Boffa Miskell

Kapuni Green Hydrogen Project

Landscape and Visual Effects Assessment

Prepared for Hiringa Energy

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*Cover photograph: T*urbines of the Kapuni Green Hydrogen project viewed from 2km at the intersection of Manaia and Skeet Roads

Executive Summary

Boffa Miskell Limited (**Boffa Miskell**) has been engaged by Hiringa Energy Limited (**Hiringa**) to carry out a landscape and visual effects assessment for the proposed Kapuni Green Hydrogen Project, on farmland near Kapuni, South Taranaki).

The Project comprises installation of four, 206m tall three-bladed wind turbines aligned in a north-south direction. The turbines comprise a tapered cylindrical tower, a nacelle with three rotor blades. The turbines will be spaced approximately 360m apart. The hub height will sit at 125m with approximately 80m long rotor blades giving an overall 162 m rotor radius and an overall 206m tip height.

Originally, the four turbines proposed were 230m tall three-bladed wind turbines aligned in a north-south direction. The turbines comprised a similar tapered cylindrical tower, a nacelle with three rotor blades and the turbines were spaced approximately 360m apart. The hub height sat at 149m with approximately 80m long rotor blades giving an overall 162 m rotor radius and an overall 230m tip height.

However, following micro-siting investigations and advice from turbine suppliers, the configuration of turbines on the proposed site were slightly altered and a shorter tower proposed but the same diameter rotor retained resulting in a 24m lower tip height. This is referred to as the 2.5D layout.

The original landscape and visual effects assessment, including the series of visual simulations prepared were based on the original layout and tip height. As a result of the layout and height changes, all the visual simulations were reviewed and assessed as regards to potential changes to the level of landscape and visual effects. Several of the visual simulations from viewing distances at 1km or less have been completely re-done, whereas the visual simulations from greater distances have not been re-done as the level of landscape and visual effects are unchanged.

In addition, since the landscape and visual effects assessment was completed in December 2020, ongoing consultation with hapū has resulted in consideration of visual effects from several additional marae not included in the original assessment. Full visual simulations have been completed for three viewpoints adjacent to marae; however, for the four marae viewpoints identified more recently, only wire frame[1] models have been prepared due to the distance of the marae from the wind turbine site. These involved inserting the revised turbine layout and heights into the Windfarm software model and a wire frame image generated from each of the identified marae viewpoints. The wire frame images illustrate the scale of the turbines and their relationship to the viewpoint.

Access to the Site will be off Kokiri Road along an existing east-west farm race near the southern site boundary. Access will only require widening of the race in places to enable construction and transportation of turbine

[1] Production of wire frames are produced using Windfarm software and are a key step in the preparation of visual simulations.

components. Apart from a small section of hedgerow along Kokiri Road to enable access to the Site no other existing vegetation is required to be removed.

Creating a new access track along the southern boundary, which is the preferred landowner option will require some additional culverts.

Hiringa and Ballance Agri-nutrients are developing a wind to hydrogen project at the nearby Ballance site. The renewable electricity generated by the four wind turbines will be used to power the Ballance Plant and produce green hydrogen from electrolysis for production of ammonia / urea and a hydrogen supply for heavy transport. The power produced by the turbines will be transmitted to the electrolysis infrastructure adjacent to the Ballance plant on Palmer Road either by a new underground cable connected to existing overhead lines in Palmer Road or via a new underground cable.

The Site lies within the volcanic ring plain of the South Taranaki District, characterised by the andesitic cone of Mt Taranaki, visible across much of the District. The ring plain forms a gently sloping landscape towards the coast, merging into both marine terraces and hill country to the east. Pastoral farming is the dominant land use across the district with dairy farming the main activity. It is a 'working' productive rural landscape comprising extensive areas of pasture broken up by shelterbelts, boxthorn hedgerows, small woodlots, and groups of amenity trees across with incised stream gullies originating from Mt Taranaki. The ring plain currently accommodates several non-farming, industrial type activities with the Kapuni Gas Treatment Plant, Kapuni Production Station, the Ballance Plant, Fonterra plant and the 8 gas well sites, all of which are well established and contribute to the overall landscape character of the immediate area and also in relation to the broader ring plain landscape.

The Project will have an adverse effect on landscape character when the turbines are considered as a small cluster of individual elements, however, when they are considered in broader context of the simple 'geometry' of the ring plain and the wider South Taranaki district, the effects on landscape character are attenuated.

The turbines will introduce a new and prominent element into the ring plain landscape, but they will not visually dominate it, no more so than either the Kapuni Gas Plant, Ballance Plant or Fonterra Plant do.

The turbines will have an adverse effect on landscape character and while this will be relatively limited, it does affect the associative values, especially those expressed by Nga iwi o Taranaki in relation to the maunga and its connection and influence on the wider landscape.

A summary of the landscape effects of the Project is outlined below:

	Contributing Factors	Level of Effect	Nature of Effect
Landform Effects	• A flat site that that requires minimal landform alteration (i.e. excavation for turbine foundations and construction of a site access track). • Site access off Kokiri Road will use an existing farm race near the Site's southern boundary • Minor earthworks only to widen races being used for construction access to enable delivery of turbine components and construction traffic	Very Low	Neutral
Vegetation Effects	• A short section of one hedgerow will need to be removed on the Site to enable construction access but no other woody vegetation will be removed or affected on the Site or on adjoining areas	Very Low	Neutral
Landscape Character Effects	• Turbines will be new elements on the ring plain landscape • For Nga Iwi o Taranaki, the activities on the ring plain are linked physically and metaphysically to the maunga • Height, scale, form, and dynamic movement of the turbines will affect the character of ring plain landscape., albeit a small part of it • With only four turbines, the spatial extent is limited • The wind turbines will not adversely affect the continuation of the existing dairy farm with stock able to access to the base of the turbines.	Moderate-High	Adverse

The Site is well separated in terms of distance from the surrounding towns and settlements and from both SH3 and SH45. The four turbines will have a wide theoretical visibility because of the low relief of the ring plain and the wider South Taranaki landscape. The scale of Mt Taranaki is however the dominant element in this landscape and its presence provides an overall context.

At 206m tip height (i.e. when the blade is standing vertically) there are no other built elements of that height or scale on the ring plain. In addition, the form of the turbines and their dynamic movement also contribute to their visibility.

The Project has a large potential visual catchment and the viewing audience is varied, comprising residents on the surrounding farms and rural properties and those residing in the various small settlements and towns around the district. There are also those people who work in the various industries and workplaces in the settlements and in the countryside, along with the transient viewing audience; people who are driving, cycling or walking to and from work, on route to shopping or errands, participating in recreational activities, visiting friends, or driving for pleasure.

This wind energy project is significantly different to others developed elsewhere in New Zealand in that it comprises only four wind turbines. Four turbines situated within this flat, open landscape is not an issue per se, despite the height and scale of the turbines because the receiving landscape can absorb structures of this height. This situation is similar but in a different way to how the landscape has absorbed the large footprints and bulk and scale of both the Kapuni Gas Plant and Ballance Plant. The visual relationship between the turbines and Mt Taranaki as the backdrop is the primary issue. Depending where the viewer is situated on the ring plain the nature of the visual relationship with the mountain changes.

The four turbines contrast with the other landscape elements because of their height, form, and dynamic movement in the open, flat, rural landscape. Despite that the turbines dwarf the other vertical elements on the ring plain, the even, flat, and gently rising topography that extends to the base of the mountain provides a broad horizontal scale that can accommodate large scale elements. In other words, the turbines will appear in scale with the landscape as a whole and they are visually anchored and absorbed by the landscape.

Adverse visual effects will be experienced from a limited number of private properties; on site assessments were made and visual simulations prepared from a representative range of these private properties and a summary of the visual effects from these is in the table below. The visual effects from these properties are primarily those with an open and panoramic view of Mt Taranaki from the internal and/or external living areas. However, many landowners of these properties have extensively planted around their dwellings for wind protection and enclosure and thus views towards the maunga or towards the turbines are screened.

Private viewpoints: Summary of visual effects

Viewpoint Number	Location	Level of Visual Effects	Nature of Effect
H6	Meyer Property, Kokiri Road	High	Adverse
H14	Lawn Farm, Manaia Road	Moderate	Adverse
H18	Smith & Sutton Property, Manaia Road	High	Adverse
H29	Delvin / Poole Property, Skeet Road	Moderate	Neutral
H88	Smith Property, Inaha Road	High	Adverse
H108	Johnston Property, Thomas Road	Moderate	Adverse

At viewing distances of 2km or less, the visual effects are generally moderate, sometimes greater but beyond this the visual effects rapidly diminish. At distances of 3-5+km, the homogeneity and dominant horizontal nature of the ring plain mean that the turbines are generally visually absorbed into the wider landscape.

From the roads and from other public areas, the views are transient and ever-changing as the viewer moves through the landscape; weather conditions also have a major influence on visibility and the level of visual effects. It is only from a few locations and from distances less than 2 km where views are adversely affected to any degree and then only when the turbines sit directly in front of Mt Taranaki and in conditions when the maunga is visible.

Public Viewpoints: Summary of Visual Effects

Viewpoint Number	Location	Level of Visual Effects	Nature of Effect
P1	Upper Glenn Road	Low	Adverse
P2	Intersection of Normanby Road and Manaia Road	Low	Adverse
P3	Junction of Normanby Road and Kokiri Road	High	Adverse
P4	Intersection of Normanby Road and Tito Road (Okaiawa)	Low	Adverse
P5	Manaia Sports Park, Manaia	Low	Adverse
P6	TSB Sports Hub, Hawera	Low	Neutral
P7	Hawera Aerodrome	Low	Neutral
P8	Intersection of Manaia Road and Skeet Road	Moderate	Adverse
P9	Eltham Road, east of Kaponga	Low	Neutral

Given the height of the turbines, there is very limited opportunities to mitigate adverse visual effects. Tree planting on the Site is neither feasible nor desirable. Tree planting close to the viewpoint can provide effective screening similar to that which occurs in relation to viewpoint R-10 (Delvin / Poole, located 1.6km north of the Site). For those properties where such existing screen planting does not occur and the visual effects are high, landowners could be offered tree planting. Such planting would be subject to the wishes and agreement of affected property owners and would typically involve planting of shelterbelts or stands of amenity trees at suitable distances between the dwelling and the wind turbines.

Compared to wind farms developed in various parts of New Zealand, the effects of the four Kapuni turbines on the biophysical landscape (i.e. landform and vegetation) will be minimal because of the flat topography, the low level of landscape modification and that no existing vegetation will be removed.

While the turbines will be prominent when viewed from various places on the ring plain, the nature and scale of the landscape is such that the four

turbines can be successfully accommodated without significant adverse landscape and visual effects.

As noted, the maunga and its connection and influence on the wider landscape holds special value to Nga iwi o Taranaki and siting of the turbines in key viewshafts across the ring plain will result in adverse cultural landscape effects. Assessments were carried out in relation to three marae, but four other generally more distant marae locations have not been visited and assessments made. Instead, for these marae locations, wire frame models have been generated that illustrate the scale of the turbines from these viewpoints and their contextual relationship to Mt Taranaki.

Marae viewpoints: summary of visual effects

Viewpoint Number	Location	Level of Visual Effects	Nature of Effect
H71	Te Aroha Marae, Inaha Road	High	Adverse
H109	Aotearoa Marae, Hastings Road	Low	Adverse
H111	Waiokura Marae, Winks Road	Low	Adverse
H112	Mawhitiwhiti Marae, Omahuru Road	N/A	N/A
H113	Oeo Pa, South Road	N/A	N/A
H114	Okare ki Uta Marae, Taikatu Road	N/A	N/A
H115	Tawhitinu Marae, South Road	N/A	N/A

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1.0 Introduction

Boffa Miskell Limited (**Boffa Miskell**) was engaged by Hiringa Energy Limited (**Hiringa**) to carry out a landscape and visual effects assessment for the proposed Kapuni Green Hydrogen Project, which involves the development of four wind turbines on farmland near Kapuni, South Taranaki (**Figure 1**). Hiringa and Ballance Agri-nutrients are developing a wind to hydrogen project at the nearby Ballance site. The renewable electricity generated by the four wind turbines will be used to power the Ballance industrial plant and produce green hydrogen from electrolysis for production of ammonia / urea and a hydrogen supply for heavy transport. The power produced by the turbines will be transmitted to the electrolysis infrastructure adjacent to the Ballance plant on Palmer Road either by a new underground cable connected to existing overhead lines in Palmer Road or via a new underground cable.

The four wind turbines will produce 24MW on a 227 ha. block of land owned by PKW Parininihi ki Waitotara Farms Limited Partnership (PKW) Trust (the **Site**). Wind speed and direction analysis by Hiringa has been carried out and the four turbines are orientated in a north-south direction to maximise power output from the predominant westerly wind.

The proposed Kapuni Green Hydrogen Project (the **Project**) is different in several ways from the erection of turbines to capture wind energy that have been developed elsewhere in New Zealand because:

- Of how the power will be used (i.e. production of green hydrogen).
- It will supply power primarily to a single user; and
- It is located on a 'flat' site on the Taranaki ring plain as opposed to on elevated sites such as hilltops and ridgelines.

This landscape and visual effects assessment considers the Project in terms of the broader landscape and in relation to the local landscape and the individual properties and communities.

This assessment addresses the following aspects:

(i) A description and appraisal of the existing landscape, including its physical, perceptual, and associative factors.

(ii) Overview of the statutory provisions in relation to landscape and visual matters in the Taranaki Regional Policy Statement and the South Taranaki District Plan.

(iii) An assessment of the wind turbines on the biophysical aspects such as effects on landforms and vegetation.

(iv) An assessment of the effects of the wind turbines on landscape character.

(v) An assessment on any outstanding natural features and landscapes, including:

(vi) An assessment of visual effects; and

(vii) An assessment of the proposed power transmission.

2.0 Description of the Existing Environment

2.1 Landscape Context

A technical landscape assessment for South Taranaki was completed in 2014[2] to help inform the review of the South Taranaki District Plan. The South Taranaki District comprises approximately 358,000 ha along the west coast of the North Island. It encompasses the northern extent of the South Taranaki Bight and includes the southern and western areas of Mt Taranaki. The eastern area of the district also extends into a larger area of rugged hill country which continues into the Whanganui District and encompasses part of Whanganui National Park.

At a broad scale, the landforms of South Taranaki comprise three main elements:

- Mt Taranaki volcano and its surrounding ring plain.
- The folded soft rock sediments of the hill country; and
- The sequence of uplifted sedimentary marine terraces along the southern coastal area.

A transition from the volcanic ring plain into more gently rolling areas of hill country and the presence of coastal sands on part of the marine terraces are also evident in association with these three overarching landform elements.

The proposed Kapuni Green Hydrogen Project is located on the ring plain, which has a uniform elevation graduating in distinguishable bands from the base of the volcanic cone (**Figure 2**). The ring plain forms a gently sloping landscape which merges into both marine terraces and hill country to the east.

Mt Taranaki at 2518 masl forms a distinctive backdrop to the ring plain. The andesitic volcanic cone dominates the South Taranaki landscape and is visible throughout much of the district. In parts, the ring plain is comprised of lahar (volcanic mudflow), debris flow and tephra (fragmented volcanic material) deposits and includes distinctive rounded lahar mounds.

The high rainfall experienced on Mt Taranaki also provides the source of many of the rivers which radiate through the ring plain and flow through parts of the adjoining hill country (**Figure 2**). Mt Taranaki has a significant effect on the climate on the ring plain with the mountain often shrouded in cloud.

While native forest covers an area of 9.6km radius from the summit, the ring plain is largely devoid of native vegetation cover. However, many of the stream gullies across the ring plain have been fenced and the stream margins planted with native vegetation.

Originally Taranaki was one of the most densely forested areas of New Zealand, which included extensive totara-broadleaf forest spread across the ring plain and connecting with broad swathes of rimu and tawa across the inland hills. Maori occupation began around 1250-1300 AD during which the clearance of some of the original forest began, particularly along the coastline. The arrival and settlement of Europeans saw the clearance of most of the remaining coastal forests alongside much of the existing rimu and tawa forests extending into the inland hill country. This subsequently enabled the establishment of significant areas of dairy farming which has formed the basis of Taranaki's economy since the 1880s. In the 1960s the oil and gas industry has undergone major development in South Taranaki and has had a significant influence on Taranaki's landscape and economy. The Kapuni Gas Treatment Plant, Kapuni

[2] *South Taranaki Landscape Assessment, 2014*, prepared by Boffa Miskell Limited for South Taranaki District Council

Production Station, the Ballance Agri-nutrients Plant, and the Fonterra plant are major industrial developments in the area and there are also gas well sites distributed across the ring plain (**Figures 3 and 5**).

However, pastoral farming is the dominant land use across the district with dairy farming the main activity. It is a 'working' productive rural landscape comprising extensive areas of pasture broken up by shelterbelts, boxthorn hedgerows, small woodlots, and groups of amenity trees with incised stream gullies originating from Mt Taranaki.

Dwellings, mostly single level are distributed across the ring plain and generally surrounded by shelterbelts, hedgerows, and amenity planting to provide wind protection and enclosure, especially from the dominant westerly wind (**Figure 3**).

The ring plain has been extensively modified, initially by extensive agricultural development, which has been further changed in places with the advent of oil and gas development. In broad terms, it is a landscape composed of clearly definable elements with the ring plain extending out around the base of the mountain making it a landscape easy to understand and navigate.

South Taranaki Landscape Study

The 2014 landscape assessment subdivided the district into three landscape character types and eleven landscape character areas. The volcanic ring plain, which is one of the three landscape character types identified, is subdivided into four landscape character areas – Mt Taranaki, Pungarehu in the north, Manaia the central section, and Waingongoro in the south (**Figure 4**).

The Project is situated in the Manaia landscape character area (**Figure 4**), which extends to the south of Mt Taranaki and is generally flatter and typically lacks the pattern of lahar mounds that are evident to the north-west. SH 3 to west and SH 45 (the Surf Highway) traverse this character area with a grid road network throughout. The field subdivision follows a similar grid-like pattern, which contrasts with the radial stream pattern that extends across the ring plain.

The assessment records the 'Key Characteristics' for the Manaia landscape character area as:

> *"Flattened area of volcanic ring plain with strong radial stream pattern extending towards the coastline from Mount Taranaki*
>
> - *Low level laharic cliffs along exposed coastal edge*
> - *Predominately free draining productive soils accommodating dairy, cropping and horticultural use*
> - *Boxthorn hedges along paddock boundaries with areas of riparian vegetation along stream corridors*
> - *Dispersed rural settlement pattern associated with agricultural use and small rural service towns accessed along a gridded rural road network*
> - *Some industry associated with oil and gas extraction established near the coastal edge and inland."*

The assessment records the 'Forces of Change' for the Manaia landscape character area as:

> *"Smaller farmsteads are increasingly being subsumed by larger land holdings*
>
> - *Expansion of intensive agricultural or industrial development and associated increase in scale and modification of character of rural development*

- *Expansion of existing oil and gas extraction and processing areas along the coastal edge*
- *Reintroduction and colonisation of indigenous vegetation along stream margins*
- *Expansion of coastal lifestyle development associated with existing recreation opportunities established at Kaupokonui."*

Hawera situated the junction of SH3 and SH45 is the main town and there are several small settlements along SH 3 (Eltham, Stratford) and SH 45 (Manaia, Opunake). Hawera is located 13.5 km to the south-east, Kapuni is a small settlement located approximately 2 km immediately to the northwest of the Site, Manaia on SH 45, 5 km immediately to the south of the Site, Kaponga 7.7 km to the north, and Eltham 15 km to the north-east

The Kapuni Gas Treatment Plant, the Kapuni Production Station, the Ballance Agri-nutrients plant, and the Fonterra plant are all situated within the Manaia landscape character area and influence the character of this area. There are also several gas well sites located throughout the ring plain (**Figures 3** and **5**).

The landscape assessment also identifies, maps, and describes outstanding natural features and landscapes in the district; there are none identified in the vicinity of this area of the ring plain. The assessment also identified 'Other' natural areas, features and landscapes but there are none of these in this category located within the Manaia landscape character area within the ring plain.

In the section on 'Landscape Opportunities and Threats', "energy developments, including oil and gas wells, production plants and wind farms" are recorded. However, in noting these, the landscape assessment also notes that,

> *"Many of these activities are also opportunities in so far as they provide for the reasonable use of the land for people's livelihood, lifestyle and/ or recreational activity. The major threats to landscape values are not so much the activities themselves. It is the location, nature, scale, design and management of the activities that cause potential threats to landscape values."*

In the subsequent discussion on the opportunities and threats there is acknowledgement that oil and gas and the dairy industries have the potential to introduce large scale structures that can potentially affect the character of the landscape. Wind farms would also fall into this category.

2.2 Site Description

The Site is currently run as a dairy farm. The PKW property is in several titles, comprising 133 ha. on the west side of Kokiri Road where the four proposed turbines are located and 94 ha. to the east of Kokiri Road. The Site is bounded by several other farm properties; within a 1km radius of the Site there are 17 separate properties (**Figure 6**).

Kokiri Road runs between the land parcels. Palmer Road bounds the smaller land parcel to the east and extends northwards to join Skeet Road located 1.5 km to the north. Normanby Road is situated 2.6 km to the south, Manaia Road is 1.8 km to the west. Inaha Road extends north off Normanby Road (**Figure 6**).

There are four dwellings on the PKW farm property, all of which are located east of the turbines (**Figure 6**). A milking shed, various associated outbuildings and structures, including an effluent disposal pond are situated on the main block of the property with access off Kokiri Road.

A series of farm races traverse the Site and the adjoining properties. While the Site is essentially flat, there are small undulations and depressions. Small streams which form part of the network of waterways radiating from Mt Taranaki traverse parts of the Site, Kapuni Stream to the east of Kokiri Road and Waiokura Stream to the west of the turbine location (**Figure 5**).

There are several hedgerows across the Site, some running north-south and others east-west. There is also 400m length of hedgerow immediately east of the proposed turbines. Most of the dwellings on the site have hedgerows, shelterbelts, or amenity trees around along part of their boundaries.

3.0 Project Description

The original Kapuni Green Hydrogen Project comprised installation of four 230m m tall three-bladed wind turbines aligned in a north-south direction and spaced approximately 360m apart. The hub height was at 149m with approximately 80m long rotor blades giving an overall 162m rotor diameter (**Figure 6**) and an overall 230m tip height. The original landscape and visual effects assessment completed in December 2020 was carried out based on this turbine layout and height.

However, further turbine micro-siting investigations were carried out and a slightly amended turbine configuration adopted, together with a shorter turbine tower but the length of the rotor blades unchanged (**Figure 6**). This is referred to as the '2.5D layout'. The Project now comprises installation of four, 206 m tall three-bladed wind turbines aligned in a north-south direction. This north-south linear arrangement ensures that the turbines effectively harness the dominant westerly winds. The turbines comprise a tapered cylindrical tower and a nacelle with three rotor blades. The turbines will be spaced approximately 360m apart. The hub height will sit at 125m with approximately 80m long rotor blades giving a rotor diameter of 162m and an overall 206m tip height (**Figure 6**)

The turbines will produce 24MW of power, which will be used to supply power to the nearby Ballance Plant, where following an electrolysis process it will produce 5MW of hydrogen gas, which will be used in the production of ammonia at the plant. Water required as part of the electrolysis process will be sourced from Waingongoro Stream, which Ballance already has a consent for. The four turbines will be connected to the national grid and any excess power not required at the Ballance Plant will be exported to the grid.

From the wind data that Hiringa have been collecting at the Site since 2019, the expected turbine capacity factors will be equivalent to, if not better than, some of the best onshore wind farms in the world.

Each turbine site will require a reinforced concrete foundation (22.8m wide and 3.495m deep). Overall volumes of disturbance on the Site will be in the order of 21,000-25,000 m^3 and approximately 4,000 to 5,000m^3 of excavated material from each turbine foundation, some of which will be used as backfill and the balance disposed in various places on the PKW property or disposed off-site.

The turbine towers, nacelle and rotors will be all be painted off-white / light grey matt finish (RAL 7035). In accordance with CAA regulations each turbine will have a red light at each hub. The regulations also require that each turbine has a light in the tower centre (front and back) to allow 360-degree viewing.

A 5m by 10m substation and switch rooms (i.e. footprint of 20-foot container) will be built near the base of turbine 3. An underground cable from the turbines will connect to the substation to the Ballance Plant. Option 1 involves the cable running from the turbines eastward across the PKW farm and then across Kokiri Road and then finally to connecting to the 33kV Powerco network lines running along the west side of Palmer Road. Option 2 provides a new direct 33kV line to the Ballance Kapuni Plant and requires an easement with a single landowner (**Figure 5**).

Given the Site's flat topography, only minor earthworks will be required to provide construction access to the Site. There are two access options to the Site, one is to use the existing east-west farm race into the Site and the other option is to create a new east-west track along the southern boundary of the PKW farm. From there, farm races will be used to access each turbine site. The races will be widened with an improved hardstand surface and short sections of hardstand will be constructed between some of the turbines. The existing shelterbelt and hedgerows within the farm will not be removed or altered.

Creating a new access track along the southern boundary, which is the preferred landowner option will require some additional culverts.

The dairy farming operation on the Site will continue following construction of the turbines with no restrictions on stock access or movement.

4.0 Statutory Provisions

4.1 Resource Management Act

Part 2 matters pertinent to landscape and visual aspects are sections 5, 6(a), 6(b), 7(c) and 7 (f). Section 5 sets out the purpose of the RMA, which is to promote sustainable management and section 6 sets out matters of national importance. While culverts will be installed as part of the access track across the Site to the turbine locations, the Project will not adversely affect the preservation of the natural character of the coastal environment, rivers, lakes and wetlands and their margins (s6 (a) and it is not located in an identified outstanding natural feature or landscape (s6 (b)).

Section 7 (c) concerns the maintenance and enhancement of amenity values and s7 (f) the maintenance and enhancement of the quality of the environment.

4.2 Taranaki Regional Policy Statement

The Taranaki Regional Policy Statement 2010 (RPS) sets out the wider landscape and natural character policy provisions for the region.

Chapter 10 of the RPS sets out relevant policy in relation to natural features and landscapes with NFL Policy 1 specifically relating to identified outstanding natural features and landscapes. Such areas are referred to as those features or landscapes of exceptional value or eminence or distinction at a national, regional or district level.

The RPS refers to the outstanding natural features and landscapes within South Taranaki as including Mt Taranaki and parts of the distinctive lahar mounds of the ring plain. In addition to outstanding natural features and landscapes, the RPS also identifies that recognition shall be

given to other natural features and landscapes which are not outstanding but still of value to the region for values which include natural character, amenity, heritage values, scientific and educational significance (NFL Policy 2).

NFL Policy 3 lists the criteria in relation to the protection of outstanding and where appropriate other natural features and landscapes of value and under (d) refers to

> *"the extent to which the subdivision, use or development recognises or provides for the relationship of tangata whenua and their culture and traditions with their ancestral lands, water, sites, wâhi tapu and other taonga;"*

In relation to the protection of amenity values, AMY Policy 1 refers to avoiding adverse effects of resource use and development on rural amenity values and lists the qualities and characteristics that contribute to amenity values in the Taranaki region.

As noted above, the Site is not located in an outstanding landscape but given that Mt Taranaki is an ONFL and its significance to tangata whenua and the recognition that it is given in Te Anga Putakerongo / Record of Understanding between Nga iwi o Taranaki and the Crown, the potential landscape effects of the Project on Mt Taranaki need to be considered.

4.3 South Taranaki District Plan

As noted earlier, the Project is unusual, in that unlike other wind energy projects elsewhere in New Zealand, it is not a wind farm comprising many wind turbines situated over an extensive land area, generally hill country, but instead it comprises a row of just four evenly spaced wind turbines situated on a flat site.

The Site is in the Rural Zone. The South Taranaki District Plan sets out the objectives and policies for activities in the Rural zone. As noted above, industrial type land use activities already operate in the Rural zone, including in the Manaia landscape character area identified in the South Taranaki Landscape Assessment.

Policy 2.1.9 addresses the character and amenity of the rural environment and Policy 2.1.11 provides for the establishment and operation of new non-farming activities provided they avoid, remedy, or mitigate adverse effects, including reverse sensitivity effects.

Agricultural farming is the dominant activity throughout the wider district and as a separate land use activity, wind farms fit comfortably into the rural environment. Farming can continue unaffected by the operation of a wind farm, especially given the minimal level of earthworks and other changes that are required for the wind farm to successfully operate.

The small number of turbines and their linear configuration limit the area occupied by the wind farm without any restriction around the curtilage, minimising the amount of quality farmland removed from traditional agricultural production.

The district plan provisions also recognise the significance and value of renewable energy resources and Objective 2.9.6 specifically provides for this. Potential adverse landscape and amenity effects of renewable energy development and activities are to be avoided, remedied, or mitigated (Objective 2.9.7). Where they are unable to avoided, remedied, or mitigated other measures can be employed such as offsetting and/or environmental compensation (Policies 2.9.13 and 2.9.21).

5.0 Landscape and Visual Effects

While landscape and visual effects assessment are closely related, they form separate procedures. The assessment of the potential effects on the landscape forms the first step of this process and is carried out as an effect on landscape elements and features and on landscape character. The assessment of visual effects considers how the changes to the physical landscape affect the viewing audience.

Landscape and visual effects are influenced by individual attitudes and perceptions. This landscape and visual assessment is an expert technical assessment and does not presume to represent the opinions and views of individuals

The first wind farms were developed in New Zealand over 20 years ago and are now a familiar part of the landscape in several parts of New Zealand. In comparison to many other parts of the world, New Zealand was 'late' in harnessing wind energy because of the successful and widespread development of hydroelectric power.

Most of New Zealand's wind farms are situated on elevated locations along ridges and hilltops and most comprise large groups of turbines developed by the various large energy companies. Many of New Zealand's wind farm have the highest energy yields in the world. The development of small wind farms with few turbines suits New Zealand's topography and population distribution but very few of these have been developed, unlike to what has occurred in several other countries.

The Project, while a small development in terms of the number of turbines, is different to other wind energy projects developed in New Zealand in how the energy that is produced by the turbines will be converted to hydrogen through an electrolysis process and the hydrogen used in the Ballance Plant and in fuelling heavy vehicles associated with the plant.

A considerable body of international research has been carried out in relation to public attitudes to wind farms and wind turbines, much of which has focused on wind farms with large numbers of turbines developed by commercial generators. Attitudes to wind farms vary depending on a range of factors, depending on personal philosophy, whether the person is resident in the area, a passer-by or comes to the area for recreation.

Research has shown that there is a preference for smaller, clustered groups of turbines over larger-scale installations, and that smaller numbers of large turbines are considered preferable to larger numbers of smaller turbines (Devine-Wright, 2005; Barry et al, 2009; Stephenson et al 2010). In a paper by Barry et al (2009) it noted that many communities in New Zealand have shown resistance to large wind farm developments and that small wind farms in community ownership may be attractive to gaining community support.

Several international studies have shown that negative public opinion can be high during the planning stage of a wind farm and significantly lower after the wind farm has been built (Karydis 2013).

From a 2009 survey carried out in New Zealand, there has been a wide range of factors in submissions lodged in relation to wind farm developments that affected a submitter's decision to support or oppose a wind farm proposal (Stephenson, 2009). There is also a perception that there is widespread support for renewable energy, particularly wind, but that people are not expressing it formally in their submissions (Stephenson, 2010).

Various studies have investigated the 'proximity hypothesis' that those living closest to a wind farm will have the most negative perception of it, but such attempts have proved unsuccessful (Devine-Wright, 2005; Stephenson et al 2009). The significance of landscape context is a key factor in attitudes to wind farms and that the impact of wind farms on landscape values is the main determining factor in explaining opposition or support (Stephenson, 2009).

Various other factors affect people's perception of wind farms (e.g. local impacts of construction, peoples' perception of the developer, turbine colour, tower design) (Devine-Wright, 2005; Stephenson, 2009).

Surveys of attitudes to wind farms in New Zealand and overseas suggests that communities hold a range of views, from people who are strongly polarised for or against wind farms, to those who hold more neutral positions. Attitudes may vary depending on whether one is a casual passer-by or a resident in the vicinity of a wind farm, and the proximity of a residence to such a wind farm.

Turbine manufacturers have directed a lot of attention into turbine design, not just to improve turbine efficiency and output but also in relation to turbine aesthetics (i.e. tapered towers, shape of the nacelle, blade connections to the hub, all components painted the same colour to provide uniformity, etc) (Gipe, 2002).

5.1 Assessing Landscape Effects

Assessing landscape effects requires an understanding of the landscape resource and the magnitude of change, which results from a proposed activity to determine the overall level of landscape effects. The ability of an area of landscape to absorb change takes account of both the attributes of the receiving environment and the characteristics of the proposed development.

The magnitude of landscape change judges the amount of change that is likely to occur to areas of landscape, landscape features, or key landscape attributes. In undertaking this aspect of an assessment, the size and scale of the change needs to be considered and the duration of the change, including whether the change is reversible.

Clarity around the factors that have been considered is important, including consideration of any benefits which result from the proposed development; **Table 1** below outlines this process.

Table 1: Consideration of Landscape Effects

Contributing Factors		Higher	Lower
Landscape (sensitivity)	**Ability to absorb change**	The landscape context has limited existing landscape detractors which make it highly vulnerable to the type of change resulting from the proposed development.	The landscape context has many detractors and can easily accommodate the proposed development without undue consequences to landscape character.
	The value of the landscape	The landscape includes important biophysical,	The landscape lacks any important biophysical,

		sensory, and shared and recognised attributes. The landscape requires protection as a matter of national importance (ONF/L).	sensory, or shared and recognised attributes. The landscape is of low or local importance.
Magnitude of Change	**Size or scale**	Total loss or addition of key features or elements. Major changes in the key characteristics of the landscape, including significant aesthetic or perceptual elements.	Most key features or elements are retained. Key characteristics of the landscape remain intact with limited aesthetic or perceptual change apparent.
	Geographical extent	Wider landscape scale.	Site scale, immediate setting.
	Duration and reversibility	Permanent. Long term (over 10 years).	Reversible. Short Term (0-5 years).

5.2 Assessing Visual Effects

To assess the visual effects of a proposed development on a landscape, a visual baseline must first be defined. The visual 'baseline' forms a technical exercise which identifies the area where the development may be visible, the potential viewing audience, and the key representative public and private viewpoints from which visual effects are assessed.

The viewing audience comprises the individuals or groups of people occupying or using the properties, roads, footpaths, and public open spaces that lie within the visual envelope or 'zone of theoretical visibility (ZTV)' of the Site and proposal. The sensitivity of the viewing audience is assessed in terms of assessing the likely activity and response of the viewing audience to change and understanding the value attached to views.

The term 'Zone of Theoretical Visibility' (ZTV) is used to describe the area over which a development can theoretically be seen and is based on a Digital Terrain Model (DTM) and overlaid on an appropriate map base. It is also known as a Zone of Visual Influence (ZVI), Visual Envelope Map (VEM) or Viewshed Map. However, the term ZTV is preferred for its emphasis on two key factors:

- Visibility maps represent where a development may be seen theoretically – that is, it may not actually be visible due to localised screening of trees and other vegetation and structures, which are not represented by the DTM; and
- The maps indicate potential visibility only - that is, the areas within which there may or will be a line of sight. They do not convey the nature or significance of visual impacts, for example whether visibility will result in positive or negative effects and whether these will be significant or not.

While ZTV analyses are very useful to broadly define the theoretical extent of a viewshed, they need to be interpreted with caution and considered as an indicative tool to identify features visible from any given point. It is important to understand the parameters and data used to

generate a ZTV. ZTVs are calculated by computer, using any one of several software packages and based upon a DTM that represents topography. The resulting ZTV is usually produced as an overlay upon a base map, representing theoretical visibility within a defined study area.

As the ZTV mapping is based entirely on 'bare ground' topographic data, it does not consider the screening effects of intervening vegetation or structures in the landscape, unless LIDAR based vegetation data is used to generate the DTM. The level of reliability of the contour information will influence the accuracy of the mapping. ZTV mapping does, however, consider factors relating to the curvature of the earth and light refraction. While ZTV is a useful assessment tool, it is important to recognise it has limitations depending on the level of information and detail that has been used to generate it.

The assessment of visual effects also considers the potential magnitude of change which will result from views of a proposed development. This takes account of the size or scale of the effect, the geographical extent of views and the duration of visual change, which may distinguish between temporary (often associated with construction) and permanent effects where relevant. When determining the overall level of visual effect, the nature of the viewing audience is considered together with the magnitude of change resulting from the proposed development. **Table 2** outlines this process.

Table 2: Consideration of Visual Effects

Contributing Factors		Higher	Lower	Examples
The Viewing Audience (sensitivity)	**Ability to absorb change**	Views from dwellings and recreation areas where attention is typically focused on the landscape.	Views from places of employment and other places where the focus is typically incidental to its landscape context. Views from transport corridors.	Dwellings, places of work, transport corridors, public tracks
	Value attached to views	Viewpoint is recognised by the community such as an important view shaft, identification on tourist maps or in art and literature. High visitor numbers.	Viewpoint is not typically recognised or valued by the community. Infrequent visitor numbers.	Acknowledged viewshafts, Lookouts
Magnitude of Change	**Size or scale**	Loss or addition of key features in the view. High degree of contrast with existing landscape elements (i.e. in terms of form scale, mass, line, height, colour, and texture). Full view of the proposed development.	Most key features of views retained. Low degree of contrast with existing landscape elements (i.e. in terms of form scale, mass, line, height, colour, and texture. Glimpse / no view of the proposed development	Higher contrast/ Lower contrast. Open views, Partial views, Glimpse views (or filtered); No views (or obscured)
	Geographical extent	Front on views. Near distance views, change visible across a wide area.	Oblique views. Long distance views. Small portion of change visible.	Front or Oblique views. Near distant, Middle distant and Long distant views

Contributing Factors		Higher	Lower	Examples
	Duration and reversibility	Permanent. Long term (over 15 years).	Transient / temporary. Short Term (0-5 years).	Permanent (fixed), Transitory (moving)

5.3 Shadow Flicker

Shadow flicker is caused by the rotation of turbine blades, which cast intermittent shadows that appear to 'flicker' as the sun passes behind the turbine blades. This is most apparent when the shadow passes across most typically a window of a dwelling. The duration of this effect can be calculated using the geometry of the turbine and the relative locations of the turbine and the receptor (i.e. through window or similar). The likelihood of the effect occurring, and the duration and intensity of such an effect depends upon several factors:

- the distance of the dwelling from the turbine.
- the orientation of the dwelling relative to the turbine.
- the height and rotor diameter of the turbine.
- the time of day and time of year.
- the prevailing wind direction.
- the frequency of sunshine hours (i.e. cloud free days).
- the nature of the intervening terrain between dwelling and turbine.
- the impact of any intervening vegetation and/or structures.

International guidelines state that acceptable levels of exposure are deemed to be either:

- Acceptable Level = 30 hours per year (modelled)
- Acceptable Level = 30 minutes per day - actual (i.e. measured).

The attached Graphic Supplement in **Appendix 2** sets out further details on the shadow flicker assessment, including the assessment methodology and used to determine shadow flicker and maps and diagrams to describe and illustrate the outcomes for this Project.

The results of the shadow flicker calculations are mathematically derived and are therefore theoretical worse case scenarios. The calculations also include the following assumptions:

i) weather conditions are such that shadows are always cast (i.e. sunny at all times of the day and throughout the year).

ii) the rotors are facing directly towards the 'receptor' at all times, meaning they are at their "worse case" orientation (i.e. at their maximum size and sweep).

In practice, the shadow flicker effects would occur on considerably fewer days than this.

Shadow flicker has been considered in terms of visual effects for those properties and dwellings within the assessment area (**Figure 14**).

5.4 Nature of Effects

In combination with assessing the level of effects, the landscape and visual effects assessment also considers the nature of effects in terms of whether this will be positive (beneficial) or negative (adverse) in the context within which it occurs. Neutral effects can also occur where landscape or visual change is benign.

A change in a landscape does not, of itself, necessarily constitute an adverse landscape or visual effect. Landscape is dynamic and is constantly changing over time in both subtle and more dramatic transformational ways; these changes are both natural and human induced. What is important in managing landscape change is that adverse effects are avoided or sufficiently mitigated to ameliorate the effects of the change in land use. The aim is to provide a high amenity environment through appropriate design outcomes. **Table 3** below outlines this.

Table 3: Nature of Effects

Nature of effect	Use and Definition
Adverse (negative):	The activity would be out of scale with the landscape or at odds with the local pattern and landform which results in a reduction in landscape and / or visual amenity values
Neutral (benign):	The activity would be consistent with (or blend in with) the scale, landform and pattern of the landscape maintaining existing landscape and / or visual amenity values
Beneficial (positive):	The activity would enhance the landscape and / or visual amenity through removal or restoration of existing degraded landscape activities and / or addition of positive elements or features

5.5 Assessing the Overall Level of Effects

The overall level of effects is based on a 7-point rating scale, which is based on the NZILA Best Practice note as set out in **Table 4** below.

Table 4: Determining the overall level of landscape and visual effects

Effect Rating	Use and Definition
Very High:	Total loss of key elements / features / characteristics, i.e. amounts to a complete change of landscape character in views.
High:	Major modification or loss of most key elements / features / characteristics, i.e. little of the pre-development landscape character remains and a major change in views. *Concise Oxford English Dictionary Definition* *High: adjective- Great in amount, value, size, or intensity.*

Effect Rating	Use and Definition
Moderate- High:	Modifications of several key elements / features / characteristics of the baseline, i.e. the pre-development landscape character remains evident but materially changed and prominent in views.
Moderate:	Partial loss of or modification to key elements / features / characteristics of the baseline, i.e. new elements may be prominent in views but not necessarily uncharacteristic within the receiving landscape. *Concise Oxford English Dictionary Definition* *Moderate: adjective- average in amount, intensity, quality, or degree*
Moderate - Low:	Minor loss of or modification to one or more key elements / features / characteristics, i.e. new elements are not prominent within views or uncharacteristic within the receiving landscape.
Low:	Little material loss of or modification to key elements / features / characteristics. i.e. modification or change is not uncharacteristic or prominent within views and absorbed within the receiving landscape. *Concise Oxford English Dictionary Definition* *Low: adjective- **1.** Below average in amount, extent, or intensity.*
Very Low:	Negligible loss of or modification to key elements/ features/ characteristics of the baseline, i.e. approximating a 'no change' situation and a negligible change in views.

6.0 Associative Landscape Values

Associative landscape values are those aspects that are recognised by tangata whenua or have historic and heritage associations or associations shared and widely recognised by the local or wider community. These aspects are considered when carrying out an area, district, or regional-wide landscape assessment. Associative values were considered as part of identifying and describing the outstanding natural features and landscapes (ONFLs) in the 2014 South Taranaki Landscape Assessment.

While the Site or adjoining area is not an ONFL, the 2014 assessment identified Mt Taranaki as an ONFL. Approximately, the southern half of the mountain sits in South Taranaki. The assessment notes that Mt Taranaki, *"forms an exceptional symmetrical volcanic bush-clad form, which forms an iconic landscape recognised throughout the wider Taranaki region."* It goes on to say that, "*The entirety of Mt Taranaki is managed as a national park and includes numerous walking tracks and huts associated with recreation opportunities. The mountain, particularly the summit, is very significant to local Maori including the source of mythology such as Taranaki's retreat from the inland 'rival' volcano of Tongariro and his former wife Ruapehu. The Māori word*

tara means mountain peak, and naki is thought to come from ngaki, meaning "shining", a reference to the snow-clad winter nature of the upper slopes."

It also notes in relation to the mapped extent of the ONFL, "*Within South Taranaki, the extent of outstanding natural landscape associated with Mount Taranaki has been identified following the historically significant line which delineates Mount Taranaki along a 9.6km (6 mile) radius around its summit, all of which now falls within Egmont National Park."*

In terms of its associative values, all three attributes (i.e. tangata whenua values, historic and heritage values and shared and recognised values) were assessed as being very high. In describing each aspect, the assessment notes the following:

> ***"Tangata Whenua*** *The mountain is very significant to local iwi and forms a potent mythological form*
>
> *Contains numerous wahi tapu sites, burial sites and pa sites.*
>
> ***Historic Associations****: Captain Cook first sited and described the top of the peaked mountain as the "noblest hill I have ever seen" in 1770 and named it Mount Egmont in the honour of the Earl of Egmont.*
>
> ***Shared and Recognised*** *As the subject of innumerable paintings, photographs and postcards and rendered images to distinguish their businesses, products, souvenirs, sports teams, clubs and other interests the mountain is the district to many people.*

As part of Waitangi Treaty Settlement, Te Anga Putakerongo / Record of Understanding between Nga iwi o Taranaki and the Crown provides a comprehensive outline of the importance of the maunga stating that:

> *"The maunga are pou that form a connection between the physical and the social elements of our lived experience. For Iwi of Taranaki, they have been ever present and remain personified ancestors, a site of shared history, a physical resource, and the citadel of a unique ecosystem. Wider Taranaki society continues to look upon these maunga as key reference points for the region, shaping an immediate sense of place and social association with mutual identity. Their presence pervades our scenery, projecting mystery, adventure and beauty, capturing our attention and our imagination in how humanity can be closely bound to a landscape.*
>
> *The maunga are pou that transcend our perception of time, location, culture and spirit. They help configure how whakapapa, environment, the past and future are understood, engaged with and transmitted to future generations. This is a framework of tangible and intangible resources available to be accessed and applied in our daily lives, and open to be interpreted by various social groupings, Maori and non-Maori, in terms of spiritual, cultural and ethical values."*

The redress arrangements between Nga iwi o Taranaki and the Crown recognise Nga Maunga as a living being, which *"encompasses all of the physical and metaphysical elements of Nga Maunga from the peaks through to all of the surrounding environs."*

7.0 Assessment of Landscape and Visual Effects

While wind turbines are now familiar elements in many landscapes in several parts of New Zealand but are a new activity in South Taranaki; this is changing with the recently completed construction of the Waipipi Wind Farm. The four wind turbines proposed for the Project are larger when compared to other wind energy projects in New Zealand. Wind turbines of the height and scale proposed for the Project are a different order to other elements in the South Taranaki landscape (e.g. 40m tall towers of the Kapuni Gas Plant or the 160m height of the turbines in the Waipipi Wind Farm). Wind turbines are scalable given the relationship between the height of the tower and the rotor blades but when there is a lack of vertical references, it is relatively difficult to perceive heights or differences in turbine heights unless turbines of different sizes are seen side-by-side.

The horizontal scale of the receiving landscape is an important factor in terms of determining the level of visual effects as the degree of prominence or visual effect is not a linear function of height.

Turbine heights have steadily increased in the wind farms built in New Zealand over the past 20 years; blade lengths have also increased, all of which adds to increased efficiency and energy output (**Table 5** below).

Table 5: Evolution of Wind Turbine Development in New Zealand Wind Farms

Wind Farm	Year Built	No. Turbines	Tip Height (m)	Tower Height (m)	Blade Length (m)	Turbine Capacity
Hau Nui	1996	15	66	46	20	0.6 MW
Tararua (Stage1)	1999	48	73.5	50	23.5	0.66MW
Te Apiti	2004	55	110	70	35	1.65MW
West Wind	2009	62	127	67	40	2.3MW
Te Uku	2011	28	129	80	49	2.3MW
Turitea	2019	60	125	69	56	3.8MW
Waipipi	2020	31	160	95	65	4.3MW

As turbine heights, blade design and lengths have increased with improved efficiencies, the turbines in older existing wind farms will be ‘re-powered’ where fewer larger turbines in a less dense, reconfiguration will replace the original turbines.

The greater spacing between turbines can achieve a better visually balanced layout and overcome the issue of turbine ‘stacking’, where one or more turbines are stacked on top of each other when viewed from certain viewpoints. Turbine stacking occurs particularly within wind farms developed in broken hill country and is a much lesser issue on a plateau or plain site.

7.1 Landscape Effects

In New Zealand, wind farms are generally sited on hill country to capture the full effects of the wind and consequently extensive earthworks and civil engineering are required to construct them and to move turbine components on to a site.

Given the flat topography, this Project will not physically change the landform across the Site. The extent of earthworks to construct the wind turbines or to provide access to the Site will be minimal requiring excavation for turbine foundations and crane pads, undergrounding of the cable between the turbines and widening of the farm races to enable construction. The spoil excavated for the turbine foundations will be either used on site or disposed off-site.

Similarly, vegetation growing on the Site or in the environs will also not be affected apart from removal of a small section of hedgerow on Kokiri Road to enable access for the turbine components. The existing boxthorn hedgerows and shelterbelts within the site will remain intact.

There will however be effects on landscape character. The height, scale and form of the turbines mean that they will be prominent elements in this essentially flat and gently undulating landscape. However, the four-turbine wind farm will have a small physical footprint and will not adversely affect the existing land use activities; stock grazing and dairy farming will continue unhindered.

The project will be in a modified rural environment. The ring plain currently accommodates several non-farming, industrial type activities with the Kapuni Gas Plant, the Kapuni Production Station, the Ballance Agri-Nutrients Plant, the Fonterra plant and the 8 gas well sites, all of which are well established and contribute to the overall landscape character of the immediate area and also in relation to the broader ring plain landscape. While the fenced enclosures around the gas wells occupy relatively discrete locations, the Kapuni Gas Plant, the Ballance Plant and the Fonterra plant all have large footprints and the 40m tall towers at the Kapuni Gas Plant with its constant steam plume commands attention from considerable distance.

The pine and macrocarpa shelterbelts, together with the extensive boxthorn hedgerows are distinctive and familiar features across the ring plain and significantly contribute to its character. and these will be dwarfed by the wind turbines and affect the overall character. Hedgerows line many of the roads and their height and their the proximity to the carriageway screen views to the surrounding countryside.

While the Project will have an adverse effect on landscape character when the turbines are considered as a small cluster of individual elements, when they are considered in broader context of the simple ‘geometry’ of the ring plain and the wider South Taranaki district, the effects on landscape character are attenuated.

The actual location of the four turbines on the PKW site has advantages given its separation from roads and dwellings but despite this, the presence of the turbines will adversely affect landscape character over a wider area. The four turbines will add another prominent element to the landscape of the ring plain similar to the way the Kapuni Gas Plant, the Ballance Plant, and the gas well sites have done previously. These earlier developments are part of the existing environment and contribute to the area’s existing landscape character and the turbines will further contribute to this. Just as the Kapuni Gas Plant, especially the towers, has become a landmark and an orientation point on the ring plain, the turbines of the Kapuni Green Hydrogen Project would also become a landmark.

Nga Iwi o Taranaki view of Nga Maunga as a living being, which *“encompasses all of the physical and metaphysical elements of Nga Maunga from the peaks through to all of the*

surrounding environs". Based on this understanding, the activities that occur on the ring plain are relevant and will potentially affect iwi cultural values and other associative values.

While the four turbines occupy only a small physical area, they are new elements on the ring plain and their height form and dynamic movement will affect landscape character and may also potentially affect the cultural and spiritual connections between the maunga and the surrounding landscape. The presence of the Waipipi Wind Farm in the district, which has recently been constructed along a section of the South Taranaki coast, provides a level of familiarity with wind turbines and this will increase.

Table 6 below describes the contributing factors and the level and nature of the effects of the Project in the short / medium term and long term.

Table 6: Landscape effects

	Contributing Factors	Level of Effect	Nature of Effect
Landform Effects	• A flat site that that requires minimal landform alteration (i.e. excavation for turbine foundations and construction of a site access track). • Site access off Kokiri Road will use an existing farm race near the Site's southern boundary • Minor earthworks only to widen races being used for construction access to enable delivery of turbine components and construction traffic	Very Low	Neutral
Vegetation Effects	• A short length of hedgerow will need to be removed on the Site to enable construction access, but no other woody vegetation will be removed or affected on the Site or on adjoining areas.	Very Low	Neutral
Landscape Character Effects	• Turbines will be new elements on the ring plain landscape • For Nga Iwi o Taranaki, the activities on the ring plain are linked physically and metaphysically to the maunga • Height, scale, form, and dynamic movement of the turbines will affect the character of ring plain landscape, albeit a small part of it • With only four turbines, the spatial extent is limited • The wind turbines will not adversely affect the continuation of the existing dairy farm with stock able to access to the base of the turbines.	Moderate-High	Adverse

7.2 Visual Effects

The four turbines will have a wide theoretical visibility because of the low relief of the ring plain and the wider South Taranaki landscape. At 206m tip height (i.e. when the blade is standing vertically) there are no other elements of that height or scale on the ring plain. In addition, the form of the turbines and their dynamic movement also contribute to their visibility.

In hilly terrain where most of New Zealand's wind farms are situated, the level of visibility is governed largely by topography. In these situations, turbines are not seen as standard

individual elements but instead as a collection of parts of turbines and often 'stacked' on top of one another. In a relatively flat landscape, the level of visibility is governed by vegetation such as shelterbelts, woodlots, and tall hedgerows.

As part of understanding the potential level of visibility, a ZTV (Zone of Theoretical Visibility) map was prepared. The ZTV prepared has been based on contour information only and does not consider the location and height of vegetation or structures. It provides a starting point and a useful tool to guide where field investigations should be undertaken. ZTVs need to be supported with ground -truthing and other analysis. Unsurprisingly, the computer-generated ZTV map (**Figure 8A**) shows the Project's large, potential visual catchment. The ZTV map does not mean that from every location in the shaded area that turbines will be visible given that from various locations, shelterbelts and other trees, buildings and structures may obscure the turbines totally or in part.

The prominence of Mt Taranaki as a dramatic and recognisable backdrop to the ring plain provides context in terms of scale, and how the Project is judged in terms of the level of visibility and visual effects.

Viewing Audience

The Project has a large potential visual catchment and the viewing audience is varied, comprising residents on the surrounding farms and rural properties and those residing in the various small settlements and towns around the district. There are also those people who work in the various industries and workplaces in the settlements and in the countryside.

There is also the transient viewing audience; people who are driving, cycling, or walking to and from work, on route to shopping or errands, participating in recreational activities, visiting friends, or driving for pleasure. Within this group there are the views from 'special' places to consider such as from marae, parks, and other recreational areas (e.g. lookouts or viewing areas, etc).

Following a desk-top analysis, together with inputs from both Hiringa Energy and planning and engineering consultants, BTW, a range of key potential viewpoints from both public locations and adjoining private properties were identified for further investigation. This 'long list' of viewpoints was subsequently refined following field work and ground-truthing; several additional viewpoints were also identified and visited.

The field work and site visits enabled local and contextual analysis to be carried out and photographs taken from the viewpoints identified and from other potential viewpoints identified during field work. The aim of this work was to identify a range of representative viewpoints from both 'public' locations and from private properties at a range of distances and directions and to prepare visual simulations as part of the analysis of visual effects.

The 2011 Board of Inquiry decision for the Turitea Wind Farm in the Manawatu addressed in some detail, the factors that affect visual effects. The decision observes that while distance alone is not a satisfactory means of determining the level of visual effect, it is the factor that makes the greatest contribution to effects. [3] The decision also concludes that the number of viewers is not a determinant of visual effects.[4]

[3] Para 65, pages 13-18: *Chapter 13: Landscape and Visual Amenity Effects, Turitea Wind Farm,* Board of Inquiry Decision, 2011

[4] Para 82, ibid

The presence and distinctive shape of Mt Taranaki is all pervasive, and views of the volcano are highly valued by Taranaki locals and visitors alike; it is the defining element of the Taranaki landscape. Views of the mountain vary depending on the location from within the region and from locations further afield. Views are ever-changing, within minutes sometimes, with cloud often shrouding the upper sections of the mountain or its entirety.

Also, as noted in section 6.0, for Nga Iwi o Taranaki, Nga Taranaki has enormous significance that extends beyond the maunga out to the surrounding environs, that transcends landscape and visual aspects.

Shadow Flicker

Shadow flicker has been considered in relation to assessment of visual effects on those properties located within the zone of influence (ZoI); refer section in Graphic Supplement, **Appendix 2,** including **Figure 14.** The shadow flicker assessment has been carried out in relation to the revised Project with the e. 2.5D layout and 206m turbines.

As noted in section 5.3, the results of the shadow flicker calculations are mathematically derived and are therefore theoretical worse case scenarios. The calculations also include the following assumptions:

- Weather conditions are such that shadows are always cast (i.e. sunny at all times of the day and throughout the year.
- The rotors are facing directly towards the receptor at all times, meaning they are at their "worse case" orientation (i.e. at their maximum size and sweep).

In practice, the shadow flicker effects would occur on considerably fewer days than this.

According to NIWA stats, New Plymouth has a 30-year average of 2197 sunshine hours per year, which is one of the highest in New Zealand.[5]

Potential shadow flicker effects vary in relation to each of the eight residential properties where shadow flicker analysis has been prepared. As illustrated on the shadow flicker diagrams for each of these particular properties, potential shadow flicker events occur late in the day (i.e. from 4.00pm) apart from at one property (Smith and Sutton in Manaia Road) where potential shadow flicker would occur early in the morning.

Building orientation and layout, position of windows, planting around dwelling and location of adjoining structures all need to be considered when assessing shadow flicker diagrams, which are based on a series of parameters modelled in WindFarm software. For each of the eight dwellings assessed, an aerial plan, together with a ground level view of the dwelling are included to help illustrate each situation.

Viewpoints and Visual Simulations

To assist with the visual analysis and assessment of visual effects, visual simulations from fifteen representative viewpoints were prepared (nine public viewpoints and six private viewpoints). These viewpoints are from various distances and orientations from recognised public locations and from immediately outside or close to dwellings on private properties.

[5] NIWA_sunshine_hours.xlsx

Assessments from three marae were also completed and visual simulations prepared; these marae are situated between approximately 2.4km and 6.6km from the turbines. In addition, four other marae were subsequently identified but given the distances of these from the turbines (i.e. from 7km to 17km) site visits were not made to these marae and visual simulations were not prepared. Instead, wire frame models were produced, which provide an indication of the scale of the turbines from these marae and the relationship of the turbines to Mt Taranaki.

Visual simulations were specifically selected from locations with clear foregrounds. For many of the viewpoints from private dwellings, this meant selecting a location outside the curtilage of the area around dwellings given that many dwellings are surrounded or partly so by shelterbelts, hedges, and amenity trees.

Many of the visual simulation viewpoints are at a similar elevation to the turbines, which is also unusual when compared with other situations where wind farms are in hill country. This is an important factor in relation to turbine dominance. Given their height, the turbines are often prominent elements in the flat ring plain landscape, but they are not as dominant when turbines are sited along ridges and hilltops, which tends to accentuate their height and scale and often their dominance. Sometimes dominance may also occur when a turbine(s) appears in the foreground of a view.

The visual effects of the turbines vary considerably depending on orientation, backdrop, and context. Mt Taranaki to the north of the Site, is a frequent backdrop for sites located to the south of the wind turbine site. The visual simulations include those from several viewpoints south of the Site looking north towards Mt Taranaki.

Viewpoints provide a selection of representative views but of course, the composition of the view and the visibility of turbines varies as the viewer moves around. This factor is particularly relevant to private properties and dwellings. Viewpoints from dwellings or locations close by with open views towards the Project were selected to provide a practical focus to assessing visual effects from those properties.

For each viewpoint, three visual simulation images are provided on two sheets.

On the first sheet there are two images, both panoramas, with a 90-degree field of view (FoV), which shows the turbines in context of the wider landscape:

- Top image (A) shows the turbine rotors facing towards the viewpoint; and
- The bottom image (B) shows the rotors facing towards the dominant westerly wind direction' given that approximately 85% of the wind is from the westerly quarter

On the second sheet there is a single frame from the same viewpoint with a 40-degree FoV. This image is included because when these images are printed at A3 scale and held at the recommended reading distance of 500mm, they allow the viewer to stand at the viewpoint and visualise the wind turbines at their correct size and location. Also included on each of the viewpoints from private properties is a 'key map' in the bottom right of the image to illustrate the viewpoint location. The key map shows the extent of vegetation and outbuildings around each of the dwellings in relation to the points noted above.

Figure 8B helps to explain effects of distance and the proportion of the view that the four turbines occupy at different distances. As the distance from the turbines increases, the proportion of the view occupied by the turbines decreases as does their scale. The simple 'geometry' and broad horizontal scale of the of landform also contributes to attenuating the level of effects on the landscape.

Figure 8C illustrates how tall vegetation when its located close to the viewer can provide effective screening of turbines.

Figures 9 and **10** provide further explanation, together with other information about the visual simulation process.

Viewpoints from Public Locations (Appendix 1)

Figure 11 shows the locations of the representative viewpoints from public locations and **Table 7** below summarises the details of each. The assessments provide the level of visual effect based on the 7-point scale and take account such factors as distance, orientation, relationship to Mt Taranaki, extent of screening, and the other landscape elements and features in the landscape.

The visual simulations from the viewpoints in **Figure 11** and in **Table 7** below illustrate the original turbine layout and height. Visual simulations for the revised 2.5D layout have not been prepared. The very small change in the turbine layout would be indiscernible and the visual effects of reduced turbine height would barely register at the distances involved (i.e. ranging from 1.9km to 13.5km).

Table 7: Public Viewpoints

Viewpoint Number	Location	Type	Distance from closest turbine
P1-A	Upper Glenn Road	Panoramas (Facing and Dominant Wind)	5.4 km
P1-B	Upper Glenn Road	Single Frame (Facing)	5.4 km
P2-A	Intersection of Normanby Road and Manaia Road	Panoramas (Facing and Dominant Wind)	3.1km
P2-B	Intersection of Normanby Road and Manaia Road	Single Frame (Facing)	3.1km
P3-A	Junction of Normanby Road and Kokiri Road	Panoramas (Facing and Dominant Wind)	2.7km
P3-B	Junction of Normanby Road and Kokiri Road	Single Frame (Facing)	2.7km
P4-A	Intersection of Normanby Road and Tito Road (Okaiawa)	Panoramas (Facing and Dominant Wind)	4.6km
P4-B	Intersection of Normanby Road and Tito Road (Okaiawa)	Single Frame (Facing)	4.6km
P5-A	Manaia Sports Park, Manaia	Panoramas (Facing and Dominant Wind)	4.6km
P5-B	Manaia Sports Park, Manaia	Single Frame (Facing)	4.6km
P6-A	TSB Sports Hub, Hawera	Panoramas (Facing and Dominant Wind)	13.5km
P6-B	TSB Sports Hub, Hawera	Single Frame (Facing)	13.5km
P7-A	Hawera Aerodrome, SH3	Panoramas (Facing and Dominant Wind)	11.7 km
P7-B	Hawera Aerodrome, SH3	Single Frame (Facing)	11.7 km

Viewpoint Number	Location	Type	Distance from closest turbine
P8-A	Intersection of Manaia Road and Skeet Road	Panoramas (Facing and Dominant Wind)	1.9km
P8-B	Intersection of Manaia Road and Skeet Road	Single Frame (Facing)	1.9km
P9-A	Eltham Road (East of Kaponga)	Panoramas (Facing and Dominant Wind	8.0km
P9-B	Eltham Road (East of Kaponga)	Single Frame (Facing)	8.0km

Each viewpoint is briefly described and assessed in the commentaries below.

Viewpoint P1: Upper Glenn Road (5.4 km to the closest turbine)

Upper Glenn Road is located west of the Project and the wind turbines 5.4 km away are seen in the context of open pasture hedgerows and shelterbelts typical of the South Taranaki dairy farming landscape. The turbines, while visible at this distance in this flat, open landscape, are minor elements.

The visual effects are **low.**

Viewpoint P2: Intersection of Normanby & Manaia Roads (3.1km to closest turbine)

Located east of viewpoint P1, this viewpoint while approximately 2 km closer is similar in that the turbines are visible and a little more prominent but the level of visual effects similar. From here the turbines are well separated from Mt Taranaki and the row of turbines comprise a small proportion of the wider landscape.

There is little difference in terms of visibility or visual effects whether the turbine rotors are facing the dominant wind direction or face on to the viewpoint.

The visual effects are **low.**

Viewpoint P3: Junction of Normanby & Kokiri Roads (2.7km to closest turbine)

From this location and viewing angle, turbines sit in the mid-ground of the view with Mt Taranaki forming a backdrop. Like most rural roads in South Taranaki barberry hedgerows enclose both sides of both Normanby and Kokiri Roads along most of their lengths and thereby restrict views to the surrounding countryside. However, in places there are some short gaps in the hedgerows such as at the junction of Normanby and Kokiri Roads, enabling wider views.

The elements of this rural landscape are typical to those found throughout South Taranaki with shelterbelts and hedgerows, power poles and occasional small groups of farm buildings and dwellings. Given their height and form, the turbines are prominent elements in this essentially flat and very gently rolling rural landscape. The shelterbelts and hedgerows close to the turbines are dwarfed by the height of the turbines. Mt Taranaki has a commanding presence in this landscape and while the turbines interrupt this view, they occupy a small portion of the broader view.

From this viewpoint there is a noticeable difference of when the turbine rotors are facing the dominant westerly wind direction and when the rotors are face on.

Considered in isolation, the turbines have a high level of visual effects given their position in relation to the mountain beyond; the height and form of the turbines and their dynamic nature

provide a contrast and counterpoint to shape and form of Mt Taranaki. The visual presence of the turbines will be attenuated when the rotors are facing the dominant wind direction where the rotors will be viewed on 'edge'.

The visual effects are **high**.

Viewpoint P4: Intersection of Normanby and Tito Roads, Okaiawa (4.6km to closest turbine)

Okaiawa is a small settlement around the junction of Normanby and Ahipaipa Roads south-east of the Site. Buildings clustered around the intersection restrict views beyond the road corridor but there are locations where hedgerows are absent and open views across the countryside and towards the Site are possible. While there are groups of tall amenity trees, shelterbelts and hedgerows clearly defining paddock boundaries, houses, farm buildings and power poles are also distinctive landscape elements in the outlook from this area. These provide the landscape context from this viewpoint and act as counterpoints to the turbines.

At 4.6km distant, the turbines while visible, form a distinctive group that sit comfortably in the wider landscape; they are visually separated from the sweeping form of Mt Taranaki. There is little difference in terms of visibility or visual effects of the turbines whether the rotors are facing the dominant wind direction or face on to the viewpoint.

The visual effects are **low.**

Viewpoint: P5 Manaia Sports Park, Manaia (4.6km from closest turbine)

The Manaia Sports Park is located on Bennett Drive at the north-eastern edge of the town. There are open views of Mt Taranaki from much of the sports park. The turbines, while visible, are part of a collection of natural and built landscape elements and are well separated from the mountain. Tall shelterbelts, groups of amenity trees, together with familiar park elements (floodlights, goal posts, grandstand and buildings) comprise a diverse panorama and at 4.6km, the four turbines form a group of elements that are visible but are not prominent and do not dominate the outlook from this location. The turbines are a small cluster located at the end of a shelterbelt

From this angle, the level of visibility and visual effects of the turbines is affected by the direction the turbine rotors are facing with a noticeable difference when the rotors are facing the dominant westerly wind direction.

The visual effects are **low**.

Viewpoint P6: TSB Sports Hub, Hawera (13.5km to closest turbine)

The TSB Sports Hub in Camberwell Road Hawera is home to a range of sports and recreational facilities. It is located within the urban area of the town and comprises a large sports pavilion, grandstand, a range of other buildings adjoining open playing fields enclosed by a tall shelterbelt along Camberwell Road.

The viewpoint is from the upper level of the grandstand. From this elevated position there are views beyond the shelterbelt to the residential areas and beyond. Mt Taranaki provides an imposing and distinctive form from within environs of the sports hub, especially from the grandstand. While the sports hub buildings, floodlights and other elements provide the immediate landscape context, the turbines are also viewed in the context of the houses and other elements of the adjoining residential area; they are not part of the viewshaft from the grandstand to the mountain.

The visual effects are **low**.

Viewpoint P7: Hawera Aerodrome, SH3 (11.7 km to closest turbine)

The aerodrome is located on eastern side of SH3; the viewpoint selected is adjacent to the Hawera Aero Club building, which is at the end of the access road off SH3. This location provides an open view across the runway and environs to the turbines to the north-west and as like most views from the south looking north, Mt Taranaki dominates the view.

Beyond the runway and environs there are shelterbelts and belts of other tall trees. The turbine rotors are visible just above these belts of trees and are visually absorbed as part of this broader landscape context. At this distance and given that more than just the tips of the rotors are visible, the 'windscreen wiper' [6] effect is not an issue here.

The visual effects are **low.**

Viewpoint P8: Intersection of Manaia Rd & Skeet Rd (1.9km to closest turbine)

Viewed from the corner of the carpark of the Kapuni War Memorial Hall at the intersection of Manaia and Skeet Roads, there is wide panorama looking south-east; Mt Taranaki is located behind the viewer. The turbines are prominent elements occupying the centre of the view and their height, form, and movement contrast against the open, flat horizontal landscape.

From this and similar locations north of the Site, turbines will not be viewed against a landform backdrop but instead against an ever-changing sky and cloud pattern. On a dull day like the viewpoint photograph, the white painted turbines contrast against the darker sky whereas on a bright but cloudy day, the overall form and profile of the turbines will be quite different with the turbines quite subdued. Also, from this angle, the level of visibility of the turbines is affected slightly by the direction the turbine rotors are facing with a noticeable difference when the rotors are facing the dominant westerly wind direction.

The visual effects are **moderate**.

Viewpoint P9: Eltham Road, east of Kaponga (8.0km from closest turbine)

Eltham Road runs east-west between SH3 (Eltham) to SH45 (Opunake), north of the Site. At 8.0km distant the turbines comprise a small group of elements within a wide and expansive rural landscape.

Farm buildings, power poles and other recognisable elements set within an expansive matrix of pasture, shelterbelts and hedgerows are the primary elements of this working rural landscape. The towers and associated steam plume of the Kapuni Gas Plant also forms part of this panorama.

The turbines will not be viewed against a landform backdrop but instead against the sky in the context of existing vertical influences throughout the area of the ring plain. Given the distance, the brightness of the day and the type and level of cloud cover will have a bearing on the level of visibility of the turbines; this aspect more so than from viewpoint P8.

At this distance, while the four turbines are visible and because of their height and form are distinguishable but not particularly prominent. The level of visibility of the turbines is affected by

[6] Windscreen wiper effect occurs when landform or vegetation screens most of a turbine's rotors leaving only the rotor tips visible. This results in the rotors s being mostly screened and but momentarily visible. In some situations, this phenomenon is considered having a greater visual effect than when turbines and rotors are fully visible.

the direction the turbine rotors are facing with a noticeable difference when the rotors are facing the dominant westerly wind direction.

The visual effects are **low**.

Table 8: Public Viewpoints: Summary of Visual Effects

Viewpoint Number	Location	Level of Visual Effects	Nature of Effect
P1	Upper Glenn Road	Low	Adverse
P2	Intersection of Normanby Road and Manaia Road	Low	Adverse
P3	Junction of Normanby Road and Kokiri Road	High	Adverse
P4	Intersection of Normanby Road and Tito Road (Okaiawa)	Low	Adverse
P5	Manaia Sports Park, Manaia	Low	Adverse
P6	TSB Sports Hub, Hawera	Low	Neutral
P7	Hawera Aerodrome	Low	Neutral
P8	Intersection of Manaia Road and Skeet Road	Moderate	Adverse
P9	Eltham Road, east of Kaponga	Low	Neutral

Viewpoints from Private Locations (Appendix 2)

Determining those properties where visual effects assessments should be carried out, particularly in relation to the position of dwellings on these properties considered several aspects:

- Those properties that adjoin the Project.
- Review and desktop analysis of the ZTV.
- Field work.

From this initial work, a long list of properties and dwellings were identified, and field work carried out and site visits made, and photographs taken from each viewpoint. The aim was to identify a range of locations from private properties and dwellings, which together with the selected viewpoint locations from public locations, would provide a range of representative viewpoints that fairly demonstrate the potential visibility of the turbines and assist in determining visual effects.

Thirteen viewpoints from or close to private dwellings were identified; for some properties there was more than one viewpoint identified and photographs taken to capture different aspects of potential views. Further field work and analysis identified several other potential locations to be considered.

A wire frame model of the turbines in the context of the surrounding landscape was prepared from each viewpoint and following field work, including a site visit to each location, the list was refined, and visual simulations prepared from six representative viewpoints.

Many dwellings on the properties visited are enclosed by tall shelterbelts, hedgerows and amenity tree plantings and so views to the surrounding landscape and wider countryside were not possible or were significantly restricted. In these instances, a viewpoint(s) was selected from immediately beyond the curtilage of the dwelling looking towards the turbines.

On each set of visualisation images, a key map is included at the bottom right of the page to show the viewpoint location.

Viewpoints from private dwellings and properties will vary even when the dwellings are quite close to each other because of the angle of view and landscape context (i.e. presence of trees, hedgerows and other vegetation, buildings, and other structures, etc). Completing visual simulations from every dwelling within a defined radius of the turbines is not practical and would achieve little.

However, to provide an understanding of the number and location of dwellings in relation to the Project, a desktop assessment of visual effects using Google Earth, was carried out from each of the dwellings shown on **Figure 12**. This assessment is tabulated in **Appendix 4.** (For consistency, the numbers assigned to each of the dwellings in the table is the same as those used in the noise assessment report).

Figure 12 shows the locations of the representative private viewpoints and **Table 9** below lists the details of each.

Most of the private viewpoints selected are from within 2km radius of the turbines. The distribution of viewpoints and the distances were selected with a focus on those located generally south of the Site given the context of the respective views from these locations (i.e. looking towards Mt Taranaki).

The visual simulations from these private viewpoints comprise a combination of the original proposal and from the revised 2.5D proposal; this is shown on **Table 9** below. Updated visual simulations were prepared for three viewpoints at 1.5km or less from the turbines and these are highlighted in the table below (i.e. H6, Meyer, H29, Delvin/Poole, and H108, Johnston). For each of these properties the visual simulations for the original proposal are included as well as visual simulations for the revised 2.5D proposal (highlighted).

Table 9: Private Viewpoints

Viewpoint Number	Location	Type	Distance from closest turbine
H6-A	Meyer Property (Kokiri Road)	Panoramas (Facing and Dominant Wind	1.3 km
H6-B	Meyer Property (Kokiri Road)	Single Frame (Facing)	1.3 km
H6-C	Meyer Property (Kokiri Road)	Panoramas (Facing)	1.3 km
H6-D	Meyer Property (Kokiri Road)	Single Frame (Facing)	1.3 km
H14-A	Lawn Property (Manaia Road)	Panoramas (Facing and Dominant Wind)	1.8 km
H14-B	Lawn Property (Manaia Road)	Single Frame (Facing)	1.8 km
H18-A	Smith & Sutton (Manaia Road)	Panoramas (Facing and Dominant Wind	1.7 km
H18-B	Smith & Sutton (Manaia Road)	Single Frame (Facing)	1.7 km
H29-A	Delvin / Poole (Skeet Road)	Panoramas (Facing and Dominant Wind)	1.6 km
H29-B	Delvin / Poole (Skeet Road)	Single Frame (Facing)	1.6 km

Viewpoint Number	Location	Type	Distance from closest turbine
H29-C	Delvin / Poole (Skeet Road)	Panoramas (Facing)	1.6 km
H29-D	Delvin / Poole (Skeet Road)	Single Frame (Facing)	1.6 km
H88-A	Smith Property (Inaha Road)	Panoramas (Facing and Dominant Wind)	3.4 km
H88-B	Smith Property (Inaha Road) -	Single Frame (Facing)	3.4 km
H108-A	Johnston Property (Thomas Road)	Panoramas (Facing and Dominant Wind)	1.5km
H108-B	Johnston Property (Thomas Road)	Single Frame (Facing)	1.5km
H108-C	Johnston Property (Thomas Road)	Panoramas (Facing)	1.5km
H108-D	Johnston Property (Thomas Road)	Single Frame (Facing)	1.5km

Each viewpoint is briefly described and assessed in the commentaries below.

Viewpoint H6: Meyer Property, 1698 Kokiri Rd (1.3km from closest turbine)

The Meyer property is located south-west of the Site and is 1.3 km from the closest turbine. Mt Taranaki forms the backdrop to the four turbines. The single level Meyer dwelling is set back from Kokiri Road and is surrounded by tall shelterbelts and tree planting thus restricting views from the house or its immediate surrounds.

The viewpoint is located at the edge of a paddock adjacent to the driveway off Kokiri Road. The paddock is enclosed by a hedgerow and at the northern end of the paddock by a row of semi-mature deciduous trees. The turbines are prominent and are dominant elements when viewed at this distance; they interrupt the view to Mt Taranaki. The deciduous trees even without leaves do however partly screen the lower section of the turbines.

Unlike from some viewpoints there is little difference in terms of visibility or visual effects whether the turbine rotors are facing the dominant wind direction or face on to the viewpoint.

A shadow flicker analysis was undertaken for the Meyer dwelling given that it is located within the 10 times rotor diameter (i.e. 1620m) Zone of Influence (ZoI). A detailed explanation of the shadow flicker analysis is included in the Graphic Supplement, **Appendix 2**).

The Meyer dwelling (Dwelling #6) is located close to the edge of the ZoI approximately 1300m from the closest turbine and **Figure 19** includes a diagram showing the potential effects of shadow flicker, which would occur during June and July around sunset. Theoretically, there would be shadow flicker from just one turbine (turbine #1) over approximately 56 days amounting to around 22.5 hours per year (or 24 minutes per day). However, as noted in in section 5.3, the shadow flicker calculations produced by the WindFarm software are worse case scenarios. In practice, the shadow flicker effects would occur on considerably fewer days than this.

However, as noted above, the dwelling is surrounded by tall hedgerows and dense planting preventing views of any of the turbines from the dwelling or from the immediate surrounds.

While the visual effects are **high** from this general location, from the actual dwelling there are no adverse visual effects or shadow flicker effects given the screening from vegetation.

Viewpoint H14: Lawn Farm, Manaia Road (1.8 km from closest turbine)

The Lawn property bounds on to the southern boundary of the PKW Site. There is a central race that runs the length of the property and close to the boundary with the PKW Site. Mr and Mrs Lawn live on the west side of Manaia Road opposite the farm but there are two dwellings located on the farm at approximately 1.9km distant. The two dwellings are enclosed by trees and other planting at the rear in the direction of the turbines. Assessments were made from the gardens at the rear of both staff houses and from outside the Lawn's house; photographs were taken from all three locations.

In addition, an assessment was carried out and photographs taken from an upstairs bedroom of the two-story staff house. From here, the outlook to the adjoining farm and countryside beyond was very limited because of tall trees and an outbuilding at the rear of the property.

An assessment was also completed from the main farm race on the property because of the landowner's concern about the view from the race to Mt Ruapehu, approximately 120km to the north-east. While the race is approximately 700m from the closest turbine, the turbines would not encroach on the view of Mt Ruapehu.

The visual simulation is from the road berm close to the entrance to the Lawn's house, which is approximately 1.8 km from the closest turbine. The turbines are prominent silhouetted against the sky but do not dominate the landscape because of the number and type of foreground elements present and the uniformly flat topography.

The level of visual effects is **moderate** from the viewpoint location adjoining the Lawn's house but from the dwelling and garden the level of visual effects are ameliorated because of the foreground and mid-ground vegetation. The visual effects are **moderate** from the staff dwellings on the property.

Viewpoint H18: Smith & Sutton Property, Manaia Road (1.7km from closest turbine)

The Smith and Sutton property is located north of the Lawn property and directly west of the Site. There are two dwellings close to each other; the main dwelling is located on a small rise set back off Manaia Road. There are established hedges and planting around part of this site and a double garage adjoining the house, which restricts views. The viewpoint is just outside the curtilage with open views towards the turbines.

The turbines are prominent silhouetted against the sky and dominate the view. The turbines occupy a significant proportion of the wider view from this location, which like most of the other viewpoints is a typical South Taranaki dairy farm landscape (i.e. paddocks enclosed by hedgerows and shelterbelts and farm outbuildings). Given the location and angle of view, the direction the rotors are facing makes no difference in terms of visual effects.

A shadow flicker analysis was undertaken for the main dwelling given that it is located within the 10 times rotor diameter (i.e. 1620m) Zone of Influence (ZoI). A detailed explanation of the shadow flicker analysis is included in the Graphic Supplement.

The main dwelling (Dwelling #18) is located on the very edge of the ZoI, approximately 1620m from the closest turbine. **Figure 20** includes a diagram showing the potential effects of shadow flicker, which would occur briefly during sunrise in March and October. Theoretically, there would be shadow flicker from just one turbine (turbine #4) over approximately 32 days per year amounting to around 10.1 hours per year (or 19 minutes per day). However, as noted in in section 5.3, the shadow flicker calculations produced by the WindFarm software are worse case scenarios. In practice, the shadow flicker effects would occur on considerably fewer days than this.

Also, the dwelling has some tall vegetation and outbuildings around it, which provides some screening towards the turbines. The viewpoint selected for the visual simulation is in the paddock adjoining the dwelling where there is a clear and open view of the turbines.

The level of visual effects is **high**.

Viewpoint H29: Delvin / Poole Property, Skeet Road (1.6km to closest turbine)

The Delvin / Poole property is situated directly north of the Site; the dwelling is located on the opposite side of the road to the farm property, The viewpoint is from the front of the dwelling, which has an open view to Skeet Road but the farm is screened by a tall mixed shelterbelt.

The proximity of the shelterbelt to the viewer means that it screens the turbines with only the tops of the rotors visible above the shelterbelt. However, while only the tips of the rotors are visible, there is the 'windscreen wiper' effect to consider. This phenomenon is often considered as having a greater visual effect that when turbines and rotors are fully visible.

While the turbines are mostly screened, considering the proximity of the turbines and wiper effect, the visual effects are **moderate.**

Viewpoint H88: Smith Property, Inaha Road (3.4 km to closest turbine)

The Smith property is also located on Inaha Road but 1 km further south of the Te Aroha Marae. The viewpoint location is at the rear of the property adjacent to the indoor and outdoor living areas. The owners have established a 3.0m tall hedge along the western boundary of the garden to protect the house and outdoor living areas from the dominant wind but along the rear garden boundary there is no planting and so there are unobstructed views across farmland towards Mt Taranaki in the distance. The house has been positioned to take advantage of the open and unobstructed view of Mt Taranaki from many rooms from within the house and from the outdoor living areas and garden.

From this distance and angle, the turbines occupy a small proportion of the overall panoramic view and are seen against the backdrop of Mt Taranaki. The turbines interrupt the open uncluttered view of Mt Taranaki.

Whilst a small consolation, the visual effects of the turbines is affected by the direction the turbine rotors are facing; they are less prominent are facing the dominant westerly wind direction.

The visual effects are **high.**

Viewpoint H108: Johnston Property, Thomas Road (1.5km from closest turbine)

The 180ha. Johnston property is located south-west of the Project and at 1.5km to the closest turbine is a similar distance to the Project as the Meyer property. The Johnston's moved into their new house on the property about a year ago and are in the process of developing shelter planting and amenity vegetation around the dwelling. Currently, there are open views from both the indoor and outdoor living areas to the north across farmland to Mt Taranaki in the distance.

The turbines while prominent, do not have the mountain as the backdrop and instead they sit to the east. From this angle, pine shelterbelts visually separate the turbines from the sweeping slopes of Mt Taranaki. Silhouetted against the sky, the turbines do not dominate the view. Unlike from some viewpoints there is little difference in terms of visibility or visual effects whether the turbine rotors are facing the dominant wind direction or face directly to the viewpoint.

One of the many small waterways that radiate from the mountain sits below the house platform and provides the foreground from this viewpoint. The waterway has been fenced and the Johnston's have implemented an ongoing planting to protect and enhance this waterway. In time, this vegetation would provide a foreground text to the outlook from the rear of the dwelling towards the turbines.

The visual effects are **moderate.**

Table 10: Private viewpoints: Summary of visual effects

Viewpoint Number	Location	Level of Visual Effects	Nature of Effect
H6	Meyer Property, Kokiri Road	High	Adverse
H14	Lawn Farm, Manaia Road	Moderate	Adverse
H18	Smith & Sutton Property, Manaia Road	High	Adverse
H29	Delvin / Poole Property, Skeet Road	Moderate	Neutral
H88	Smith Property, Inaha Road	High	Adverse
H108	Johnston Property, Thomas Road	Moderate	Adverse

7.3 Viewpoints from Marae Locations (Appendix 3)

As part of the landscape and visual effects fieldwork carried out in 2020, views from roads adjacent to three marae were assessed, photographs taken from suitable viewpoints and visual simulations produced. Hiringa's ongoing consultation with hapū of Ngāruahine, together with the response from the Ministry for the Environment in relation to the Fast Track Consenting[7] process identified four additional marae to be considered as part of addressing potential cultural landscape effects. Site visits and assessments were not been carried out in relation to these marae, but other material was produced to help illustrate and understand the level of visibility of the turbines from each location.

Assessments were completed, including producing visual simulations based on the revised proposal with the 2.5D layout and 206m tall turbines for Te Aroha Marae in Inaha Road, Aotearoa Marae in Hastings Road, and Waiokura Marae in Winks Road.

Computer-generated wire frame models were generated for the four other marae locations (i.e. Mawhitiwhiti Marae in Omahuru Road, Oeo Pa in South Road, Okare Ki Uta Marae in Taikatu Road and Tawitinu Marae in South Road). The wire frame models and accompanying Google Earth image from each viewpoint, included kin the Graphic Supplement, illustrate the scale of the turbines and their relationship to Mt Taranaki from each viewpoint.

Table 11 below outlines the details of each of these viewpoint locations. An assessment of visual effects was carried out in relation to the three viewpoints where site visits and field work were completed ([.e. Te Aroha Marae, Aotearoa Marae and Waiokura Marae) but given the distances of the other four marae from the turbines, they were not visited or assessments and visual simulations completed.

Table 11: Marae viewpoints

[7] Application number: PJ-0000722, Ministry for the Environment, 6 November 2020.

Viewpoint Number	Location	Type	Distance from closest turbine
H71-A	Te Aroha Marae (Inaha Road)	Panoramas (Facing)	2.4km
H71-B	Te Aroha Marae (Inaha Road)	Single Frame (Facing)	2.4km
H109-A	Aotearoa Marae (Hastings Road) -	Panoramas (Facing)	6.6km
H109-B	Aotearoa Marae (Hastings Road) -	Single Frame (Facing)	6.6km
H109-C	Aotearoa Marae (Hastings Road) -	Single Frame (Facing)	6.6km
H111-A	Waiokura Marae (Winks Road)	Panoramas (Facing)	4.7km
H111-B	Waiokura Marae (Winks Road)	Single Frame (Facing)	4.7km
H112	Mawhitiwhiti Marae (Omahuru Road)	Wire frame and Google Street View image)	6.9km
H113	Oeo Pa (South Road)	Wire frame and Google Street View image)	16.8km
H114	Okare Ki Uta Marae (Taikatu Road)	Wire frame and Google Street View image)	10.9km
H115	Tawhitinu Marae (South Road)	Wire frame and Google Street View image)	13.4km

Viewpoint H71: Te Aroha Marae, Inaha Road (2.4km to closest turbine)

Inaha Road runs north-south to the east of the Site. Te Aroha Marae (Ngati Manuhiakai sits on a gentle rise above Inaha Road and has wide open views northwards to Mt Taranaki. Hedgerows and vegetation growing along the Inaha Stream occupy the middle ground.

The turbines are seen in the context of the mountain and while they are not located directly in front of the maunga they are very much viewed in its context and interrupt the view to the lower sweeping slopes.

The level of visibility and visual effects of the turbines is affected by the direction the turbine rotors are facing with a noticeable difference when the rotors are facing the dominant westerly wind direction.

Ngati Manuhiakai hapū have provided a letter of support for the project.

The visual effects are **high**.

Viewpoint H109: Aotearoa Marae, Hastings Road (6.6km to closest turbine)

Aotearoa Marae is set back from Hastings Road and is approximately 6.6km east of the proposed Site. Apart from a clump of cabbage trees there is little tall vegetation growing on the

site or in the intervening paddocks between the marae and the turbines. Consequently, there are open, unobstructed views of the turbines from both the marae and from the adjoining Road. The turbines, however, do not sit in front of the maunga and instead are seen against sky backdrop.

Given the distance, the landscape context and that the turbines are well separated from Mt Taranaki the visual effects are **low.**

Viewpoint H111: Waiokura Marae, Winks Road (4.7km to closest turbine)

Waiokura Marae is situated east of Manaia and 4.7km south of the turbines. From the marae there are clear views of Mt Taranaki with the cluster of turbines situated to the east and well separated from the maunga. The turbines are stacked in a tight cluster because of the viewing angle, which reduces their visibility and level of visual effects.

The visual effects are **low.**

Mawhitiwhiti Marae, Oeo Pa, Okare ki Uta Marae, Tawhitinu Marae

All four marae are situated more than 7km from the Site with Mawhitiwhiti Marae approximately 7km directly west and Oeo Pa, Okare ki Uta Marae and Tawhitinu Marae between 11km and 17km to the southwest. The views from all four locations do not feature Mt Taranaki as a backdrop.

Table 12: Marae viewpoints: Summary of visual effects

Viewpoint Number	Location	Level of Visual Effects	Nature of Effect
H71	Te Aroha Marae, Inaha Road	High	Adverse
H109	Aotearoa Marae, Hastings Road	Low	Adverse
H111	Waiokura Marae, Winks Road	Low	Adverse
H112	Mawhitiwhiti Marae, Omahuru Road	N/A	N/A
H113	Oeo Pa, South Road	N/A	N/A
H114	Okare ki Uta Marae, Taikatu Road	N/A	N/A
H115	Tawhitinu Marae, South Road	N/A	N/A

7.4 Summary of Landscape and Visual Effects

Wind turbines are by necessity large structures that require open landscapes to effectively harness the wind and so it is not possible to avoid all visual effects. Given the height and scale of the four turbines in the flat and open ring plain landscape, turbines will be prominent elements.

While they will introduce a prominent new element into the ring plain landscape, they will not dominate it, no more so than the Kapuni Gas Plant, Ballance Agri-Nutrients Plant or Fonterra Plant do. The turbines will have an adverse effect on landscape character and while this will be relatively limited, it does affect the associative values, especially those expressed by Nga iwi o Taranaki in relation to the maunga and its connection and influence on the wider landscape.

The Site is well separated in terms of distance from the surrounding towns and settlements and from both SH3 and SH45.

Public viewpoints P1, P2, P3, P4, P5, P6 and P7 are from the south of the turbines and so Mt Taranaki forms part of the wider landscape context in these views. Viewing distances vary from 2.7 km to 13.5 km and so provide a wide range of views. In P3 (intersection of Normanby and Kokiri Roads), the turbines sit in the in the mid-ground directly in front of Mt Taranaki.

A similar situation exists with marae related viewpoints H71, H109, and H111.

The broad horizontal scale of four turbines situated in this flat, open landscape is not an issue per se despite their size, as this landscape can absorb structures of this height. This situation is similar but in a different way to how the landscape has absorbed the large footprints and bulk and scale of both the Kapuni Gas Plant, Ballance Plant and Fonterra Plant. The visual relationship between the turbines and Mt Taranaki as the backdrop is the primary issue. Depending where the viewer is situated on the ring plain, the nature of the visual relationship with the mountain changes.

The four turbines contrast with the other landscape elements because of their height, form, and dynamic movement in the open, flat, rural landscape. Despite that the turbines dwarf the other vertical elements on the ring plain, the even, flat, and gently rising topography that extends to the base of the mountain provides a broad horizontal scale that can accommodate large scale elements. In other words, the turbines will appear in scale with the landscape as a whole and appear visually anchored and absorbed by the landscape.

Adverse visual effects will be experienced from a limited number of private properties, primarily those where there is an open and panoramic view of Mt Taranaki from the property's internal and external living areas. However, from many other properties, landowners have extensively planted around their dwellings for wind protection and enclosure and thus views towards the turbines are totally or partly screened.

At viewing distances of 2km or less, the visual effects are generally moderate or high, but beyond this the visual effects rapidly diminish. At distances of 3-5+km, the homogeneity and dominant horizontal nature of the ring plain mean that the turbines are visually absorbed into the wider landscape.

From the roads and from other public areas, the views are transient and ever-changing as the viewer moves through the landscape; weather conditions also have a major influence on visibility and the level of visual effects. In addition to the transient nature of views from these rural roads, the volume of traffic is low. It is only from a few locations and from distances less than 2 km where views are adversely affected to any degree and then only when the turbines sit directly in front of Mt Taranaki.

The Site is part of an extensive working landscape characterised by productive rural activities. The existing farming will continue on the Site, maintaining the underlying rural character. Trees or buildings do not provide a relative scale relationship for the turbines; however, their scale is somewhat immersed within the wider landscape. Siting wind turbines in the ring plain landscape is appropriate because they need open landscapes, with good wind exposure and consistent wind speeds and be of a scale to accommodate structures of this height.

The flat terrain increases the potential for vegetation such as shelterbelts to screen the turbines from different places. However, given the height and scale of the turbines it is only when the shelterbelts are close to a viewpoint that such screening would be successful (**Figure 8C**). In this Figure, the visual simulation from Viewpoint H29 (Delvin / Poole) illustrates the screening effects of vegetation situated close to the viewer. The cross section at the bottom of this Figure illustrates that a shelterbelt of increasing height at a greater distance would have a similar screening effect in relation to this viewpoint.

Strategic tree planting can also attenuate adverse visual effects by providing perspective depth where the turbines are viewed in the context of other vertical elements that also contrast with the flat topography.

Given the flat terrain and that there are only four turbines, turbine stacking is not an issue as demonstrated in the viewpoints, apart from Viewpoint H111 from Waiokura Marae, where at nearly 5 km distant, the tight turbine cluster sits discretely well east of Mt Taranaki. It is difficult to find another location where stacking would be an issue. Each turbine is seen as an individual element and the issue of turbines or parts thereof, being viewed stacked on top of each other and thus increasing the overall bulk and perception of density of the turbines is avoided.

While there are adverse visual effects from a limited number of locations, both public or private, the threshold or tipping point in terms of significant adverse visual effects is not achieved. Similarly, in respective to cumulative effects, the four turbines contribute to the similar non-farming or industrial activities of the Kapuni Gas Plant, Ballance Plant, Fonterra Plant and gas well sites but not to a level that would result in significant adverse cumulative effects.

8.0 Measures to Avoid, Remedy and Mitigate Effects

Measures to avoid, remedy and mitigate effects have been considered during the planning and design of the Project and incorporated in several ways. This has included the following:

- The Site, particularly the parcel where the four wind turbines are located is physically well separated from dwellings on adjoining farm properties.
- The Site is close to where the power will be used thus minimising the transmission distance and the potential for a new transmission line or additional poles (i.e. it is only 2.7 km to the electrolysis infrastructure adjacent to the Ballance Plant.
- The Site is flat and requires minimal earthworks.
- There are two access options to the Site, one is to use the existing east-west farm race into the Site and the other option is to create a new east-west track along the southern boundary. Access to the Site using the existing farm races will only require widening of the races in places to enable construction and transportation of turbine components. Apart from a small section of hedgerow along Kokiri Road to enable access to the Site no other existing vegetation is required to be removed.
- Creating a new access track along the southern boundary, which is the preferred landowner option will require some additional culverts.
- While the cable between turbines will need to cross a stream, this will be achieved by boring under the stream.
- The towers and rotors will be painted in a uniform off-white matt finish to unify to reduce reflectivity and to provide an overall unified structure (also the turbines will not include any branding or logos.
- Transmission from the turbines to the electrolysis infrastructure adjacent to the Ballance Plant will be via an existing transmission line, which is likely to be upgraded (refer two options in **Figure 5**).

Given the necessary height of the turbines associated with energy generation, there is no opportunity to mitigate adverse visual effects through reducing their scale. Tree planting on the Site itself is neither feasible nor desirable. Tree planting close to the viewpoint can provide effective screening like that which occurs in viewpoint R-10 (Delvin / Poole), located 1.6km north of the Site. A shelterbelt is located along the road directly opposite this dwelling and provides effective screening. However, proposing such tree planting as a mitigation measure is generally not feasible nor acceptable without careful consideration of how this may impact on other available views.

For several of the viewpoints from private properties, dwellings are surrounded by tall shelterbelts, hedges and/or amenity planting and thus screening views to the surrounding countryside, including towards the turbines. For those properties where existing screen planting is limited or does not exist and the visual effects are high, landowners could be offered tree planting. Such planting would be subject to the wishes and agreement of affected property owners and would typically involve planting of shelterbelts or stands of amenity trees between the dwelling and the wind turbines (see **Figure 8C**).

9.0 Conclusions

The Kapuni Green Hydrogen Project comprises a line of four turbines on a flat site that operates as a dairy farm. Dairy farming is the main, and long-standing activity on the Taranaki ring plain but in places other energy-related activities have become well established, notably the Kapuni Gas Plant and several gas well sites.

Compared to wind farms developed in various parts of New Zealand, the effect of the four Kapuni turbines on the biophysical landscape (i.e. landform and vegetation) will be minimal because of the flat topography, the degree of landscape modification and that no existing vegetation will be removed.

The 206m tall turbines will introduce a new and prominent element into the ring plain landscape but they will not dominate it, no more so than either Kapuni Gas Plant or the Ballance Plant do. The turbines will have an adverse effect on landscape character and while this will be relatively limited, it does affect shared and recognised (i.e. associative) values, especially those expressed by Nga iwi o Taranaki in relation to the maunga and its connection and influence on the wider landscape.

The Site is well separated in terms of distance from the surrounding towns and settlements and from the two main highways, SH3 and SH 45. The row of turbines will have a wide theoretical visibility from surrounding areas because of the low relief of the ring plain and there are no other elements of the height and scale of the 206m tall turbines. The turbines contrast with other landscape elements because of their height, form, and dynamic movement in the open flat rural landscape. However, broad horizontal scale of the landscape can accommodate large scale elements.

The turbines have a large potential visual catchment and the viewing audience is relatively varied. The visual relationship between the turbines and Mt Taranaki as a backdrop when viewed from the south is the primary issue in terms of visual effects. The visual relationship of the turbines with the mountain changes depending on where the viewer is situated.

Adverse visual effects will be experienced from a limited number of private properties, primarily those where is an open and panoramic view of Mt Taranaki. However, many dwellings are

extensively planted with shelterbelts, hedgerows, and amenity trees and thus views towards the turbines or to Mt Taranaki are screened.

From roads and other public areas, views are transient and ever changing. At viewing distances of 2km or less, the visual effects of the turbines are generally moderate, sometimes greater but beyond this the visual effects rapidly diminish. At distances of 3-5km, the dominant horizontal nature of the ring plain mean that the turbines are visually absorbed into the wider landscape.

While the turbines will be prominent when viewed from various places on the ring plain, they will not dominate it and nature and scale of the landscape is such that the four turbines can be successfully accommodated without significant adverse landscape and visual effects.

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Appendices 1, 2 and 3 are included in the Graphic Supplements

Appendix 4: Dwelling Inventory: Visual Effects

About Boffa Miskell

Boffa Miskell is a leading New Zealand professional services consultancy with offices in Auckland, Hamilton, Tauranga, Wellington, Christchurch, Dunedin, and Queenstown. We work with a wide range of local and international private and public sector clients in the areas of planning, urban design, landscape architecture, landscape planning, ecology, biosecurity, cultural heritage, graphics, and mapping. Over the past four decades we have built a reputation for professionalism, innovation, and excellence. During this time, we have been associated with a significant number of projects that have shaped New Zealand's environment.

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