 'Minor to Moderate' levels of impact are of progressively reducing importance. Impacts graded as 'Minor' also constitute effects which warrant consideration, but individually carry little weight in the decision making process.

Impacts on the visual resource have been described by representative views in the Project Study Area. Impacts can be short term (i.e. those occurring during installation/construction of a development) or long term (i.e. those lasting for the life time of the Project). In addition, they can be wide-spread (i.e. taking up a large proportional change in the view) or localised.

As stated previously, the impact or effect of a wind farm is a subjective issue. Whilst some people regard wind turbines as attractive, graceful structures that symbolise clean energy; others find wind turbines unattractive and an unwelcome addition cluttering the skyline. For the purposes of this assessment, subjective interpretation of the Project has been avoided; rather, the focus has been directed on the significance of the impact (i.e. a transparent judgement on the sensitivity of the visual resource, combined with the anticipated magnitude of change to the view).

5.4.8 Cumulative landscape and visual impact assessment

The aim of the cumulative LVIA is to describe and assess the ways in which the Project could have additional impacts when considered in combination with other proposed and built developments in the area.

Information to inform the cumulative LVIA is based on descriptions of other similar scale projects to the extent that such data was publicly available at the time of this assessment. The cumulative situation may change as applications are made or withdrawn. Therefore, the cumulative assessment is current as of March 2016.

The cumulative impact assessment methodology follows a qualitative method similar to the main LVIA assessment; including a three step process, as follows:

- **Step One:** Identification and description of existing projects within the Project Study Area.

  The projects included in the cumulative assessment are those that have been approved by the Queensland Coordinator-General or have sufficient information in the public domain (e.g. an environmental impact statement) to enable an assessment of the potential impacts. Projects included for consideration in the cumulative impact assessment also need to be located sufficiently close to the Project for cumulative landscape and visual effects to be possible.

- **Step Two:** Project screening i.e. exclusion of projects anticipated to generate a negligible cumulative impact on landscape and visual amenity.

  A provisional review has been conducted to streamline the assessment process to eliminate, or scope out projects, which are anticipated to generate negligible landscape and visual impacts. The inclusion of a site is based on a judgement of whether views of the Project and the other development are anticipated at the same time.

- **Step Three:** Assessment of cumulative landscape and visual impacts.

  This step determines the nature and extent of potential impacts in relation to landscape and visual values of the region, as determined through the assessment criteria in the main LVIA. The assessment considers if the cumulative impact would be “combined” (two or more projects visible from one viewpoint), “successive” (two or more projects visible from one location and with the same viewfield), or “sequential” (developments viewed at different times e.g. passing along a road).

5.5 Existing environmental values

5.5.1 Regional context

The Project is located in the Cooranga North area, in central southern Queensland. The Project Site straddles the northern part of the Great Dividing Range, between Kingaroy (approximately 50 km north east of the Project Site) and Dalby (approximately 65 km south of the Project Site). The nearest township to the Project is Bell, located approximately 15 km to the south and comprises a population of approximately 270 (2011 ABS Census Data). The Bunya Mountains provide a distant backdrop to the south-east of the Project Site, including elevated densely forested ridges and peaks reaching up to 1,136 m AHD at Mt Kiangarow. See Figures 1.1 and 2.1 (in Volume 2) for the Project Site location and surrounding context, including its proximity to the BMNP.

Landform within the Project Study Area is varied, consisting of gently undulating plains and valleys, rolling hills and ridges, extensive areas of native open forest and low-lying fertile arable plains. The landform, vegetation and land use strongly correlates to the underlying geology and soils. These broadly comprise volcanic uplands (mostly Main Range Volcanics associated with the Bunya Mountains); sodosol soils mostly covered by native open forest; smoothly rolling pastoral plains comprising chromosol and vertosol soils; and distinctive Red Ferrosol soils associated with Kingaroy. Figure 5.2 (Volume 2) illustrates the varied landform within the Project Study Area. The main creeks through the area include; Downfall Creek to the south, and Jandowae, Jingi Jingi and Mount Ivory Creeks to the west, which flow into the Condamine catchment. (Ironpot and Boughyard creeks flow to the north flow into the Burnett catchment (see Figure 5.2, Volume 2).

Many parts of the Project Study Area’s landscapes have been shaped by settlement and use of the landscapes by people. Existing land use within and adjacent to the Project Study Area is predominantly rural, characterised by pastoral or grazing properties for livestock production (predominantly cattle), within the localities of Cooranga North, Bilboa, Boyneside and Ironpot (see Figure 11.1, Volume 2). The main roads providing access to the Cooranga North region include the Bunya Highway, linking Kingaroy with Dalby. The majority of local roads within the Project Study Area are gravel / unsealed roads, including Kingaroy Niagara Road, Ironpot Creek Road, Cooranga North-Niagara Road and Kingaroy-Jandowae Road (partly sealed).

There is little built infrastructure in the local area with the exception of electricity transmission lines. In the wider landscape, the presence of infrastructure is increasing as a result of road upgrades, liquefied natural gas projects with associated wells and new/upgraded electricity transmission facilities to service the growing region. This includes the new Western Downs Substation and associated 275 kV transmission line and Surat Basin to Halys 500 kV transmission line. While these types of infrastructure decrease the perceived naturalness of the landscape they are a familiar component of the Queensland rural landscape.

5.5.2 Landscape character

Five landscape character types have been identified within the Project Study Area. These are identified in Figure 5.3 (Volume 2) and described in Table 5.8 to Table 5.12. These are:

- Type A: Undulating Foothill Plains and Valleys
- Type B: Rolling Hills and Ridges with Open Forest
- Type C: Lowland Native Forest
- Type D: Forested Volcanic Uplands

- Type E: Settled Red Soil Plains.

Table 5.8 Summary description of landscape character Type A within the Project Study Area

Type A: Gently Undulating Foothill Plains and Valleys	
Landscape Baseline Assessment	
Location and boundaries	This landscape covers a large part of the Project Study Area, generally located at the foothills of the Great Dividing Range in the northern and south eastern parts of the Project Study Area.
Typical character images: 	
Key characteristics	- Fairly open low-lying landscape of smoothly rolling plains, comprising chromosol and vertosol soils. - Remnant patches of Eucalypt forest nestled amongst surrounding hills and ranges. - Gentle undulations and depressions associated with watercourses and dams. - Long distant views to the Great Dividing Range (including the Bunya Mountains) provide a backdrop to this landscape. - Predominantly open plains of grazing pastures for cattle, with occasional areas of arable farmland, including terraces. - Groups of mature grass trees (*Xanthorrhoea* species) amidst pasture fields and hills are a particularly distinctive and memorable feature of this landscape (e.g. near Niagara Road). - Sparsely settled landscape, comprising only isolated property homesteads and cottages. - Other built elements include roads, fencelines, cattle yards and powerlines. - Strong rural character with a perceived sense of remoteness and tranquillity away from main roads.
Precedent modifications and infrastructure elements	- This is a sparsely settled landscape with a notable absence of large scale infrastructure or built elements; with the exception of telecommunication infrastructure (including telegraph poles and the recently-constructed 275 kV transmission lines which traverse the southern part of the study area between the Bunya Highway and Cooranga North-Niagara Road, linking to Western Downs and Halys Power Substations). - The landscape has been modified for agricultural practices, including clearing of land for cultivation of dryland arable farmland (e.g. oats, wheat, canola), pasture improvement for grazing of cattle and occasional fields of Leucaena (an exotic high-protein legume fodder crop used for cattle feed). - Construction of stock fencing (typical post and wire style), gates and grids, small dams, stock wells, windmills, and occasional yards and machinery sheds in grazing areas. - The Wild Dog Barrier Fence (or 'Dingo Fence') traverses this area in a northerly direction, starting near Jimbour-Cooranga Road. - Construction of roads, bridges and tourist trails (e.g. 'Great Bunya Drive' (between Toowoomba and Gympie) and 'Rural Getaway' (between Mundubbera and Warialda)).

Table 5.9 Summary description of landscape character Type B within the Project Study Area

Type B: Rolling Hills and Ridges with Open Forest	
Landscape Baseline Assessment	
Location and boundaries	This landscape covers a large part of the Project Site and is largely defined by the elevated hills and ridges of the Great Dividing Range. Due to its elevated exposed character, the majority of turbines would be located within this landscape.
Typical character images: 	
Key characteristics	- A pronounced, elevated landscape of smoothly rolling hills, ridges and deep incised valleys, which has evolved from an underlying volcanic geology (mostly Main Range Volcanics). - Simple, large scale landform with a prominent and mostly unbuilt skyline. - Partially cleared for grazing pastures and interspersed with open Eucalypt forest and dense vine thicket / low scrub. - Gently sloping hill sides are often cultivated through use of contour banks, which accentuate the variation in landform and provide a strong landscape pattern (e.g. near the Kingaroy-Jandowae Road / Bunya Highway junction). - Tall grass trees (*Xanthorrhoea glauca*) are a particularly distinctive feature in this landscape. - The pronounced landform allows expansive views over the surrounding mostly rural landscape, including long distant views to BMNP (to the south-east) and settled arable plains near Jimbour and Jandowae (to the south-west) from the hills between the Bunya Highway and Niagara Road. - Despite some pastoral grazing areas, the landscape is sparsely settled and comprises a strong sense of remoteness and tranquillity.
Precedent modifications and infrastructure elements	- The landscape has been modified for agricultural practices, including clearing of land for grazing of cattle and associated construction of stock fencing (typical post and wire style), gates, small dams and stock yards. - The only large scale infrastructure or built elements include telegraph poles and the recently-constructed 275kV transmission lines which traverse the southern part of the project site between the Bunya Highway and Cooranga North-Niagara Road. - Construction of roads, bridges and tourist trails, e.g. ‘Great Bunya Drive’ (between Toowoomba and Gympie).

Table 5.10 Summary description of landscape character Type C within the Project Study Area

Type C: Lowland Native Forest	
Landscape Baseline Assessment	
Location and boundaries	This landscape extends across the northern and western parts of the Project Study Area and is largely defined by the densely forested lowlands. It covers several State Forests, including Mahen State Forest, Jandowae State Forest and Diamondy State Forest.
Typical character images: 	
Key characteristics	- Sodosol soils (mostly grey) comprise a gravelly, sandy character; often exposed in areas and vulnerable to tunnel and gully erosion. - Undulating landform incised by several narrow dry gullies and creeks. - Key vegetation communities include Callitris forest (e.g. *Callitris glaucophylla*, *Allocasuarina luehmannii* and *Eremophila mitchellii*) and Eucalypt/Corymbia open forest (e.g. *Corymbia citriodora* and *Eucalyptus Crebra*). - Occasional cleared areas used for native pasture grazing, mainly by beef cattle. - Sparsely settled character with little modifications (albeit roads, access roads, and fence lines e.g. the 'Dingo Fence'). - Generally comprises a high level of naturalness with a strong sense of remoteness and a sparsely settled character. - Dense forest provides an important natural element and visual backdrop to the wider landscape. - Strong sense of enclosure when travelling through this landscape.
Precedent modifications and infrastructure elements	- Very few; only roads, unsealed access roads, bridges and fences.

Table 5.11 Summary description of landscape character Type D within the Project Study Area

Type D: Forested Volcanic Uplands	
Landscape Baseline Assessment	
Location and boundaries	Typically defined by the elevated plateau and undulating hills of the Great Dividing Range; particularly BMNP.
Typical character images: 	
Key characteristics	- Underlying geology of Main Range Volcanics (thought to be the remains of an old shield volcano), overlain by nutrient-rich, red-brown and black Dermosol soils. - Rising abruptly from the surrounding plains, the landform consists of prominent steep hills and mountains with deep moist gullies. - Maximum height of approximately 1,136 m AHD, at Mt. Kiangarow. - Subtropical rainforest is a defining feature of this landscape, comprising the largest stand of ancient bunya pines (*Araucaria bidwillii*) in the world and Red Cedar (*Toona ciliata*). - Other key vegetation communities include dry rainforest, range-top grasslands (locally known as 'balds'), open forests and woodlands. - On steep, lower slopes, hoop pines (*Araucaria cunninghamii*) emerge above dry rainforests and vine thickets. - On some lower western slopes, brigalow (*Acacia harpophylla*) and belah (*Casuarina cristata*) forests and bottle-tree scrubs occur. - Contains rare and threatened plants including orchids and small herbs. - The concentration of Red Cedar, hoop and bunya pines attracted a logging industry during the 19th Century, including tramways and up to 25 sawmills, each with its own small community of workers and their families. The final sawmill at Wengenville closed in 1961 and the tramway was dismantled. - Includes picnic and camping areas (at Dandabah, Westcott and Burtons Well), holiday accommodation (including cabins and guesthouses) and more than 35 km of walking tracks for visitors to the National Park. - Strong sense of enclosure in densely forested areas. - The vast tracts of native forest and grassland areas evoke a strong sense of naturalness, remoteness and tranquillity.
Precedent modifications and infrastructure elements	- Very few modifications and infrastructure elements other than roads (e.g. Bunya Mountains Road), access roads, fences, and visitor facilities and amenities (e.g. walking tracks, lookouts/landings, interpretative signage, parking areas, cabins, guesthouses). - Traces of the former timber / logging industry, e.g. Carbine's chute (an earthen trench running almost vertically down the mountain, used to transport logs to the valley below).

Table 5.12 Summary description of landscape character Type E within the Project Study Area

Type E: Settled Red Soil Plains	
Landscape Baseline Assessment	
Location and boundaries	This landscape type is located in the north-eastern part of the Project Study Area, at the northern foothills of the Great Dividing Range, surrounding Kumbia.
Typical character images: 	
Key characteristics	- Volcanic geology (consisting of basalt and granite) overlain by Red Ferrosol soils. - Soils contain high levels of iron, which produces distinctive fertile red clay loams. - Mildly undulating landscape with an open and exposed character with long distant views and strong skylines. - Land use is primarily arable farmland with a variety of broadacre field crops (depending on season, water availability and commodity demands), including peanuts, sunflowers, wheat and lucerne. - Transport corridors are straight in character, reflecting the flat topography and often with minimal road-side vegetation. - Sparsely settled landscape, with only property homesteads and cottages, and rural towns such as Kumbia and Kingaroy (to the northeast of the study area). - Harmonious rural character, which is valued and celebrated by local communities and visitors.
Precedent modifications and infrastructure elements	- This landscape has been modified for agricultural practices, including clearing and levelling of land for cultivation of arable farmland, and to a lesser extent, pastures for grazing of cattle and sheep. - Construction of roads, railways and bridges. - Telecommunication infrastructure (e.g. telegraph poles and large-scale pylons which traverse the landscape in a northerly direction west of the Bunya Highway / Youngmans Road junction).

5.5.3 Residential properties

Potential impacts on residential properties were largely addressed through the selection of public viewpoints close to affected residential viewers. In addition, some specific impacts on residential viewers were assessed based on the identification of viewers with specific concerns as identified through AGL's community consultation process. It is noted that the 2008 LVIA (ERM, 2008) undertook community consultation with owners of residential dwellings on properties not financially involved in the Project, whose properties were located in closest proximity to the Project (that is, within 3 km of the nearest wind turbine[2]).

Of the 41 non-participating landowners (mostly rural homesteads) located within 3 km of the nearest wind turbines, only one property owner was identified through the community consultation process as having significant concerns regarding the visual impact. This property owner was particularly concerned with changes to the value

[2] It is considered that within 3 km, turbines with a blade tip height of up to 180m will be clearly evident, and in some cases, visually dominating elements in the landscape. Beyond 3 km, this change is anticipated to reduce, due to the reduction in visibility and associated ability to affect the inherent character of the landscape. This sensitivity distance is supported by past Victorian Planning Panel decisions and recent New South Wales Land and Environment Court decisions.

of the property (currently uninhabited), rather than the potential reduction of visual amenity. In addition, the 2008 LVIA (which was based on a greater number of turbines but smaller (130 m) turbine) found that "*no major concerns were expressed regarding the visual impact of the wind turbines and the general community consensus at the Open Day was positive towards the proposed wind farm*". Even non-participating landowners, with no direct financial gain from the Project, apparently indicated an appreciation for the potential contribution of the Project to the overall community benefit.

However, during the 2011 Initial Assessment Report Submission period, a total of 16 responses were received from submitters that raised concern about rural amenity and visual impact concerns – a number of whom are residents in the area surrounding the proposed wind farm site.

The final selection of viewpoints described in Section 5.6.4 was based on a robust assessment of those properties likely to be affected by the Project as assessed through the site visit, the Project description and the ZTV studies. It has also considered the information collated in the 2008 LVIA and later consultation undertaken by AGL.

5.5.4 Community perception

Community perception of wind farms is an important consideration in assessing the landscape and visual impact of a project. This is related to people's attitudes to 'green' or renewable energy as well as their reaction to the physical presence of wind turbine infrastructure in the landscape.

The 2008 LVIA (ERM, 2008) reported on a number of studies which discuss public opinion on wind farms. The key relevant observations from that study are summarised below:

- No research on public opinion of wind farms has yet been undertaken in Queensland
- Overseas and national research suggests that 60-70% of people generally find wind turbines an attractive element in the landscape, with up to 15% of respondents undecided and 20% disliking wind farms
- Other types of large infrastructure projects (such as transmission lines, mines and road corridors) tend to have a lower level of acceptance by the community. The greater degree of acceptance of wind farms tends to relate to their sculptural form and their presence as a symbol of renewable energy. By way of contrast, their opponents believe they are unattractive 'industrial' intrusions that clutter the skyline
- Studies suggest that acceptance tends to increase the further a wind farm is located from a respondent's home. For example, a study from the Southern Tablelands suggests that 83% accepted a wind farm at 10 km (8% opposed) with a decrease to 71% in favour (19% opposed) within 1 km
- Studies from the United Kingdom suggest that concerns about noise and visual impact generally decrease once a wind farm is in operation i.e. familiarity tends to increase acceptance (rather than increase opposition).

Since that time, additional academic research has been undertaken both in Australia and overseas. This research has been reviewed to inform the current LVIA. Hall, Ashworth and Devine-Wright (2013) in their paper *Societal acceptance of wind farms: Analysis of four common themes across Australian case studies* examined seven case studies which identified strong community support for wind farms generally, but local opposition to specific proposed wind farm schemes based on four key themes including place attachment. The findings note "*a 'silent majority' of rural residents who do not explicitly demonstrate support through media attention or political engagement*". However, they note research indicating the impact of visual changes to a place or landscape can significantly influence attitudes towards a wind farm and highlight the sense of attachment of participants to their local landscape concluding that "*such amenity concerns are highly subjective, difficult to quantify and to compensate if at all*".

Wilson and Dyke (2015) in their research *Pre and post-installation community perceptions of wind farm projects: the case of Roskrow Barton* identified the complexity of determining and addressing community attitudes to wind farms noting that "*the value that individuals attribute to the countryside varies from person to person depending on experience and memories. Judgement is, thus, subjective with some disliking the appearance of wind farms and finding them ugly, whereas others only see graceful structures*". Their research concluded that (for this example), "*although negative perceptions can be found both pre-and post-installation, collectively the community have become used to the turbines and that attitudes have generally become more favourable*".

Local resident opinion has been provided through the submissions on the 2011 Initial Assessment Report. These studies and comments indicate that there is some opposition to the Project by local residents on the grounds of visual, landscape and 'rural' amenity. Since a wide-scale survey has not been undertaken it is not possible to

quantify the extent of the local community who currently support or object to the Project on landscape or visual grounds.

While community perception of wind farms is an important consideration in assessing the landscape and visual impact of the Project, the research and reaction of the local community to the Project indicates that wind farms evoke a subjective response and arouse a wide range of opinion. Therefore, for the purposes of this assessment, subjective interpretation of the Project has been avoided. As previously stated, the focus has instead been directed to determining the significance of the impact (i.e. a transparent judgement on the sensitivity of the landscape resource, combined with the anticipated magnitude of change).

5.5.5 Visual amenity

The visual baseline has been assessed and described in terms of views from selected representative viewpoints within the Project Study Area. It is considered that the viewers (visual receptors) who may experience views of the Project are likely to include:

- Residents living on rural properties (including homesteads and cottages) in proximity to the Project
- People working in the countryside
- Recreational users of the landscape on foot or vehicle, including those visiting BMNP
- Tourists passing through the Project Study Area by vehicle, including travellers along designated scenic routes (e.g. 'Great Bunya Drive' and 'Dingo Fence Tourist Drive' between Cooranga North, Jandowae and Jimbour)
- Travellers using major and minor roads within the Project Study Area, including motorists on the Bunya Highway.

Figure 5.4 (Volume 2) shows the locations of key tourist drives and walking tracks. Based on an understanding of the Project in relation to the key views and viewers likely to be affected, 12 viewpoints were selected for detailed assessment through the LVIA process. These views are not exhaustive but are intended to be representative of the range of views likely to be experienced and the range of receptor groups likely to be affected by views of the Project. The selected viewpoints are provided in Table 5.13:

Table 5.13 Selected viewpoints

Viewpoint	Description
VP1	Niagara and Jarail Road Junction
VP2	Niagara Road
VP3	Niagara Road East
VP4	Kingaroy-Jandowae Road
VP5	Bunya Highway North
VP6	Ironpot Road
VP7	Mt Kiangarow summit, Bunya Mountains National Park
VP8	Bunya Highway South
VP9	Boiling Springs Lookout
VP10	Diamondy Road
VP11	Cooranga North
VP12	Ironpot Creek, Niagara Road

It should be noted that these viewpoints differ somewhat from those selected and represented in the 2008 LVIA (ERM 2008) which were discussed and agreed with the local community during the 2008 consultation. Although the viewpoints selected at that time represented a good range of views and types of viewers likely to be affected by the Project, the layout has since changed. Accordingly, three additional viewpoints have been selected to represent the current Project Site layout, including:

- Representative views from a publicly-accessible recreational trail within BMNP in place of the 2008 LVIA Viewpoint 7 from Bunya Mountains Road (VP7)
- Views from a publicly-accessible local road (Niagara Road) which also represents views from a nearby residence located in close proximity to the Project (VP2)
- Representative views from Cooranga North (VP11).

Particular viewpoints that have been selected to represent views that may be obtained by typical residential viewers include:

- A viewpoint representing views from Cooranga North township (refer to VP11)
- One property centrally located amongst the Project, along Niagara Road; whose owner has raised concerns regarding the scheme, including the visual impact on the property homestead (refer to VP12)
- VP6: Ironpot Road
- VP8: Bunya Highway South.

The viewpoint selection process has been informed by 3D modelling and ZTV mapping (to indicate what areas are likely to have views of the Project) and verification in the field, to ensure the selected viewpoints represent the 'worst-case' scenario for a range of likely viewers. The selected viewpoints are identified in Figure 5.5 (Volume 2) and described in Section 5.6.4. The location of each viewpoint was recorded on site using a hand-held GPS unit.

5.5.6 Zone of theoretical visibility mapping

A ZTV map (also known as a "Zone of Visual Influence", "Visual Envelope Map" or "Viewshed") has been used as a tool to represent the area, over which the Project may theoretically be seen, based on terrain data (i.e. Digital Terrain Model). The idea of the ZTV mapping is to illustrate areas of the landscape from which the turbines would be potentially visible. For the purposes of this assessment, the ZTV has also been used to inform the selection of representative viewpoints as described above.

Based on the identification of key issues associated with the baseline assessment, ZTV maps were compiled to reflect a nominal layout and turbine height for a potential illustrative turbine development scenario:

- A ZTV to 'blade tip' which shows potential visibility of one or more wind turbines up to its highest point. Figure 5.6, Volume 2 indicates if any blade tips will be visible and Figure 5.8, Volume 2 indicates how many of the turbine tips will be theoretically visible (i.e. up to 20 turbines, 21 to 40 turbines, 41 to 60 turbines, 61 to 80 turbines, 81 to 102 turbines)
- A ZTV to 'hub' or 'nacelle' height which shows potential visibility of one or more wind turbines up to the height of its hub or nacelle. Figure 5.7, Volume 2 indicates if any turbine hubs will be visible and Figure 5.9, Volume 2 indicates how many of the turbine hubs will be visible (i.e. up to 20 turbines, 21 to 40 turbines, 41 to 60 turbines, 61 to 80 turbines, 81 to 102 turbines).

In interpreting the ZTV mapping, three important issues need to be recognised:

- The accuracy of the ZTV is affected by the limitation of the DEM used to establish the surface elevation (AHD), which consisted of a 25 m grid
- The ZTV mapping is based on the ground surface elevation only, and does not take account of detailed variations in ground plane such as intervening vegetation, buildings or minor changes in topography, such as road cuttings. Where such features intervene between the viewer and the proposed wind farm (e.g. tree belts alongside roads, forested areas such as the BMNP), then this local visual screening may reduce the visibility of the project – often substantially
- The ZTV mapping is based on an example layout and is for illustrative purposes only. Turbines and ancillary wind farm infrastructure may be situated in different locations but still within the Project Site. The mapping is considered to represent a reasonable assessment of potential views of the Project once operational.

5.5.7 Photomontages

Photomontages have been prepared for all of the 12 photographed viewpoints where it was assessed that views of the wind farm would be possible. Therefore, the photomontage viewpoints represent a range of viewer types (e.g. residents living on rural properties, recreational visitors, tourist travelling along designated routes) with the greatest visual exposure to the Project (i.e. the greatest numbers of turbines or part thereof, visible from the public realm). The photomontages seek to represent an illustrative 'worst case scenario' in terms of turbine height.

5.6 Potential impacts

5.6.1 Key sources of potential impact

This section describes the key components of the Project that are relevant to this LVIA.

This LVIA is not based on a fixed wind turbine layout; rather, the LVIA is based on a proposed Project Site. Once approved by the Coordinator-General, the Project Site will be the bounds within which the wind turbines, access roads and other associated infrastructure must be located.

Key components of the development activities anticipated for the construction/installation, operation, and decommissioning and rehabilitation which are relevant to the assessment of landscape and visual impacts are set out in this section. For further details on the description of the Project, refer to Chapter 2 Project Description.

5.6.1.1 Construction phase

The construction phase of the Project is temporary and estimated to last approximately two to two and a half years. Impacts on the landscape (including landscape features and its inherent character and qualities) and visual amenity are described in Table 5.14.

Table 5.14 Potential impacts during construction phase

Development activities and infrastructure	Indicative imagery*
Construction of the temporary contractor compound(s) and fencing.	
Civil works i.e. upgrade of existing and construction of new site access roads (up to 12 m in width), levelling, earthworks, and local vegetation clearance.	
Construction of the turbine foundations (excavation approximately 10 m in diameter) and high voltage collector cable (approximately 0.5 m wide, installed adjacent to the access road where possible).	

Development activities and infrastructure	Indicative imagery*
Progressive transportation of the wind farm components (i.e. turbine blades, towers, hubs/nacelles); movement of plant and vehicle movements, including load deliveries to site; and onsite storage of the wind farm components.	
Construction of high voltage overhead transmission lines.	
Underground cabling and associated 3 m wide temporary access road.	
Construction of substation.	
Progressive installation of the turbines and permanent meteorological mast.	

Development activities and infrastructure	Indicative imagery*
Machinery and material storage.	
Reinstatement work, including removal of temporary accommodation.	

***** Images from the construction and operation of Cape Bridgewater Wind Farm (2006-2007), Clements Gap Wind Farm (2008-2009), Hallett Hill Wind Farm (2008), and Snowtown Wind Farm (2007) have been used to help illustrate the likely visual magnitude of change anticipated for the Project.

5.6.1.2 Operational phase

The turbines and associated infrastructure will lead to the direct loss of discrete areas of farmland through the creation of access roads, turbine foundations, crane hardstands and the erection of the substation building. The operational phase of the Project is estimated to last approximately 25 years. The potential impacts on the landscape (including landscape features and its inherent character and qualities) and visual amenity are outlined in Table 5.15.

Table 5.15 Potential impacts during operational phase

Development activities and infrastructure	Indicative imagery*
Wind turbines and associated turbine hardstands (approximately 60 m x 60 m). It has been assumed that development scenarios could include up to 102 turbines at up to 180 m high (117 m to hub).	

Development activities and infrastructure	Indicative imagery*
Permanent meteorological mast.	
Access roads (width is rehabilitated to 6 m after construction).	
High voltage overhead feeder lines (conductors connecting the cable marshalling points to the main switchboard and the wind farm substation).	
Powerlink switchyard (collecting the power from the wind farm substation and supplying it to the grid, via the Powerlink 275 kV transmission line).	

Development activities and infrastructure	Indicative imagery*
Wind farm substation, including operation and maintenance buildings collecting power from the wind farm and sending it to the Powerlink switchyard.	

***** Images from the construction and operation of Cape Bridgewater Wind Farm (2006-2007), Clements Gap Wind Farm (2008-2009), Hallett Hill Wind Farm (2008), and Snowtown Wind Farm (2007) have been used to help illustrate the likely visual magnitude of change anticipated for the Project.

5.6.1.3 Decommissioning and rehabilitation phase

At the end of the operational lifetime of the Project's infrastructure, the wind farm operator may repower the wind farm (replace the wind turbines) or replace the wind turbine components, such as the gearbox and generator.

Alternatively, and for the purposes of this LVIA, the Project may be decommissioned, which would involve the turbines and all other above-ground infrastructure on-site being dismantled and removed from the Project Site, returning the landscape and associated views to their present condition. This includes all the interconnection and substation infrastructure. The tower bases would be cut back to below ploughing level or top soil built up over the foundation to achieve a similar result.

The access roads, if not required for farming purposes or fire access, would be removed and the site reinstated to original condition and use. Access gates, if not required for farming purposes, would also be removed. The underground cables occur below ploughing depth and contain no harmful substances. They can be recovered if economically attractive, or left in the ground. Terminal connections would be cut back to below ploughing levels.

Surface topsoils would be replaced or existing soils ameliorated to a condition suitable for landscape restoration, ensuring erosion controls are in place, drainage lines are re-established and pasture/crop/shrub/forest species are re-instated, allowing agricultural activities (such as ploughing) or forest plantings to recommence after the wind farm infrastructure has been decommissioned.

This stage would be of similar duration to the construction phase, with the dismantling of all above ground structures and the reinstatement of disturbed ground. Typical elements would include temporary contractor compounds, and fencing, plant and vehicle movements (including use of tall cranes), laydown areas and machinery and material storage.

The duration of the decommissioning and rehabilitation activities are only temporary (approximately 12 to 24 months) impacts on the landscape (including landscape features and its inherent character and qualities) and visual amenity are considered to be beneficial. Over the longer-term it is anticipated that rehabilitation will reinstate the landscape character, views and visual amenity to their former condition.

5.6.2 Landscape character impact assessment

The existing landscape character has been described in Section 5.4.5. Table 5.8 to Table 5.12 provide an assessment of the landscape character sensitivities for each identified landscape character type, the likely magnitude of change as a result of the identified potential impacts, an overall level of visual effect, and a resultant significance of that effect. It is considered that a layout with 115 turbines would not represent a material change to the landscape character assessment below.

Table 5.16 Landscape character type A visual assessment

Type A: Gently Undulating Foothill Plains and Valleys	
Landscape Character Sensitivity Assessment	This landscape is valued at the local level. It includes an area within Western Downs Regional Council Area that has been included on the Draft Scenic Overlay Map (OM-011) as a High Landscape Value Area. While the introduction of rigid linear elements such as wind turbines on the surrounding ridgelines will likely contrast with the perceived strong rural character, sense of remoteness and tranquillity, the open, and low lying nature of the landscape provides opportunity for wind turbines to assimilate into the simple character of the landscape The change will be experienced by people living on rural properties, working locally (e.g. farmers, graziers, farm-assistants, farming/grazing contractors) and visiting the area The overall inherent sensitivity is considered to be **Low**.
Magnitude of Change Assessment	The potential impact of the Project is closely related to a range of parameters, the most important being distance. It is considered that within 3 km, turbines with a blade tip height of up to 180 m will likely be clearly evident, and in some cases, visually dominating elements in the landscape. This is particularly the case for the area between Diamondy Road and Niagara Road, where there may be a number of turbines located within the *Gently Undulating Foothill Plains and Valleys* landscape type. Although the operational elements of the Project (including the substation, overhead feeder lines and the presence of plant and vehicle movements) may not be as intrusive in some locations due to intervening vegetation and changes in landform, the introduction of turbines of this scale will likely bring about a dominant change in the landscape character of the *Gently Undulating Foothill Plains and Valleys* landscape type within 3 km of the nearest element (e.g. turbine, substation, transmission pylon) and will therefore incur a **High** magnitude of change. Beyond 3 km, this change is anticipated to reduce to a **Medium** magnitude of change, due to the reduction in visibility and associated reduction in the ability to affect the inherent character of the landscape.
Level of Visual Effect	**Moderate adverse**: due to a *Low* sensitivity and a *High* magnitude of change within 3 km of the nearest turbine. This will likely reduce to a **Minor to Moderate adverse** effect beyond 3 km from the nearest turbine.
Significance of Effect	The effect of the Project on the *Gently Undulating Foothill Plains and Valleys* is considered to be Moderate adverse and therefore **Not Significant**.

Table 5.17 Landscape character type B visual assessment

Type B: Rolling Hills and Ridges with Open Forest	
Landscape Character Sensitivity Assessment	A simple, prominent and mostly unbuilt skyline. It includes an area within Western Downs Regional Council Area that has been included on the Draft Scenic Overlay Map (OM-011) as a High Landscape Value Area. Although the introduction of large linear elements such as wind turbines on the ridgelines will likely contrast with the perceived strong sense of remoteness and tranquillity, the ability of this broad scale simple landscape to integrate the Project will be greater than in a small scale, intricate landscape (this will be dependent on the sensitive micro-siting and design of the Project). The change will likely be experienced by people living on rural properties, working locally (e.g. farmers, graziers, farm-assistants, farming/grazing contractors) and visiting the local area, including those travelling along the Bunya Highway (refer to Viewpoint 5 in Volume 2). The overall inherent sensitivity is considered to be **Medium.**
Magnitude of Change Assessment	The potential impact of the Project is closely related to a range of parameters; the most important being distance, combined with the concentration of activity and wind farm infrastructure proposed in this landscape type. Most of the proposed turbines are located in this landscape type. It is considered that within 3 km, turbines with a blade tip height of up to 180 m will likely be visually dominating elements in the landscape. The operational elements of the Project (including the substation, overhead feeder lines and the presence of plant and vehicle movements) may not be as intrusive in some locations due to intervening vegetation and changes in landform. However, the introduction of turbines of this scale within 3 km of the nearest element (e.g. turbine, substation, transmission pylon) will likely bring about a dominant change in the landscape character of the *Rolling Hills and Ridges with Open Forest* landscape and will therefore incur a **High** magnitude of change. Beyond 3 km, this change is anticipated to reduce to a **Medium** magnitude of change, due to the reduction in visibility and associated reduction in the ability to affect the inherent character of the landscape.
Level of Visual Effect	**Moderate to major adverse** within 3 km of the nearest turbine (due to the *medium* degree of landscape sensitivity combined with the *high* landscape change anticipated) This will likely reduce to a **Moderate adverse** effect beyond 3 km from the nearest turbine.
Significance of Effect	The effect of the Project on the Gently Undulating Foothill Plains and Valleys is considered to be Moderate to Major adverse and therefore **Significant** within 3 km of the nearest turbine. The effect of the Project beyond 3 km from the nearest turbine is Moderate adverse and therefore **Not Significant.**

Table 5.18 Landscape character type C visual assessment

Type C: Lowland Native Forest	
Landscape Character Sensitivity Assessment	High degree of perceived naturalness, remoteness and inaccessibility, with little evidence of human uses and modifications to the land, however the visual enclosure from the wider landscape reduces the sensitivity of the *Lowland Native Forest* landscape to a small extent The overall inherent sensitivity is considered to be **Medium.**
Magnitude of Change Assessment	The majority of the wind farm infrastructure is located outside of the *Lowland Native Forest* landscape type, with only one turbine likely to be located on the ridgeline running parallel to Wellcamp Lane (near the junction with Cooranga North-Niagara Road). This is likely to result in a minor loss of grassland, trees and shrubs. Elsewhere, direct impacts to the *Lowland Native Forest* landscape are not anticipated. Due to the densely-forested character and associated limited visibility with the Project Study Area; the operational elements of the Project (including the substation, overhead feeder lines and the presence of plant and vehicle movements) will likely result in a considerable change to the inherent character of the *Lowland Native Forest* landscape within 3 km of the nearest element (e.g. turbine, substation, transmission pylon). Beyond 3 km, this change is anticipated to reduce, due to the reduction in visibility and associated ability to affect the inherent character of the landscape and will therefore incur a **Medium** magnitude of change. Beyond 3 km, this change is anticipated to reduce to a **Low** magnitude of change, due to the reduction in visibility and associated reduction in the ability to affect the inherent character of the landscape.
Level of Visual Effect	**Moderate adverse** within 3 km of the nearest turbine (due to the *Medium* degree of landscape sensitivity combined with the *Medium* landscape change anticipated). This will likely reduce to a **Minor to Moderate adverse** effect beyond 3 km from the nearest turbine.
Significance of Effect	The effect of the Project on the *Lowland Native Forest* is considered to be Moderate adverse and therefore **Not Significant** within 3 km of the nearest turbine. The effect of the Project beyond 3 km from the nearest turbine is Moderate to Minor adverse and therefore also **Not Significant.**

Table 5.19 Landscape character type D visual assessment

Type D: Forested Volcanic Uplands	
Landscape Character Sensitivity Assessment	High degree of perceived naturalness, tranquillity, remoteness and inaccessibility, with little evidence of human uses and modifications to the land, however the sense of enclosure and limited visibility to the wider landscape reduces the sensitivity of the *Forested Volcanic Uplands* landscape slightly. This landscape character type falls in the Western Downs Regional Council Area that has been included on the Draft Scenic Overlay Map (OM-011) as a High Landscape Value Area. The overall inherent sensitivity is considered to be **High.**
Magnitude of Change Assessment	Direct impacts on the elements and features of the *Forested Volcanic Uplands* landscape are not anticipated, due to the distance of this landscape from the siting of the Project (northern boundary of this landscape is approximately 3 km from the nearest turbine). Due to the densely forested character and associated limited visibility within the Project Study Area, the introduction of operational elements of the Project will likely only result in a noticeable change to the inherent character of the northern part of the *Forested Volcanic Uplands* landscape, where the wind farm components (e.g. turbines, substation and/or overhead feeder line) will likely be visible. This change will only be experienced by a small component of the overall *Forested Volcanic Uplands* landscape and therefore will incur a **Low** magnitude of change. Elsewhere, there is likely to be a barely perceptible change, due to the limited visibility with the Project and associated ability to affect the landscape character and therefore will incur a **Negligible** magnitude of change.
Level of Visual Effect	**Moderate adverse** within 3 km of the nearest turbine (due to the *High* degree of landscape sensitivity combined with the *Low* landscape change anticipated). This will likely reduce to a **Minor to Moderate adverse** effect beyond 3 km from the nearest turbine.
Significance of Effect	The effect of the Project on the *Forested Volcanic Uplands* is considered to be Moderate adverse and therefore **Not Significant** within 3 km of the nearest turbine. The effect of the Project beyond 3 km from the nearest turbine is Moderate to Minor adverse and therefore also **Not Significant.**

Table 5.20 Landscape character type A visual assessment

Type E: Settled Red Soil Plains	
Landscape Character Sensitivity Assessment	The *Settled Red Soil Plains* are fairly open, with sparsely settled rural character and little large-scale infrastructure. They also have long distant views and strong skylines. This character area does not fall within the Western Downs Regional Council Area so does not fall within the area of Draft Scenic Overlay Map (OM-011) shown as a High Landscape Value Area. The overall inherent sensitivity is considered to be **Low.**
Magnitude of Change Assessment	Direct impacts on the elements and features of the *Settled Red Soil Plains* landscape are not anticipated, due to the distance of this landscape from the siting of the Project (approximately 4 km to the nearest turbine). However, the introduction of turbines of up to 180 m will likely be clearly discernible and will therefore indirectly affect the character of the *Settled Red Soil Plains* landscape. Therefore, the Project is likely to result in a noticeable change to the inherent character of the *Settled Red Soil Plains* landscape within 8.5 km of the nearest element (e.g. turbine, substation, transmission pylon) and therefore will incur a **Low** magnitude of change. Beyond 8.5 km, this change is anticipated to reduce, due to the reduction in visibility and a reduced ability to affect the inherent character of the landscape.
Level of Visual Effect	**Minor adverse** within 3 km of the nearest turbine (due to the *Low* degree of landscape sensitivity combined with the *Low* landscape change anticipated). This will likely reduce to a **Minor to Negligible adverse** effect beyond 3 km from the nearest turbine.
Significance of Effect	The effect of the Project on the *Settled Red Soil Plains* is considered to be Minor adverse and therefore **Not Significant** within 3 km of the nearest turbine. The effect of the Project beyond 3 km from the nearest turbine is Minor to Negligible adverse and therefore also **Not Significant.**

5.6.3 Summary of landscape character impacts

Due to the distinctive form and large scale of wind farm developments, the introduction of turbines will inevitably change the landscape character of the area; particularly within 3 km of the Project Site, where the Project will form a dominating new built feature in this remote rural landscape setting. Although the direct impact on landscape features (i.e. loss of pastures and vegetation due to the construction of turbine foundations, access roads, substation and overhead feeder lines) will be limited, the introduction of large scale turbines (unlike any existing feature of the current landscape) is likely to result in a substantial change to the horizon and landscape character of the North Cooranga area, affecting its strong sense of remoteness and tranquillity. The wind turbines may also affect the perception of scale associated with the rolling hills and ridges of the northern part of the Great Dividing Range (i.e. a turbine height of 180 m is comparable to the variation in landform within the northern part of the Great Dividing Range, which is from 680 m to 855 m adjacent to the Bunya Highway).

However, this change will be perceived in the context of a landscape which is sparsely populated (i.e. no towns located in the Project Study Area, other than Cooranga North) and already contains large scale telecommunication infrastructure, including telegraph poles, 132 kV transmission lines, and the recently-constructed 275 kV transmission lines which traverse the southern part of the Project Study Area between the Bunya Highway and Cooranga North-Niagara Road, linking to Western Downs and Halys Power Substations.

In addition, the Project does not lie within an area protected for its landscape and visual values. Although BMNP Boundary is located approximately 3 km south-east of the nearest turbine, changes to the perception of character would only be evident from elevated clearings in northern parts of the Bunya Mountains (e.g. peaks, lookouts, clearings along walking tracks) and, in fact, the field visit indicated that the established walking tracks and lookouts typically do not overlook the Project Site due to intervening landform and vegetation. Elsewhere, the inherent character of the wider BMNP will experience little perceptual change (if any), due to the distance (less than3 km), limited visibility and no direct impact on the features for which the BMNP was designated (i.e. its "*spectacular mountain scenery*" (DERM, 2010c) of ancient rainforests, forests, woodlands, waterfalls, unique range-top grasslands). A summary of the results of the landscape assessment is provided in Table 5.21.

Table 5.21 Summary of anticipated impacts of the Project on landscape character during operation

Landscape type	Judgement on Inherent Landscape Sensitivity	Judgement on magnitude of change	Judgement on potential landscape impact	Judgement on significance of impact
Type A: Gently Undulating Foothill Plains and Valleys	Low	Up to a High change	**Moderate adverse** (within 3 km)	**Not Significant**
			Minor to Moderate adverse (beyond 3 km)	**Not Significant**
Type B: Rolling Hills and Ridges with Open Forest	Medium	Up to a High change	**Moderate to major adverse** (within 3 km)	**Significant**
			Moderate adverse (beyond 3 km)	**Not Significant**
Type C: Lowland Native Forest	Medium	Up to a Medium change	**Moderate adverse** (within 3 km)	**Not Significant**
			Minor to Moderate adverse (beyond 3 km)	**Not Significant**
Type D: Forested Volcanic Uplands	High	Up to a Low change to the northern part reducing to a Negligible change.	**Moderate adverse** (within 3 km)	**Not Significant**
			Minor to Moderate adverse (beyond 3 km)	**Not Significant**
Type E: Settled Red Soil Plains	Low	Up to a Low change	**Minor adverse**	**Not Significant**

5.6.4 Visual amenity impact assessment

5.6.4.1 Zone of theoretical visibility analysis

The Project layout is modelled on four maps:

- Figure 5.6, Volume 2 which shows the area from which it is theoretically possible to see any blade tip
- Figure 5.7, Volume 2 which indicates the are from which it is theoretically possible to see any hubs/nacelles
- Figure 5.8, Volume 2 which indicates the extent of visibility of the turbine tips across the Project Study Area (i.e. how many tips would be visible) categorised by up to 20 turbines, 21 to 40 turbines, 41 to 60 turbines, 61 to 80 turbines, and 81 to 102 turbines.
- Figure 5.9, Volume 2 which indicates the theoretical extent of visibility of the turbine hubs across the Project Study Area (i.e. how many hubs would be visible) categorised by up to 20 turbines, 21 to 40 turbines, 41 to 60 turbines, 61 to 80 turbines, and 81 to 102 turbines.

Figures 5.6 and 5.7 in Volume 2 show that the Project is theoretically visible for a wide area around the Project Study Area. As would be anticipated, the blade tips have a slightly higher extent of theoretical visibility than the hubs. However, the broad pattern is the same with visibility contained predominantly by the undulating and elevated land associated with the Bunya Mountains to the south-east and undulating lands to the north of the Project Site.

Figures 5.8 and 5.9 in Volume 2 show the extent of wind farm visibility increases with distance from the Project Site. Closest to the Project Site, most views encompass a relatively small number of turbines. As distance increases, a greater number of turbines become visible with some distant areas, particularly to the west, anticipated to be able to view most of the turbines. In interpreting this data it is important to note that in the flatter landscapes to the east, local screening elements such as tree belts are particularly effective in curtailing views, so the actual visibility is likely to be less than indicated. Furthermore, at greater distances from the Project Site, the turbines form a smaller part of the overall landscape view and appear as less dominant elements than those experienced closer to the Project Site where fewer but more dominant turbines are visible. Additionally within the forested landscapes of the Bunya Mountains to the south west, dense vegetation is likely to substantially curtail visibility.

Using the ZTV studies, field surveys and the method for assessing significance set out in Table 5.7, a summary of the baseline analysis and overall likely visual impact anticipated during the operation of the Project is provided for each viewpoint in Table 5.22 to Table 5.33.

Table 5.22 Likely visual effect of the Project on VP1

Viewpoint 1: Niagara Road and Jarail Road Junction	
	
Existing view from Viewpoint 1: Southerly view from Junction of Niagara Road and Jarail Road (75° field of view)	
Visual Baseline Assessment	
Location and description	- GPS Location: E341716, N7046327 - Elevation: 598 m - Southerly view from the junction of Niagara Road and Jarail Road. - Nearest turbine is approximately 744 m to the east of this viewpoint. - Represents typical and accessible views of residents, visitors and workers travelling along Niagara Road (an unsealed gravel road extending in an east-west direction between the Bunya Highway and Kingaroy Jandowae Road) and Jarail Road (an unsealed gravel road extending north of this junction to Ironpot Road). - The landscape in this view comprises forested hills and partially cleared valleys used for pastoral grazing, associated with the *Rolling Hills and Ridges with Open Forest* landscape type (Type B). - A high voltage electricity easement passes through this landscape in an east-west direction, resulting in middle ground views of pylons and powerlines.
Key visual sensitivities	- Although this view comprises a sparsely settled rural landscape character; the presence of pylons and powerlines detract from the sense of remoteness and tranquillity, thus reducing the overall sensitivity of this view.
Overall inherent sensitivity	The overall sensitivity of receptors from this point is considered to be **Low**, due to small numbers of people likely to experience this view combined with presence of existing pylons and powerlines.

Visual Evaluation	
 **Photomontage view from Viewpoint 1: Southerly view from Junction of Niagara Road and Jarail Road (75° field of view)** *NOTE: This photomontage is indicative only; refer to Viewpoint 1, Figure 5.10 in Volume 2 for appropriate scaled photomontage.*	
Judgement of magnitude of change	Although the turbines will be viewed in the context of a landscape containing transmission lines, the magnitude of change on this receptor is considered to be dominant and therefore **High**, due to the following factors: - The close proximity to the Project (nearest turbine is approximately 744 m to the west of this viewpoint); - The photomontage (refer to Viewpoint 1 - Volume 2) indicates that up to around three turbines will be evidently visible (with the blade tips of additional turbines faintly visible on the horizon), of which two will be visible almost at their full height (including the turbines towers, hubs and full blade rotation) on the landform, as it rises to the south; taking in a large portion of this view. - From this viewpoint, the main effect results from the introduction of new elements into the landscape (i.e. the introduction of large-scale turbines in a remote rural landscape with a predominantly unbuilt skyline) and the ability to discern whole turbines in relation to natural elements such as trees. - The site infrastructure is also likely to be visible in this view, including access roads connecting each turbine.
Judgement of potential effect	**Moderate adverse:** due to the *low* degree of visual sensitivity combined with a *High* magnitude of change.
Significance of effect	The effect of the Project on VP01 is considered to be Moderate adverse and therefore **Not Significant.**

Table 5.23 Likely visual effect of the Project on VP2

Viewpoint 2: Niagara Road	
 **Existing view from Viewpoint 2: Easterly view from Niagara Road, near the junction of Woolletts Road (75° field of view)**	
Visual Baseline Assessment	
Location and description	- GPS Location: E330609, N7045780 - Elevation: 463 m - Easterly view from Niagara Road, near the junction of Woolletts Road. - Nearest turbine is approximately 4.2 km east of this viewpoint. - Represents typical and accessible views of residents, visitors and workers travelling along Niagara Road; an unsealed gravel road extending in an east-west direction between the Bunya Highway and Kingaroy Jandowae Road. - The foreground and middle ground of easterly views from this point comprise a gently undulating mosaic of lowland native forest with extensive cleared areas predominantly used for native pasture grazing (part of landscape type A). - Distant views to the elevated forested hills and ridges associated with the Great Dividing Range (part of landscape type B).
Key visual sensitivities	- Sparsely settled rural landscape character with a moderate sense of remoteness. - Notable absence of large scale infrastructure or built elements. - An 'un-built' skyline.
Overall inherent sensitivity	Although local residents are sensitive receptors, the overall sensitivity of receptors from this point is considered to be **Low**, due to small numbers of people likely to experience this view combined with lack of recreational users of the landscape.

Visual Evaluation	
 **Photomontage view from Viewpoint 2: Easterly view from Niagara Road, near the junction of Woolletts Road (75° field of view)** *NOTE: This photomontage is indicative only; refer to Viewpoint 2, Figure 5.11 in Volume 2 for appropriate scaled photomontage.*	
Judgement of magnitude of change	The magnitude of change on this receptor is considered to be considerable and therefore **Medium**, due to the following factors: - The upper parts of around 11 turbines will be visible, forming a clearly discernible, but not dominant, element of the view, due to the distance of the viewpoint to the turbines (nearest turbine is approximately 4.2 km east of this viewpoint) and sense of scale in relation to the surrounding landform - The introduction of large-scale turbines in a remote rural landscape with a notable 'un-built' skyline.
Judgement of potential effect	**Minor to Moderate adverse:** due to the *low* degree of visual sensitivity combined with a *Medium* magnitude of change.
Significance of effect	The effect of the Project on VP02 is considered to be Minor to Moderate adverse and therefore **Not Significant.**

Table 5.24 Likely visual effect of the Project on VP3

Viewpoint 3: Niagara Road East	
	
Existing view from Viewpoint 3: North westerly view from Niagara Road East (75° field of view)	
Visual Baseline Assessment	
Location and description	- GPS location: E351064, N7042234 - Elevation: 632 m - North westerly view from Niagara Road East. - Nearest turbine is approximately 1.9 km north-west of this viewpoint. - Represents typical and accessible views of residents, visitors and workers travelling along the eastern section of Niagara Road (approximately 1km from the Bunya Highway junction); an unsealed gravel road extending in an east-west direction between the Bunya Highway and Kingaroy Jandowae Road. - The foreground of this view is typical of the *Gently Undulating Foothill Plains and Valleys* landscape type (Type A). - The middle ground and background is typical of the *Rolling Hills and Ridges with Open Forest* landscape type (Type B), centrally located within the Project Site. - A high voltage electricity easement passes through the valley, resulting in middle ground views of pylons and powerlines.
Key visual sensitivities	- Although this view comprises a strong rural landscape character, the presence of pylons and powerlines detract from the sense of remoteness and tranquillity, thus reducing the overall sensitivity of this view.
Overall inherent sensitivity	The overall sensitivity of receptors from this point is considered to be **Low**, due to small numbers of people likely to experience this view combined with presence of existing pylons and powerlines.

Visual Evaluation	
 **Photomontage view from Viewpoint 3: North westerly view from Niagara Road East (75° field of view)** *NOTE: This photomontage is indicative only; refer to Viewpoint 3, Figure 5.12 in Volume 2 for appropriate scaled photomontage.*	
Judgement of magnitude of change	Although the skyline is already affected by the presence of transmission lines, the magnitude of change on this receptor is considered to be dominant and therefore **High**, due to the following factors: - The close proximity to the Project (nearest turbine is approximately 1.9 km north-west of this viewpoint); - The photomontage (refer to Viewpoint 3 -Volume 2) indicates that a number of turbines will be visible at their full height on the landform, as it rises to the north-west; taking a large portion of this view; - The main change relates to the introduction of new elements into the landscape. - The Project Site infrastructure is also likely to be visible in this view, including access roads connecting each turbine and the proposed substation and new overhead electrical transmission line.
Judgement of potential effect	**Moderate adverse:** due to the *low* degree of visual sensitivity combined with a *High* magnitude of change.
Significance of effect	The effect of the Project on VP03 is considered to be Moderate adverse and therefore **Not Significant.**

Table 5.25 Likely visual effect of the Project on VP4

Viewpoint 4: Kingaroy-Jandowae Road	
	
Existing view from Viewpoint 4: North easterly view from Kingaroy-Jandowae Road (75° field of view)	
Visual Baseline Assessment	
Location and description	- GPS Location: E344063, N7035340 - Elevation: 557 m - North easterly view from Kingaroy-Jandowae Road (approximately 1 km north-west of the Bunya Highway junction). - Nearest turbine is approximately 4 km north of this viewpoint. - Represents typical and accessible views of residents, visitors and workers travelling along Kingaroy-Jandowae Road; a sealed two-lane road extending in a north-south direction between the Bunya Highway and Cooranga North. - The foreground of north easterly views from this viewpoint comprise valley of lowland plains used mainly for dryland arable farmland and pastoral grazing areas, bounded by the *Rolling Hills and Ridges with Open Forest* landscape type (Type B). - Distant views to the elevated forested hills associated with BMNP.
Key visual sensitivities	- Sparsely settled rural landscape character with a moderate sense of remoteness and tranquillity. - Notable absence of large scale infrastructure or built elements. - An 'un-built' skyline.
Overall inherent sensitivity	Although this viewpoint has a notable absence of built features affecting the skyline and provides memorable views over remote and tranquil rural landscape for nearby residents, workers (e.g. farming employees, contractors) and travellers along Kingaroy-Jandowae Road, it is considered to have a **Low** sensitivity against the change proposed. This is due to the low sensitivity of viewers (i.e. smaller numbers of travellers along a local road, which is not currently dedicated as a scenic drive).

Visual Evaluation	
 **Photomontage view from Viewpoint 4: North easterly view from Kingaroy-Jandowae Road (75° field of view)** *NOTE: This photomontage is indicative only; refer to Figure 5.13 Viewpoint 4 in Volume 2 for appropriate scaled photomontage.*	
Judgement of magnitude of change	The magnitude of change on this receptor is considered to be considerable and therefore **Medium**, due to the following factors: - The turbines will form a clearly discernible, but not dominant, element of the view, due to the distance of the viewpoint to the turbines (nearest turbine is approximately 4 km north of this viewpoint with only the upper part of the turbines visible along the wooded ridgeline) - The introduction of large-scale turbines in a remote rural landscape with a moderate sense of remoteness and tranquillity and a notable 'un-built' skyline; and - The Project would result in a considerable change to the skyline of this view, which is currently defined by the Bunya Mountains.
Judgement of potential effect	**Minor to Moderate adverse:** due to the *low* degree of visual sensitivity combined with a *Medium* magnitude of change.
Significance of effect	The effect of the Project on VP04 is considered to be Minor to Moderate adverse and therefore **Not Significant.**

Table 5.26 Likely visual effect of the Project on VP5

Viewpoint 5: Bunya Highway North	
 **Existing view from Viewpoint 5: Westerly view from the Bunya Highway (75° field of view)**	
Visual Baseline Assessment	
Location and description	- GPS Location: E360064, N7044020 - Elevation: 598 m - Westerly view from the Bunya Highway (approximately 8km west of the Bunya Mountains Road junction); part of '*Great Bunya Drive*' tourist route between Gympie and Toowoomba. - Nearest turbine is approximately 11.0 km west of this viewpoint. - Represents typical and accessible views of residents, visitors, workers and tourists travelling along the Bunya Highway; a sealed two-lane road extending in a northeast-southwest direction between Kingaroy and Dalby. - Westerly views from this elevated point provide panoramic views towards the proposed Coopers Gap Wind Farm site, including landscapes typical of the *Rolling Hills and Ridges with Open Forest* (Type B) landscape type and *Settled Red Soil Plains* landscape type (Type E). - Distant views to the *Forested Volcanic Uplands* landscape type (Type E) associated with Bunya Mountains National Park. - Transmission pylons punctuate the skyline
Key visual sensitivities	- Medium sensitivity of receptors, including travellers along *Great Bunya Drive*, a designated scenic route. - Although this view comprises a strong rural character; the presence of a highway, pylons and powerlines detract from the sense of remoteness and tranquillity, thus reducing the overall sensitivity of this view.
Overall inherent sensitivity	Although this viewpoint already contains large scale built features (i.e. transmission pylons and powerlines), it is considered to have a **Medium** sensitivity overall to the change proposed, due to the medium sensitivity of viewers (e.g. tourists and nearby residents).

Visual Evaluation	
 **Photomontage view from Viewpoint 5: Westerly view from the Bunya Highway (75° field of view)** *NOTE: This photomontage is indicative only; refer to Viewpoint 5, Figure 5.14 in Volume 2 for appropriate scaled photomontage.*	
Judgement of magnitude of change	Although this viewpoint is located approximately 11.0 km east of the nearest turbine and the skyline is already affected by the presence of transmission lines, the magnitude of change on this receptor is still anticipated to be noticeable and therefore **Low**, due to the following factors: - From this elevated viewpoint, the Project will be visible on the horizon, seen against an open sky; although several of the turbines will be hidden or partly blocked by changes in landform and intervening vegetation, allowing only views to the blade tips of some turbines; - At this distance, whilst the turbines will be evident they will not change the fundamental visual character of the landscape and will 'blend' with the existing view to a moderate extent introducing another simple and repetitive element into this large-scale landscape. - The bases of many of the turbines will be screened by foreground vegetation and changes in landform; - The photomontage (refer to Viewpoint 5 - Volume 2) indicates that a large proportion of the turbines will be visible on the landform as it rises to the south, towards Bunya Mountains National Park; - The main impact of the change relates to the introduction of turbines along the skyline. - The turbines will form a clearly visible, but not defining element of the view.
Judgement of potential effect	**Minor to Moderate adverse:** due to the *low* degree of visual sensitivity combined with a *Medium* magnitude of change.
Significance of effect	The effect of the Project on VP05 is considered to be Minor to Moderate adverse and therefore **Not Significant.**

Table 5.27 Likely visual effect of the Project on VP6

Viewpoint 6: Ironpot Road	
	
Existing view from Viewpoint 6: Elevated southerly views from Ironpot Road (75° field of view)	
Visual Baseline Assessment	
Location and description	- GPS Location: E342250, N7056594 - Elevation: 498 m - Elevated southerly views from Ironpot Road; also representative of views from a nearby residence / property homestead. - Nearest turbine is approximately 7.4 km south west of this viewpoint. - Represents typical and accessible views of residents, visitors and workers travelling along Ironpot Road; a sealed two-lane road extending in an east-west direction between the Bunya Highway and Ironpot Creek, approximately 8.5 km north of Niagara Road. - Southerly views from this elevated point provide expansive views over the Project Site, including landscapes typical of the *Gently Undulating Foothill Plains and Valleys* (Type A) and the *Rolling Hills and Ridges with Open Forest* (Type B) landscape types. - Distant views to the *Forested Volcanic Uplands* landscape type (Type E) associated with Bunya Mountains National Park.
Key visual sensitivities	- Expansive long-distance views with a notable 'un-built' skyline. - Strong rural character, with a notable sense of remoteness and tranquillity.
Overall inherent sensitivity	Although this viewpoint has a notable absence of built features affecting the skyline and provides memorable elevated views over remote and tranquil landscape for a nearby resident, workers (e.g. farming employees, contractors) and travellers along Ironpot Road, it is considered to have a **Low** sensitivity overall to the change proposed, due to the low sensitivity of viewers (i.e. smaller numbers of travellers along a local road, which is not currently dedicated as a scenic drive).

Visual Evaluation	
 **Photomontage view from Viewpoint 6: Elevated southerly views from Ironpot Road (75° field of view)** *NOTE: This photomontage is indicative only; refer to Viewpoint 6, Figure 5.15 in Volume 2 for appropriate scaled photomontage.*	
Judgement of magnitude of change	Although this viewpoint is likely to be located approximately 7.4 km from the nearest turbine, the magnitude of change on this receptor is still anticipated to be considerable and therefore **Medium**, due to the following factors: - From this elevated viewpoint, the entire width of the wind farm will be visible, taking a large portion of this view. The turbines will be visible at near full height on the landform as it rises to the south, towards Bunya Mountains National Park. - The bases of many of the turbines will be screened by foreground vegetation and changes in landform. - The Project would result in a considerable change to the skyline of this view, which is currently defined by the Bunya Mountains. However, the simple and repetitive elements accord with the large scale and vast open character of the landscape viewed from this vantage point. - The photomontage (refer to Viewpoint 6 - 2 Volume 2) and ZTV indicates that parts of around 70 turbines will be visible on the landform as it rises to the south, towards Bunya Mountains National Park although only around 40 will be substantially visible.
Judgement of potential effect	**Minor to Moderate adverse:** due to the *low* degree of visual sensitivity combined with a *Medium* magnitude of change.
Significance of effect	The effect of the Project on VP06 is considered to be Minor to Moderate adverse and therefore **Not Significant.**

Table 5.28 Likely visual effect of the Project on VP7

Viewpoint 7: Mt Kiangarow summit, Bunya Mountains National Park	
 **Existing view from Viewpoint 7: Elevated north westerly view from Mt Kiangarow summit** *NOTE: This photomontage is indicative only; refer to Viewpoint 7, Figure 5.16 in Volume 2 for appropriate scaled photomontage.*	
Visual Baseline Assessment	
Location and description	- GPS Location: E355889, N7032309 - Elevation: 1,136 m - Elevated easterly view from Mt Kiangarow summit lookout; the highest point of the Bunya Mountains, looking as far to the north-west in the direction of the Project Site as possible. - Nearest turbine is approximately 10 km north-west of this viewpoint. - Represents views of tourists and recreational visitors to Bunya Mountains National Park (e.g. bushwalkers, hikers, bird watchers). - The foreground and middle ground of north westerly views from this point comprise a natural landscape character of range-top grasslands (locally known as 'balds'), bunya pine forest and lowland open forest. - Distant views across the *Gently Undulating Foothill Plains and Valleys* landscape type (Type A) and the *Rolling Hills and Ridges with Open Forest* landscape type (Type B) within and adjacent to the Project Site.
Key visual sensitivities	- The Bunya Mountains are a landscape of national and local importance, reflected in its designation as a National Park and identified as a natural feature of high scenic amenity value in the Wambo and Kingaroy Planning Schemes. - The concentration of native vegetation. - High degree of naturalness, remoteness and tranquillity with a notable absence of human influences, albeit distant views to transmission lines and settled rural landscapes (e.g. the open plains of grazing pastures associated with the *Gently Undulating Foothill Plains and Valleys* landscape type).
Overall inherent sensitivity	Although there are likely to be small number of people experiencing this view, the overall sensitivity of receptors from this point is considered to be **High** due to the national importance of the locality, attracting viewers whose interest is specifically focussed on the landscape.

Visual Evaluation	
Judgement of magnitude of change	Although this viewpoint is likely to be located approximately 10 km from the nearest turbine, a distance at which the turbines could be theoretically visible, in fact intervening landform and vegetation curtails north-westerly views of the project site. Therefore the magnitude of change on this receptor is **negligible** /no impact due to the following factors: - From this elevated viewpoint, tourists and recreational visitors to Bunya Mountains National Park are unlikely to see the wind farm due to the presence of intervening vegetation. - Even if the turbine layout changes and peripheral turbines become visible the broad scale landscape and the big skies would enable the turbines to be integrated into the landscape and would occupy a relatively small part of the panoramic view.
Judgement of potential effect	**No impact** up to **Minor to Moderate adverse:** due to the *High* degree of visual sensitivity combined with a *Negligible* magnitude of change.
Significance of effect	The effect of the Project on VP07 is considered to be Minor to Moderate adverse and therefore **Not Significant.**

Table 5.29 Likely visual effect of the Project on VP8

Viewpoint 8: Bunya Highway South	
 **Existing view from Viewpoint 8: Northerly view from the Bunya Highway (75° field of view)**	
Visual Baseline Assessment	
Location and description	- GPS Location: E348037, N7036753 - Elevation: 584 m - Northerly view from the Bunya Highway; part of '*Great Bunya Drive*' tourist route between Gympie and Toowoomba. - Represents typical and accessible views of residents, workers, visitors and tourists travelling along the Bunya Highway; between Bell and Kumbia. - This viewpoint also represents typical views from a property / residence. - Nearest turbine is approximately 2.9 km north of this viewpoint, located beyond the forested hills in this view. - Northerly views from this point are dominated by the pastoral foothills and forested hills associated with the *Rolling Hills and Ridges with Open Forest* landscape type.
Key visual sensitivities	- Notable 'un-built' skyline. - Medium sensitivity of receptors, including travellers along *Great Bunya Drive*, a designated scenic route.
Overall inherent sensitivity	This viewpoint is considered to have a **Medium** sensitivity overall to the change proposed, due to the medium sensitivity of viewers (e.g. tourists and nearby residents) combined with the notable 'un-built' skyline in this rural landscape.

Visual Evaluation	
 **Photomontage view from Viewpoint 8: Northerly view from the Bunya Highway (75° field of view)** *NOTE: This photomontage is indicative only; refer to Viewpoint 8, Figure 5.17 in Volume 2 for appropriate scaled photomontage.*	
Judgement of magnitude of change	The magnitude of change on this viewpoint will be noticeable but due to sequential impacts experienced travelling along the highway the impact on the receptor is considered to be **medium**, due to the following factors: - The proximity to the wind farm (nearest turbine is approximately 2.9 km north of this viewpoint, beyond the forested hills in this view). - Despite the proximity to the viewpoint, the intervening vegetation and localised variations in landform will partially block views to the lower parts of the turbine towers. However, the blade tips, hubs and upper parts of the turbine towers are likely to be clearly discernible elements in this view, seen against an open sky as the traveller progresses along the highway. - The magnitude of change relates mainly to the introduction of built elements into the rural landscape rather than to the specific turbine configuration. - The wind farm would overall result in a dominant change to the skyline of sequential views experienced from the Highway.
Judgement of potential effect	**Moderate adverse:** due to the *Medium* degree of visual sensitivity combined with a *High* magnitude of change.
Significance of effect	The effect of the Project on VP08 is considered to be Moderate to Major adverse and therefore **Not significant.**

Table 5.30 Likely visual effect of the Project on VP9

Viewpoint 9: Boiling Springs Lookout	
	
Existing view from Viewpoint 9: Elevated easterly view from near Boiling Springs Lookout (75° field of view)	
Visual Baseline Assessment	
Location and description	- GPS Location: E336849, N7040393 - Elevation: 534 m - Elevated easterly view from near Boiling Springs Lookout; located along Boiling Springs Road (part of '*Dingo Fence Tourist Drive*', which links between Cooranga North, Jandowae and Jimbour). - Represents typical and accessible views of residents, workers, visitors and tourists travelling along *Dingo Fence Tourist Drive* north of Cooranga North. - Nearest turbines are approximately 4.4 km east of this viewpoint, either side of the transmission. - Boiling Springs Lookout is located within a high voltage electricity easement, resulting in close range views of pylons and powerlines.
Key visual sensitivities	- Medium sensitivity of receptors, including visitors to Boiling Springs Lookout and travellers along *Dingo Fence Tourist Drive*.
Overall inherent sensitivity	Although the visual sensitivities are limited (due to the dominance of pylons and powerlines), the viewpoint comprises a **Medium** overall sensitivity to change, due to the medium sensitivity of the viewers / receptors.

Visual Evaluation	
 **Photomontage view from Viewpoint 9: Elevated easterly view from near Boiling Springs Lookout (75° field of view)** *NOTE: This photomontage is indicative only; refer to Viewpoint 9, Figure 5.18 in Volume 2 for appropriate scaled photomontage.*	
Judgement of magnitude of change	Although the skyline is already affected by the presence of transmission lines, the magnitude of change on this receptor will be considerable and therefore **Medium**, due to the following factors: - The close proximity to the wind farm (nearest turbine is approximately 4.4 km east of this viewpoint, either side of the transmission lines). - The top parts of the turbines (including blades, hubs and top parts of the towers) are likely to be clearly discernible from this elevation viewpoint; experienced by tourists and visitors travelling along *Dingo Fence Tourist Drive* and visiting Boiling Springs Lookout. - The magnitude of change as the change relates mainly to the introduction of built elements into the rural landscape rather than to the specific turbine configuration.
Judgement of potential effect	**Moderate adverse:** due to the *Medium* degree of visual sensitivity combined with a *Medium* magnitude of change.
Significance of effect	The effect of the Project on VP09 is considered to be Moderate adverse and therefore **Not Significant.**

Table 5.31 Likely visual effect of the Project on VP10

Viewpoint 10: Diamondy Road	
 **Existing view from Viewpoint 10: South easterly view from Diamondy Road (75° field of view)**	
Visual Baseline Assessment	
Location and description	- GPS Location: E338009, N7051514 - Elevation: 503 m - South easterly view from Diamondy Road; a local unsealed gravel road which extends east- west between Jarail Road and Diamondy State Forest. - Nearest turbines are located approximately 875 m south of this viewpoint. - Represents typical and accessible views of residents, workers and visitors travelling along Diamondy Road. - The foreground and middle ground of south easterly views from this point comprise a gently undulating mosaic of lowland native forest with extensive cleared areas predominantly used for native pasture grazing. - Distant views to the elevated forested hills and ridges associated with the Great Dividing Range (part of landscape type B).
Key visual sensitivities	- Notable 'un-built' skyline. - Rural landscape character with a strong sense of remoteness.
Overall inherent sensitivity	Although this viewpoint comprises a strong sense of remoteness and a notable absence of built features affecting the skyline, it is considered to have a **Low** sensitivity overall to the change proposed, due to the low number of viewers.

Visual Evaluation	
 **Photomontage view from Viewpoint 10: South easterly view from Diamondy Road (75° field of view)** *NOTE: This photomontage is indicative only; refer to Viewpoint 10, Figure 5.19 in Volume 2 for appropriate scaled photomontage.*	
Judgement of magnitude of change	The magnitude of change on this receptor will be dominant and therefore **High**, due to the following factors: - The very close proximity to the Project (nearest turbine is approximately 875 m south of this viewpoint). - Although the turbines tower bases will be concealed by foreground vegetation, the middle and upper parts of the towers, hubs and rotating blades will form a prominent element of the view and some vegetation clearance may also be evident during the construction phases;. - The effect relates mainly to the introduction of built elements into the existing remote rural landscape with a notable 'un-built' skyline.
Judgement of potential effect	**Moderate adverse:** due to the *low* degree of visual sensitivity combined with a *High* magnitude of change.
Significance of effect	The effect of the Project on VP10 is considered to be Moderate adverse and therefore **Not Significant.**

Table 5.32 Likely visual effect of the Project on VP11

Viewpoint 11: Cooranga North	
	
Existing view from Viewpoint 11: Elevated northerly views from Cooranga North-Niagara Road (75° field of view)	
Visual Baseline Assessment	
Location and description	- GPS Location: E341516, N7038087 - Elevation: 539 m - Elevated northerly views from Cooranga North-Niagara Road; also representative of views from the entrance to Cooranga North township from Kingaroy-Jandowae Road. - Nearest turbine is approximately 2.3 km north east of this viewpoint. - Represents typical and accessible views of residents, visitors and workers travelling along Cooranga North-Niagara Road; a sealed two-lane road extending in a northerly direction between Kingaroy-Jandowae Road and Niagara Road. - Northerly views from this elevated point provide expansive views over the Cooranga North (including Cooranga North historic school site) towards the proposed Coopers Gap Wind Farm site, including landscapes typical of the *Gently Undulating Foothill Plains and Valleys* (Type A) and the *Rolling Hills and Ridges with Open Forest* (Type B) landscape types.
Key visual sensitivities	- Notable 'un-built' skyline and absence of large scale infrastructure or large scale built elements. - Medium sensitivity of visual receptors, including residents and visitors to Cooranga North.
Overall inherent sensitivity	The overall sensitivity of receptors from this point is considered to be **Medium**, due to the medium sensitivity of the viewers / receptors, the 'un-built' skyline and absence of large scale infrastructure or large scale built elements.

Visual Evaluation	
 **Photomontage view from Viewpoint 11: Elevated northerly views from Cooranga North-Niagara Road (75° field of view)** *NOTE: This photomontage is indicative only; refer to Viewpoint 11, Figure 5.20inVolume 2 for appropriate scaled photomontage.*	
Judgement of magnitude of change	The magnitude of change on this receptor is anticipated to be dominant and therefore **High**, due to the following factors: - The close proximity to the wind farm (nearest turbine is approximately 2.3 km north east of this viewpoint); - Although there is some intervening landform and vegetation in the foreground of this view, this photomontage (refer to Viewpoint 11- Volume 2) indicates that at least three considerably dominant turbines will visible on the landform as it rises to the north, occupying a large portion of this view with the scale contrasting with the domestic scale of the foreground elements; - The middle and upper parts of the turbine towers, hubs and rotating blades will be clearly discernible, resulting in a dominant change to the skyline of this view.
Judgement of potential effect	**Moderate to Major adverse:** due to the *Medium* degree of visual sensitivity combined with a *High* magnitude of change.
Significance of effect	The effect of the Project on VP11 is considered to be Moderate to Major adverse and therefore **Significant.**

Table 5.33 Likely visual effect of the Project on VP12

Viewpoint 12: Ironpot Creek, Niagara Road	
 **Existing view from Viewpoint 12: Westerly views from Niagara Road (75° field of view)**	
Visual Baseline Assessment	
Location and description	- GPS Location: E343863, N7043740 - Elevation: 606 m - Westerly views from Niagara Road; also representative of views from a nearby residence. - Turbines would be visible in a number of directions from this viewpoint. The nearest turbine would be approximately 1.7 km north east with another cluster located along the ridgeline approximately 2 km west. - Represents typical and accessible views of residents, visitors and workers travelling along Niagara Road; an unsealed gravel road extending in an east-west direction between the Bunya Highway and Kingaroy Jandowae Road. - Westerly views from this point provide expansive views over the valley of Ironpot Creek and a property homestead towards the proposed Coopers Gap Wind Farm site, including landscapes typical of the *Gently Undulating Foothill Plains and Valleys* (Type A) and the *Rolling Hills and Ridges with Open Forest* (Type B) landscape types.
Key visual sensitivities	- Strong rural character, with a notable sense of remoteness and tranquillity. - An 'un-built' skyline. - Notable absence of large scale infrastructure or built elements.
Overall inherent sensitivity	Although this viewpoint has a notable absence of built features affecting the skyline and provides memorable views over remote and tranquil landscape for a nearby resident, workers (e.g. farming employees, contractors) and travellers along Niagara Road, it is considered to have a **Low** sensitivity overall to the change proposed, due to the low sensitivity of viewers (i.e. smaller numbers of travellers along a local road, which is not currently dedicated as a scenic drive).

Visual Evaluation	
 **Photomontage view from Viewpoint 12: Westerly views from Niagara Road (75° field of view)** *NOTE: This photomontage is indicative only; refer to Viewpoint 12, Figure 5.21 in Volume 2 for appropriate scaled photomontage.*	
Judgement of magnitude of change	The magnitude of change on this receptor is anticipated to be considerable and therefore **Medium**, due to the following factors: - The close proximity to the Project (nearest turbines are located approximately 2 km both west and east of this viewpoint); - The turbines are largely located beyond the intervening landform and vegetation in the foreground of this view, - The photomontage (refer to Viewpoint 12- Volume 2) indicates that parts of around three turbines could be visible on the landform as it rises to the west. - Even through the scale and profile of the ridges seem reasonably congruent with the proposed turbines, the size of the proposed turbines and effect of seeing only parts of the blades emerging beyond the ridgeline result in a considerable change to this view.
Judgement of potential effect	**Minor to Moderate adverse:** due to the *low* degree of visual sensitivity combined with a *Medium* magnitude of change.
Significance of effect	The effect of the Project on VP12 is considered to be Minor to Moderate adverse and therefore **Not Significant.**

5.6.5 Summary of visual amenity impacts

In undertaking the assessment of visual impacts, it is necessary to acknowledge that varying attitudes to wind energy developments are expressed by different individuals and constituencies. Some of the attitudes commonly encountered are described in Section 5.5.4.

A number of submissions were made in response to the 2011 Initial Assessment Report by residents and others who object to the Project on landscape and visual grounds (including general 'rural amenity'), specifically:

- The submitters' general dislike of the likely change to views that would be obtained from their properties associated with the presence of the proposed turbines
- The submitters' concerns related to the negative impact of the turbines on the picturesque rural character of the area.

This feedback is acknowledged and has been considered in the current assessment.

The Regional Landscape Values of the area as described in the Wide Bay Burnett Regional Plan (September 2011) are also acknowledged in relation to this issue; noting in particular the comment on page 153 that residents and visitors to the region value the extensive and diverse range of significant landscapes that are considered to be "…*some of the main reasons that people move to, and stay in, the region*."

Aesthetic perceptions have been identified as one of the strongest influences on these attitudes, particularly with respect to visual impacts, which can be positive or negative depending on individual attitudes to the principle and presence of wind generation.

There is also an increasing body of evidence that negative attitudes can reduce with time particularly for those living in proximity to wind farm sites, as they become familiar with the operational wind farm as described in Section 5.5.4 on Community Perceptions. Therefore, it is difficult to arrive at a collective view on the direction and duration of impact caused by a wind farm project, which is relevant for all visual receptors. Accordingly, this chapter provides an assessment based on the professional judgement of the assessment team and the methodology described herein.

The visual assessment has found that the introduction of new wind turbines and associated infrastructure (including access roads, substation and high voltage overhead feeder lines) along with the necessary maintenance activity for the Project, will change the existing character and visual amenity of views experienced by people living, working and visiting the wind farm site and the surrounding landscape. The Project may be seen from fixed locations (as described and illustrated in the representative viewpoint descriptions, evaluations and photomontages) or as people move through the area on roads or paths (sequential views). However, the effect of a wind farm is a subjective issue and the effects or impacts may be perceived as adverse or beneficial, depending on individual attitudes to the principle and the presence of wind generation, noting that many of the affected community have expressed concern regarding the visual impact of the turbines in their submissions to the previous 2011 Initial Assessment Report. However, it is also recognised that attitudes may also reduce in intensity with time, as people become familiar with the operational site.

A summary of the anticipated impact on the representative viewpoints is provided in Table 5.34. It is noted that some of the impacts have increased when compared with the initial 2008 LVIA (ERM, 2008) due to the modified scheme and changes in the adopted assessment methodology.

Table 5.34 Summary of anticipated impact on representative viewpoints.

Viewpoint name	Anticipated approximate distance to nearest turbine	Key visual receptors	Viewpoint Sensitivity	Magnitude of change	Potential Visual Effect	Significance of Effect
VP1: Niagara and Jarail Road Junction	Approximately 744 m to the west of this viewpoint	Residents, visitors and workers travelling along Niagara Road and Jarail Road	Low	High	Moderate adverse	**Not Significant**
VP2: Niagara Road	Approximately 4.2 km east of this viewpoint	Residents, visitors and workers travelling along Niagara Road	Low	Medium	Minor to moderate adverse	**Not Significant**
VP3: Niagara Road East	Approximately 1.9 km north west of this viewpoint	Residents, visitors and workers travelling along the eastern section of Niagara Road, between Cooranga North and the Bunya Highway	Low	High	Moderate adverse	**Not Significant**
VP4: Kingaroy-Jandowae Road	Approximately 4 km north of this viewpoint	Residents, visitors and workers travelling along Kingaroy-Jandowae Road	Low	Medium	Minor to moderate adverse	**Not Significant**
VP5: Bunya Highway North	Approximately 11.0 km west of this viewpoint	Residents, visitors, workers and tourists travelling along the Bunya Highway	Medium	Low	Minor to moderate adverse	**Not Significant**
VP6: Ironpot Road	Approximately 7.4 km south west of this viewpoint	Residents, visitors and workers travelling along Ironpot Road; also representative of views from a nearby residence.	Low	Medium	Minor to moderate adverse	**Not Significant**
VP7: Mt Kiangarow summit, Bunya Mountains National Park	Approximately 10 km north west of this viewpoint	Tourists and recreational visitors to Bunya Mountains	High	Negligible	Minor to Moderate to adverse	**Not Significant**
VP8: Bunya Highway South	Approximately 2.9 km north of this viewpoint	Residents, workers, visitors and tourists travelling along the Bunya Highway; also representative of views from a nearby residence.	Medium	Medium	Moderate adverse	**Not Significant**
VP9: Boiling Springs Lookout	Approximately 4.4 km east of this viewpoint	Residents, workers, visitors and tourists travelling along Dingo Fence Tourist Drive	Medium	Medium	Moderate adverse	**Not Significant**
VP10: Diamondy Road	Approximately 875 m south of this viewpoint	Residents, workers and visitors travelling along Diamondy Road	Low	High	Moderate adverse	**Not Significant**
VP11: Cooranga North	Approximately 2.3 km north east of this viewpoint	Residents, visitors and workers travelling along Cooranga North-Niagara Road; also representative of views from the southern edge of Cooranga North township (near Cooranga North historic school site)	Medium	High	Moderate to major adverse	**Significant**
VP12: Ironpot Creek, Niagara Road	Approximately 1.7 km north east and 2 km west of this viewpoint	Residents, visitors and workers travelling along Niagara Road; also representative of views from a nearby residence	Low	Medium	Minor to Moderate adverse	**Not Significant**

5.6.6 Summary of anticipated impacts during construction / installation

Although the Project Site occupies three landscape types, including the *Gently Undulating Foothill Plains* landscape type (Type A), the *Rolling Hills and Ridges with Open Forest* landscape type (Type B) and a small part of the *Lowland Native Forest* landscape type (Type C), the majority of the Project infrastructure will be located within the *Rolling Hills and Ridges with Open Forest* landscape type (Type A).

Based on the potential impacts associated with the Project (refer to Section 5.6.1) there is likely to be significant, albeit short term (approximately two to two and a half years) changes and effects to the landscape character, views and visual amenity as a result of the presence of construction crews (including transportation of the crew between activity sites and nearby towns) and large scale machinery installing the Project infrastructure in an elevated sparsely settled rural landscape. Construction activities (including excavation, trenching, earthmoving, vegetation clearance/trimming, installing the turbines by crane and temporary lighting) would be likely to disrupt the perceived sense of tranquillity and remoteness, and the long distant views with predominately unbuilt skylines associated with the *Rolling Hills and Ridges with Open Forest* landscape type.

However, given the sparse settlement pattern and remote location of the Project Site, the change will be experienced by a small number of visual receptors. These will include people living on rural properties, working locally (e.g. farmers, graziers, farm-assistants or farming/grazing contractors) and visiting the local area, including those travelling along the Bunya Highway (refer to Viewpoint 5 and 8); thus, reducing the widespread influence and overall severity of the effect.

5.6.7 Summary of anticipated impacts during decommissioning and restoration

At the end of the operational lifetime of the Project, it is assumed the wind farm infrastructure will be decommissioned and the site will be rehabilitated, returning the landscape character to its present condition.

It is anticipated that the impacts that result from decommissioning of the Project Site will be similar to those during the construction phase, as it is essentially a reversal of the construction process, although potentially a quicker process. Accordingly, there is likely to be significant, albeit short term, changes and effects on the landscape character, views and visual amenity as a result of the presence of construction crews and large scale machinery removing the Project components and rehabilitating the affected sites (e.g. graded landform, spreading topsoil and seeds). Land affected will return to a more natural appearance over time as the vegetation (grassland, trees and shrubs) matures, resulting in a negligible impact on the appearance of surface vegetation in the longer term. Tower bases will be cut back to below ploughing level or top soil built up over the foundation to achieve a similar result. The access roads, if not required for farming purposes or fire access, will be removed and the site reinstated to original condition and use. Access gates, if not required for farming purposes, would also be removed.

5.7 Mitigation measures

This section outlines the standard operating procedures and other factors considered to reduce and manage the impact of a wind farm on the landscape, views and visual amenity. It is acknowledged that due to the size of the proposed structures it is not possible to ‘screen’ or ‘hide’ all the turbines or associated infrastructure within the landscape. However, the measures outlined below can assist in providing a more harmonious appearance to the Project overall, particularly when viewed from sensitive viewing locations or in relation to those views experienced from residential properties lying close to the Project.

The mitigation framework outlined in Table 5.35 is based upon a process that seeks, as a first priority, to eliminate or minimise adverse landscape and visual impacts through careful design and siting of infrastructure then, secondly, to implement detailed design tailored to the specific location to manage any adverse impacts identified.

Given that the wind turbines are potentially visible within at least 17 km (depending on weather conditions), the proposition of providing and maintaining off site planting to manage all views of the Project is not practical. The mitigation framework has therefore been focussed on managing the impact of construction activities, managing the visual amenity of nearby residents adversely affected by the Project (e.g. tailored off site mitigation for specific residences, if required through the consultation process), post construction site rehabilitation activities (e.g. reinstating temporary access roads and storage areas), and providing advice for the decommissioning of the Project.

Table 5.35 Potential activity-based mitigation measures to minimise landscape and visual effects

Proposed mitigation category	Description of measures to minimise landscape and visual effects
Activities undertaken during construction and operation	
Facilities siting and design	- Facilities will be designed to minimise impact on the current land use, including minimising land take / loss of productive agricultural land wherever practicable. - Facilities will be designed / located to minimise tree and other vegetation removal where practicable. - A semi-matt finish on the turbine towers, nacelles and blades will be used to avoid potential visual impacts from blade glint caused by reflection of the sun. - Where new access roads are required on private properties, these will be aligned and built in consultation with the respective individual landowner(s). They will be tidily maintained and include gates (where necessary) similar in style to those in the surrounding rural landscape. - After dark construction lighting will be controlled to minimise effects on sensitive visual receptors. - The natural line of the landscape will be used wherever practicable to reduce visibility and assist integration of the Project infrastructure.
Landscape strategy to hide / screen the substation and other elements	- During the detailed design of the Project, landscape elements (landform, vegetation, hard elements as appropriate) that will interrupt sightlines from sensitive vantage points may be considered where a significant visual impact; particularly nearby residences (following consultation with landowners). For example, shelterbelt planting adjacent to the property line of an affected residence. - It should be noted that screening effects to mitigate tall structures such as 180 m turbines are only effective where features providing screening (e.g. trees and tall shrubs) are located close to the viewer (or visual receptor). Screening features located at a distance from the viewer will be less effective in containing views i.e. turbines of this size would be visible above the tree tops. - Where appropriate and practical, excess spoil from site excavations will be incorporated into bunding at the base of the proposed buffer planting to increase the overall height of the screen planting. However, it is important to note that this is not appropriate for all landscape types e.g. flat open landscapes with little vegetation. - Any new tree and shrub planting, proposed as part of any detailed landscape design for the Project will help integrate each component into the surrounding landscape. Any screening will consist of mixed plants of local provenance including some fast growing species, as appropriate to the landscape character. - As the location of the proposed substation is visually contained and concealed from key visual receptors (i.e. nearby residences and public roads) through changes in landform, vegetative screening is not essential for the mitigation strategy, but will be discussed and considered with landowner(s).
Construction management and rehabilitation	- A construction environmental management plan will be developed that seeks to control landscape and visual effects including: • Conducting design reviews prior to ordering of materials to ensure that low-glare, semi-matt products and the correct colours have been specified. • Locating construction compounds within visually unobtrusive location(s) where practicable. • Ensuring maintenance of tidy and contained construction compound. • Roads providing access to site compounds and installation works areas will be maintained free of dust and mud during construction. • Protection of valued features (e.g. remnant vegetation, watercourses), using fencing to keep contractors out of areas where damage may result. • Undertaking construction in sensitive areas, such as road crossings at waterways, in dry weather where possible to minimise visual impacts that can result from sedimentation and erosion caused by heavy rain. • Controlling the movement and location of plant and materials during the construction period. • Instigating progressive rehabilitation of disturbed areas using suitably qualified

Proposed mitigation category	Description of measures to minimise landscape and visual effects
	and experienced contractors, including bush regenerators where the aim is to reinstate pre-existing natural communities. • Where necessary, the topsoil at all construction sites and compounds will be carefully scraped from the site to a depth of 200-600 mm (the actual depth of the topsoil) and stored in mounds no greater than 2 m high at the perimeter of sites and along the edge of the cabling route, for re-use. • In areas where the mounds are to be in place for long periods of time they will be seeded with native grass seeds/sterile cover crops to help reduce erosion and prevent weed colonisation.
Site waste management plan	- A site waste management plan will be prepared to improve materials resource efficiency and ensure waste is minimised and reduce impacts on landscape character, views and visual amenity. Any waste (including timber cleared during construction) will be re-used, recycled or recovered in other ways before disposal options are explored (which is also likely to achieve costs savings). The plan will be updated by the principal contractor/site manager as work progresses (i.e. the plan should become a 'living' document to measure current progress against intended targets contained in the plan) and will ensure that workers on the site are aware of the plan and co-operate with it (this will include provision of suitable site induction, information and training).
Activities undertaken during decommissioning and rehabilitation	
Construction activities and rehabilitation	- A post-decommissioning rehabilitation plan will be prepared for the implementation, establishment and maintenance of the proposed landscape / rehabilitation works in order to reinstate the Project Site to its pre-existing (or enhanced) conditions. - On completion of operation, all components, materials (e.g. hard standing) and access roads associated with the scheme will be removed from the Project Site. Affected areas will be reinstated and rehabilitated to its former or preferred land use, in consultation with the land holders. - Topsoil will be re-spread, graded and seeded with appropriate crops, native grasses, shrubs or plant species, in consultation with the land holders. - Turbine foundations will remain in-situ and rehabilitation works (i.e. grading and spreading of subsoil, topsoil, mulch and seeding) will be undertaken to enable agricultural activities to re-occur, such as grazing pastures. - Materials and machinery will be stored tidily during this phase. - Components of the facilities will be reused / recycled, where possible, for future use elsewhere.

5.8 Residual impacts

Residual impacts relate to any changes in the overall level of effect for potential impacts post the implementation of mitigation. Although a number of reasonable mitigation measures will be applied to help reduce the extent of the Project's effect on landscape character and visual amenity, such mitigation measures are considered unlikely to significantly alter the level of effect assessed in Section 5.6. Subsequently, the residual impact is therefore considered to mimic those impacts identified in Table 5.21 and Table 5.34.

5.9 Cumulative landscape and visual impact assessment

The aim of this Cumulative LVIA is to describe and assess the ways in which the Project will have additional landscape and visual impacts when considered together with other large scale projects within the wider landscape context of the Project Site.

A key concern is the visibility of the wind turbines, but also of concern are the ancillary development activities such as access road construction, mobile camps, increased traffic on rural roads, potential interruption to farming and grazing operations, and their effect on the landscape. Of particular importance is:

- How these developments relate to each other in the design and relationship to their settings (e.g. massing, height, scale, form, style)

- Their frequency as one moves through the landscape (i.e. as seen sequentially from main transport and recreational routes)
- Their visual separation to allow experience of the character of the landscape in-between.

Coordinated Projects and Department of Transport and Main Roads (TMR) Projects (including significant developments currently in construction, approved developments, or developments currently undertaking or which have recently submitted an EIS) that have been considered in the cumulative landscape and visual assessment are described in Table 5.36. In addition to the projects identified below, a number of other projects were identified and considered but have not been included as they are located more than 150 km from the Project so there is an extremely low likelihood of cumulative landscape and visual impacts to be experienced at this distance. These projects include the Wandoan Coal Project; Landsborough to Nambour Rail Project, Nathan Dam and Pipeline, D'Aguillar Highway Safety Improvements; Toowoomba Second Range Crossing.

Table 5.36 Projects potentially relevant to the cumulative LVIA

Project name	Location	Description	Distance & direction from site boundary	Consideration in the cumulative LVIA
Tarong Northern Land Ash Emplacement Project	North-west of Yarraman (between Tarong and Yarraman State Forests).	Construction of an additional ash storage facility to service both the Tarong and Tarong North power stations. It will ultimately be approximately 50 m high with a moderate slope of 1:8 (height: width). The project is currently proceeding (due for completion by 2030).	Approximately 60 km east of the Project Site boundary	**No**: The operational impact of this development and the Project will be experienced separately, due to the large distance between; therefore cumulative impacts are not expected.
New Acland Coal Mine Stage 3	Expansion of the existing New Acland open-cut coal mine, from 4.8 million tonnes per annum (Mtpa) to up to 7.5 Mtpa.	The project is currently proceeding.	Acland, approximately 89 km south east of site	**No:** The operational impact of this development and the Project will be experienced separately, due to the large distance between; therefore cumulative impacts are not expected.
South Burnett Coal Project	Approximately 6 km south Kingaroy and 17 km north-west of Nanango.	Proposed development of a thermal coal mine producing up to 10 Mtpa of coal. The project was a declared a 'coordinated project' in August 2016.	Approximately 35 km east of the Project Site	**No:** The operational impact of this development and the Project will be experienced separately, due to the large distance between; therefore cumulative impacts are not expected.
Wetalla Water Pipeline	A 45 km underground water pipeline to supply treated wastewater to the New Acland coal mine.	The project is currently proceeding and is due to be completed in 2017.	Kelvinhaugh, approximately 106 km south east of site	**No:** Pipeline is located underground so, after the initial construction phase (before the Project), will not meaningfully

Project name	Location	Description	Distance & direction from site boundary	Consideration in the cumulative LVIA
				impact on landscape and visual values.
Australia Pacific LNG (Origin)	Between the Walloons gas fields (from Injune to Millmerran) and Gladstone.	Development of an integrated liquefied natural gas project in Queensland comprising three principal elements: - further development of its coal seam gas (CSG) resources in the Walloons gas fields stretching from Injune to Millmerran; - construction of a 450 km underground gas pipeline from the gasfields to Gladstone; and - development of an LNG processing plant and export terminal on Curtis Island near Gladstone comprising four gas trains with a total capacity of up to 18 million tonnes per annum of LNG. - Project ongoing (due for completion 2035)	Miles, Approximately 140 km west of the Project Site boundary	**No:** The operational impact of this development and the Project would be experienced separately due to the large distance between them; therefore cumulative impacts are not expected.
Surat Gas Project	Dalby, Chinchilla, Kogan, Jandowae, Miles	Ongoing development of an integrated liquefied natural gas project in Queensland comprising further development of its coal seam gas (CSG) resources with associated gas well and processing infrastructure.	Jandowae, Approximately 30 km west of the Project Site.	**No:** The operational impact of this development and the Project would be experienced separately due to the large distance between them; therefore cumulative impacts are not expected.
Queensland Curtis LNG	Between the Surat Basin and Gladstone	An integrated liquefied natural gas project in Queensland comprising: - expansion of coal seam gas operations in the Surat Basin to provide gas for two liquefied natural gas plants or trains and gas for domestic markets; - development of a gas and water pipeline network of approximately 800 km; and - development of the LNG processing and export facility on Curtis Island,	Approximately 40 km west of the Project Site boundary	**No:** The operational impact of this development and the Project would be experienced separately due to the large distance between them; therefore cumulative impacts are not expected.

Project name	Location	Description	Distance & direction from site boundary	Consideration in the cumulative LVIA
		near Gladstone. The Coordinator-General decided that the project can proceed subject to certain conditions contained in the report.		
Toowoomba Second Range Crossing	New highway north of Toowoomba	New second range crossing, with tunnel to bypass Toowoomba,	Toowoomba (130 km) south east of site.	**No:** Although this project will affect the landscape character and views in the vicinity of Toowoomba, it is considered too far to meaningfully affect the visual setting or views to the Project.
Warrego Highway Upgrades	Upgrades through sections of Toowoomba, Chinchilla and Dalby.	Various upgrades to the Warrego Highway are proposed in the vicinity of Toowoomba, Chinchilla and Dalby. This includes a number of duplication projects.	Toowoomba-Charlton (130 km); Chinchilla (90 km); Dalby (60 km);	**No**: The road widening schemes are too far from the Project to be experienced cumulatively or to open new views towards the Project.

5.9.1 Assessment of cumulative impact

The assessment of cumulative impact is judged on the basis of publicly available information for each project listed in Table 5.32 (e.g. Developer website, EIS documentation), information from the Department of Infrastructure, Local Government and Planning and site visits.

Three types of cumulative impacts on landscape character and visual amenity have been considered in the assessment:

- "Combined" impacts occur where a static receptor is able to view two or more developments from a standpoint/viewpoint within the receptors arc of vision (assumed to be 120 degrees for the purpose of this assessment) at the same time
- "Successive" impacts occur where a receptor is able to view two or more developments from a viewpoint, but needs to turn their head to see them
- "Sequential" impacts occur where a receptor is moving from one area to another, for instance when a person is travelling along a road or track and is able to see two or more developments at the same, or at different times as they pass along the route. Sequential effects can potentially affect views from routes over a wide area, but with the exception of the largest developments (e.g. adjacent windfarms) have a limited effect when the developments are 30 km apart or more.

No new proposed developments have been identified that are likely to be seen at the same time as (i.e. "combined" and "successive" impacts) or sequentially with the Project. This is primarily due to the large distance between the developments, combined with the presence of vegetation and changes in landform (i.e. undulations in the landscape providing enclosure to views).

5.10 Summary and conclusions

There are few landscapes in which a wind farm will not introduce a new and distinctive feature. In order to perform their function effectively, wind turbines are likely to be tall and frequently located in open or elevated landscapes. Consequently they are difficult (virtually impossible) to conceal, even if this were desirable, and therefore are likely to be highly visible and incongruent with the existing landscape character. Accordingly, all wind farms will result in some significant changes to the landscape and visual resource due to their size and prominence.

The capacity of a landscape to accommodate wind farm development depends on two considerations:

1. The degree of impact the development will have on the existing character of the landscape; and
2. The extent to which this impact can be modified and reduced by design.

Community perception of wind farms is an important consideration in assessing the landscape and visual impact of the Project. In comparison to more traditional forms of large scale infrastructure (e.g. major roads, open cut mines, transmission lines etc.), wind farms evoke a greater range of opinion. This is primarily because their presence and associated effect is a subjective issue. For example, some regard wind farms as a symbol of 'green' or renewable energy and are partial to their sculptural form. Some consider wind turbines attractive, graceful elements in the landscape. While others perceive wind turbines as unattractive elements, which clutter the skyline. For the purposes of this assessment, subjective interpretation of the Project has been avoided. Rather, the focus has been directed on the significance of the impact (i.e. a transparent judgement on the sensitivity of the landscape or visual resource, combined with the anticipated magnitude of change).

Even the most well-sited and designed wind farms result in substantial changes to the existing environment. The key issues in relation to landscape and visual amenity are the changes in the character of the landscape close to the Project Site (especially within 3 km of the nearest turbine, where the scheme would have a dominating effect on the landscape) and visual impacts on individual properties nearest the Project.

The issues of greatest concern identified by the LVIA include:

- Significant, albeit short term (approximately two to two and a half years), effects on the landscape character, views and visual amenity during the construction phase as a result of the presence of construction crews (including transportation of the crew between the Project Site and nearby towns) and large scale machinery installing the wind farm infrastructure in a remote elevated rural landscape (The *Rolling Hills and Ridges with Open Forest* landscape type)
- Potential long term disruption to the perceived sense of tranquillity and remoteness, and the long distant views with predominately unbuilt skylines associated with the *Rolling Hills and Ridges with Open Forest* landscape type
- Potential long term indirect effect of the Project and associated detraction from the sense of remoteness and tranquillity in the *Gently Undulating Foothill Plains and Valleys* and *Lowland Native Forest* landscape types; especially those areas within 3 km of the nearest turbine
- Effect on sensitive visual receptors, including residents that live in close proximity to the Project who are likely to experience the facilities on a daily basis (as represented in Viewpoints 6, 8 and 12) and users of rural roads including tourists travelling along scenic routes
- Visual perception of the increase in traffic on rural roads (e.g. due to required construction, ongoing maintenance and decommissioning of the Project).

In comparison with other, well-established, forms of development in the countryside (e.g. associated with arable farming and grazing industries), wind turbines are relatively unfamiliar, prominently vertical and have the unique characteristic of movement. Individually or in groups, they will be distinctive features in the landscape. However, the anticipated landscape and visual impacts will need to be considered in parallel with a of multitude matters, such as the following:

- The limited locational flexibility of wind farms (e.g. require windy locations, feasible connection to the grid and/ or supply network) and the need to find a balance between maximising energy capture whilst minimising impacts (i.e. siting can be influenced by non-operational factors, including local landscape characteristics)
- Although the Project Site comprises a strong rural character with a sense of remoteness and tranquillity, it is a sparsely-populated location, therefore, limiting the volume of visual receptors

- The residual loss of landscape features (e.g. mature vegetation) required as a result of installing the wind farm components within the Project Site (i.e. installing the turbine foundations, access roads, substation and overhead feeder lines) is likely to be relatively small, and the turbines and associated infrastructure will be situated to avoid vegetation wherever possible
- Modifications to the landform and drainage required as a result of installing the wind farm components within the Project Site (e.g. levelling of land and an increase in impermeable surfaces in a rural landscape) is likely to be minimal
- The existing site has a history of modification for farming practices (including vegetation clearance and landform modifications) and already contains 275 kV transmission line infrastructure
- Although the Project is likely to be visible from northern elevated and/or exposed parts of the Bunya Mountains National Park there are no formal walking tracks through this part of the park and the Project will not fundamentally alter the reasons for which this national asset was designated. The turbines are unlikely to be visible from the key walking tracks and associated lookouts within the northern part of the National Park that typically look westwards (e.g. Mt Kiangarow and Ghingion), while lookouts in the southern part of the National Park typically look westwards (e.g. Barker Creek and Pine Gorge).

It is considered that a layout with 115 turbines would not represent a material change to the outcome of the overall landscape and visual assessment.

5.11 References

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