Appendix 2: Expected Construction Traffic

Heavy Traffic Movements							
Foundations (goldwind foundation)							
	No.	Volume (m3)			Truck volume (m3 or t)		
Concrete	24	550	13200		6	2200	
		(t)					
Steel	24	38	912		10	91.2	
		(t)					
Conduit, bolts, earthing etc	24	5	120		10	12	
Total							2303
Electrical							
	no.						
Transformers - individual	24					24	
	no.						
Transformers - main	1					1	
	km	km/roll	rolls				
Cable	19	0.5	38			38	
Switchgear - sub station						5	
		components					
Cable Layer	1	5	5			10	
	m	m2					
Backfill (thermal grading)	18900	0.3	5670		12	472.5	
	Buildings	parts					
Buildings - Sub Station	2	2	4			4	
Switchgear - turbines						10	
33kV overhead Line - poles and wire						10	
							575
Crane							
Crane body, counterweights etc						10	
Minor Crane						3	
							13
Earthmoving and Aggregate							
	m	m2	m3				
Finishing Grade to roads (7m x 0.4m)	18900	2.8	52,920		12	4410	
	Units	Seasons					
Excavators, trucks, bulldozers etc	75	2	150			150	
							4560
Turbines							
Blades	24	3	72			72	
Nacelle	24	2	48			48	
Towers	24	4	96			96	
Hub	24	1	24			24	
Miscellaneous	24	2	48			48	
							288
Various							
Conduit, Fixings, Piles, Pipes, Tools, etc etc						50	
							50
Total							7789
Contingency	1.1						**8568**

Appendix 3: District Plan Assessment

Standards	Comment
8.4.1 Number and Location of Parking Spaces **8.4.1.3 Standards**	
(1) Where any new activity establishes, the use of any land or building changes or a building is constructed or substantially reconstructed, altered or added to, parking facilities shall be provided on that site in accordance with the minimum standards set out in the table below. (2) Generally, the standard for parking is set out by activity (regardless of the zone it is located in), as the activity generates/attracts demand for parking to similar levels regardless of the zoning. However, some specific zone situations are identified. (3) Where there is more than one activity on a site the parking requirement is calculated separately for each activity and then added together. If a particular activity is not referred to in the following table, the most similar activity for the proposal shall apply to determine the parking requirement. (4) Where the assessment of the number of parking spaces results in a fractional space being involved, any fraction under one-half shall be disregarded and fractions of one-half or more shall be counted as one space. (5) For dwellings in the Residential and Township Zones one of the two parking spaces is to be shown on the building consent application in a position that a garage or carport can be built on the site in compliance with the provisions of the District Plan. (6) In the Conservation (Wetland) and (Indigenous Forest) Zones parking shall be provided within the zone and clear of any public road. No parking area providing spaces for more than five vehicles shall be located within 50 metres of any dwelling located outside the zone. Where the dwelling is separated from the zone by a road, this separation standard shall not apply. (7) In all zones, for any new or expanded activity where any of the circumstances set out in (7)(a) or (7)(b) below apply, a Transportation Impact Assessment (TIA) shall be prepared. Where the activity is a Permitted, Controlled or Restricted Discretionary Activity in the zone, the activity shall be a Restricted Discretionary Activity, with discretion restricted to the assessment matters in Rule 8.4.1.4(1)(c). (a) For sites with direct access to a state highway, the activity will: (i) Provide 5 or more parking spaces on site either to meet the requirements of this District Plan or to meet the demand generated by the activity; and/or (ii) Have an average daily traffic generation/through put of 10 vehicle movements or more (ingress and egress is 2 movements). (b) For sites with direct access to a road other than a state highway, the activity will: (i) Provide 50 or more parking spaces on site either to meet the requirements of this District Plan or to meet the demand generated by the activity; and/or (ii) Have an average daily traffic generation/through put of 250 vehicle movements or more (ingress and egress is 2 movements). Notes: For the purpose of	Expected to comply. (1)-(4) No specific requirement for this activity but the nature and location of the activity means all parking will be contained on site. (5)N/A (6) N/A (7) a) parking will be accommodated on site b) the site has access to a road other than a state highway. Average vehicle movements are 121 vpd and the TIA requirement is not triggered by the average vehicle movements. (8) TIA requirement is not triggered by the parking or trip generation. (9) The proposed activity is longer than 12 months and therefore is not a temporary use as defined in Section 4: Definitions.

Standards	Comment
determining whether a Transportation Impact Assessment is required typical vehicle movement values for various land use categories can be sourced as a guide from NZTA Research Report 453 Trips and Parking Related to Land use, November 2011. Refer to Table C1 in Appendix C. In the case of a single dwelling an average of 8.5 vehicle movements has been adopted for the purpose of this rule. (8) Where a Transportation Impact Assessment is required, it shall be at a level of detail appropriate to the scale of the activity, consider all relevant modes, and consider the network affected by the proposal at least including the intersections upstream and downstream. The assessment shall address the following matters: (a) Description of the existing environment, including: (i) The site, its location and existing activities (ii) The surrounding road network – infrastructure capacity and condition, traffic volumes, traffic conditions, safety performance, any transport strategy considerations and the ability of the local network to safely and efficiently accommodate traffic. (b) Location, type and scale of the proposal – traffic generation, transport modes, vehicle types, vehicle parking and manoeuvring layout and design standards, signage, pedestrian and cycle access, cycle parking, end of journey facilities, rail level crossings and consistency with any relevant transport strategies. (c) Transportation Considerations – the extent to which particular roads will be affected in terms of safety, efficiency, pavement life and maintenance cost; on-site provision for parking; loading/servicing and queuing; safe and efficient provision for ingress/egress including capacity, separation and visibility. Note: Where fewer carpark spaces are proposed than required by the Standard in Rule 8.4.1.3, an assessment in terms of the matters in Rule 8.4.1.4(1)(a) shall be provided. (d) Evaluation of Transportation Impacts – transportation effects, mitigation options and proposals for mitigation. (e) Written approvals/comments from the relevant road controlling authority (f) Conclusions - transportation impact, mitigation proposed. (9) For Temporary Uses, where the relevant Road Controlling Authority has approved, or waived the requirement for, a temporary traffic management plan then the requirement for a Transportation Impact Assessment under Rule 8.4.1.3(7)(a) or (b) above shall not apply, provided that any approved temporary traffic management plan or associated restrictions shall be adhered to. Notes: For some zones, where sites adjoin a residential or reserve zone, specific standards and criteria are provided in that zone for consideration of the location of parking spaces.	
8.4.2 Number and Location of Loading/Drop Off Spaces **8.4.2.3 Standards**	

Standards	Comment
(1) Where any new activity establishes, the use of any land or building changes, or a building is constructed or substantially reconstructed, altered or added to, loading facilities shall be provided on that site in accordance with the following standards set out in the table below. (2) Where the assessment of the number of loading/drop off spaces results in a fractional space being involved, any fraction under one-half shall be disregarded and fractions of one-half or more shall be counted as one space. Note: For some zones, where sites adjoin a residential or reserve zone, specific standards and criteria are provided in that zone for consideration of the location of loading spaces.	Expected to comply. (1)- (2) No specific requirement for this activity. The nature and location of the activity means all parking will be contained on site.
8.4.3 Vehicle Access and Crossing **8.4.3.3 Standards**	
(1) Vehicle crossings for an activity shall be provided from the formed carriageway of a public road, other than a state highway, in accordance with the following standards: NOTE: Refer also to Rule 8.4.1.3(7) to determine if a Transportation Impact Assessment is required. (a) Sight Distances (i) The minimum sight distances from vehicle crossings in all zones shall be in accordance with Table 3.4 and shall be measured in accordance with Diagram HDC304 of the HDC Engineering Manual. (b) Separation (i) Where the regulatory speed limit is 50km/hr or less the minimum separation between any vehicle crossing and an intersection in all zones shall be in accordance with Diagram HDC305 of the HDC Engineering Manual. (ii) Where the regulatory speed limit is greater than 50km/h the minimum separation between any vehicle crossing and an intersection in all zones shall be in accordance with Diagram HDC306 of the HDC Engineering Manual. (iii) The minimum separation distances between vehicle crossings in all zones shall be in accordance with Diagram HDC306 of the HDC Engineering Manual. (iv) The minimum separation distance between a vehicle crossing and a railway level crossing shall be 30 metres. (c) Number of Vehicle Crossings The maximum number of vehicle crossings in the urban areas shall be as below: (i) Site less than 20m frontage: One crossing (ii) Site greater than 20m frontage: Two crossings. (d) Location of Vehicle Crossings (i) Except for in the rural area, for any corner site, only one vehicle crossing	Does not comply. (1) a)Sight distances. 250m for 100 km/hr speed environment. Exceeds 250m to the south. The available sight distance to the west is 135m. For speed environment of 70 km/hr HDC minimum sight distance is 140m. Actual speed environment is 70-80 km/hr. We would expect drivers to be alert due to the one-lane bridge, and given the low traffic volume on Rawhiti Road, the consequence of the slightly reduced visibility is not likely to be of consequence. (1)b)Does not comply. 200m separation required. Separation to other accesses is 120m to the west and 150 to the south. (1) c) complies.

<table>
<tr><th>Standards</th><th>Comment</th></tr>
<tr><td>per frontage shall be permitted.

(ii) In the rural area where a corner site has a frontage to a state highway or arterial road as well as to a collector road or local road, then the vehicle crossing shall be limited to the frontage located on the collector or local road.

(iii) For Lot 6 DP 399569 (12 Magnolia Lane, Waihi) no vehicle crossing point connection to Cornwall Street/Lawrence Road shall be permitted. (iv) For the land to the east of Smith Street and north of Wenlock Street, Waihi (legally described as part of Lot 7 DPS 33511) no vehicle crossing point connection to Whangamata Road-SH 25 shall be permitted.

(v) No new vehicle crossing is permitted onto a state highway.

(e) Dimensions, Formation and Construction of Vehicle Crossing Points

(i) The minimum dimensions for vehicle crossings off a local road, collector road or arterial road shall be in accordance with the following standards:

<table>
<tr><th>Class</th><th>Standard</th></tr>
<tr><td>A</td><td>Standard Articulated Vehicle Crossing in the rural area.</td></tr>
<tr><td>B</td><td>Standard Rural Vehicle Crossing for all activities that do not require a Class A entrance nor are residential activities, in the rural area.</td></tr>
<tr><td>C</td><td>Standard Vehicle Crossing for residential activities, in the rural area, Reserve (Active) and Reserve (Passive) Zones.</td></tr>
<tr><td>D</td><td>Standard Commercial/Industrial Vehicle Crossing for non-residential activities, in the urban area.</td></tr>
<tr><td>E</td><td>Standard Residential Vehicle Crossing for residential activities, in the urban area and Reserve (Active) Zones).</td></tr>
</table>

Notes (1) The dimensions and formation standards for the above classes of vehicle crossings are in the HDC Engineering Manual. A copy of the standards is included in Appendix 13 in Section 8.6.14. (2) Where access within a site is required to be provided to a "two-way access" standard, the width of the vehicle crossing from the road shall be the same or greater than the width of the "two-way access." (3) For the dimension and formation standards of crossings off a state highway refer to the Transit NZ Planning Policy Manual. (4) The New Zealand Transport Agency is the controlling authority for state highways. Section 51 of the Government Roading Powers Act 1989 lists many things which it is an offence to do, cause or permit on a state highway, without the written permission of the New Zealand Transport Agency. This includes undertaking any work on a state highway. Reference to the section referred to is advised before undertaking work on a state highway.

(f) Gradient

(i) In all zones, the grade change from the formed road edge, the vehicle crossing itself and the internal access, access leg or internal driveway within the property (where the entrance has to be partly formed within the property as it cannot all be formed in the road reserve), shall not exceed the access drive, breakover angle and departure angles as set out in Section 3.11 of the HDC Engineering Manual.

(ii) The maximum centre-line gradient for vehicle access (ie. internal access,</td><td>The crossing is existing. One proposed from Rawhiti Road. It is a paper road.

(1) d) complies

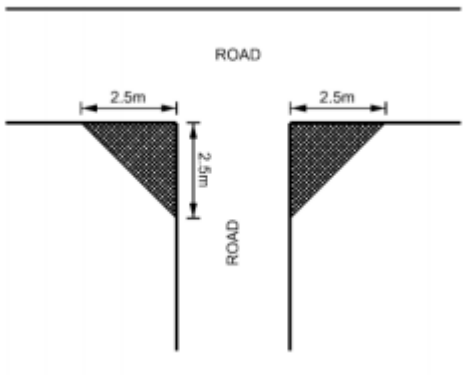
(1) e)Expected to comply. Vehicle crossing will be upgraded. Class A Standard Articulated Vehicle Crossing in rural area.

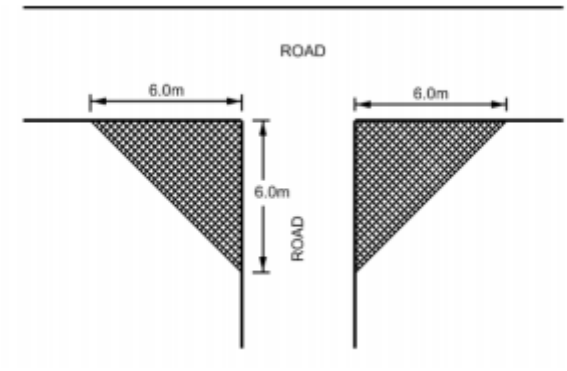
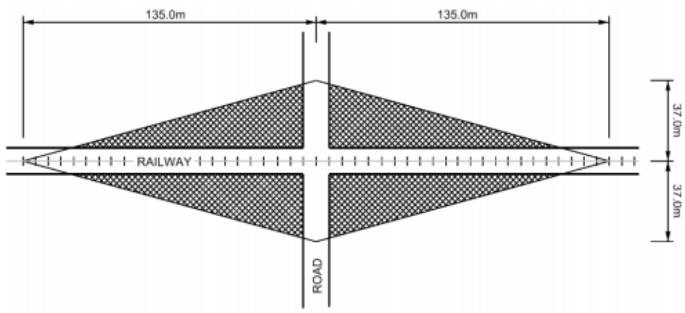
(1)f)expected to comply.

g) N/A</td></tr>
</table>

Standards	Comment
access leg or internal driveway to the body of the lot as required in (g)(ii) below) shall be in accordance with the relevant standard in Tables 3.1 or 3.2 of the HDC Engineering Manual (refer to Appendix 1 and 2 in Sections 8.6.1 and 8.6.2 for a copy of Tables 3.1 and 3.2). (g) Additional Standards Applicable to Subdivision In all zones, access shall be provided as follows: (i) Every lot shall be provided with legal access in terms of Section 106 of the Resource Management Act 1991. (ii) Every lot shall be capable of being provided with a vehicle crossing in accordance with the performance standards in 8.4.3.3 above (other than allotments created through road closure or severance, access denial strips, public utilities and allotments created for the protection of a significant heritage or environmental feature where vehicle access is not required), except that where vehicle access to the body of the lot is restricted by terrain or a water course, an internal vehicle access shall be constructed from the vehicle crossing to a point immediately beyond the restriction. (iii) For those lots which can only provide one safe vehicle crossing point, or access via an internal access or access leg, then the construction of the vehicle crossing shall be required to the minimum standards stated in 8.4.3.3 above. (iv) No additional lots shall be created which require vehicle access onto a Limited Access Road. Notes: (1) Access Denial Strips will be required as a condition of subdivision consent where circumstances require access to be prohibited in terms of maintaining road safety. (2) Where vehicle access into the body of a lot crosses difficult terrain, the vehicle access shall be required to be constructed at time of subdivision to allow access into the body of the lot or to a defined building platform (where this is required to be shown) as a condition of the subdivision approval.	
8.4.4 Design of Parking, Drop Off and Loading Spaces, Access and Turning Areas **8.4.4.3 Standards**	
(1)Where parking, loading/drop off spaces are provided on a site, the following standards shall be met: (a) Any carparking area and/or drop off spaces shall be laid out in accordance with the car turning and parking dimensions shown in Diagram HDC307 in the HDC Engineering Manual and the 90 percentile car tracking curve. (b) On site turning areas shall be provided to avoid the reversing of vehicles from: (i) any carparking or drop off area containing more than three parking spaces; or (ii) any access onto a state highway or arterial road; or (iii) any carpark or loading/drop off space located a minimum of 20 metres from the road boundary. (c) Any loading space(s) shall have minimum dimensions as follows: (i) Length 8.0 metres (ii) Width 4.0 metres (iii) Height 4.4 metres with sufficient turning areas to accommodate a 90 percentile single axle truck tracking curve, which would avoid the need to reverse vehicles from the loading space(s) to the road and vice versa. (d) Any vehicle occupying any parking or loading/drop off space must have ready access to a road at all times, without the necessity of moving any vehicle occupying any other parking or loading space, with the exception of vehicle parking for a dwelling, where only one parking space need be accessible at all	Expected to comply. (1) (a) – (d) No district plan parking requirement. However, site is well off the road and long access road and all vehicle parking, loading, manoeuvring etc will be provided on site. e) internal access width will need to be at least 6m wide for a minimum distance of 10m from the road boundary. We expect the access road width will be 6m for a greater distance given the over dimension loads expected.

Standards	Comment
times. (e) Where the internal access width is required to be provided for the two-way operation of vehicles onto and off the site, then the access width shall be at least 6m wide for a distance of 10m within the site from the road boundary.	
8.4.5 Formation, Screening and Landscaping of Parking and Loading and Manoueuvring Areas **8.4.5.3 Standards**	
(1) Where parking, loading/drop off spaces and manoeuvring areas are provided on a site, the following standards shall be met: (a) Where three or more parking and/or a loading/drop off space(s) are required to be provided, such parking and loading spaces shall be clearly marked out and identified. (b) Where a group of three or more parking spaces is required to be provided (excluding those required for a dwelling or located within a building) in the Residential, Town Centre, Industrial, Reserve (Active) and Township Zones on sites which adjoin a sensitive zone, the parking spaces shall be effectively screened on the applicable side(s) by a solid fence not less than 1.8m in height. (c) In the Town Centre, Industrial, or Township Zones, kerbing or a similar barrier not less than 0.100m high shall be provided on those parts of the site frontage not used for vehicular access, where parking spaces and/or a loading/drop off space(s) or manoeuvring area(s) adjoins a road, to separate parking, loading and manoeuvring areas from the road. (d) Where any group of five or more parking spaces, or any loading/drop off space(s) or vehicle manoeuvring area are to be provided and are visible from any state highway or arterial road or are visible from an adjacent sensitive zone, a landscape planting strip shall be provided and maintained along the applicable boundary of that area (except for required vehicular access) to a minimum depth of 2 metres. (e) Except in the Industrial Zone, where any group of twenty or more parking or drop off spaces and associated manoeuvring areas are to be provided, and are visible from any street or road (not otherwise covered in (d) above), a landscape planting strip shall be provided and maintained along the frontage of that area (except for required vehicular access) to a minimum depth of 2 metres. (f) In the Town Centre and Industrial Zones, where in accordance with Rule 8.4.8 a landscape buffer strip is required to be provided between an internal access and the boundary of a sensitive zone, it shall be planted and thereafter maintained to a minimum depth of 2 metres. (g) In the urban areas (except for the parking area and associated access for a dwelling), the whole of the required parking and/or loading spaces, and manoeuvring areas and the associated access thereto from the road frontage shall be formed and drained and thereafter maintained with a permanent all weather, dust-free surface, such as bitumen, concrete or cobblestones, except that in the Industrial and Township Zones a compacted aggregate low in fines	Expected to comply. (1)(a)No district plan parking requirement. All parking, manoeuvring, loading will be provided on site. (b) – (c) N/A (d)The site is well off the road and not expected to be visible from the road (e)-(h) N/A

Standards	Comment
may be used as an all weather surface. (h) Any activity or development required to provide a landscape planting strip or landscape buffer strip shall provide a landscape plan for certification prior to implementation which shows: (i) Existing landscape features, landforms and development. (ii) Proposed landscape features, landforms and development. (iii) Specification of materials to be used, including precise identification of plant types. (iv) Indicative maintenance programme.	
8.4.6 Protection of Traffic Sight Lines **8.4.6.3 Standards**	
(1) No construction of buildings, fences or other structures, placing of obstructions or the growth of vegetation shall be permitted in the immediate vicinity of road and railway intersections as follows: (a) Town Centre, Industrial and Township Zones Road Intersections – over 1 metre in height within the area shown in the diagram, except above first floor level. Hauraki District Plan September 2014 Section 8.4: Vehicle Parking, Loading and Access (Words in italics in rules and assessment criteria are defined in Section 4.0 Definitions) 8.4-22  (b) All other zones Road Intersections – over 1 metre in height within the area shown in the diagram.	N/A – not near a road or railway intersection.

Standards	Comment
 (c) All zones - Railway Intersections (i) Over 1 metre in height within the area shown in the diagram. Where there are two or more rail tracks the 37m sight line applies from the centreline of the nearest track.  Note: The standards in (a) and (b) above do not apply where a corner splay has already been vested and cleared in accordance with Performance Standard 8.4.7 - Corner Splays.	
8.4.7 Corner Splays **8.4.7.3 Standards**	
(1) Where land at an intersection is subject to subdivision, or where a new subdivision involves creating an intersection, corner splays to the dimensions set out in the table below shall be shown on the subdivision plan and shall be shown as "Road" to vest in the Council on the survey plan. ***Zone*** / **Standard** Residential, Low Density Residential and Industrial — 6.0 metre splay Township, Town Centre — 2.5 metre splay Rural, Marae Development, Coastal, Karangahake Gorge — 40 metres on *state highways, arterial roads*; 15 metres on *collector roads* and *local roads* Reserve (Active and Passive), Conservation (Indigenous and Wetland) and Paeroa Flood Ponding — N/A Notes: (a) The corner splays shall be defined by a diagonal line joining points, the standard distance back from where two straight lines (one line along each street/road boundary) meet. (b) The corner splay may need to be cleared of vegetation and/or re-contoured to provide the necessary sight lines as required	N/A not a subdivision or new road.

<table>
<tr><th>Standards</th><th>Comment</th></tr>
<tr><td>in the Standards in Rule 8.4.6.3.</td><td></td></tr>
<tr><td colspan="2">8.4.8 Internal Access
8.4.8.3 Standards</td></tr>
<tr><td>(1) The maximum number of lots or dwellings served by an internal access shall not exceed the limits specified in the following table:
<table><tr><th>Zone</th><th>Maximum Use of Internal Access</th></tr><tr><td>(a) Residential</td><td>Up to 3 Allotments or 3 Dwellings</td></tr><tr><td>(b) Low Density Residential</td><td>Up to 4 Allotments or 4 Dwellings</td></tr><tr><td>(c) Industrial, Town Centre, Township</td><td>Up to 2 Allotments</td></tr><tr><td>(d) Rural and Coastal</td><td>Up to 5 Allotments or 5 Dwellings</td></tr></table>Note: The above standards are more restrictive than the standards for use of internal access in the HDC Engineering Manual; for the avoidance of doubt the standards in Rule 8.4.8.3(1) above prevail.
(2) The legal width, maximum length, carriageway width and formation standards of the internal access shall be in accordance with either Table 3.1 or 3.2 of the HDC Engineering Manual (refer to Appendix 1 and 2 in Sections 8.6.1 and 8.6.2 for a copy of Tables 3.1 and 3.2).
(3) The legal boundary of the internal access shall accommodate any required passing bays.

(4) Where the internal access standards as specified in (a) to (d) above are not met, the internal access shall be provided to full road standard in accordance with the standards in Rule 8.4.9 and shall vest in the Hauraki District Council as "Road". For an existing internal access this rule shall only apply when additional lots are to be created which require access from it.

(5) No two or more vehicle access strips within a subdivision or development may lie adjoining or adjacent to one another unless easements are granted over each vehicle access strip in a manner which enables their combined use with a single point of access to a public road.
(6) Where the internal access in the Industrial and Town Centre Zones is located adjacent to the zone boundary with a sensitive zone, the nearest boundary of the internal access shall be located two metres from the zone boundary to allow a landscape buffer strip to be provided (refer to Rule 8.4.5) unless the boundary is effectively screened for the length of the internal access by a solid fence not less than 1.8 metres in height. The required minimum width of an internal access shall be measured from the edge of the two metre landscape buffer strip or fenceline.

Note: The above standards for internal access are either not applicable or should be used as a guide in the Paeroa Flood Ponding, Conservation (Indigenous Forest & Wetland), Reserve (Active & Passive), Karangahake Gorge or Marae Development Zones.</td><td>Does not comply with all requirements.
(1) In the Rural zone. The internal access is a paper road.
(2) Does not comply with all requirements of Table 3.1 since the length of the internal road is longer than 1000m.
Table 3.1 requires minimum accessway width of 9m, formed width 4.8m wide, 12.5% grade (12.5-20% specific design)
(3) – (4) expect that the internal access will be designed and constructed to accommodate expected traffic.
(5) – (6) N/A</td></tr>
<tr><td colspan="2">8.4.9.3 Street and Road Design</td></tr>
<tr><td>(1) Where a subdivision or development results in a need to upgrade an existing road or form a new road, that road development shall comply with:</td><td>Does not comply with all requirements.
(a)Does not comply with</td></tr>
</table>

Standards	Comment
(a) The relevant standards in either Tables 3.1 or 3.2 of the HDC Engineering Manual (refer to Appendix 1 and 2 in Sections 8.6.1 and 8.6.2 for a copy of Tables 3.1 and 3.2). (b) The roading hierarchy shown on the Roading Hierarchy Maps with the District Planning Maps. (c) The indicative road layout principles shown on the Structure Plans (where relevant) in Section 8.6 Appendices 3 to 12. (d) For the land to the east of Smith Street and north of Wenlock Street, Waihi (legally described as part of Lot 7 DPS 33511) no new road connection to Whangamata RoadSH 25 shall be permitted.	all requirements of Table 3.1 since the length of the internal road is longer than 1000m. (b) –(d) N/A. Rawhiti Road is in the MPDC

Table 4: Assessment Criteria

Appendix 4: Kaimai Wind Turbine Definition Memorandum dated 21 May 2018 and the Kaimai Wind Farm Civil Engineering Peer Review report, May 2018 completed by Tiaki Engineering Consultants.

KAIMAI WIND FARM

Memorandum

Title: Kaimai Wind Turbine Definition

Date: 21 May 2018

Specialty	Company and Expert	Email
AEE	Enspire, Sue Ruston	sue@enspire.co.nz
Archaeological;	Andrew Hoffman	ajarchaeology@gmail.com
Aviation;	Peet Aviation, Brian Whelan	brian@rft.aero
Civil Drawings	Tektus, Jack Turner	jack.turner@tektus.nz
Civil Peer Review	TBA	
Construction	Energy3, Tom Cameron	tom@energy3.co.nz
Ecology - Site	Kessels and Associates; Gerry Kessels	Gerry@kessels-ecology.co.nz
Ecology - Environs	Ecology NZ; Simon Chapman	simon.chapman@ecologynz.nz
Electricity Market	ERS; Ashley Wall	ashley.wall@xtra.co.nz
Geotechnical;	KGA, Jacqui McCord	Jacqui@kga.co.nz
Turbine Transportation	Tranzcarr; Warwick Bell	warwick.bell@macmove.co.nz
Landscape	Mike Moore	mike@mmla.co.nz
Landscape Peer Review	Boffa Miskel; Boyden Evans	Boyden.Evans@boffamiskell.co.nz
Project Rationale	Energy3, Tom Cameron	tom@energy3.co.nz
Radio Communications	Lambda; Stephen Aitkinson	stephen@lambda.co.nz
Shadow Flicker	Energy3, Tom Cameron	tom@energy3.co.nz
Siltation	CES, Murray Preston	office@ces94.co.nz
Stormwater	CES, Murray Preston	office@ces94.co.nz
Tourism	TRC; Donna Graf	donna@trctourism.com
Traffic	Gray Matters, Alaisdair Gray	alasdair.gray@graymatter.co.nz

1. The purpose of this memorandum is to re-define the turbines that we wish to install at the Kaimai Wind Farm. However, within that definition we must allow a measure of flexibility to allow for competition in the turbine procurement process – that is – we don't wish to be constrained into using an obsolete turbine or a turbine from a single manufacturer.
2. Previously the turbines we defined as:
    a. Upper Ridgeline: 112m Hub Height, 136m rotor diameter, 180m tip height
    b. Lower Ridgeline: 132m Hub Height, 150m rotor diameter, 207m tip height
3. The previous definition was based upon the Vestas 3.6/4.2MW platform. However other manufacturers are now surpassing Vestas – notably GE and Gamesa/Siemens so we need to include for them also and not all future configurations are known.
4. Our new dimension scenarios are as follows
    a. Upper Ridge(18-24):
        i. (i) 112m Hub Height, 136m rotor diameter, 180m tip height (as before)
        ii. (ii) 107m Hub Height, 146m rotor diameter, 180m tip height

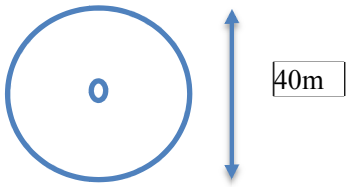
iii. (iii) 98m Hub Height, 146m rotor diameter, 171m tip height
iv.
v.

b. Lower Ridge(1-17):
   i. (i) 132m Hub Height, 150m rotor diameter, 207m tip height (as before)
   ii. (ii) 128m Hub Height, 160m rotor diameter, 207m tip height
   iii. (iii)110m Hub Height, 160m rotor diameter, 190m tip height
   iv.

Obviously, there is a lower practical limit in terms of for tip clearance above the ground, for this we have allowed 30m, which defines scenario (iii).

Clearly not all scenarios will need special mention for all of your studies.

5. Please clearly state in the summary/intro/front page of your documents the above dimension scenarios have been considered.
6. No changes are proposed to the location of turbines nor to the base arrangements.
7. The nacelle shapes have also changed recently, most notably with the GE turbine which has a large box structure under the Nacelle. Please note this if on relevance.
8. With respect to the maximum mass - my information at this stage is that the maximum weight remains as per the Vestas option of 90t. The maximum blade length becomes 78m.
9. Please revise your reports accordingly and email a revised updated version with an appropriate revision number included ASAP. This will allow us to complete the AEE.
10. Allow a locational flexibility (in the horizontal plane) of 20m. Which means the centre of the turbine tower could move 20m in any direction. For the avoidance of doubt the complete range of movement is therefore a circle of 40m diameter.
11. With respect to 10 above, please note if increased environmental effects would result for any particular turbine from moving the turbine by 20m in any direction. And either 1. assess those effects or 2. recommend that the movement in any particular direction is reduced or prohibited.
12. Images of Nacelles that should be allowed for are attached – dimensions available.



ENGINEERING CONSULTANTS

Kaimai Wind Farm

Civil Engineering Peer Review

KAIMAI WIND FARM LTD

Project reference: 13969

May 2018

KAIMAI WIND FARM

KAIMAI WIND FARM CIVIL ENGINEERING PEER REVIEW, PAEROA

May 2018
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TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 Project Background

Long-term projections on New Zealand's electricity demand indicate sustained growth over the medium to long-term. This increase must be met by sustainable growth in power generation capacity, and national government has provided direction and commitment toward the growth of capacity particularly from renewable sources. Latest projections indicate that up to 52% of new bulk energy sources to the New Zealand Grid up to 2026 would need to be sourced from wind power.

The proposed Kaimai Wind Farm development seeks to harness renewable wind energy within the upper North Island region close to Auckland, Hamilton and Tauranga demand centres, to supply an additional 100MW power capacity into the supply grid to this area. Typically the following criteria would be assessed to determine the suitability of a proposed wind farm site –

- Availability of a reliable wind source
- Availability of suitable land for construction of turbines
- Close proximity to locations of high energy demand
- Suitable distance from large population centres
- Practical access for transporting equipment and materials to the site
- Ability to connect to the national grid, and
- Avoidance of sensitive environmental areas

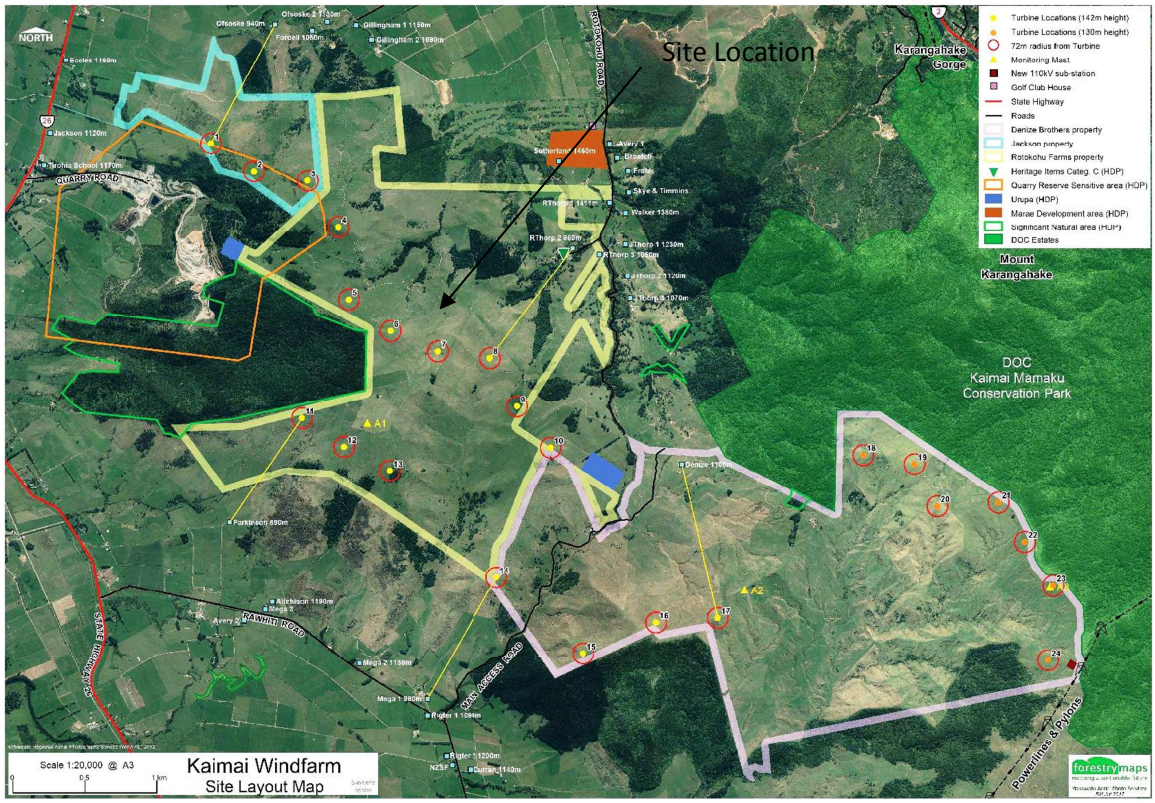

Figure 1: Site location and layout (Courtesy of Forestry Maps and Ventus Energy)

Kaimai Wind Farm Ltd have undertaken a broad range of studies to assess these any many other factors relating to the suitability, practicality and sustainability of the proposed wind farm, situated on the northern slopes of the Kaimai ranges, some 7km south of Paeroa and located within three privately owned farms, as indicated on the above site location and layout plan (Figure 1).

1.2 Scope of Work

Tiaki Engineering Consultants Ltd (TECL) has been engaged to undertake a broad peer review of the various civil engineering assessment studies, reports and preliminary designs completed by various parties in the development of the project concept, prior to commencing the process for application for Resource Consent from the Waikato Regional and Hauraki District councils.

The peer review therefore reviews the preliminary work carried out in assessing the suitability of the site from an engineering and construction practicality viewpoint, as well as identifying engineering risks associated with the construction, prior to Resource Consent application.

The report summarises the main items identified during the peer review process for further discussion and comment, and also seeks to provide consistency in approach and standard between the various engineering studies completed. It is further noted that on 23rd May the proposed turbine specifications for the installation were changed, and that all related reports were to be updated for the new specifications as required.

2.0 GEOTECHNICAL INVESTIGATION AND CONSIDERATIONS

A geotechnical engineering investigation exercise and report was carried out by KGA Geotechnical in 2016, including site investigation at each of the proposed twenty-four turbine sites and the electrical sub-station site, and general recommendations for the proposed access road upgrades. The investigation included a desktop study of aerial photos and published geotechnical maps, a detailed on site visual inspection, and selected sub-surface testing using hand operated equipment.

The report included assessment of Seismic design parameters considered applicable to the site, general site stability, settlement potential, founding parameters, drainage, access way and cable trench considerations, as well as the expected potential for sourcing roading and platform aggregate within the course of construction excavation.

The Table below provides a brief overall site summary as a geotechnical risk matrix for all twenty-four turbine sites identified. RZG have confirmed a similar matrix to be included within their report for the purposes of high level assessment.

Table 1: Description

Turbine	Historic Slope Instability	Shallow Rock Noted <3m	Creation of Platform for Turbine & Crane	Suspect Founding Conditions	Access Track Considerations
1					
2					
3	Yes	Yes	Yes		
4		Yes	Yes		
5			Yes	Yes	
6			Yes		
7			Yes		
8		Yes			
9		Yes			
10		Yes	Yes		
11	Yes	Yes	Yes		
12			Yes		
13		Yes	Yes		
14	Yes	Yes	Yes		Yes
15	Yes		Yes		
16	Yes		Yes		
17	Yes		Yes		
18	Yes		Yes		
19			Yes		
20	Yes		Yes		
21			Yes		
22	Yes		Yes	Yes	
23	Yes		Yes	Yes	
24	Yes		Yes		

In general the assessment report was suitable as an initial investigation for the purposes of feasibility assessment and Resource Consent application. Following initial review, the following potential issues were raised –

- It is important that there is consistency between the geotechnical recommendations and the other roadway and construction reports in terms of requirements such as maximum cut and fill slopes to platforms and roadways, assessment of deep road cuttings and steep side embankments at crest curves and platform sites, and estimated potential volume of rock which may be won during construction activities that can be used for crane platforms, laydown areas and road metalling. The geotechnical report should include some commentary on expected retaining wall solutions in areas of large cut and fill typically at platform and laydown area sites, as well as particular sections of roadway. In discussion with KZG, it is expected that a minimal percentage of metal required on the site will be won during roadworks operations, however the location of potential borrow pits and spoil areas has been determined, and will be included within the report.
- Although there have been some discussion on typically conservative foundation sizes for the turbines with the suppliers, further work is required to assess on-site conditions against supplier assumptions and minimum requirements for bearing capacity, etc. It is however expected that preliminary foundation sizes have been conservatively estimated. Foundation design assessment for each specific site will form an important part of the detailed design stage and will require individual assessment for each turbine.
- The characteristics of the proposed typical rock layers for founding are unclear at this preliminary stage, as only indicative refusal depths have been verified to date. It is expected that deep borehole drilling will only take place during detailed design stage, and the

suitability of the underlying rock for potential dowel anchorage assessed thereafter. Again, detailed foundation assessment and design will be required for each unique turbine site at detailed design stage, and RZG have confirmed that they will include recommendations within the preliminary assessment of the level of further investigation, testing and geotechnical design required for each site at the following detailed design stage.

- Although some of the general seismic characteristics of the site location, and underlying soil conditions are indicated in the geotechnical report, none of the engineering reports viewed to date discuss the expected Importance Levels and Design Life of the proposed facility, both of which will influence the design loading magnitude of seismic effects on the turbines, in terms of NZS1170 Part 0 design Annual Probabilities of Exceedance. It is therefore currently unclear as to what parameters have been used to assess the nominal foundation sizes, and whether this has been assessed against New Zealand Standards. The RZG report is to be updated to include information such as the expected Design Life, Importance Level, peak ground accelerations and resultant seismic design actions and requirements applicable to the site in general.
- Although not specifically related to the geotechnical aspects of the project, the turbine supplier will need to undergo significant design verification checks and review to ensure that the supplied turbines, ie blades and stem, are capable of resisting the local design seismic loading effects specific to the site conditions, in accordance with the requirements of New Zealand Standards and Codes of Practise.
- The geotechnical report should propose the level of geotechnical investigation, testing, verification and PS4 sign-off required for each individual turbine site during construction (In addition to the detailed geotechnical investigation and design process), to assist in formalising any Resource Consent conditions for on-site verification and sign-off of foundation platforms.

3.0 SEDIMENT CONTROL, STORMWATER AND CULVERT ASSESSMENTS

An engineering investigation report was carried out by Civil Engineering Services Ltd in October 2017, including site investigation and visual assessment at each of the proposed sites, detailing of general siltation mitigation proposals and solutions suitable to a typical discreet turbine site and typical roadway formations, as well as a separate assessment report of 4no culvert crossings identified along the main access roadway from State Highway 26 to the south of the site (Road One).

Following review of the reports completed to date and discussions between Civil Engineering Services Ltd, the following areas were discussed for further investigation and inclusion in preliminary assessments during the Resource Consent appraisal process or at detailed design stage as required –

- Although the sediment control and siltation mitigation proposals are well described and outlined within the report, it was agreed that a typical turbine site layout plan would be useful considering the similarity in site layouts, detailing typical arrangements of foundation excavations, water cut offs, topsoil bunding, rock check dams and silt fences, sediment pits and decant ponds, etc in relation to the adjacent crane pads and laydown areas. A typical layout drawing plan would enable better understanding of the logistics required for each discreet site, and facilitate better review and discussion during the Resource Consenting process.

- Further to the initial site investigation of culvert crossings, an additional fifth culvert crossing was discovered on site by the farmer at approximately chainage 2200m along 'Road One'. This is to be investigated and included within the assessment report by Civil Engineering Services Ltd.

- Roadway long-section preliminary designs completed after the culvert crossing assessment report indicate some filling and raising of the roadway at certain sag curves along 'Roadway One', including some raising of road levels over culvert crossings assessed. These raised roadways should be taken into consideration when assessing some of the culvert crossings which are assumed to overtop during 2 year storm events or greater for final design purposes and have been assessed on the basis of causeway design, as raised headwall levels would increase backflow behind the culvert and cause potential flooding or erosion issues elsewhere adjacent the roadway.

4.0 ACCESS ROADWAY NETWORK DESIGN

Preliminary engineering designs and drawings were carried out by Tektus Consultants Ltd in October 2017 for the upgrading of existing farm access roadways and tracks to a gravel / metal surfaced double access lane 6m wide roadway, which would be suitable for the construction access demands and trip frequencies of the individual turbine and substation sites, as well as for the long-term accessibility and maintenance requirements of the facility. It is noted that the full wind farm of 24no turbines is located across three adjacent privately owned farms, and that in general most of the proposed roadway access upgrades follow existing farm track basic alignments.

The roadway does however traverse reasonably steep and contoured hilly terrain which poses a number of challenges both for the construction of the roadway, as well as creating a reasonable and practical access route to all 25 discreet sites during the construction period for the intended deliveries. In this regard, the following items were noted for discussion –

- The roadway design longsections have a number of slopes at 15% (1 vertical in 6.7 horizontal) and an individual steepest section of 16.2% (1 vertical in 6.2 horizontal), which is steeper than the recommended 1 in 8 slopes mentioned within the Construction Report. It is recommended that this be investigated further with intended transport companies or Tranzcarr to verify that delivery of large and heavy components are possible at these slopes, particularly in potentially wet conditions.
- Again, some correlation with the geotechnical report is required to ensure limitations are not exceeded with respect to maximum allowable cut and fill slopes, limitations to deep cutting areas at certain roadway crowns, and potential sequencing of roadway construction to make best use of potential gravel material borrow areas in roadway cuttings. Retaining structures may be required in certain areas.
- In terms of roadway geometry, there are some unusual practical requirements to be considered with respect to the delivery of the seventy-two no. 78m length single unit turbine blades to the individual turbine sites. Tranzcarr Transportation studies have only

assessed routes to the entranceway on SH26, however restrictions to transport to individual sites will be governed by the internal access route geometry. Vertical alignment over the 78m blade length at the crest of certain roadway sections are of concern, as are horizontal curves where steep embankment cuttings are present to the inside of the curve. It is understood that each blade weight is approximately 20t, and is not feasible to perform any airlift operations of the blades via helicopter. It is strongly recommended that Tranzcarr assess the designed internal roadway and adjacent embankment geometry to confirm the transportability and manoeuvrability of the 78m long single-piece blades along these roads.

- The wind farm construction reports as a whole should indicate the degree of possible variability in position of each wind turbine site, and if this will have any impact on final access roadway route selection.

5.0 CONSTRUCTION CONSIDERATIONS

An overall engineering assessment report was carried out by Energy3 in March 2018, dealing primarily with the practical aspects of the construction phase of the wind farm installation, reviewing the preliminary geotechnical parameters identified, access and roadway construction requirements and potential issues, typical preliminary foundation details provided to date and construction requirements for these, as well as the craneage and laydown area requirements for each discreet turbine site and the single substation site.

The Construction Report was reviewed by Tiaki in an attempt to create consistency in parameters across the various civil engineering related reports, as well as identify any additional considerations required from a practical perspective in the design and construction methodology of the facility, which may require further input or consideration at Resource Consent stage. Following this review process, the following items were identified for further discussion and consideration –

- In general it is recommended that Heritage New Zealand, local iwi leadership structures and mana whenua, and the general public be engaged prior to formal application for Resource Consent, to ensure no unforeseen opposition to the planned project at consent stage.
- Although the planned wind farm site is remote, in an agricultural area and situated on privately owned land, the project involves significant construction disruptions in the district. The report should, for completeness, include planned limitations to noise effects on the site, surrounds and accessways, as well as daily hours of work, any weekend restrictions and expected overall construction project duration. These requirements would normally be included within Resource Consent conditions.
- The construction report should give consideration to the expected large volumes of concrete placement for each turbine foundation, in terms of volume of supply over a single day, access restrictions for concrete truck volumes to a single point, and seasonal issues over winter periods for mass concrete placements. It may be beneficial to assess the possibility of establishing a concrete batching plant on or near site rather than ready-mixed concrete from surrounding town centres, given the large volumes and transport challenges involved.
- Mention should be made within this report of a Traffic Management Plan requiring district and other local road authority approval prior to the commencement of construction activities.

- As mentioned within the roadway portion of the review above, the Tranzcarr report deals with the transportation of the turbine blades to the access point to the site from SH26. It is recommended that Transcarr be engaged again to include an assessment of the internal access roads on the farms to each of the 24 individual turbine sites, as this is expected to be the critical area in terms of manoeuvrability of the 78m long blades over vertical crest curves, and around horizontal bends with cut embankments on the inside of the curve. It is understood that each blade weight is approximately 20t, and is not feasible to perform any airlift operations of the blades via helicopter.
- Co-ordination of issues raised within other civil disciplines of this report should be updated within the Construction Report, such as the basis of preliminary foundation sizes against local conditions, engineered backfill over foundations for design stability requirements, suitability of rock founding layers, assessment of local design parameters to New Zealand Standards and Codes of Practice in design, roadway alignment and side slope limitations, possible retaining wall solutions in selected areas, expected volume of gravel material available to cut on site and suitable for metalling of roadways, platforms and laydown areas, general roadway geometric and capacity design standards for construction traffic requirements, etc.
- The report should include some indication of the ongoing maintenance requirements and responsibilities of the various parties involved within publicly accessible and private roadways on the farms, once upgrading of the access roadways and construction of the wind farm turbines and substation are completed. If Kaimai Wind Farms Ltd is to maintain roadways and carry out periodic regrading and reshingling of roads, this should probably be mentioned in the report as it may be a consent condition.
- Expected nett cut and fill volumes, and nett spoil off of the site, should be estimated and included in the report, as this has transportation and environmental implications.
- It should be noted in the Construction Report that two of the existing culverts are recommended for upgrade from a hydraulic capacity viewpoint, to bring their capacity up to a minimum of a 2 year storm event. The remainder of the culvert crossings should be inspected by a structural engineer prior to commencement of construction heavy traffic. Additionally at detailed design stage, the ability of existing culvert crossings to be overtopped as a causeway during larger storm events needs to be assessed against proposed lifting of roadway levels across vertical sag curves.

6.0 DISCUSSIONS AND RECOMMENDATIONS

In general the civil engineering related reports are completed to between a feasibility and preliminary design stage, and are suitable for the purposes of supporting documentation for Resource Consent application. Some correlation and consistency is required between reports which were developed in parallel to ensure that engineering design parameters and limits are uniform across all areas of the design.

Additional information has been identified in certain of the reports which can be readily included, which may assist in the Resource Consent review process, and formulation of consent conditions.

Certain design requirements and considerations have been highlighted at this stage which may require adjustment to the final design approach. In particular, the practicality of transportation and

delivery of the 78m long wind turbine blades along the internal roadways requires additional investigation in terms of slope steepness, vertical clearance over crest curves, and manoeuvrability around tight horizontal curves in cuttings or where there are steep embankments on the inside of curves. Ensuring that the design of all proprietary equipment associated with the turbines meets the seismic requirements of New Zealand Standards and the local conditions present at the site will also require careful consideration during the detailed design stage.

In general it is recommended that Heritage New Zealand, local iwi leadership structures and mana whenua, and public participation hearings be carried out prior to formal application for Resource Consent, to ensure no unforeseen opposition and delays to the planned project at consent stage.

7.0 APPLICABILITY

This report has been prepared for the benefit of **Kaimai Wind Farm Ltd** with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose without our prior review and agreement.

If you require any additional engineering input for this project or have any questions or queries please do not hesitate to contact us.

Tiaki Engineering Consultants LTD

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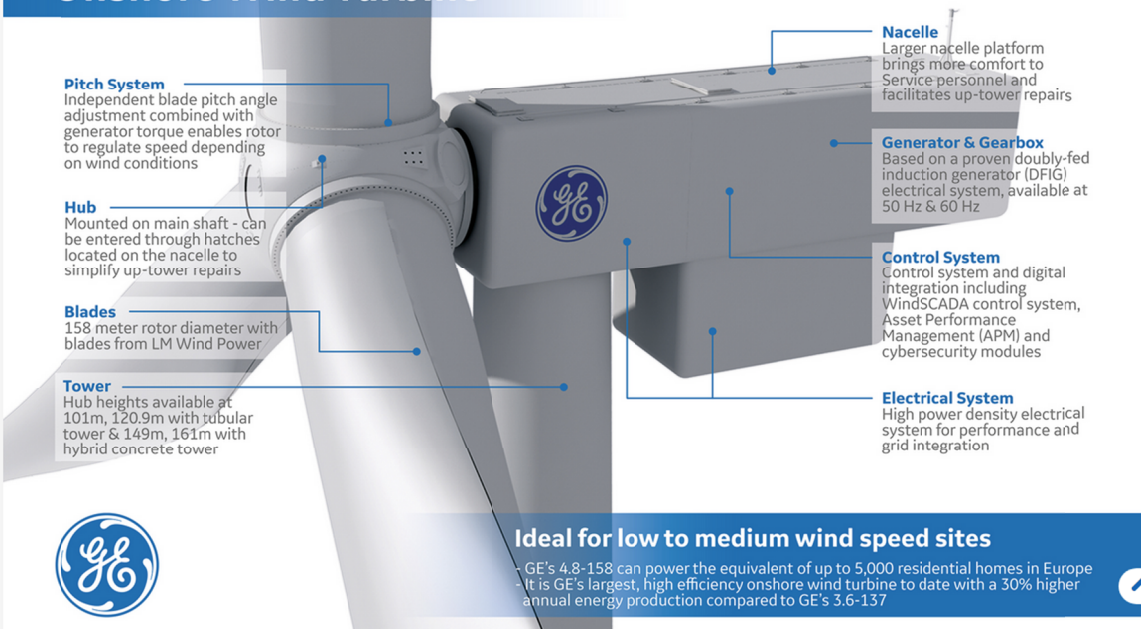
Onshore Wind Turbine



Pitch System
Independent blade pitch angle adjustment combined with generator torque enables rotor to regulate speed depending on wind conditions

Hub
Mounted on main shaft - can be entered through hatches located on the nacelle to simplify up-tower repairs

Blades
158 meter rotor diameter with blades from LM Wind Power

Tower
Hub heights available at 101m, 120.9m with tubular tower & 149m, 161m with hybrid concrete tower

Nacelle
Larger nacelle platform brings more comfort to Service personnel and facilitates up-tower repairs

Generator & Gearbox
Based on a proven doubly-fed induction generator (DFIG) electrical system, available at 50 Hz & 60 Hz

Control System
Control system and digital integration including WindSCADA control system, Asset Performance Management (APM) and cybersecurity modules

Electrical System
High power density electrical system for performance and grid integration

Ideal for low to medium wind speed sites

- GE's 4.8-158 can power the equivalent of up to 5,000 residential homes in Europe
- It is GE's largest, high efficiency onshore wind turbine to date with a 30% higher annual energy production compared to GE's 3.6-137