

# Kaimai Wind Farm Rotokohu Road, Paeroa

## Landscape and Visual Effects Assessment Report

20 June 2018



**Prepared by**

**MIKE MOORE**

*BSc, Dip LA, MRRP, ANZILA*

LANDSCAPE ARCHITECT

*Po box 5076, Dunedin*

*Tel (03)479 0833 . fax (03) 479 0834 . cell 0274 360 163*

*Email [mike@mmla.co.nz](mailto:mike@mmla.co.nz)*

## Introduction

Kaimai Wind Farm Ltd proposes to develop a 24 turbine wind farm over an area of approximately 1,304 ha, situated on the north-western flanks of the Kaimai Range between Mt Te Aroha and the Karangahake Gorge. The purpose of this report is to address the landscape and visual effects arising. It will be structured as follows:

- Site and area description
- Landscape values
- The proposed development
- Mitigation measures
- Landscape effects
- Visual effects
- Statutory planning assessment
- Conclusion

This report is accompanied by two A3 graphic supplements. Graphic Supplement A contains photographs and maps (Figures A1 – A17) and Graphic Supplement B contains photo-simulations (Viewpoints B1 – B21).

## Site and Area Description

The proposed wind farm site is located on the main ridge and western slopes of the northern Kaimai Range, between Paeroa and Te Aroha. It covers an area of approximately 1304ha and is located over several rural properties. **Figure A1** shows the location of the site.

The geology of the area is volcanic and the hills are moderately steep and rugged in character. The Kaimai Range rises to approximately 460 – 480m in this vicinity but most of the proposed site is located on a lower, offshoot ridge-form that is generally approximately 200 – 300m in height. Various small streams drain the area toward the Waihou or Ohinemuri Rivers.

Most of the site is under pasture cover and is managed by grazing stock. There are dwellings present on the various Rotokohu properties that are part of the site but other than these, built elements are predominantly farm sheds, fence lines and farm tracks. The area on the main Kaimai Range abuts the Kaimai Mamaku Conservation Park, an area of regenerating indigenous broadleaved forest and there is also a large patch of indigenous forest along the southern site boundary on the western slopes. A 110kV transmission line on pylons crosses the main Range at the south-eastern corner of the site and there is a large piggery located at approximately 400m elevation on the western slopes of the Ranges, approximately 1km to the south of the site. The main part of the site on the secondary ridge, also includes small areas of secondary indigenous forest, as well as some areas of exotic woodlots on steeper slopes and there are scattered rocks outcropping on the paddock surfaces. Adjacent to this part of the site to the west, is a quarry and an approx. 144.25 ha area of indigenous forest scheduled in the Hauraki District Plan as a Significant Natural Area.

The site overlooks the intensively farmed Hauraki Plain to the west, including several towns, the closest of which, are Paeroa and Te Aroha. Whilst the primary landscape context is to the west, the location of 7 turbines on the main Kaimai Range ridgeline means that areas east of the Range, including Waihi and the surrounding farmed countryside within the Waihi Basin, are also affected by the proposal. In terms of the Kaimai Range itself, the site sits between the local high points of Mt Te Aroha (953m) with its transmission tower, to the south and Mt Karangahake (544m) to the north.

**Figures A2 – A13** illustrate the character of the site and surrounding areas.

### **Landscape values**

The landscape values associated with the wind farm site and its context will be discussed in terms of biophysical features, patterns and processes, sensory qualities, and shared and recognised values.

### Biophysical features, patterns and processes

The northern Kaimai Range has important natural character values recognized and protected through to a large degree by the Kaimai Mamaku Conservation Park. The Range itself is a dominant landscape feature of rugged hill country creating the topographical divide between the Waikato and Bay of Plenty areas. This range is expressive of its volcanic origins and of tectonic activity along the Hauraki Fault (Edbrooke, 2001). Whilst the vegetation has been modified and is variable in character and quality, there are large areas of contiguous forest cover that provide habitat for indigenous wildlife including birds, frogs, bats and skinks. This area has botanical significance as the southern limit of kauri and the northern limit of Kamahi, Red Beech and Silver Beech (Buckland et al, 2010).

The proposed wind farm site is located on the western side of the Range in an area where indigenous forest cover has been removed for pastoral farming. Smaller areas of bush cover contribute to natural character values and there is a 'significant natural area' noted in the District Plan immediately to the south-west of the site in the Raeotepapa Stream area.

There are no natural character values recognized in the District Plan or other statutory documents that relate to the site itself.

### Sensory qualities

The northern Kaimai Range forms a visually prominent backdrop to the Hauraki Plain landscape to the west and the Waihi Basin area to the east. It has quite different characteristics as seen from these places.

From the Hauraki Plains, the Range forms a strong backdrop, its steep slopes contrasting sharply with the flat lowlands. It has naturalness values based on its rugged natural landform and the low visual effects of built elements but naturalness is significantly modified by the clearance of indigenous forest cover for agricultural purposes and the presence of exotic woodlots, often not planted to follow land forms. To the west of the site, a quarry also modifies the natural landscape character.

From the east, the indigenous forest cover on the Kaimai Range is largely contiguous, although pastoral land use does creep over the tops near the site. Overall though, natural character landscape values are high from this side. From both sides of the range visual prominence and sensitivity is high.

### Shared and recognised values

The Waikato Regional Landscape Assessment (Buckland et al, 2010) notes that there are high tangata whenua values held for the area included as part of the Kaimai Range ONL. It mentions the presence of 'Pa sites along the west facing slopes', tracks through the bush and the use of the resources of the ranges for food and medicine.

Kaimai Wind Farm Ltd is consulting with tangata whenua regarding cultural values held for the site and its wider setting, and has received a summary Cultural Impact Assessment. Arising from this, it is my understanding that the Kaimai Mamaku Range is an area of high spiritual and cultural significance to Ngati Hako. This is on the basis that there were pa (marae), kainga (villages), wahi tapu (sacred places), urupa (burial places), pa tuna (fish gathering areas), waahi rongoa (healing places) and waahi mate (places for preparing for death) surrounding and within the ranges. The forests and streams also provided plentiful food resources and were traversed by ancient walking tracks. A number of important peaks of cultural and spiritual significance to Ngati Hako are located in the wider area of the proposed wind farm site. These are shown on **Figure A14** and form the important cultural landscape of Ngati Hako. Those closest to the site on the Kaimai Range include Raeotepapa, Karangahake, Te Moananui Hill (Tapu Ariki) and Te Aroha. A feature considered significant is the mists on the hills - representing earlier generations.

As shown in the Hauraki District Plan there are two urupa sites located adjacent to the wind farm site, one near the end of Wright road and the other adjacent to the quarry. The archaeological report (Hoffmann, 2017) notes a pa site on the indigenous forest covered promontory of Raeotepapa near the western boundary of the wind farm site (not within the site). It also discusses an archaeologically sensitive area within the site (near turbine 6) which is noted as an old clearing / cultivation site.

There are historic heritage values of significance in the wider area of the site associated with gold mining on the Ohinemuri Gold Field. The original Paeroa to Karangakake bridle track crossed the hills to the north of the site and followed Rotokohu Road. Within the wind farm site itself, there are two remnant prospecting features near the upper ridge as identified in the archeological report (Hoffmann, 2017). Rotokohu Road and the track through the site to Rawhiti Road was the main Paeroa – Te Aroha Road until the railway and road via Tirohia was developed. Otherwise, the history of the site is one of forest clearance and development of the land for agriculture.

The Kaimai Mamaku Conservation Park is an area with recognised value for recreational activities (walking / tramping / camping) within a natural setting.

#### Landscape values recognized in the Statutory Documents

The landscape values of the northern Kaimai Range are recognized in the Hauraki District Plan and Waikato Regional Policy Statement by Outstanding Natural Landscape Area (HDP) which corresponds with the Conservation Indigenous Forest Zone, and Outstanding Natural feature and landscape (WRPS) overlays. As illustrated in **Figure A15**, there is a degree of discrepancy between the boundaries of these overlays when overlaid. It is my assumption that this is due to mapping inaccuracies and that they are intended to coincide, and in the vicinity of the site, adopt the Kaimai Mamaku Conservation Park boundary. This would mean that there is no overlap with the project site which is more modified and predominantly grazed pasture.

The Waikato Regional Landscape Assessment (Buckland et al, 2010) discusses the values of the Kaimai Range ONFL. The main factors contributing to its identification as an ONFL are given as:

- Its distinctive peaked landform
- Its elevation
- The extensive bush cover
- Cultural values

The landscape assessment report also discusses the Ranges having a wild and remote character and in places very high natural character.

These factors are reflected in the description of values and characteristics of the Kaimai Range (North of Ngatamahinerua) ONFL in Table 12A in the WRPS as follows:

- Volcanic origin
- Te Aroha – highest point. Distinctive peaked landform, its elevation, extensive bush.
- Significance to tangata whenua – many pa and marae sites.
- Wild and remote on the higher slopes
- Good quality bush.

In areas outside the ONL / ONFL (including the site itself), the HDP discusses rural character values such as openness and the presence of existing native bush.

#### Summary – Key landscape character attributes and values

The key landscape character attributes and values associated with this site and its landscape setting are as follows:

- Biophysical landscape values
  - The rugged and distinctive natural landforms, expressive of their volcanic and tectonic origins.
  - The presence of and biodiversity values associated with, large areas of contiguous native forest cover (particularly on the eastern side of the range) as well as smaller areas and pockets of native bush.
- Sensory qualities
  - The Kaimai Range forms a visually prominent natural landscape backdrop to the more settled lowlands to both east and west. The natural landscape attributes are the natural landforms, the presence of indigenous vegetation cover (particularly on the eastern side), and the generally low influence of built elements.
- Associative activities and meanings
  - The Kaimai Range has significance to tangata whenua.
  - There are historic heritage values related to mining history and historic transportation routes in the wider area.

- The Kaimai Mamaku Conservation Park has recognized natural landscape based recreational values and the same area has recognition as an outstanding natural landscape.

### The proposed development

Kaimai Wind Farm Ltd propose the development of a 100MW wind farm. This is illustrated in **Figures A16 and A17**, and will involve 24 wind turbines. Two heights of turbines are proposed as follows. The lower height for the ridge turbines is in response to the higher wind speeds in this area, making smaller machines viable, but also to mitigate landscape and visual effects by reducing the scale of the turbines relative to the landform.

<i>location</i>	<i>Number of turbines</i>	<i>Hub height</i>	<i>Rotor diameter</i>	<i>Height to blade tip</i>
<i>Top ridge</i>	7	98 - 112m	136 - 146m	171 - 180m
<i>Elsewhere</i>	17	110 - 132m	150 - 160m	190 - 207m

The turbine locations fall into two distinct compartments, with the 7 smaller ones aligned along the main Kaimai Range ridgeline at between approximately 460m – 490m elevation. The remainder and majority, spread across the lower hill-form which is an off-shoot from the main range, at elevations ranging from approximately 170m – 310m. The towers will be of tubular steel construction mounted on concrete foundations which will be approximately 530 m<sup>2</sup> in area. The turbine rotors will have 3 blades. A degree of flexibility has been allowed in defining the turbine dimensions and locations to avoid being constrained into using a particular model of turbine from one manufacturer. Figure A17 shows that various nacelle design options are being considered. The shape of the nacelle will not have an appreciable impact on the overall visual effects of the turbines. As regards turbine location, the application seeks a small degree of flexibility in the horizontal plane of 20m in any direction from the point shown on the plans, and this has been taken into account in my assessment (i.e. flexibility to permit micro-siting).



Access to the site will use the existing farm track off Rawhiti Road and the internal roading will largely utilize the existing farm access tracks. These will be upgraded, including widening to 6m along with gradient and corner adjustments. Earthworks associated with this will be extensive and will entail cut or fill batters up to approximately 25m high in a few places, although generally much less. These will be graded to a 1:1.5 slope and hydroseeded to revegetate with grass. The total length of roads involved is approximately 18.9km.

Earthworks will also be required to create platforms for the turbines along with associated laydown areas and crane pads. These platforms will typically be approximately 120 x 20m in area. Cut and fill batter slopes associated with these will generally be no more than 10m high but will be as much as approximately 20m in some places. The overall extent of earthworks required to facilitate the project is estimated at 460,000m<sup>2</sup> in area, with a total cut volume of 900,000 m<sup>3</sup>. Of this total cut volume, 113,500m<sup>3</sup> will be placed as engineered fill along the road alignment, and the balance of 786,500m<sup>3</sup> will be placed on site in specific suitable cleanfill disposal areas. These predicted area and volume estimates include a 20% contingency to account for potential increases during the detailed assessment and design phase because of refinements in the platform and road alignment designs.

A substation approximately 65 x 35m in area and up to 6m in height will be required, and is proposed to be located at the south-eastern end of the site adjacent to the 110kV overhead line on the main Kaimai Range ridge. This will include a Control building 18.6 x 4.5m in area. Transmission lines will largely be run underground but there will be overhead 33kV lines supported on double poles between turbines 14 and 15, and turbine 17 and the substation site. There will also be two additional pylons similar in scale to the existing 110kV pylons (up to 24m) adjacent to the substation.

Aviation lighting is likely to be required by the Civil Aviation Authority. The number and positions of the lights is not yet known as it will be the subject of a specific order from the CAA.

## **Mitigation measures**

Features of the site and the proposed wind farm that help to minimise adverse landscape and visual effects are as follows:

### Location and site characteristics

The site is within a 'working rural landscape' context where natural landscape values are already modified by farming and forestry land use. This context will generally assist in minimizing the impact of the proposed wind farm on natural landscape values. The site character is such that the wind farm can largely be developed without major disruption to natural landforms. Whilst considerable earthworks will be required, these affect less than 2% of the overall area of the site and can be mitigated through appropriate battering of cut faces and revegetation. In general, access roads follow existing tracks and do not cross steep slopes.

The wind farm will be located so that the turbines are no closer than 804m from dwellings in the surrounding area.

### Specific mitigation measures

Wind turbines are typically finished in an off-white – light grey colour in accordance with Civil Aviation requirements and in recognition that their tall vertical forms relate to the sky more than the land. A non-gloss paint finish will be used to minimize any potential for blade glint. To minimize visual prominence all painted substation elements will be finished in dark grey tones with light reflectance values of no more than 10%.

All areas disturbed during construction will be rehabilitated as soon as practicable following construction. To minimize any long-term effects associated with earthworks and / or vegetation removal, topsoil will be stripped and stockpiled. Following construction topsoil will be re-spread over the affected areas and the areas sown or hydroseeded with pasture grass species similar to surrounding farmland.

The turbine scale is necessarily large for operational reasons but smaller scale turbines are proposed to reduce visual impact and associated adverse natural character effects on the main Kaimai Range ridge area (turbines 18 – 24).

Night lighting of the turbines will undoubtedly be required by Civil Aviation New Zealand. Typically, this involves at least some of the turbines having red flashing lights attached to the top of their nacelles for safety reasons. To mitigate adverse effects on the naturalness of the night sky, the applicant proposes to use an active aviation light management system that activates only when approaching aircraft are detected. Information on the system proposed to be used is included in Appendix B.

Only one turbine location (Turbine 13) will require the removal of indigenous vegetation. As noted in the Ecological Effects Assessment Report (Kessels Ecology, 2018), 70m<sup>2</sup> of secondary broadleaved treeland and 0.17ha of secondary broadleaved forest will be removed, with the remaining 1.15ha of secondary broadleaved forest not affected. The Supplementary Ecology Report (Ecology NZ, 2018) describes this bush as 'no more than moderate in quality' and as likely to collapse in the long term under current management conditions, due to stock access. This report identifies moderate quality habitat values for native fauna and discusses ways that effects on native fauna can be mitigated. Whilst its ecological significance is modest, this bush fragment contributes to a small extent, to the naturalness of the rural landscape and associated amenity values and it is recommended that the specific siting of turbine 13 takes into account the minimization of effects on this vegetation.

## **Landscape effects**

Landscape effects describe the impact of the proposal on the landscape elements, patterns, and processes, and its character. Their significance is determined with reference to the value and sensitivity of the landscape, and the scale and character of the proposal. The nature and magnitude of the landscape effects are described below based on the following:

#### Nature of effect

- *Positive*
- *Neutral*
- *Adverse*

#### Magnitude of effect

- *Very high*
- *High*
- *Moderate high*
- *Moderate*
- *Moderate - low*
- *Low*
- *Very low*

#### Biophysical effects

Within the site the existing landforms are modified by tracking and the wind farm will extend these tracks as part of access, construction and roading improvements, turbine pads and laydown areas. In general, the track locations are on relatively gentle slopes and the earthworks will integrate readily and without the need for large cut and fill batters. In some areas however, more extensive earthworks will be required. These new forms will change the landforms and initially the earthworks will be readily discernable. However, with hydroseeding and once vegetation is re-established, their prominence will significantly reduce. In the scale of the hills overall, these landform modification effects will be relatively small and will be effectively mitigated by the proposed re-grassing. With the exception of a small patch of secondary indigenous forest and treeland near turbine 13, no indigenous vegetation will be impacted, and while areas of pasture will be removed because of road widening and the footprint required for the turbines, at an overall landscape scale, the effects will be low.

The proposed wind farm will introduce seven 180m high turbines to the main Kaimai Range ridge and seventeen 207m high turbines at the lower level. The upper group of turbines extend along an approximately 2km length of the ridgeline. The lower group roughly follow ridge forms, and extend along the hill tops for approximately 5km. At

180m and 207m tip height, the scale of the turbines, their verticality, movement of the rotors, and skyline position will mean that they will contrast with the other, mainly natural elements, in their rural landscape setting. The proposal also involves the addition of the substation, two new pylons, lines and associated poles. In the context of the turbines these will be minor elements.

The turbines will add a new element to the existing agricultural landscape and the wind farm will extend the effects of tracking and associated earthworks, and to a small extent, the effects of the elements associated with power reticulation. Other than this, the existing landscape elements, patterns and processes will remain relatively unchanged and the existing farming operations will continue. The turbines will be long term elements in the landscape, but they can be removed should the wind farm be decommissioned, resulting in only localized landform modifications as an on-going effect.

There will be no physical impacts on cultural or historic features (urupa, pa and mining sites) with the possible exception of the archaeologically sensitive clearing cultivation site which may be impacted by the development of the road to turbines 11 – 13 and which may require an authority from Heritage New Zealand (Hoffmann, 2017).

#### Effects on landscape character

The site is largely located on a secondary spur to the west of the main Kaimai Range but also extends up the western slopes to the main ridgeline. The site and its context on the western side of the range, is farmland that can be described as 'working rural landscape'. It is predominantly pasture with areas of exotic woodlot and areas of secondary indigenous forest of various scales. There is also a working quarry and piggery nearby. The landscape scale is large and the landscape values are associated with its open rural character and low impact of built elements. The legibility of the natural landforms and general coherence of the landscape is moderate and is adversely affected by vegetation patterns that cut across the natural topography in some places, reflecting land ownership / land use changes more strongly than natural processes and patterns. There are no particularly recognised landscape values within the site other than those generally associated with rural character, and wind farms are provided for as a Discretionary Activity in the Rural Zone in the Hauraki District Plan.

The wind farm will introduce prominent new built elements and it will cover a considerable area. This will reduce the naturalness of the rural landscape but the slender form, small footprint and low bulk of the turbines means that they will not screen the existing landform, or unduly reduce the openness of the landscape. In addition, the scale of the Kaimai Range is large and the scale of the Hauraki Plain adjacent, is expansive. These factors assist in integrating the wind farm with the landscape.

The existing landscape elements, patterns and processes will remain largely unchanged (although there will be increased influence of tracking and other earthworks to accommodate the turbines) but the wind farm will introduce contrasting new elements (turbines) into the landscape. The turbines and associated earthworks effects will increase the complexity of the landscape composition but will not significantly reduce landform legibility. Adverse effects on this are minimized by the turbine locations largely relating to the ridgelines and localized promontories of the hills.

The most sensitive part of the site is the upper area on the main ridge of the Kaimai Range. This is adjacent to an area that has been identified as an Outstanding Natural Landscape (ONL) in the Hauraki District Plan and as an Outstanding Natural Feature and Landscape (ONFL) in the Waikato Regional Policy Statement. More generally, this ridgeline forms the skyline defining the extent of the Waihi Basin landscape to the east and the Hauraki Plains landscape to the west.

The eastern side of the Kaimai Range is largely covered in regenerating indigenous forest and has high natural landscape character values. The mainly contiguous forest cover provides for high landform legibility and aesthetic coherence. The proposed 7 ridgeline turbines will introduce large elements that will strongly contrast with the existing mainly natural ridgeline character but due to their slender form and low bulk the turbines will appear relatively unsubstantial. Their presence and considerable scale will however, adversely affect the naturalness of an approximately 2km length of this ridgeline, which has recognized landscape values.

Landscape effects - assessment

In making overall assessments on the nature and magnitude of the effects of the proposal on the landscape character and values, it is useful to differentiate between the higher and lower parts of the wind farm, due to the different character and sensitivity of their contexts. This is laid out in the following tables:

**Main Kaimai Range ridgeline area (Turbines 18 - 24)**

	Rating	Comment
Value and sensitivity of the landscape	High	This part of the site has high landscape value and sensitivity due to its highly prominent, elevated, main ridgeline location and its location directly adjacent to the forest covered Kaimai Mamaku Conservation Park. The natural landscape values of this area are recognized through its status as an ONL / ONFL in the District plan and Regional Policy Statement. Sensitivity is less on the western side of the range, where natural values are modified by pasture and farming land use. The range generally is of spiritual and cultural significance to Ngati Hako.
Effects of the proposed development	High	<p>The proposed development will involve modifications to the landform but once site rehabilitation has been completed the wider landscape effects of this will not be of major significance. Modifications to vegetation are confined to the area already in pasture and managed for grazing.</p> <p>The proposed development will involve the introduction of 7 large dynamic structures over an approximately 2km length of the ridgeline. Whilst there are small farm structures and a 110kV transmission line existing in this area, the turbines will be substantially larger scale and will introduce a visually prominent new built feature to the ridgeline, visible from both east and west.</p> <p>The turbines are slender structures and the development will have minimal effect on the form of the ridgeline but it will affect its naturalness. Given the high natural character of this as viewed from the east, the effects of this on landscape values will be adverse in nature and high in magnitude. The more modified</p>

		character of the area as viewed from the west assists in reducing the impact of the turbines from this angle but the ridgeline is still high in elevation and highly prominent. Overall, the nature of the effects of the proposed wind farm on the landscape character and values will be adverse in nature and high in magnitude.
Overall rating – landscape character and values effects	<b>Adverse / High</b>	

**Lower area – (Turbines 1 - 17)**

	Rating	Comment
Value and sensitivity of the landscape	Moderate high	The lower part of the site, whilst highly visible, is further from the ONL and at a lower elevation. In this area, the working rural landscape character is more strongly expressed and naturalness values are lower. There are no identified or recognised landscape values in the District Plan other than the general values associated with rural character (e.g. openness). It is acknowledged that the Kaimai Range generally is of spiritual and cultural value to tangata whenua and that the culturally significant peak of Raeotepapa is located on this lower spur landform.
Effects of the proposed development	High	The landforms in this area are affected to a small degree by farm tracks. The proposed development will involve further changes to the landform but once rehabilitation has been successfully completed, the wider landscape effects of this will be low.  Modifications to vegetation are almost entirely confined to the area already in pasture and managed for grazing.  The proposed development will involve the introduction of 17 turbines across the lower western spur landform, roughly following ridge forms and extending along the hill tops for a distance of approximately 5km. These will introduce prominent new elements into the rural landscape but the existing



		<p>landscape patterns and land uses will otherwise remain largely unchanged. Landscape complexity will be increased by the addition of turbines and enlarged access track network but due to the small footprint and slender form of the turbines, landscape coherence will not be highly affected. The existing relationship of built / natural elements will be altered and naturalness reduced. In this strongly ‘working rural’ context the effect of this is low. Given the lower elevation and the containment provided by the main range to the east, visibility of the wind farm is largely confined to the area west of the ranges. Overall, the nature of the effects of the proposed wind farm on the landscape character and values will be adverse in nature and moderate in magnitude. This rating has taken into account that wind farms are not an inherently incompatible activity in working rural landscapes, however, in this particular location the scale of the turbines relative to that of the landforms is moderate – large.</p>
<p>Overall rating – landscape character and values effects</p>	<p><b>Adverse / Moderate</b></p>	

Landscape effects – Summary comments

In terms of effects on landscape character and values, the proposed wind farm will add a large new element to the landscape but it will generally be able to be integrated with the working rural character of the site. The exception to this, is the area on and near the main Kaimai Range ridgeline. This area has much higher sensitivity and less capacity to absorb change due to its higher naturalness qualities and association with the forested ONL land on the eastern side of the range. Extending development to this part of the site impacts the Waihi Basin area, which would otherwise be largely unaffected if these 7 turbines were not included.

In terms of effects on cultural landscape values, the wind farm is located on the Kaimai Range - an area of high spiritual and cultural significance to Ngati Hako. It does not

directly impact any of the identified culturally significant peaks but is located in close proximity to Raeotepapa in particular. It is my understanding that Ngati Hako have expressed concerns about the visual presence of the turbines on the hills they hold sacred and about any potential impacts of these on the mists (pers comm, Kaimai Wind Farm Ltd). Beyond this, this assessment does not comment further on the cultural landscape effects as this is most appropriately contributed by tangata whenua.

## **Visual effects**

Visual effects describe the impact of the proposal on the views available to people and the impact of this on amenity values. Amenity values are defined in the RMA as *'those natural or physical qualities and characteristics of an area that contribute to people's appreciation of its pleasantness, aesthetic coherence, and cultural and recreational attributes'*. Visual effects are determined with reference to the sensitivity of viewers to change and the value placed on existing views, and the scale and character of the proposal. The method adopted in assessing the visual effects of the proposal is as follows:

- (a) Identify and describe the viewing audiences and assess the likely sensitivity of the viewing audience to change.
- (b) Identify a range of representative viewpoints in relation to each of the viewing audiences.
- (c) Describe the visual effects of the proposal using the photo-simulations as a guide, coupled with site visits.
- (d) Assess the nature and magnitude of the visual effects with reference to the explicit scales set out as for landscape effects above, and their common English meanings.

Potential visibility of the wind farm is illustrated in the Zone of Theoretical Visibility Map (**ZTV map** Graphic Supplement B). This has been prepared by Energy3 Ltd using 'Wind farm' software and focuses on a 15km visual catchment based on turbine tip height. The

ZTV is based on landform only (20m contours), and does not take into account screening by vegetation or structures.

Energy3 Ltd has also prepared computer generated photo-simulations (**Viewpoints B1 – B21**) using 'Wind farm' software. These simulations, and a statement of the methodology used in their preparation, are included in Graphic Supplement B. It should be noted that images limited to an A3 page tend to understate visual impacts and should be used as a guide only, in conjunction with field inspections to gauge a true indication of visual effects.

The simulations provide a useful basis on which to assess the change to the views from the various representative viewpoints. What these changes mean for viewers experience of amenity is more complex however, and is affected by individual preferences, attitudes and experience. Typically, there are widely divergent responses expressed to the appearance of turbines in the landscape. For some people, they are seen as elegant sculptural elements representing environmentally friendly power generation, whilst for others they are seen as foreign utilitarian elements cluttering the skyline.

The following assessment addresses potential effects on visual amenity from 18 representative viewpoints. Whilst wind turbines will always contrast with the more natural elements in rural landscapes, the nature and scale of their visual effects depends upon their compatibility with the character of the landscape setting and the values held for it by the viewing audience, and also the degree of dominance or prominence from the particular viewpoint. Assessments of the nature of the visual effects have been informed by the landscape values expressed in the statutory documents.

The wind farm site is located on the Kaimai Range which is the defining topographical feature between the Hauraki Plains to the west and the Waihi Basin to the east. The site orientates mainly to the west and is most visible from this side, but because some of the turbines are located on the main Kaimai Range ridgeline and with view-shafts through the Karangahake Gorge there will also be visibility of the wind farm to the east.

On the Hauraki Plains (western) side, the landscape is intensively farmed and there are two main towns (Paeroa and Te Aroha), as well as the smaller settlement of

Mackaytown located within 10km of the site. Assessments of the levels of visibility and the effects on visual amenity have been made from these settlements.

Visibility from Karangahake within the gorge has been assessed and the wind farm will be screened by landform from this area. Other important viewpoints assessed include the main transportation routes of State Highway 2, State Highway 26 and Paeroa Tahuna Road, Rawhiti Road, a close public road to the south west, and No 1 Road – a viewpoint representative of more distant views to the west.

Residential viewpoints near (under 2km) to the site are considered likely to be sensitive viewpoints. **Figure A18** illustrates the location of dwellings that fall into this category. It has not been possible to assess each of these individually, but viewpoints on nearby public roads considered to be broadly representative of the effects from these dwellings have been assessed. The areas involved are Rotokohu Road, Thorpe Road, State Highway 26 at Tirohia, and the northern end of Rawhiti Road.

Viewpoints assessed as important on the Waihi Basin (eastern) side of the range include the town of Waihi, the settlement of Waikino and State Highway 2. A viewpoint representative of the closest settled area to the east of the site (Kennedy Road) is also included. Also, on the side of the range there is the Kaimai Mamaku Conservation Park and viewpoints considered potentially impacted in this area that have been assessed include Mt Karangahake summit and Dickey Flat campsite. There are no close (within 2km) residential viewpoints on the eastern side of the range.

The visual amenity effects assessment is presented below in tabular form for each of the viewpoints / viewing audiences considered.

Visual effects – Hauraki Plains (western side)

Viewpoint	Paeroa
Relevant simulations	Viewpoints B1 – B3 are indicative of effects from three places within or adjacent to Paeroa where there are relatively clear views to the site.
Distance to nearest turbine	Viewpoint B1: 4781m Viewpoint B2: 5591m

	Viewpoint B3: 7567m
Number of turbines visible	Viewpoint B1: 24 Viewpoint B2: 23 Viewpoint B3: 22
Viewer sensitivity	Paeroa (population approx. 3,900) is located approximately 5 – 7km north of the proposed wind farm. People potentially affected by the wind farm include local residents and visitors to the town. Viewer sensitivity is moderately high because the wind farm site forms a major part of the landscape to the south of the town. It will be visible from some residential locations although from many places it will be screened by vegetation and structures.
Description of visual effects	<p>The Kaimai Range defines the landscape to the east of Paeroa. Looking southward, the forest covered form of Mt Karangahake is the dominant feature. Behind this in the distance, is Mt Te Aroha with its distinctive and prominent transmission tower. The outlying spur on which most of the site is located defines the skyline to the south. This is a patchwork of pasture, woodlots and small indigenous forest pockets.</p> <p>The turbines will be seen in two distinct groups. Only three of the higher group will be significantly visible with the remainder either mainly or totally screened. Those visible will appear beyond the indigenous forest covered ridge leading to Mt Karangahake. All of the lower level turbines will be visible although the more southern ones will be partially screened. The turbines will be seen lined out along the hills in an irregular grouping but the spacing will generally relate to the landform. Earthworks effects will not generally be visible with the exception in the vicinity of turbines 16 and 17 where a road will run along a slope below the turbines. Once the batter slopes are re-established in grass cover any effects of this will be minimal.</p> <p>The existing landscape will remain but a visually significant new element will be added. The scale, verticality and dynamism of the turbines will ensure that the wind farm is a feature. At this distance, the turbines will not appear unduly dominant but they will reduce the current naturalness of the landscape.</p> <p>The main, lower group of turbines will integrate well with the working rural character of the landscape. The nature of their visual effects on views and visual amenity is adverse and the magnitude moderate - low. Whilst groupings of turbines reduce naturalness values, these values are significantly modified in this area. Although the turbines are visually</p>

	<p>prominent, they do not disrupt the existing landscape, and could be perceived as a feature of interest.</p> <p>With regard to the group of 7 turbines along the main ridgeline, the visual amenity effects associated with naturalness in this context are more significant and rated as adverse in nature and moderate in magnitude. A higher rating is avoided because only three turbines are substantially visible and these contrast with the natural landscape rather than intrinsically alter it. Equally however, a lower rating is not considered appropriate because of the scale and associated visual prominence of the turbines and their location in a visually sensitive area with high natural character values.</p>
<b>Rating</b>	<p><b>Lower group (turbines 1 – 17) : Adverse / Moderate - low</b></p> <p><b>Higher group (turbines 18 – 24) : Adverse / Moderate</b></p>

<b>Viewpoint</b>	<b>Mackaytown</b>
Relevant simulations	Viewpoint B4 is indicative of effects from higher (ridgetop) viewpoints within Mackaytown. It is representative of the most affected viewpoints within the settlement due to its elevation and position eastward.
Distance to nearest turbine	4216m
Number of turbines visible	13
Viewer sensitivity	Mackaytown is a small residential enclave and the people affected in this area will be predominantly local residents. Viewer sensitivity is high.
Description of visual effects	<p>Mackaytown is located at the western end of the Karangahake Gorge and separated from the wind farm site by a spur of the Kaimai Range on the true left of the Ohinemuri River. The outlook westward from this area is enclosed by the hills which are rural in character with a mixture of pasture and regenerating forest and scrub cover. Northward, the view opens out to the Hauraki Plains.</p> <p>The tops of up to 13 of the lower group of turbines will be visible over the top of the western ridge and will be seen on the skyline from this particular viewpoint. Visibility will vary widely within Mackaytown depending on specific viewpoint and in many places visibility will be nil. Although not</p>

	<p>dominant elements at this viewing distance the verticality and movement of the turbines combined with their skyline location will mean that they are focal points where visible.</p> <p>Where they are visible, the turbines will have adverse effects as they will represent an intrusion into the western Karangahake Gorge landscape. The magnitude of effects will be moderate – high from viewpoints such as VP B4, which represents the most affected in this locality. Overall, considering the likely high sensitivity of viewers, the form and movement of the turbines, but the limited number of places where they will be visible within the settlement, the magnitude of effects would be moderate – low</p>
<b>Rating</b>	<b>Adverse / Moderate - low</b>

<b>Viewpoint</b>	<b>Te Aroha</b>
Relevant simulations	Viewpoint B5 illustrates effects from the northern edge of the town. Viewpoints within the urban area are more likely to be screened by foreground vegetation and buildings.
Distance to nearest turbine	6926m
Number of turbines visible	24
Viewer sensitivity	Te Aroha (population approx. 3900) is located approximately 6 - 7km to the south of the proposed wind farm site. People potentially affected by the wind farm will include local residents and visitors to the town and the viewer sensitivity is moderate. Whilst the wind farm site forms part of the landscape context to the north of the town, these hills are much less visually imposing than Mt Te Aroha directly adjacent to the east and so their contribution to the towns landscape setting is much less. Visibility from within the town is low due to screening by foreground elements.
Description of visual effects	<p>The Kaimai Range defines the landscape to the east and the hills of the site including both the lower ridge and higher main range are visible to the north of the town. These have a variable rural character under a mixture of pasture, exotic woodlots and bush cover. The higher part of the site is seen in a less natural context from this viewpoint than from many others.</p> <p>The proposed turbines will spread across the hill forms along the northern</p>

	<p>skyline and awareness of the two groupings will be less from this perspective. Most of the turbines will be visible but some will be screened by landform. It is unlikely that any effects of excavation associated with roading etc will be obvious. The landscape will remain intact but a visually significant new element will be added. The scale, verticality and movement of the turbines will mean that the wind farm is seen as a feature. At 6km distance, the turbines will not be visually dominant but they will reduce the naturalness of the landscape.</p> <p>The wind farm generally will integrate with the working rural landscape character from this area and the nature of the visual effects will be adverse, and low in magnitude. Whilst the turbines reduce naturalness values, these are modified when viewed from this area. Despite the turbines being visually prominent, they do not disrupt the existing landscape, and could be perceived as a feature of interest.</p>
<b>Rating</b>	<b>Adverse / low</b>

<b>Viewpoint</b>	<b>State Highway 2 – west of the ranges</b>
Relevant simulations	Viewpoints B6 and B7 illustrate effects from beyond Paeroa. Viewpoint B1, whilst not on State Highway 2 is nearby, and is generally representative of effects south-east of Paeroa.
Distance to nearest turbine	Viewpoint B1: 4781m Viewpoint B6: 8220m Viewpoint B7: 13845m
Number of turbines visible	Viewpoint B1: 24 Viewpoint B6: 24 Viewpoint B7: 24
Viewer sensitivity	This is a busy road and the main road between Auckland and Tauranga. Road users will include locals and tourists and there will be a wide range in viewer sensitivity to landscape change and in attitudes toward wind farms. Viewer sensitivity is moderate.
Description of visual effects	The Kaimai Range defines the landscape to the east from this area, and is a mix of native forest and modified farmland. Mt Karangahake and Mt Te Aroha are prominent focal points. The outlying ridge on which the site is largely located has a more modified character with a low amount of native



	<p>forest cover. The quarry near Tirohia is also visible and affects naturalness. The proposed turbines will be seen in two distinct groups – the smaller, higher range group, and the main group of larger turbines on the lower ridge. The turbines will be focal features due to their scale, form, height and movement. Their level of visual prominence will increase with proximity. Beyond Paeroa (approx. 7km distant), the turbines will be visible but they will not be seen as highly prominent elements in the landscape. From the section of highway south-east of Paeroa that they will be visible, the viewing distance (at over 4km) means that they will not be dominant elements. Earthworks effects will be largely indiscernible because of the viewing distances and because the batter slopes will be revegetated.</p> <p>The upper group of turbines will have visual amenity effects that are adverse in nature and moderate in magnitude. This rating reflects their location high on the main range in a highly visible position and within a context with high natural landscape values. In contrast, the lower group will integrate reasonably well with the landscape. This is because their immediate context is much more modified and their location is lower, within the broader visual containment of the surrounding hills. The visual amenity effects of this group will be adverse in nature and low in magnitude. As previously discussed, the existing landscape character will remain intact with a new visually significant element added. Naturalness will be reduced but this is not of major importance given the existing level of modification. The wind farm will not interrupt the existing landscape pattern and character, and will be seen by some as a feature of interest.</p>
<p>Rating</p>	<p><b>Lower group (turbines 1 – 17) : Adverse / Low</b>  <b>Higher group (turbines 18 – 24) : Adverse / Moderate</b></p>

<p><b>Viewpoint</b></p>	<p><b>State Highway 26</b></p>
<p>Relevant simulations</p>	<p>Viewpoint B8 is a view from State Highway 26 at Tirohia, representative of views from the highway at its closest point to the site. Viewpoint B1 is close to State Highway 26 and illustrative of effects from the highway south of Paeroa. Viewpoint B5 illustrates a view from State Highway 26 to the south of the site (just north of Te Aroha) and Viewpoint B3 is a view from State Highway 26 to the north (on the north side of Paeroa). The Hauraki Rail Trail cycle route runs in close alignment to State Highway 26 and similar</p>

	visual effects will arise.
Distance to nearest turbine	Viewpoint B1: 4781m Viewpoint B3: 7567m Viewpoint B5: 6926m Viewpoint B8: 1715m
Number of turbines visible	Viewpoint B1: 24 Viewpoint B3: 22 Viewpoint B5: 24 Viewpoint B8: 19
Viewer sensitivity	State Highway 26 is an important travel route close to the site on the plains below to the west. It is a busy road and the main road between Paeroa and Te Aroha. Road users will include locals and tourists and there will be a wide range in viewer sensitivity to landscape change and in attitudes toward wind farms. The cycle trail users will also be locals and tourists and it is an important recreational corridor. Users of this are likely to be more focused on recreational activity than road users and may be more sensitive to landscape change. Overall, viewer sensitivity is moderate.
Description of visual effects	<p>The wind farm site, particularly the lower ridge, is visually prominent in views from this road (both travelling north and south), being as close as 1km near Tirohia and within the focus of main views. The site in this area is low rural hills under a mix of pasture, native forest and forestry cover. The main range further back is similarly modified by rural land use. At Tirohia, the quarry and stands and groups of surrounding exotic trees reduce the naturalness and quality of the rural landscape.</p> <p>The visual effects of the turbines will increase with proximity to the site. The effects of the wind farm from those parts of the highway near Paeroa and Te Aroha will be much as described for those places above. Simulation I however, shows views from a closer viewpoint near Tirohia. From here many of the turbines are screened by intervening landform, but where visible, the turbines will appear as dominant elements on the skyline. Earthworks effects will not be visible from this and similar closer proximity viewpoints.</p> <p>Despite being dominant, it is my opinion that the turbines will be well integrated with the working rural character of the landscape. As previously discussed, the existing landscape character will remain intact but a visually significant new element will be added that will further modify the naturalness of the environment. For travelers, the duration of the effects</p>

	are fleeting (as opposed to residents who will experience the effects as a long term and continuous part of their living environment). The nature of effects on visual amenity values is adverse due to effects on the naturalness of the rural landscape. The magnitude of these effects is low because the turbines / wind farm will fit into the existing working rural landscape.
<b>Rating</b>	<b>Adverse / Low</b>

<b>Viewpoint</b>	<b>Paeroa Tahuna Road</b>
Relevant simulations	Viewpoint B9
Distance to nearest turbine	7938m
Number of turbines visible	24
Viewer sensitivity	Paeroa Tahuna Road is a busy road and significant viewing corridor. Road users will be primarily locals but will also include some tourists. Viewer sensitivity is moderate.
Description of visual effects	<p>From this perspective, the site is part of the hill backdrop to the Hauraki Plain, strongly defining the landscape to the east. In this area the hills are of modified character with pasture cover predominant, along with smaller areas of bush. The Kaimai Range has a more natural character southward at Mt Te Aroha with more complete indigenous bush cover.</p> <p>From the simulation viewpoint and environs, all 24 turbines will be visible, although some will be partially screened by landform. From closer distances as the road approaches Tirohia, some turbines will become screened although overall dominance of those visible will increase. The turbines will not dominate but they will be seen as a prominent new element and a focal point because of their contrast with the natural hill forms, their scale, and the movement of the rotors. Earthworks effects will have low visibility once revegetation has been completed. The turbines will affect an approximately 7km length of the skyline and will be seen on both the nearer, lower ridge form and the more distant higher ridgeline. Their scale, particularly relative to the lower ridgeline, is an issue but they will not</p>

	<p>essentially disrupt the existing landscape forms and patterns and will read as another layer.</p> <p>The wind farm will reduce the visual amenity values associated with the naturalness of the landscape and will appear as a fairly prominent element. The nature of the effect of the wind farm on visual amenity values will be adverse but the magnitude of the effect will be moderate – low. This rating reflects the relatively low impact on the coherence of the landscape, but also the significant geographic spread of the wind farm as seen from this angle.</p>
<b>Rating</b>	<b>Adverse / Moderate - low</b>

<b>Viewpoint</b>	<b>Rawhiti Road</b>
Relevant simulations	Viewpoints B10 and B11 are simulations from near the northern and southern ends of Rawhiti Road respectively.
Distance to nearest turbine	Viewpoint B10:1445m Viewpoint B11: 2757m
Number of turbines visible	Viewpoint B10: 18 Viewpoint B11: 23
Viewer sensitivity	Rawhiti Road is a more minor road but is addressed because of its proximity to the site. Road users will be primarily locals. Overall, viewer sensitivity is moderate.
Description of visual effects	<p>The wind farm site is seen from this area as low hills to the north, rising higher to the east, strongly defining the landscape to this side. The character of the hills is ‘working rural’ dominated by pasture with patches of native forest and exotic forestry.</p> <p>The number of turbines visible will depend on specific viewpoint with turbines 11 – 17 being the most prominent. Viewing distances range upward from approximately 1km from the road. From the closer viewpoints, fewer turbines are seen, with landform screening of the more distant ones but those visible will appear as dominant elements on the skyline. Visual effects associated with earthworks will be minimal. From more distant viewpoints most of the turbines will be visible, including those on the higher ridge. There will be some visibility of earthworks associated with road improvement in the area below turbine 18 but generally earthworks effects</p>

	<p>will not have significant visual effects. Revegetation will mitigate the visual impact of the earthworks where visible.</p> <p>The wind farm will result in the introduction of a visually significant new element that will contrast with the mainly natural elements in the rural landscape. The scale, verticality and movement of the turbines will attract attention and their scale relative to their hillslope setting is an issue. They will provide a distinctive contrast but they will not disrupt the existing landscape forms and patterns.</p> <p>The turbines will reduce the naturalness of the landscape and will appear as dominant elements. This makes the nature of their effect on visual amenity values adverse, however, this will be limited because of their minimal impact on coherence. The magnitude of these effects from this area overall is moderate.</p>
<b>Rating</b>	<b>Adverse / Moderate</b>

<b>Viewpoint</b>	<b>No 1 Road</b>
Relevant simulations	Viewpoint B12 is a simulation from No 1 Road which is considered representative of more distant viewpoints on the Hauraki Plains to the west of the site.
Distance to nearest turbine	12366m
Number of turbines visible	24
Viewer sensitivity	This simulation is representative of the effects from roads, dwellings and farm land in more distant areas to the west of the site. Viewers will primarily include residents of the area. The sensitivity to landscape change from these areas will be relatively high (as part of a living / working environment) but modified by the distance involved. Overall, viewer sensitivity is moderate.
Description of visual effects	The Kaimai Range is an important feature, defining the extent of the landscape eastward from this area. Mt Te Aroha is the primary feature but other lesser peaks, including Mt Karangahake are also significant and seen as secondary focal points. The range has variable character. Some areas e.g. in the vicinity of Mt Te Aroha, have strongly expressed natural

	<p>character with extensive bush cover, whilst in other places (including the site) modified pasture land extends to the ridgetop. Depending on specific viewpoint the secondary ridge, on which the site is largely located, either forms part of the skyline, or is seen with the higher ridge behind.</p> <p>As shown in Simulation B12, all the turbines will be visible from this distance, some entirely silhouetted on the skyline and others with semi screening or having some degree of backdrop, from landform. Earthworks effects, once vegetation has been established on areas disturbed by earthworks are unlikely to be discernible. The level of visual prominence of the turbines will vary with atmospheric and lighting conditions. Generally though, whilst turbines will be discernible they will not appear dominant or prominent at this distance. They will reduce the naturalness of the hills to some extent but will generally be absorbed within their landscape setting. Visual effects will be adverse in nature and low in magnitude.</p>
<b>Rating</b>	<b>Adverse / Low</b>

<b>Viewpoint</b>	<b>Close residential / sensitive viewpoints - Rotokohu / Wright Roads area</b>
Relevant simulations	Viewpoint B13 is a simulation from a viewpoint on Rotokohu Road. The Rotokohu / Wright Road area is a particularly relevant viewpoint because there are 8 existing dwellings located on the eastern side of the road and 4 to the west. On the western side there is also a Marae Development Zone and the Paeroa Golf Course and club house. There will be views toward the wind farm site from within or near these dwellings and the Marae development area and golf course. Views from Rotokohu Road give a general indication of the character of these, although the elevation and proximity of the viewpoints varies. The closest dwelling is 960m from the nearest turbine whilst the Golf Club clubhouse is over 2km. Simulation VP A illustrates the effects from north of the golf course. Whilst this is more distant than other potential viewpoints, it is also more open.
Distance to nearest turbine	2427m
Number of turbines visible	17
Viewer sensitivity	Viewers in this area include residents and recreationalists and sensitivity to

	landscape change is assessed as high.
Description of visual effects	<p>The wind farm site is seen from this area as the low rolling hills defining the valley to the west / south-west. These are pasture covered and rural in character with exotic woodlots and some native forest patches present. To the south, the main Kaimai Range is also visible and from this angle is largely native forest covered with some exotic forestry on the nearer slopes.</p> <p>From this area, the turbines on the north-eastern side of the lower ridge (Turbines 1 – 9) will be most significant with those located further back (Turbines 11 – 15) being likely to be more screened. From some viewpoints, particularly those on the west side of the road, the higher level turbines (on the main Kaimai Range ridgeline) will also be visible at distances of over 2km. These will be seen above the native forest covered slopes. Effects associated with roading earthworks are unlikely to be an issue from this area.</p> <p>The wind farm will result in the introduction of a visually significant new element that will contrast with the mainly natural elements in the rural landscape. The scale, verticality and movement of the turbines will attract attention and their scale relative to the hills is an issue. Whilst they will contrast, they will not disrupt the existing landscape forms and patterns and will read as another layer.</p> <p>The turbines will reduce the existing levels of naturalness of the rural landscape and will appear as fairly dominant elements and their effect on visual amenity values will be adverse. The magnitude of these effects will vary with the particular viewpoint and the degree of screening. Generally though, where the proposed turbines are prominent they are likely to result in visual effects of high magnitude due to their proximity and degree of dominance, and geographic spread within the views. Mitigating factors include the low impact on the landform coherence.</p>
<b>Rating</b>	<b>Adverse / High</b>

<b>Viewpoint</b>	<b>Close residential / sensitive viewpoints - Thorpe Road area</b>
Relevant simulations	Viewpoint B14 is a simulation from Thorpe Road. This viewpoint is simulated because it is a nearby public road (albeit dead-end) with several dwellings located adjacent. There are 5 dwellings near the western end of

	Thorpe Road, between 940 – 1150m of the nearest turbine, and two located further eastward over 2km distant. This viewpoint has been selected because turbine visibility is greater from this mid-valley location due to less land form screening.
Distance to nearest turbine	2218m
Number of turbines visible	21
Viewer sensitivity	Viewers in this area will primarily be residents and sensitivity to landscape change is high.
Description of visual effects	<p>The main group of dwellings are located close to the base of the hill slopes which are pasture and woodlot covered, and rise behind the dwellings to the south-west. Most of the turbines in the lower ridge group will be screened by landform from this area but the turbines located on the ridgetop directly behind will be visible to varying extents. Where visible these will be dominant elements on or protruding over the immediate skyline. The higher group of turbines on the main Kaimai Range ridge will also be visible from this area at distances of over 4km. Earthworks effects will not be visible from viewpoints in this area.</p> <p>Where visible, the turbines will introduce a new element, reducing the naturalness of the landscape and will appear as reasonably dominant elements. A mitigating factor is that the turbines are to the south-west and 'behind' the houses, all of which appear to have their main outlook away from the hill backdrop. From some viewpoints, intervening ridge forms will provide partial screening and a sense of separation from the turbines. Due to the scale and presence of the turbines as seen from this area, but considering the orientation of the dwellings and the degree of landform screening, the effects on visual amenity as adverse in nature and moderate - high in magnitude.</p>
<b>Rating</b>	<b>Adverse / Moderate high</b>

<b>Viewpoint</b>	<b>Close residential / sensitive viewpoints – Tirohia area</b>
Relevant simulations	Viewpoint B8 is a simulation from a viewpoint on State highway 26 near Tirohia which is generally representative of effects from this area. As



	shown in Figure A17 there are 21 dwellings (and a school) within 2km of the nearest turbine in the area adjacent to the site to the north-west, including Tirohia. The closest dwelling in this area is 1120m from the nearest turbine.
Distance to nearest turbine	1715m
Number of turbines visible	19
Viewer sensitivity	The subject of this assessment are the residents in the Tirohia area and these people will have high sensitivity to change to their living environment.
Description of visual effects	<p>The wind farm site, particularly the lower ridge, is visually prominent from this area and is seen as low rural hills under a mix of pasture, bush and forestry cover. The main range further back is similarly modified by rural land use. At Tirohia, the quarry and surrounding exotic trees reduce the naturalness and quality of the rural landscape.</p> <p>From this area many of the turbines are screened or partially screened by intervening landform and the main part of the wind farm is viewed end-on, reducing its geographic spread in the landscape. Where visible however, the turbines appear as dominant elements on the skyline. Earthworks effects will largely be indiscernible from these closer proximity viewpoints. The turbines will not unduly detract from the working rural character of the landscape but their scale and dominance will be such that from this proximity effects on visual amenity will be adverse in nature and moderate in magnitude.</p>
<b>Rating</b>	<b>Adverse / Moderate</b>

<b>Viewpoint</b>	<b>Close residential / sensitive viewpoints - Rawhiti Road – north end</b>
Relevant simulations	Viewpoint B10 is a simulation from Rawhiti Road near its northern end and is indicative of effects from this area.
Distance to nearest turbine	1445m
Number of turbines visible	18
Viewer sensitivity	As shown in Figure A17 there are 27 dwellings within 2km of the nearest

	turbine in this vicinity, with the closest house being 804m.
Description of visual effects	<p>The wind farm site is seen from this area as low hills to the north-east rising higher eastward and strongly defining the landscape. The character of these hills is 'working rural' with pasture dominant but also patches of native forest and exotic forestry.</p> <p>The number of turbines visible will depend on the specific viewpoint with turbines 11 – 17 being the most prominent. From the closer viewpoints, fewer turbines are seen, with landform screening of the more distant ones but those visible will appear as dominant elements on the skyline. Visual effects associated with earthworks will be minimal but there will be some visibility of the road to turbine 15 on the hill face. Visual effects associated with this will be low once batters are revegetated. From the more southern viewpoints the turbines on the higher ridge will be visible at distances of over 4 km.</p> <p>The turbines will be substantial new elements that will contrast with the existing rural landscape. Their scale and dominance will be such that the visual amenity effects will be adverse in nature and high in magnitude from the residential viewpoints in this area.</p>
<b>Rating</b>	<b>Adverse / High</b>

Visual effects – Waihi Basin (eastern side)

<b>Viewpoint</b>	<b>Waihi</b>
Relevant simulations	Viewpoint B15 is a simulation from a high point within the town of Waihi and is considered representative of the visual effects of the wind farm from Waihi generally.
Distance to nearest turbine	12341m
Number of turbines visible	7
Viewer sensitivity	Waihi includes a significant population (approx. 4,500) located approximately 11 - 14km east of the proposed wind farm site. People potentially affected by the wind farm will include local residents and visitors to the town. Given the high natural character of the Kaimai Range in this area, the ONL status in the District Plan and the fact that it is managed as

	Conservation Park, viewer sensitivity is high. The wind farm site will be visible from some residential views although screened from many as well.
Description of visual effects	<p>From Waihi, the Kaimai Range is seen as the largely indigenous forest covered, hill country that defines to the landscape westward. Mt Karangahake and Mt Te Aroha, are prominent features. Natural character is not entirely without modification, due to such features as the broadcasting tower on Mt Te Aroha and the pasture in the vicinity of turbines 18, 19 and 20. Overall however, the Kaimai Range has strongly expressed natural character values as viewed from this area.</p> <p>The effect of the proposed wind farm will be that the seven upper turbines will be visible over an approximately 2km of the ridgeline and will be seen above the native forest covered slopes below. Although the height of these turbines will be 34m lower compared with the lower ones, in the context of the scale of the Range, they will still be of a scale that makes them prominent elements, especially given that they are silhouetted on the skyline. Given their height, verticality, skyline location and rotor movement they will appear as a focal point in many light conditions They will reduce visual amenity values associated with naturalness but mitigating factors are that whilst they represent an added built element, they do not otherwise change the character of the landscape and appear as a relatively light, layer above it.</p> <p>Considering the community values held for the ranges, the considerable viewing distance, and the prominent skyline location, the effects of the wind farm on visual amenity values will be adverse in nature and Moderate – high in magnitude from this viewpoint.</p>
<b>Rating</b>	<b>Adverse / Moderate - high</b>

<b>Viewpoint</b>	<b>Waikino</b>
Relevant simulations	Viewpoint B16 is a simulation from a viewpoint at a higher elevation within the settlement of Waikino and representative of effects from higher parts of the town. Visibility of the wind farm from lower parts of the town will be less.
Distance to nearest turbine	6329m
Number of turbines visible	19

Viewer sensitivity	Waikino is a small township located at the eastern end of the Karangahake Gorge. The people affected in this area will be predominantly local residents. The area impacted is conservation park and has ONL classification in the District plan. Viewer sensitivity is assessed as high accordingly.
Description of visual effects	<p>The Kaimai Range defines the landscape to the west of Waikino although the Karangahake Gorge creates something of a break in this containment to the north of Mt Karangahake. Mt Karangahake itself, is a significant focal feature from here, and the character of the ranges is overwhelmingly natural, albeit modified by the appearance of the cleared pasture country near the site.</p> <p>The 7 ridge-top turbines will be visible on the skyline of the range to the south of Mt Karangahake. At this distance, the scale of the turbines will not be unduly dominant but will be such that combined with their rotor movement and skyline location, they will attract attention and will become focal points. In addition, the tops of the rotors of several of the lower group of turbines will also be visible across the top of several intervening ridges to the north of Mt Karangahake. These will be less prominent than the group along the top of the range but their movement will attract attention, depending on light and atmospheric conditions.</p> <p>The nature of the effects on visual amenity values will be adverse given the recognized natural landscape values associated with the Kaimai Range in this area. The magnitude of these effects will be high for the 7 range-top group of turbines because of their effects on naturalness related visual amenity values. The magnitude of effects associated with the more distant group seen to the north of Mt Karangahake will be low, given the distance and sense of separation from this landscape.</p>
Rating	<p><b>Lower group (turbines 1 – 17) : Adverse / Low</b></p> <p><b>Higher group (turbines 18 – 24) : Adverse / High</b></p>

<b>Viewpoint</b>	<b>State Highway 2 – east of the ranges</b>
Relevant simulations	Viewpoint B17 is a simulation from State Highway 2 approximately 2.5km west of Waihi and Viewpoint B18 is a simulation from State Highway 2 approximately 4km to the south-east of Waihi. These are indicative of the effects from the highway at varying distances.

Distance to nearest turbine	Viewpoint B17: 8587m Viewpoint B18: 12848m
Number of turbines visible	Viewpoint B17: 14 Viewpoint B18: 7
Viewer sensitivity	<p>This is a busy road and the main road between Auckland and Tauranga. Road users will include locals and tourists and there will be a wide range in viewer sensitivity to landscape change and in attitudes to wind farms. Given that the Kaimai Range in this area has recognized conservation and ONL values, viewer sensitivity to change in this specific area is likely to be higher than might otherwise be expected. Overall, viewer sensitivity is moderate - high.</p>
Description of visual effects	<p>From this eastern side, the Kaimai Range is largely indigenous forest covered, hill country that defines the landscape westward. Mt Karangahake and in places, Mt Te Aroha, are prominent features. Natural character is not entirely without modification because the broadcasting tower on Mt Te Aroha, the pylons and transmission line that crosses to the south of the site, and pasture in the vicinity of turbines 18, 19 and 20 are all visible to varying extents and from various places. Overall however, the Kaimai Range has strongly expressed natural character based visual amenity values as viewed from this area.</p> <p>The main effect of the proposed wind farm will be that the seven upper turbines will be visible over an approximately 2km of the ridgeline and will be seen above the bushland below. Turbines 18 – 21 will be largely entirely visible but turbines 22 – 24 will be partially screened by landform. Although these turbines will be 27m lower compared with the lower group of turbines, they are still significant in terms of their scale in the context of the scale of the Range. Given their height, verticality, skyline location and movement, they will appear as a focal point. These turbines will reduce naturalness but mitigating factors are that whilst they represent an added built element, they do not otherwise change the character of the landscape and appear as a relatively insubstantial layer above it.</p> <p>From some places (e.g. Viewpoint B17) some of the main lower group of turbines will also be visible across the top of intervening ridgelines, to the north of Mt Karangahake. For the most part, these turbines will be mainly screened with only the tops of their rotors and nacelles visible. Where this occurs, and in combination with the ridgetop turbines, the wind farm will intrude into this viewshed from the opposite side of the range. These</p>

	<p>turbines are more distant than the range-top group and will be seen through the low point in the range landform associated with the Karangahake Gorge.</p> <p>The nature of the effects on visual amenity values will be adverse given the recognized natural landscape values associated with the Kaimai Range in this area. The magnitude of these effects will be high for the 7 range-top group, given their significant visual impact from here and the effect of this on recognized naturalness related amenity values. The magnitude of effects associated with the more distant group seen to the north of Mt Karangahake will be low, given the distance, screening from many places, and sense of separation from this landscape.</p>
Rating	<p><b>Lower group (turbines 1 – 17) : Adverse / Low</b></p> <p><b>Higher group (turbines 18 – 24) : Adverse / High</b></p>

<b>Viewpoint</b>	<b>Kennedy Road</b>
Relevant simulations	Viewpoint B19 is a simulation from Kennedy Road. The significance of this viewpoint is that it is intended to be generally representative of effects from the rural area near the edge of the Kaimai Mamaku Conservation Park (i.e. the closest settled areas eastward).
Distance to nearest turbine	3560m
Number of turbines visible	7
Viewer sensitivity	Viewers in this area will be predominantly local residents for whom the ranges to the west form a part of the landscape setting of their living environment. This, combined with the fact that the ranges in this area have recognized conservation and landscape values makes viewer sensitivity high.
Description of visual effects	The indigenous forest covered Kaimai Range is a dominant landscape element and a defining feature to the west from this area. Its natural character contributes significant visual amenity and this is recognized through the ONL status of the area in the planning documents. Whilst the range is overwhelmingly natural in character it is not without modification given the transmission line and the grazed pasture country around the

	<p>proposed wind farm site.</p> <p>The effects of the wind farm arise from the presence of turbines 18 – 24 on or near the main ridgeline. These will be the only turbines visible and there will be no other effects from other wind farm elements e.g. earthworks. Turbines 18 – 22 will be largely entirely visible but the lower parts of turbines 23 and 24 will be screened by landform. The turbines will be seen in contrast with the native forest covered hill form below and will be visually 'light' in comparison with this. Their verticality, scale and movement will mean that they will be focal points.</p> <p>Considering the recognized natural landscape values of the range and the modifying effect that the presence of the large, dynamic structures will have on these, the visual amenity effects will be adverse in nature and high in magnitude.</p>
<b>Rating</b>	<b>Adverse / High</b>

<b>Viewpoint</b>	<b>Kaimai Mamaku Conservation Park – Mt Karangahake Summit (Trig)</b>
Relevant simulations	Viewpoint B20 is a simulation from the trig on the summit of Mt Karangahake. This viewpoint is illustrated because it is a high profile destination within the Conservation Park and is sufficiently open (in terms of forest cover) to have visibility of the wind farm site.
Distance to nearest turbine	1627m
Number of turbines visible	19
Viewer sensitivity	Users of the Kaimai Mamaku Conservation Park, be they locals or tourists, are likely to be appreciative of the recognized natural character and natural landscape values. Viewer sensitivity to landscape change is very high.
Description of visual effects	The forest cover within the Kaimai Mamakau Conservation Park is typically fairly dense and views outward from the forest tracks are typically constrained. Mt Karangahake summit (trig) is a significant viewpoint however, from which there are views across the surrounding landscape are possible. The views are panoramic and encompass the bushland of the Conservation Park and the farmed and settled lands beyond. The farmland of the upper part of the wind farm site is visible in the middle distance to the

	<p>south with Mt Te Aroha viewed behind. Westward, the high promontory to the west of the trig site blocks views to some extent, but much of the western spur of the lower part of the site can be seen beyond with the Hauraki Plain as the distant backdrop.</p> <p>From this viewpoint the ridgeline turbines will be prominent features lining away southwards, approximately 1.6 – 2.8km distant and as little as 60m lower in elevation. All but Turbine 18 will be visible and these will be seen beside rather than within the conservation lands, and within the context of the adjacent farmland that already modifies natural landscape values. The main group of (larger) turbines will be partially screened by the promontory to the west, but Turbines 1 – 9 and 11 - 13 will be visible at distances of approximately 3.5 – 5.6km. These will be significantly lower in elevation (approx. 250m or more) and will be seen as part of the working rural landscape westwards.</p> <p>The visual amenity effects of the wind farm vary between the upper main ridgeline group and the main, lower group. As far as the lower group is concerned, this will be significantly separated from this viewpoint both by elevation and distance and will be seen as well integrated with the working rural nature of the western spur landscape. In contrast, the main ridgeline turbines will be much closer and more prominent and will have a much closer relationship with the Conservation Park. Overall, from Mt Karangahake, the nature of effects of the lower group is adverse (in that naturalness of the rural landscape is reduced) but that the magnitude of these effects is low. Regarding the ridgeline group, the effects on visual amenity will be adverse in nature and high in magnitude due to their prominence from this viewpoint and the associated impact on natural character values. Whilst values often associated with conservation areas to do with remoteness and isolation are already highly modified (due to the presence of cleared land) the presence of the large turbine structures will further reduce naturalness values by a considerable degree.</p>
Rating	<p><b>Lower group (turbines 1 – 17) : Adverse / Low</b>  <b>Higher group (turbines 18 – 24) : Adverse / High</b></p>

<b>Viewpoint</b>	<b>Kaimai Mamaku Conservation Park – Dickey Flat Campsite</b>
Relevant	Viewpoint B21 is a wireframe diagram illustrating theoretical visibility from



simulations	this viewpoint. This viewpoint has been analyzed because it is a high profile destination within the Conservation Park that was identified as potentially being open enough (in terms of bush cover) to have visibility of the wind farm site. Site investigation at Dickey Flat Campsite has established that foreground vegetation will mainly preclude views from this viewpoint and because of this a full simulation has not been prepared.
Distance to nearest turbine	2485m
Number of turbines visible	7
Viewer sensitivity	Users of the Kaimai Mamaku Conservation park, be they locals or tourists, are likely to be appreciative of the recognized natural character and natural landscape values. Viewer sensitivity to landscape change is very high.
Description of visual effects	<p>Dickey Flat Campsite is a popular public campsite located adjacent to the Waitewheta River and within the valley to the east of the main ridgeline part of the wind farm site and it has an enclosed and secluded character. The forested slopes rise toward the summit of the Kaimai Range across the river from the campsite but views toward the ridgeline are typically precluded by both foreground and midground vegetation.</p> <p>The wireframe model (VP Dickey Flat Campsite) indicates that without taking vegetation screening into account, the proposed 7 turbines on the main Kaimai Range ridgeline could be visible. Having visited this campsite, any visibility will be slight due to screening provided by foreground trees and the forest cover on the hillslopes between the viewpoint and the site. It is possible that from specific places a glimpse of rotating rotor blades may be visible on the skyline and this may draw some minor attention and perhaps give rise to a degree of nuisance. Overall however, the magnitude of effects on visual amenity values are very low.</p>
<b>Rating</b>	<b>Adverse / Very low</b>

Visual effects – Summary comments

The table below summarizes the ratings relating to the various turbine groups, for the viewpoints assessed. The key points arising from my analysis of the viewpoints and viewing audiences are as follows:

Viewpoint	Rating – Magnitude of adverse effects						
	Very high	High	Moderate - high	Moderate	Moderate - low	Low	Very low
Paeroa				T 18-24	T1-17		
Mackaytown					T1-24		
Te Aroha						T1-24	
SH 2 (West)				T18-24		T1-17	
SH 26						T1-24	
Paeroa Tahuna Rd					T1-24		
Rawhiti Rd				T1-24			
No1 Road						T1-24	
Rotokohu Rd		T1-24					
Thorpe Rd			T1-24				
Tirohia				T1-24			
Rawhiti Rd (north)		T1-24					
Waihi			T18-24				
Waikino		T18-24				T1-17	
SH 2 (East)		T18-24				T1-17	
Kennedy Road		T18-24					
Mt Karangahake		T18-24				T1-17	
Dickey Flat Camp							T18-24

In all cases, the nature of the effects are adverse to varying degrees. Whilst many viewers may respond to the wind farm positively, the adverse rating reflects the need to assess effects on visual amenity against the guidance on community held landscape values found in the planning documents. These include such aspects as naturalness and openness. The introduction of 180m and 207m high turbines clearly modifies naturalness and openness, although considering the scale of the structures, they have a relatively small physical footprint and low effects on existing landscape elements, patterns and processes.

In terms of the magnitude of effects, these are greatest where the wind farm is seen within in a more natural / sensitive context, particularly to the east of the Range, and where the viewing audience is in closer proximity, and more sensitive e.g. nearby residents or users of the Conservation Park.

#### Visual effects of night time lighting

Civil Aviation New Zealand require at least some of the turbines to have red flashing lights attached to the top of the nacelles for safety reasons. Depending on atmospheric conditions these are likely to be seen at least 15km away, with intensity increasing with proximity. Clearly, these lights have the potential to affect the naturalness of the night sky where visible. To mitigate this effect, the applicant proposes to use an active aviation light management system that activates only when approaching aircraft are detected. This provision will considerably reduce any night time lighting effects. The effects of night time lighting of the turbines will be adverse in nature but considering the mitigation proposed, low in magnitude.

#### **Statutory planning assessment**

The site is located within the Rural Zone in the Hauraki District Plan (HDP) and abuts areas zoned 'Significant Natural Area' and 'Conservation'. There are also 2 urupa features noted in the District Plan maps adjacent. The Hauraki District Plan and Waikato Regional Policy Statement provisions considered relevant to the landscape and visual effects of the proposed wind farm are outlined in Appendix A.

In terms of Section 7.4.5.5 (4) of the HDP, the proposed wind farm is a Discretionary Activity. The relevant assessment criteria are found in both the Rural Zone section (5.1.7) and the Provision for Network Utilities and Energy Generation section (7.4.8). Those assessment matters considered relevant to this report are listed below, with brief comment, as follows:

### Section 5.1.7.1 Rural Zone General Assessment Criteria for Discretionary Activities

*(1) 'The degree to which buildings, other structures and activities will adversely affect the rural landscape characteristics, particularly in relation to the open rural character.'*

#### Comment

The wind farm will change the existing rural character and will modify its naturalness. Essentially though, whilst there will be landscape change, rural character per se, will still be strongly expressed, albeit with a new layer of production added. In many parts of New Zealand wind farms are familiar elements in the rural landscape. Turbines have small footprints and rural activities can continue more or less unaffected. Whilst they add a significant new element, they will not adversely affect the existing rural landscape elements, patterns or processes.

*(6) 'Whether buildings are sufficiently set back from the boundaries of neighbouring properties to avoid causing a nuisance by way of overshadowing, obstruction of views, noise, glare and loss of privacy.'*

#### Comment

The nearest dwelling to the proposed turbines is 804m distant, and there are 67 dwellings within 2km of the nearest turbine. Existing views from these dwellings or from nearby on the surrounding properties will be modified due to the introduction of large, visually significant structures. This assessment has not included site visits to any of the adjacent private properties and effects on these places can only be generalized from the assessments made from the nearby public roads. This assessment has considered different viewing audiences and carried out assessments from public viewpoints, including the review of computer-generated visual simulations from representative viewpoints. It is likely that there will be high adverse visual effects from some nearby properties.

The analysis of shadow flicker (Energy3 Ltd) has concluded that there will be exposure to shadow flicker above current guidelines for 15 dwellings in the area surrounding the site and discusses possible mitigation measures to minimize nuisance caused by this.

Glint effects of sunlight on the turbine blades will be mitigated by the use of matte paint finishes. There will be no effects on privacy.

*(8) 'Whether features of the proposal including the location, design and colour of buildings and structures, the planting of trees and shrubs, and the shaping of earth avoid, remedy or mitigate any adverse effect on the existing landscape.'*

#### Comment

The wind farm design is necessarily dictated by operational requirements which in this case, control the location, number and scale of the turbines required. It is proposed however to mitigate the visual and landscape effects to the extent possible within these parameters, particularly by undertaking earthworks in such a way as to facilitate rapid and effective revegetation of batter slopes and by reducing the height of the turbines on the high ridge. As part of the design process, several turbines have been removed, from earlier design layouts to minimise adverse effects on neighbouring properties.

Mitigation involving planting is impractical given the scale of the structures but could be considered for offsite locations to screen particular views if desired by affected neighbours. The turbine colour is set by Civil Aviation requirements and is appropriate to mitigate visual effects as the off-white colour helps to minimize contrast with generally light, sky colours.

*(9) 'The extent to which existing native bush, or other vegetation which contributes to visual amenity and / or biodiversity values (as assessed against the criteria in 6.2.5.8), is retained and the reasons why any clearance is proposed.'*

## Comment

In general, no indigenous vegetation of any significance will be impacted by the proposed development. The exception to this is in the vicinity of Turbine 13 where some of a small patch of indigenous bush will be removed to make way for the turbine platform.

*(10) 'Whether development adjacent to either the Conservation Zones, the Karangahake Gorge Zone or the Coastal Zone creates a situation where the buildings and activities dominate or detract from the natural environment of those zones.'*

## Comment

The upper part of the site is adjacent to the Conservation (Indigenous Forest) Zone in the Hauraki District Plan. The wind farm will have no direct effects on the vegetation or landform within the conservation land but the higher turbine group will have adverse effects on the natural landscape character of the zone, particularly as viewed from the east. Given the visual lightness / low bulk of the turbine structures, they will not 'dominate' the natural environment but they will detract from natural landscape character values.

*(12) 'Whether any exploration, mining, earthworks and / or tracks and driveways necessary to accommodate the activity would create a significant adverse visual impact, particularly in the Outstanding Natural Landscape Area and District Amenity Landscape Area.'*

## Comment

Earthworks associated with the proposed development will have low adverse visual effects from beyond the site once revegetation of batter slopes is achieved. There will be no earthworks effects within the adjacent ONL.

(21) *'Whether the activity and any buildings and structures are of a scale and intensity which are in keeping with the character and amenity values of the existing rural environment.'*

#### Comment

In common with all wind farms, the proposed wind farm is of a character and scale that will contrast rather than integrate with, the rural landscape. However, this does not automatically make it inappropriate. The naturalness of the rural environment will be further modified but adverse effects will be mitigated by the low level of impact on the existing landscape elements, patterns and processes. In terms of turbine size, the number of turbines, and its geographic spread, the proposed wind farm is of considerable scale. Overall however, it will not dominate its landscape setting given the scale of the Kaimai Range and the expansiveness of the adjacent Hauraki Plains. The scale of the Waihi Basin to the east is smaller, but the wind farm is much less visible from this side.

#### Section 7.4.8 (1) Provision for Network Utilities and Energy Generation Assessment Criteria for Discretionary Activities

##### (1) Visual / Landscape / Amenity / Heritage Impacts

- (a) *'Whether the utility / activity will have an adverse visual impact on the natural and built environment, and in particular, whether it will detract from the surrounding landscape by:*
- (i) markedly reducing the degree of visual openness and significance of the landscape;*
  - (ii) increasing the degree of modification in rural and non-urban coastal parts of the District, or reducing in other than a minor way the visual coherence of the landscape;*
  - (iii) being incongruous with the existing landform particularly with respect to ridge lines, promontories and coastline;*
  - (iv) obscuring or detracting from significant views obtained from public places;*
  - (v) being incongruous with existing heritage resources such as sites, buildings, places or areas of heritage, cultural and archaeological value.'*

## Comment

The proposed wind farm will increase the number and presence of built elements in the rural landscape in this locality but will not significantly reduce openness per se. This is because of the slender form and low bulk of turbines which seen collectively, add a layer to rural landscapes rather than altering their existing elements, forms and land uses. The wind farm will increase the complexity of the landscape but it will not obscure the existing landscape and will not significantly modify its visual coherence. Whilst the turbines relate to the pattern of ridgelines and promontories generally, at the finer scale there is some variability and the wind farm will modify coherence but to a modest extent. Landform coherence is currently modified anyway, with vegetation patterns sometimes overlaying awkwardly with the underlying topography. There are no significant views obstructed, but views of the Ranges from surrounding areas will be modified.

*(b) 'Whether the height, colour, form and scale of the proposed utility / activity and its overall design and external appearance will result in any adverse effects being avoided or mitigated with respect to the scale and form of the buildings / structures on adjoining or neighbouring sites, or important aspects or characteristics of the landscape in which it is proposed to be located.'*

## Comment

The proposed wind farm will introduce a new element that will contrast with the existing landscape elements. Whilst adding a significant new feature, it will not significantly alter the landscape pattern and character. Turbine heights, colours and forms, together with the overall wind farm layout are dictated to a large extent by operational requirements. Where possible modifications have been made to mitigate landscape character and visual effects, including reducing the turbine heights on the higher ridge and reducing the number of turbines generally.

*(c) 'Whether the utility / activity will be screened by landscaping or other means, sufficient to soften hard structures and minimize the scale of the structures, and to result in a visual appearance compatible with the surrounding structures and built forms in the landscape, having regard to operational requirements.'*



## Comment

The scale of the turbines is such that screening by vegetation is not achievable. From the various viewpoints surrounding turbines are screened to varying extents by landform. As previously discussed, the wind farm will contrast with the existing landscape but is not a feature inherently incompatible with rural landscapes. From most viewpoints it will be seen in the context of a modified working rural landscape. The exception to this is where it is seen from the eastern side of the range. From many viewpoints on this side, most of the turbines will be screened.

*(d) 'Will the extent of earthworks for the creation of building platforms and access tracks create adverse visual effects that cannot be avoided, remedied or mitigated.'*

## Comment

In general, the earthworks associated with the road upgrading, laydown areas and turbine platforms are located where they will not be significantly visible from surrounding viewpoints. They will be undertaken to ensure that successful and timely revegetation can be achieved.

*(e) 'Whether there will be cumulative adverse visual effects on the landscape or character of the general vicinity as a result of adding to existing utility services and / or energy generating activities within the area, particularly overhead lines, radio communication or telecommunication facilities and turbine structures.'*

## Comment

There are no other wind farms within the landscape context of the proposed site and therefore, no cumulative effects in this sense. In terms of utilitarian elements generally, the most significant element in this area is the transmission tower on Mt Te Aroha which is visible from both sides of the Kaimai Range and which affects its natural character.

The proposed turbines, in particular the group on the top ridge, will further modify the naturalness of the Range to a moderate extent.

*(g) 'Whether utility / activity will result in any adverse impact on the existing character of the area in which it is proposed to be located, considering issues such as:*

*(i) the scale of the work*

*(ii) the intensity of the proposed activity, including hours of use and the number of people involved, and the effects of traffic generated either during the construction or operational phase.'*

#### Comment

As outlined above, the wind farm will result in a significant addition to the landscape that will alter the existing character. There will be some adverse effects, particularly in relation to naturalness values. These will be most significant where the existing natural landscape values are highest i.e. relating to the upper ridge and the landscape on the eastern side of the Range. Whilst the turbines will add another layer to the landscape, its existing pattern and land use processes will otherwise remain largely unchanged.

*(h) 'Whether there are activities existing or likely to exist that will potentially be adversely affected by noise, lighting, glare and / or radiofrequency and electric magnetic fields generated by the utility / activity. Relevant New Zealand Standards and Codes of Practice will be used as a guide.'*

#### Comment

The wind farm will have visual impacts as viewed from surrounding dwellings, roads and towns. Potential blade glint effects will be mitigated by matte paint finishes. Adverse lighting effects on the character of the night sky and the naturalness of the Kaimai Range will be effectively mitigated by the proposed use of the active aviation light management system.

(i) *'Whether the siting of a utility has taken into account the proximity and nature of existing dwellings / household units, or likely future dwellings / household units permitted by the Plan, in terms of visual impact, site access, noise and health and safety.'*

#### Comment

The proposed development has been configured to ensure that turbines are not located in close proximity to existing and future dwelling sites. The site occupies higher elevation land with steeper slopes forming a buffer to the more densely settled areas at lower elevation. The design has been through various iterations which have involved removal of turbines to minimize effects on dwellings. Even so, the scale of the turbines is such that there will be high adverse visual effects from some closer residential viewpoints. In these cases, mitigation planting options, to provide screening and visual buffering on the properties involved should be explored.

#### Relevant objectives and policies

The objectives and policies in the HDP and WRPS considered relevant to this report are outlined in Appendix A. My summary of the key issues arising from these, with brief comment, is as follows:

- Does the proposal maintain rural character amenity values including openness?
- Does the proposal avoid, remedy or mitigate adverse effects of activities on the amenity of neighbours?
- Does the proposal protect the values of the adjacent ONFL from inappropriate use and development?

Does the proposal maintain rural character amenity values including openness?

As discussed, wind farms are invariably located in rural settings and are not generically antithetical to rural character. Because of the scale, dynamism, verticality and built form of turbines they always contrast with the more natural elements in the rural landscape. Equally however, due to their small footprints, whilst they add a significant new element, they do not fundamentally change the existing landscape elements, patterns and processes. The wind farm proposed is no exception. It will change the landscape character by adding a major new element and in so doing, will further modify its naturalness, increase complexity and reduce coherence but only to a limited degree in my assessment. Openness, in the sense that the landform is still visible and legible, will not be greatly reduced. The proposed wind farm is generally consistent with the provisions seeking to protect rural character and associated amenity values.

Does the proposal avoid, remedy or mitigate adverse effects of activities on the amenity of neighbours?

The wind farm has been designed to ensure that the turbines have setbacks of 804m or more from adjoining residences, and as outlined in the Project Rationale Report, previously proposed turbines have been removed from the scheme to assist in mitigating adverse amenity effects on residents on neighbouring properties. Even so, it is my assessment that the sheer scale of the turbines means that they will have a dominant effect where visible from viewpoints within approx. 2km. It is likely that factors such as orientation to main views and the presence of screening vegetation will mitigate adverse effects from some neighbouring residences. It is also likely that specific mitigation measures (such as the establishment of screen plantings on neighbouring properties, should the owners be agreeable) could be effective, and such off-site mitigation options should be explored.

Does the proposal protect the values of the adjacent ONFL from inappropriate use and development?

The site is not within an ONFL but the upper ridgeline part of it is directly adjacent to the Kaimai Range ONFL. The ONFL includes those parts of the Range that are under

indigenous forest cover, in this area including the eastern slopes of the range and the upper slopes and summit of Mt Karangahake. The wind farm will have no impact on the indigenous forest within the ONFL, but turbines 18 – 24 will have adverse effects on the natural landscape character of the main ridgeline of the Kaimai Range as viewed from areas surrounding, as well as adverse effects on the wilderness qualities from some places within the ONFL. Whilst turbines 18 – 24 have a high level of adverse effects on ONFL values, most of the wind farm is located at lower altitude, within a modified working rural context and on a separate ridge landform to the west of the main range. These turbines will either not be visible in context with areas included within the ONFL (e.g. most areas to the east of the range), or they will be seen as being separate from the main Kaimai Range within a modified farmland context (i.e. on a discrete ridge form, with the main range behind). This part of the wind farm will have a low level of adverse effects on the ONFL values.

## **Conclusion**

The proposed Kaimai Wind Farm site is modified farmland but has visual sensitivity due to its prominent position on the Kaimai Range and the proximity of the higher part of the site to the Kaimai Mamaku Conservation Area, an area recognized as an Outstanding Natural Landscape.

The proposed wind farm has an area of 1304ha covering three properties, and will have 24 turbines. Because of their distinctive form and at around 200m tall, the turbines will be prominent. Most of the turbines will be located on a lower secondary ridge but a group of seven will be on the main Kaimai Range ridge. Their specific locations will generally be in response to the landform pattern of spurs and ridgelines. Substantial earthworks will be required for access roads and platform creation but generally these will not have major long term visual effects due to the avoidance of steep, visually prominent slopes and the proposed revegetation of batter slopes.

The effects of the proposal on landscape character and values will be adverse / high as far as the upper group of 7 turbines are concerned, and adverse / moderate for the main lower group of turbines, with the variation relating to the differing character and

sensitivity of the contexts. The upper group impacts the main ridgeline and is visible within a highly natural context from the Waihi Basin area whilst the lower group is lower and in an area where a working rural landscape character is more strongly expressed.

In terms of effects on the visual amenity of the various affected viewing audiences, the proposed wind farm will be visible over a wide area and the nature and significance of effects varies with viewing distance and the degree of visual dominance, as well as the character of the context as seen from the specific viewpoints. Assessments for the various areas range from adverse / high to adverse / very low. The viewers likely to be most sensitive to the visual change that the proposal will bring are close-by residents. In general, effects from areas within approximately 2km of the nearest turbine are assessed as at least adverse / moderate due to the dominance of the turbines within this distance. Visual effects are also more significant when seen from the eastern side of the range due to the highly natural landscape context. From other viewpoints, at distances from which the turbines will not be seen as dominant, the wind farm will be well integrated in what is a modified, working rural landscape. It will add a significant new feature but in other respects existing landscape elements, patterns and processes will remain largely unchanged.

In terms of the relevant assessment matters in the HDP and its fit with the relevant objectives and policies in the HDP and WRPS, the proposed wind farm is generally consistent with those matters protecting rural character and associated amenity values, but there are adverse effects on the values of the adjacent ONFL and the visual amenity values of neighbours.



Mike Moore

Registered NZILA Landscape Architect

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## **Appendix A: Statutory document provisions considered relevant to the landscape and visual effects of the proposed development**

### **Hauraki District Plan**

#### 5.1 Rural Zone

##### Objective 1

*'To ensure a range of compatible rural land use activities can be undertaken, which benefit from the productive potential, location and rural character of the zone.'*

##### Policy (iii)

*'Ensure buildings (including dwellings) and rural activities maintain the amenity value of a predominantly open rural character and the productive use of the land.'*

##### Objective 2

*'To preserve and enhance the open rural landscape character of the zone.'*

##### Policy (i)

*'Ensure the erection of buildings does not detract from the open rural landscape character values of the Rural Zone.'*

##### Objective 4

*'To ensure that adverse effects of a land use activity on the environment or on the amenities of neighbours are avoided, remedied or mitigated.'*

##### Policy (iii)

*'Other adverse effects (eg noise, smell, glare, vibration, visual) on the environment and amenity of the District (particularly where they are near to residential or other sensitive activities) should where practical be avoided, or remedied or mitigated.'*



## 5.2 Conservation (Indigenous Forest) Zone

### Objective 1

*'To protect and enhance the biological diversity and outstanding landscape character values of the zone.'*

## 6.3 Protection of Outstanding Natural Features and Landscapes and District Amenity Landscapes

### Objective 1

*'Protect the integrity and the aesthetic, cultural and intrinsic values of outstanding natural features and landscapes and maintain the high cultural and visual amenity values of the District Amenity Landscapes.'*

### Policy (i)

*'Control the subdivision, use and development of land so that the adverse effects on aesthetic and intrinsic values and on the visual and physical integrity of outstanding landscapes and natural features are avoided, remedied or mitigated.'*

## 7.4 Provision for Network Utilities and Energy Generation

### Objective 3

*'The sustainable utilization and management of the District's natural and physical resources for electricity generation and associated necessary infrastructure (including recognition of the need to connect to the National Grid or distribution network) whilst ensuring the adverse effects on the environment are avoided, remedied or mitigated.'*

### Policy (i)

*'Recognize and provide the opportunity for electricity generation from the District's natural and physical resources, particularly those of a renewable nature, while as far as practicable avoiding, remedying or mitigating the potential adverse effects on the environment.'*

In terms of Section 7.4.5.5 (4), the proposed wind farm is a Discretionary Activity. The relevant assessment criteria are found in both the Rural Zone section (5.1.7) and the Provision for Network Utilities and Energy Generation section (7.4.8). Those matters considered relevant to this report are listed below as follows:

Section 5.1.7.1 Rural Zone General Assessment Criteria for Discretionary Activities

- (1) *'The degree to which buildings, other structures and activities will adversely affect the rural landscape characteristics, particularly in relation to the open rural character.'*
- (6) *'Whether buildings are sufficiently set back from the boundaries of neighbouring properties to avoid causing a nuisance by way of overshadowing, obstruction of views, noise, glare and loss of privacy.'*
- (8) *'Whether features of the proposal including the location, design and colour of buildings and structures, the planting of trees and shrubs, and the shaping of earth avoid, remedy or mitigate any adverse effect on the existing landscape.'*
- (9) *'The extent to which existing native bush, or other vegetation which contributes to visual amenity and / or biodiversity values (as assessed against the criteria in 6.2.5.8), is retained and the reasons why any clearance is proposed.'*
- (10) *'Whether development adjacent to either the Conservation Zones, the Karangahake Gorge Zone or the Coastal Zone creates a situation where the buildings and activities dominate or detract from the natural environment of those zones.'*
- (12) *'Whether any exploration, mining, earthworks and / or tracks and driveways necessary to accommodate the activity would create a significant adverse visual impact, particularly in the Outstanding Natural Landscape Area and District Amenity Landscape Area.'*
- (21) *'Whether the activity and any buildings and structures are of a scale and intensity which are in keeping with the character and amenity values of the existing rural environment.'*

Section 7.4.8 (1) Provision for Network Utilities and Energy Generation Assessment  
Criteria for Discretionary Activities

(1) Visual / Landscape / Amenity / Heritage Impacts

- (a) *Whether the utility / activity will have an adverse visual impact on the natural and built environment, and in particular, whether it will detract from the surrounding landscape by:*
- (i) *markedly reducing the degree of visual openness and significance of the landscape;*
  - (ii) *increasing the degree of modification in rural and non-urban coastal parts of the District, or reducing in other than a minor way the visual coherence of the landscape;*
  - (iii) *being incongruous with the existing landform particularly with respect to ridge lines, promontories and coastline;*
  - (iv) *obscuring or detracting from significant views obtained from public places;*
  - (v) *being incongruous with existing heritage resources such as sites, buildings, places or areas of heritage, cultural and archaeological value.'*
- (b) *Whether the height, colour, form and scale of the proposed utility / activity and its overall design and external appearance will result in any adverse effects being avoided or mitigated with respect to the scale and form of the buildings / structures on adjoining or neighbouring sites, or important aspects or characteristics of the landscape in which it is proposed to be located.'*
- (c) *Whether the utility / activity will be screened by landscaping or other means, sufficient to soften hard structures and minimize the scale of the structures, and to result in a visual appearance compatible with the surrounding structures and built forms in the landscape, having regard to operational requirements.'*
- (d) *Will the extent of earthworks for the creation of building platforms and access tracks create adverse visual effects that cannot be avoided, remedied or mitigated.'*
- (e) *Whether there will be cumulative adverse visual effects on the landscape or character of the general vicinity as a result of adding to existing utility services and / or energy generating activities within the area, particularly overhead lines, radio communication or telecommunication facilities and turbine structures.'*

- (f) *'Whether the utility / activity will adversely affect biodiversity values by removing or modifying significant bush, vegetation, landform or other natural habitats, and / or impacting on bird and bat movement / migration.'*
- (g) *'Whether utility / activity will result in any adverse impact on the existing character of the area in which it is proposed to be located, considering issues such as:*
- (i) the scale of the work*
  - (ii) the intensity of the proposed activity, including hours of use and the number of people involved, and the effects of traffic generated either during the construction or operational phase.'*
- (h) *'Whether there are activities existing or likely to exist that will potentially be adversely affected by noise, lighting, glare and / or radiofrequency and electric magnetic fields generated by the utility / activity. Relevant New Zealand Standards and Codes of Practice will be used as a guide.'*
- (i) *'Whether the siting of a utility has taken into account the proximity and nature of existing dwellings / household units, or likely future dwellings / household units permitted by the Plan, in terms of visual impact, site access, noise and health and safety.'*

## **Waikato Regional Policy Statement**

### **Objective 3.5 Energy**

*'Energy use is managed, and electricity generation and transmission is operated, maintained developed and upgraded, in such a way that:*

- (g) addresses adverse effects on natural and physical resources'.*

### **Objective 3.20 Outstanding Natural Features and Landscapes**

*'The values of outstanding natural features and landscapes are identified and protected from inappropriate subdivision, use and development.'*

### **Policy 12.1 Outstanding Natural Features and Landscapes**

*'Identified values and characteristics of outstanding natural features and landscapes (including seascapes) of regional or district significance are protected from adverse effects, including cumulative effects, arising from inappropriate subdivision, use and development.'*

## Appendix B : Proposed Active Aviation Light Management System

Illuminance calculation (as supplied by Tektus) in relation to Hauraki District Plan Standard 8.2.5.3 (2) Lighting.

- Vestas aviation data suggests a max candela rating of 2,000 cd
- <https://www.rapidtables.com/calc/light/candela-to-lux-calculator.html>
  - **Candela to lux calculation with distance in meters**
  - The illuminance  $E_v$  in lux (lx) is equal to the luminous intensity  $I_v$  in candela (cd), divided by the square distance from the light source  $d^2$  in square meters ( $m^2$ ):
    - $E_{v(lx)} = I_{v(cd)} / (d_{(m)})^2$
    - 2000 cd at 100m = 0.2 lx
- Therefore the 8.0 lx standard at the boundary should be easily complied with.

# Vestas InteliLight<sup>®</sup>

## Active Aviation Light Management

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### Benefits of Vestas InteliLight<sup>®</sup>:

- Proven system based on over 10 years of operational experience.
  - Efficient solution tailored to wind park application.
  - Aviation lights activate only when needed, avoiding unnecessary, continuous lighting.
  - Aviation lights remain off 98 % of the time depending on aircraft activity.
  - Available across turbine brands and multibrand parks.
- 

Vestas InteliLight<sup>®</sup> delivers reliable activation of the aviation lights when needed, while avoiding unnecessary continuous lighting. It is a proven end-to-end solution, designed by Vestas and optimised specifically for wind power plant application. The result is an industry-leading, effective and safe solution available across turbine brands and multibrand parks.

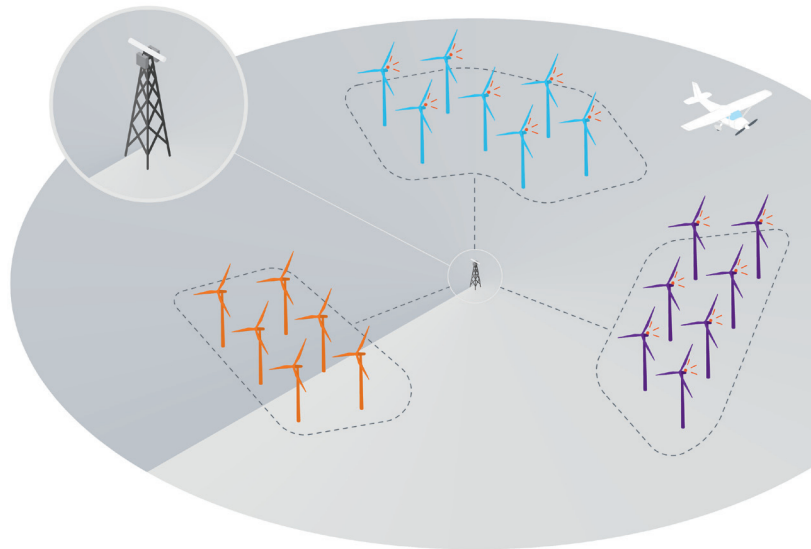
### Proven Solution

For Vestas InteliLight<sup>®</sup>, the priority of the system design and function is reliable performance. The first system was installed in 2007 and has been continuously optimised based on more than 10 years of operational experience. Today, more than 700 MW of turbines operate with Vestas InteliLight<sup>®</sup> and total system orders exceed 1 GW\*. The system works autonomously on-site, while continuous remote monitoring verifies system integrity. A secondary power backup and fail-safe mode ensure operational readiness.

### System Integration

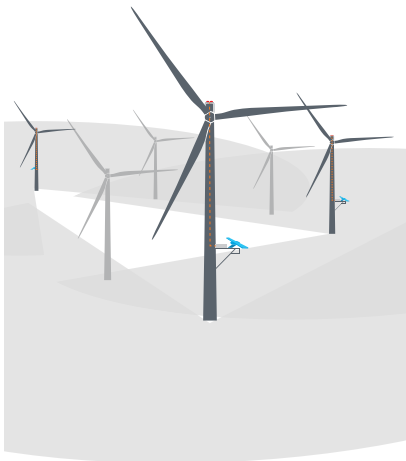
Vestas InteliLight<sup>®</sup> is directly connected with the turbine aviation lights through the Vestas communication network, enabling prompt and reliable reaction when needed. For non-Vestas turbines, the turn-key system is directly connected to the turbine aviation lights, working independently of the windpark control system.

\* Based on installed capacity by the end of 2017 and firm order intake for 2018



Aviation lights activate when needed:

One Vestas IntelliLight® radar may cover several wind parks, yet the system only activates lights in the relevant parks. In this case, aviation lights are activated in the blue and purple wind parks, but remain off in the orange wind park.



### Availability of Vestas IntelliLight®:

Vestas IntelliLight® is authority-approved for use in the following countries\*:

- Canada (Certified by TC)
- Finland (Certified by TRAFI)
- Germany (Certified by DFS/BMVI)
- Norway (Certified by Luftfartstilsynet)
- Sweden (Certified by Transportstyrelsen)
- United States (Certified by Federal Aviation Administration)

\* Configuration is country and site dependent.

### Siting

In the case of Vestas wind park planning, the Vestas IntelliLight® application is considered in the regular Vestas turbine siting process. For existing Vestas, non-Vestas and multibrand wind park application, a coverage assessment is prepared by dedicated IntelliLight personnel. Specialised siting tools using topographical 3D maps are applied to ensure safe and efficient radar terrain coverage and aviation safety.

### Installation

The compact Vestas IntelliLight® hardware is installed on the side of the turbine tower or on a stand-alone mast. Vestas ensures valid type certification and aids in the site preparation and permit application to authorities, including initial application as well as verification and as-built documentation.

### Operation

Vestas IntelliLight® is a complete end-to-end solution, from aircraft detection to controlled activation of aviation light and surveillance hereof. The system continuously and autonomously scans the wind park's surrounding area. Each radar has an instrumented range up to 36 kilometers. If an approaching aircraft is detected, its distance, speed, and heading are tracked and an automatic assessment is made on whether or not to activate the aviation lights. Optionally, a secondary audio alarm can be triggered through the VHF aviation channels.

### Service

Vestas offers a comprehensive service package that ensures the proper maintenance and operations of the system during the lifetime of your wind power plant. Frequent testing and ongoing reporting by Vestas, coupled with periodic inspection and calibration performed by certified Vestas IntelliLight® technicians, enables you to demonstrate that the system is fully functional at all times.

### For more information

Learn more on [vestas.com](http://vestas.com). Please contact your local Vestas office for market specific availability and further information.

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Vestas Wind Systems A/S  
 Hedeager 42 . 8200 Aarhus N . Denmark  
 Tlf: +45 9730 0000 . Fax: +45 9730 0001  
[vestas@vestas.com](mailto:vestas@vestas.com) . [vestas.com](http://vestas.com)

**Wind.** It means the world to us.™