

APPENDIX D:
INDEPENDENT PEER REVIEW – LANDSCAPE AND VISUAL

INDEPENDENT REVIEW



JUPITER WIND FARM

***Prepared for
NSW DEPARTMENT OF PLANNING
& ENVIRONMENT***

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Review of the Jupiter Wind Farm 54 turbine Proposal

1.0 Executive Summary

The proposed Jupiter Wind Farm (JWF) project includes 54 turbines in two separate Precincts. The project has several distinct features, the most prominent of which are the high number of elevated lifestyle residences overlooking the project Precincts and the clustered arrangement of the turbines in each Precinct.

During the course of our review the proponent has provided two visual assessments of varying turbine options. Our review of the proponent's visual assessments has concluded that the viewpoints and methodology of the initial assessment by Clouston Associates provides the more relevant and objective outcomes. As a result, our assessment is based on the original viewpoints and methodology but assesses the latest turbine layout.

All assessments agree that the change of landscape character created by the windfarm will impact on elevated residential viewers. The change will be from a '*Grasslands*' character to a '*Wind Farm/Pastoral*' character and in our opinion that change will be a significant impact on the overall landscape character. The acceptability of this change in landscape character should be a key consideration in any consent for development. Our review of the potential impacts on residential viewers indicates that despite a reduction in turbine numbers between the original and final turbine layouts, the overall impacts of the proposal remain significant for a high proportion of the residence within 3km of the proposed turbines.

The proponent has proposed mitigation using vegetation screens. To reduce the impacts, the extent and number of screens required would be significant due to the orientation and elevation of a high number of residential viewing locations. This would be exacerbated by the difficulty achieving acceptable growth rates for effective screening. We consider that for the JWF, the likelihood of a successful project mitigation strategy based on vegetation screening is low.

1.1 Overview

O'Hanlon Design Pty Ltd has been engaged by the NSW Department of Planning and Environment (DPE) to review and comment on the quality and accuracy of the landscape and visual assessment report for the proposed JWF, provided as part of the Environmental Impact Statement (EIS) submitted for development approval by EPYC Pty Ltd (the Proponent) in October 2016. The engagement specified the expert review was to include consideration and provision of:

- Preparation of an independent expert review report focusing on areas of significant visual impact providing a review, advice and commentary on:
 - The Jupiter Wind Farm (including methodology, assumptions and assessment of impacts including cumulative impacts), and if necessary, identify critical flaws/gaps in the methodology to be addressed by the Proponent to ensure it accords with all relevant guidelines,
 - any significant landscape features relevant to the Project,
 - a conceptual framework for addressing landscape issues,
 - the suitability of the proposed mitigation and management measures if required,
 - any changes required for the acceptability of the project, in particular the acceptability of the wind turbines or related infrastructure as viewed in the landscape from public or private viewpoints, and
 - the original Jupiter Wind Farm visual assessment (Annexure F) and the subsequent updated assessment of residences within a 3km radius of any turbine.

Our methodology has been a review of the original baseline site information, DP&E visual assessment guidelines, parts of the proponent's Environmental Impact Statement, the Annex F Landscape & Visual Impact Assessment (LVIA). The review also included three site visits in January and February 2017. Those visits included access to 40 of the more highly affected residences, with a desktop review of remaining residences and potential viewing locations. In addition, we assessed topographic maps for the study area to identify local issues and potential cumulative or regional issues. The purpose of these reviews was to provide background information, a reference for the methodology and depth of assessment that could be considered reasonable for determination of the site suitability and areas of significant visual impact.

Subsequent to the preparation of our preliminary draft review, the Proponent proposed a possible modification of the application to 44 turbines with associated infrastructure. This was also reviewed in anticipation of the final submission. The Applicant's final submission of the modified proposal now includes 54 turbines and is accompanied by an Updated Visual Impact Assessment (UVIA) dated September 2017 prepared by ERM.

1.2 Introduction

The Jupiter Wind Farm project as originally submitted in the EIS December 2016 proposed 88 Wind Turbines to be located within the Southern Highlands region situated approximately 5 kilometres south east of Tarago and approximately 18 km east of Bungendore. The subsequent proposed revision has amended the JWF proposal to 54 wind turbines in a more compact area.

Updated Key Project Statistics:

- Updated Project: 54 Turbines in two Precincts (24 Upper Precinct, 30 Lower Precinct)
- Overall Height (top of tip): 173m unchanged from the LVIA. (Refer UVIA Table 4.1)
- Overall Height (to hub): 110m unchanged from the LVIA. (Refer UVIA Table 4.1)
- Rotor Diameter: 126m unchanged from the LVIA. (Refer UVIA Table 4.1)
- Associated 132kV overhead powerlines, collector substation and switching substation.
- There are two existing wind farms in the region. Capital Wind Farm (CWF) is located 12.2km to the East of the JWF whilst Woodlawn Wind Farm (WWF) is located 8.5km North East of the proposed JWF.

1.3 Distinctive Visual Factors

The JWF has several distinctive features. The first is that a significant proportion of the residential viewpoints to the north and east, and a smaller number to the south, are located adjacent to the ridges or on elevated ridge faces placing the viewer close to the level of the turbine nacelles. These viewpoints are relatively more elevated than the more common residential viewpoints in the Southern Highlands of NSW where viewers are often well below the tower base and the relative height difference between the viewer position and the proposed nacelle is sometimes as high as 350 - 400m. Many residences at JWF are located between RL 700 and RL 750 with most turbine nacelle levels varying between RL 800 and RL 860. This distinction is a result of the topography, the subdivision patterns and available wind turbine locations.

A high proportion of the elevated allotments surrounding the proposal have been developed as "lifestyle blocks" with elevated residences situated to take advantage of the existing view. Many of these allotments are occupied by residents whose primary use of the allotment is for lifestyle enjoyment where agricultural purposes are a secondary consideration.



It is notable that around the JWF project area the perceived landscape character may differ significantly between viewing locations in the valleys, closer to the main roads and those located in the more elevated positions, particularly depending on the elevation of the selected viewpoints and potential for a greater scope of visible topographical relief. Another associated differentiator, resulting from the specific local topography is that the JWF turbines are grouped more in clusters within and over a series of undulating hills rather than in lineal strings along a high-level series of ridges.

1.4 Assessment Notes

It is noted in both the original LVIA and the UVIA that access to individual properties was in some cases not available, therefore many of their assessments are desktop assessments only or assessed from

adjacent roads. Properties assessed in this manner are identified in the LVIA Assessment with * or ** respectively. The ULVA notes the availability of property access in the accompanying text for each residential assessment. Our site visits include a substantial number of inspections of residences that were not visited by the Proponent's visual assessment consultants. However, our review is also based on a significant number of desktop reviews.

It is important to note that this review is not a full visual assessment of the JWF proposal for reasons outlined in Section 2. Our review is primarily based on the LVIA stated methodology and adjusted following our review of each methodology, the localised or topographical factors we have identified on site and during our desktop analysis of additional topographical information.

1.5 Terms and Abbreviations

Terms and abbreviations used throughout the text of the report are shown in **Table 1.1** below

Table 1.1 Terms and Abbreviations

Term / Abbreviation	Meaning
AHD	Australian Height Datum
CWF	Capital Wind Farm
DNWG	Draft National Windfarm Guidelines July 2010
DPE	NSW Department of Planning & Environment
EIS	Environmental Impact Statement-EPYC December 2016
EP&A Act 1979	NSW Environmental Planning and Assessment Act 1979
JWF	Jupiter Wind Farm
km	Kilometre
LEP	Local Environmental Plan
LGA	Local Government Area
LVIA	Landscape and Visual Impact Assessment – prepared by Clouston Associates – Dec. 2016
NAF	Wind Farms and Landscape Values - (National Assessment Framework)
RtS	Response to Submissions
RL	Relative Level
SEARs	Secretary's Environmental Assessment Requirements
U.S.D.A.	United States Department of Agriculture
UVIA	Final Landscape and Visual Impact Assessment – Prepared by ERM – Sept. 2017
VAB	Wind Energy: Visual Assessment Bulletin - DPE December 2016
VIA	Visual Impact Assessment
WWF	Woodlawn Wind Farm

2.1 Assessment Methodologies

The JWF LVIA assessments are unique in our experience as the Proponent has submitted two VIA's to cover similar windfarm proposals in the same visual catchment as variations of the same development. The initial LVIA, Issue H, was prepared October 2016 by Clouston Associates for the 88 turbine proposal and following subsequent amendments to the proposal an Updated VIA was prepared September 2017 by ERM for the reduced 54 turbine proposal. The two VIA's use slightly different methodologies but both are generically based on the widely accepted methodology created originally by the U.S.D.A Forest Service. This is the same methodological basis as the visual assessment process recently published by NSW Dept. of Planning and Environment the *Wind Energy: Visual Assessment Bulletin* (VAB). Each VIA methodology has however been individually adapted and adjusted to reflect different approaches to quantifying baseline assessment criteria and different synthesis methodologies.

2.2 Overall Performance Objectives

The original LVIA was written prior to the publication of the VAB. It therefore does not refer to the VAB directly but the similarity in the methodology is easily identified. The UVIA was written subsequent to the publication of the VAB based on revised SEARs issued prior to publication of the VAB. The UVIA clearly states that the VAB does not apply to the project. The UVIA identifies the aims of the VAB, refers directly to the VAB methodology and states that the ULVA methodology is consistent with the requirements outlined in Appendix 1 and 2 of the VAB. In Section 3 the UVIA further highlights where it is considered that the methodology of the UVIA meets the intent of the VAB.

Based on previous experience, and with a desire to reduce subjectivity in the visual assessment process, the DPE provides in the VAB on page 2, Performance Objectives including to:

- *Provide the community and other stakeholders with greater clarity on the process along with an opportunity to integrate community landscape values into the assessment process; and*
- *Provide greater consistency in assessment by outlining appropriate assessment terminology and methodologies.*

Regardless of the validity of the application of the VAB to this assessment, the intent of the VAB Performance Objectives is common to any well-prepared assessment. The clear purpose of these Performance Objectives is to provide a transparent assessment process and, where possible, to reduce the subjectivity of the path that leads to a series of impact assessments. The VAB suggests gathering data around a series of baseline study inputs. Key inputs are local community consultation, landscape character, sensitivity levels and visibility distance zones. Both the LVIA and the UVIA have followed this process and prepared a range of the Baseline Study Factors. Each VIA has used slightly different terminology and adaptations.

2.3 Community Consultation

The VAB and the Draft National Windfarm Guidelines July 2010 (DNWG) both highlight the importance of community consultation in identifying landscape values, key public viewpoints and importantly setting management objectives for the landscape units. These are key components of the Scenic Quality and management. The VAB indicates that local community and Local Council feedback is vital in assessing these factors and the setting of Scenic Quality Classes within the landscape. Neither the LVIA nor the UVIA appear to have used local community input to define any landscape values.

In section 5 of the UVIA 'Community Perception' a range of community perception studies are considered. These do not directly address the issue of local input to landscape values, but focus on the sensitivity of viewers and overall community attitudes to windfarms in the landscape generally. It is reasonable to assume that given some of the studies are almost 10 years old, some of the community studies to which the UVIA refers are likely to be based on community perceptions of significantly smaller turbines than those proposed at JWF.

Approximately 450 submissions were received to the initial exhibition of the 88 turbine JWF proposal, a high proportion of which raised visual issues as a concern. The UVIA notes that some community members considered the proposal a very significant and unwanted visual change to the landscape. This appears to be the only summary of community perceptions that are based on recent local input.

In the absence of this base study information, it is relevant to consider other indicators of local community values of landscape features and scenic quality of the Project Area landscape. One indicator of possible local community values provided by Goulburn Mulwaree Council, is the zoning of most of the Upper

Precinct as E3 – Environmental Management as part of the Goulburn Mulwaree Council Local Environmental Plan 2009.

Another indicator is the subdivision and use of the elevated areas to the north and north-west of the Upper Precinct and the proposed subdivision of Mt Fairy west of the Lower Precinct. Our perception that these zoning areas and subdivisions, both current and proposed, are created to a significant degree based on visual qualities of the land is further reinforced by:

- The high level of uptake of the allotments in the newer subdivisions,
- The lack of significant agricultural undertakings on many recently subdivided properties: they tend to be more directed to private agricultural purposes only,
- The prevalence of high quality 'lifestyle' developments on many allotments as distinct from predominantly rural uses, and
- The orientation of the recently constructed residences, many of which are located to take maximum advantage of the outlook afforded from their allotment.

2.4 Landscape Sensitivity

Reading the UVIA there appears to be some confusion around landscape sensitivity and the sensitivity of viewers. This is related to the use of sensitivity as an outcome rather than a contributing factor toward determination of Scenic Quality. The UVIA Executive Summary concludes that the landscape sensitivity is Low. This indicates the ability of the existing landscape to accept change without significantly modifying the Landscape Character. This contrasts with the statement in Clause 3.18 that in residential locations the landscape sensitivity is always High. The UVIA appear to mean that viewer sensitivity at residential locations is always High.

Additionally, Clause 3.15 of the UVIA indicates that generally the greater the landscape modification the lower the viewer sensitivity. This connection is not always a direct correlation. Many modified landscapes, particularly those with a unified visual character are highly valued by viewers. The effect of modification is context related. Urban elements, culturally modified areas and pastoral lands can have significant scenic quality and high sensitivity to change depending on the context and proposed change to the landscape character.

2.5 Comparison of Baseline Study Factor synthesis

The VAB clearly notes that the interpretation, relative weighting and synthesis of these Baseline Study factors is a key step in the methodology.

The valuation and manipulation of the parameters contributing to this synthesis is one of the defining difference between each of the adopted methodologies. The VAB analyses the landscape to determine an existing Landscape Character Type and highlights any key landscape features prior to synthesizing the baseline information into Scenic Quality Classes. Those Scenic Quality Classes are then used to determine the Visual Influence Zones (VIZ) that lead to the performance objectives required to assess impact on the existing Landscape Character. This is achieved using a series of tabulated matrices that seek transparency and objectivity.

Both the LVIA and the UVIA attempt to consolidate this process in different ways. The LVIA creates a Landscape Character Impact (LCI) rating. The LVIA uses a matrix to create its LCI rating. The process is clear and transparent however nuances of landscape quality are lost in the synthesis of the LCI as it lacks an assessment of scenic quality class around which to base the quality and value of the landscape into which the turbines will be located.

The UVIA in Section 9 provides a diagram showing the interrelationship of the three key parameters of distance/viewer numbers and landscape character/sensitivity. The UVIA does not create a matrix. The UVIA assesses the Landscape Character in units and then the synthesis of parameters is left until the final assessment where distance, landscape character, viewer numbers and sensitivity are all bundled together to create a rating. This process lacks the clarity of identifying the relative contribution of various parameters to the outcome created by a matrix and appears to increase the potential for high subjectivity that visual assessors generally strive to reduce. The focus in the UVIA is on the 'Scale of the Effects' for each public viewpoint as determined by the individual assessor using professional opinion.

The UVIA then repeats this methodology for the private viewpoints noting that all residences are considered to be high sensitivity, low viewer numbers. The result is a series of assessments in the UVIA that lack clarity and appear to be based solely on the professional opinion of the assessor, potentially with high subjectivity and reduced objectivity.

It is reasonable to conclude that both the LVIA and the UVIA do not meet the same standard of clarity and objectivity the VAB seeks to provide.

Based on this analysis, I conclude that the methodology in Section 4 of the LVIA appears superior to the UVIA in clarity of synthesis of the baseline study inputs.

2.6 Distance and Turbine Visibility

Using a range of different terminology both the LVIA in Section 4.1 (Table 4.1) and the UVIA in Section 6.1 (Table 6.1) introduce visibility as a parameter to be included in the assessment of impacts. Both arrive at differing scales of distance at which they describe 'prominence' or 'dominance'.

The UVIA, written after the receipt of public submissions, does not address the issue of recent increases in turbine heights due to changing technology. The LVIA attempted to identify adjustments in Table 4.1 to account for changes in technology and this parameter was the subject of a number of responses by the community to the EIS.

In the wording of both tables there is acknowledgment that 178m high turbines, could be prominent or dominant as far as 10km from the viewer. Obviously the closer the viewer the more likely turbines will be dominant. The critical element is not the wording but the scaling and the weighting of this parameter in any visual assessment. Both assessments indicate a high probability of dominance or prominence in the range out to 4 km.

The ability to translate the commentary in Section 4.1 of the LVIA into a workable matrix in Table 4.6 is hampered by the need to translate five perception distances into four impact outcomes. In relation to the LVIA table 4.6 I consider that the highest rating should extend at least to 3km and that is supported by the analysis in Section 4.1 of the LVIA.

The UVIA creates 5 perception distances however it does not display a synthesis methodology that demonstrates a correlation between the distance and the resultant impacts. It is therefore not possible to draw a conclusion on the weighting of distance in the following synthesis of the UVIA.

Based on this analysis I conclude that the LVIA methodology, adjusted as noted above provides the best level of clarity and objectivity.

2.7 Review of Impact Assessment Synthesis

In Section 9.2.6 'Scale of effects' the UVIA outlines the method for synthesis of the three parameters, *Distance*, *Viewer Numbers*, and *Landscape Character*. The synthesis is not clear however the following statements apply

Low – "The assessment of a 'low' level impact can be derived if the rating of any one of three factors is assessed as low.

Medium – "The assessment of a 'medium' adverse effect will depend on all three assessment criteria being assessed as higher than low.

High – The assessment of a 'high' or 'inacceptable' adverse effect from a publicly accessible viewpoint usually requires the assessment of all these three elements to be high.

This synthesis technique is significantly limited and in several instances the outcomes do not match the description of the synthesis. For example:

- 9.6.17 UP L11 Boro Road (Low viewer numbers/ Low sensitivity). Moderate Impact rating,
- 9.6.18 UP L18 Roseview Road (Low viewer sensitivity). Low/Moderate rating,
- 9.6.22 UP L22 Boro Road (Low viewer numbers/ Low sensitivity). Moderate Impact rating.

This unclear logic is repeated for Medium and High Impact assessments throughout the UVIA.

However, of greatest concern is the limiting effect of this synthesis. For example, assuming that in Section 9.2.2 the assessment is based on 'Landscape Sensitivity' from Table 8.2 not 'Landscape Character' noted in the diagram, only one parameter 'Water Bodies' in Table 8.2 is High. This means no land based landscape element should generate a High rating.

Conversely, as Farmland 'The Plains' is rated 'low' its visual impact can never exceed low and would be rated low for high viewer numbers viewing turbines at very close range and low for low viewer numbers viewing turbines at long distance. No indication of the methodology for synthesis of parameters is provided prior to the assessment of residential impacts.

The result of some of the residential assessments in the UVIA appears inconsistent with the methodology

outlined in Section 9.2.6. It is not clear when the viewer sensitivity at all residences is set at 'High' by the UVIA how that translates into 'Viewer Numbers' or 'Landscape Character' for the purpose of assessment. For example, at residence J76 Section (10.8.3) I agree with the stated impact rating at 'high' however this appears to be based on, at best, a 'medium' landscape sensitivity and low viewer numbers. Without any commentary to indicate a difference in parameters, residence J3 (Section 10.8.1) with very similar unscreened views from the residence and curtilage receives a rating of 'moderate to high'. I cannot identify a reason for the difference in these ratings.

This subjective synthesis technique is probably responsible for the generally much lower impact ratings in the UVIA than in the LVIA.

As a result, I consider the LVIA synthesis methodology for public viewpoints to result in the most reliable assessment of the likely visual impacts, with higher objectivity.

2.8 Landscape Character Assessment

Identification of Landscape Character and the resultant Scenic Quality should be the key elements of the baseline analysis of any visual assessment. In the JWF Project both the LVIA and the UVIA identify the primary elements of the Landscape Character. The LVIA does not assess the Landscape Character in the usual manner leading towards a Scenic Quality Class. The LVIA uses Section 3 to create a series of Landscape Character Impact Ratings (LCI). The LVIA methodology attempts to address the question of overall acceptability of change on different zones in the landscape. The LVIA uses Sensitivity and Magnitude to form a view on the likelihood of the Project to dominate and change the Landscape Character. This is an overall impact assessment, not linked to the assessment in Section 4 of individual locations using different assessment parameters. The LVIA Landscape Character Impact Assessments are clearly set out in a matrix of sensitivity and magnitude.

The UVIA uses a methodology closer to the VAB. The UVIA identifies the Character Units then rates each according to its sensitivity to change. Table 8.2 identifies the assessed 'Landscape Sensitivity' to change which is then used to assess impacts. Unfortunately, the paragraph following Table 8.2 confuses the methodology by the introduction of viewer sensitivity and describes it as Landscape Sensitivity at individual properties. Landscape Sensitivity is described in Section 8.5 of the UVIA and the Sensitivity of each unit is stated in Table 8.2. The accompanying commentary refers to factors that are considered in the outcomes of Table 8.2 but does not identify the weighing of factors or methodology of reaching each sensitivity assessment. The level of clarity is lower than the LVIA and the ratings appear more subjective.

The LVIA determines the overall impact rating. An individual High or Moderate/High impact rating in the LVIA is therefore a statement of inability of the Landscape Character to absorb the change without changing its character.

In the UVIA one of the most significant portions of the Project area, the "*Unit 2: Farmland*", which is equivalent to the LVIA "*Undulating Grassland*", is set as Low/Moderate sensitivity. This difference in rating is difficult to justify without a clear matrix or definition of the relative weighting factors in the UVIA. This difference in rating is critical to the assessment of the likely change of Landscape Character and the effect of the placement of turbines into this landscape.

2.9 Methodology Assessment Summary

From the conclusions we have reached in each of the individual elements above in Section 2, it appears that the methodology of the original LVIA from Clouston Associates (October 2016) provides the most transparent and reliable guide to the impacts created by the proposed Jupiter Wind Farm.

3.1 Changes in Landscape Character

An assessment using the VAB should attempt to set the Landscape Character type and move on to assess the effect of any change on the Scenic Quality to determine the degree of change created by the development and ultimately, via Performance Objectives, the suitability of the Project. It is reasonable to consider that the existing VAB Landscape Character type, as described in the VAB is a combination of “Pastoral” and “Naturally Appearing”. This is the equivalent of the “Grasslands/Woodlands” character units in the LVIA and UVIA. All these character types are significantly different to a “Wind Farm/Pastoral” Landscape Character. One of the key questions to be addressed in the review by the department, is the acceptability of the proposed change in Landscape Character.

Table 3.2 *Explanation of Ratings* in the LVIA creates a matrix which sets the “Undulating Grassland” unit as Moderate/High sensitivity and is therefore assessed as capable of absorbing only limited change. This assessment is significant as a large number of residential viewpoints are focused to take advantage of the existing character of the “Undulating Grassland” landscape unit where the turbines are proposed to be located. The LVIA acknowledges the low probability of the landscape absorbing the proposed changes without changing the existing Landscape Character.

The responses to the exhibition of the JWF Proposal indicate that the existing local Landscape Character and the resultant existing Scenic Quality of the project area are highly valued by many of the residents. Currently the pastoral and naturally appearing elements of the landscape are predominant. It is those predominant characteristics that have created the visual environment that is highly valued by the bulk of the residents. The introduction of 54 highly identifiable man-made elements into this predominantly rural landscape will change the visual balance of the landscape to a more industrialized landscape form. While the two proponent’s assessments differ around the degree of sensitivity of the landscape and the ability of the landscape to absorb the proposed changes, it is obvious that the introduction of the proposed wind farm will change the local Landscape Character to a “Wind Farm/Pastoral” Landscape Character.

3.2 Land Use Zoning

As noted in Section 2.3 “Community Consultation”, both the LVIA and the UVIA have identified as part of their baseline studies the different land use zoning that affects the Upper Precinct of the Project. The LVIA notes the Project and surrounding Land Use zonings in Section 3.1.3 and Figure 3.2. The LVIA provides no commentary on the value of the Sensitive Land Use E3- Environmental Management zoning, its objectives or potential influence on the landscape values.

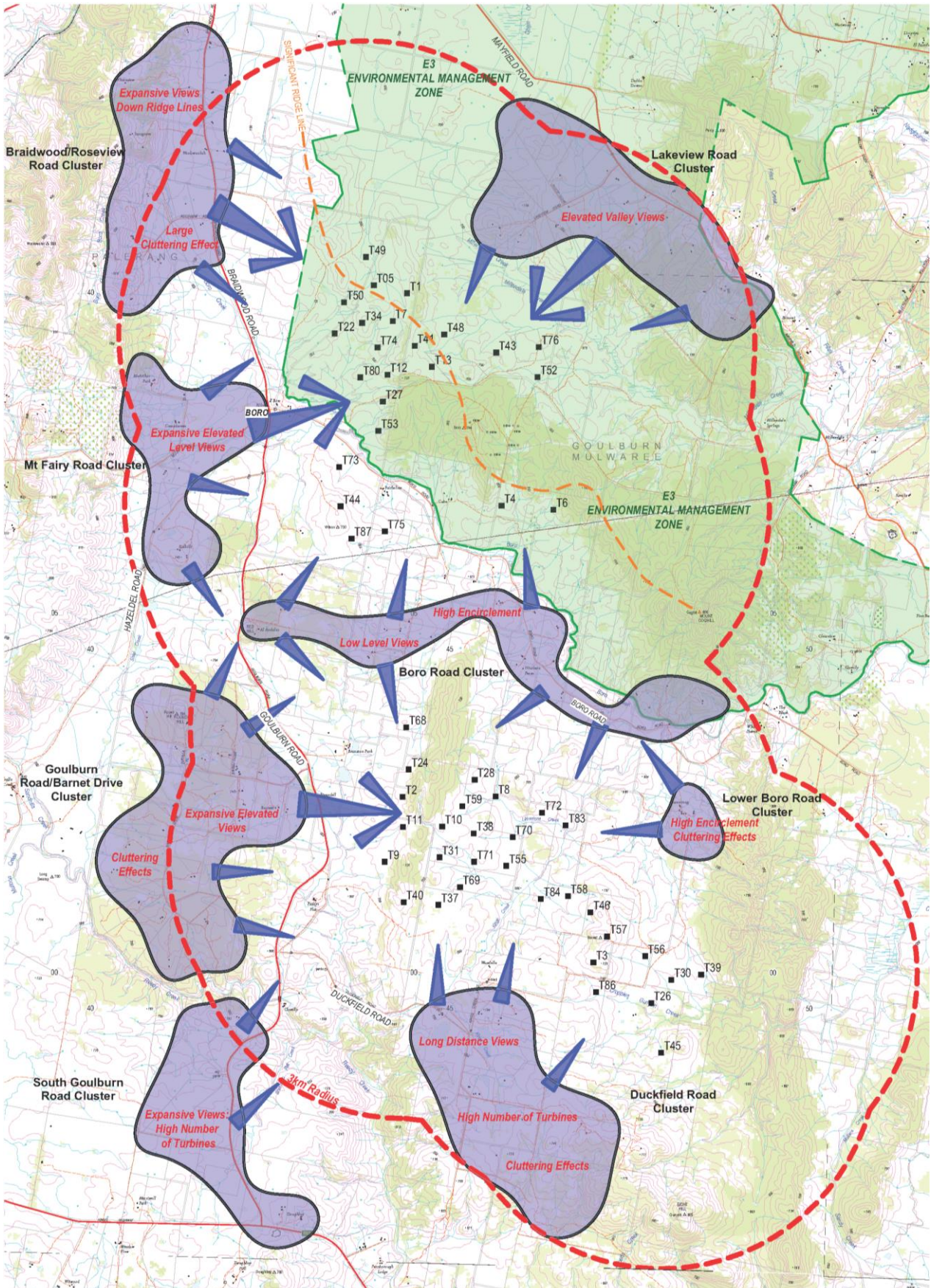
The extent of the E3 zoning relative to the residential assessment clusters is shown on Figure 3.1. Five of the eight residential clusters have views into the E3 – Environmental Management Zone; the Lakeview Road Cluster, the Braidwood/Roseview Road Cluster, the Mt Fairy Road Cluster, the Boro Road Cluster and the Goulburn Road/Barnet Drive Cluster. Most of the proposed Upper Precinct turbines will impact on the E3 zoned landscapes which would be viewed by a high proportion of the 80 residences located within those 5 clusters, most specifically those on elevated sites.

The UVIA identifies the Land Use zoning in section 8.3.1 as Sensitive Land Use E3- Environmental Management and quotes the objectives of the zoning in the Goulburn Mulwarr LEP. The UVIA concedes that the LEP objective to protect, manage and restore the aesthetic values is relevant to the visual assessment. It does not provide further commentary by reference to the second objective – “to provide a limited range of development that does not have an adverse impact on those values”.

The UVIA does note that “much of the area affected by land use zone E3 – Environmental Management that is proposed to receive turbines is currently cleared and used for agricultural purposes...”. The implication appears to be that once the land is cleared the landscape value is significantly reduced. The UVIA concludes its commentary on the E3 zoning, noting “the construction of the turbines would allow for the continued use of this area for farming practices” The UVIA does not consider the effect of the turbines on the aesthetic value and does not demonstrate how the construction of the turbines will protect, manage and restore the aesthetic values.

Consideration of the stated zoning objectives indicates that the area zoned E3, regardless of its current use or history of vegetation clearance, is identified for protection, management and more specifically, restoration. This indicates that the intention is for the E3 area to at least maintain the existing environmental attributes and if possible to enhance those values. The zoning objectives further specify that development should not adversely impact any of the existing values, including any aesthetic values.

Figure 3.1 The E3 Environmental Management Zone



As noted in the UVIA, the location of turbines in the cleared section of the E3 area will impact on the scenic quality of the cleared area. However, when considering the turbines located in the cleared sections of the E3 area their combination with the wider extent of the E3 area, including the adjacent woodlands and remnant vegetation, should be considered. This wider consideration is particularly relevant in the valley south of the Lakeview Road cluster of residences and on along Mayfield Road.

This valley differs visually from the bulk of the Project area. The end of the north/south ridgeline upon which Turbine T05 is sited (the T05 ridge) divides the creek drainage system initially into east and west draining areas. The west draining area is the headwater of Mittendale Creek running to the east. The west side of the T05 ridge is the source of Boro Creek which runs south until changing course to the west near Boro Road. Those drainage lines create some interesting diversity in form and vegetation type depending on the location of the viewers. Viewed from higher levels to the east (Roseview Road), the end of the ridge is juxtaposed against the vegetated ridges to the west. Viewed from the north (Lakeview Road) the T05 ridge forms an eastern enclosure to the valley and a contrast to The Boro to the south which is heavily



covered with remnant vegetation at RL 744. This topography creates a different set of underlying conditions. The vegetation visible in this catchment appears to have greater diversity than the balance of the Project area. The vegetation types include grasslands, low native heath and variety of open and closed forest elements. To the east the remnant vegetation clearing is more sporadic providing greater visual and colour contrast. These differences contribute to the higher level of Scenic Quality and aesthetic value identified by the environmental zoning than the surrounding landscape.

Figure 3.2 A section of the E3 Environmental Management Zone

Using this wider level of consideration, it is reasonable to conclude that the aesthetic values to be considered for the E3 zone would be the aesthetic value of the valley, the T05 ridge and surrounding catchment when viewed by users and residents within the E3 zoning and additionally those with views into the E3 zoned areas.

3.4 Cluttering Effects

Generally, turbines are considered less intrusive when viewed as distinct elements or when rotor directions are uniform. The uniformity creates visual order and harmony of the elements. When turbine rotors and towers visually overlap the uniformity is reduced particularly if the rotors are at varying angles. This is often described as the visual cluttering effect of turbines in the landscape. This cluttering effect is evident in Figure 4.3 of the LVIA where the depth of turbine overlapping is evident in the photomontage. In the JWF proposal, most elevated residential clusters that have views across several layers of turbines. The most affected clusters are evident in figure 3.1.

At the JWF the difference in relative level between elevated viewers in these residential clusters and the turbine rotor is lower than most wind farm arrangements. The cluttering effect would be exaggerated for many of the elevated residences as it will combine with the reduced difference in relative viewing position, resulting in an even higher level of visual clutter as rotors will appear to have greater overlaps. This combination of elevated residential viewers and a clustered layout creates a higher level of impact than would result from a more lineal turbine layout viewed from lower elevations.

4.1 Viewpoints

The LVIA and the UVIA differ in location and number of public viewpoints. The LVIA focuses on viewpoints that are more significantly impacted and the UVIA gives a wider coverage to more distant viewpoints using a cascading system of town, main road and local road viewpoints. As the purpose of this review is to focus on the most impacted locations, the LVIA viewpoints are the most appropriate model for our review.

The LVIA Viewpoints appear a representative sample of the variety of public locations and representative of the clusters of residences at varying heights, distances and levels of impact. The selected representative Viewpoints appear to include locations close or adjacent to the likely “worst case scenario” locations. These locations do not exactly match those in the UVIA. Where possible we have identified an adjacent comparable UVIA location and provided the UVIA assessment and location. The following tables are a summary of the impacts at LVIA Public Viewpoints.

Most of the public viewpoints are from lower elevations. This is due to the positioning of most major roads and public viewpoints within the valley area. A few viewpoints are located at higher levels along local roads. Viewers in the valleys along the main roads will view the turbines as elevated elements atop ridges. In most cases the view is more enclosed, and the turbines are prominently silhouetted against the sky. Figures 9.38 and 9.39 on page 74 of the UVIA are representative of these types of impacts.

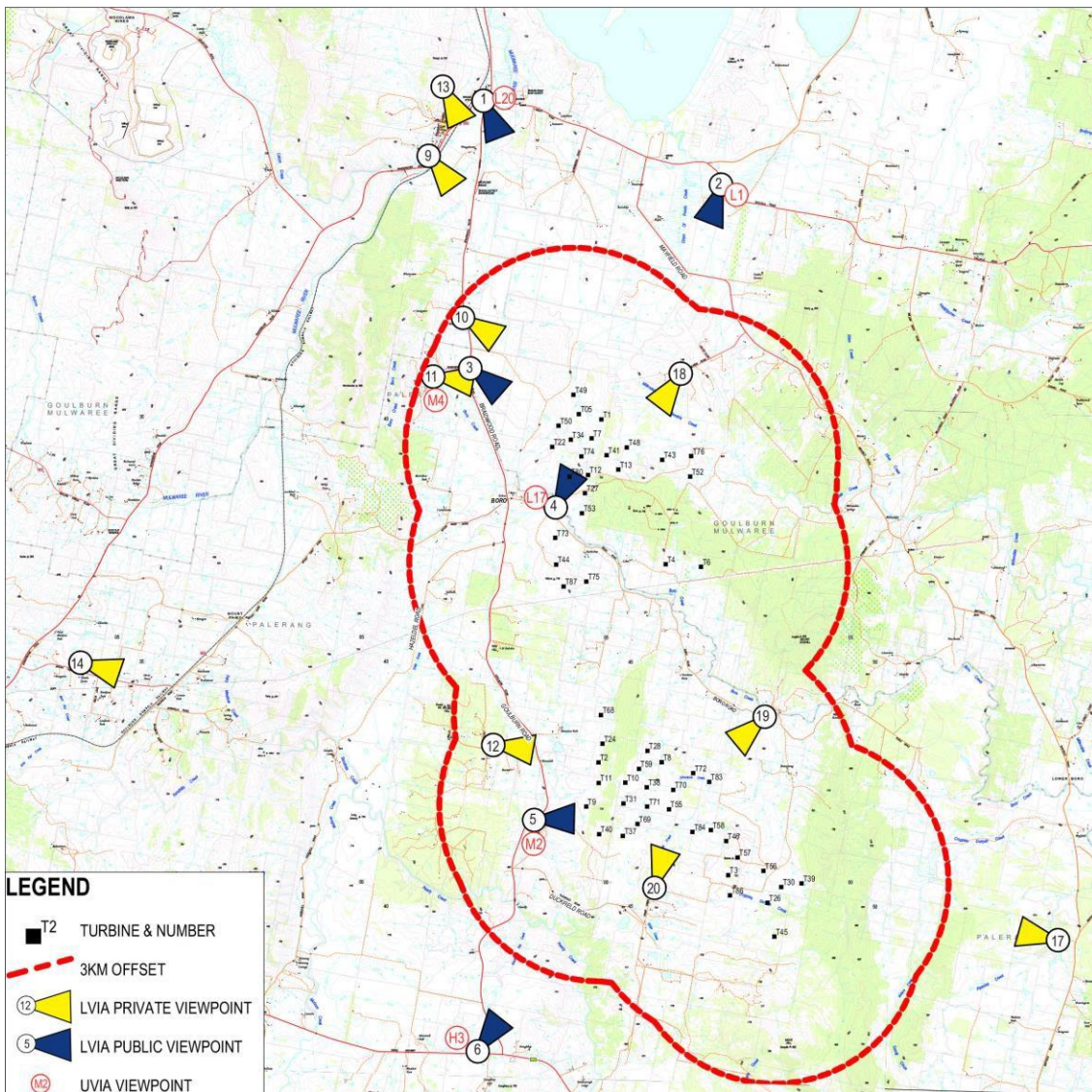


Figure 4.1 Representative Viewpoints

4.2 Conceptual Framework of the Review of Representative Viewpoints

For our review of Representative Viewpoints, the Magnitude factor “Distance of View” noted in the LVIA has been adjusted to indicate High impacts out to 3km rather than 2km. Moderate impacts to 10km. Our review is based on existing conditions without modification for any possible mitigation. For our review of the UVIA impacts assessment distances have been adjusted to match the 54 turbines layout and a review of that change of impact compared to the 88 turbine layout has been prepared. LVIA Viewpoints 7,8,15 and 16 have been removed as they are no longer valid in the 54 turbine layout due to the removal of the original Southern Precinct.

Table 4.2.1 Representative Public Viewpoints (based on LVIA Figure 4.6)

VP	LVIA 88 Turbine Assessment		OHD 88 Turbine Review		UVIA 54 Turbine Assessment (closest appropriate location)		OHD 54 Turbine Review	
	Dist.	Assessment	Review	Notes	Dist.	Assessment	Review	Notes
1	5.6km	Moderate	Moderate		T49 6.3km	Low (T2)	Moderate	A
2	5.1km	Low	Low-Moderate	B	T49 5.4km	Low (L1)	Low-Moderate	A
3	1.3km	Moderate-High	Moderate-High	D	T49 2.2km	Low (M4)	Moderate-High	A
4	1.0km	Low/Moderate	Moderate	B	T73 0.4km	Low (L17)	Moderate	A
5	0.7km	Moderate- High	Moderate-High	H	T09 0.9km	Low-Mod (M2)	Moderate-High	C
6	3.4km	Low-Moderate	Moderate	B,E	T40 5.2km	Low (H3)	Low-Moderate	C,E

Table 4.2.2 Representative Private Viewpoints (based on LVIA Figure 4.6)

VP	LVIA 88 Turbine Assessment		OHD 88 Turbine Review		UVIA 54 Turbine Assessment (closest appropriate location)		OHD 54 Turbine Review	
	Dist.	Assessment	Review	Notes	Dist.	Assessment	Review	Notes
9	5km	Moderate	Moderate	B,G	T49 5.6km	Neg-Low (M5)	Moderate	A
10	2.4km	Moderate- High	High	B,G	T49 2.7km	Low (M4)	High	A
11	2.3km	High	High	G	T50 2.8km	Low-Mod (L19)	High	A
12	2.3km	High	High	G	T02 1.7km	Low-Mod (L16)	High	C
13	6.2km	Moderate	Moderate	F	T49 6.9km	Low (L20)	Moderate	A
14	10.6km	Moderate-Low	Moderate- Low			N/A	Moderate-Low	C
17	5.8km	Moderate	Moderate	F		N/A	Moderate	C
18	1.5km	High	High		T76 1.7km	Low-Mod (L6)	High	A
19	1.5km	Moderate-High	High	G,F	T82 1.9	N/A	High	C,F
20	1.2km	Moderate-High	High	G,F	T37 1.4	Low-Mod (L12)	High	C,F

Notes

- A. Predominant view of turbines in Upper Precinct
- B. LVIA Summary of Ratings for 88 turbines rounded up in OHD review.
- C. Predominant view of turbines in Lower Precinct.
- D. Distance of high impact view adjusted to 3km in OHD review
- E. OHD assessment adjusts LVIA Quantum of View to Moderate.
- F. OHD assessment adjusts LVIA Quantum of View to High.
- G. Turbine extent in 54 Turbine scheme exceeds 120°.

4.3 Cumulative Impacts

Both the UVIA and the LVIA contain sections on the cumulative effects of the JWF with both the Capital Wind Farm and the Woodlawn Wind Farm.

Both identify a range of sequential and simultaneous cumulative impacts on Public Viewpoints. The most significant impacts are along Lumley Road and Mt Fairy Road. Due to the topography of the area and the layout of the road network the cumulative impacts are likely to be relatively low.

I consider there would be minimal cumulative visual impact created by the JWF and that people's perception of the regional landscape character would not be significantly changed due to the introduction of the JWF into the regional landscape.

5.1 Residential Viewpoints

For the purpose of this review we have divided the residential viewing locations into residential clusters as shown below. In this review distances have been adjusted to match the updated 54 turbine layout.

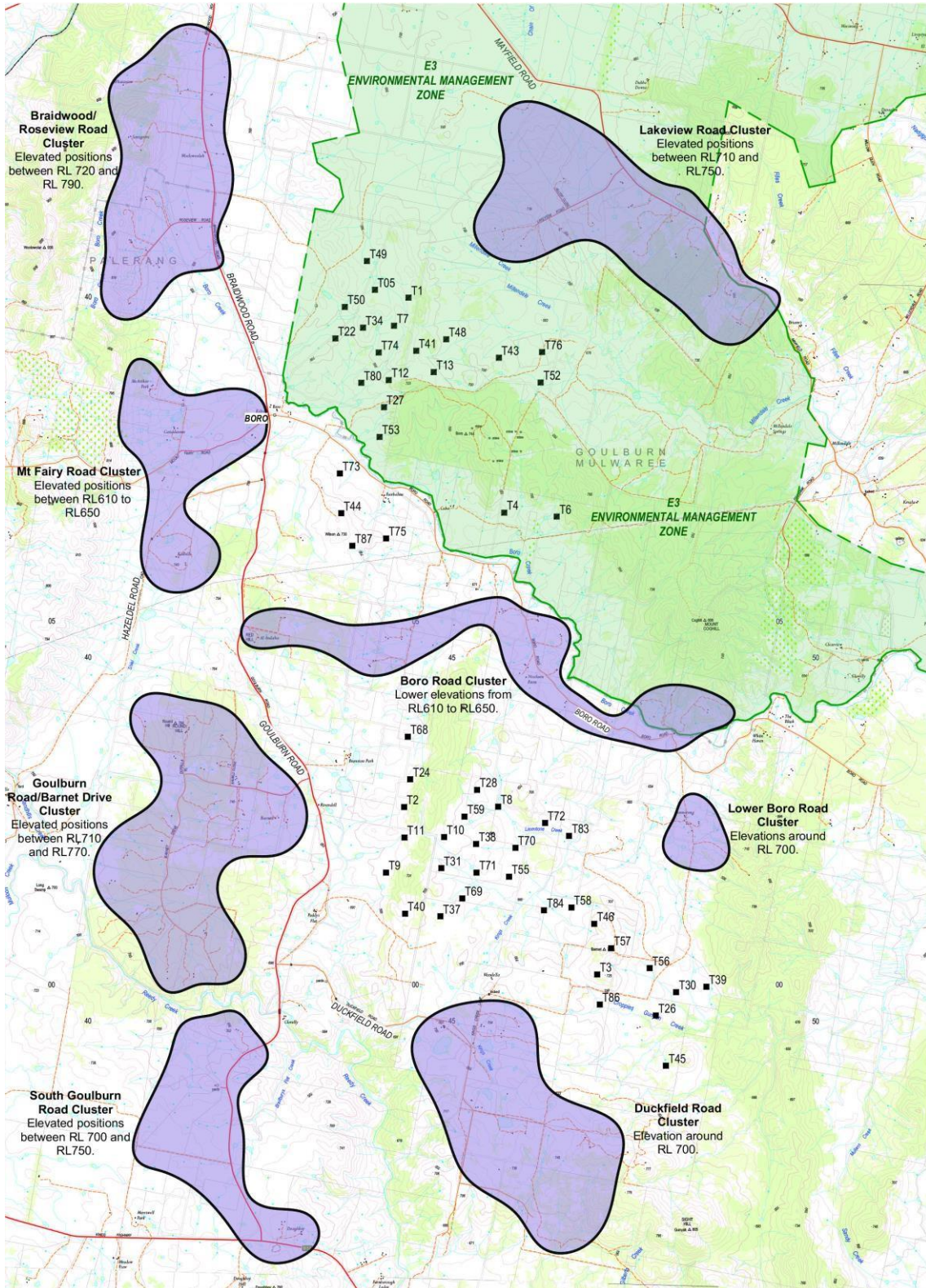


Figure 5.1 Residential Clusters

Table 5.1.1 Lakeview Road Cluster (Northern-Eastern Cluster)

This cluster of residences at the north-eastern edge of the Upper Precinct, at elevations between RL710 and RL750, has views south/southwest toward the Upper Precinct and some more distant views of the Lower Precinct.

Residences on the east of this cluster view across Creek and the E3 Management Zone toward the Upper Precinct turbines with Mt Fairy in the background. Residence at J003 Figure 10.34 on p.129 of the UVIA is a wireframe overlay representative of the turbine layout visible for the most affected residences in this cluster.

VP	LVIA 88 Turbine Assessment		OHD 88 Turbine Review		UVIA 54 Turbine Assessment		OHD 54 Turbine Review	
	Dist.	Assessment	Review	Notes	Dist.	Assessment	Review	Notes
J60	2km	Mod- Low*	Mod- High		T49 2.3km	N/A	Mod-High	V
J154D AA	2.6km	Mod- High	Mod-High		T76 2.6km	Mod-High	Mod-High	
J155	2.3km	Moderate**	Mod-High		T76 2.4km	Low	Moderate	
J239	2.6km	Mod- High	Mod-High		T76 2.6km	Low	Moderate	
J244	2.4km	Mod- Low*	Mod-Low		T76 2.4km	N/A	Low-Mod	
J153	1.9km	Mod- High**	Mod-High		T76 1.9km	N/A	Mod-High	
J221	2.2km	Negligible*	Low-Mod		T76 2.1km	N/A	Low-Mod	
J003	1.4km	High	High		T1 1.6km	Mod-High	High	V
J76b	1.3km	High**	High		T76 1.6km	N/A	High	V
J152	1.7km	Moderate*	Moderate		T76 1.7km	N/A	Moderate	V
J230B	2.0km	Negligible*	Negligible		T76 2.0km	N/A	Negligible	
J258	2.6km	Negligible*	Negligible		T76 2.6km	N/A	Negligible	
J230A	1.9km	Negligible*	Negligible		T76 1.9km	N/A	Negligible	
J76A	1.1km	High**	High		T76 1.5km	High	High	V.G
J325	2.3km	Negligible*	Negligible		T76 2.3km	N/A	Negligible	
J259	2.4km	Negligible*	Negligible		T76 2.4km	N/A	Negligible	
J260	2.7km	Low*	Low		T76 2.7km	N/A	Low	
J261	2.7km	Negligible*	Negligible		T76 2.7km	N/A	Negligible	

* denotes a desktop assessment

** denotes an assessment from the road

G. More than 15 turbines located within 3km of the residence.

V. Visited by OHD.

Table 5.1.2 Braidwood/ Roseview Road Cluster (North-Western Cluster)

This cluster of residences at the north-western edge of the Upper Precinct at levels between RL 720 and RL 790, having views south/southeast toward both the Upper and Lower Precincts.

Figure 10.22 on p.123 of the UVIA at residence J435-DA is a wireframe overlay representative of the turbine layout visible for residences in this cluster.

VP	LVIA 88 Turbine Assessment		OHD 88 Turbine Review		UVIA 54 Turbine Assessment		OHD 54 Turbine Review	
	Dist.	Assessment	Review	Notes	Dist.	Assessment	Review	Notes
J10	2.6km	High**	High		T22 2.9km	Mod - High	High	V
J19	2.2km	High**	High		T50 2.7km	N/A	High	V
J65	2.7km	High**	High		T50 3.3km	N/A	Mod-High	F
J93	2.5km	High**	High		T49 3.1km	N/A	High	V.F
J126	2.7km	High**	High		T49 3.5km	N/A	Mod-High	V.F
J126B	1.9km	Moderate*	Mod- High		T49 2.7km	Neg - Low	Moderate	
J130	2km	High**	High		T50 2.5km	N/A	High	V
J33 DA	2.5km	High	High		T50 3.2km	N/A	Mod-High	V.F
J134	1.7km	Mod-High**	High		T50 2.4km	N/A	Mod-High	V
J135	1.9km	High	High		T50 2.6km	Moderate	High	
J156	2.4km	Mod- High**	Mod- High		T49 3.1km	Low	Mod-High	F
J157	2.1km	Mod- High**	Mod- High		T49 2.9km	N/A	Mod-High	
J158	3km	Moderate	Moderate		T49 3.7km	N/A	Moderate	F
J198B	2.7km	Negligible*			T49 3.4km	N/A	-	F
J257	1.7km	Mod- High**	High		T50 2.3km	Low-Mod	Mod-High	V
J272	2.6km	High	High		T50 3.1km	N/A	High	V.F
J394	2.9km	Moderate	Mod/Low		T49 3.7km	N/A	-	F
J435	N/A	N/A	N/A		T50 2.6km	Mod-High	Mod-High	F

* denotes a desktop assessment

** denotes an assessment from the road

F. 54 Turbine scheme distance increased to greater than 3km

V. Visited by OHD.

Table 5.1.3 Boro Road Cluster (Central Cluster)

This cluster of residences at the eastern edge of the Upper Precincts at lower elevations from RL610 to RL650, have views northeast toward the Upper Precinct and views East toward the Lower Precinct.

Figures 10.106 and 10.115 on p.165 and p.168 of the UVIA at residences J40 and J145 respectively are wireframe overlays representative of the turbine layout for residences visible in this cluster.

VP	LVIA 88 Turbine Assessment		OHD 88 Turbine Review		UVIA 54 Turbine Assessment		OHD 54 Turbine Review	
	Dist.	Assessment	Review	Notes	Dist.	Assessment	Review	Notes
J145	1.3km	Mod- High**	Moderate		T4 1.3km	Moderate	Moderate	A
J144	1.2km	Mod- High**	Mod-High		T6 1.6km	N/A	Mod-High	A
J87	1.4km	Moderate	Moderate		T87 1.4km	N/A	Moderate	V.A
J40	1.3km	High**	Mod-High		T68 1.4km	Mod - High	Mod-High	V.A
J146	1.1km	Mod- High*	Mod-High		T6 1.5km	N/A	Mod-High	V.A
J142	1.6km	Mod- High**	Mod-High		T28 1.8km	N/A	Mod-High	V.A.G
J75A	1.8km	Moderate*	Mod- Low		T87 1.8km	N/A	Moderate	V
J16	1.1km	Moderate**	Moderate		T68 1.1km	Low	Mod-High	G
J147	1.6km	Mod- High**	Mod-High		T28 2.0km	N/A	Mod-High	
J75B	1.9km	Mod- High*	Mod- Low		T87 1.9km	N/A	Mod-High	V
J148	1.4km	Moderate	Mod-High		T28 1.7km	N/A	Mod-High	G
J141	1.3km	Moderate**	Mod-High		T72 1.7km	Low-Mod	Mod-High	G
J234B	1.7km	Negligible*	Low		T83 2.1km	Low	Low	V
J190	2.1km	Mod- High*	Mod-High		T83 2.4km	N/A	Mod-High	
J234A	1.7km	Mod- High**	Mod-High		T83 2.0km	N/A	Mod-High	V
J242	2.2km	Negligible*	Low		T83 2.6km	N/A	Low	V

* denotes a desktop assessment

** denotes an assessment from the road

A. Turbine extent in 54 Turbine scheme exceeds 120°.

G. More than 15 turbines located within 3km of the residence.

V. Visited by OHD.

Table 5.1.4 Mt Fairy Road Cluster (Upper Western Cluster)

This cluster of residences adjacent to or along the slopes accessed from Mt Fairy Road with viewing elevations around RL710 and views predominantly west to the Upper Precinct. Figure 10.59 on p.139 of the UVIA at residence J139 DA is a wireframe representative of the turbine layout visible for residences in this cluster.

VP	LVIA 88 Turbine Assessment		OHD 88 Turbine Review		UVIA 54 Turbine Assessment		OHD 54 Turbine Review	
	Dist.	Assessment	Review	Notes	Dist.	Assessment	Review	Notes
J91	2.2km	Moderate	Moderate		T22 2.6km	Low-Neg	Moderate	
J26	2.3km	Moderate*	Moderate		T73 2.4km		Moderate	
J127	2.3km	Mod-High**	Mod-High		T73 2.4km	Mod-High	Mod-High	V
J392 (189)	1.3km	Mod-High**	Mod-High		T73 1.4km		Mod-High	G
J138	1.2km	Mod-High**	Mod-High		T73 1.3km		Mod-High	G
J97A	2.2km	Moderate*	Moderate		T53 3.1km		Mod-High	V.F
J97C	2.3km	Moderate*	Moderate		T44 2.3km		Low-Mod	V.F
J139D A	-	-	-		T42 2.0km	Mod-High	Mod-High	

Table 5.1.5 South Goulburn Road Cluster (South-Western Cluster)

This cluster of residences southwest of the Upper Precinct along Goulburn Road is located between RL 700 and RL750 with views north toward the Upper Precinct.

VP	LVIA 88 Turbine Assessment		OHD 88 Turbine Review		UVIA 54 Turbine Assessment		OHD 54 Turbine Review	
	Dist.	Assessment	Review	Notes	Dist.	Assessment	Review	Notes
J178	1.2km	Mod- High*	Moderate		T40 2.8km	N/A	Low-Mod	
J424	1.7km	Mod- High**	Moderate		T40 3.4km	N/A	Low-Mod	F
J425	1.6km	Mod- High**	Moderate		T40 3.3km	N/A	Low-Mod	F
J 422	1.8km	Mod- High**	Moderate		T40 3.7km	N/A	Low-Mod	F
J423	2.4km	High	Mod- High		T40 4.2km	N/A	Moderate	F
J83A	2.8km	Mod- High	Moderate		T40 4.6km	N/A	Moderate	F
J416 (J83)	2.9km	Moderate*	Moderate*		T40 4.6km	N/A	Low-Mod	F

* denotes a desktop assessment

** denotes an assessment from the road

F. 54 Turbine scheme distance increased to greater than 3km

G. More than 15 turbines located within 3km of the residence.

V. Visited by OHD.

Table 5.1.6 Goulburn Road/Barnet Drive Cluster (Lower Western Cluster)

This cluster of residences between the Upper and Lower Precincts is located between RL710 and RL770.

Figures 10.80 and 10.81 on p.151 of the UVIA at residence J20 are wireframe overlays representative of the turbine layout visible for residences in this cluster.

VP	LVIA 88 Turbine Assessment		OHD 88 Turbine Review		UVIA 54 Turbine Assessment		OHD 54 Turbine Review	
	Dist.	Assessment	Review	Notes	Dist.	Assessment	Review	Notes
J58B	3km	Mod- High	Mod/High		J68 3.0km	N/A	Mod-High	V.F
J101	2.5km	Low*	Low		J68 2.6km	N/A	Low	
J188	2.7km	Negligible*	Negligible		J2 2.8km	N/A	Negligible	
J43	2.4km	Moderate**	Low-Mod		T2 2.5km	Low-Neg	Low	
J5	1.9km	High**	High		T2 2.0km	Mod	Mod-High	
J186	2.1km	Moderate*	Moderate		T2 2.3km	N/A	Moderate	
J186A	2.0km	Moderate*	Moderate		T2 2.3km	N/A	Moderate	
J181	2.0km	High**	High		T19 2.2km	N/A	High	
J46	2.3km	Negligible*	Low		T9 2.6km	N/A	Low	
J116A	1.9km	Mod- High*	Mod-High		T9 2.1km	N/A	Mod-High	
J20	1.3km	High**	High		T9 1.5km	Mod-High	High	
J85	1.5km	Mod- High*	Mod-High		T9 1.7km	N/A	Mod-High	
J23	3.0km	Negligible*	Negligible		T9 3.1km	N/A	Negligible	F
J116B	1.9km	High**	High		T9 2.0km	N/A	High	
J15	2.6km	Negligible*	Negligible		T9 2.7km	N/A	Negligible	
J116	3.0km	Negligible*	Negligible		T9 3.5km	N/A	Negligible	F
J180	2.6km	Negligible*	Negligible		T9 3.2km	N/A	Negligible	F
J185	2.1km	Negligible*	Negligible		T9 2.6km	N/A	Negligible	
J182	2.3km	Negligible*	Negligible		T9 3.3km	N/A	Negligible	F
J184	1.9km	Mod- Low*	Moderate		T9 3.0km	N/A	Moderate	

* denotes a desktop assessment

** denotes an assessment from the road

F. 54 Turbine scheme distance increased to greater than 3km

V. Visited by OHD.

Table 5.1.7 Duckfield Road Cluster (Southern Cluster)

This cluster of residences south of the Upper Precinct are all located around RL 700 have views north toward Lower Precinct and distant views to the north of the Upper Precinct.

Figure 10.93 on p.158 of the UVIA at residence J208 is a wireframe overlay representative of the turbine layout visible for residences in this cluster.

VP	LVIA 88 Turbine Assessment		OHD 88 Turbine Review		UVIA 54 Turbine Assessment		OHD 54 Turbine Review	
	Dist.	Assessment	Review	Notes	Dist.	Assessment	Review	Notes
J208	1.1km	Mod- High	Mod-High		T86 1.2km	Moderate	Mod-High	V.G
J216	1.1km	Moderate	Moderate		T37 1.5km	N/A	Moderate	V.G
J226	1.4km	Moderate**	Moderate		T37 1.6km	Low/Mod	Moderate	G
J217	1.4km	Mod- High	Mod-High		T86 1.6km	Moderate	Mod-High	V.G
J235	1.6km	Moderate**	Mod-High		T86 1.9km	Low	Mod-High	G
J247	2.0km	High	High		T86 2.2km	Moderate	High	
J243	2.2km	Mod- High**	Mod-High		T86 2.2km	N/A	Mod-High	
J243A	2.1km	Mod- High**	Mod-High		T86 2.2km	N/A	Mod-High	
J199	2km	Mod- High*	Mod-High		T86 2.1km	N/A	Mod-High	
J269	1.4km	Moderate	Moderate		T45 2.0km	N/A	Moderate	
J191	2.7km	Negligible*	Negligible		T45 2.6km		Low	

Table 5.1.8 Lower Boro Road Cluster (South- Eastern Cluster)

This cluster of residences east of the Lower Precinct are all located around RL 700 have views west toward Lower Precinct and possible distant views to the north of the Upper Precinct.

Figure 10.129 on p.172 of the UVIA at residence J162 is a wireframe overlay representative of the turbine layout visible for residences in this cluster.

VP	LVIA 88 Turbine Assessment		OHD 88 Turbine Review		UVIA 54 Turbine Assessment		OHD 54 Turbine Review	
	Dist.	Assessment	Review	Notes	Dist.	Assessment	Review	Notes
J174A	1.2km	Mod-Low*	Moderate		T83 1.6km	Neg-Low	Moderate	
J174B	1.4km	Moderate	Moderate		T83 1.8km	N/A	Moderate	
J162 (DAA)	1.2 km	High	High		T39 1.5km	High	High	

* denotes a desktop assessment

** denotes an assessment from the road

G. More than 15 turbines located within 3km of the residence.

V. Visited by OHD.

5.2 Summary of Residential Impacts

An overview of the residential assessments above reveals that the 54 turbine proposal has reduced impacts in some locations. The changes are primarily due to the reduced number of turbines being viewed.

Of the residences reviewed by OHD our breakdown of our assessment of the 54 turbine layout into impact ratings is:

- 14 residences – High impact
- 37 residences – Mod-High impact
- 20 residences – Moderate impact
- 8 residences – Low-Moderate impact
- 7 residences – Low impact
- 13 residences in Negligible impact.

As in the original LVIA report our assessed range of impacts are significantly skewed to High and Mod-High ratings. More than 50% fall into the High and Moderate/ High range.

Most of the High ratings fall in the elevated clusters north and west of the Project Area. The removal of turbines in the Lower Precinct has significantly reduced impacts in the South Goulburn Road Cluster.

In the Braidwood/Roseview Road Cluster the proposed reduction in numbers and increased distances from viewpoints in the 54 turbine proposal has reduced some of the impacts however the impacts in the overall landscape are in many cases still significant and several residences are still rated High.

In the Lakeview Road Cluster, the impacts for the most affected residences J003, J76A and J76B remain High.

In the Boro Road Cluster the impacts have not varied significantly. The turbine offset distances at most residences remain less than 2 km. For similar reasons we have assessed no rating changes in the Lower Boro Road Cluster.

5.3 Mitigation Measures

As identified above a significant number of residences are potentially affected by High or Moderate to High impacts. In Section 10 of the UVIA a significant commentary is provided on the possibility of mitigating visual impacts using vegetation screening. The LVIA Section 06 considered the same mitigation technique. It is reasonable to conclude that given the scale of the turbines in the landscape a vegetation screen is the most likely option if screening is considered necessary or desirable.

The LVIA explains the limitations of effective vegetation screening including –

- Species selection
- Growth rates plant maintenance, watering regimes
- Relative distance to the viewer, and
- The highly localised nature of any screen.

For some residences screening is a possibility but subject to a range of potential deficiencies. The quality of the outcome and the effectiveness of the screen will vary, and it should not be assumed that vegetation screening will reduce all the impacts to acceptable levels or be suitable for every location. Vegetation screening can potentially be successful for controlling impacts when viewed from specific viewpoints. The opportunity to create screening for residences within 2km of the turbines or where the topography falls away toward the view is likely to be more limited, as noted in the UVIA.

In many cases the proposed screening would be required to reduce the impact to acceptable levels over an extended field of view within the cartilage of the residence and would create a completely new and enclosed form of outlook from the residence. As a result, lifestyle residences designed to take advantage of extended views of the landscape would be likely to lose the outlook which is a key component of the residence. This would negate the original design intent and layout of the residence and is likely to be inappropriate for many residences.

All residences identified with High impacts around JWF, are situated in elevated locations with expansive views of the landscape. These elevated locations face downslope toward the view. To create effective vegetation screening in such locations is likely to be difficult. The steep slopes mean screening must either be close to the viewer, blocking the outlook or grow to a significant height and density to accommodate

the changes in level. In addition, the slope increases water run-off and usually reduces available topsoil. As a result, growth rates on the slope are likely to be much slower than average in the area.

All screening outcomes are predicated on the assumption that screening will grow within a reasonable timeframe. This assumption will be significantly affected by variability of soil type, weather, plant maintenance and species selection. It is my opinion that the reductions in visual impacts resulting from the proposed mitigation measures noted in the LVIA and UVIA, are highly optimistic. In some locations effective screening is likely to take at least a decade to achieve and possibly much longer.

Importantly, vegetation screening does not address the change in landscape character created by a wind farm, in fact the screening can become another contributing element in the change of character. In my opinion vegetation screening should only be used judiciously to reduce localised specific impacts where the extent of the screening is limited and the likelihood of creating a successful screen is high.

Around the JWF the potential use of extensive vegetation screening for a significant number of residences would require a high degree of community and proponent co-operation over many years to ensure a successful outcome. Given the nature of the viewing locations and the high number of residences that would be involved at JWF, I consider that the likelihood of implementing a mitigation program that is supported by the community, well maintained by the proponent and successful in reducing impacts to acceptable levels at the most affected residences, is low.

5.4 Night Lighting Impacts

The proposed obstacle lighting at the JWF is required on 31 of the 54 turbines.

Key features of the lighting are

- The lighting is located on turbines around the perimeter of the turbine layout.
- Lighting would be a continuous red light and is not identified as baffled to prevent light spill.

The UVIA notes that LED lights appear to create lower impacts than medium intensity lights and that at Chalicum Hills Wind Farm in Victoria baffling was employed to ensure light spread is restricted to approximately 0.5o below the horizontal.

As noted above Section 1.3 '*Distinctive Visual Factors*' at the JWF the viewing level of many of the residential viewing locations are within 100-150m of the turbine nacelles. This increases the likelihood of light spill and reduces the potential benefits of any baffling.

The red colour of the lights in a group is not a standard characteristic of a rural area at night and would be obviously different from the standard residential lightings and lighting around the homesteads. When viewed from both public and residential viewpoints.

The UVIA provides an analysis of Visibility Zone C (at least half of the rotor swept path visible) in Figure 7.5. The diagram identifies the number of possible turbine nacelles visible from a viewpoint without consideration of localised screening. Most significantly affected appears to be the Duckfield Road Cluster, where potentially all night lighting would be visible. The Boro Road and Lakeview Road Clusters appear to also have a potentially high proportion of the 31 obstacle lights visible. The Roseview Road Cluster appears to have high visibility of the Upper Precinct obstacle lighting.

These highlighted locations will have clear views of multiple turbine lights against the background of a dark sky.

As the obstacle lighting is along the perimeter turbines the closest turbines to each residence will have obstacle lighting. For residents within 3km this is likely to change the character of the night sky.

Edward (Terry) O'Hanlon RAIA

Director

O'Hanlon Design Pty Ltd.

Relevant Documents

Relevant Documents

During preparation of this report we have reviewed and taken into consideration the following documents:

- *Jupiter Wind Farm Environmental Impact Statement*
EPYC Pty Ltd: October 2016
- *Jupiter Wind Farm: Landscape and Visual Impact Assessment Issue 'H'(LVIA)*
Clouston Associates: October 2017
- *Jupiter Wind Farm: Updated Visual Impact Assessment Annexure 'E' (UVIA)*
ERM: September 2017
- *Wind Farms and Landscape Values - National Assessment Framework*
Under the auspices of the Council of National Trusts and Auswind: 27 June 2007
- *Wind Energy: Visual Assessment Bulletin for State significant wind energy development*
NSW Planning & Environment: December 2016.
- *Topographic & Orthophoto Maps*
Department of Lands
 - *8827-1N Windellama*
 - *8827-1S Oallen*
 - *8827-2N Durran Durra*
 - *8827-3N Manar*
 - *8827-4N Lake Bathurst*
 - *8827-4S Boro*