

**IN THE MATTER** of the Resource Management Act 1991

**AND**

**IN THE MATTER** of a notice of requirement issued by **WEL NETWORKS LIMITED** pursuant to section 168(2) of the Act for designations (3) to authorise the implementation of the Western Network Upgrade Project

## **STATEMENT OF EVIDENCE OF TONY GLENN KEYTE**

### **1. INTRODUCTION**

#### **Qualifications and experience**

- 1.1 My name is Tony Glenn Keyte. I am a senior civil and transportation engineer with Bloxham, Burnett & Olliver Limited (BBO), a firm of consulting engineers, planners and surveyors. I have over 18 years experience as a civil and traffic engineer.
- 1.2 My qualifications are Masters of Engineering in Transportation (University of Canterbury, 2007) and a New Zealand Certificate in Civil Engineering (Waikato Polytechnic, 1991).
- 1.3 I am an associate member of the Institute of Professional Engineers New Zealand and a member of the Registered Engineers Association, Member of Contractors Association, Member of NZ Water and Waste Association and have a number of other memberships with NZ and Australian engineering associations.
- 1.4 I have undertaken civil engineering roles on a number of large infrastructure projects in the North Island of New Zealand with a strong focus on roading and land development.

### **Involvement in project**

- 1.5 I have been engaged by WEL Networks Ltd (“WEL”) to assess the public road environment and transportation planning effects of a proposal to establish and operate:
- (a) The Te Uku Wind Park substation;
  - (b) The Te Kowhai substation; and
  - (c) A 110kv line between the Te Uku Wind Park substation and Te Kowhai Substation.
- 1.6 WEL have also asked me in my civil engineering capacity to consider the civil engineering aspects of the project presented in the NOR.
- 1.7 I have visited the site and am familiar with the surrounding locality and have established a general understanding of the site.
- 1.8 As part of my involvement with this project, I have taken advice from WEL (in particular, Mr Jackson) with regard to expected methods of construction to assist in forming my evidence.

### **Purpose and scope of evidence**

- 1.9 Against that background, the purpose of my evidence is to describe and assess the transportation effects of the proposal and address key civil engineering aspects of the proposal.
- 1.10 In that regard my evidence will address the following:
- (a) Key elements of the proposal (Section 3). In this section I outline the key elements in relation to traffic and civil engineering.
  - (b) Location in the road network (section 4). In this section I identify the location of the site in terms of its accessibility using the road network and describe the State Highway and local road connections are described
  - (c) Road safety (Section 5). In this section I assess the key intersection and access locations and comment on suitability for the proposed use.
  - (d) Assess the traffic likely to be generated by, and potential effects on the road network of, the activity (Section 6).

- (e) Assess the proposal against relevant transport related policies objectives and strategies including the relevant provisions of the district plan and the New Zealand Transport Strategy (Section 7).
- (f) Address civil and geotechnical issues (Section 8). In this section, I give an overview of the geology, geotechnical design and consider the “hot spots” in relation to pole locations.
- (g) Submissions received in relation to traffic and civil engineering (Section 9).
- (h) Comments on the officers report and suitability of the proposed conditions (Section 10).
- (i) Outline my conclusions and recommendations (Section 11).

1.11 A summary of my evidence is provided in section 2.

#### **Expert Witness Code of Conduct**

1.12 I have been provided with a copy of the Code of Conduct for Expert Witnesses contained in the Environment Court’s Consolidated Practice Note 2006[2006] NZRMA 357. I have read and agree to comply with that Code. This evidence is within my area of expertise, except where I state that I am relying upon the specified evidence of another person. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

## **2. SUMMARY**

2.1 The purpose of this section of is to provide a brief summary of my evidence. My detailed comments follow.

#### **Location in and use of road network**

2.2 The key roads in the state highway and district road network that will be used for access include State Highways 23 and 39 (regional arterial roads); Te Mata Road and Kawhia Road (scenic and tourism route); Karakarariki Road, Cogswell Road, Heddon Road and Bedford Road (local roads).

#### **Road safety**

2.3 I have considered the safety effects of the proposed activity in areas where the risk is highest, i.e. at intersections and access locations. State Highway

39 will only be used for access to the Te Kowhai substation, traffic volumes will be low and I do not envisage any risks associated with traffic safety in relation to the use of that road. The sight distances at each local road intersection with State Highway 23 are good and, in my view, should not give rise to any safety issues.

- 2.4 The entrance to the Te Kowhai Substation on Bedford Rd has sufficient sight distance provided that the existing long grass and vegetation is trimmed, which is proposed as Condition 7.5 (Te Kowhai conditions). Access to the Te Uku Wind Park substation will be via the same access as the Wind Park (i.e. Te Mata Road, Kawhia Road). There will be no safety issues associated access the Te Uku Wind Park substation.
- 2.5 The safety of each access point to pole locations will need to be assessed and, if the sight distance is less than the District Plan requirement, suitable traffic management systems should be implemented via traffic management plan.

#### **Traffic generated by proposal**

- 2.6 Construction of the substations involves movement between five to 20 vehicles over a 28 week period. In addition the lines construction will generate traffic through the transport of poles to lay down areas and by transport of poles and equipment to individual pole sites.
- 2.7 The construction methodology for the project will ultimately be determined by the contractor who constructs the line and therefore traffic generation cannot be estimated with precision. However, I have assessed traffic generation based on two scenarios (i.e. the likely construction methodology set out in the NOR and minimising use of helicopters for transportation and erection of poles), in order to have assessed the “worst case scenario”.
- 2.8 Based on the likely construction methodology set out in the NOR, total traffic movements would be 2920 (19 vehicles or 38 vehicle movements per day averaged over 6 months). Based on the scenario which minimises use of helicopters, total traffic movements would be 3068 (20 vehicles or 40 vehicle movements per day averaged over 6 months).
- 2.9 The typical daily increase in traffic volumes will only have a minor effect on the roading network. Even if those levels were to double to 40 vehicles per day (equating to 80 total movements), that level of traffic generation would still have a minor effect of the roadway capacity.

### **Relevant objectives, policies and strategies**

- 2.10 The construction planning activity proposed via the Construction Management Plan is consistent with the objectives of the New Zealand Transport Strategy and the New Zealand Transport Agency.
- 2.11 The relevant objectives and policies of the district plan relate to ensuring the road network is integrated, safe, responsive and sustainable and maintained improved and protected, providing adequate on-site parking and minimising impact on the environment resulting from the land transport system. This proposal is consistent with those objectives.

### **Civil and geotechnical engineering issues**

- 2.12 The geology of the proposed route typically consists of basement siltstone and sandstone materials and some more recent alluvium and unwelded ignimbrite deposits. The underlying parent material is covered in more recent deposits of ash in many places.
- 2.13 Geotechnical investigations will be undertaken before the design of the route is finalised and foundations designed as a result. Micro-siting of poles may be required to avoid site specific poor soils and engineering design will be varied to suit the pole foundations.
- 2.14 Where poles are required to be located in areas that exhibit visual signs of land instability, construction will be engineered to suit by sleeving poles and founding on bed rock through deeper concrete foundations.
- 2.15 Poles located in the hilly section of the route tend to be located on ridge lines or high points which have more stable geology than side slopes. Poles located in steep slopes may require consent from Environment Waikato.
- 2.16 Poles 89 and 90 are located near an existing roading cut embankment, which is steep and could be subject to minor surface slipping. Options to address this issue include coring an oversize hole down below ground (road) level and placing the pole inside a sleeve, which would mitigate any soil movement.
- 2.17 Poles located in flood plains can be successfully erected and concrete foundations founded on firm layers well below the ground surface which will minimise any high water level induced effects.

- 2.18 Poles located in areas of active movement can be mitigated through engineering design by founding on competent rock or by micro siting locations one way or the other from the active site within the designation.
- 2.19 Where earthworks are such that silt and sediment control measures are required, the Environment Waikato Erosion and Sediment Control Guidelines for Land Disturbing Activities guides the required site controls. These will be addressed via the Construction Management Plan.

### **Submissions**

- 2.20 Ms Fletcher has raised the issue of the possibility of vehicles damaging the poles. This issue is addressed by requiring poles to be erected outside of the “clear zone”. “In the event that a pole cannot be erected outside of the clear zone, the proposed conditions provide for a guardrail style barrier to be erected in front of the pole.
- 2.21 Mr McGowan has raised an issue with respect to further widening and upgrading of roads and the restriction the lines will place on this. The road controlling authority has the right to upgrade roads within the corridor irrespective of whether or not utilities are in the corridor and issues arising will be addressed at such time.
- 2.22 Other submissions relating to signage and land stability have already been addressed.

### **Proposed conditions**

- 2.23 In my view, the proposed draft conditions suggested by Council adequately mitigate the effects raised by submitters and any other traffic related effects and geotechnical and civil engineering related effects, subject to minor amendments.

## **3. KEY ELEMENTS OF PROPOSAL**

- 3.1 The proposal is comprehensively described in the Notice of Requirement together with the further information supplied through the Section 92 process and in evidence by others. I have briefly outlined those elements relevant to my evidence below.

### **Traffic related elements**

- 3.2 The key transportation elements can be summarised as follows:
- (a) Erection of (approximately) 237 power poles;
  - (b) Construction of two substations, one at the existing Transpower Te Kowhai Substation site and one at the Te Uku Wind Park site;
  - (c) Primary access via State Highways and local roads;
  - (d) Secondary access via existing farm track networks;
  - (e) Some minor upgrading to existing tracks as required.
- 3.3 The key transportation planning matters in this application are:
- (a) The movement for construction related vehicles to and from the site;
  - (b) Site access provisions;
  - (c) The transportation of some over dimension loads.

### **Civil engineering elements**

- 3.4 The key civil engineering matters relevant to this proposal are the location of poles in the following areas:
- (a) In areas of potential land instability;
  - (b) On steep slopes;
  - (c) On the bank within State Highway 23 (pole 90A);
  - (d) Within in flood plains; and
  - (e) On ground that exhibits anecdotal evidence of possible historic movement.

## **4. LOCATION IN AND USE OF THE ROAD NETWORK**

- 4.1 In this section of my evidence, I will identify the location of the site in the context of the road network and describe the proposed use of each of those roads. This includes both state highways and district road network hierarchy.

4.2 Figure 1 shows the general location of the site in the wider context of the road network. The site is spread out over a large area (some 28km) and access is via a number of different routes and roads.

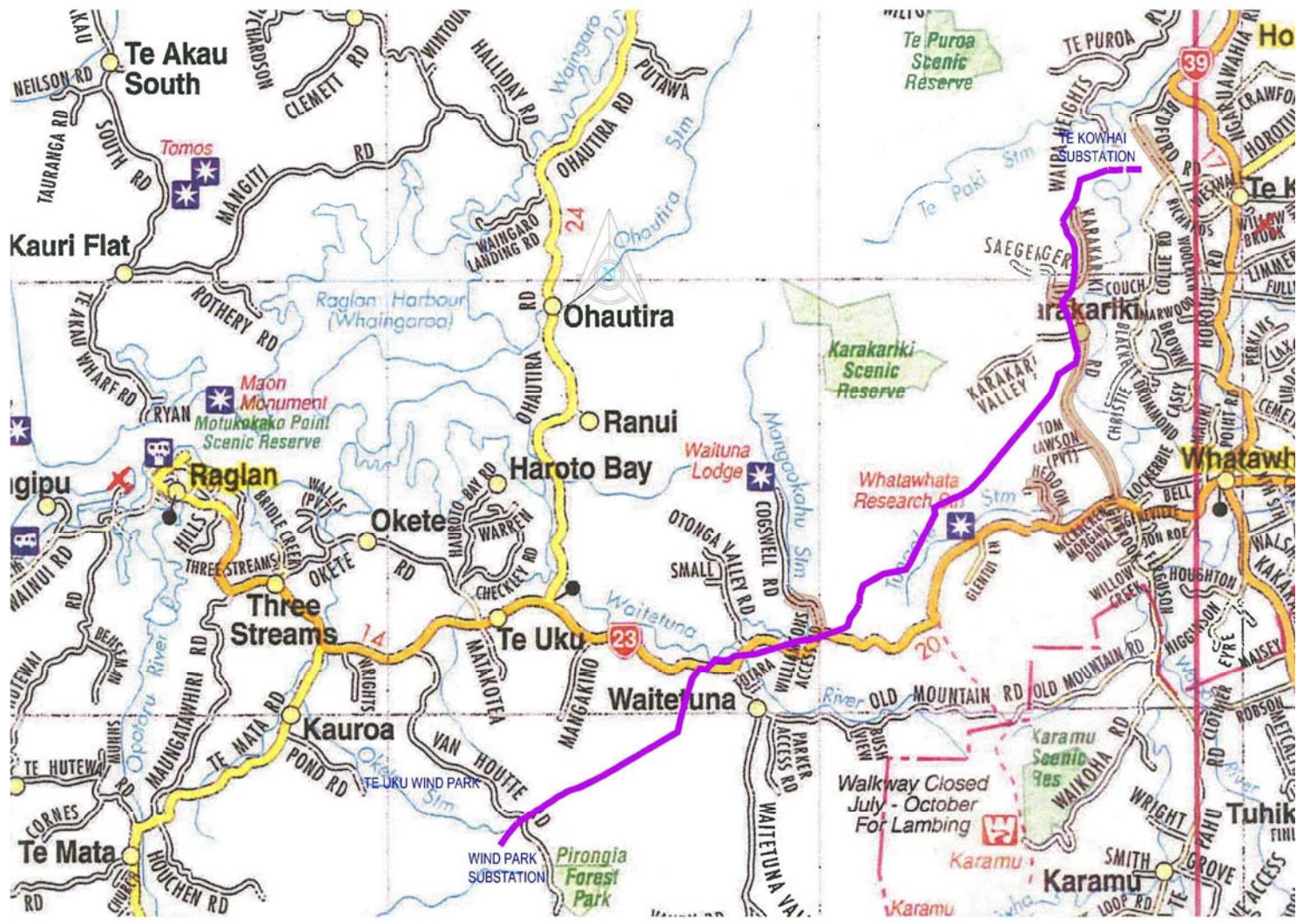


Figure 1 - Roading Locality Map

- 4.3 The key roads that will be used for access include:
- (a) State Highway 23 – Regional Arterial
  - (b) State Highway 39 – Regional Arterial
  - (c) Te Mata Road – Scenic and Tourism Route
  - (d) Kawhia Road – Scenic and Tourism Route
  - (e) Karakarariki Road – Local Road
  - (f) Cogswell Road - Local Road
  - (g) Heddon Road – Local Road
  - (h) Bedford Road – Local Road
- 4.4 State Highway 23 is the main road from Hamilton to Raglan and will be used to transport poles to lay down areas and to individual pole within the State Highway 23 road reserve. It will also be used for access for construction purposes.
- 4.5 Its Regional Arterial status indicates the importance of the road as a life line to communities such as Raglan, Te Uku, Te Mata and Waitetuna. Whilst these communities rely on the State Highway as a connection to Hamilton and the wider area the standard of road alignment is lower than that of primary routes such as State Highway 1 or 2. It has traffic volumes of around 6500 vehicles per day (7.6% being heavy commercial vehicles<sup>1</sup>). The traffic volumes decrease as the State Highway gets further away from Hamilton. Typically, 25-30% of all vehicles on the highway are commuter traffic and use the road during peak periods of 7:30am to 8:30am and 5pm to 6pm. Whilst the road is of lower standard than primary State Highways, it is of suitable standard to accommodate large vehicles.
- 4.6 State Highway 39 is the main route to the Te Kowhai substation and will be used for the purposes of construction of that substation and transporting equipment to the substation.
- 4.7 Te Mata Road and Kawhia Road will primarily be used for access to the Te Uku Wind Park substation (including transportation of equipment to that site) and for

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<sup>1</sup> Traffic volumes are sourced from NZTA traffic count database. Count location is on SH23 close to Maori Point Road.

the purposes of constructing of the poles on the Vanhoutte and Clifford properties. It may be used to access the Richards and Van der Helm property, however it is also possible that access to the pole locations on these properties could be from the SH23 access to each of the properties and via their farm tracks.

- 4.8 Karakariki Road will be used for access to transport and construct the poles along that road and nearby properties (i.e. those east of The Deviation).
- 4.9 Cogswell Road will be used for access to the pole locations near that road and to dismantle some of the existing lines in that area.
- 4.10 Heddon Road is an unsealed road which will be used for access to poles on private property in that location.
- 4.11 Bedford Road will be used to transport equipment to the Te Kowhai substation and for the purposes of construction of that substation.

## 5. **ROAD SAFETY – SITE ACCESS AND SIGHT DISTANCES**

- 5.1 The purpose of this section of my evidence is to assess potential safety issues of the proposed activity. For the purposes of that assessment, I have considered the safety effects of the proposed activity in areas where the risk is highest, i.e. at intersections and access locations.

### **State Highway 23 and State Highway 39**

- 5.2 As noted above, the primary access to the sites will be via State Highway 23 and State Highway 39. As State Highway 39 will only be used for access to the Te Kowhai substation, traffic volumes will be low and I do not envisage any risks associated with traffic safety in relation to the use of that road.
- 5.3 The use of State Highway 23 will be much higher given that almost all of the equipment for the project will need to be transported along that route. I have visited each local road intersection with State Highway 23 and assessed the potential safety issues that may arise at those intersections.
- 5.4 The results of my analysis are set out in the table below.

**Table 1: State Highway 23 intersections**

	<b>Intersection Form</b>	<b>Road Width</b>	<b>Sight Distance (looking from intersection)</b>	<b>Comments</b>
<b>Cogswell Rd</b>	"T" intersection with Right Turn Bay	5m	Right – good Left 100m	65km/h curve – recommended sight distance = 149m*
<b>Heddon Rd</b>	"T" intersection	4m (unsealed)	Right – good Left - good	
<b>Karakariki Rd</b>	"T" intersection	6m sealed  4m wide unsealed in places	Right – good Left - good	

\*the sight distance looking to the left applies for vehicles turning right out of the intersection. This is unlikely as most vehicles will turn left out of Cogswell Rd and head towards Hamilton.

5.5 In summary, the sight distances at each intersection are good and, in my view, should not give rise to any safety issues in relation to the traffic related activities required to build the project. My investigations into the New Zealand Transport Agency Crash Analysis Database did not reveal any significant historic crash problems with any of the intersections mentioned in Table 1 when compared to the national average for similar intersections.

#### **Te Kowhai substation access**

5.6 I also visited the entrance to the Te Kowhai Substation on Bedford Rd. The site access has sufficient sight distance to comply with the Waikato District Council's District Plan, provided that the existing long grass and vegetation is trimmed<sup>2</sup>. I note that the officer's report suggests that the maintenance of that vegetation

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<sup>2</sup> I note that the vegetation has been trimmed as at 6/3/09

during the construction period should be included in the traffic management plan for the site (Condition 7.5, Te Kowhai conditions) and I agree with that condition.

- 5.7 I also note that the northern intersection of State Highway 39 and Bedford Road consists of a full right turn and provides appropriate sight distances for that intersection.
- 5.8 Mr and Mrs Hodge have raised an issue in their submission relating to appropriate signage at the Te Kowhai substation. In that regard, Mr and Mrs Hodge have observed that the current sign at the vehicle entrance to the Te Kowhai Substation site is not readily able to be seen and results in the ongoing need for vehicles to “U-Turn” in the entrance to the Hodge’s property. A practical method to ensure that vehicles do not miss the site entrance is for WEL to erect a clearly marked entrance sign and also to provide advanced warning signage, particularly during the construction period. This would both address Mr and Mrs Hodges’ concerns and improve traffic safety in relation to that entrance way. The proposed conditions address signage at Condition 7.4 (Te Kowhai conditions).

#### **Te Uku Wind Park substation access**

- 5.9 Access to the Te Uku Wind Park substation will be via Te Mata Road, Kawhia Road and then via the new Te Uku Wind Park road to the Wharauroa Plateau (which is required by Condition 7.3, Te Uku conditions). This route was assessed in the Te Uku Wind Park consent and was considered to be appropriate for construction traffic for the Wind Park subject to conditions relating to upgrading access ways. It is essential that this road is constructed, otherwise transport of heavy transformers to the substation site (near the summit) would not be possible.
- 5.10 In my view, there will be no safety issues associated with access the Te Uku Wind Park substation.

#### **Access to pole locations**

- 5.11 Access to pole locations will generally utilise existing farm or property access points. The safety of each access point is unknown at this stage, however the officer’s report recommends that these be identified and an assessment undertaken with respect to suitable site distances as part of the Traffic Management Plan (Condition 6.2(b) (Lines conditions)). In my view, that is an appropriate condition. Should the sight distance be less than the District Plan

requirement, suitable traffic management systems should be implemented, including temporary warning signage.

## 6. **TRAFFIC GENERATED BY PROPOSAL**

- 6.1 The purpose of this section of my evidence is to assess the traffic likely to be generated by the proposal and assess the likely effects of the proposal on the road network.

### **Te Kowhai and Te Uku Wind Park substations**

- 6.2 The method of construction of the substations is addressed in the evidence of Mr Mollekin. In summary, construction of the substations involves movement of vehicles over a 28 week period as follows:

- (a) Site earthworks (2 weeks) approximately 200 truck loads = 16 per day;
- (b) Formwork and foundations (4 to 6 weeks) approximately 1 truck per day, two vans per day, two concrete trucks over one week and 10 aggregate trucks (aggregate to Te Kowhai Substation only);
- (c) Building construction (12-16 weeks) approximately 5 vehicles per day;
- (d) Installation of electrical equipment (6 weeks) approximately 5 vehicles per day).

- 6.3 The traffic generated at the Te Uku Wind Park substation site is likely to be less, given that many of the vehicles required for construction of that substation will already be on site and there will be no need to transport aggregate from off site as that will be sourced from the Te Mata Quarry or from borrow areas on site. Thus, in general terms, the effects of the traffic associated with construction of the Te Uku Wind Park substation has been factored into the Wind Park consent.

### **Transportation of poles and line**

- 6.4 Poles will generally be transported by vehicle to a site relatively close to the erection point and stockpiled in a lay down area. A number of poles will be transported together typically stacked on trailers two high and three wide. Haulage trucks will most likely be standard 18m semi trailers with the loads extending over the back of the vehicle. The use of over dimension vehicles will be required from time to time to transport the longer poles to site. The lines will also be transported by haulage trucks to a lay down area or in some cases directly to

the location for erection, i.e. just in time process to minimise double handling and security issues.

- 6.5 The transportation of poles will be required to be undertaken in accordance with the accepted rules and regulations required of over dimension haulage.
- 6.6 Estimates as to the traffic likely to be generated by transportation of the poles and line are set out in the table below.

#### **Construction of poles and line**

- 6.7 I understand that WEL intends to let a contract for construction of the project and that the contractor will ultimately determine the construction methodology, however I have assessed traffic effects based upon both:
  - (a) The likely construction methodology as set out in the NOR (Volume 1B), which uses helicopters wherever it is necessary due to terrain or would otherwise be economical to do so; and
  - (b) A construction method that minimises the use of helicopters and maximises the use of land based vehicles (i.e. where helicopters are used only where it is not possible to gain access via land).
- 6.8 In that regard, my assessment of effects includes a “worst case scenario” assessment. I note that the method of pole foundation and erection could also vary depending on availability of construction equipment and time of year. As will be discussed below, I have estimated traffic generation over a 6 month period rather than a 12 month period (which is the expected construction time frame), which would cover a “worst case scenario” in that regard.
- 6.9 The particulars relating to the physical method of construction of the poles are set out in detail in the NOR, Mr Mollekin’s evidence and Mr Jackson’s evidence.
- 6.10 I have summarised the likely pole foundation and installation method into the key activities as follows:

**Table 2 – Likely foundation and installation method**

	<b>Foundation Construction Method</b>	<b>Foundation Concrete Pour</b>	<b>Pole Installation Method</b>	<b>Line Installation</b>
Bulldozer & Backloader Auger	237			
Helicopter		112	148	237
Truck		125	89	

**Assessment of traffic likely to be generated**

- 6.11 Based on the likely construction methodology outlined above, the construction of the pole foundations will generate only limited vehicle movements on public roads due to the fact that the auger is track mounted and will generally stay on the site moving from one pole to the next.
- 6.12 In terms of construction of the substations and installation of the poles and line, the table below sets out the estimated traffic movements associated with the likely construction methodology and with the construction scenario which minimises the use of helicopters (thus maximising use of land based vehicles).

**Table 3 – Traffic movements likely to be generated**

	<b>Using Helicopters</b>	<b>Minimising the Use of Helicopters</b>
Staff Vehicles	650 total (5 per day)	650 total (5 per day)
Cable Deliveries	100 total	100 total
Pole Deliveries including uplifting and taking to site	40 to lay down area 89 to pole sites	40 to lay down area 237 to pole sites
Concrete Deliveries (either to laydown or directly to site)	237 poles = 119 trucks	237 poles = 119 trucks
Other Materials (steel Cages etc)	312 (2 per day)	312 (2 per day)
Track improvement materials and plant	100 trucks	100 trucks
Substation Construction	500 trucks total 860 light vehicles total	500 trucks total 860 light vehicles total
Dismantle and removal of old line	50 light vehicles 100 trucks	50 light vehicles 100 trucks
<b>TOTAL</b>	2920  19 vehicles per day average (38 vehicle movements)	3068  20 vehicles per day average (40 vehicle movements)

6.13 This estimate is based on a six day working week over a six month construction period. As noted above, a six month construction period is optimistic (the

construction period is expected to be closer to 12 months) but I have undertaken the assessment on this basis in order to reflect high per day traffic volumes that might arise as a result of particular circumstances (such as weather restrictions, etc).

#### **Assessment of traffic related effects**

- 6.14 Table 2 indicates that there will be minimal difference in the number of vehicles on the overall network, regardless of the construction methodology. The main difference between the two scenarios is the length of travel for each vehicle and the roads that are used. For example, poles will be delivered to a central convenient lay down area. At this location, if helicopters are being used, the poles will be airlifted and taken to the pole install location. If they are transported by road instead of helicopter, the pole will be re-loaded to a suitable truck with off road ability and transported by local road to the nearest access track at which point it will be transported over land via tracks.
- 6.15 Either way, the typical daily increase in traffic volumes that will arise from this project (i.e. between 38 and 40 vehicle movements per day) will only have a minor effect on the both the State Highways and local authority roads. It is likely that the increased traffic volumes will be higher on some days than others. Even if the traffic was to double to 40 vehicles per day (equating to 80 total movements) that level of traffic generation would still have a minor effect of the roadway capacity particularly as those movements are spread out of a large portion of the network i.e. from Bedford Road to as far as Kawhia Road. The concentrations of vehicles on an individual road will be much less than that.
- 6.16 The lay down areas have not been defined or nominated at this stage of the process and I understand that the preferred contractor will nominate such sites on the basis of safety and accessibility. In order to provide certainty that appropriate locations are selected, the contractor should be required to submit the details of those lay down areas in the Construction Management Plan and that is proposed by Condition 2.2(a) (Lines conditions) and access arrangements should be considered in the context of the Traffic Management Plan (addressed by Condition 6.2, Line conditions).

### **7. RELEVANT STRATEGIES, POLICIES AND OBJECTIVES**

- 7.1 The purpose of this section of my evidence is to address the relevant strategies, policies and objectives as set out in the New Zealand Transport Strategy, the

objectives of the New Zealand Transport Agency and the relevant provisions of the District Plan.

### **New Zealand Transport Strategy**

- 7.2 The New Zealand Transport Strategy (NZTS) is the national guiding document, issued by the Minister of Transport, to direct transportation outcomes in New Zealand. Its vision is:

*“By 2010 New Zealand will have an affordable, integrated, safe, responsive and sustainable transport system”.*

- 7.3 The Strategy is underpinned by four key principles. These are:

- (a) **Sustainability** – *“To ensure that transport is underpinned by the principles of sustainability and integration, transport policy will need to focus on improving the transport system in ways that enhance economic, social and environmental wellbeing, and that promotes resilience and flexibility. It will also need to take account of the needs of future generations, and be guided by medium and long term costs and benefits”.*
- (b) **Integration** – *“It is intended to facilitate integration, cooperation and collaboration between stake holders to ensure the efficient use of existing and new public investment”.*
- (c) **Safety** – *“To ensure that transport is underpinned by the principles of safety and responsiveness, policy will need to ensure high standards of health, safety and personal security for all people, including users, workers and operators”.*
- (d) **Responsiveness** – *“The diverse needs of urban and rural communities needs to be recognised”.*

- 7.4 The construction planning activity proposed (i.e. via the Construction Management Plan) is consistent with the objectives of the New Zealand Transport Strategy. Contractor travel planning is recommended to minimise transport movement, and minimise the probability of safety related interactions on the road network for the duration of the construction period. The use of helicopters to help minimise impacts on lower volume roads should also be encouraged.

## **Land Transport New Zealand and New Zealand Transport Agency (NZTA)**

7.5 The objectives of these two authorities are set out in the Land Transport Management Act (LTMA) 2003 and the Land Transport Management Amendment Act 2004. New Zealand Transport Agency (formally Land Transport New Zealand and Transit New Zealand) has the objective of:

*“contributes to an integrated, safe, responsive, and sustainable land transport system”.*

7.6 In undertaking this assessment, I have given proper consideration to this objective and consider that the proposal meets that objective.

7.7 Consultation has been co-operatively progressed with New Zealand Transport Agency. New Zealand Transport Agency has written to confirm its acceptance of the proposal subject to the incorporation of a traffic management plans and construction details of the poles to be erected in road reserve. The conditions of NZTA’s letter are included as recommended conditions of the NOR.

## **District Plan**

7.8 The transport related objectives and policies of the Waikato District Plan are set out in Chapter 8 Land Transport Network of the proposed District Plan. The key objectives and policies in the proposed plan are similar to that in the operative plan. Generally speaking, the relevant objectives and policies relate to:

- (a) Ensuring the road network is integrated, safe, responsive and sustainable and maintained improved and protected.
- (b) Land use activities should provide adequate on-site parking
- (c) Minimisation of impact on the environment resulting from the land transport system.

7.9 In undertaking this assessment, I have given proper consideration to this section and consider that the proposal meets the objectives and policies of the District Plan. The use of helicopters will minimise effects on the land transport system. Sufficient parking is provided at both substation sites. My involvement in the Te Uku Wind Park Operations and Maintenance area design provides sufficient parking for five vehicles. My visual observations at the Te Kowhai Substation reveals ample hardstand and parking area. Both substation site parking is all off road parking.

7.10 Consultation has been co-operatively progressed with Waikato District Council (roading). WDC has written to WEL to confirm its acceptance of the proposal subject to the incorporation of a traffic management plans, setbacks and construction details of the poles to be erected in road reserve, which matters have been addressed via proposed conditions of the NOR.

## 8. **CIVIL AND GEOTECHNICAL ENGINEERING ISSUES**

8.1 I am not a specialist geotech engineer, however I have many years experience in civil engineering in relation to construction projects in the general area. I also have sought some general advice from my colleagues at Bloxam Burnett & Olliver Ltd in relation to specific geotechnical issues in relation this proposal.

8.2 The purpose of this section of my evidence is to briefly review the geology of the area with a view to drawing general conclusions about the suitability of the route for the purposes of constructing poles, to describe the process that WEL will follow in order to ensure that poles are suitably located from a civil engineering perspective and to discuss how poles located in potential “hot spots” may be constructed. I will also provide some detail with respect to the silt and sediment control measures that may be required to be employed.

### **Overview of site geology**

8.3 I have reviewed the NOR and the general geology that encompasses the project area. The geology of the proposed route for the 110kv line alignment from the Te Uku Wind Park to Te Kowhai Substation typically consists of basement siltstone and sandstone materials, with the last section near Te Kowhai consisting of more recent alluvium and unwelded ignimbrite deposits. The underlying parent material is covered in more recent deposits of ash in many places. There are other soils such as peat, gravels and sands but these are not as predominant in the area.

### **Geotechnical design**

8.4 While site specific geotechnical investigations have not yet been undertaken, such investigations would ordinarily be undertaken before the design of the route is finalised. In that regard, WEL proposes to appoint a suitable designer who would be required (amongst other things) to:

- (a) Satisfy themselves that the design(s) proposed for foundations and support of the pole locations and substations is suitable and fit for purpose

in accordance with the appropriate civil engineering, Council and electricity regulations.

- (b) Undertake any geotechnical testing required to determine the foundation conditions that exist and make all necessary allowance for the variability of soils across the site.
- (c) Ensure the long term stability of any works designed, ensuring the design life (60 years) of the poles and lines is not compromised by the soils or foundations.
- (d) Ensure that all civil engineering required for the foundations of the poles and or foundation improvement works will be designed by a registered engineer.
- (e) Provide WEL with ACENZ standard producer statement for design (PS1) and engage an independent engineer to provide a design review producer statement (PS2) for all situations.
- (f) Ensure that all risks associated with soils, local stability and global stability are mitigated in the design process.

8.5 To achieve the points above, design of foundations will be proved through various geotechnical investigations. Micro-siting of poles along the designation corridor may be required to avoid site specific poor soils and the civil and structural engineering design relating to pole foundations will be varied to suit the pole foundations.

#### **Potential “hot spots”**

8.6 I have undertaken a desktop review of the route and substation sites in order to identify any potential “hot spots” that may need to be addressed in the final design stages.

8.7 The key areas that may need to be addressed include:

- (a) Areas of land instability.
- (b) Poles on steep slopes.
- (c) Poles 89 and 90 (in State Highway 23 road reserve, outside Mr Hope’s property).

- (d) Within in flood plains; and
- (e) On ground that exhibits anecdotal evidence of possible historic movement

### **Land instability**

- 8.8 In my view, whilst some areas may present challenges due to the steep terrain, the fact that many of the poles are sited near the top of ridges means slope instability is not a significant factor in many locations. In areas of land instability, it is likely that poles will be able to be relocated in order avoid those areas. Where poles are required to be located in areas that exhibit visual signs of land instability, construction will be engineered to suit by sleeving poles and founding on bed rock through deeper concrete foundation.

### **Steep slopes**

- 8.9 I understand that it is not proposed to located poles on steep slopes in areas of high risk erosion, however if the final design results in locating poles in such areas, consent may be required from Environment Waikato. In such circumstances, typical engineering design would include a slope stability analysis to ensure the pole foundations will be suitable.
- 8.10 In general, poles located in the hilly section of the route tend to be located on ridge lines or high points so that the lines are able to clear vegetation. Construction on ridge tops is simpler than on sloping hill sides because they tend to have more stable geology and is easier to operate construction equipment. They are more exposed to wind load, which will likely determine the foundation type.

### **Poles 89 and 90**

- 8.11 Poles 89 and 90 are located on State Highway 23 road reserve adjacent to Mr Hopes property. They are located near an existing roading cut embankment between the road edge and the boundary. Mr Hope has expressed some concern over the stability of the bank and the inherit risks in locating a pole in this location.
- 8.12 I undertook a field visit to assess the issues raised and concur that the cut face is steep and could by subject to minor surface slipping. There are engineering solutions and construction methods available which will not create any further instability to the slope and would provide insulation for the pole from any natural

slope instability. For example, coring an oversize hole down below ground (road) level and placing the pole inside a sleeve would mitigate any soil movement. I have discussed Mr Hope's concerns with him who appeared to accept that there are engineering solutions that will address his concerns.

- 8.13 These issues will be addressed via Condition 6.5 (Lines conditions) requires that engineering design plans for poles located in road reserves that require specific geotechnical design will be submitted to WDC for approval.

#### **Flood plains**

- 8.14 A number of poles at the Te Kowhai end of the route are proposed to be constructed in known flood plain, namely poles 207, 208, 209, 247 and 248. Whilst erection of the poles will avoid periods of flood, there is no engineering reason why they cannot be successfully be erected in such locations. Flood plains of the lower Waipa River are not usually subject to high velocity running water, rather the flood plain area generally acts as storage and velocities of the water are very low. Concrete foundations will be founded on firm layers well below the ground surface which will minimise any high water level induced effects.

#### **Land showing signs of historic movement**

- 8.15 Poles 95 through to 98 are shown as being located on land that exhibits signs of historic movement. Many of the locations of active movement can be mitigated through engineering design by founding on competent rock or by micro-siting locations one way or the other from the active site. As part of the detailed design, engineering geologist will make that assessment and recommendation.

#### **Silt and sediment control measures**

- 8.16 It is not currently proposed to locate any poles in high risk erosion areas (i.e., slopes no steeper than 25 degrees), which would require a resource consent from Environment Waikato. In my view, the amount of soil excavation associated with the pole construction is minimal.
- 8.17 However the earthworks associated with the substations and track improvements for access to the pole locations have the potential to require more stringent control measures. Where such measures are required, the Environment Waikato Erosion and Sediment Control Guidelines for Land Disturbing Activities guides the required site controls.

- 8.18 An example of possible control measures that could be employed at the larger earthworks sites (i.e., the substation platforms) involve using some of the topsoil stripped for the construction of an earthbund around the full earthworks site. That would be furnished with a decanting system at the down stream location and the topsoil bund would be grassed.
- 8.19 Where access tracks are upgraded, any earthworks runoff to waterways will be contained using silt fences or similar. Earthwork faces will be hydroseeded as soon as practical after the works have been completed.
- 8.20 These matters will be addressed via the Construction Management Plan.

## 9. **SUBMISSIONS**

- 9.1 In this section I will address the issues raised by submitters in respect to traffic and traffic related activities and geotechnical/civil engineering issues.

### **Traffic related submissions**

- 9.2 Mrs Olivia Fletcher has raised the issue of the possibility of vehicles damaging the poles. I interpret from this that poles within the road reserves are vulnerable to impact by errant vehicles. This issue is very real as we do see many reported accidents involving impacts with utility poles. However, modern day design standards for poles in road reserve require the pole to be erected outside of the clear zone. "Clear Zone" is a term in the road safety profession used to define the zone (width) adjacent to the road within which an errant vehicle is most likely to recover. That width is dependent on the speed environment of the road. In the case of Waikato District, approvals to construct poles within road reserves are subject to road safety guidelines. In the case a pole cannot be erected outside of the clear zone, a guardrail style barrier must be erected in front of the pole to redirect an errant vehicle back to the road without impacting the pole. The design of pole locations and possible mitigation methods are covered in the proposed conditions for the lines (Section 6).
- 9.3 Mr Lance McGowan has raised an issue with respect to further widening and upgrading of roads and the restriction the lines will place on this. The road controlling authority has the right to upgrade roads within the corridor irrespective of whether or not utilities are in the corridor. The shifting of services as a result of road widening and costs to do so is subject to separate agreements with each utility operator. The location of the poles is generally as far from the road edge as possible. These matters are addressed by proposed Condition 6.6.

- 9.4 Mr and Mrs Hodge have also raised issues relating to signage on the Te Kowhai substation and I have already addressed those matters above.

**Submissions relating to geotechnical/civil engineering matters**

- 9.5 Mr Hope has raised an issue with regard to the stability of the State Highway cut face on SH23 adjoining his property. I have discussed this in detail above.

**10. OFFICERS REPORT**

- 10.1 In my view the officer's report has adequately addressed all of the traffic related issues and recommended suitable conditions to mitigate any traffic related effects.
- 10.2 In my capacity as a civil engineer, I also confirm that the officer's report has adequately addressed the geotechnical and civil engineering aspects particularly through the draft conditions relating to the requirement for construction management plans.

**11. PROPOSED CONDITIONS**

- 11.1 In my view, the proposed draft conditions suggested by Council adequately mitigate the effects raised by submitters and any other traffic related effects and geotechnical and civil engineering related effects.
- 11.2 I do suggest that as part of the Traffic Management Plan, a specific mention of the need to identify lay down areas for materials including access and egress arrangements should be included in Condition 6.2 (Lines conditions). I also suggest (as discussed above) that a guardrail only be required where poles are located within the clear zone (which requires a minor amendment to Condition 6.7).
- 11.3 The Construction Management plan condition for both the substations and the line requires the applicant to describe the activities proposes including measures to minimise an effects such as sediment discharge and runoff, dust and noise. These requirements are necessary for Council to be confident that the works are being undertaken with all due care and be informed under their local authority obligations. The management plan also includes a protocol for informing landowners of the timing and duration of the works. In my view the requirements of the Construction Management Plan are a normal requirement and acceptable in the proposed form.

## 12. **CONCLUSIONS AND RECOMMENDATIONS**

- 12.1 My assessment and evidence above reveals that the traffic related effects are very minor. The overall road network will experience a very minor increase in vehicles each day of the construction period. The increase traffic numbers will be more noticeable on low volume roads such as Heddon Rd, however the increased numbers will be low effects over a short period of time making them no more than minor.
- 12.2 The design of the pole foundations and associated geotechnical investigations proposed will ensure suitable and safe foundations are constructed to meet the design life criteria for the lines. Sufficient flexibility is retained via the width of the designation in order to enable micro-siting of poles in order to ensure that any areas of instability are avoided. In any event, I am confident that suitable engineering solutions can adopted to mitigate risk where areas of instability cannot be entirely avoided

**Tony Keyte**  
**March 2009**