




REPORT

Green Hydrogen Project - Traffic Impact Assessment

for Hiringa Energy Limited and Ballance Agri-Nutrients Limited

Rev A2 - 08/07/2021

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Reviewed

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Rev A2 - 08/07/2021

CONTENTS

TABLES

FIGURES

1 INTRODUCTION

This report provides an assessment of the transport and traffic matters relevant to the construction and operation of the proposed Green Hydrogen project, located in Kapuni, South Taranaki.

The report considers traffic and transport implications for the project, including assessing the actual and potential impacts arising from the project. The report also addresses mitigation that is considered necessary in order to minimise transport related impacts.

At the time of this assessment the detailed design of the works has not been completed, nor appointment of key roles such as the physical works contractor and the transport operator for the large overmass / overdimension wind turbine components. Those appointments will dictate supplier and service provider details such as quarry and concrete plant locations, and also transport details such as trailer configurations for over mass and overdimension loads – all of which are functions of specific operators, suppliers and contractors.

Following the commercial model for windfarms, the supplier of the wind turbines (in this case Vestas) will be responsible for the Transport of the wind turbine components. The responsibility of the transport includes the detailed planning of the actual route and transport configurations for the wind turbine components (in this case from Port Taranaki to Site). Further, a windfarm turbine supplier only commits to undertaking the associated transport planning once the project (including relevant consents) are confirmed.

This assessment provides recommendations that ensure future stages of the project are undertaken in a manner that avoids or mitigates the impacts of the project on wider road network including traffic safety and efficiency.

This assessment is based off plans and information provided in the Resource Consent Application and Assessment of Environmental Effects for the Project.

1.1 Project location

The project is located on farmland owned and managed by Parininihi ki Waitotara (PKW), located approximately 2.5 km south-east of the Ballance Agri-Nutrients site, see Figure 1.1.

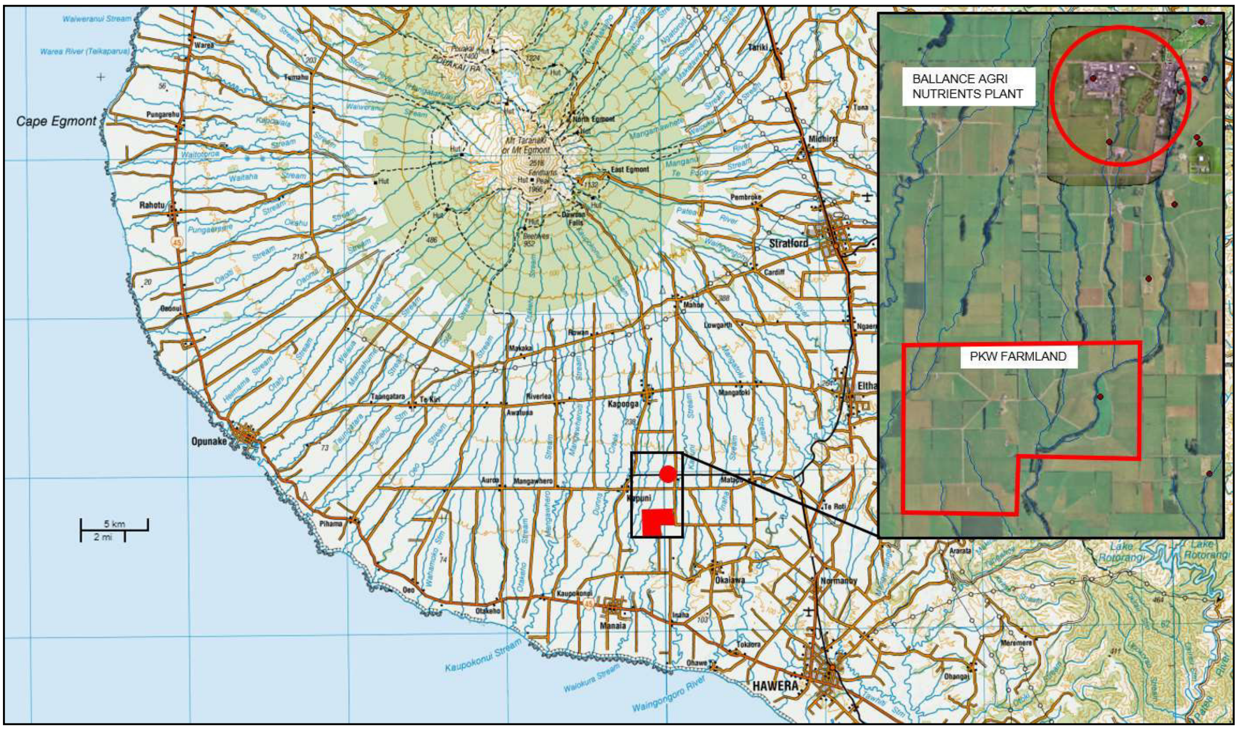

Figure 1.1: Site layout map (Topo map sourced from LINZ)

1.2 Project description

The full project is described in the Resource Consent Application and Assessment of Environmental effects Kapuni Green Hydrogen Project (May 2021).

A summary of the relevant aspects of the project as they pertain to transport include the construction and operation of:

- 4/ 6 MW wind turbines – approximately 162 m diameter at 125 m hub height
- Installation of an Underground Cable from the Wind turbine site to the Ballance Kapuni Site
- Substation and electrolyser near Ballance Kapuni site
- Palmer Road Hydrogen Storage and Refuelling Facilities.

The components are located as shown in Figure 1.2 below.

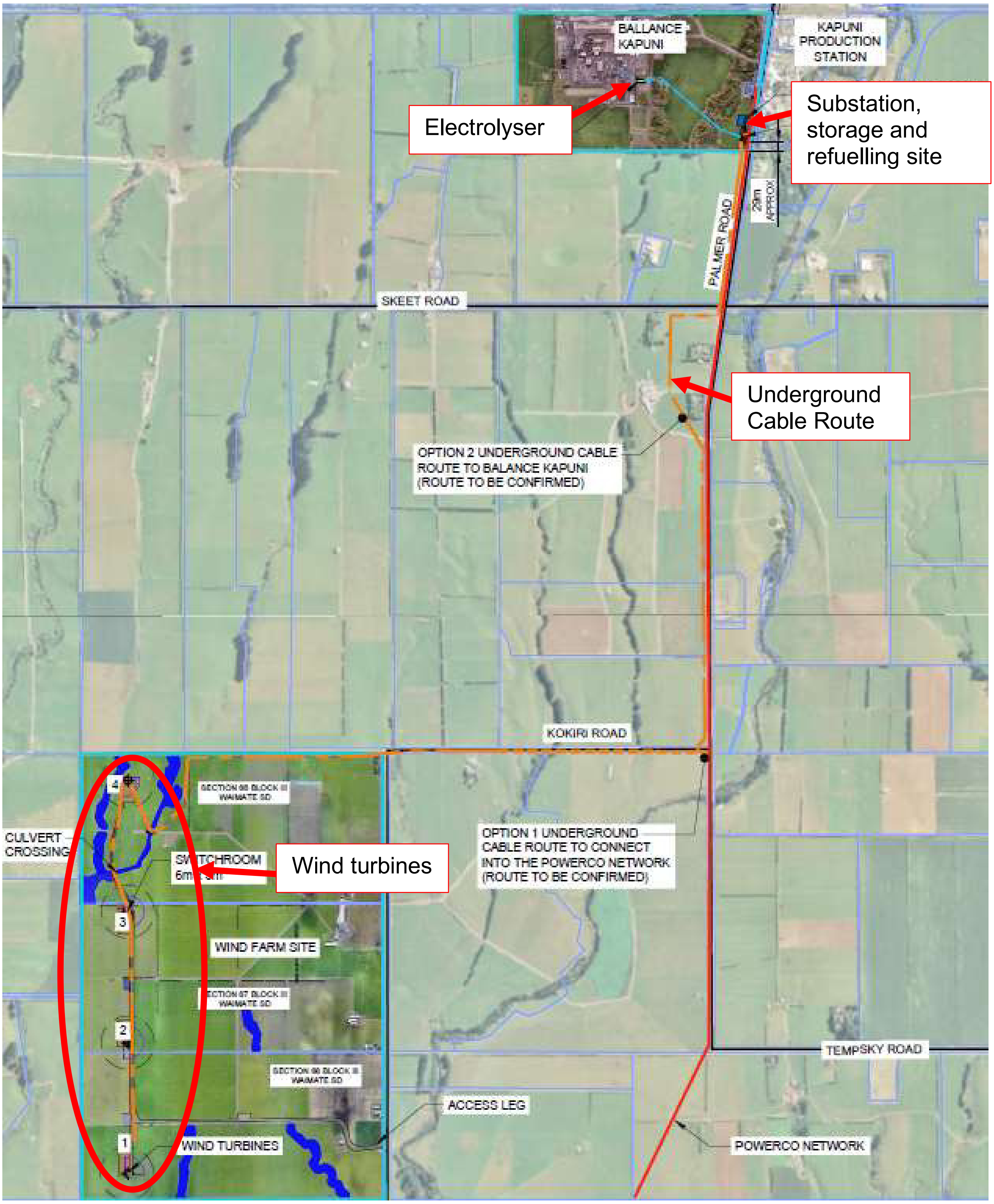

Figure 1.2: Location plan at Kapuni (Extract from BTW Drawing 191149-05)

2 PREDICTED TRAFFIC AND EQUIPMENT TRANSPORT REQUIREMENTS

The traffic generation related to the project comes in various forms, and includes:

- Construction
- Operations
- Decommissioning

These aspects are detailed further below.

2.1 Construction traffic

The main construction traffic is related to:

- Construction access works and wind turbine foundation construction
- Delivery of Wind turbine components
- Underground cable installation
- Palmer Road Hydrogen Storage and Refuelling Facilities including electrolyser and substation.

These are described below.

2.1.1 Construction Access and Wind turbine foundation construction

General

Detailed ground (soil) investigation has not been undertaken at the site related to the foundation design of the wind turbine foundations. Based on input from specialist designers to date, and initial soil investigations, it is anticipated that the foundation for the wind turbines will be likely in the form of a mass gravity reinforced concrete base, supported by a ground improvement layer (which will consist of a compacted gravel layer). The ground improvement layer will replace a layer of existing ground – which will need to be removed from site.

The mass gravity foundations are anticipated to be approximately 20 metres in diameter at the base and will require approximately 750 m^3 of concrete and 240 tonnes of reinforcing steel (per turbine base).

The majority of the traffic movements are related to the construction of the facility, and specifically the formation of the wind turbine foundations and supporting infrastructure.

The gravel required at the wind turbine site will be utilised mainly in three areas:

- access tracks within the site
- laydown areas/working platforms
- subgrade improvement under the mass gravity foundation.

Bulk volumes

Bulk material volumes and associated anticipated truck movements for the access track and four wind turbine foundations are shown below in Table 2.1.

Table 2.1: Wind turbine material quantities import (main components) and associated truckloads

Material	Unit	Qty	Truckloads
Gravel – access, laydowns and subgrade improvement layer	m³	16,000	1,000
Concrete – 4 foundations	m³	3,000	500
Reinforcing	Tonne	960	40
Earthworks – soil disposal	m³	18,400	1,150
Wind turbine components (over mass, over dimension)	EA	48	48
Electrical / Cabling		-	10
Switch room		-	10
Demobilisation incl removal of redundant gravel areas	m³	9,100	578

Note: This table is related to transportation of materials (only)

These volumes are estimates for the purposes of project planning and transport assessment. Traffic movements are expected to be twice that stated as number of truckloads i.e. in and out for each load. The number of required truckloads are subject to change during the detailed design phase of the project.

Sequencing – wind turbine construction

The construction of the wind turbine site will occur in the following general sequence:

- Site Track construction
  - Site earthworks and culvert installation
  - Gravel import
- Foundation construction
  - Mobilisation
  - Earthworks – excavation and disposal of excess soil from site (topsoil will be stockpiled onsite for reuse)
  - Gravel import / Ground improvement
  - Reinforcing steel placement
  - Concrete Pour
  - Demobilisation
- Crane pad construction
  - Gravel Import and placement
- Wind turbine erection
  - Mobilisation (incl main and auxiliary cranes)
  - Mobilisation of Turbine Components to site
- Demobilisation
  - Plant and equipment (from turbine erection)
  - Gravel removal – removal of any gravel from temporary areas such as crane pads, parallel access (800 m) and additional track width for over dimension swept paths
  - Final demobilisation.

Traffic generation

Following the installation of site access tracks, the construction of the turbine foundations are expected to be undertaken one by one, culminating with 4 separate concrete pours occurring over a period of weeks.

Current project scheduling, Figure 2.1, (Application Appendix A.4) provides for site works to commence in October 2021, with the balance of the civil works completed by February 2022 and turbine erection between February and Jun 2022.

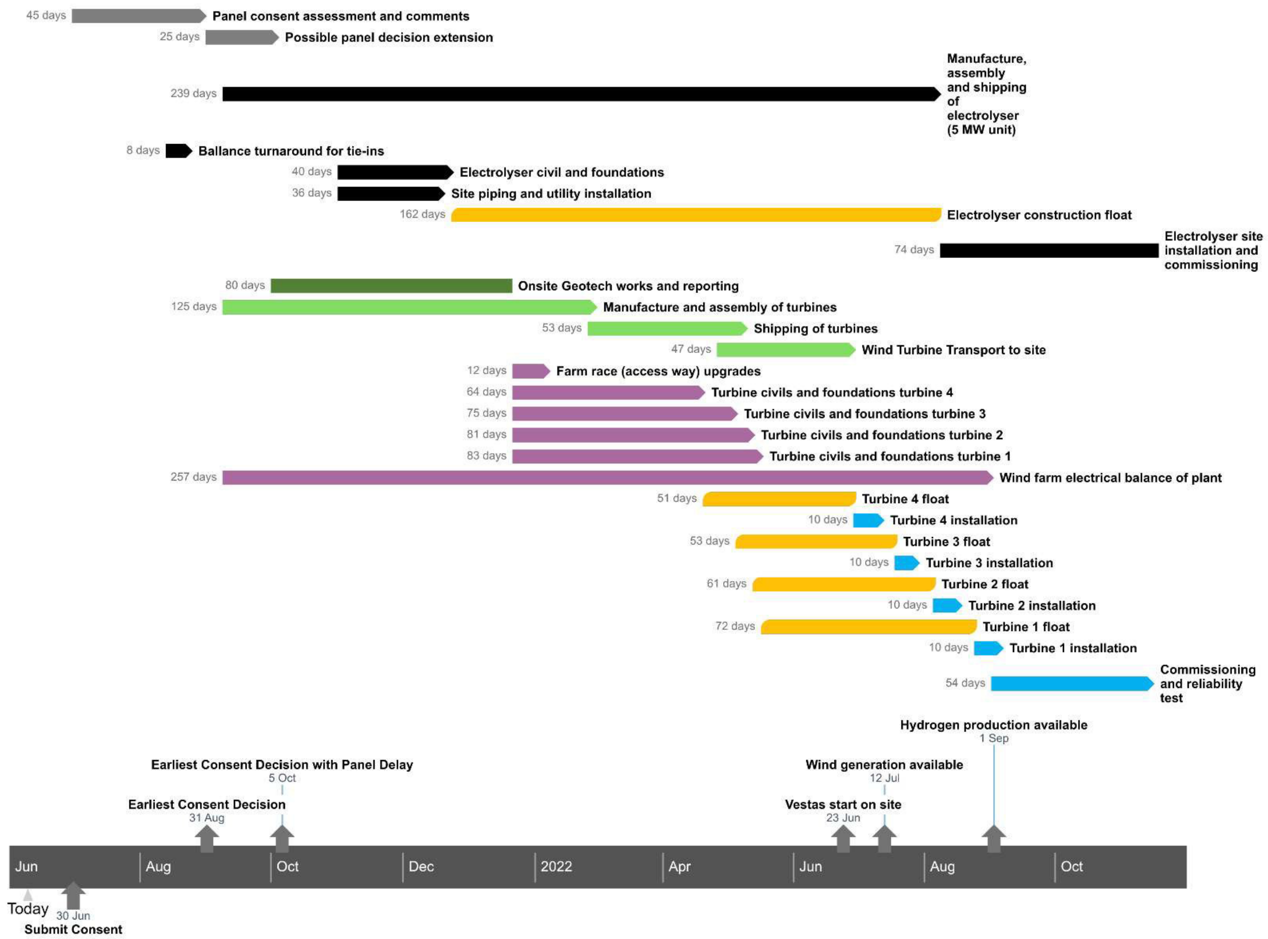

Figure 2.1: Draft Project Schedule (Extract from Application Appendix A.4)

A more detailed scheduling is available and will be updated to reflect detailed design and appointment of a physical works contractor.

For the purposes of this assessment, an estimated maximum (practical) number of heavy vehicle loads per day that can be delivered to site, and corresponding minimum number of total days for transportation related to each activity has been provided in Table 2.2 below – noting that this would need to be multiplied by two to provide total vehicle movements (in and out). This is intended to be informative for the purposes of the traffic assessment (rather than definitive or precise).

Light vehicle movements associated with the project are not expected to be significant, nor will they have a significant effect on the existing road network. This assessment has mainly focussed on the effects related to the Heavy Vehicle movements.

Table 2.2: Estimated truckloads and timing – wind turbines

		Truckloads	Max loads/day	Minimum number of Days for transport	Comments
Track construction					
	Mobilisation	6	6	1	
	Gravel import	415	48	9	Truck and Trailers
Foundation construction					
	Mobilisation	8	8	1	
	Earthworks / soil from site	1150	48	24	Truck and Trailers Expected to be delivered to a site within 20 km of the site
	Gravel import	225	48	5	Truck and Trailers Sourced from one or more Taranaki Quarries
	Reinforcing	40	6	7	Long haul truck and trailers
	Concrete pour	500	125	4	Concrete trucks 1 long day per foundation pour
	Demobilisation	8	8	1	
Crane pad					
	Mobilisation	6	6	1	
	Gravel import	360	48	8	Truck and Trailers
Wind turbine erection					
	Mobilisation incl cranes	30	6	5	Includes main and auxiliary cranes
	Components	48	4	12	Specialist trucks and trailers - Overmass, overdimension
	Demobilisation	30	6	5	
Demobilisation					
	Gravel removal - crane pads	360	48	8	Truck and Trailers
	Gravel removal – access track	184	48	4	Truck and Trailers
	Gravel removal - track radii	25	13	2	Truck and Trailers
	Demobilisation	8	8	1	

A significant majority of the truck movements relate to the cartage of gravel to/from site, the export of excavated soil from the turbine foundations and the concrete pours.

The most intense number of movements within a single day is expected to be those related to the concrete pour, which is likely to be a continuous pour within one day for each turbine base.

2.1.2 Delivery of Wind Turbine components

The total number of wind turbine components is relatively small when compared with other wind farm projects – 12 blades, 4 hubs, 4 nacelles, 4 powertrains, 4 coolers and 20 tower sections.

The components for this project are unique given their size – these are expected to be the largest wind turbines that have been installed in New Zealand to date. As a comparison, the blades for this project are approximately 79 metres long whereas the nearby Waipipi wind farm (near Waverley) have used blades that are 64 metres long. The Waipipi and Turitea wind farm components were delivered from Port Taranaki along State Highway 45 and State Highway 3.

Further information on the turbine components is provided below.

Main components

The V162 Vestas wind turbine (125 m hub height) is the preferred turbine. All main components of the wind turbines are either over mass, overlength or overheight/width (or a combination thereof).

The mass and dimensions of the main components (transport configuration) are summarised in Table 2.3 below. Specific information used for this assessment is included in the Vestas document '*V162-5.6 MW Preliminary Weights and Dimensions' (0083-6741 V03).* Exact details from Vestas may change prior to the placement of the turbine order, though the general dimensions and masses are not expected change enough to make a significant difference to the transport planning. The configuration of the trailer units (axle spacings, widths, lengths etc) will be more critical in the planning and will be a function of the chosen Transport operator including consultation with Vestas during detailed transport planning.

Table 2.3: Main Component Summary

Component	Transport Dimensions (including transport frames)	Mass	Comment
Blade (V162)	81.1 metres (length) 4.5 metres (width) 4.0 metres (height)	28,100 kg	Overlength
Hub	4.98 metres (length) 4.40 metres (width) 4.04 metres (height)	64,000 kg	Overmass (gross) Overheight
Nacelle (without power train and transformer)	18.18 metres (length) 4.20 metres (width) 4.35 metres (height)	72,470 kg	Overlength Overmass (gross) Overheight
Power train	7.5 metres (length) 2.7 metres (width) 3.0 metres (height)	97,493 kg (12,999 kg/m)	Overmass (gross) Overmass (axle load)
Tower - Highest mass per metre of tower section and largest diameter – Section 1	13.15 metres (length) 4.6 metres (diameter) 4.95 metre (Flange diameter)	86,000 kg (6,540 kg/m)	Overmass (gross) Overmass (axle load) Overheight
Tower - Highest mass – Section 2	20.44 metres (length) 4.6 metres (diameter)	90,000 kg (4,403 kg/m)	Overlength Overmass (gross) Overmass (axle load(?)) Overheight
Tower – Longest section – Section 5	33.00 metres (length) 4.15 metres (diameter)	62,000 kg (1,879 kg/m)	Overlength Overmass (gross) Overheight

Critical mass and dimensions of the main components are shown in Table 2.4. These are the largest mass and or dimensions of the main components – noting that this includes their transport frames, rather than just the component dimension/mass.

Table 2.4: Critical aspects for consideration

Critical aspect	Component	Maximum dimension/mass (transport configuration)
Length	Blade	81.1 metres
Height	Tower	4.95 metres (excl ground clearance and trailer)
Mass	Power Train	97,493 kg (12,999 kg/m)

Each aspect listed above, and their respective component, will need specific detailed planning undertaken – for length (swept paths), height (overhead powerlines and infrastructure), and mass (generally bridge and culvert capacities) in consultation and co-ordination with the nominated Transport operator.

2.1.3 Installation of the Underground Cable

The installation of the underground cable between the wind turbine site and the Ballance Plant will require construction in the road reserve and private property depending on which route is ultimately preferred. This work will include shallow open trenching, and underboring via directional drill at key locations such as streams/culverts and road crossings. The likely equipment used for this activity is listed below.

- A trenching crew which consists of:
  - A small excavator (between 1.5 - 4 Tonne)
  - Truck (tipper)
  - Crew/personnel vehicle
  - Traffic management vehicle
  - Cable truck/trailer
- A directional drill crew which consists of:
  - A small excavator (between 1.5 - 4 Tonne)
  - Truck transports for directional drill
  - Hydrovac truck (or similar)
  - Crew/personnel vehicle
  - Traffic management vehicle
  - Water truck
  - Directional drill (tracked)

Construction traffic volumes will be relatively minor, and the biggest effect of their work will be while they operate in the Road Reserve of Kokiri, Palmer and potentially Skeet Roads. The nature of the work is similar to the recent nationwide construction and installation of the Ultrafast Fibre network. Temporary traffic management will require either a shoulder or lane closure at all times.

When trenching within private land, the traffic related to the activity will be barely noticeable to other road users.

2.1.4 Palmer Road - Hydrogen Storage and Refuelling Facilities

Part of the project includes the construction and installation of the Palmer Road Hydrogen Storage and Refuelling Facilities, Figure 2.3. Once constructed, the facilities will provide for the transfer of Hydrogen to re-fuel trucks, and also load hydrogen onto Multi Element Gas Cylinders (MEGC) to supply other refuelling sites around New Zealand. The Palmer Road facilities also provide a location for the substation and nearby electrolyser that will be utilised by the Ballance Agri-Nutrients site for the supply of both electricity and hydrogen.

Construction of the Palmer Road facility, substation and electrolyser will be undertaken utilising a small crew to undertake the civil works, which includes the foundation construction and installation of operational components.

Access to the electrolyser will be undertaken through the existing Ballance Agri-Nutrients site, Figure 2.2. The existing Ballance Agri-Nutrients access is a well-established industrial vehicle access point and includes suitable internal access roads.

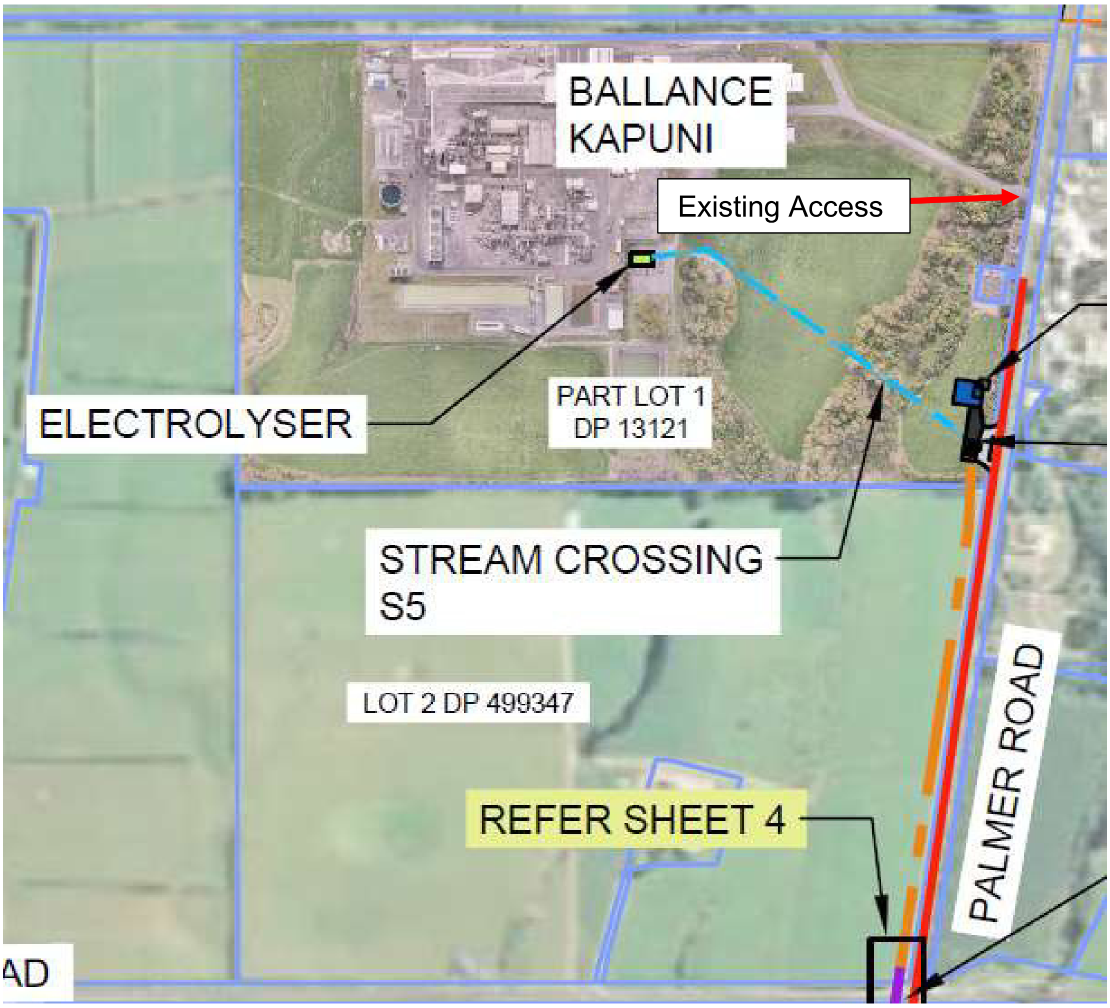

Figure 2.2: Existing Access into Ballance Agri-Nutrients

The refuelling facility will be accessed off Palmer Road, via a new entry and exit, Figure 2.3.

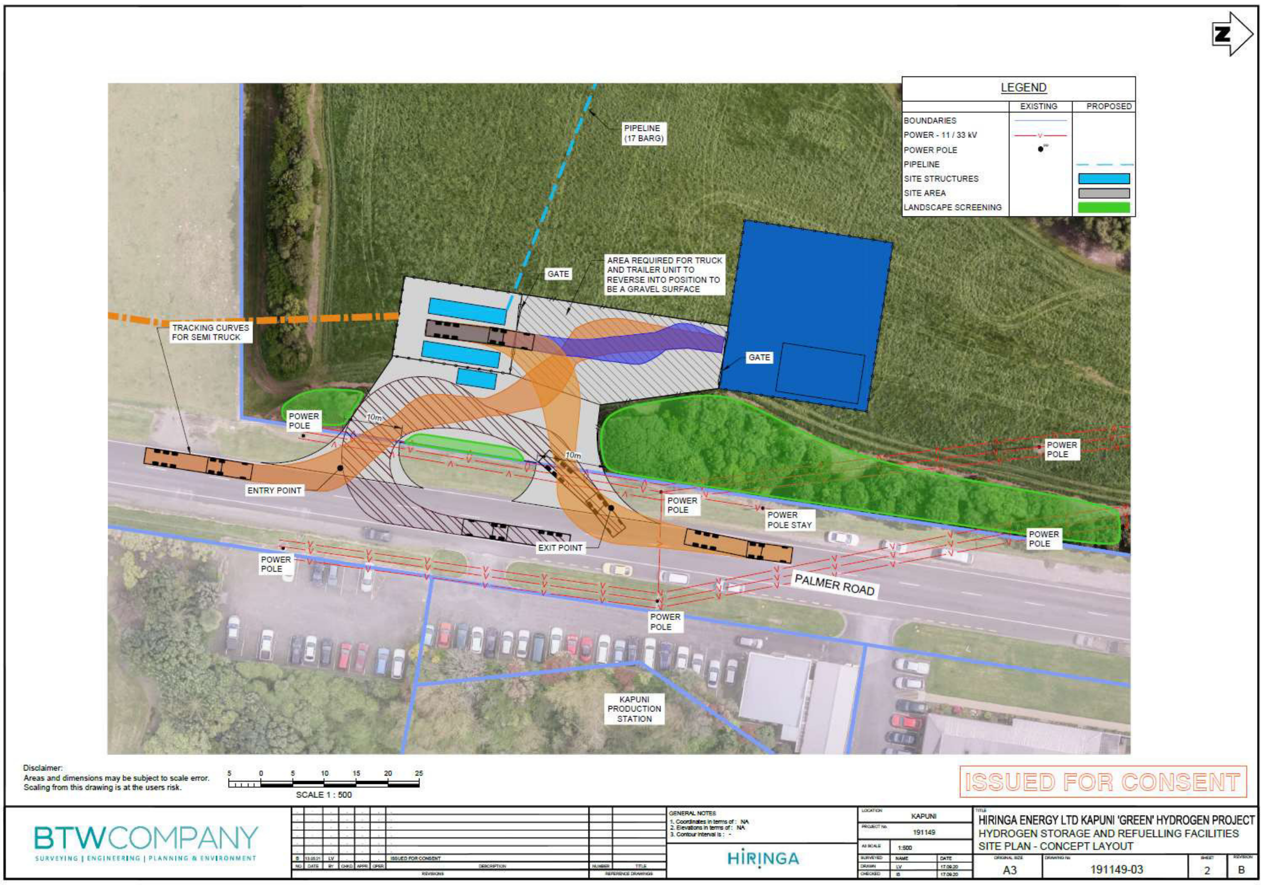

Figure 2.3: Palmer Road Hydrogen Storage and Refuelling Facilities (Extract from BTW Drawing 191149-02)

The transport of gravel to the site (including substation and electrolyser) equates to approximately 80 truck and trailer movements (in/out) (40 loads).

Other heavy vehicle movements related to the construction of the facility are estimated to not exceed an additional 40 truck movements (20 loads).

The work is expected to be undertaken over a 6-8 week period.

2.2 Operational traffic

Wind turbines

Following commissioning of the project, there is little operational traffic related to the wind turbines, other than periodic inspections and light maintenance undertaken by personnel from light and medium service vehicles. These will be very low volume and infrequent. Most monitoring will be done remotely.

It is anticipated that periodic maintenance, renewal or decommissioning will require specific planning for the necessary heavy vehicle transport. The time interval between such events is considered to be large, and much of the same mitigation undertaken for the construction and installation activities will need to be replicated under those scenarios.

Palmer Road Hydrogen Storage and Refuelling Facilities

The Palmer Road facility will see a number of trucks visiting the site on a regular basis to both load and distribute hydrogen to other refuelling sites around New Zealand, and also refuel Fuel Cell Electric Vehicles (FCEVs) trucks at the site. This is further discussed below.

The number of FCEVs able to refuel at the proposed refuelling station is capped by the amount of hydrogen able to be produced, compressed, and dispensed. The current station design is for a daily maximum of 50 heavy vehicles although the initial proposal is to begin refuelling up to 25 heavy vehicles per day. It is anticipated that vehicles using the refuelling station will predominantly consist of existing heavy fleet vehicles operating in the area, with a very low chance of vehicles detouring significantly (e.g. from New Plymouth) to use the site. There is therefore not proposed to be a significant increase in heavy traffic in association with the hydrogen storage refuelling station.

2.3 Decommissioning

The wind turbine and electrolyser have a design life of 25 years. At the end of their useful life an assessment will be undertaken whether to dismantle the overall facility or replace/rehabilitate key components.

Wind turbines

At the end of their useful life the wind turbine blades will be crushed and cut up and disposed offsite. This would mean that the vehicles undertaking the transport of the dismantled parts would not generally be overmass or over dimension.

Should a decision be made to rehabilitate/replace the wind turbine components, then it is expected that transport planning at that stage would be undertaken to assess the replacement components and the transport route that they would take.

If the entire facility is decommissioned, it is expected that demolition of the upper section of the concrete foundation would be undertaken, and material disposed offsite by trucks. The balance of the foundation including the gravel improvement layer would remain in-situ, meaning that there would only be a smaller proportion of the total traffic movements required to decommission the site compared to those that too to establish the site.

Hydrogen Storage and Refuelling Facilities

The decommissioning of the refuelling facility would take similar heavy vehicle movements to those that it will take to establish the facility – noting that these are relatively minor in the context of heavy vehicle movements on the wider transport network.

Overall

At the time of refurbishment or decommissioning a specific transport planning exercise would be undertaken including the preparation and approval of an overall Decommission Plan, noting that the anticipated traffic movements would be much less than those required to establish the overall facility.

3 EXISTING ROAD NETWORK

The road network that will be utilised for the transport related to this project is generally within Taranaki, though there will be some long-haul transport along main routes from out of the region.

State Highways (3, 44 and 45) will be used extensively by the project and includes construction traffic related to the general construction activities and also the transport of the main components of the wind turbines.

Generally, Local Roads that will be used by the project in any concentration are located within the South Taranaki District.

Local Roads located in other districts such as New Plymouth are not considered within this report in any detail. This is because they are generally related to sites where the mitigation for traffic generation has already been incorporated into the road network – such as the quarries and concrete plants.

3.1 Local road network

3.1.1 General

The Kapuni area supports a notable amount of industry, including a proliferation of oil and gas related facilities and infrastructure on Palmer Road. There are also a number of activities related to the agricultural sector – including the support for farms in the area, and also a Rendering plant located at Okaiawa.

The terrain of the Taranaki Ring plain in the Kapuni area is conducive to a suitable road network to support the local community (including industry). This combination of heavy vehicle demand and a good road building environment means that the South Taranaki District has a sealed local road network that is typified by sealed roads that have long straight and open sections, and on more regular routes (including collectors and arterials) have marked two lane, two way roads.

Source: Google Street View

Figure 3.1: Example of typical South Taranaki two lane, two way road in the Kapuni Area (Tempsky Road)

It is not uncommon for South Taranaki District Local Roads to have a high proportion of heavy vehicle traffic, often 15-25% of total traffic.

Ballance Agri-Nutrients and the Todd Kapuni Gas Treatment Plant and Kapuni Production Station facilities are located on Palmer Road, approximately 600 m north of the intersection with Skeet Road. Both of these activities include the use of heavy vehicles to service their facilities.

Skeet Road, Palmer Road and Eltham Road are all defined as 'Collector Roads' in the South Taranaki District Plan. This roading hierarchy status specifically provides for heavy vehicle movements.

Pedestrian and cyclists

Pedestrians and cyclists do not have a dedicated cycle/pedestrian infrastructure (cycle lane) which is typical within this rural setting across New Zealand. No pedestrian or cyclist count has been undertaken for this project, although, anecdotally, general volumes are low most of the time.

3.1.2 Kokiri Road

Kokiri Road is the main Local Road that will provide access to the Wind Turbine Site, Figure 3.2.

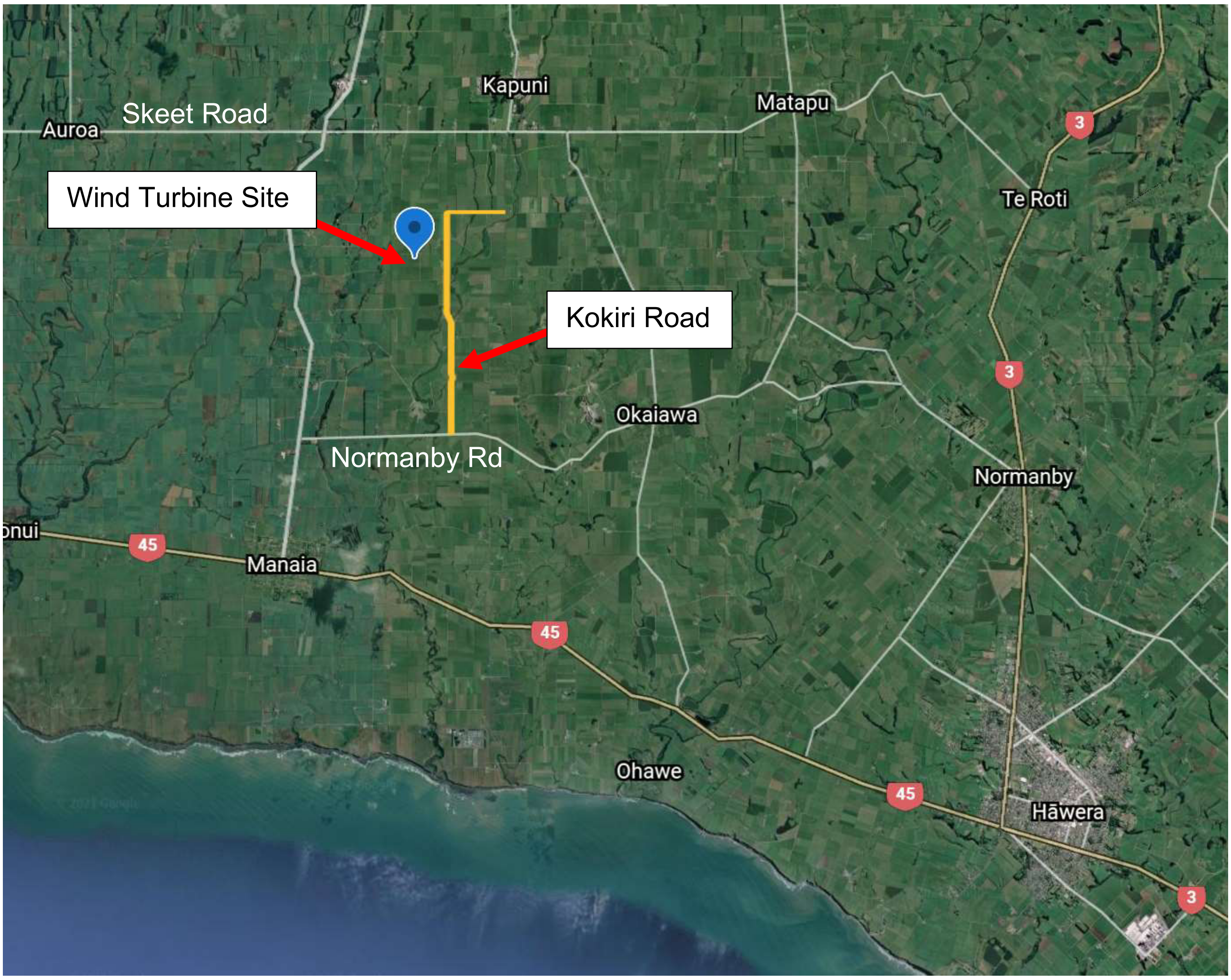

Figure 3.2: Kokiri Road, Kapuni

Kokiri Road joins Normanby Road to the South, and Palmer Road to the north end. Both Normanby and Palmer Roads are sealed, two lane, two way roads adjacent to the respective intersections with Kokiri Road.

Kokiri Road varies in width along its length. There are three discrete sections defined by seal width and road marking, Figure 3.3.

Figure 3.3: Kokiri Road schematic

The road has an estimated traffic count of 50 vehicles per day, with 10% heavy commercial vehicles.

The road has a single lane bridge located south of the Wind Turbine Site and approximately mid-way along the north-south length of the road (2200 metres from Normanby Road), Figure 3.4. It is approximately 3.4 m wide kerb to kerb, and 30 metres long. This bridge will largely prevent over mass or over dimension loads approaching the site from the South.

Figure 3.4: Kokiri Road Bridge over Kapuni Stream

Section 1 - Palmer Road to 359 Kokiri Road

Kokiri Road, between 359 Kokiri Road and Palmer Road, is a two way, single lane (unmarked) sealed local Road. The pavement width varies over its length, though is typically 5.0 m in width, Figure 3.5. The shoulder of the carriageway is maintained as grass berm.

Figure 3.5: Kokiri Road – Section 1 looking east

Section 2 - 359 Kokiri Road to Bridge

Kokiri Road between 359 Kokiri Road (approximately 3570 m from Normanby Road) and the single lane bridge, is a two way, two lane sealed local Road. The pavement width is typically 5.8 – 6.0 m wide with marked centreline, Figure 3.5. The shoulder of the carriageway is maintained as grass berm.

Figure 3.6: Kokiri Road – Section 2 looking South

Section 3 - South of Bridge to Normanby Road

Kokiri Road, between the bridge and Normanby Road, is a two way, single lane (unmarked) sealed local Road. The pavement width varies over its length, though is typically 4.0 m in width, Figure 3.5. The shoulder of the carriageway is maintained as grass berm.

Figure 3.7: Kokiri Road – Section 3 looking South

The nature of the Road means that Kokiri Road would be suited to consideration of one way construction traffic (while still allowing for general public to use the road for two way traffic), noting that over mass and over dimension loads almost certainly will be approaching the site from the north over Section 1 and 2 of Kokiri Road.

3.1.3 Existing Farm Site – Kokiri Road (Wind Turbine site)

The property where the wind turbines will be established has five existing vehicle access points on the western side of Kokiri Road. The location of the existing vehicle access points is shown in Figure 3.8. There are two for dwellings, and three for farm entrances – with one as the main access to the dairy milking shed.

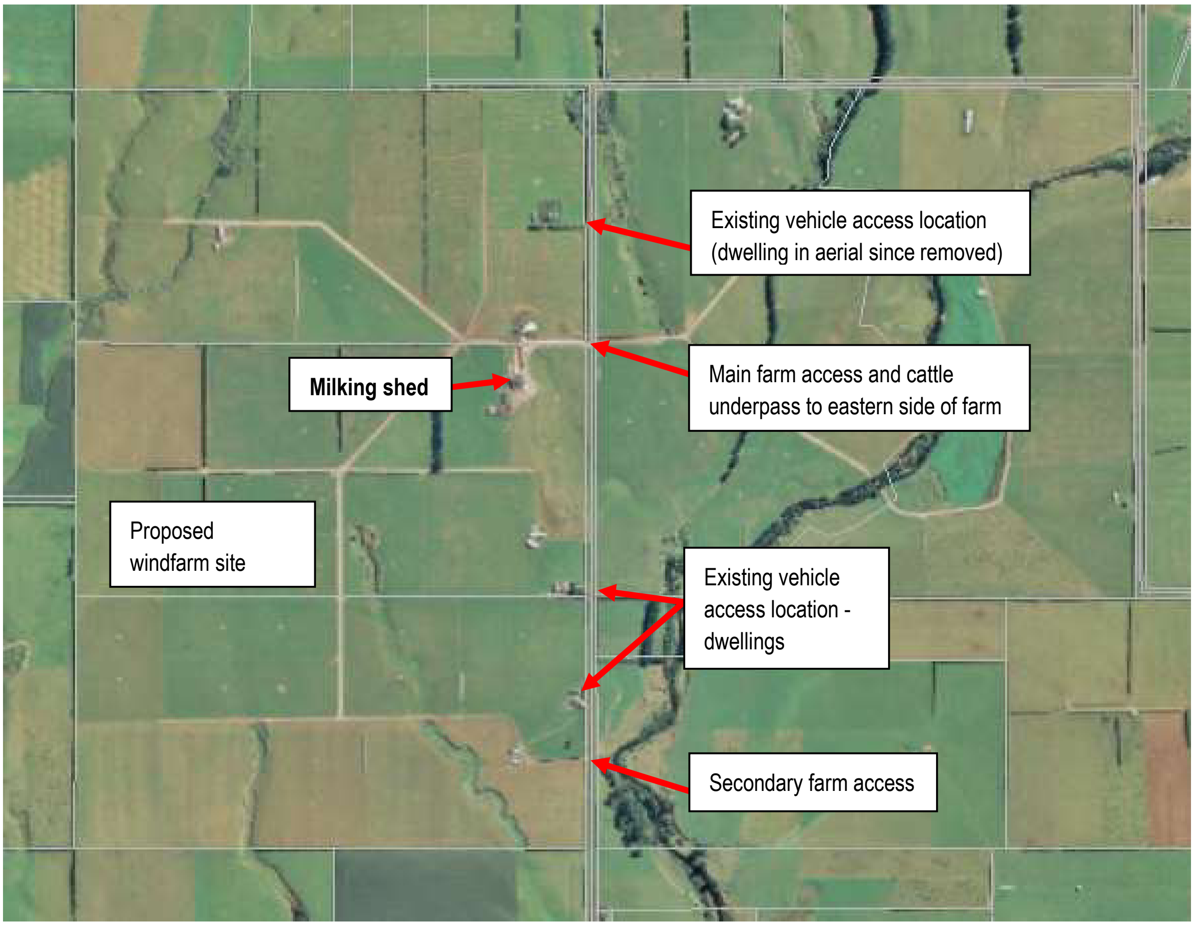

Figure 3.8: Existing site and vehicle access locations

The proximity of these existing access points to the proposed access points for the project provide suitable separation distances.

The general area consists of straight road sections with road sight visibility along the farm road frontage.

3.1.4 Palmer Road

Palmer Road is a two lane, two way sealed Collector Road. At the intersection with Kokiri Road, Figure 3.9, Palmer Road is a two lane (2.9 - 3.0 m width lanes), two-way road with sealed shoulders giving an average seal width of 5.8 - 6.0 metres. The shoulder of the carriageway is maintained as grass berm.

Palmer Road, immediately north of the Kokiri Road intersection has estimated daily traffic of 348 with 14% heavy commercial vehicles.

Figure 3.9: Palmer Road (At the Kokiri Road intersection looking north)

3.1.5 Normanby Road

Normanby Road is a two lane, two way sealed Collector Road. At the intersection with Kokiri Road, Figure 3.9, Normanby Road is a two lane (2.9 - 3.0 m width lanes), two-way road with sealed shoulders giving an average seal width of 5.8 - 6.0 metres. The shoulder of the carriageway is maintained as grass berm.

Normanby Road, immediately east of the Kokiri Road intersection has estimated daily traffic of 281 with 13% heavy commercial vehicles.

Figure 3.10: Normanby Road (Looking west, adjacent to the Kokiri Road intersection)

3.2 State Highways

As a region, Taranaki is primarily accessed by Road via State Highway 3 to the North and South.

Within the Region, State Highway 45 provides a coastal link around Mt Taranaki, connecting towns such as Okato, Rahotu, Opunake and Manaia to New Plymouth and Hawera (where State Highway 45 connects to State Highway 3).

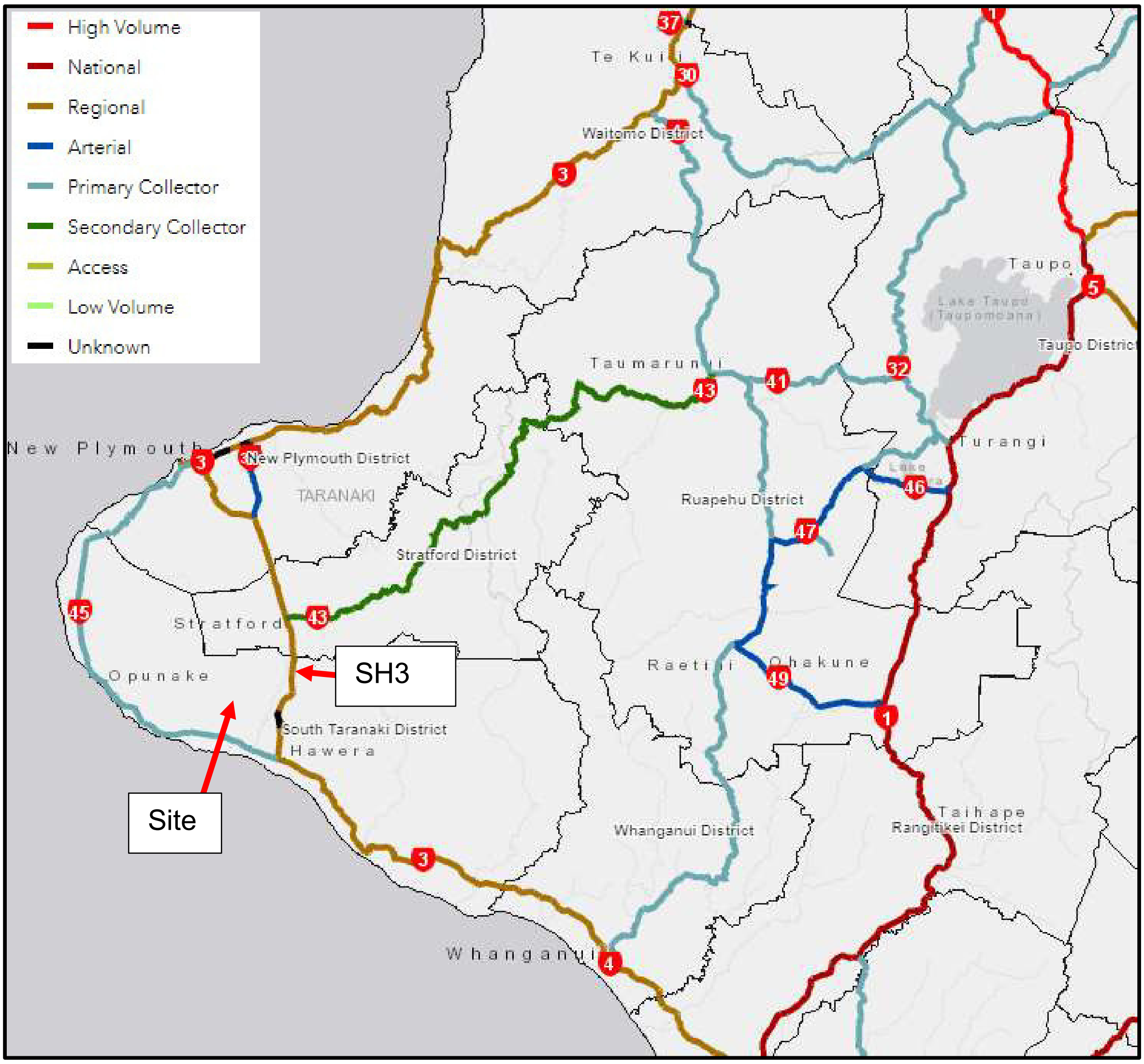

Figure 3.11: Waka Kotahi NZTA One Network Road Classification

3.2.1 State Highway 3

State Highway 3 between New Plymouth and Hawera is generally a two lane, two way sealed State Highway with a majority of open road / Rural road environment with a posted speed limit of 100 km/hr, with appropriate speed restrictions in urban areas.

State Highway 3 is classified as a Regional Arterial on the One Network Road Classification (ONRC). SH3 (just north of Stratford) reports an Annual Average Daily traffic (2019) of 11,881, with 10.7% heavy commercial vehicles. This is typical of other traffic volumes between New Plymouth and Hawera, noting that traffic counts drop below 10,000 AADT between Eltham and Hawera.

3.2.2 State Highway 45

State Highway 45 (as the coastal link) between New Plymouth and Hawera is generally a two lane, two way sealed State Highway with a majority of open road / Rural road environment with a posted speed limit of 100 km/hr, with appropriate speed restrictions in urban areas.

State Highway 45 is classified as a Primary Collector on the One Network Road Classification (ONRC). SH45 (just north of Rahotu) reports an Annual Average Daily traffic (2019) of 1,932, with 4.3% heavy commercial vehicles. This is typical of other traffic volumes along the route noting that traffic volumes drop between Opunake and Hawera to approximately 1200 AADT.

4 ASSESSMENT AND IMPACTS

4.1 Consultation

Consultation has been undertaken with Waka Kotahi NZTA, South Taranaki District Council and Port Taranaki. The outcomes of the discussions are summarised below:

4.1.1 Waka Kotahi NZTA

As detailed in the consent application, a meeting was held with representatives from Waka Kotahi NZTA to introduce them to the project, and gain understanding from their perspective for a project of this nature.

From the meeting, after explaining the scope of the project, Waka Kotahi NZTA described:

- They have experience with similar projects such as Waipipi and Turitea windfarms.
- Encouragement to allow early co-ordination once further details are confirmed, including appointment of the transport company for the overmass/over dimension components
- Requirement for a Construction Traffic Management Plan

  That the CTMP would include:

  — Detailed Route analysis including survey of key aspects such as overhead power lines and overmass capacities

  — Test runs of overdimension components – especially the blades

  — Scheduling

  — Co-ordination with maintenance works on the Highways

  — Consultation and co-ordination prior to any upgrade works on the State Highway network to allow for swept paths of overdimension loads

There appeared to be general comfort with the project proposal, on the basis that the above was undertaken in conjunction with further Waka Kotahi NZTA engagement.

4.1.2 South Taranaki District Council

Discussions with the South Taranaki District Council (STDC) Roading team related to the potential effects on their Local Road Network. These discussions indicate that STDC would facilitate the activities, in the interests of economic activity in the region and that construction activities including associated traffic movements of this nature and scale are not foreign to STDC. From the consultation, the STDC roading team indicated the following actions to be undertaken:

- Further consultation as the project develops including identification/discussion on any areas of road improvements necessary to facilitate the traffic activities, and also bridge capacities
- Preparation and approval of a Construction Traffic Management Plan – related to the bulk material transport and includes for example daily site activities, all project phases and transport types and multiple traffic routes
- Undertake a specific Transport Plan – Wind Turbine components transport from Port Taranaki to the Site
- Undertake the physical works on the areas of road improvements necessary to facilitate the traffic activities

- Enter into a Road Maintenance Agreement between STDC and the Project owners – this will address any extraordinary maintenance experienced on the road network

All requirements are common on similar projects within the South Taranaki District.

4.1.3 Port Taranaki

In late 2020, discussions were undertaken with Port Taranaki Staff, including Port engineering services, to discuss the landing of wind turbine components at the Port, their temporary storage and ability to negotiate through the Port internal roading layout.

Following those discussions, it was established that the Port (with further detailed planning) can receive, handle and temporarily store the components until they are ready to transport to the project site.

This confirmation means that suitable scheduling of transportation to the site can occur in a logical and sequential fashion. This planning detail will be addressed in the Transport Plan (Wind turbines) and will minimise disruption on road users between the Port and the site.

4.2 Palmer Road - Hydrogen Storage and Refuelling Facilities

The number of traffic movements associated with the construction and operation of the hydrogen storage facility is relatively low and managed through the creation and use of the refuelling facility. This includes appropriate geometry on all weather surfaces for turning movements and parking.

The new facility would be in-keeping with the road environment created by the adjacent industry (Ballance Agri-Nutrients and Todd Gas Treatment Plant). This road environment is well used to a built-up road frontage, unlike other rural road frontages in the Taranaki region. In short, the location of the refuelling facility is on an appropriate straight section of Palmer Road.

The traffic associated with the electrolyser within the Ballance Agri-Nutrients will access the site via the existing vehicle access, which is well established for use by Heavy Vehicles. There is almost no ongoing traffic related to the ongoing operation of the Electrolyser once installed and operational, other than for periodic inspection and maintenance.

4.3 Suitability of existing road layout

There are a number of significant rural roads in the vicinity of the site. General heavy vehicles travelling from New Plymouth/Stratford to the Kapuni area can come via Opunake Road / Palmer Road to the north, or if from Eltham via Eltham Road (and then Palmer Road). Any traffic travelling from Hawera would likely travel through Okaiawa (via State Highway 45 and Scott Road).

Figure 4.1 below shows Average Annual Daily Traffic (AADT) at locations that are likely to be part of the dedicated heavy vehicle traffic route for the project. Other road users would relate to dairy farm and agricultural related activities and the industrial activities at Kapuni.

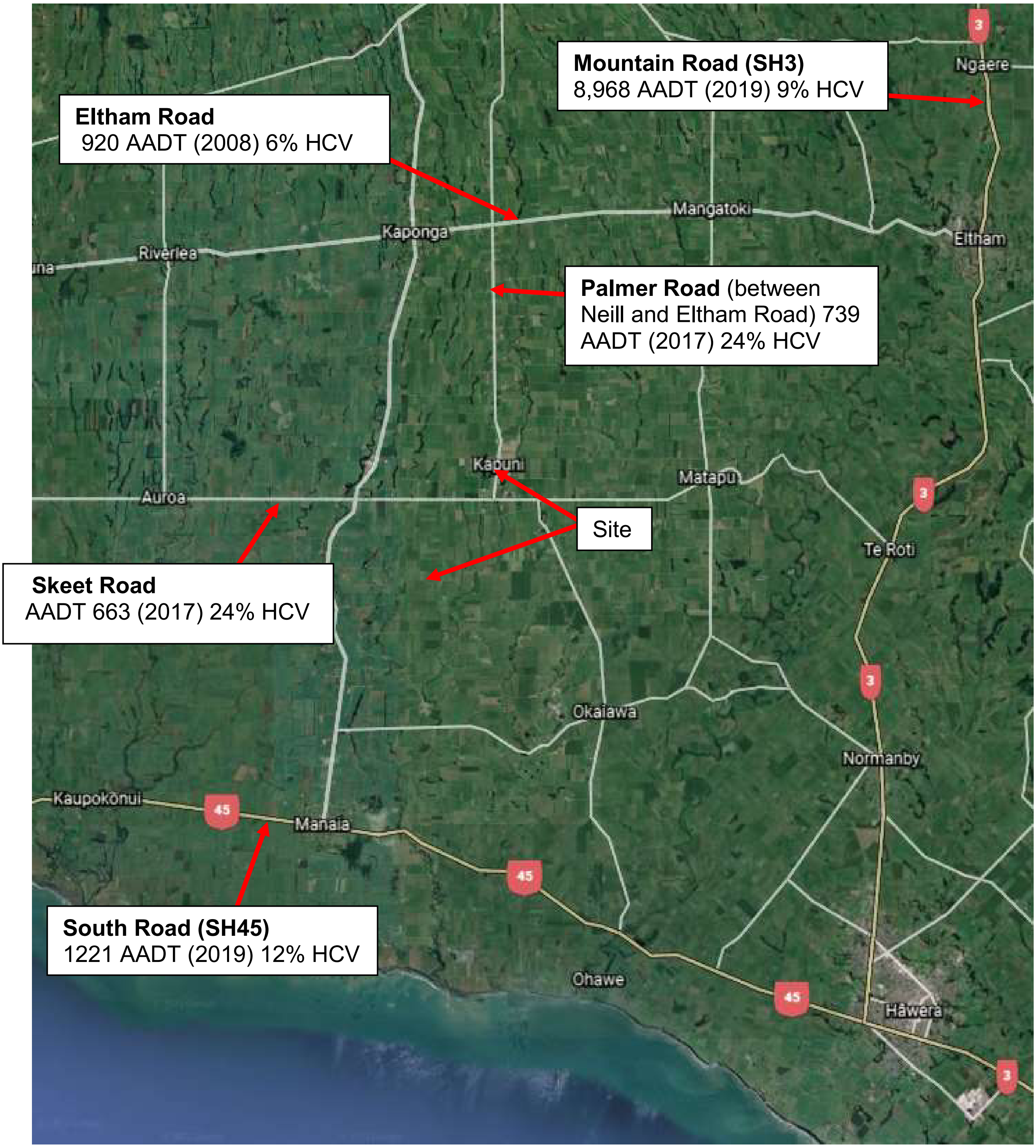

Figure 4.1: Road layout / network in the vicinity of the site

4.4 Construction materials

The supply of concrete, gravel, reinforcing steel and other materials will be sourced from a variety of locations and suppliers – most expected from within the Taranaki Region. Examples of quarries and concrete batching plants that may be utilised are shown in Figure 4.2.

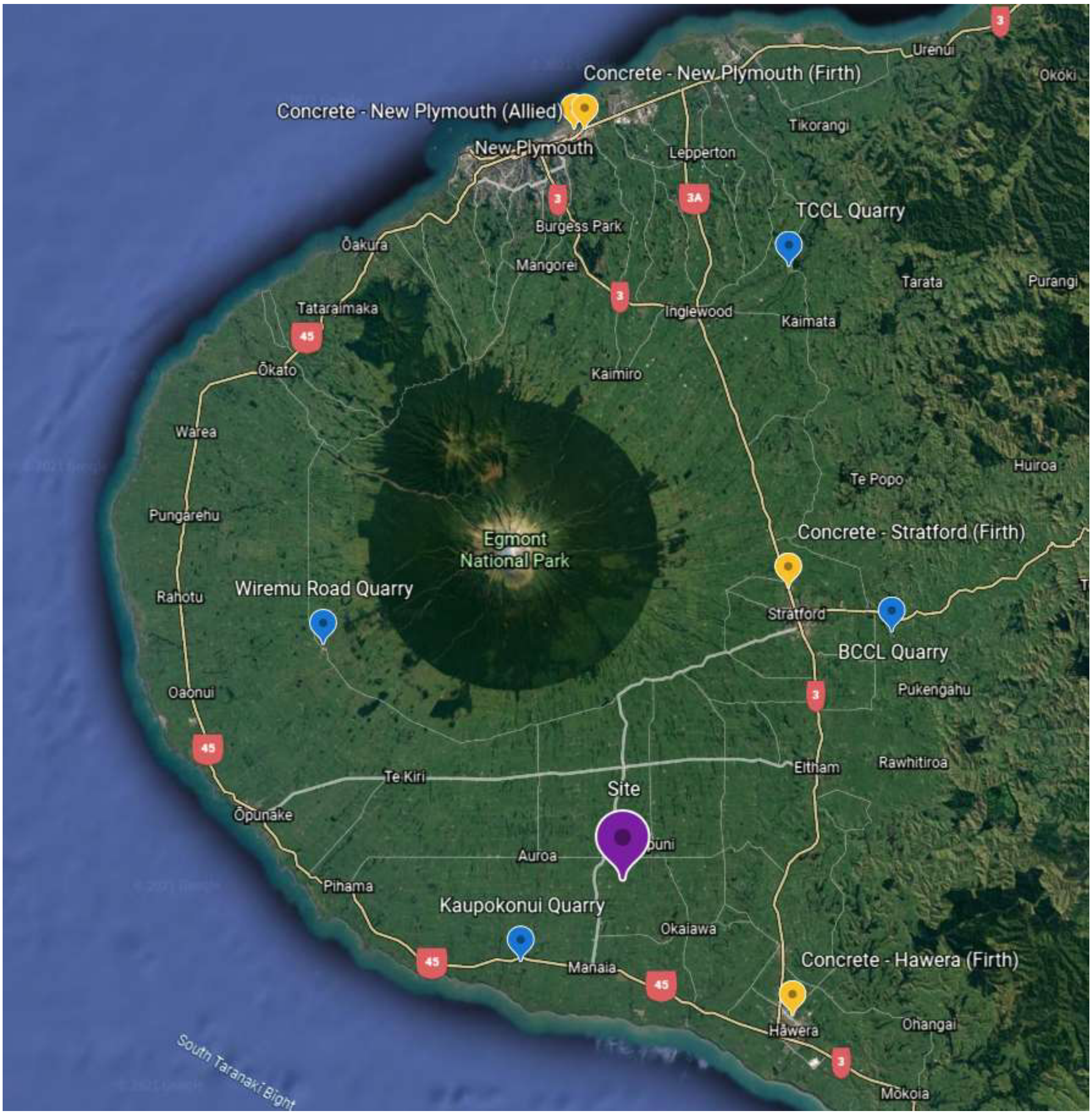

Figure 4.2: Location of suppliers within Taranaki Region

4.5 Overmass / overdimension loads

4.5.1 Routes considered

Various routes for the different components have been considered to date. Below provides a summary description of the main outcomes and does not detail all analysis undertaken to date (mainly related to swept path analysis).

Blades

As an initial focus, the blades are considered to be too long to consider a route via Inglewood (SH3), Figure 4.3. In short, there are no intersections that allow the blades to turn off Breakwater Road / St Aubyn Street or Molesworth Street in New Plymouth, onto State Highway 3. An option to use State Highway 3A has been reviewed, but navigation through the Township of Inglewood is still not considered feasible via this route.

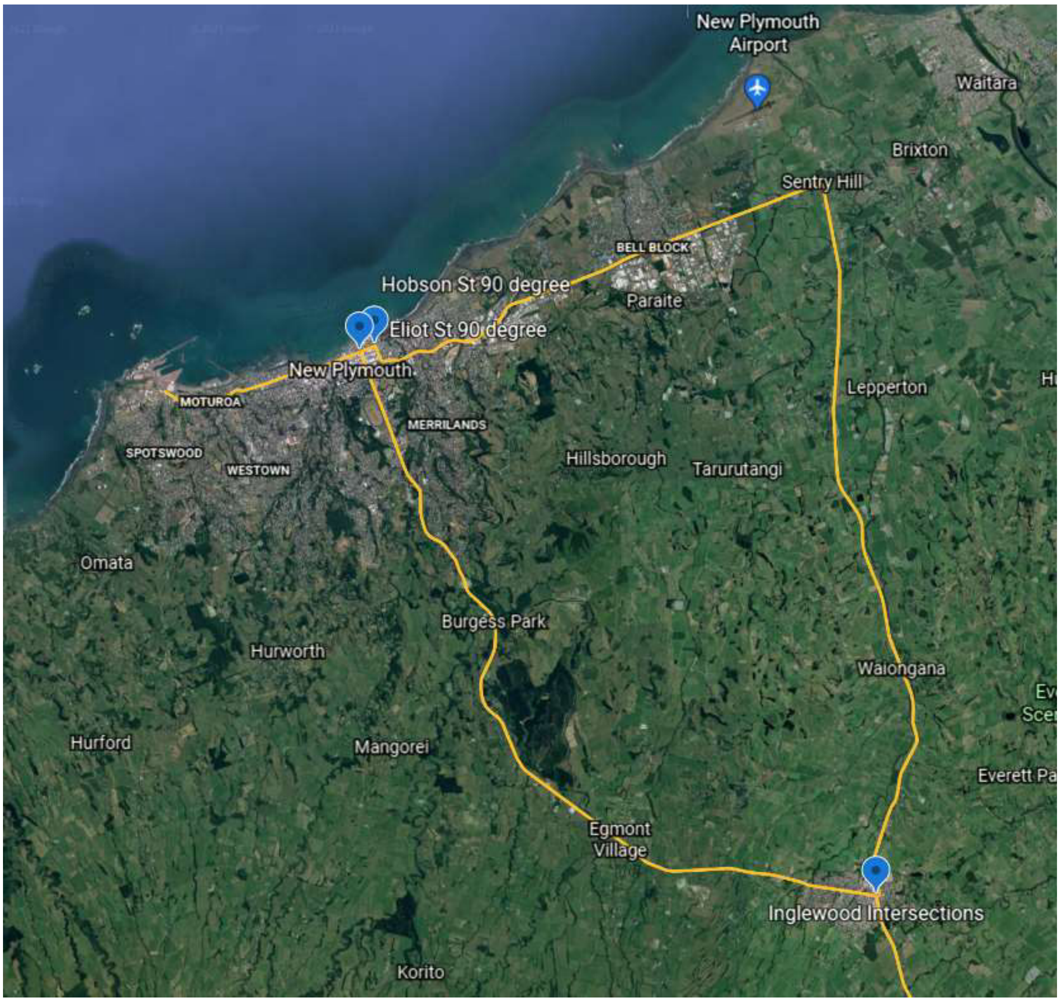

Figure 4.3: Blade route considered through Inglewood (sharp 90 degree corners noted with blue teardrop markers)

A Coastal route around State Highway 45 was then reviewed. This included a survey and tracking curves through one of the main ‘pinch points’ at Tataraimaka prior to the remainder of the route being considered. Swept path assessment of this location is shown in Appendix A.

After consideration of several routes, once departing from State Highway 45, the route shown below, Figure 4.4, seems most practical from information at hand at this stage of the project.

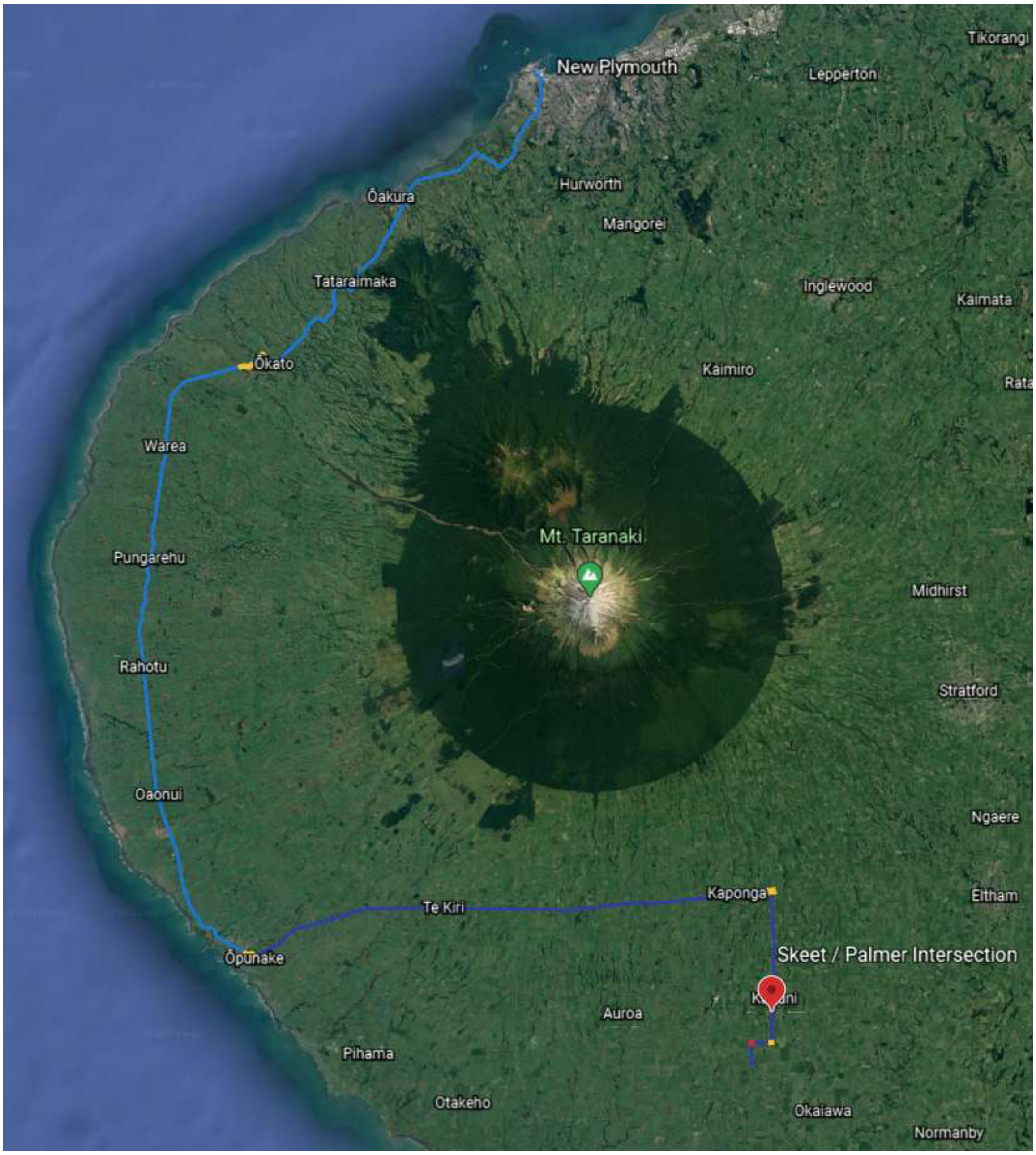

Figure 4.4: Likely Blade route via SH45, Eltham and Palmer Roads

As a side note, a more southern approach may exist, Figure 4.5 – but due to constraints through SH45 south of Opunake, and also the narrow bridge on Kokiri Road approaching the site from the South, this is not as straight forward as the Eltham Road Option shown above.

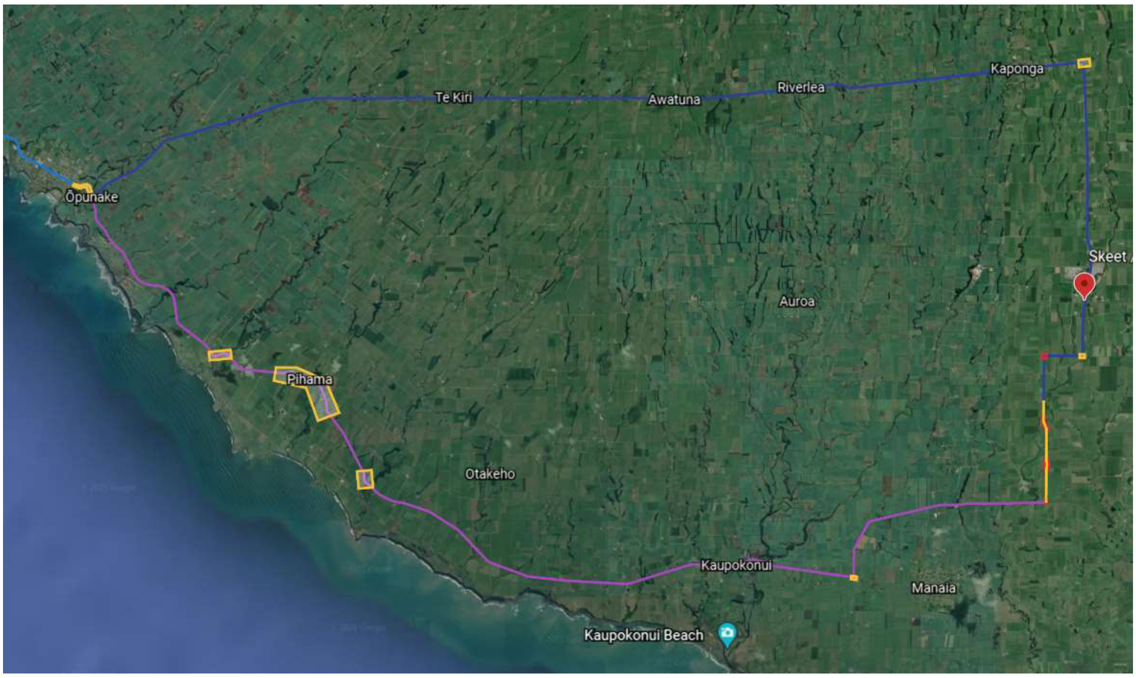

Figure 4.5: Southern Approach (purple line) for blades has largely been discounted as an option

The preferred Coastal route is likely also suitable for overmass loads that are not overheight, noting that Pioneer Road near the Port (which is the only option for the blades to connect from Breakwater Road to SH45) has several dozen overhead lines (low voltage and phone). This is the same road that the Waipipi blades were taken along.

There are several corners where some temporary access to private land will be required – such as the SH45/Eltham Road intersection, Eltham Road/Palmer Road and Palmer Road/Kokiri Road as known examples.

South Taranaki District Council (STDC) have indicated that Eltham Road is likely their best road for overmass loads (due to bridge capacities), as opposed to other roads in the network when approaching the site from the West.

Tower Sections

The Tower sections (5 per turbine) are constrained mainly by their height and also mass, noting that the mass per unit length vary depending on the section and diameter. This means that during bridge capacity assessments, some bridges (depending on the respective bridge lengths) will be more sensitive to the axle loading and others to the gross mass.

A detailed assessment of bridge capacity and also overhead powerlines has not yet been undertaken. Based on information received for State Highway 3 (which indicates preferable height clearance for the selected tower and its section dimensions), and also the expected structural capacity in State Highway bridges, it is expected that the preferred route for the Tower sections is via SH3 and Normanby, Figure 4.6.

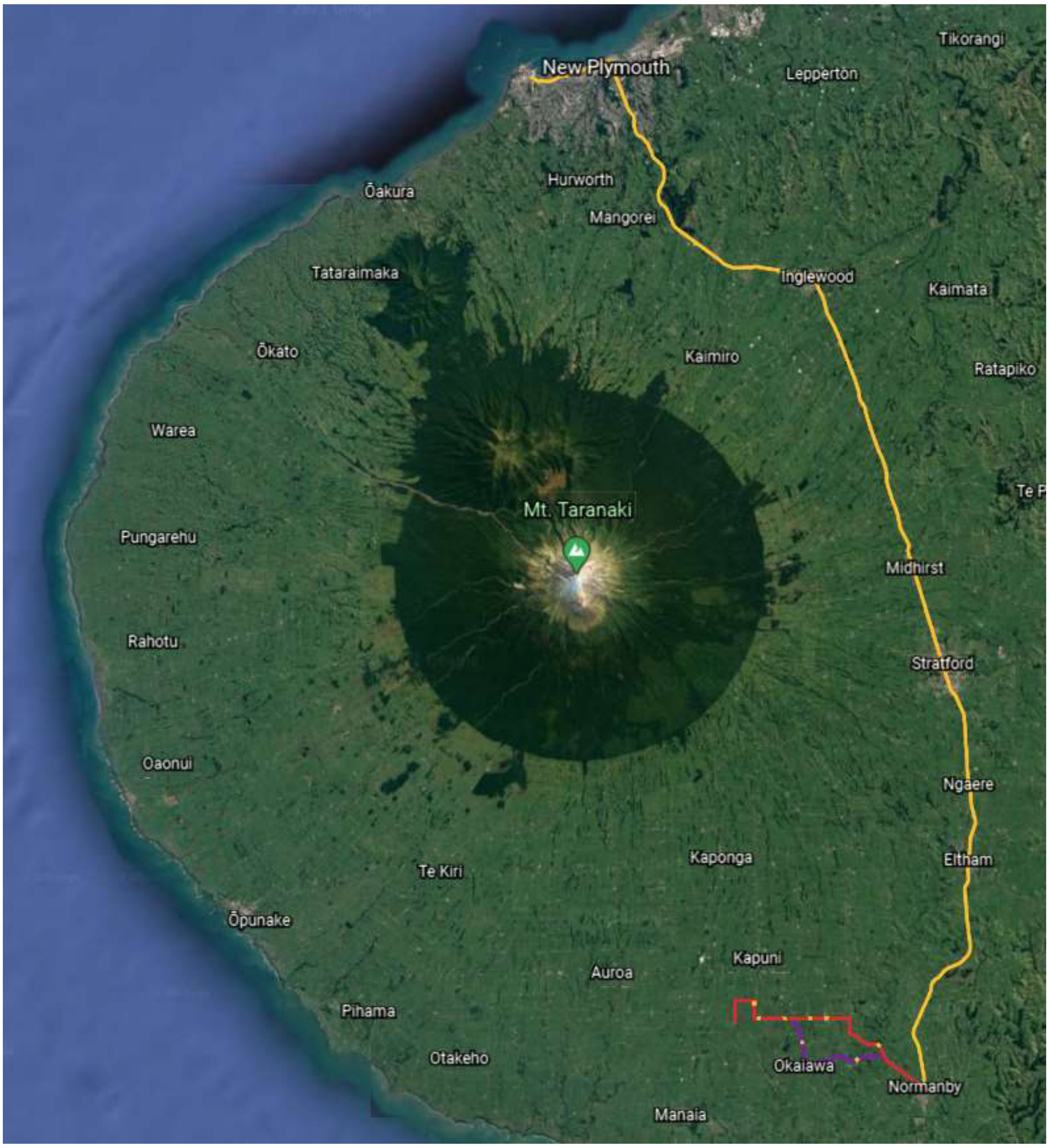

Figure 4.6: Route from New Plymouth to site for overheight loads

From the assessment, the two most likely routes from Normanby to the site are shown below, Figure 4.7, (known bridges / culverts highlighted).

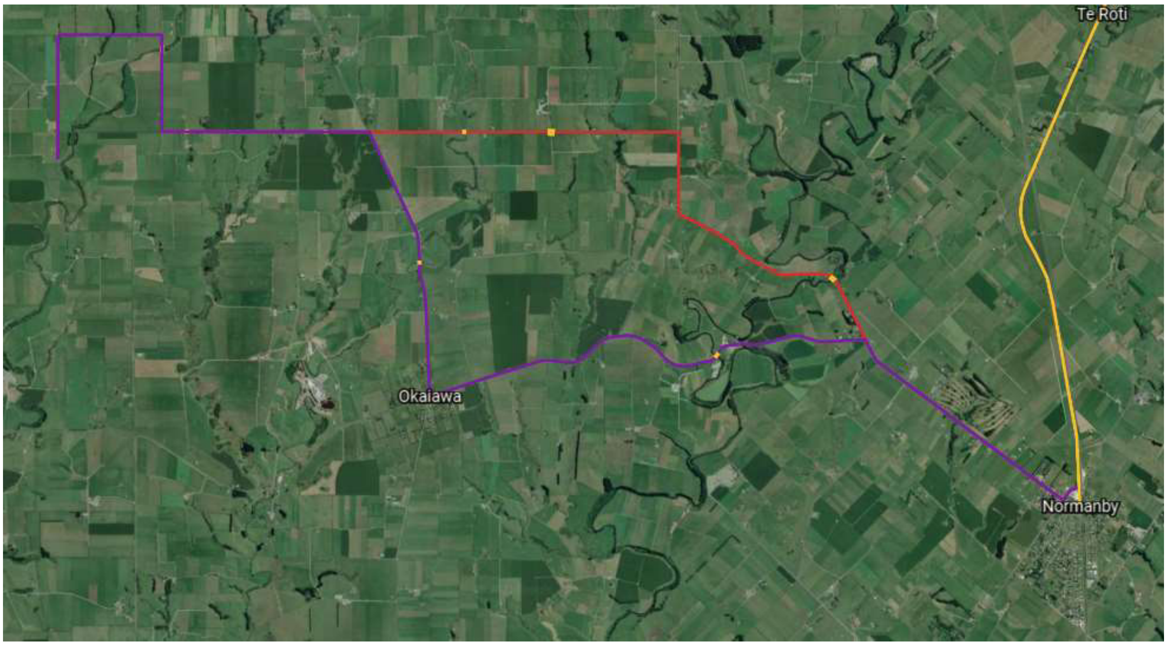

Figure 4.7: Likely Overmass Inland Route

The actual route will be determined by the bridge capacities, overhead line clearances and swept paths.

From this assessment, some road reserve and private land will be needed to allow for the swept paths of the turbine blades. This will only be for the duration of the transport related to the turbine components. This work will include liaison with associated stakeholders including any private landowners, Waka Kotahi NZTA, New Plymouth and South Taranaki District Councils and Port Taranaki.

4.5.2 Hub, Nacelle and Power Train

These short(er) but generally overmass loads are likely overheight depending on trailer configuration, and therefore may consider either the Coastal Route (or variant) taken by the blades or the Inland SH3 route proposed for the Tower Sections.

The decision making on the chosen route will be dependent on the detailed constraints and also operational conditions (such as expected traffic volumes during transit) and the like.

4.5.3 Recommended Routes

Based on current information, Table 4.1 below provides a summary of the likely route for respective components.

Table 4.1: Component Route Summary

Component	Expected Route
Blade (V162)	Coastal (via SH45)
Hub	Either Coastal or Inland
Nacelle (without power train and transformer)	Either Coastal or Inland
Power train	Either Coastal or Inland
Tower - Highest mass per metre of tower section and largest diameter – Section 1	Inland (via SH3)
Tower - Highest mass – Section 2	Inland (via SH3)
Tower – Longest section – Section 5	Inland (via SH3)

5 RECOMMENDATIONS

From the assessment undertaken, it is clear that the key transportation issues are related to the construction activities of this project. Specific issues related to construction include:

- Wind Turbine
  - Foundation construction – significant numbers of truck movements to import/export of gravel (access, laydown and subgrade improvement), concrete, reinforcing steel and also export of excess soil.
  - Components – delivery of a combination of overmass, over length and over height/width components such as blades, tower sections, powertrain and the like.

Generally, there are no anticipated ongoing transport issues with long term operation of the facility once installed and operating, noting that there will be some scheduled (and potentially unscheduled) maintenance/renewal of components that may require specific traffic management – though these (if required) will be rare and infrequent events. Likewise, the impact of the decommissioning process will also be minimal (assuming suitable transport planning).

These matters have been considered within this report.

5.1 Mitigation – ensuring road safety and efficiency

The majority of the project's traffic generation is related to the construction activities. Once operational the project has minimal ongoing traffic.

With regard to construction activities, the following comments are made.

Site construction including gravel, concrete and soil transportation.

Construction traffic related to transport of bulk items will occur over a period of months, with the most intensive daily traffic movements related to the concrete pours of each turbine foundation.

These effects can be mitigated through adherence with:

- A suitable Construction traffic management plan, including:
  - Traffic planning including co-ordination with suppliers and transport companies
  - Traffic flow and management including potential directional flow along Kokiri Road and other roads as appropriate.
  - Temporary traffic management
  - Consultation with affected stakeholders

Erection of wind turbines and movement of oversize components

There are four turbines proposed for the project. While this is a small number of turbines on a wind farm scale, the turbines themselves will be the largest to date constructed in New Zealand, and also transported within Taranaki.

There is history and experience of transporting wind turbine components from Port Taranaki through South Taranaki.

The effects of transporting these large components can be adequately mitigated by:

- Co-ordination with the South Taranaki District Council
  - Planned maintenance works
  - Information sharing on road infrastructure and planned routes
  - Road maintenance agreement between the Project and STDC
- Co-ordination with Waka Kotahi NZTA
  - Planned maintenance works
  - Information sharing on road infrastructure and planned routes
- Preparation and adherence with a Construction Traffic Management Plan (bulk transport) undertaken in close co-ordination with the Civil Contractor and also Transport plan (Wind Turbine Components).

5.2 Goals and Scope of recommended plans

Further to the above, project traffic management should have the general intent of:

- Embracing a culture of continuous improvement
- Ensuring all legislative requirements are met, as they relate specifically to the project
- Ensuring a focus and culture related to road safety and efficiency
- Planning and facilitating Emergency management (both related to the project and allowing emergency services to operate unhindered)
- Consultation and notification – consultation with key stakeholders including STDC, Port Taranaki, Waka Kotahi NZTA and others, and also ensure notification to road users and the community as appropriate.

For each plan, this scope should include:

- Construction Traffic Management Plan (bulk transport)
  - Construction programme including traffic volumes and timing
  - Traffic demand management – minimisation of traffic generation, and scheduling to minimise effects on the road network
  - Monitoring of construction traffic
  - Detailed route planning including all suppliers, use of adjacent road network and specifically Kokiri Road
  - Nature and timing of any road improvement works required. Physical works will be undertaken proactively prior to the relevant activity commencing and be prepared to amend or improve once the activity commences.
  - Road safety including minimising effects on existing activities including School buses
  - Temporary Traffic Management including any specific plans related to each phase and activity of the works including signage
  - Operational requirements including driver behaviour, compliance and education
  - Communication with stakeholders including relevant Road Authorities, Emergency Services, the community and road users generally

    - Learnings from co-ordination with STDC, Port Taranaki and Waka Kotahi NZTA
    - Permits – all necessary permits be obtained for overmass and overdimension loads from the respective Road Controlling Authorities
    - Contingency planning
    - Continuous improvement – ongoing review of activities including receiving feedback

- Transport plan (Wind Turbine Components)
    - Scheduling including component types, configuration and timing
    - Traffic demand management – scheduling to minimise effects on the road network
    - Detailed route planning including swept paths, components and truck/trailer configurations, passing bays, bridge capacities, use of adjacent road network and specifically Kokiri Road
    - Trial run over network mimicking the actual loads, prior to the transport of the actual components
    - Nature and timing of any road improvement works required. Physical works will be undertaken proactively prior to the relevant activity commencing and be prepared to amend or improve once the activity commences.
    - Road safety including minimising effects on existing activities including School buses
    - Temporary Traffic Management including any specific plans
    - Operational requirements
    - Communication with stakeholders including relevant Road Authorities, Emergency Services, the community and road users generally
    - Learnings from co-ordination with STDC,NPDC, Port Taranaki and Waka Kotahi NZTA
    - Permits – all necessary permits be obtained for overmass and overdimension loads from the respective Road Controlling Authorities
    - Contingency planning
    - Continuous improvement – ongoing review of activities including receiving feedback

Both plans should be prepared by a suitably experienced and qualified transport engineer in consultation with STDC and Waka Kotahi NZTA.

5.3 Road maintenance agreement

It is recommended that as part of the project, a road maintenance agreement be put in place to ensure that extraordinary maintenance created by the project is addressed. The agreement should include:

- Pre-construction survey of adjacent roads, including (at a minimum) Kokiri Road (entire length) and Palmer Road (from Eltham Road to Tempsky Road) and the relevant intersections to each of these roads.
- Road improvements identified through the Construction Traffic Management Plan and Transport Plan be undertaken proactively, and in advance of the relevant transport activities.
- A requirement that at the completion of the works the roads used by the construction traffic are in no worse condition than prior to commencement of the works.

6 CONCLUSION

The project is located in an area of Rural South Taranaki that has a low population density and that is supported with a good existing road network and infrastructure.

The most intense traffic is related to the construction of the facilities, though there is ongoing traffic related to the Hydrogen Storage and Refuelling Facilities on Palmer Road.

Traffic related to the project can be adequately managed through refinement and detailed project transport planning between now and the commencement of construction.

This will include detailed work related to the general construction activities and also transport of overmass/overdimension loads related to the wind turbines. These will be best captured post consent and prior to commencement of construction within a Construction Traffic Management Plan and Transport Plan, as detailed in Section 5 of this report.

General construction traffic

There are a high number of truck movements associated with the construction of the wind farm – most movements being on truck configurations that are common on the State Highways and Local Roads.

The large number of truck movements related to the bulk goods, such as concrete, gravel and soil can be adequately managed on the existing road network through practical planning, communication with stakeholders and associated mitigation – this will be captured in a Construction Traffic Management Plan.

Wind turbine components

The transport of overmass and overdimension components from Port Taranaki to the site can be undertaken, providing suitable detailed planning and preparation is undertaken. This planning will be captured in a Transport Plan, undertaken by the wind turbine supplier (Vestas).

Ongoing operation

There is traffic associated with the ongoing operation at the site - most is related to the Hydrogen Storage and Refuelling Facilities on Palmer Road. These effects will be mitigated through suitable design and layout of the site, which allows for swept paths and turning areas related to the heavy vehicles accessing the site.

Decommissioning / refurbishment

When the time comes, a specific transport planning process will need to be undertaken to ensure that the decommissioning of the facility is undertaken in a methodical fashion. The anticipated traffic generation from this activity will be well less than the inputs required to establish the facility, and therefore will be manageable at that time.

Overall

With further detailed planning and design, the traffic related to the facility construction and operation can be mitigated to ensure the safety and efficiency of the road network is not detrimentally affected.

APPENDIX A SWEPT PATH ANALYSIS

Swept path analysis of critical locations has been undertaken utilising a 79 metre blade and a nominal trailer configuration (there are multiple potential trailer configurations). The section at Tataraimaka is attached as an example.

A.1 Tataraimaka

20 0 20 40 60 80 100 120m

SCALE 1 : 2500

PLAN

SCALE 1:2500

DRAFT

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REVISIONS

NUMBER	TITLE

REFERENCE DRAWINGS

GENERAL NOTES
1. Coordinates in terms of : NA
2. Elevations in terms of : NA
3. Contour interval is : 0.5m

HIRINGA

LOCATION: KAPUNI
PROJECT No. 191242
A3 SCALE: 1:10000

	NAME	DATE
SURVEYED		
DRAWN	LV	17.12.19
CHECKED	JO	17.12.19

TITLE
KAPUNI GREEN HYDROGEN PROJECT
TATARAIMAKA TRACKING CURVES FOR 80m BLADE
OVERVIEW PLAN

ORIGINAL SIZE	DRAWING No	SHEET	REVISION
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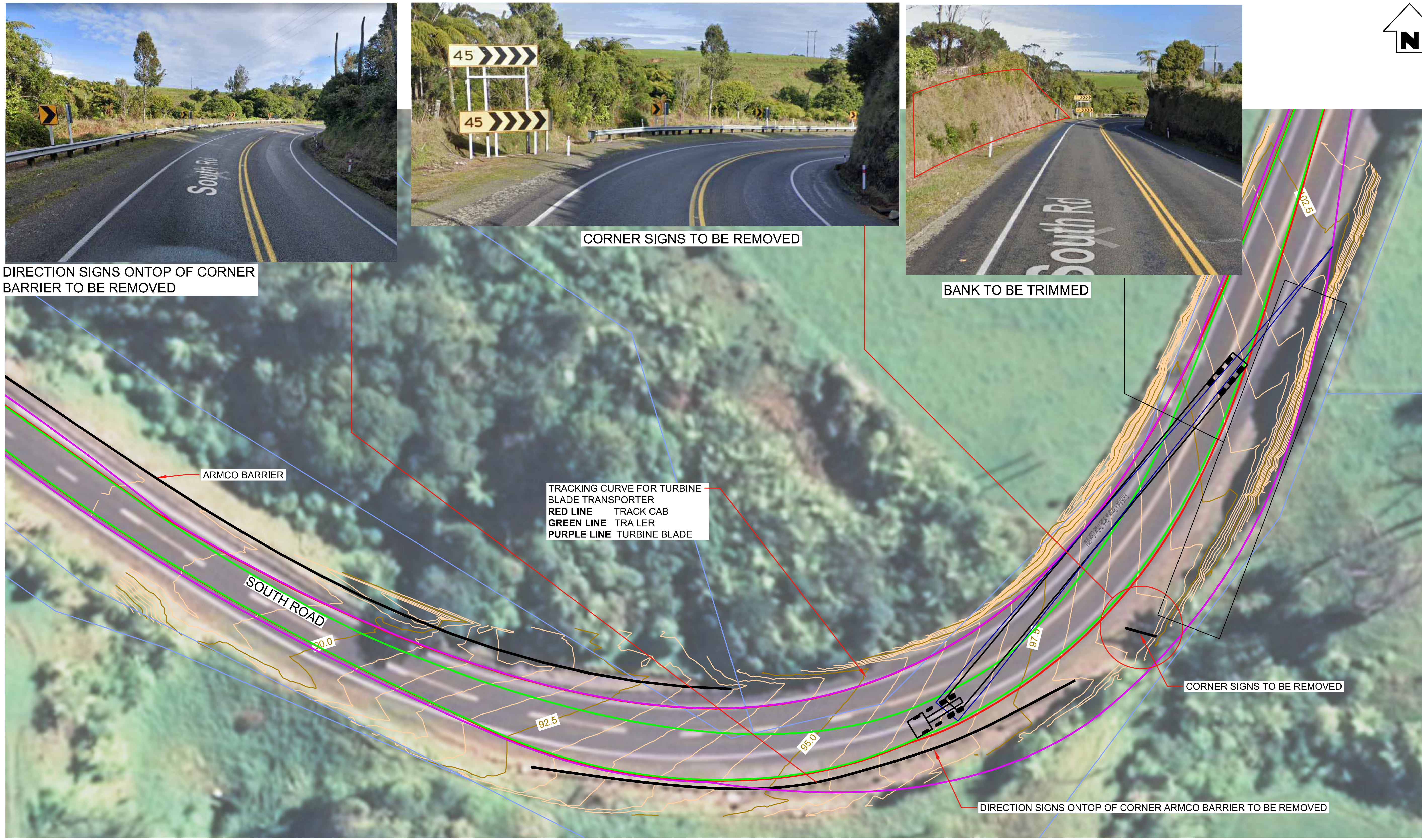

NOTE - MODEL BASED ON CONFIGURATION 1 - HOOTEBOOM SUPER WING CARRIER

5 0 5 10 15 20 25

SCALE 1 : 500

PLAN

SCALE 1:500

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B	02.06.20	LV	IS	.	.	80m BLADE ADDED INTO MODEL

REVISIONS

NUMBER	TITLE

REFERENCE DRAWINGS

GENERAL NOTES
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3. Contour interval is : 0.5m

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LOCATION	KAPUNI	
PROJECT No.	191242	
A3 SCALE	1:500	
SURVEYED	NAME	DATE
DRAWN	LV	17.12.19
CHECKED	JO	17.12.19

TITLE
KAPUNI GREEN HYDROGEN PROJECT
TATARAIMAKA TRACKING CURVES FOR 80m BLADE CORNER ONE

ORIGINAL SIZE	DRAWING No	SHEET	REVISION
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NOTE - MODEL BASED ON CONFIGURATION 1 - HOOTEBOOM SUPER WING CARRIER

PLAN

SCALE 1:500

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REFERENCE DRAWINGS

GENERAL NOTES
1. Coordinates in terms of : NA
2. Elevations in terms of : NA
3. Contour interval is : 0.5m

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LOCATION	KAPUNI	
PROJECT No.	191242	
A3 SCALE	1:500	
SURVEYED	NAME	DATE
DRAWN	LV	17.12.19
CHECKED	JO	17.12.19

TITLE
KAPUNI GREEN HYDROGEN PROJECT
TATARAIMAKA TRACKING CURVES FOR 80m BLADE
CORNER TWO

ORIGINAL SIZE	DRAWING No	SHEET	REVISION
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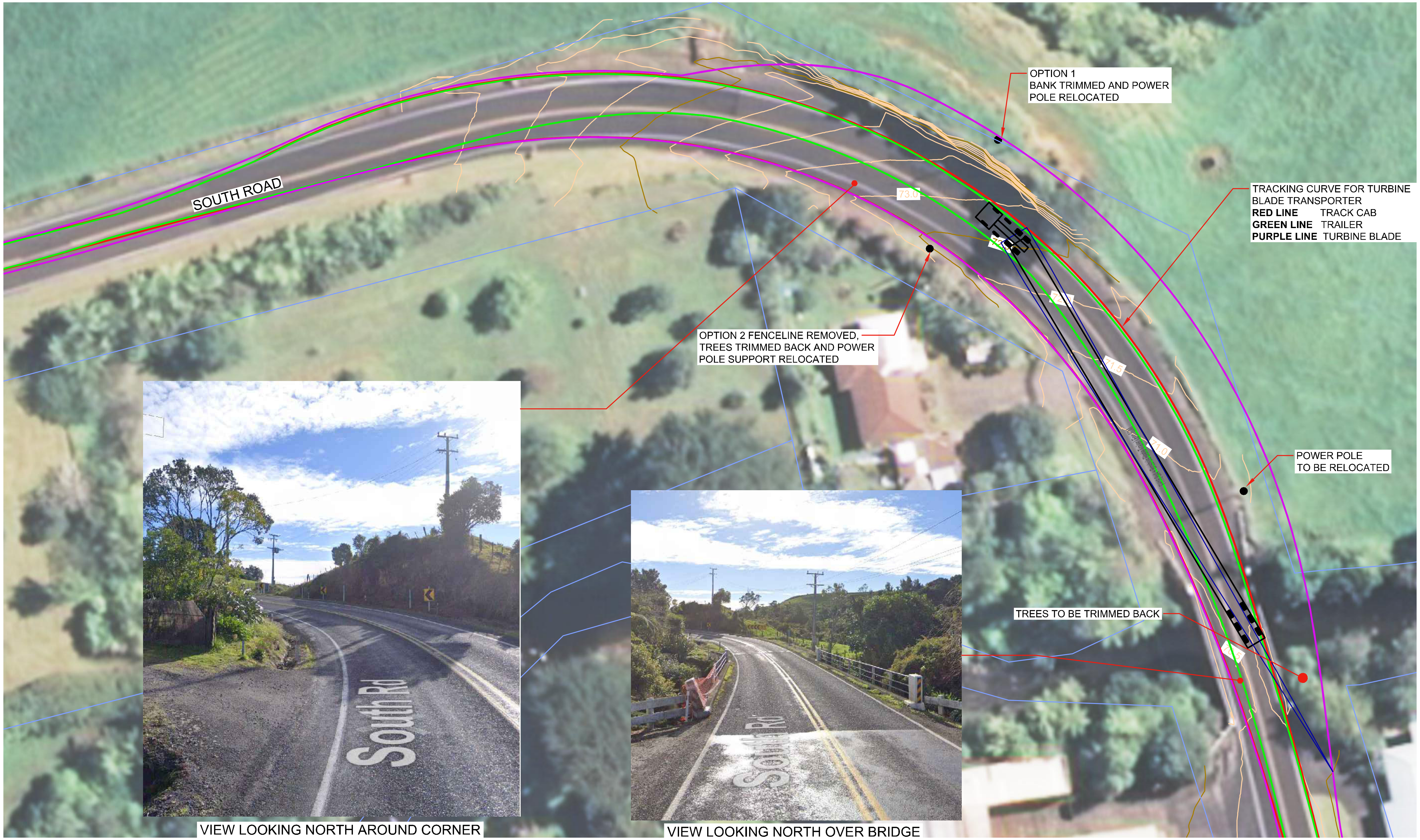
NOTE - MODEL BASED ON CONFIGURATION 1 - HOOTEBOOM SUPER WING CARRIER



VIEW LOOKING NORTH AROUND CORNER

VIEW LOOKING NORTH OVER BRIDGE

5 0 5 10 15 20 25

SCALE 1 : 500

PLAN

SCALE 1:500

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REFERENCE DRAWINGS

GENERAL NOTES
1. Coordinates in terms of : NA
2. Elevations in terms of : NA
3. Contour interval is : 0.5m

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LOCATION: KAPUNI
PROJECT No.: 191242
A3 SCALE: 1:500

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CHECKED	JO	17.12.19

TITLE
KAPUNI GREEN HYDROGEN PROJECT
TATARAIMAKA TRACKING CURVES FOR 80m BLADE
CORNER THREE

ORIGINAL SIZE	DRAWING No	SHEET	REVISION
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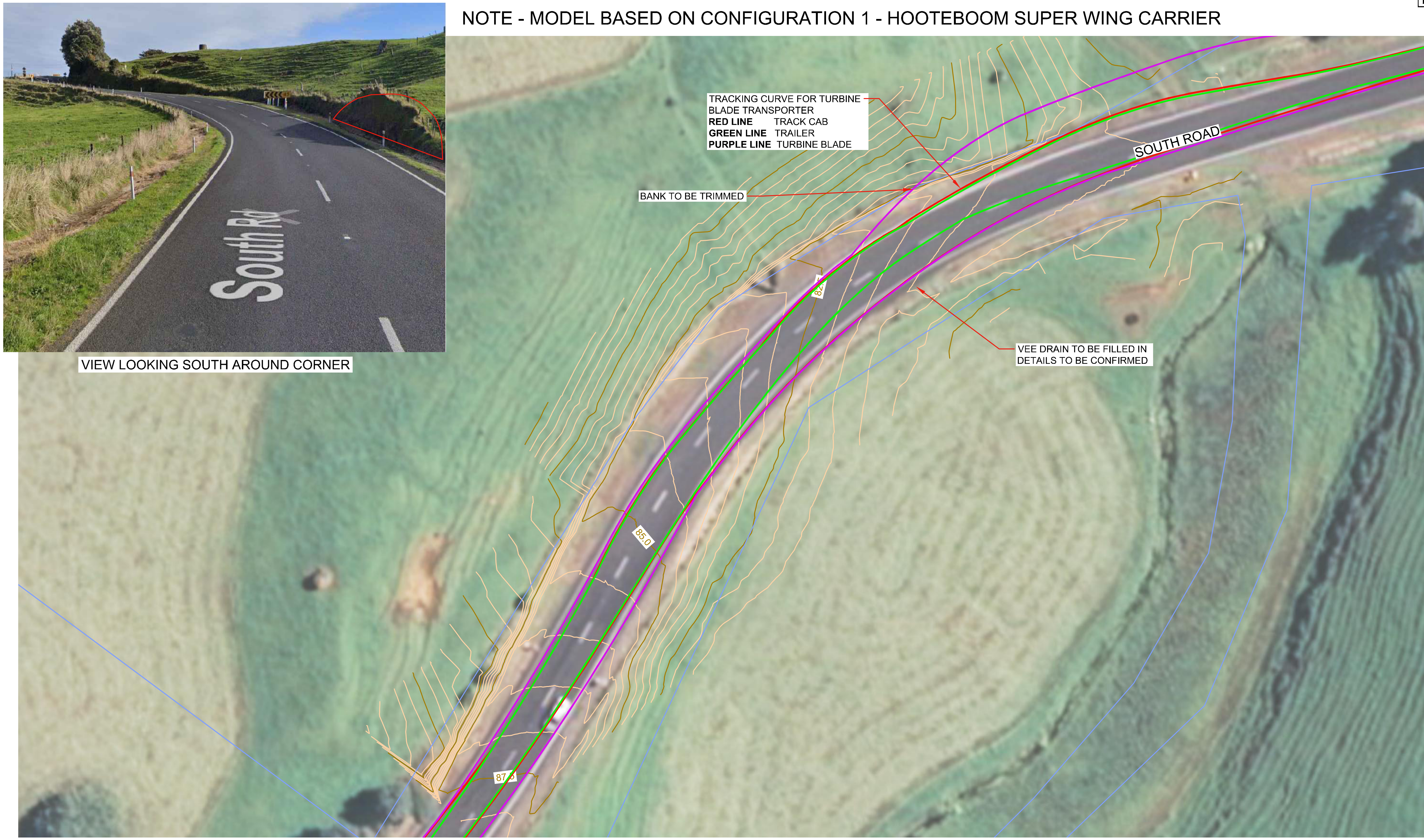
NOTE - MODEL BASED ON CONFIGURATION 1 - HOOTEBOOM SUPER WING CARRIER



5 0 5 10 15 20 25

SCALE 1 : 500

PLAN

SCALE 1:500

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REFERENCE DRAWINGS

GENERAL NOTES
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3. Contour interval is : 0.5m

HIRINGA

LOCATION	KAPUNI
PROJECT No.	191242
A3 SCALE	1:500

SURVEYED	NAME	DATE
DRAWN	LV	17.12.19
CHECKED	JO	17.12.19

TITLE
KAPUNI GREEN HYDROGEN PROJECT
TATARAIMAKA TRACKING CURVES FOR 80m BLADE
CORNER FOUR

ORIGINAL SIZE	DRAWING No	SHEET	REVISION
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