QTLC QUEENSLAND TRANSPORT AND LOGISTICS COUNCIL

PASTIN SOLUTIONS

REVIEW OF OVERSIZE OVERMASS WIND FARM ARRANGEMENTS

Report 2023

Supporting
QEJP Windfarm
Transportation

“Wind farm construction involves significant volumes of heavy vehicle oversize overmass haulage"

1. Abbreviations

TMR	Department of Transport and Main Roads
EPW	Department of Energy and Public Works
GCM	Gross Combination Mass
GCW	Gross Combination Weight
HVNL	Heavy Vehicle National Law
IAP	Intelligent Access Program
IIMM	International Infrastructure Management
LGAQ	Local Government Association of Queensland
MCU	Material Change of Use
MDL	Mass, Dimension and Loading
NHVR	National Heavy Vehicle Regulator
OSOM	Oversize Overmass
OEM	Original Equipment Manufacturer
PP	Period Permits
QLD	Queensland
QPS	Queensland Police Service
QTLC	Queensland Transport and Logistics Council
SARA	State Assessment and Referral Agency
SEQ	South East Queensland
SPV	Special Purpose Vehicle
STP	Single Trip Permits
TMR	Department of Transport and Main Roads

Contents

Supporting QEJP Windfarm Transportation

The Executive Summary

The Queensland Government is committed to the transition to a renewable energy future. To achieve this goal, the Government has set renewable energy targets of 70% by 2032 and 80% by 2035, underpinned by an unprecedented level of investment in renewable energy projects.

Investment in wind farms across the State creates a logistical challenge for the transportation of wind farm components from sea ports to wind farm sites, with a significant increase in the number of wind farm components requiring transportation across the Queensland road transport network. It is imperative that the transportation of these components is done in an efficient, cost-effective and safe manner to reap the benefits of wind farm investment and achieve the Government's renewable energy targets.

Wind farm construction involves significant volumes of heavy vehicle OSOM haulage to transport large wind farm components such as masts, blades and transformers. The access roads, wind turbine ground foundations and other ancillary infrastructure also necessitate the transport of large volumes of construction materials to the site as well a subsequent operational requirement for maintenance traffic.

The Queensland Transport and Logistics Council (QTLC) is a cooperative industry and government advisory body that provides advice to industry stakeholders, state and federal governments on the development, planning, regulation and operation of freight and logistics transport, infrastructure and services in Queensland (www.qtlc.com.au).

QTLC members have raised concerns regarding inefficiencies and constraints in current wind farm development processes, from the initial development application process through to the transportation of componentry and materials. These inefficiencies and constraints have created delays and significant additional costs to wind farm projects. QTLC recognised that if nothing is done, with the increase in wind farm projects

coming online, these inefficiencies and constraints have the potential to significantly impact wind farm project delivery and increase costs for Queenslanders.

QTLC identified an opportunity to pro-actively work with stakeholders to ensure a common understanding of the requirements for wind farm developments and to develop best practices in project planning, development and transportation in relation to wind farm operations.

In July 2023, the QTLC engaged Pastin Solutions to undertake a review of heavy vehicle access requirements for the transportation of wind farm components.

Stakeholders from sixty organisations were interviewed including: developers and Original Equipment Manufacturers (OEM) from the renewable energy sector; State road managers; Local Government road managers; transport operators; the National Heavy Vehicle Regulator (NHVR); electricity generators and distributors; Queensland ports; Queensland Police Service (QPS); Queensland Department of Energy and Public Works (EPW); Queensland Department of State Development, Infrastructure, Local Government and Planning (State Development); Local Government Association of Queensland (LGAQ); rail operators, regional economic development associations and the Queensland Renewable Energy Council.

The review considered the current state regarding application processes, approvals, and port capabilities, in order to identify gaps and issues with current processes and to identify opportunities for improvement.

Eleven recommendations listed in order of short to medium term implementation have been identified to ensure the efficient movement of wind farm components into the future. The recommendations have been grouped in one or more of the following themes: stakeholder coordination, permits, escorts, infrastructure planning and investment, and technology and data.

	Recommendation	Theme	Time	Resp.
1	The creation of pre-approved routes, specifically on major highways and exits from each of the Qld port facilities.	Permits, Stakeholder Coordination	Short	TMR
2	Streamlining permits and permit conditions.	Permits	Short	TMR, NHVR
3	Creation of transport corridors which are designed for OSOM movements, with a focus on routes from Queensland Ports to major highways.	Stakeholder Coordination, Infrastructure Planning and Investment	Short	TMR
4	State Assessment Referral Agency (SARA) process re-mapping with the inclusion of State and Local Road Managers for early discovery of route development.	Stakeholder Coordination	Short	DSD
5	Inclusion of telematics for monitoring of transport movements by Local Road Managers.	Technology & Data	Short	NHVR
6	Creation of a reference group to coordinate the multi-faceted project teams involved in the transportation of wind farm components from Port to destination, reporting to the EPW Renewable Facilitation Sub-committee.	Stakeholder Coordination	Short	QTLC
7	Formation of a taskforce to ensure all Qld ports are operationally ready for wind farm projects.	Stakeholder Coordination, Infrastructure Planning and Investment	Short	TMR
8	Development of an online mapping tool to assist in route planning.	Permits, Tech & Data	Medium	TMR, NHVR
9	Local Road Managers to work with the NHVR to identify and develop transportation routes.	Permits, Tech & Data	Medium	LGA/NHVR
10	Use of industry pilots to escort low risk OSOM moves, reducing the demand for Queensland Police Service (QPS) officers that are in short supply and better utilised in Policing matters.	Escorts	Medium	TMR/QPS
11	Support the expansion of convoy moves.	Stakeholder Coordination, Infrastructure Planning and Investment	Medium	TMR
12	Review of the Electrical Safety Code of Practice 2020 to streamline the requirements of Surveys on key transport corridors	Stakeholder Coordination, Infrastructure Planning and Investment	Medium	TMR

Executive Summary

There is an opportunity for the QTLC to work collaboratively with stakeholders by leading the implementation of these recommendations. Addressing the identified gaps in current and future/arising practices and processes is imperative to ensure the successful development and operation of wind farm sites across Queensland.

Government, the energy industry and the transport industry have previously demonstrated the capacity to respond quickly to achieve some of the desired efficiencies when catering for wind farm component movements. Improving further on processes and practices will assist all parties involved to continue to achieve the desired efficiencies, while the number of OSOM movements expands significantly. This will require the continuing co-operation, focus, and resource commitment of all participants. Failure to do so will delay wind farm projects, impacting on the achievement of Queensland's renewable energy targets.

1. Introduction

1.1 CONTEXT OF THE REVIEW

The Queensland Government is investing $1.16 billion to ensure Queenslanders can continue to enjoy an affordable, secure and sustainable supply of electricity. The Queensland Energy and Jobs Plan (QEJP), released in September 2022, commits to energy targets of 70% renewable energy by 2032 and 75% by 2035. Significant Government investment in renewable energy projects, has resulted in an increase in wind farm projects, which will continue over coming years. This will put considerable strain on the existing transport infrastructure and permitting process.

To support the achievement of these targets, the Queensland Government has committed to working with stakeholders to develop best practice guidance material on project planning and development. This report will assist the renewable energy industry, local governments and landholders in having a common understanding of best practices for the transportation of wind farm components, to ensure that strategic land use considerations are factored into the planning process.

The transition to a renewable energy future has already commenced and has seen an unprecedented level of renewable energy investment activity, with 17 large-scale projects either commencing construction or finalising commercial arrangements.

Wind farm proponents have raised issues with current operational aspects of their Oversize Overmass (OSOM) movements, and their ability to construct their projected wind farms efficiently and economically.

Wind farm construction involves significant volumes of heavy vehicle haulage. Turbine components such as masts, blades and transformers normally require oversize overmass (OSOM) haulage from a coastal port to a construction site hundreds of kilometres inland. Turbine foundations, access roads and ancillary infrastructure also necessitate the transport of large volumes of materials to the site. The OSOM and other heavy vehicle construction haulage contributes to significant loads on local and state road networks during wind farm construction. Construction of wind farms also creates an ongoing local traffic increase during the later operational phase where routes are still required to service the sites with replacement blades and componentry.

Government, the energy industry sector and the transport industry have demonstrated the capacity to respond quickly to deliver some of the desired efficiencies when catering for OSOM movements, while mitigating their impacts on other road users and their safety. Continuing to achieve this while the number of OSOM movements expands significantly, will require the continuing co-operation, focus, and resource commitment of all participants. Failure to do so will delay potential wind farm projects, which will also impact the jobs and inputs needed for their development, harming the state economy by billions of dollars during the next five years.

The Coordinator General (CoG) in the Queensland State Development, Infrastructure, Local Government and Planning Department owns the framework in which original equipment manufacturers (OEMs) engage in the approvals process for wind farm developments. Transport is a very small feature in their guidance material and several stakeholders have noted that clearer frameworks, guidance, and coordination is required by the Queensland Government. CoGs have expressed a keen interest in getting proponents together with relevant agencies for this project.

The Department of Energy and Public Works (EPW) were involved in ongoing discussions with transport and logistics proponents on issues in 2023 and are supportive of QTLC investigating afresh the challenges and opportunities to improve the transportation issues associated with projected wind farm projects. As the lead agency behind QEJP, EPW have been open in saying that work and discussions of this nature will be required to support QEJP through known areas of improvement such as skilling, construction, and community engagement.

1. Introduction

TMR has facilitated planning and subsequent transportation of components for the construction of wind farm projects and other power-generating assets. This assessment and facilitation role is resource intensive and requires coordination across multiple areas within TMR to ensure that access is provided in a safe and timely manner. These moves differ to current processes around access permissions for OSOM movements, where the transport operator is only required to submit a permit application through the National Heavy Vehicle Regulator (NHVR) Portal and assessed by TMR as a road manager. Wind farm components are high, wide, long, heavy, and require multiple trips and significant planning to ensure that the load can travel along the network safely. This often requires detailed assessments and road modifications to enable each load to fit. For each wind turbine, there are 1214 components and associated OSOM movements.

1.2 SCOPE OF THE REVIEW

Pastin Solutions was engaged by the QTLC to review current heavy vehicle access requirements, practices, and principles and to identify gaps and discuss potential solutions with the stakeholders involved in the movement of wind farm components from port to site. The review comprised the following:

- Interviews with stakeholders to ascertain the concerns being faced now and expected in the future by all stakeholders involved in the transportation of equipment for wind farms.
- Workshops and the development of potential solutions to the challenges identified, as well as others foreseen. Solutions include, but are not limited to, initiatives and improved processes in the areas of stakeholder coordination, permitting, escorting, infrastructure planning and investment and technology and data.
- It is noted that not all stakeholders who were interviewed were willing to provide detailed costings and/or timeframes related to wind farm projects due to commercial sensitivities. The information provided in this report reflects the level of detail provided by stakeholders.

1.3 APPROACH

The following approach was taken for the review:

- Inception – Established project objectives, confirmed key stakeholders and sources of information and identified key project success factors. Inception activities comprised of:
  - Inception meeting
  - Stakeholder identification, confirmation of roles and responsibilities
  - Confirmation of the project plan/timeline
- Discovery – Undertook the review process to assess, and where possible quantify, the productivity, asset management and safety impact of existing access arrangements for OSOM vehicles.
- Engagement – Undertook significant engagement with the renewable energy industry, transport operators and road managers.

1.4 STAKEHOLDER ENGAGEMENT

A total number of 60 organisations were interviewed from the following stakeholder groups:

- Renewable Energy Sector – Developers, Original Equipment Manufacturers (OEM)
- State Road Managers
- Local Government Road Managers
- Transport Operators
- National Heavy Vehicle Regulator (NHVR)
- Power generators and distributors
- Queensland ports including Brisbane, Gladstone, Bundaberg and Townsville
- Queensland Police Service (QPS)
- Department of Energy and Public Works (EPW)
- Department of State Development, Infrastructure, Local Government and Planning (State Development)
- Local Government Association of Queensland (LGAQ)
- Queensland Renewable Energy Council (QREC)

2. Renewable energy

2.1 QUEENSLAND'S RENEWABLE ENERGY TARGETS

Queensland began a renewable energy boom in 2015 to reduce emissions, create jobs, and diversify the economy with a target of 50% renewable energy by 2030. The Queensland Energy and Jobs Plan (QEJP), introduced in September 2022, extends the goal to 70% renewable energy by 2032 and 75% by 2035. The state has made considerable progress, with 52 large-scale renewable energy projects representing over $10 billion in investment, providing around 8,000 construction jobs and generating more than 5,900 MW of clean energy, avoiding over 14 million tonnes of emissions annually.

The state boasts over 9,000 MW of renewable energy capacity, including rooftop solar, which plays a crucial role in achieving the targets. More than 780,000 homes and small businesses in Queensland have rooftop solar, making the state the leader in household solar installations in Australia, with 1 in 3 homes using solar energy.

The Queensland Renewable Energy and Hydrogen Jobs Fund, now boosted to $4.5 billion, allows government-owned energy corporations to collaborate with the private sector and invest in commercial renewable energy and hydrogen projects. The fund supports initiatives such as the Queensland Renewable Energy Zones (QREZ) (see Figure 1), Borumba Dam Pumped Hydro, clean energy in schools, Solar 150 projects, renewables for remote communities, CleanCo, and Renewables 400.

The Fund focuses on investment proposals that promote additional renewable energy generation and storage capacity, demonstrate commercial value, and create employment opportunities. The government is committed to strategic network investments and developing new renewable energy projects in the northern, central, and southern QREZs. Additionally, the government aims to reach at least 25 gigawatts of total renewable energy in these regions by 2035.

Projects supported by the Fund include the Wambo Wind Farm, Tarong West Wind Farm, Central Queensland Hydrogen Project, Kogan Renewable Hydrogen Project, Greenbank Battery, Large-Scale and Community Batteries, Central Queensland Wind Farms, Swanbank Battery, and the Hydrogen-Ready Gas Peaking Power Station at Kogan Creek.

In October, 2023, the Energy (Renewable Transformation and Jobs) Bill 2023 (Qld) was introduced to Parliament

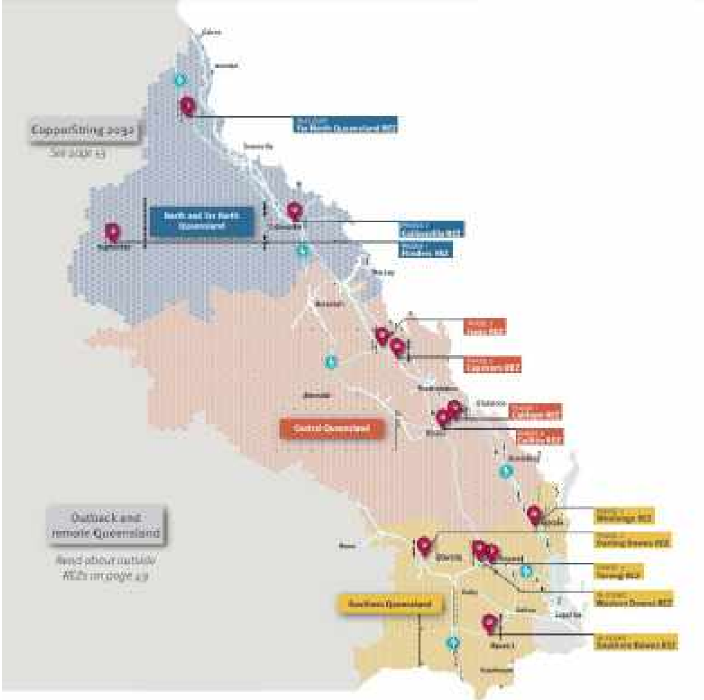


Figure 1: Renewable Energy Zones Map, source: www.epw.qld.gov.au (2023)

legislating the QEJP and seeking to enshrine the three renewable energy targets in legislation.

The Draft 2023 Queensland Energy Zone Roadmap was recently released, outlining the pathway to connect 22 gigawatts of wind and solar generated power.

2. Renewable energy

2.2 CURRENT RENEWABLE ENERGY PROJECTS

Due to commercial sensitivities or uncertainty of volumes for specific projects, stakeholders were not able to provide detailed information on future projects (next 10 years). With this stated, the current outline of major projects are listed below, along with two case studies of wind farm projects, one of which is in the final stages of being commissioned and one of which is now operational.

Herries Range / MacIntyre Wind Farm

- Located in the Warwick region of Southeast Queensland
- Will provide 2000MW coupled with the MacIntyre Wind Precinct
- $2 billion project
- 162 locations of component construction
- 2160 components within the project wit potentially 4000 transport moves

CopperString Project

- Located in North QLD inclusive of Mt Isa, Cloncurry, and Townsville
- Combined with solar and alternate energy sources, will provide 6000MW
- $5 billion project
- Includes the 800MW Prairie Wind Farm and 1000MW Wongalee Project

Wambo Wind Farm

- Stanwell has been allocated $192.5 million towards its investment in the 252MW Wambo Wind Farm, which it will develop in partnership with global renewables developer, Cubico. Stanwell will own 50 per cent of the wind farm and offtake the remaining 50 per cent through a power agreement.
- Construction of the wind farm is expected to commence shortly and be operational by 2024.

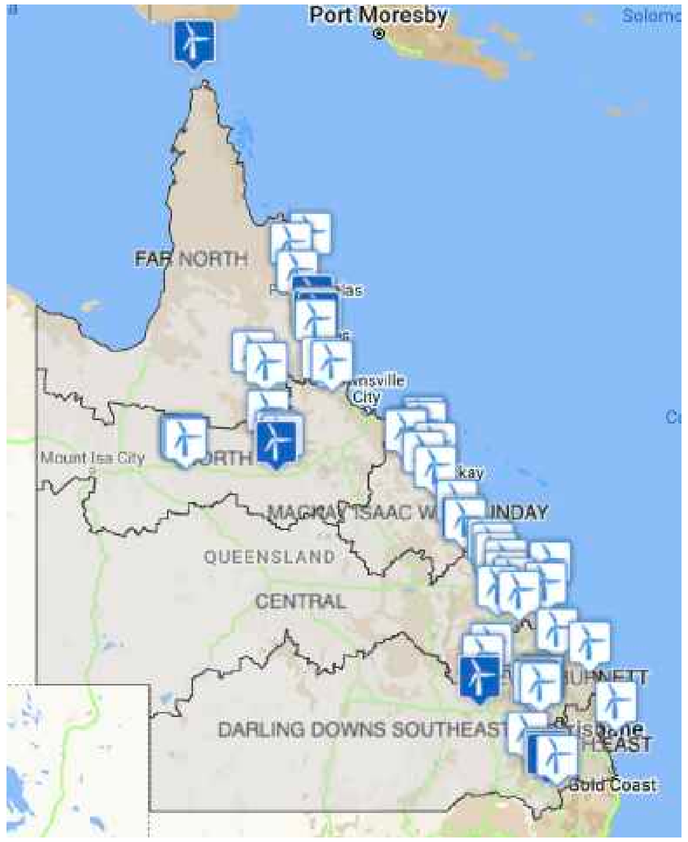


Figure 2. Current Wind Farm Projects
Power plants map of Queensland (epw.qld.gov.au)

Tarong West Wind Farm

- Stanwell has been allocated $776.1 million to build the Tarong West Wind Farm in the South Burnett region of Queensland. As Australia's largest publicly owned wind farm, Tarong West could generate up to 500MW capacity, enough clean energy to power up to 230,000 homes.
- The wind farm could be built in a strategic partnership with global renewable energy giant RES. A final decision is expected in 2024, and if approved, construction would also commence in 2024, with commercial operations from 2026.

For further information on Queensland wind farm projects, three wind farm development case studies are provided at Appendix 1. The case studies include information on the development approval processes, traffic impact assessments and transport management plan requirements. further information on Queensland wind farm projects, three wind farm development case studies are provided at Appendix 1. The case studies include information on the development approval processes, traffic impact assessments and transport management plan requirements.

3. Current process affecting Windfarm Transportation

3.1 OVERALL PROJECT PLANNING AND DEVELOPMENT ASSESSMENT

When planning or commencing a renewable energy project, developers must obtain access to suitable and available land and follow the relevant development assessment processes. Developers are required to consider planning and environmental requirements under the relevant Queensland and local government legislation applying to the site. These requirements will vary depending on the type of project, site characteristics and constraints, and the assessing authority's legislative frameworks. Developers should contact local, state and federal government agencies early in the project planning stage to understand:

- what matters need to be addressed in the development application
- whether there are any further approvals required, which sit outside of the planning and development assessment framework

The Department of State Development, Manufacturing, Infrastructure and Planning (DSDMIP) is responsible for Queensland's development assessment framework under the *Planning Act 2016 (Qld)* . It is also responsible, through the SARA, for assessing developments that could impact on matters of interest to Queensland against the State Development Assessment Provisions. As part of its assessment, SARA may seek technical advice from other Queensland Government agencies and the proponents may be required to obtain additional approvals.

Renewable energy projects must also comply with development assessment requirements in local government planning schemes. Local planning scheme codes should already include adequate provisions to ensure new development avoids, minimises or mitigates impacts on local roads. Developers should also refer to the Department of Transport and Main Roads "Guide to Traffic Impact Assessment 2017" for further information on how to assess the traffic impacts of a proposed development.

Renewable energy projects in Queensland must also comply with electrical safety and workplace health and safety requirements including:

- Electrical Safety Act 2002 (Qld)
- Work Health and Safety Act 2011 (Qld)
- associated regulations:
  - Electrical Safety Regulation 2013 (Qld)
  - Work Health and Safety Regulation 2011 (Qld)
- relevant codes of practice
- Australian and industry standards.

3. Current process affecting Windfarm Transportation

3.1.1 ASSESSMENT PROCESS FOR WIND FARMS

Development applications for Queensland wind farm proposals must be lodged with SARA and will be assessed against *State Code 23: Wind Farm Development of the State Development Assessment Provisions.*

Queensland's wind farm code provides a consistent, coordinated, whole-of-government approach to assessing and regulating wind farm development across Queensland. It helps achieve quality renewable energy outcomes while protecting communities from adverse impacts from wind farm development.

State Code 23 has recently been reviewed (the review closed in September 2023) and key changes have been proposed. Key changes proposed to the State Code and Planning Guidance will:

- strengthen the environmental assessment criteria to prevent impacts on threatened species and associated habitats and areas of high ecological value.
- clarify requirements for replanting and rehabilitating areas that are cleared for construction that are not needed to remain cleared for operations.
- require projects to better understand areas of high erosion risk, particularly in Great Barrier Reef catchments, when formulating site layouts and to submit material for assessment to demonstrate that erosion and run off during construction can be adequately managed.
- require applicants to demonstrate during the assessment that a viable heavy haulage route can support project construction.
- introduce a new assessment criterion requiring proponents to assess the implications on surrounding communities and townships of proposed on-site construction camps.

It is anticipated that information and/or recommendations captured in this report will feed into the review of State Code 23.

3.1.2 APPROVALS FOR COMPLEX PROJECTS

There are several assessment pathways that can be followed for complex renewable energy projects.

The Department of State Development, Infrastructure, Local Government and Planning (DSDILGP) can assist project proponents map out the development approval processes for more complex large-scale renewable energy projects (e.g. with a hydro-electric or geothermal component or a combination of wind and solar).

Projects declared under the *State Development and Public Works Organisation Act 1971 (SDPWO Act)* can use powers under the act to assist with project delivery. The relevant minister may declare a project to be a 'prescribed project' under Part 5A of the SDPWO Act if the project is of significance, economically and socially, to Queensland or a region of Queensland.

A prescribed project declaration enables the Coordinator-General, if necessary, to intervene in the approvals process in a number of ways to ensure timely decision making for the prescribed project. This declaration can be sought by the project proponent as was the case in the Kidston Wind Farm.

3. Current process affecting Windfarm Transportation

3.2 WIND FARM TRANSPORTATION APPROVAL PROCESS

The current wind farm transport application process is outlined below from project inception and development through to application with the NHVR, road managers, affected power distributors and the Queensland Police Service (QPS). Each application requires approvals from the relevant authorities and may require multiple applications if there are any variations in component dimensions or weights.

The main impacts from wind farms on transport infrastructure and traffic occur during the construction phase. Wind farms generate traffic movements that have the potential to impact on the road network, including state and locally-controlled roads, railway corridors and railway level crossings. During the construction phase, the road network is used to transport equipment, construction plant and turbine components to the site. The OSOM moves are only a small percentage of total moves (industry representatives indicated that they are less than 5% of their total moves). The balance of moves typically being deliveries of balance of plant during construction. Typically, the construction stage involves a high number of daily vehicle movements involving heavy vehicles.

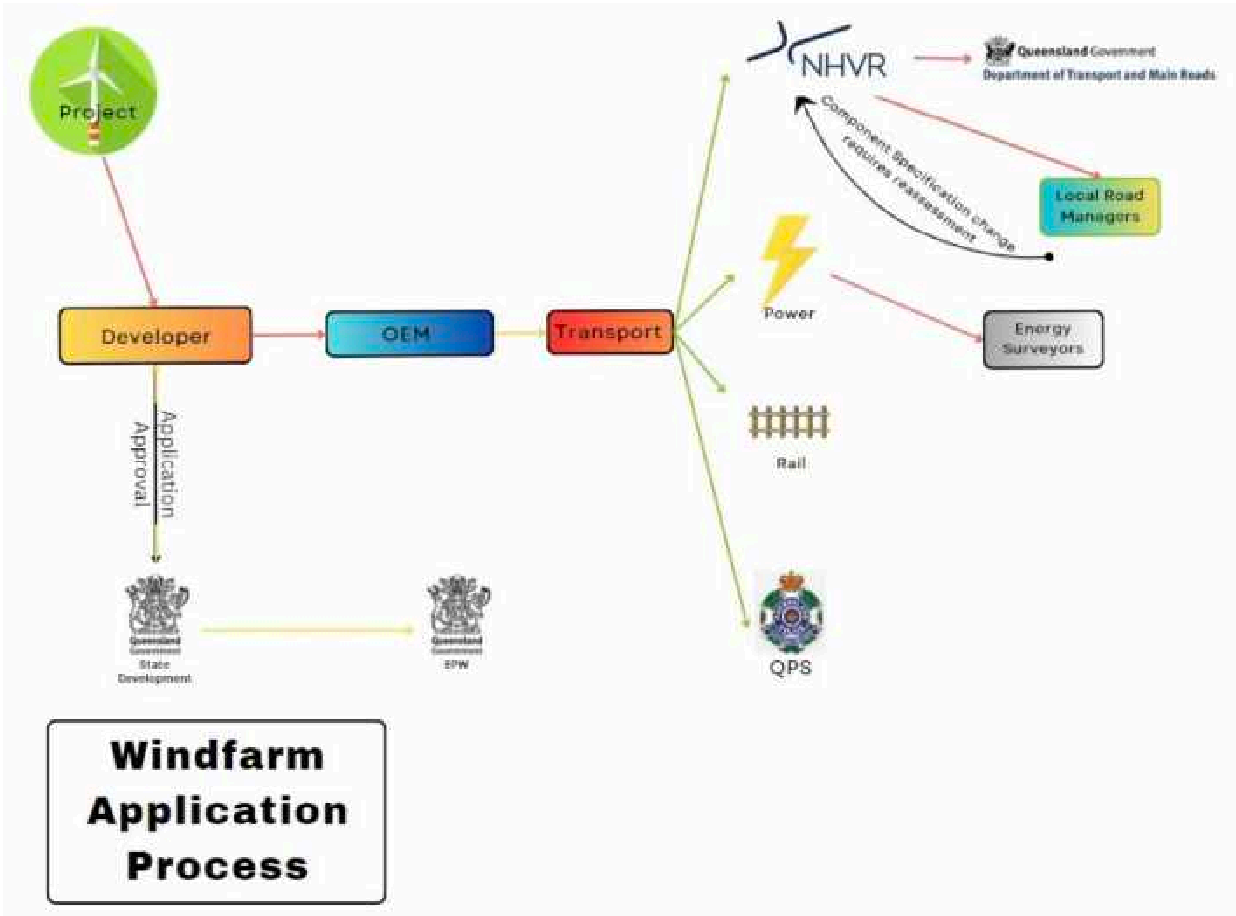


Figure 3: Current Wind Farm Transport Application Process

In the current wind farm application process, the developer gains the overall approval for the project to proceed under the SARA. The developer engages the OEM for the wind farm construction and supply of materials who then engages a transport and logistics provider. In the current process, the transport and logistics provider applies for permits from the NHVR, affected power distributors, rail operators and the QPS. The process of permitting through the NHVR involves TMR and local road managers relevant to the local council area that the wind farm components are being transported to or through to final destination.

3. Current process affecting Windfarm Transportation

3.2 WIND FARM TRANSPORTATION APPROVAL PROCESS

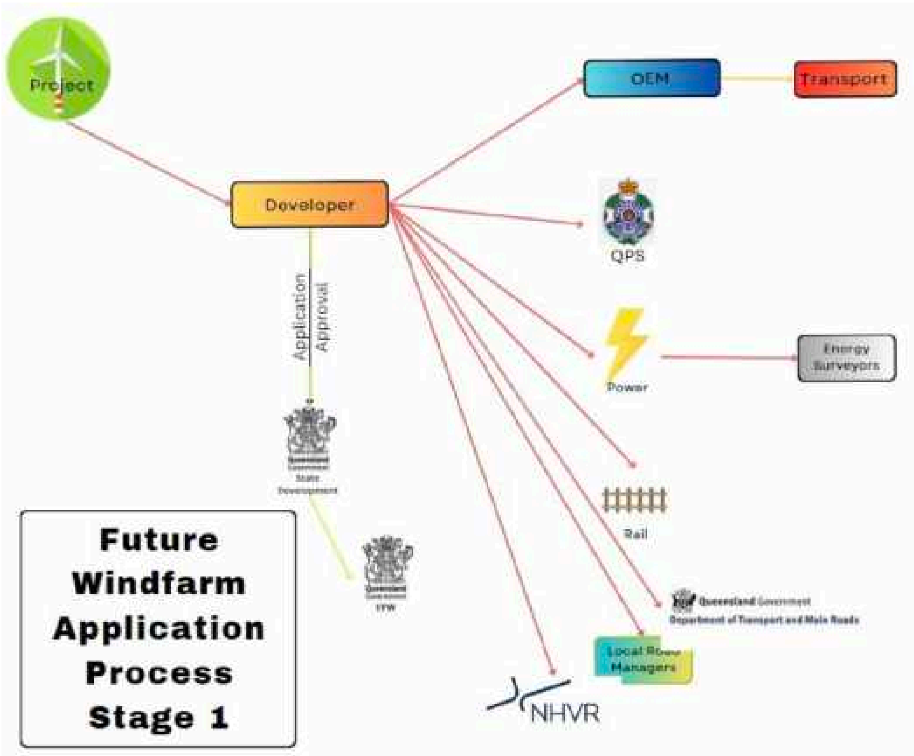


Figure 4: Proposed Future Wind Farm Transport Application Process Stage 1 – Developer engages with relevant stakeholders as part of the SARA development application process.

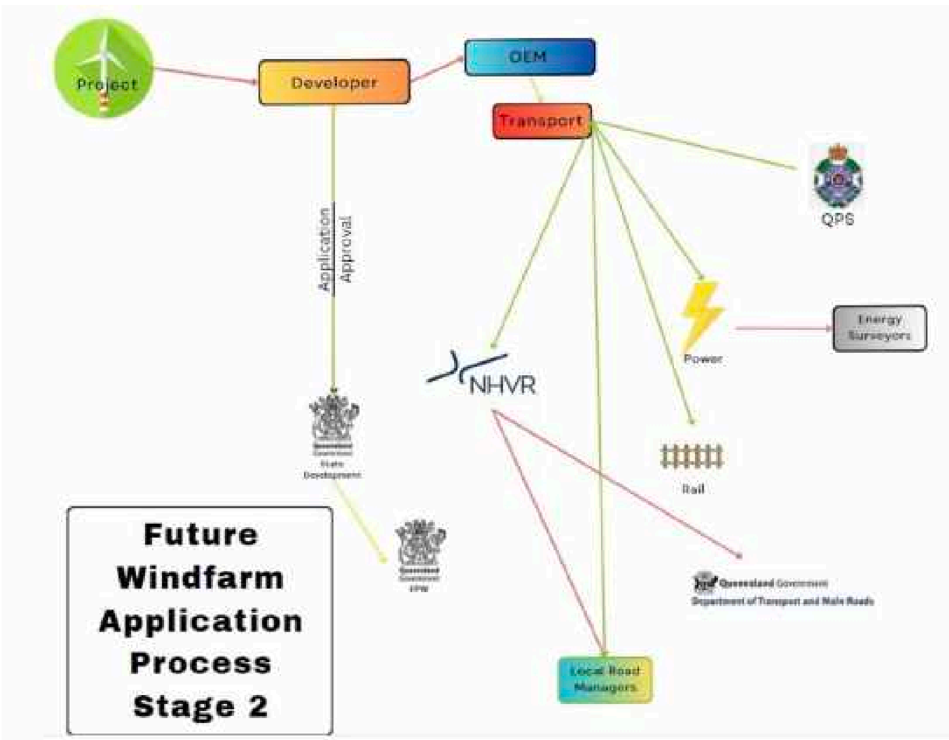


Figure 5: Proposed Future Wind Farm Transport Application Process Stage 2 – Transport operator re-engages with stakeholders to confirm requirements at the operational planning stage.

3. Current process affecting Windfarm Transportation

3.2.1 SARA DEVELOPMENT APPLICATION PROCESS

The Department of State Development is the first point of contact for developers to begin the application process. While the Department of State Development is responsible for the Development Application (DA) process, the application for road access is through the NHVR in consultation with the road manager(s). OEM's and transport operators are therefore encouraged to build relationships with the relevant road managers to obtain prior consent.

The Department of State Development is currently reviewing the State Code 23 SARA application process, and therefore this is an ideal time for the access process for OSOM movements to be improved to provide greater direction.

The SARA process for wind farms in Queensland involves the following steps:

3. Current process affecting Windfarm Transportation

3.2.1 SARA DEVELOPMENT APPLICATION PROCESS

It is important to note that the above process may evolve or change over time, and specific details might vary depending on the scale and location of the wind farm project.

Applicants are strongly encouraged to consult with TMR and relevant local authorities on the implications of heavy vehicle haulage routes during the formulation of site layouts and project design. This engagement will ensure that project componentry such as turbine heights, blade lengths and other project components can be viably constructed after gaining approvals. Gaining this confidence prior to lodging an application will provide greater confidence with other aspects of project support such as informing acoustic modelling, access track construction cross sections, erosion risk assessments etc. This increased level of construction confidence minimises the need to seek changes to an approval that can occur if heavy vehicle haulage implications are only considered after a Material Change of Use (MCU) approval is issued.

To demonstrate compliance with Performance Outcomes 16 – 20 of the SARA application process, applicants should accompany their application with a heavy vehicle and OSOM construction concept strategy. This strategy should outline the:

- consultation that has occurred with relevant local authorities and TMR in the formulation of the strategy
- proposed turbines and ancillary infrastructure key components that were used to inform the strategy formulation (for example, expected volumes and maximum weights and lengths of components requiring OSOM haulage)
- proposed vehicle types to be used for OSOM haulage (this should involve consultation with prospective haulage contractors)
- key 'pressure points' on proposed OSOM routes such as bridges, structures, and sections of constrained horizontal geometry due to the nature of the route, such as tight winding roads up ranges
- details of how the proposed OSOM haulage can be feasibly achieved, at full cost to the proponent, if an MCU were to be approved.

If SARA supports the view that heavy vehicle haulage is realistically viable for the construction of a project, conditions of approval will then require the preparation of detailed Traffic Impact Assessments and detailed Construction and Heavy Vehicle Haulage Plans to be prepared prior to commencing construction.

3.2.2 TRANSPORT MANAGEMENT PLAN

The development phase of a wind farm project requires engagement with various stakeholders including TMR and state and local governments. Approvals from these stakeholders for road access are based on the submission of various project outlines, including a Transport Management Plan (TMP).

The TMP for wind farms in Queensland is an essential component of the overall planning and development process. It focuses on managing the transportation aspects of constructing and operating a wind farm. The TMP ensures that the movement of heavy vehicles and equipment during construction and maintenance does not adversely impact local communities, roads, and the environment. Below is an outline of the typical components of a TMP for wind farms in Queensland:

Introduction and Project Overview:

- Introduce the TMP and its purpose.
- Provide an overview of the wind farm project, including its location, size, and key construction and operational activities.

3. Current process affecting Windfarm Transportation

3.2.2 TRANSPORT MANAGEMENT PLAN

Project Timeline and Phases:

- Outline the construction and operational phases of the wind farm project.
- Provide a timeline for each phase, indicating the expected duration and timing of significant transportation activities.

Transportation Routes:

- Identify the proposed transportation routes for heavy vehicles carrying wind turbine components and construction materials.
- Consider the existing road network and any upgrades required to accommodate transportation needs.
- Highlight any alternative routes considered and the reasons for selecting the preferred routes.

Traffic Management:

- Describe the traffic management strategies to minimise disruptions to local traffic flow during construction and operation.
- Detail how traffic will be controlled during specific construction activities, such as turbine component deliveries and crane movements.

Road Condition Surveys:

- Conduct road condition assessments before construction to establish baseline conditions.
- Specify plans for conducting regular road condition surveys during and after construction to monitor and address any potential damage caused by construction traffic.

Environmental Considerations:

- Address environmental concerns related to transportation activities, such as potential impacts on flora, fauna, and sensitive areas.
- Outline measures to mitigate environmental impacts, such as using temporary mats or road upgrades in sensitive areas.

Community Engagement and Communication:

- Explain the methods and frequency of community engagement regarding transportation activities.
- Describe how the project team will communicate with the local community about traffic disruptions, construction schedules, and safety measures.

Safety and Emergency Response:

- Detail safety protocols for transportation activities, including escort arrangements, vehicle speed limits, and safety signage.
- Provide emergency response plans in case of accidents or incidents during transportation.

Monitoring and Compliance:

- Describe the monitoring and reporting procedures to assess the effectiveness of the TMP and ensure compliance with its requirements.
- Identify responsibilities for monitoring and reporting from both the wind farm proponent and relevant authorities.

It is important to note that the specific requirements and details of a TMP for a wind farm project will vary based on the project's location, scale, and other factors. Developers must comply with Queensland's regulations and guidelines while preparing the TMP.

3. Current process affecting Windfarm Transportation

3.2.3 TRANSPORT AND MAIN ROADS PERMIT APPLICATION PROCESS

The following is an outline of the Transport and Main Roads (TMR) permit application process.

1. Planning approvals are submitted (12-24 months prior to project commencement).
2. TMR is engaged as an iterative process.
   - Assessment and approval of Traffic Impact Assessment (TIA)
   - Infrastructure investigation
3. An initial heavy vehicle assessment engagement commences.
   - Route assessment submitted (If approved, stakeholder engagement commences. If disapproved, a new route must be submitted).
   - Structural assessments made.
   - Transport operator engaged.
4. A suitable route is established.
5. Stakeholder engagement meetings commence on a monthly, then fortnightly and weekly as required (at least 12 months prior to project delivery start date). These meetings include:
   - State or Local Road Managers (relevant to the route)
   - Queensland Police Service (QPS)
   - Queensland Rail (QR)
   - Transport Operator
   - Developer
   - Engineering Consultants
6. The Traffic Management Plan (TMP) and TIA are finalised and approved by all relevant parties.
7. Application to NHVR for permits occurs.
   - Permits are issued per configuration for multiple trips and are project specific.
8. A trial movement occurs, which includes blade and tower components.
9. A post-trial meeting occurs and the success of the trial is assessed.
10. On success of the trial, TMR approves the permit.

Note: The transport operator continues to provide updates of delivery schedules to TMR throughout the project. TMR will review the movements through local road managers and undertake assurance activities to ensure dimensions and mass (relevant to the perm it) are adhered to.

3. Current process affecting Windfarm Transportation

3.2.4 NATIONAL HEAVY VEHICLE REGULATOR PERMIT APPLICATION PROCESS

Since 2014, the National Heavy Vehicle Regulator, has managed permit applications for participating jurisdictions. Queries about vehicle specifications should be addressed by establishing clear expectations for the vehicle's Gross Combination Mass (GCM), registration requirements, and roadworthiness, as mandated by law. Examples of typical vehicle combinations used in wind farm component transportation and typical vehicle configurations used in wind farm blade transportation are at Appendix 5.

While the NHVR handles consultation and coordination with road managers, transport operators are encouraged to cultivate direct relationships with road managers and other stakeholders to secure prior access consent. This fosters a better understanding of industry needs and road manager expectations, enhancing the quality of permit applications. This approach does not involve deviating from established processes; instead, it seeks to bolster industry understanding and foster cooperation between NHVR and road managers, raising the standard of permit applications.

3.2.4.1 PERMIT PROCESS AND THE NHVR PORTAL

The permit process serves a dual purpose, encompassing the NHVR's assessment of public safety risk and the road managers' evaluation of a restricted access vehicle's compatibility with specific roads.

The NHVR Portal, introduced in August 2016, is the online platform on which transport operators apply for their Class 1 OSOM permits. For interstate movements and for states with delegated authority to the NHVR, transport operators are mandated to submit applications through this centralised system, following the "one system, one permit" approach. The process involves the following stages:

- Application Initiation: Transport operators use an online portal to submit applications, providing essential information for thorough assessment by both the NHVR and road managers.
- NHVR Assessment: The NHVR evaluates aspects including vehicle size, mass, configuration, mass distribution, and fitness for the intended task.
- Road Manager Evaluation: The NHVR's assessment is forwarded to relevant road managers, who assess factors like the vehicle's interaction with traffic, infrastructure, road conditions, and road dimensions.
- Road Manager Response: Affected road managers provide their evaluations to NHVR.
- Assessment Consolidation and Decision: NHVR compiles received assessments and issues a final decision, resulting in either permit approval or rejection.
- Information Requests: NHVR and road managers retain the ability to request further information from transport operators at any stage, including third-party approvals.

Supporting QEJP Windfarm Transportation >>>> 0021

3. Current process affecting Windfarm Transportation

3.2.4 NHVR APPLICATION PROCESS

	Apply	Assess	Consent	Notify

Customer	• Checks for applicable Notices for their vehicle type.
	• Assess and maps the intended route to ensure the vehicle is suitable for the road infrastructure.
	• Consults with impacted road managers where:
	  ▪ there are multiple ways to enter a site
	  ▪ they are working on a state government project
	  ▪ the route may require smaller or specific vehicle types
	  ▪ it may reduce the likelihood of rejection.
	• Consults with and provides third party approvals where required (Third Party information).
	• Completes application with true and accurate information.
	• Ensures application is submitted with sufficient time for assessment by road managers.
	• Where escalation may be required, provide sufficient information to support the request.
	• Pays the appropriate fee and submits via NHVR Portal.
	•
		• Responds to requests for information from NHVR.	• Responds to requests for information from road managers.
			• Responds to requests for information from NHVR.
				• Responds to requests for information from NHVR.

NHVR	• Responds to enquiries. • Responds to support requests. • Reviews requests for escalation of applications prior to the commencement of the freight task. • Supports industry with emergency access requests in the event of a natural disaster.	• Performs quality check of application and ensures the vehicle type is eligible to operate on the road network. • Assesses the application including vehicle information, route/s, and relevant road managers to ensure the application complies with jurisdictional policy. • As per the HVNL, seeks consent from impacted RMs and facilitates the end to end process.	• Provides support and advice to customers and road managers. • Validates road managers extension of time (EOT) requests. • Ensures information requests are actioned in a timely manner. • Liaises with customers and road managers in relation to valid escalation requests.	• Prepares and issues relevant documentation (Permit or Refusal Notice) to customers and road managers. • Ensures information requests are actioned in a timely manner.

Road Manager	• Assesses and maintains road infrastructure.
	• Responsible for reviewing issued permits for potential permit amendments (route and conditions) or cancellations.
	• Provides pre-application support for customers by responding to enquiries and giving advice.
			• Assesses the request for consent:
			  ▪ determines if a route assessment or consultation with a third party is required and whether an EOT is needed.
			  ▪ If further documentation is necessary, notifies NHVR and customer.
			• Assesses if the roads are suitable for the vehicle type:
			  ▪ if roads are not suitable, a road manager may propose an alternative route for review by the Regulator and customer
			  ▪ if providing consent, determines and applies appropriate conditions
			  ▪ if providing refusal, provides valid reasons as per the HVNL as outlined in the Approved Guidelines for Granting Access
			• Provides a decision via NHVR Portal within the legislated timeframe.
				• Notifies the NHVR if there are changes to heavy vehicle networks impacting issued permits.
				• Manages route disruptions, including natural disasters, and liaises with the NHVR to minimise impacts to the supply chain.

Figure 6: NHVR Application Process (source: Roles and Responsibilities - Access permit application process (nhvr.gov.au))

3. Current process affecting Windfarm Transportation

3.2.5 ELECTRICITY DISTRIBUTOR APPLICATION PROCESS

Transporting a load that's more than 4.6m high requires power companies to conduct an assessment stipulated in the Electrical Safety Code of Practice 2020, checking the suitability and the requirements necessary for the safe transport of a proposed high load by physically checking the intended route against the height of transmission lines.

For safety reasons and to protect transmission assets, approvals must be sought from the power companies for the transportation of any OSOM loads. Depending on the category of the OSOM load, certain conditions will be required for the protection of electrical infrastructure (see Figure 7). Category 2,3 and 4 loads are also required to provide the time and date of transport and details of the service provider facilitating the transport.

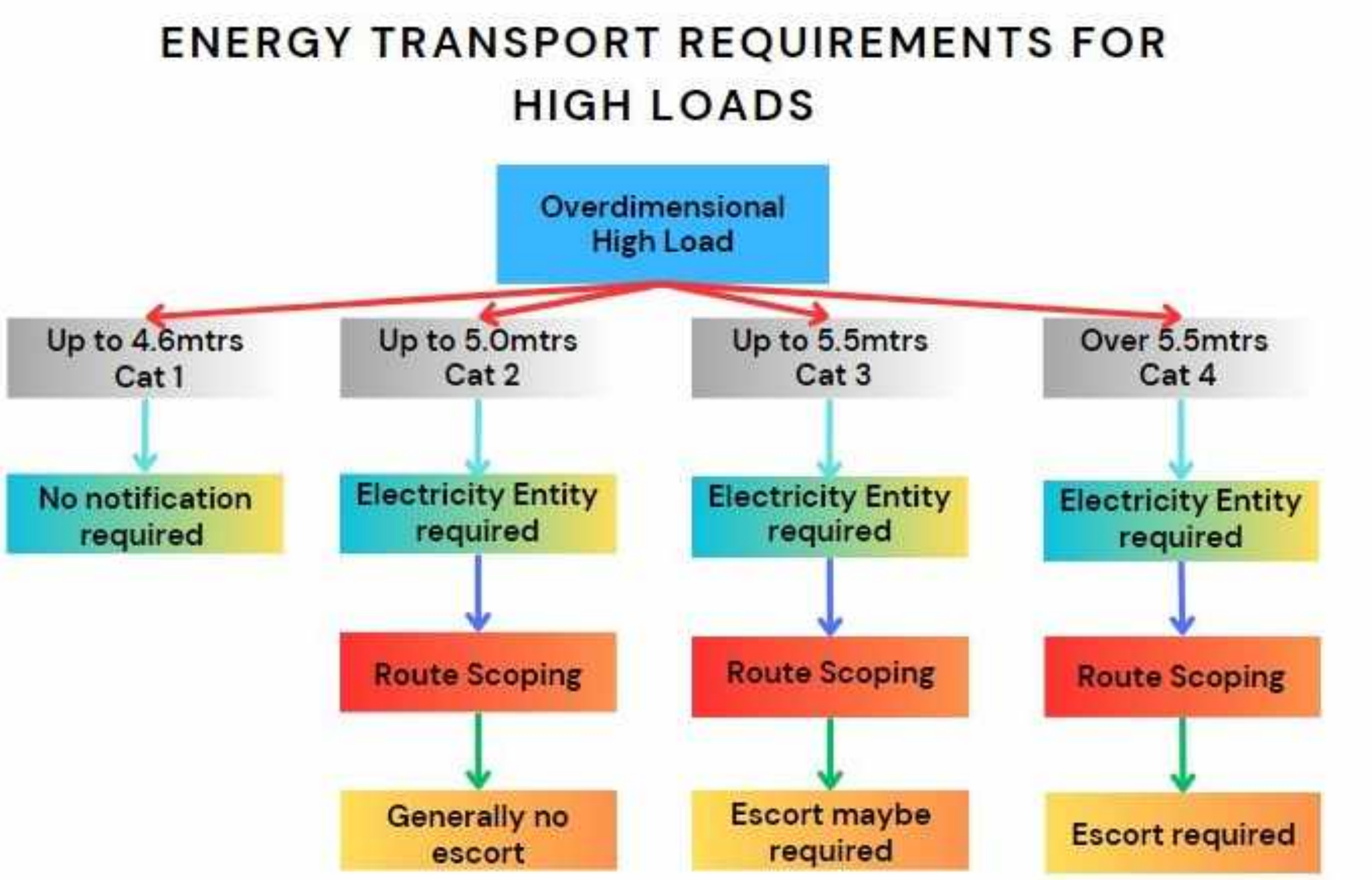


Figure 7: Energy transport requirements for high loads

If approval is required from the relevant electricity distributor, applications can be lodged online through the relevant power or energy companies that manage the power line assets. A form is then required to be completed to identify the route and affected power lines, with supporting location maps. Once the application is lodged and reviewed the assessment team contacts the applicant to discuss fees and to begin the negotiations required to make an offer to undertake the work.

3. Current process affecting Windfarm Transportation

3.2.6 QUEENSLAND POLICE SERVICE (QPS) ESCORT APPLICATION PROCESS

The Heavy Vehicle Road Operations (HVRO) Program Office is responsible for providing police officers for OSOM escorts anywhere within Queensland.

Applications are lodged online. The application can only be actioned if a valid NHVR permit has been issued and the NHVR permit must be attached when submitting the application. It is also recommended to include any third party approvals to expedite the process. An online application guide is provided to operators as to how to go through the process.

Processing times can vary depending on how long the move will take. QPS has provided indicative timeframes on their website indicating that single-day movements require a minimum of 3 business days to process an application. Movements requiring multiple days must be submitted a minimum of 5 business days beforehand. If QPS resources are unavailable to escort the load, the movement will be delayed.

3.3 QUEENSLAND PORTS

With the initial transport mode for wind farm components being sea freight, the Queensland ports that range from Brisbane through to Cairns, provide a gateway for the delivery of components for the various wind farm projects.

Each of the ports vary in size and capabilities. The two major ports of Brisbane and Townsville have facilitated recent and current wind farm movements, with the smaller ports of Gladstone and Cairns also having experience in wind farm component movements in recent years.

Figure 7: Queensland Ports (Department of Transport and Main Roads) (2023)

3. Current process affecting Windfarm Transportation

3.3 QUEENSLAND PORTS

Below is a list of the key seaports in Queensland which are currently or could potentially handle the logistics for a wind farm project:

1. Port of Brisbane:
   - Queensland's major seaport with extensive infrastructure and container handling capabilities.
   - The Port of Brisbane has easy access to major transportation networks, including road and rail connections, making it well-suited for receiving and distributing wind turbine components.
   - The Port of Brisbane has successfully handled major wind farm projects such as Coopers Gap across the Port of Brisbane's berths.
   - The Port of Brisbane offers 250,000 m2 + of hardstand for component storage, with a potential extension should this be required.
   - Currently the port is holding approximately 180,000 m2 of componentry for an existing wind farm project.

2. Port of Townsville:
   - The Port of Townsville is major seaport with facilities for handling a diverse range of cargo.
   - The Port of Townsville offers proximity to various wind farm sites in Northern and North-West Queensland, making it an ideal choice for projects in those regions.
   - The Port of Townsville offers 60,000 m2 of hardstand for component storage, with future expansion planned to accommodate new wind farm project projections that will travel through the Port of Townsville.

3. Port of Gladstone:
   - One of Queensland's largest multi-commodity ports with modern facilities.
   - The Port of Gladstone can handle heavy and oversized cargo, making it suitable for receiving wind turbine components.
   - The Port of Gladstone is currently receiving components for the Clark Creek Wind Farm project.
   - The Port of Gladstone offers 200,000 m2 of hardstand for component storage.
   - Currently the port is holding approximately 160,000 m2 of component storage due to project delays.

4. Port of Mackay:
   - The Port of Mackay offers general cargo and container handling facilities.
   - The Port of Mackay has conducted successful feasibility studies into the handling of wind farm components through the port, including an assessment of storage and road access to the major highway.
   - The Port of Mackay is strategically positioned to support wind farm projects in the Central Queensland region.
   - The Port of Mackay is yet to handle major wind farm projects across the Mackay Port Berths.
   - The Port of Mackay offers 97,000 m2 of hardstand for component storage.

5. Port of Cairns:
   - The Port of Cairns is capable of handling various cargo types and is well-connected to major highways.
   - The Port of Cairns can be considered for wind farm projects in Far North Queensland.
   - The Port of Cairns offers 100,000 m2 + of hardstand for component storage with potential expansion on requirement.

3. Current process affecting Windfarm Transportation

3.3 QUEENSLAND PORTS

6. Port of Bundaberg:
   - The Port of Bundaberg primarily handles bulk cargo, but its facilities can be adapted to accommodate wind turbine components.
   - The Port of Bundaberg could be considered for wind farm projects in the Wide Bay-Burnett region.
   - The Port of Bundaberg is yet to handle major wind farm projects across the Bundaberg Port Berths.
   - A potential large-scale hardstand development for component storage has been prepared.
   - A transport route from the Port of Bundaberg has been loaded into the NHVR Portal Route Planner, which means that this route plan is accessible to any proponents (as registered route number 18NZZ-2v1).

It is important to note that the suitability of a specific port for a wind farm project will depend on the project's specific requirements, location and logistical considerations. Developers of wind farm projects typically conduct thorough assessments to select the most appropriate port for their needs based on numerous factors, including transportation routes and project schedules. For up-to-date and detailed information, it is best to consult with relevant port authorities and logistics experts in Queensland.

4. Issues with Current Processes

4.1 ISSUES FOR CURRENT PROCESS AFFECTING WINDFARM TRANSPORTATION

Interviews with key stakeholders highlighted gaps and issues with current processes, from development application and planning, through to the transportation in relation to wind farm operations. The issues have been grouped into the headings below:

- Planning and Development Application
- Police Escort Services
- Electrical Surveys and Escorts
- Permits and Permit Conditions
- Corridor Management and Road Access
- Port Infrastructure
- Stakeholder Coordination

Each of the issues identified can result in delays and increased costs. Transport and logistics stakeholders commented that they have been unable to make a sustainable profit on project works due to delays. They are also concerned about capacity in the network and supporting infrastructure and that as wind farm projects increase in number, resources (escorts, Port berthing/storage, road availability) will be exhausted, resulting in further delays and costs. There is also an expectation that blade lengths and componentry weights will increase in coming decades.

Feedback from transport and logistics operators also noted that the cost to move components in Queensland is considerably more expensive in comparison to other states, with transmission line lifts and escorts being the most expensive differences. This will manifest in projects either going to other jurisdictions or a higher capital expenditure, leading to higher Power Purchase Agreements (PPAs) and subsequently higher power prices for consumers.

It was also noted that there is a lack of understanding in terms of transportation timeframes and requirements, resulting in unnecessarily short timeframes in which to find transportation solutions for wind farm equipment.

Recommendations have been identified to address the issues outlined below (as outlined in Section 5 of this Report) and are noted for each issue. For details on each recommendation, refer to the relevant recommendation in Section 5 of this report.

4.1.1 PLANNING AND DEVELOPMENT APPLICATION

In the inception phase of a project, the current SARA process does not include all stakeholders. In particular, the energy distributors and road managers are not included in the initial inception discussions.

The current SARA process also omits the inclusion of thoroughly clarified dimensions and weights of the wind farm componentry upfront, which results in additional assessment timing and costs when a project commences and the weights are known. Often the specification provided on arriving components is not correct i.e. there may be a 100 tonne specification and then the transformer which is delivered is 300 tonne. Transport and logistics providers want the freight corridor to be pre-approved at the time a development approval is issued, however TMR says this is impossible as they don't know blade lengths, other component weights and transport combinations until closer to the time of transport.

Regarding development application, in some cases there is a disjoint as to who is responsible for the development application. In the case of transformer moves, the weights and dimensions of the transformers are often not supplied to the transport operator and the road managers until later in the process (at the operational planning stage), placing a time

4. Issues with Current Processes

4.1.1 PLANNING AND DEVELOPMENT APPLICATION

constraint on the approval process. Industry frustration has been voiced, but it is evident that the correct weights and dimensions need to be supplied at the inception of the Development Application process, to avoid delays and additional costs.

Both developers and local council raised concerns about social licence. Social license is the ongoing support within the community and other stakeholder to maintain the regulatory environment necessary for successful operations. Developers spoke about the difficulties of travelling through entertainment precincts and school zones with Local councils noted the ongoing disruption to other local road users and industry - an example was provided of impacts on timely and safe school bus services. Some councils also expressed concern that TMR may refuse access to the State network which as a consequence pushed traffic onto their local road network. Council also noted that while proponents may fund some infrastructure upgrades, ongoing maintenance of (often expensive sealed) roads had to be paid for by Councils and this caused a strain on already stretched budgets.

Early and genuine relationships between local communities and renewable energy proponents, including conversations about transport impacts is fundamental in both parties understanding the concerns of each other and managing ongoing impacts. Local council, in reflecting on lessons learned from the recent coal seam gas boom indicated that they wished to deal with one proponent per project only rather than multiple sub-contractors.

In the context of wind farm development, social licence is an important consideration from early planning stages through to operations to build community awareness and engagement, particularly in regional and remote areas. The importance of social licence has been highlighted in recent years at the Australian Clean Energy Summits and the Australian Energy Infrastructure Commissioner is currently leading a Community Engagement Review for renewable energy infrastructure (Improving community engagement and support for renewable energy infrastructure - DCCEEW).

The following example demonstrates how the issues identified occur in practice.

SARA Process

A developer provided an example of the failure of the SARA (State Assessment and Referral Agency) process, where low loaders on pavements caused issues, but it was unclear who the responsible party was. The developer approached both the council and the Department of Transport and Main Roads (TMR) for formal guidance, but both were reluctant to provide assistance, stating they no longer have a 'seat at the table' regarding SARA requirements. The lack of coordination and the disconnect in the process between the agencies and the on-site situation led to difficulties in addressing the problem effectively.

Recommendation 4 - SARA process re-mapping with the inclusion of state and local road managers for early discovery of route development.

4. Issues with Current Processes

4.1.2 POLICE ESCORT SERVICES

There is concern among transport and logistics operators and project developers about the availability and sustainability of finite QPS resources for escorting OSOM loads. They are concerned about securing QPS escorts (which are onerous in nature and cost). They have also raised concern that they feel QPS will not have the resources to support them with required escort numbers under the current framework.

This is evidenced by an increasing failure to secure QPS resources on the day of moves when all other permits have been secured and the cargo loaded.

The continuity of project moves is crucial for large-scale projects like wind farms where maintaining project timelines is essential for cost efficiency and project success. The HVRO (Heavy Vehicle Road Operations) Program Office is responsible for providing police officers for wide load escorts anywhere within Queensland. Much of the pool of police officers are based closer the metropolitan area with a smaller pool that can service the region. The industry feels that as the projects increase in number, resources to service these moves will be exhausted resulting in delaying moves and projects.

There have been issues with congestion at port storage facilities, due to delays in transport movements because of delays in obtaining escort resources.

Recommendation 10 - Use of industry pilots to escort low risk OSOM moves, reducing the demand for Queensland Police Service (QPS) officers that are in short supply and better utilised in Policing matters.

4.1.3 ELECTRICAL SURVEYS AND ESCORT

As planning for the OSOM movement is not completed until closer to the move, power companies only provide an estimated cost at the early stages of the project, with an updated cost provided closer to the actual move. OEMs raised concerns with power companies not providing reasonable timelines or fixed costs on transmission line adjustments. These adjustments generally cost in the millions of dollars and may incur a 25% variation.

Transport and logistics operators stated that power companies are a significant barrier for them when conducting OSOM moves as they are time consuming and expensive. Permanent line lifting can save significant time and cost during an OSOM movement. However, an issue was raised where power escorts are still required on lines that have been permanently lifted, even after there has been considerable investment in lifting the lines for clearance and in the training of pilots and drivers in order for them to be 'authorised persons' in regard to electrical infrastructure. They are currently required to get escorts even though their vehicles are designed to provide a minimum of 600mm space. This is due to the Queensland Office of Electrical Safety's General Code of Conduct and Worksafe's Electrical Safety Code of Practice 2020 that that overrides other approvals. There is also a requirement for operators to conduct surveys every four weeks. The cost for a route survey quoted by industry was $6600 and is likely to be paid along the same route by multiple companies.

An example was provided where it was stated that the removal of electrical escorts saved 3 ½ hrs of travel time in an OSOM movement of a wind farm component. For each wind turbine, there are 1214 components and associated OSOM movements this would have a substantial cost and time saving for each project.

The following example demonstrates how the issues identified occur in practice.

4. Issues with Current Processes

4.1.3 ELECTRICAL SURVEYS AND ESCORT

Power Companies

A large transport and logistics operator outlined an issue with the power companies relating to power lines and the regulations surrounding them. Wind farm components are large and high, and a key aspect of efficient OSOM movements is to have the power lines lifted. However, there seems to be challenges from certain power companies who require extra precautions such as escorting each load and regularly checking the power lines along OSOM routes. Developers and transport companies stated that these requirements are excessive and they believe they are a waste of resources and money. They feel that the power companies could be better placed to respond to future demands by future planning certain corridors used for OSOM loads. The discussion also touched on the use of renewable energy and how such decisions impede progress in this area.

A specific concern was raised about the additional measures imposed on this transport operator which requires a high load escort to still accompany loads, even though the route has had all the power lines lifted by the power company and the route is scoped every 4 weeks to ensures adequate clearance.

There was criticism from industry towards the Government and power companies for wanting the high load scope company to provide accurate monthly measurements of the power lines, rather than just ensure there remains adequate clearance for the oversize loads. Industry noted that excessive red tape concerning power lines, is impacting the efficient operation and expansion of utilities in Queensland.

A recent article in reneweconomy.com.au indicated that the New South Wales Government had secured a deal to ensure the State's roads are capable of carrying large volumes of OSOM wind turbine parts and transformers though a Memo of Understanding with EnergyCo to upgrade the state's road network in consultation with communities, councils and road users during construction of Renewable Energy Zones.

The article further adds that as a greater number of major wind farms reach development stage, the energy company wants to get ahead of any problems which could be potential barriers to progress on renewables. Individual developers will still be responsible for meeting each project's road haulage requirements and mapping a feasible route from port to site.

Recommendation 3 - The creation of transport corridors which are designed for OSOM movements, with a focus on routes from Queensland Ports to major highways.

4. Issues with Current Processes

4.1.4 PERMITS AND PERMIT CONDITIONS

Transport and logistics operators stated that access across bridges on the road network is becoming increasingly difficult to obtain, with travel conditions being placed on permits which add both time and money. An example stated was where empty trailers returning from an OSOM delivery had travel conditions on all bridges on the return journey that required 1 Level 2 escort and 1 x pilot. These empty vehicles are travelling at weights less than other heavy vehicles on the network, who are running under permits that do not have these restrictions.

It was also commented that local road managers do not have the resources or knowledge to conduct bridge assessments and therefore a contractor is engaged to do this at a cost. This cost is passed onto the transport operator, who in turn passes the cost on to the developer.

The following example demonstrates how the issues identified occur in practice.

OSOM Route

An OEM outlined the challenges faced due to the Cunningham Highway being the oversized route out of Brisbane. Initially, there was an approved transport management plan to lift the power lines along the route to accommodate oversized loads, but an unforeseen issue arose. Another department had planned construction work on the highway without informing the oversize/overmass team within the road agency, restricting access to the road for all but one night a week.

With the potential delay of their project, the OEM decided to seek an alternative oversize route into Brisbane via Toowoomba, Millmerran, and Inglewood, which would provide alternative access for their project. The decision to construct this new route came at a significant cost, but it now provides the whole industry with an additional route out of Brisbane for future wind farm projects.

This example highlights the complexities and challenges faced during the development process, particularly when dealing with transport and infrastructure limitations. The OEM's proactive approach led to the creation of an alternative route that benefits not only their project, but also future wind farm developments.

Recommendation 1 - The creation of pre-approved routes, specifically on major highways and exits from each of the QLD port facilities.

Recommendation 2 - Streamlining permits and permit conditions.

Recommendation 5 - Inclusion of telematics for monitoring of transport movements by Local Road Managers.

Recommendation 8 - Development of an online mapping tool to assist in route planning.

Recommendation 9 - Local Road Managers to work with the NHVR to identify and develop transportation routes.

4. Issues with Current Processes

4.1.5 CORRIDOR MANAGEMENT AND ROAD ACCESS

TMR has facilitated planning and subsequent transportation of components for the construction of wind farm projects and other power-generating assets. This assessment and facilitation role is resource intensive and requires coordination across multiple areas within TMR to ensure that access is provided in a safe and timely manner.

These moves differ to current processes around access permissions for OSOM movements, where the transport operator is only required to submit a permit application through the National Heavy Vehicle Regulator (NHVR) Portal and assessed by TMR as a road manager. Wind farm components are high, wide, long, heavy, and require multiple trips and significant planning to ensure that the load can travel along the network safely. This often requires detailed assessments and road modifications to enable each load to fit. For each wind turbine, there are 1214 components and associated OSOM movements.

One difficulty in managing network access for power-generating assets is that often sites are in remote areas where the road network was not designed for high volumes of traffic or for heavy vehicles. This increases the chances of structural, geometry and pavement deficiencies and can create additional resource constraints for TMR assessments.

Previously, TMR has only been required to manage one or two of these projects concurrently. However due to the State's commitment to renewable energy, TMR has received an extensive number of requests to commence consultation for future wind farm projects.

Maintenance schedules and major road works have interrupted wind farm deliveries and need to be managed in a more coordinated manner.

Stakeholders raised an issue with road volume limitations, where they stated that for OSOM moves they were limited to 6 nights per week and 6 loads per day. These limits are set by the state and local road managers to balance the needs of all road users.

The reverse logistics of return components was also raised as an issue, as the road modifications for wind farms are constructed in one direction, which is the opposite on a return travel route. The modifications are also returned to original state once the project has finished and therefore require new modifications to allow passage.

The following example demonstrates how the issues identified occur in practice.

Road Access

Even when there is a pre-approved route, there is no process for the identification of roadworks on these routes. A developer described road access delays caused by Transurban's upgrade of the Logan Motorway, which prevented night access for OSOM movements to the Coopers Gap Wind Farm. Transurban cited potential delays to their own project as the reason for the restriction. As an alternative route, they had to take the longer and costly route via Mt Gravatt Capalaba Road, involving multiple powerline lifts.. The developer emphasised the need for upfront planning, correct permits, and transport management to avoid such delays. There is an opportunity for closer interaction with TMR to ensure that potential road works or delays are communicated as part of the permit application process.

Recommendation 1 - The creation of pre-approved routes, specifically on major highways and exits from each of the QLD port facilities.

4. Issues with Current Processes

4.1.5 CORRIDOR MANAGEMENT AND ROAD ACCESS

Recommendation 3 - The creation of transport corridors which are designed for OSOM movements, with a focus on routes from Queensland Ports to major highways.

Recommendation 5 - Inclusion of telematics for monitoring of transport movements by Local Road Managers.

Recommendation 11 - Support the expansion of convoy moves.

4.1.6 PORT INFRASTRUCTURE

OEMs highlighted that investment into regional ports is imperative to ensure the success of future projects.

Each Port needs an appropriate laydown area to accommodate wind farm components. Feedback from several OEMs stated that not having the appropriate laydown areas will add to delays and result in extra costs to industry and Government. From the port stakeholder's perspective, there is a concern that laydown areas on ports need to be expanded for future project holding requirements. They also noted that further investment is needed, specifically in the Gladstone region, to ensure that transit through town centres is safe and efficient. Gladstone was seen as a central port servicing current projects and having the most direct access to Windfarm projects. Bundaberg Port is also seeking additional funding to develop their quayside and Townsville Port has a 10-year plan for expansion to accommodate future wind farm projects, all of which require significant investment.

Recommendation 7 - Formation of a taskforce to ensure all Qld ports are operationally ready for wind farm projects.

4.1.6 STAKEHOLDER COORDINATION

Transformer Dimensions

A Regional Council Road Manager outlined the complexities and challenges of dealing with transformers for the Clarke Creek wind farm project. The transportation of the transformers is being organised through a third-party freight forwarding company, rather than being included in the main contract with the Clarke Creek Project. This has led to the involvement of three different transport operators, who are each seeking permits for transporting the transformers, but their configurations are too big to be easily approved.

When a load is over 100 tonnes, it is necessary to assess each load and configuration individually. While some assessments can be done in-house using a structural engineer, the largest ones require outsourcing, adding to the administrative burden, in particular for local road managers.

Furthermore, coordination between the various parties involved, including the transport operators, TMR, and the council, is crucial, however as there is no established forum between these parties, the lack of communication creates uncertainty and complications.

This highlights the bureaucratic and administrative challenges involved in dealing with oversized loads and coordinating between different stakeholders during the construction of the Clarke Creek Wind Farm.

Recommendation 4 - SARA process re-mapping with the inclusion of state and local road managers for early discovery of route development.

Recommendation 3 - Creation of a reference group to coordinate the multi-faceted project teams involved in the transportation of wind farm components from Port to destination, reporting to the EPW Renewable Facilitation Sub-committee.

5. Recommendations

The stakeholder consultation undertaken reviewed the current state regarding application processes, approvals and port capabilities, and identified issues with current processes and opportunities for improvement. Recommenda-tions to address the current issues and to ensure the efficient movement of wind farm components into the future are outlined in the table below. Further detail on each recommendation is provided in this section. Recommendations have been identified as short, medium or long term and have been grouped in one or more of the following categories: stakeholder coordination, permits, escorts, infrastructure planning and investment, and technology and data with potential responsibility allocated to the most appropriate body.

	Recommendation	Theme	Time	Resp.
1	The creation of pre-approved routes, specifically on major highways and exits from each of the Qld port facilities.	Permits, Stakeholder Coordination	Short	TMR
2	Streamlining permits and permit conditions.	Permits	Short	TMR, NHVR
3	Creation of transport corridors which are designed for OSOM movements, with a focus on routes from Queensland Ports to major highways.	Stakeholder Coordination, Infrastructure Planning and Investment	Short	TMR
4	State Assessment Referral Agency (SARA) process re-mapping with the inclusion of State and Local Road Managers for early discovery of route development.	Stakeholder Coordination	Short	DSD
5	Inclusion of telematics for monitoring of transport movements by Local Road Managers.	Technology & Data	Short	NHVR
6	Creation of a reference group to coordinate the multi-faceted project teams involved in the transportation of wind farm components from Port to destination, reporting to the EPW Renewable Facilitation Sub-committee.	Stakeholder Coordination	Short	QTLC
7	Formation of a taskforce to ensure all Qld ports are operationally ready for wind farm projects.	Stakeholder Coordination, Infrastructure Planning and Investment	Short	TMR
8	Development of an online mapping tool to assist in route planning.	Permits, Tech & Data	Medium	TMR, NHVR
9	Local Road Managers to work with the NHVR to identify and develop transportation routes.	Permits, Tech & Data	Medium	LGA/ NHVR
10	Use of industry pilots to escort low risk OSOM moves, reducing the demand for Queensland Police Service (QPS) officers that are in short supply and better utilised in Policing matters.	Escorts	Medium	TMR/ QPS
11	Support the expansion of convoy moves.	Stakeholder Coordination, Infrastructure Planning and Investment	Medium	TMR
12	Review of the Electrical Safety code of Practice 2020 to streamline the requirements of Surveys on key transport corridors	Stakeholder Coordination, Infrastructure Planning and Investment	Medium	TMR

1. Planning and Development Application

• Key Findings	Recommendations	Outcomes	Timeframe	Resp.
• Current SARA process requires further inclusion of stakeholders with developer to plan haulage routes • Current SARA process omits the inclusion of clarified dimensions and weights of componentry upfront which results in inadequate route identification, assessment and investment • Maximise safety and minimize disruption to local communities • Build early, genuine relationships between local communities and renewable energy proponents - managing transport impacts is fundamental to both parties • Improve social license • Strike a balance between safe, efficient and environmentally responsible development	Recommendation 4. SARA process re-mapping with the inclusion of State and Local Road Managers for early discovery of route development.	Streamline permits and improve stakeholder coordination Understand & plan for issues early Resolve disputes Set clear communication & responsibilities Improve timeliness Safe, efficient and environmentally responsible developments	Short	DSDILGP

2. Police Escorts

• Key Findings	Recommendations	Outcomes	Timeframe	Resp.
• There is concern from all industry regarding the availability and sustainability of finite QPS resources • Industry values QPS escort service and there is a desire to maintain QPS for high-risk loads • Continuity of project moves is crucial for maintaining project timelines • Congestion at Ports is already occurring due to lack of QPS escorts • QPS resource pool metropolitan-based with a smaller pool in regions • Current girder trial and previous trials highlight alternatives for low-risk loads	Recommendation 10. Use of industry pilots to escort low risk OSOM moves, reducing the demand for Queensland Police Service (QPS) officers that are in short supply and better utilised in Policing matters.	Maintain escorts for high risk loads Better align loads numbers and location forecasts with police resources Improve social license	Medium	QPS/TMR

3. Electrical Surveys and Escorts

• Key Findings	Recommendations	Outcomes	Timeframe	Resp.
• Loads >4.6m high require power companies to conduct assessment, get permit, escort conditions set depending on height • Planning & accurate costing for OSOM movement not completed until closer to move, power companies only provide cost estimations at the early stages of the project. Adjustments usually cost millions and may incur 25% variation • Permanent line lifting saves time and cost but escorts still required thereafter due to ESO COP that overrides all other approvals • Also requirement for surveys every 4 weeks (approx. $6,600)	Recommendation 1 - The creation of transport corridors which are designed for OSOM movements, with a focus on routes from Queensland Ports to major highways Recommendation 12. Review of the Electrical Safety code of Practice 2020 to streamline the requirements of Surveys on key transport corridors.	Permits, Stakeholder Coordination Red Tape Cost Address time & resource constraint	Short	TMR Power Utilities

4. Permit and Permit Conditions

• Key Findings	Recommendations	Outcomes	Timeframe	Resp.
• Bridge access increasingly difficult to obtain • Conditions can be inconsistent – sometimes mirrored for return journey • Road managers don't have the resources or knowledge to conduct bridge assessments - contractors engaged at cost and passed onto the transport operator, who in turn passes it onto developer • Route data is currently available from NHVR and could be used visually in a mapping tool to identify optimal routes and plan last mile access • Telematics provides low cost assurance for road managers	Recommendation 1 - The creation of pre-approved routes, specifically on major highways and exits from each of the QLD port facilities Recommendation 2 - Streamlining permits and permit conditions Recommendation 5 - Inclusion of telematics for monitoring of transport movements by Road Managers Recommendation 8 - Development of an online mapping tool to assist in route planning Recommendation 9 - Local Road Managers to work with the NHVR to identify and develop transportation routes	Address cost and resource capacity issues Enhance consistency and timely outcomes. Address resource and skills constraints Streamline permits, using technology and data	Short/ Medium	TMR/LGAQ/ NHVR

5. Corridor Management & Road Access

• Key Findings	Recommendations	Outcomes	Timeframe	Resp.
• Assessment and facilitation role of windfarm transportation is resource intensive & requires coordination across multiple areas within TMR • Windfarm moves differ to current processes around access permissions for OSOM movements, where the transport operator is only required to submit a permit application through the NHVR Portal and assessed by TMR as a road manager • Detailed assessments and road modifications to enable each load to fit • Sites often in remote areas – increases chances of structural, geometry and pavement deficiencies and adds additional resource constraints for TMR assessments • TMR previously dealt with 1-2 projects concurrently – QEJP represents significant step change • Maintenance schedules and major road works have interrupted wind farm deliveries – there is a need for coordinated • Current road volume limitations present an issue for scale of QEJP windfarm build • Reverse logistics of return components can be an issue • NHVR have an existing project to support local government maximise existing infrastructure • Convoy moves are successfully utilised safely in other jurisdictions and could address resource constraints	Recommendation 1 - The creation of pre-approved routes, specifically on major highways and exits from each of the Qld port facilities Recommendation 3 - The creation of transport corridors which are designed for OSOM movements, with a focus on routes from Queensland Ports to major highways Recommendation 5 - Inclusion of telematics for monitoring of transport movements by State and Local Road Managers Recommendation 11 - Support the expansion of convoy moves	Address capacity, sustainability and cost issues. Streamline permits, using technology and data Improve stakeholder coordination and infrastructure Planning and investment decision	Short/ Medium	TMR/NHVR/ LGAQ

6. Port Infrastructure

• Key Findings	Recommendations	Outcomes	Timeframe	Resp.
• Investment into regional ports is imperative • Industry hold significant concerns over appropriate laydown areas at Ports given likely cost and time delays of projects • There is an immediate need to nesure safe and efficient transit through towns close to some Ports	Recommendation 7 - Formation of a taskforce to ensure all Qld ports are operationally ready for wind farm projects	Improve stakeholder coordination and infrastructure planning and investment decision Address cost, capacity and safety issues	Short	Ports Queensland QTLC

7. Stakeholder Coordination

• Key Findings	Recommendations	Outcomes	Timeframe	Resp.
• Large number of stakeholders involved in transport process • With loads >100t, each load and configuration assessed individually • Assessments are costly, administrative and place a stretch on resources for road manager, particularly local ones • There is no established forum between all parties • A lack of communication is creating uncertainty and project complications	Recommendation 4 - SARA process re-mapping with the inclusion of state and local road managers for early discovery of route development. Recommendation 3 - Creation of a reference group to coordinate the multi-faceted project teams involved in the transportation of wind farm components from Port to destination, reporting to the EPW Renewable Facilitation Sub-committee.	Consider and permit transport requirements in advance Reduce administrative burden Address resourcing capacity Streamlined implementation of projects. Proactively address issues	Short	DSDILGP, QTLC, EPW

5. Recommendations

5.1 RECOMMENDATION 1 – PRE-APPROVED ROUTES

Pre-approval of routes can be used to streamline processes, reduce the administrative burden for local government and reduce turnaround times. The pre-approval process targets routes expected to experience large numbers of (particularly OSOM, but not exclusively) vehicle movements, such as roads in industrial areas and access routes connecting existing approved routes or State controlled roads.

A road manager can submit to the NHVR a pre-approved route that can be used by specified vehicles, including OSOM vehicle combinations. When the NHVR receives a permit application for movement on a road that is pre-approved by the relevant Road Manager for the vehicle type, the NHVR does not need to seek additional consent from the Road Manager before issuing a permit.

Another common theme raised in discussions with industry was the potential development of pre-approved routes from the QLD Ports to the project destinations.

Pre-approved routes currently exist in the Southeast Queensland Region and Bundaberg Developing Port. Preferred routes exist in regional ports that have previously handled wind farm projects. Some examples are highlighted below.

Port of Brisbane

The Southeast Queensland Region route was developed during the MacIntyre project, whereby the proponent built an alternate OSOM route through Toowoomba via Millmerran.

Figure 8: Port of Brisbane approved route

Port of Gladstone

Access to the major highway from the Port of Gladstone requires travel through a parkland area and through the CBD of Gladstone. A pre-approved route has been established through numerous OSOM moves and will be the preferred route for wind farm component movements.

Figure 9: Port of Gladstone preferred route

5. Recommendations

5.1 RECOMMENDATION 1 – PRE-APPROVED ROUTES

Port of Bundaberg

The Port of Bundaberg utilises the Bundaberg Ring Road which bypasses the city centre and provides a clear transit to the major road infrastructure linking to the National Highway. The route has been loaded into the NHVR Portal Route Planner for access by proponents under registered route number 18NZZ-2v1.

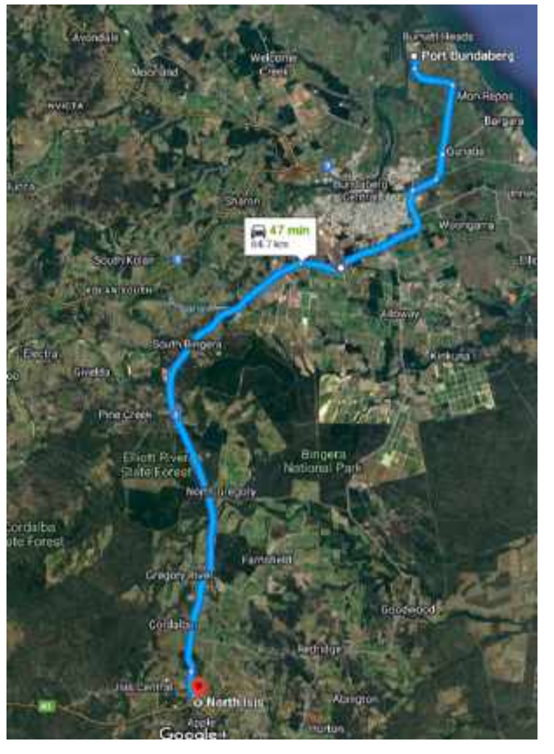


Figure 10: Port of Bundaberg approved route

Port of Mackay

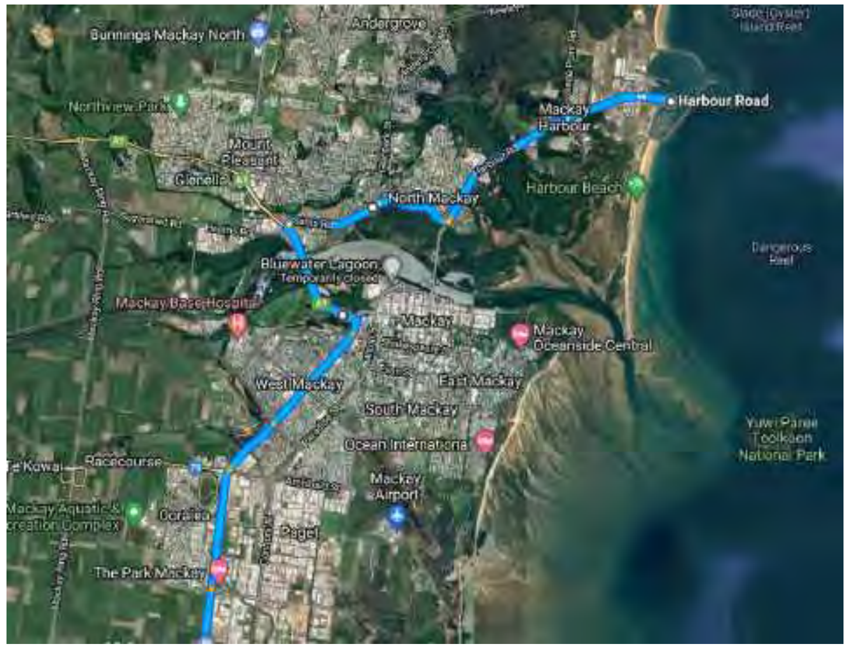


Figure 11: Port of Mackay approved route

5. Recommendations

5.1 RECOMMENDATION 1 – PRE-APPROVED ROUTES

Port of Townsville

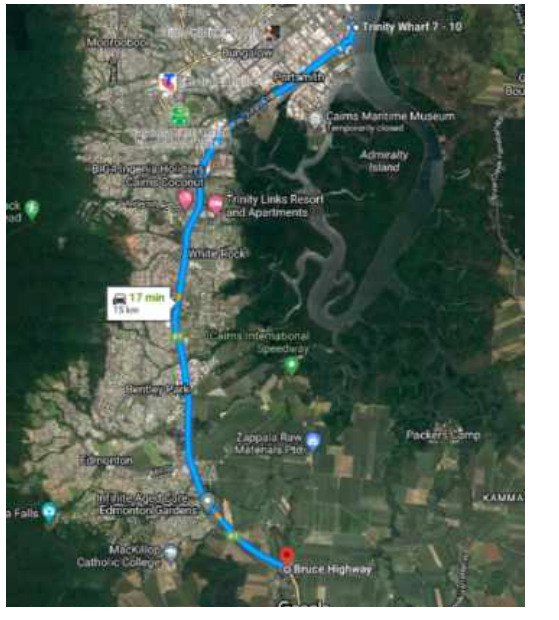


Figure 12: Port of Townsville approved route

Port of Cairns

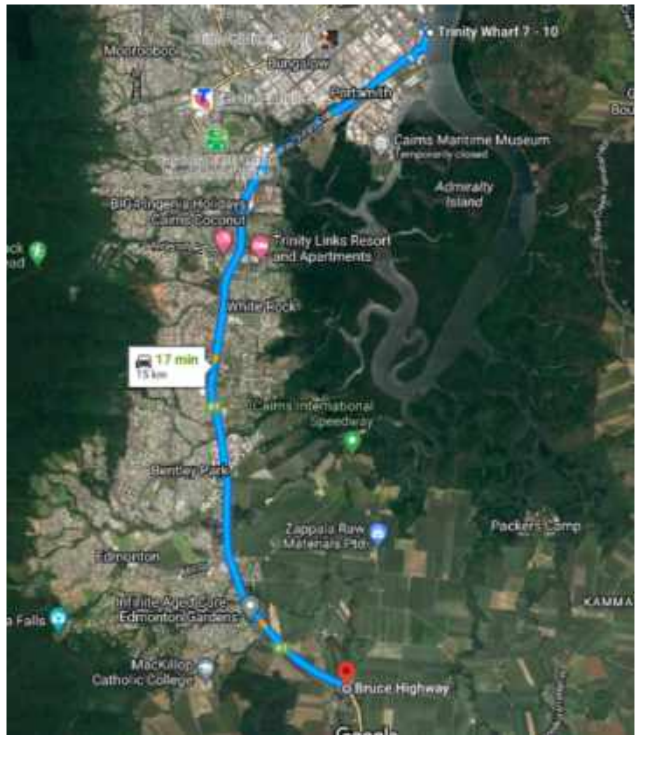


Figure 13: Port of Cairns approved route

5. Recommendations

5.1 RECOMMENDATION 2 – STREAMLINING PERMITS AND PERMIT CONDITIONS

The Department of State Development in conjunction with TMR, the Local Government Association of Queensland (LGAQ) and third-party providers should, wherever possible, pro-actively plan strategies for restricted access vehicles to enable safe and efficient access.

For example, this could be achieved through the analysis of access applications to identify areas and routes where wind farm components need to be moved. A suitable network could then be established, and certain vehicles put under a longer duration permit or notice on these pre-approved routes.

The Department of Transport and Main Roads currently groups permits for specific projects. This process could be expanded to include wind farm projects, to minimise the impact on internal resources required to process permits.

As multiple wind farm projects are realised, a key focus will be reducing the workload and the number of permits required/issued. To do this, consideration should be given as to whether existing permits could be modified to allow for access, rather than issuing a new permit. If an access decision can be accommodated by making minor or simple amendments to an existing permit or notice, then this would be preferable over the option of making a new notice.

When the road manager provides consent for restricted access vehicles to access the road network, they will often require that specific travel and/or road conditions be included on the permit or notice, as a condition in a mass or dimension authority.

The use of template (standardised) conditions in mass or dimension authorities is encouraged to ensure equity, fairness and consistency for restricted access vehicle operators and to prevent them from incurring unreasonable compliance costs. Operators should not be required to comply with different conditions which have the same intent or outcome.

National Access Framework for Heavy Vehicles (NAFHV)

The NAFHV is a national initiative which is being developed to help road managers optimise access for higher productivity vehicles and improve road safety, while also reducing emissions and infrastructure wear. This will be done through providing guiding principles which will assist road managers to understand the impacts of heavy vehicles on the road network and to plan accordingly to address infrastructure constraints.

The NAFHV outlines six shared principles to be adopted by road managers across Australia. The proposed shared principles to enhance road manager functions are:

- Enable access unless by exception
- Foster collaboration and coordination between state and local road managers, third parties and industry
- Harmonise access decision-making practices while encouraging innovation
- Encourage the use of safe, productive and sustainable vehicles
- Automate access decision-making; and
- Facilitate the exchange of open data.

The implementation of the NAFHV should be monitored to identify opportunities for further improving access decision making for the transportation of wind farm componentry. There is an opportunity for Qld to showcase any changes and improvements made in line with the NAFHV to support energy projects in Qld.

5. Recommendations

5.3 RECOMMENDATION 3 – TRANSPORT CORRIDORS

It is important to ensure that all tiers of government integrate appropriate land use planning protections for existing freight related activities such as: protection of corridors; improving communication on current issues; and identifying land for current and future logistics uses.

The creation of strategic freight networks (transport corridors) designed for restricted access vehicles, including OSOM movements, should be promoted for wind farm projects. This is particularly important for the routes from Queensland Ports to major highways. A transport corridor is a defined route which is appropriate for the heavy vehicle access required (in this case OSOM vehicles). This approach is often used in land use planning, when constructing, developing and upgrading freight hubs or industrial areas. Transport corridors can offer benefits for all parties involved in the transport process.

Below is an overview of how these benefits can be realised:

- Developers: Developers would benefit from having clarity on their approved transport route to the major highways during the early stages of the process. This would enable them to plan and budget for transportation logistics more effectively. It would also help them align their project plans with available transport infrastructure.
- Transport Operators: Transport operators would have a predetermined major route that can be easily integrated into their transportation plans. This simplifies the planning and execution of the "Last Mile Delivery" component of the transport route, making their operations more efficient and cost-effective.
- Queensland Department of Transport and Main Roads (TMR): TMR would benefit from having pre-assessed transport routes. This allows them to identify potential upgrades or improvements early in the approval process. By doing so, they can proactively address infrastructure needs, ensuring that the transport routes are safe and efficient.
- Local Road Managers: Local Road Managers can assess and provide guidance on transport routes within their jurisdictions. Having designated corridors in place streamlines their responsibilities and allows them to focus on ensuring that local roads are compatible with the designated transport corridors. This coordination can lead to better road management and maintenance.
- Bridge Assessments: All levels of road management can engage in bridge assessments at an earlier stage. This proactive approach provides ample time for assessing the condition of bridges along the transport corridors and making recommendations for potential upgrades or repairs. This can prevent delays and safety issues that may arise from inadequate bridge infrastructure.
- Electrical Assessment: Scheduling electrical assessments of powerline lifts and undergrounding of power lines earlier in the process ensures that necessary adjustments can be made in a timely manner. This not only reduces the risk of powerline-related disruptions during transportation, but also ensures the safety of transport routes.

In summary, creating dedicated transport corridors for Queensland port's exit routes to sites offers a holistic approach to transportation planning and management. It promotes efficiency, safety, and collaboration among developers, transport operators, government agencies, and local authorities. This, in turn, contributes to smoother and more reliable transportation of goods and materials in and out of the ports.

The establishment of transport corridors would ensure that all tiers of government integrate appropriate land use planning protections for existing freight related activities such as: protection of corridors; improving communication on current issues; and identifying land for current and future logistics use.

5. Recommendations

5.4 RECOMMENDATION 4 – RE-MAPPING OF SARA PROCESS

There are several important considerations for the development of future OSOM and heavy vehicle transport routes, especially in the context of wind farm projects. Key points include:

1. Early Identification of Route: Submitting accurate and concise Traffic Management Plans (TMPs) along with thorough Traffic Impact Assessments (TIAs) is crucial. The early identification of transportation needs and potential impacts, allows for better planning and mitigation strategies. It helps project developers, government authorities, and stakeholders understand the scope and requirements of transportation.
2. Identification of Major Transport Routes: Recognising major and commonly used transport routes, both for OSOM and non-OSOM moves, is essential. This knowledge provides a clear direction for infrastructure investment and road network development. It ensures that roads critical for transporting heavy equipment, such as wind turbine components, are well-maintained and can accommodate these specialised transport requirements.
3. Expenditure on the Future Road Network: Having a clear understanding of which roads are frequently used for transporting wind farm components allows government agencies to allocate funds more effectively. This targeted expenditure ensures that resources are directed toward improving and maintaining roads that are vital for wind farm projects, thereby reducing transportation costs and delays.
4. Land Clearing Requirements: Including land clearing requirements for transport purposes as part of the environmental impact study within the State Assessment and Referral Agency (SARA) process is a responsible approach. This ensures that environmental considerations are integrated into transportation planning. Land clearing should be done with care and in compliance with environmental regulations, minimising ecological disruptions.

Incorporating these elements into the planning and approval processes for wind farm projects helps strike a balance between economic development and environmental stewardship. It ensures that the transportation of large and heavy equipment required for renewable energy projects like wind farms, is well-managed, safe, and environmentally responsible. Additionally, it contributes to the overall sustainability and success of such projects.

Freight-related DAs and conditions of approval issued by all tiers of government should consider the impacts on the efficiency of freight operations and the need to optimise utilisation of infrastructure, such as the ability for freight activities to grow by avoiding throughput limits and restrictions to operating hours.

At a minimum, the assistance should involve providing guidance from road managers and third parties on guidelines and criteria required for access approval and notification to the operator on which other entities require consultation and/or consent, and who will undertake the liaison.

5.5 RECOMMENDATION 5 – TELEMATICS

The heavy vehicle network is centred around achieving an integrated road network that is suitable for the efficient operation of heavy vehicles. Investing in technology to operate the network most efficiently so heavy vehicles can maintain access would be of great benefit.

Telematics is the process of remotely transferring data over long distances. In the heavy vehicle industry it is commonly used for fleet management (including fault diagnostics) and for monitoring and compliance.

Consideration should be given to trialling technology initiatives, such as the use of telematics, to monitor compliance with permit conditions specific to the movement of OSOM loads for wind farm components. The adoption of telematics can be used to balance heavy vehicle access with the minimisation of damage to road assets (with a focus on bridges) while providing safety for all road users. As Local Governments have repeatedly said that they have limited capacity and capability to assess and update their asset management system on key assets including bridges. Using telematics would provide the ability for LGA's to assess OSOM movements in a clear, transparent and repeatable way.

5. Recommendations

5.6 RECOMMENDATION 6 – REFERENCE GROUP

Wind farm projects are large-scale projects, with considerable expenditure and extensive transport moves. The coordination between multiple parties in the development and construction of a wind farm is integral to the success of the overall project.

The management of the wind farm project movements involves several parties including:

- State and Regional Road Managers
- Electrical infrastructure providers
- Rail infrastructure operators
- Port infrastructure operators

Each of the managers are supplied a level of information from the SARA application and then directly engage with the parties involved in the project including:

- Transport and Logistics Providers
- OEM's
- Developers

The Department of Energy and Public Works chairs a Renewable Facilitation Sub-committee. The Sub-committee oversees the progressive development of wind farm projects, including infrastructure investment, location, and capacity.

A reference group should be formed to provide the Renewable Facilitation Sub-committee with information and updates on future wind farm projects including awareness of component size changes, transport requirements and technology advancements that can assist in the safe and efficient movements of those loads. The reference group could be jointly managed by the QTLC and the Queensland Renewable Energy Council, to ensure that membership and input covers the complete wind farm supply chain.

By working together, the committee can assure the best routes are identified and suitable to enable the movement of these key components to their destinations with minimal impact to the community.

5.7 RECOMMENDATION 7 – PORT TASKFORCE

With the initial transport mode for wind farm components being sea freight, the Qld ports that range from Brisbane to Cairns, provide a gateway for delivery to the various wind farm projects.

Each of the ports vary in size and capabilities, whereby the three major ports being Brisbane, Gladstone and Townsville, have experienced recent and current wind farm movements with the smaller Port of Cairns also having experience in wind farm movements in recent years.

It is recommended that a Port Taskforce be established to review the ports operational readiness for managing the logistical requirements for the increasing number of wind farm components which will continue to arrive by sea freight. The Queensland Ports Association, QTLC, or a similar body should take the role of coordinating the Port Taskforce and members should include representatives from each Port. The Taskforce's role would be to look at a whole of Queensland approach to moving wind farm components through the Ports to facilitate all wind farm projects occurring across the State.

5. Recommendations

5.8 RECOMMENDATION 8 – ONLINE MAPPING TOOL

Planning an OSOM movement is the first step in determining whether a movement is feasible. All OSOM applications require a route to be submitted as part of the application process. Currently transport operators undertake their own route planning analysis and use relevant tools to meet their obligations, including the journey and route planner within the NHVR Portal as well as relevant State and Territory online mapping tools. This application process also requires transport operators to undertake due diligence on the route, including ensuring that the OSOM movement can travel without interfering with infrastructure and making sure there are no dimensional issues along the route, which includes height clearances, swept paths and width clearance.

Technology can play an important role in the planning of OSOM movements. Route data is currently available from the NHVR and road managers and it is recommended that this data be made available in a visual format, such as an online mapping tool.

The mapping tool could be used by developers, OEMs and transport operators to inform their route planning assessment. The mapping tool would enable users to identify whether appropriate pre-approved routes or gazettals are in place for a given OSOM movement and it can also assist in identifying optimal routes for the OSOM movement. The mapping tool could also assist in planning around last kilometre access, which if not appropriately managed, can create inefficiencies in the freight system. The mapping tool could be delivered through the NHVR Portal.
In addition there are other applications available to users when planning OSOM movements.
The Look Up And Live Application helps users to plan safe works around powerlines. It uses an interactive geospatial map, where users can see where powerlines and pillar boxes are, assess the safe working distance from powerlines with the Exclusion Zone Calculator, and request safety advice and resources.

The Queensland Globe is another online interactive experience where users can view Queensland's location-based information. It displays large amounts of data covering multiple sectors and utilities. The online mapping tools within Queensland Globe have layers of information which can be overlayed to assist developers and transport operators to assess if routes are feasible for OSOM movements. Whilst the current platform only identifies the routes throughout Queensland that are approved for heavy vehicle multi-combination and higher mass limits use, it is recommended that the platform is updated to include OSOM route and structural data as well as electrical assets.

An example of maps with electrical infrastructure layers is provided below (for Class 1 OSOM Vehicles), with overlays with the following:

5. Recommendations

5.8 RECOMMENDATION 8 – ONLINE MAPPING TOOL

Figure 14: Residential connection overlay

Figure 15: Residential main line overlay

5. Recommendations

5.8 RECOMMENDATION 8 – ONLINE MAPPING TOOL

Figure 16: High voltage connection overlay

5.9 RECOMMENDATION 9 – LOCAL GOVERNMENT TO WORK WITH THE NHVR ON TRANSPORTATION ROUTES

State and local road managers should identify and develop the best routes for the transportation of wind farm components and develop a strategy to manage these movements as safely and efficiently as possible. To build this capability, local road managers should work with the NHVR to identify key OSOM routes and conduct pre-assessments of critical structures on these corridors.

The National Heavy Vehicle Regulator's (NHVR) Strategic Local Government Asset Assessment Project (SLGAAP) supports local governments to maximise their existing infrastructure assets. The SLGAAP has:

- confirmed that asset assessments significantly inform heavy vehicle access and assist operators in planning their journeys.
- assisted in validating the importance of a standardised framework to ensure consistent results across the road network.
- established the minimum data requirements to undertake bridge and culvert assessments.
- identified knowledge gaps, supporting the development of additional training materials for road managers.

There is an opportunity for local road managers to work with the NHVR to utilise the SLGAAP (and other similar funding pools) to assess structures on major OSOM routes. Developing a solution-based system for the movement of OSOM loads on local roads will have a positive impact on the assessment process for Local Government.

5. Recommendations

5.10 RECOMMENDATION 10 – INDUSTRY PILOTS

Under the current transport operating agreement and relevant to wind farm OSOM movements, a police escort must oversee any OSOM movement which is over 4.5 metres in width on critical roads in Queensland. This requirement can result in delays to movements, as Queensland Police Service (QPS) resources are often limited.

The Queensland Access Conditions Guide includes the following table (Figure 17), which outlines the escort and QPS vehicle requirements.

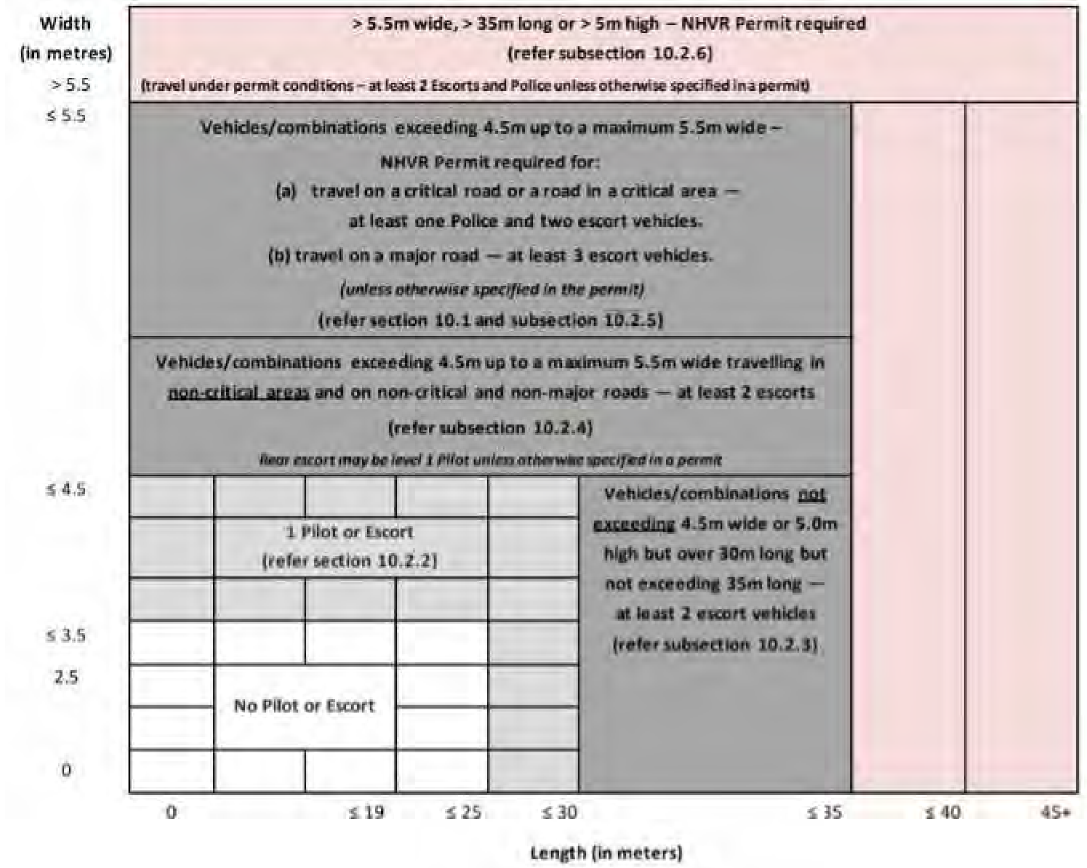


Figure 17. Pilot and escort requirements (Queensland Access Conditions Guide (publications.qld.gov.au))

Industry (non QPS) pilots are used to escort OSOM moves under 4.5 metres in width and they also work with QPS escorts in the over 4.5 metre width OSOM moves.
Industry pilots and QPS escorts are categorised by the NHVR (as outlined in Figure 18 below) into Level 1 and Level 2 categories.

5. Recommendations

Code	Course name/training required	ACT	NSW	NT	QLD	SA	TAS	VIC	WA
TLIB2004	Carry out vehicle inspection	–	–	L2	–	–	L2	L2	P
TLIF3060	Control traffic as a pilot vehicle operator[2]	–	–	L2	–	–	L2[1]	L2[1]	P
TLIF3013	Coordinate breakdown and emergencies	–	–	L2	–	–	L2	L2	P
TLIF0075	Demonstrate awareness of interacting with other road users	–	–	–	–	–	–	–	–
TLIC3010	Pilot or escort oversized and/or overmass loads	–	–	L2	*L1[3] L2 E		L2	L2	P
TLIH3002	Plan and navigate routes	–	–	E	–	–	–	–	–
TLIE3009	Use pilot and escort communication	–	–	L2	–		L2	L2	P
Bridge supervision		–	–	–	–	–	–	–	P
Knowledge test undertaken at issuing authority		–	–	–	L1[3]	–	–	–	–
Level 2 Load experience required – number of trips		–	–	10 loads greater than 4.5m wide	Minimum of 12 trips	–	Minimum of 40 oversize load movements during the 3 years	Minimum of 40 oversize load movements during the 3 years	–
Escort		–	–	10 loads piloted in a 2 pilot situation and 5 loads involving an NT Accredited Oversize Escort Operator or Authorised Officer (Police)	Minimum of 12 trips	–	–	–	–
Driver's licence: – Provisional or above (PR) – Full licence (F)		PR	PR	F	F	PR	F	F	F

[1] Refresher course every three years.

[2] In Queensland a pilot of an agricultural vehicle does not need accreditation unless a condition of the notice or permit requires a Level 1 or Level 2 pilot. For more information, refer to the permit or the National Class 1 Agricultural Vehicle and Combination Mass and Dimension Exemption Notice Operator's Guide. The pilot of an agricultural vehicle must hold a provisional or open licence.

[3] In Queensland, a Level 1 pilot must complete either the knowledge test or the TLIC3010. TLIC3010 must be completed before obtaining Level 2 escort accreditation.

Figure 18: NHVR Oversize Overmass Permit 2021

The use of private industry escorts to assist the Queensland Police Service (QPS) in the escorting of OSOM moves, is a practical solution to address resource constraints and optimise the efficiency of OSOM movements. This approach could benefit the transport industry and the community through:

1. Continuity of project moves: Private industry escorts can provide escort services when QPS resources are constrained. This ensures the continuity of project moves, which is crucial for large-scale projects like wind farms. Maintaining project timelines is essential for cost efficiency and project success, and private escorts can help achieve this.
2. Easing congestion: W hen QPS resources are constrained, delays in movements can cause congestion at Port storage facilities. By utilising private escorts, congestion at port storage facilities can be alleviated. Large OSOM moves often require coordinated efforts and escort services to navigate through congested areas, especially near ports. Private escorts can help manage traffic and ensure smoother movement of OSOM loads, reducing delays and congestion.
3. Resource optimisation: Given that QPS resources are finite, it makes sense to allocate them strategically. By diverting other OSOM moves outside of wind farm projects to private escorts or partial private escorts, QPS can focus its resources on critical areas where their expertise and presence are most needed. This allows for efficient use of law enforcement resources.

5. Recommendations

5.10 RECOMMENDATION 10 – INDUSTRY PILOTS

4. Cost efficiency: Private escort services can offer cost-effective solutions for OSOM moves. They often have specialised expertise and equipment tailored to escorting large and heavy loads. This can result in cost savings for project developers and transport operators compared to relying solely on public resources.
5. Regulatory compliance: It's essential to ensure that private escort services meet all necessary safety and regulatory requirements. Collaborating with private companies should involve clear guidelines and oversight to maintain safety standards and compliance with transportation regulations.
6. Public safety: While private company escorts can assist in escorting OSOM moves, the primary focus should always be on public safety. Coordinated efforts between QPS and private escorts should ensure that all safety protocols are followed during transport.

Stakeholders provided the example where during the 2014 G20 Summit in Brisbane, as QPS resources were being utilised for G20 security, trials of non-police escorts were undertaken (in lieu of using Queensland Police Service (QPS) escort). The success of this trial was mentioned by all operators who stated that they would like to see alternate arrangement to QPS escorts considered. In Other Jurisdictions there are a mixture of Police and Escort Wardens that are provided.

Examples were also provided of a trial which is currently underway in Brisbane for the movement of bridge girders using alternate escort arrangements. As outlined below, the bridge girder trial has several requirements to ensure the safe and timely movement of bridge girders through the Southeast Queensland region.

- The trial commenced on 29 August 2022.
- The Department of Transport and Main Roads (TMR) and Queensland Police Service (QPS) has allowed a temporary trial to allow non Police escorts when certain requirements are met.
- This trial is applicable to Class 1 OSOM movements and eligibility is dependent on meeting the below requirements:
  - ◊ The load must be bridge girders.
  - ◊ The oversize combination must not:
  - ◊ - exceed 47.5m length
  - ◊ - exceed 4.2m in width
  - ◊ - exceed 4.6m in height
  - ◊ The rear overhang must comply with legislative requirements.
  - ◊ At a minimum, 80% of the journey must be on dual carriageway roads with traffic travelling in the same direction.
  - ◊ An operator must have a permit issued by the NHVR prior to a movement occurring.
- The movement must be accompanied by escorts appointed under the Transport Operations (Road Use Management — Accreditation and Other Provisions) Regulation, Part 2 as an accredited person with the functions of an escort vehicle driver.
- Operators of Class 1 Oversize and Over Mass (OSOM) loads travelling in Queensland are only eligible to utilise these alternate escort arrangements when used in conjunction with an access permit that specifically states the TMRTGM1 condition code.

The bridge girder trial of alternative escort arrangement has delivered positive results to date, with no reported safety incidents and zero damage to road side infrastructure. TMR are currently preparing an internal report detailing the outcomes of the trial. This trial could be used as a guideline for development of a trial of non Police escorts for wind farm movements.

5. Recommendations

5.11 RECOMMENDATION 11 – SUPPORT THE EXPANSION OF CONVOY MOVES

The potential to move wind farm components in convoy has been demonstrated in Central Queensland, where QPS is working with transport operators to convoy multiple loads, reducing the number of Police escorts required. The convoy movement occurs when the following parameters are met:

- Component load dimensions are less than 70m in length.
- Three QPS escorts and three industry escorts are required for the convoy.

Convoy moves could be used in future for the movement of wind blades from Port to destination. Convoy moves occur in other states of Australia, for example in Western Australia where a "Rolling Blockade" moves multiple loads under a specific set of escorts, reducing escort numbers and costs.

There is an opportunity for TMR to review the outcomes of the Central Queensland trial and expand convoy moves across the State where appropriate.

5.12 RECOMMENDATION 12 – REVIEW ELECTRICAL SAFETY CODE OF PRACTICE

Transport and logistics operators stated that power companies are a significant barrier for them when conducting OSOM moves as they are time consuming and expensive. Permanent line lifting can save significant time and cost during an OSOM movement.

The Electrical Safety Code of Practice 2020 outlines the requirements of high loads near overhead electric lines .

There is an opportunity for the Power Utilities and WorkSafe to review the outcomes of the code of practice and streamlining the process of conducting surveys and engaging qualified persons where appropriate without reducing the safety risk associated with working around power lines.

6. Conclusion

The Queensland Government has established ambitious targets to achieve the State's transition to a renewable energy future. To achieve these targets, there has been and will continue to be, significant investment in wind energy and the development of wind farms across the State.

The size and number of wind farm components creates a complex transport task, involving several stakeholder groups and multiple approval processes. QTLC members have raised concerns regarding inefficiencies and constraints in the current processes, as these create delays and significant additional cost to wind farm projects.

Extensive consultation across the stakeholder groups involved in the transportation of wind farm componentry identified the issues outlined in this report, along with opportunities for improvement through the implementation of the report recommendations.

If nothing is done, with the increase in wind farm projects coming online, these inefficiencies and constraints have the potential to significantly impact wind farm project delivery. Now is the time to continue proactively working with all affected stakeholders to ensure a common understanding of the requirements for wind farm developments and to develop best practices in project planning, development and transportation in relation to wind farm operations.

7. References

www.epw.qld.gov.au (2023) EPW. Available at: https://www.epw.qld.gov.au/__data/assets/pdf_file/0019/36037/draft-2023-queensland-rez-roadmap.pdf (Accessed: 01 August 2023).

Cleaner Energy for Queensland (2023) Kaban Green Power Hub. Available at: https://kabangreenpowerhub.com.au/ (Accessed: 14 September 2023).

(2023) NHVR. Available at: https://www.nhvr.gov.au/files/media/document/231/202302-1345-heavy-vehicle-safety-strategy-action-plan-2023.pdf (Accessed: 01 August 2023).

Pacific Tug Group of Companies (2023) Bundaberg Pacific Marine Base. Brisbane, Queensland: Pacific Tug Group.

Ports (Department of Transport and Main Roads) (2023) Department of Transport and Main Roads. Available at: https://www.tmr.qld.gov.au/business-industry/transport-sectors/ports (Accessed: 02 August 2023).

Oversize overmass permit (2021) NHVR. Available at: https://www.nhvr.gov.au/road-access/access-management/applications/oversize-overmass-permit (Accessed: 26 July 2023).

Apply assess consent notify - nhvr.gov.au (2023) NHVR. Available at:https://www.nhvr.gov.au/files/media/document/285/202307-1378-roles-responsibilities-access-permit-application-process.pdf (Accessed: 04 August 2023).

The State of Queensland (2022) Queensland Wind Farm Precinct to dwarf all others, Ministerial Media Statements. Available at: https://statements.qld.gov.au/statements/96683 (Accessed: 26 July 2023).

State Development, Infrastructure, Local Government and Planning (2023) What is copperstring 2032 and why is it important for Queensland's Renewable Energy Future? State Development, Infrastructure, Local Government and Planning. Available at: https://www.statedevelopment.qld.gov.au/news/what-is-copperstring-2032-and-why-is-it-important-for-queenslands-renewable-energy-future (Accessed: 26 July 2023).

8. Appendices

1 – TRANSPORT MANAGEMENT PLAN EXAMPLE

13.0 Transport

13.1 Introduction

This transport chapter describes the existing transportation infrastructure within and surrounding the Study Area, and identifies potential impacts of the Project upon the transport environment. The impact assessment forecasts the likely traffic generated throughout the construction and operational phases of the Project and considers potential mitigation measures to appropriately reduce the level of impact and to maintain the operational efficiency of the existing transport networks.

The primary transport network of relevance to the Project is the road network; however, other transport modes have also been briefly described to identify their relevance to the Project in the context of moving materials to and from the Project Site.

13.2 Scope of assessment

This chapter has been prepared with reference to the Guidelines for Assessment of Road Impacts of Development (GARID) (DMR, 2006) by the Department of Main Roads (now the Department of Transport and Main Roads (DTMR)) to identify the Project's impact on State-controlled Roads (SCR).

The scope of the assessment consists of:

- A baseline study of the existing transport networks supporting the Project Site
- An assessment of the potential impacts on these transport networks due to Project generated traffic
- Potential mitigation measures to be applied to avoid or minimise potential impacts, where relevant.

This chapter focuses on the construction and operational phases of the Project where the worst case transport impacts are likely to occur.

13.3 Legislative requirements and policy

The following section provides a brief description of the principal State legislation related to transport that was used to guide the transport assessment.

The Transport Infrastructure Act 1994

The *Transport Infrastructure Act 1994* (TI Act) is the primary legislation relating to transport in Queensland. The overall objective of the TI Act is to encourage effective integrated planning and efficient management of transport infrastructure. The transport elements of relevance to the Project are roads, sea ports, rail and airports.

SCRs are defined by Chapter 6, Part 2 of the TI Act and managed in Queensland by DTMR. A number of SCRs fall within the Study Area and their use will be subject to the laws and regulations as stated in the TI Act.

The Transport Infrastructure (State Controlled Roads) Regulation 2006

The *Transport Infrastructure (State Controlled Roads) Regulation 2006* (TI Regulation) regulates access, road works and ancillary works encroaching on SCRs. SCRs in the vicinity of the Project Site include the Warrego Highway and the Bunya Highway. As the Project will require access to SCRs, the TI Regulation establishes the regulations and requirements which are to be adhered to (such as restrictions or prohibition of access during road works).

Transport Operations (Road Use Management) Act 1995

The *Transport Operations (Road Use Management) Act 1995* (Transport Operations Act) aims to provide a regulatory framework whose overall objective is to provide for the effective and efficient management of the use of Queensland state road network. The act provides a scheme which promotes the effective movement of goods and people, improves road safety and also contributes to the strategic management of the road network in ways consistent with the TI Act.

The Transport Operations Act also includes a number of subordinate legislation including the *Transport Operations (Road Use Management – Mass, Dimensions and Loading) Regulation 2005* and the *Transport Operations (Road Use Management – Fatigue Management) Regulation 2008*.

Both of these regulations act as instruments within the wider Transport Operations Act. These regulations identify whether certain loads are exempt or regulated (requiring a permit for approval prior to movement) as well as providing a regulatory framework on managing driver fatigue for heavy vehicle operators. As this Project will require transporting over-size and/or over-mass goods (turbine components) over relatively long distances (from the port to the Project Site), the requirements under the Transport Operations Act and associated regulations will dictate allowable driving times as well as permit requirements prior to transport (for over-size or over-mass goods).

Guidelines for Assessment of Road Impacts of Development

GARID (DMR, 2006) sets out the process to assess road impacts triggered by a proposed development. GARID provides a basis for the assessment of impacts on SCR by the Project and generally considers a development's road impacts to be insignificant if the development generates an increase in traffic on SCR of less than 5% over existing levels, measured either in terms of annual average daily traffic (AADT) or equivalent standard axles (ESA).

State Development Assessment Provisions – Module 20 Wind Farm Development

Under Module 20 of the SDAP, wind farm development provides suitable vehicular access, manoeuvring areas and parking for the ongoing operation and maintenance activities associated with the wind farm.

Regional and local planning requirements

The Project falls within the Western Downs Regional Council (WDRC) and the South Burnett Regional Council (SBRC) boundaries. The Project is also within regional planning areas for the Wide Bay Burnett and Surat Basin regions. The WDRC was formed in 2008 following the amalgamation of the former local government areas of Dalby, Chinchilla, Murilla, Tara and Wambo. The SBRC was also formed in 2008 as a result of the Local Government Reform Commission report released in 2007. It consists of the amalgamation of the shires of Kingaroy, Nanango, Murgon and Wondai.

The Draft Wide Bay Burnett Regional Plan and the Draft Surat Basin Regional Planning Frameworks emphasise the need for better integration of transport and land use planning, and accessibility between towns within the regions should be maintained or improved in line with growth in these towns. Assessment of the Project against the local and regional plans is contained within Chapter 11 Land Use and Planning.

In December 2013, the Queensland Government also established the single State Planning Policy (SPP) which replaced multiple previous planning policies. The aim of the SPP is to provide clarity to local and regional governments to ensure that local and regional planning polices adequately reflect and balance state interests. In relation to transport, the policy identifies State Transport Infrastructure as a state interest and the Project will need to abide by the relevant policies from the SPP. For example, the Project must not hinder or prevent transport infrastructure from being constructed in a future state transport corridor as per the SPP.

It is important to ensure that the Project complements the future planning intent for the local areas. Appropriate Schedules on Infrastructure Provisions from the Regional Council Planning Schemes (including the South Burnett Regional Council and the Western Downs Regional Council) will be considered in determining the standards required on any necessary upgrades to the road network.

13.4 Methodology

This section outlines the methodology adopted for the traffic and transport impact assessments for the Project's construction and operation phases and is based on the transport requirements. The key tasks included:

- Identifying the existing transport infrastructure in the region (i.e. road, sea ports, rail infrastructure and airports)
- Assessing the potential construction and operations impacts of the Project on the surrounding transport infrastructure, including the movement of materials, plant and equipment in addition to construction and operations workforce
- Identifying potential mitigation and management strategies to be implemented during construction and operations, where required.

The methodology centres on establishing a baseline, "without development" scenario for the transport routes and corridors, and comparing this with the anticipated impact due to Project-generated traffic, "with development" scenario.

Desktop studies use DTMR and Regional Council data as the source information to form the projected baseline "without development" traffic scenario. This baseline is compared with the traffic generation from the construction and operation phases of the Project, which is preliminarily quantified in this assessment. Potential mitigation and management measures are formulated to address the potential impacts caused by the Project's traffic generation.

The traffic and transport impact assessments have been based on a number of assumptions, as documented throughout this chapter for the purposes of the assessments. These assumptions have been made due to a lack of certainty or limitations on data at this stage of the Project. In subsequent design phases, these assumptions may be reviewed (and adjusted as necessary) as more detail becomes available.

13.4.1 Data collection and desktop review

The most recent AADT volumes (a combination of available data for 2014 and 2015) for the SCR network was provided by DTMR for the road links identified as the transport routes adopted for the Project activities. More up to date traffic data was not available at the time of assessment.

From the traffic data provided by DTMR, the annual segment growth percentage based on five year average data and compounding growth have been adopted for the traffic assessments. To determine the 2016 "existing" traffic volumes, the five years' average growth rates were applied to the historic (combination of 2014 and 2015 data) AADT volume data provided by DTMR.

Traffic data for the Regional Council roads (RCRs) potentially affected by the Project was also requested. Only one potentially affected RCR was identified namely Niagara Road. Different sections of Niagara Road fall under the jurisdiction of both WDRC and SBRC. WDRC has indicated that the most recent counts along the road in their possession were undertaken in 2002 and 2006. SBRC indicated that a count was undertaken along Jarail Road, approximately 50 m north of the Niagara Road intersection in 2014. The newer, 2014 traffic count volumes have been adopted for the traffic assessments.

Given the already very low traffic volumes and lack of significant development potential, a high level of traffic growth was not expected and SBRC has indicated that no growth is to be applied to the 2014 year traffic counts along Niagara Road. For the purpose of the traffic assessments, any road segments with an indicated negative traffic growth have been assumed to remain constant (i.e. flat-line traffic growth).

Desktop reviews of the existing road network were completed based on available data provided by DTMR including historical traffic volumes, road inventories and information for future road upgrade plans such as the 'Queensland Transport and Road Investment Program 2016-2017 to 2019-2020' (QTRIP). This information formed the basis of understanding the general conditions and operational efficiencies of the existing road network.

The impact of Project-generated traffic has been compared to the "without development" scenario to determine the percentage increase in traffic volume compared against the existing scenario as well as identifying the magnitude of these increases.

13.4.2 Impact assessment

The major mode of transport potentially impacted by the Project is the Queensland road network and was hence the focus of this traffic and transport impact assessment. Other transport modes have also been considered to identify their relevance to the Project.

Road impact assessment

In accordance with the GARID, the Road Impact Assessment (RIA) needs to identify and address the implications of the Project on the SCR. The RIA consists of both traffic and pavement impact assessment.

This assessment is undertaken with reference to the GARID and in particular the RIA process flowchart which is summarised in Figure 13.1.

Figure 13.1RIA process flowchart

Source: Figure 3.1 from GARID

GARID also outlines the performance criteria for the assessment of the road impacts which has been summarised in Table 13.1.

Table 13.1 Road impact performance criteria

Assessment type	Performance criteria
Pavement impact assessment	Construction or operational traffic generated by the development equals or exceeds 5% of the existing ESA on a road section.
Traffic operation assessment	Construction or operational traffic generated by the development equals or exceeds 5% of the existing AADT on a road section, intersection movements or turning movements.

Source: GARID (DTMR, 2006)

In order to identify the road sections potentially affected by the Project, the transport corridors related to the Project were identified. The quantity of materials, workforce and equipment were then estimated to determine the overall traffic generation for the identified construction and operation activities.

The 2016 "existing" traffic volumes along the State-controlled roads were developed based on 2014/2015 DTMR traffic census data, including the annual segment growth rates, provided by DTMR. Heavy vehicle (HV) proportions and historic traffic growth data for one, five and 10 years are also presented in the traffic census document. Average, annual segment growth rates based on the five year data were adopted in order to generate future projections of the background traffic data. The five year growth rates were adopted so that short term fluctuations in growth would not affect the assessment.

All potential traffic and transport impacts, considered for the purpose of the RIA, occur due to Project-related road usage. This is due to both the workforce and the construction materials and equipment being transported on road networks.

The roads of relevance to the Project are the domain of both State and local governments, being responsible for up-keeping operation and maintenance. As such these government bodies require assessment of the potential significant impacts upon road networks for future planning.

For the RIA, a brief overview of the methodology adopted to identify the background and Project related traffic volumes are summarised in Figure 13.2.

Figure 13.2 Methodology for generating Project traffic

Traffic operation impact assessment

The operational performance of the road network in the vicinity of the Project Site was assessed to understand the potential traffic impacts from the Project in terms of percentage increase and to identify the magnitude of the additional Project related traffic.

The traffic volumes for the various construction stages were calculated based on the indicative construction activities and timelines. These Project generated traffic volumes were then compared to the level of background traffic along the identified transport corridors to determine the likely level of impact.

According to DTMR's GARID, where Project generated traffic equals or exceeds 5% of the background traffic levels, the traffic operation of that road is considered to be impacted and further assessment is required. It should be noted that the traffic operation assessment is only designed to highlight potential areas of traffic impact and is not by itself a conclusive analysis on the likely impact to the road network.

The methodology highlighted in GARID (per cent comparison), may provide unexpected results if the background traffic is low. For this reason, it is important to consider the outcome of the per cent comparison alongside the actual magnitude of traffic generated. For this reason, the traffic operation impact assessment also considers the overall magnitude of Project generated traffic.

Pavement impact assessment

A preliminary desktop pavement impact assessment was undertaken based on the existing background traffic data available for the relevant road sections. The heavy vehicle component of the AADT was calculated for the construction period by adopting the background heavy vehicle percentages from the data provided.

The traffic volumes for the various construction stages were calculated based on the indicative construction activities and timelines (see Section 13.5.6). These traffic volumes were converted into ESA based on the assumed heavy vehicle classes used on the Project and the appropriate ESA for each vehicle class.

An ESA is a unit measurement which converts the wheel loads of traffic to an equivalent number of standard loads which is usually expressed in terms of the equivalent number of 80 kilonewtons (kN) single axle load.

The ESA for the background heavy vehicle component was calculated based on the provided heavy vehicle splits for the relevant road sections. The ESA factors were determined in consultation with DTMR.

Where the number of ESA of the additional Project related traffic equals or exceeds 5% of the background ESA (as outlined in GARID (DMR 2006)), the pavement is considered to be impacted and further assessment is required. It should be noted that the 5% pavement comparison assessment is only designed to highlight potential areas of pavement impact and is not by itself a conclusive analysis on the likely impact to the road network.

Port impact assessment

A desktop review of the current Queensland sea ports of relevance to the Project, including existing port infrastructure and future expansionary projects was conducted as part of the assessment.

Ultimately, the selection of a port for the delivery of imported construction materials, such as turbine components, will be undertaken following detailed design and be dependent upon a number of factors including:

- The capacity of the port to handle ships carrying the components
- The capacity of the port to handle break bulk of sufficient dimensions (length of turbine blades and the weight of nacelles)
- The ability for turbine components to be transported from the port to the Project Site via road freight

- Costs associated with the use of the port.

This desktop analysis primarily focused on the Port of Brisbane which has been identified as part of the transport network for the Project. The desktop review includes the short and longer term port expansion planning including the Future Port Expansion Area project. The assessment also identifies the approximate quantities to be transported through Queensland ports and the likely impact of Project related movements.

Airport impact assessment

As part of the scope of assessment, a high level desktop review of existing airports in the vicinity of the Project was undertaken. This high-level review consisted of identifying the major aviation infrastructure in the area and determining the extent of any potential impacts (such as increased flights due to Fly in-Fly Out workforce or air freight transport) as a result of the Project.

Rail impact assessment

A high level desktop review of the rail infrastructure servicing the area in the vicinity of the Project was conducted as part of the assessment. This high-level review consisted of identifying existing rail infrastructure within the vicinity of the Project and determining the extent of impacts on Queensland rail lines (such as an increased number of trains due to the use of rail freight). Impacts at rail-road crossings have also been considered.

13.5 Existing environment

This section provides a summary of the existing transport infrastructure in the vicinity of the Project, and transport infrastructure between the Project and the Pot of Brisbane. In particular, it describes the road network and identifies the port, airport and rail infrastructure in the surrounding region. An overview of the existing transport infrastructure in the region can be found in Figure 13.1, Volume 2.

13.5.1 Road network

The Darling Downs region of Queensland is serviced by a network of highways, SCRs and RCRs that function as the main transport routes in the vicinity of the Project. The highways and other SCRs provide links from the Project to Kingaroy and Gayndah to the north, Brisbane and Toowoomba to the east, Dalby to the south and Chinchilla and Miles to the west.

13.5.1.1 State controlled road network

The major SCRs intersected by the Project transport corridors include sections of the Gateway Arterial Road (U13A – Gateway Motorway South), Cunningham Highway/Ipswich Motorway (17A and 17B) which will be used to transport turbine materials from the Port of Brisbane. Closer to the Project Site the key SCRs consist of the Warrego Highway (18A and 18B), the Bunya Highway (45A), Dalby-Jandowae Road (421) and Kingaroy-Jandowae Road (424). The key SCRs in the vicinity of the Project are summarised in Table 13.2. A brief description of these roads is also provided in the following discussion.

Table 13.2 Key existing State-controlled road

Road ID	Description	Classification
U13A	Gateway Arterial Road (Gateway Motorway South)	National Highway
17A	Cunningham Highway (Ipswich Motorway)	National Highway
17B	Cunningham Highway (Ipswich – Warwick)	National Highway
18A	Warrego Highway (Ipswich – Toowoomba)	National Highway
18B	Warrego Highway (Toowoomba – Dalby)	National Highway
45A	Bunya Highway	Regional Road
421	Dalby-Jandowae Road	Regional Road
424	Kingaroy-Jandowae Road	District Road

Gateway Arterial Road

The Gateway Arterial Road (Gateway Motorway) is an approximately 50 km long highway, stretching from Drewvale (Brisbane) to Bald Hills (Brisbane). It is a major motorway which bypasses Brisbane to provide easier access between the Gold Coast and the Sunshine Coast. The southern section of the Gateway Arterial Road (Gateway Motorway South) is a fully access controlled, six lane dual carriageway, with a speed limit ranging from 80 km/hr to 100 km/hr.

Cunningham Highway (Ipswich Motorway)

The Cunningham Highway is an approximately 340 km long highway, stretching from Brisbane (where it is called Ipswich Road and Ipswich Motorway) to Goondiwindi. The relevant section of the Cunningham Highway (Ipswich Motorway) is a motorway grade, fully access controlled, six-lane dual carriageway, with a speed limit of 100 km/hr. In 2012, the Cunningham Highway (Ipswich Motorway) was upgraded to six-lanes between Dinmore and Goodna as part of the wider Ipswich Motorway upgrade project.

Warrego Highway

The Warrego Highway is an approximately 710 km long highway, stretching from Ipswich to Charleville. The highway connects the coastal centres of Queensland to the south western areas of the State. The section of the Warrego Highway forming part of the Project transport corridors is approximately 180 km in length from Ipswich to Dalby (18A and 18B).

The first approximately 100 km of the highway between Ipswich and Toowoomba is an access-controlled, four lane dual-carriageway. This section of the highway is access controlled using motorway style on and off ramps and has a speed limit ranging between 80 km/hr to 100 km/hr dropping to 60 km/hr through the Great Dividing Range and through Toowoomba.

From Toowoomba to Charleville, the highway turns into a two-lane, single carriageway with a speed limit of 100 km/hr.

Bunya Highway

The Bunya Highway is an approximately 170 km long highway, stretching from Dalby to Goomeri. The highway begins at the Warrego Highway at Dalby and heads towards the Project Site at Cooranga North where it turns north east and eventually terminates at the Burnett Highway in Goomeri. The section of the Bunya Highway forming part of the Project transport corridors is approximately 110 km in length from Dalby to Kingaroy.

The highway is predominantly a two lane, single carriageway except for the section within Dalby which is a four-lane, dual carriageway. The speed limit along the majority of the highway is 100 km/hr except for sections within built up areas (such as within Dalby) where the speed limit is reduced to 60 km/hr.

Kingaroy-Jandowae Road

Kingaroy-Jandowae Road is an approximately 40 km long road, linking the community of Jandowae to the Bunya Highway. The road begins at Jandowae and continues east towards Cooranga North, where it turns south-east and eventually terminates at the Bunya Highway.

The road is predominantly a two lane, sealed, single carriageway with centre line marking along some sections. The speed limit along the road is generally 100 km/hr and reduces to 60 km/hr around populated areas.

Dalby-Jandowae Road

Dalby-Jandowae Road is an approximately 50 km long road, linking the community of Jandowae to the Warrego Highway. The road begins at an intersection with the Warrego Highway in the township of Dalby and continues north, passing through Jandowae and eventually terminates at an intersection with Wondai Road.

The road is predominantly a two lane, sealed, single carriageway with centre line marking along some sections. The speed limit along the road is generally 100 km/hr and reduces to 60 km/hr through Jandowae.

13.5.1.2 Regional council roads

There are several RCRs in the vicinity of the Project Site including some non-gazetted roads. These roads fall under the jurisdiction of either the SBRC or the WDRC. For the Project related traffic, only Niagara Road is expected to be utilised as part of the proposed transport corridors during both the construction and operation phases.

Niagara Road

Niagara Road runs from a junction with Kingaroy-Jandowae Road east through the Project Site. It is sealed up to the intersection with Jarail Road. However, the road also runs in part as an unsealed access road through the site where it then joins the Bunya Highway south of Boyneside. Different sections of Niagara Road fall under the jurisdictions of both the SBRC and WDRC. The eastern portion of the road adjoining to the Bunya Highway is administered by the SBRC and the western portion towards Jandowae is administered by the WDRC.

13.5.1.3 Privately owned/operated roads

In addition to publicly owned and operated roads, privately owned and operated toll roads also form part of the Project's transport corridors. A brief description of these roads is provided in the following discussion.

Logan Motorway

The Logan Motorway (210A) is an approximately 30 km long highway stretching from stretching from the Pacific Motorway in Loganholme to the Ipswich Motorway in Gailes. It provides a quick connection between several major highways including the Pacific Motorway, Gateway Motorway, Centenary Highway and the Ipswich Motorway. The Logan Motorway is currently privately owned and operated by Queensland Motorways Limited and there are two toll points along the motorway at Staplyton Road and Loganlea Road.

The section of the Logan Motorway forming part of the Project transport corridors is approximately 20 km in length from the Gateway Extension Motorway merge to the Cunningham Motorway (Ipswich Motorway) merge. This section of the Logan Motorway is a fully access controlled, four lane dual carriageway with a speed limit of 100 km/hr.

Gateway Extension Motorway

The Gateway Extension Motorway (N332) is the southern expansion of the Gateway Motorway from the Pacific Motorway to the Logan Motorway. Originally completed in 1997, it is an approximately 10 km long stretch of motorway which allows traffic originating from the Bruce Highway and Gateway Motorways (west bound traffic heading towards the Warrego Highway), to bypass much of South Brisbane and Logan. The Gateway Extension Motorway is currently privately owned and operated by Queensland Motorways Limited and there is a single toll point along the motorway at Kuraby, adjacent to the Persse Road onramp.

The entire length of the Gateway Extension Motorway forms part of the Project transport corridors and consists of a fully access controlled, dual-carriageway varying between four to six lanes. The speed limit along the majority of the motorway is 100 km/hr, reducing to 80 km/hr in some sections.

13.5.1.4 Existing traffic volumes

The 2016 "existing" traffic volumes along each of the affected SCRs and RCRs were developed based on AADT data provided by DTMR (various regions) the SBRC and the WDRC. The AADT data made available for the traffic assessments were from various years, ranging from 2014 to 2015 depending on the road. The provided AADT data was then factored, using an average growth rate and compounding annually (from the year of the count) to develop the 2016 "existing" traffic volumes.

Based on the segment start and end through distances as presented in the DTMR's traffic census data, each of the SCR segments (for example the Warrego Highway, 18B: Toowoomba-Dalby) were subdivided into smaller road sections (for example 18B-1, 18B-2 etc.). The road section identifiers are presented in Figure 13.3, Volume 2.

Due to the level of available data, a number of assumptions had to be made regarding the existing traffic volumes for the purpose of the assessments. These assumptions are listed below and a summary of the "existing" year equivalent data used for the purpose of the assessments is provided in Table 13.3.

It should be noted that the transport corridors of the Project extend over three separate DTMR regions: the Metropolitan Region, the Downs South West Region and the Wide Bay Burnett Region. However, the roads falling within the Metropolitan region are predominantly multi-lane, national highway systems (such as the Cunningham Highway, Gateway Extension Motorway and the Logan Motorway).

Due to the high standard of construction and generally high background traffic volumes along these major highways, it is unlikely that the Project generated traffic volumes will have a significant traffic impact or pavement impact. Consequently, only roads along the transport corridors which fall wholly within either the Darling Downs or Wide Bay-Burnett regions have been considered and reported in Table 13.3.

The following key assumptions were adopted to derive the "existing" traffic volumes:

- For all SCRs, annual segment growth rates based on one, five and 10 year data was provided. However, for the purpose of the assessments, the five year annual growth rates (compounding annually) were adopted.
- For any segments where the annual, five year growth rate was not available, the growth rate from the adjacent road section (where growth rate data was available) was adopted. This includes RCRs where growth rates were adopted from the adjacent DTMR road section.
- If the provided traffic data indicated that negative growth would be present on any given segment, the growth rate was taken to be zero (flat-line AADT).
- For any segments where the percentage of heavy vehicles was not available, the percentage of heavy vehicles from the adjacent road section was adopted.
- Where the data regarding the growth rate or percentage of heavy vehicles for a given segment was only available in one direction (gazettal or anti-gazettal), the same data was adopted for the opposing direction.
- In the event that only combined bi-directional traffic data (such as bi-directional AADT) was available, a 50% / 50% split between the two directions of traffic flow was assumed.

Table 13.3 Summary of "Existing" 2016 traffic data

Segment ID	Road section name	Combined bi-directional traffic data				
		[illegible] AADT	Count year	[illegible]	[illegible]	[illegible]
18B-1	Warrego Highway (Toowoomba to Dalby)	20,863	2015	11.66%	2.51%	**21,387**
18B-2	Warrego Highway (Toowoomba to Dalby)	15,306	2015	17.61%	1.17%	**15,485**
18B-3	Warrego Highway (Toowoomba to Dalby)	10,457	2015	8.83%	1.17% #	**10,579**
18B-4	Warrego Highway (Toowoomba to Dalby)	20,549	2015	7.54%	9.40%	**22,481**
18B-5	Warrego Highway (Toowoomba to Dalby)	13,515	2015	11.03%	1.14%	**13,669**
18B-6	Warrego Highway (Toowoomba to Dalby)	12,066	2015	18.19%	0.00% *	**12,066**
18B-7	Warrego Highway (Toowoomba to Dalby)	9,332	2015	19.15%	0.00% *	**9,332**
18B-8	Warrego Highway (Toowoomba to Dalby)	3,689	2015	21.42%	0.00% *	**3,689**

Segment ID	Road section name	Combined bi-directional traffic data				
		Historic AADT	Count year	%HV	Annual growth rate	2016 AADT ("Existing")
18B-9	Warrego Highway (Toowoomba to Dalby)	5,469	2015	25.78%	0.00% *	**5,469**
18B-10	Warrego Highway (Toowoomba to Dalby)	7,019	2015	23.31%	0.00% *	**7,019**
18B-11	Warrego Highway (Toowoomba to Dalby)	12,417	2015	16.50%	0.00% *	**12,417**
45A-1	Bunya Highway (Dalby to Kingaroy)	4,097	2015	12.57%	0.00% *	**4,097**
45A-2	Bunya Highway (Dalby to Kingaroy)	2276	2015	12.74%	9.71%	**2,497**
45A-3	Bunya Highway (Dalby to Kingaroy)	836	2015	20.33%	1.37%	**847**
45A-4	Bunya Highway (Dalby to Kingaroy)	588	2015	27.55%	0.77%	**593**
45A-5	Bunya Highway (Dalby to Kingaroy)	747	2015	21.15%	0.00% *	**747**
45A-6	Bunya Highway (Dalby to Kingaroy)	1,084	2015	17.44%	1.05%	**1,095**
45A-7	Bunya Highway (Dalby to Kingaroy)	2,488	2015	13.34%	1.09%	**2,515**
45A-8	Bunya Highway (Dalby to Kingaroy)	4,634	2015	10.14%	0.36%	**4,651**
421-1	Dalby - Jandowae Road	1,918	2015	15.84%	5.28%	**2,019**
421-2	Dalby - Jandowae Road	929	2015	17.89%	0.00% *	**929**
421-3	Dalby - Jandowae Road	687	2015	17.35%	0.00% *	**687**
424-1	Kingaroy-Jandowae Road	105	2014	13.21%	3.96%	**113**
RCR-1	Niagara Road	38	2014	23.70%	0.00% ^	**38**

** The published growth rates along these sections was negative, hence zero growth has been adopted for the purpose of this traffic assessment.*

 # Bi-directional five year historic growth rates were not available for this section. The growth rate from the adjacent section has been adopted.

^ SBRC has indicated that no significant growths in traffic volumes are expected in the near term along Niagara Road and as such zero growth has been adopted for the assessment.

13.5.2 Stock routes

SBRC identifies, within Planning Scheme Policy (PSP) No. 8 of the former Kingaroy Shire Council (2006) Planning Scheme, a Stock Route that runs through the Project Site. This stock route is located within the road reserve of Ironpot Creek Road, north of the intersection with Niagara Road. The stock route follows north along the reserve of Ironpot Creek Road until the intersection of Ironpot Creek Road / Sarum Road, where the stock route follows Sarum Road north, out of the Project Site. The location of this stock route in relation to the road network is shown in Figure 13.4, Volume 2.

13.5.3 Port network

The closest commercial sea port to the Project Site is the Port of Brisbane. The port it is situated to the east of Brisbane City and is approximately 300 km (by road via the Warrego and Bunya Highways) to the south east of the Project Site. The Port of Brisbane is operated and managed by the Port of Brisbane Pty Ltd, under a 99 year lease from the Queensland Government.

13.5.4 Airport network

The closest major commercial airport to the Project Site is Toowoomba Airport (International Air Transport Association (IATA) Code: TWB). Toowoomba Airport is currently served by regional airlines such as Skytrans Airlines with direct flights from between Toowoomba and Brisbane, Sydney and Charleville.

There are also a number of smaller airports/aerodromes in the vicinity of the Project, within the WDRC and SBRC catchments including:

- Dalby Airport (IATA Code: DBY)
- Chinchilla Airport (IATA Code: CCL)
- Kingaroy Airport (IATA Code: KGY).

13.5.5 Rail network

The key existing rail infrastructure in the vicinity of the Project consists of the Western System rail-line, as shown in Figure 13.5, which is owned and operated by Queensland Rail (QR). The Western System is a 1,067 mm, narrow gauge, east-west running rail line linking Brisbane (via the Ipswich and Rosewood lines) to its current terminus at Quilpie in south-west Queensland. At Westgate station, the rail line splits into a north-south section terminating at Cunnamulla and the east-west section continuing further west until Quilpie. The system currently caters for all types of traffic including passenger and freight services.

A number of branch lines also connect to the Western System, including the Jandowae branch terminating at Jandowae, the Wandoan Branch terminating at Wandoan and the Glenmorgan branch terminating at Glenmorgan. The nearest railway station within the vicinity of the Project is Jandowae Station, located along the Jandowae branch, approximately 40 km west of the Project Site.

Figure 13.5Western system rail network

(Source Reference: [illegible])

13.5.6 Project description

The Project may consist of up to 115 wind turbines in an area near Cooranga North between Dalby and Kingaroy on land that is predominately used for cattle grazing and other farming activities. It should be noted that the exact number of turbines depends on the model of turbine adopted. Similarly, the exact locations of the wind turbines, access roads, electrical collector and feeder systems and other associated infrastructure will be determined during the Project's detailed design phase. For the purposes of this assessment, the maximum number of wind turbines (up to 115 turbines in total) has been adopted to provide an estimated ceiling in terms of potential additional traffic impacts. The exact number of turbines to be constructed will be determined in the Project's detailed design phase.

A maximum wind turbine layout has been used to inform the Project Site and the traffic assessment for the Project. The wind farm layout and Project Site are shown in Figure 2.1 in Volume 2. For additional detail on the Project, refer to Chapter 2 Project Description.

13.5.6.1 Construction phase

As the Project is currently in the preliminary planning and approvals stage, the detailed construction methodology and program have yet to be finalised. The Engineering, Procurement and Construction (EPC) contractor for the Project will be ultimately responsible for the detailed construction methodology for the Project. The following section describes a typical construction methodology that is likely to be used for the Project and has been adopted for the purposes of the traffic and transport assessments.

Construction activities

This section provides an indication of the key construction activities of the Project and their proposed mode of transport. For the construction of the Project, the following activities are expected to occur over a period of approximately 27 months (or two to two and a half years):

- Site establishment (temporary site facilities, lay down areas, equipment and materials)
- Earthworks for access roads and wind turbine hardstands
- Excavation for foundations
- Construction of wind turbine foundations (bolt cage, reinforcement and concrete)
- Installation of electrical and communications cabling and equipment (including overhead feeders from cable marshalling points to the substation)
- Installation of wind turbine transformers, in parallel with electrical reticulation works
- Installation of towers for the wind turbines, delivery of the wind turbine components to site
- Erection of wind turbines, using high-level mobile cranes
- Construction of the Project's substation and Powerlink substation (progressed in parallel with the construction of the Project)
- Commissioning of wind turbines, followed by reliability testing
- Rehabilitation and restoration of the site following commissioning.

Based on the construction activities listed above, Table 13.4 identifies the major construction materials and related transport modes for the traffic generated by the respective activities. As indicated below, for the purpose of this assessment, it has been assumed that all construction equipment, workforce and the majority of construction materials are being transported via the road network.

During the construction phase, works could potentially occur for six days during each week, 12 hours per day. Under such a scenario, materials could be transported to the site for up to 24 days per month (assuming a four week month). These working hour assumptions have been adopted for the purpose of the assessments; however the final working hours will depend on the terms of the Project's construction contract.

Table 13.4 Construction activities contributing to traffic generation and transport mode

Activity	Mode of transport
Road materials	Road
Concrete aggregates for footings	Road
Reinforcing steel (two deliveries per turbine)	Road
Other concrete supplies	Road
Transformers	Road
High voltage cabling	Road
Turbine blades (Three blades per turbine)	Sea and road
Turbine nacelles	Sea and road

Activity	Mode of transport
Turbine cooling towers	Sea and road
Turbine hubs	Sea and road
Tower sections (Three sections per wind turbine)	Road and/or sea and road
Substation equipment	Road
Cranes and other heavy equipment	Road
Workforce	Road

13.5.6.2 Operational phase

The wind turbines automatically start, stop and alter their output as determined by wind speed and other environmental and electrical conditions. During operations, the wind farm will be managed by both on-site and off-site personnel.

During the operational phase, it is expected that there will not be a significant impact on any transport mode relative to the construction phase. The only Project related traffic expected to be generated during the operational phase would be a low volume of light vehicle trips from the small operational workforce. As such, the magnitude of these trips is not expected to have any adverse traffic impacts during the operational phase.

13.5.6.3 Decommissioning phase

At the end of the operational life of the Project, the wind farm operator may repower the wind farm (replace the wind turbines) or replace the wind turbine components, such as the gearbox and generator. Alternatively, the Project may be decommissioned, which would involve the turbines and all other above-ground infrastructure on-site being dismantled and removed from the Project Site. For further detail regarding the decommissioning phase, refer to Chapter 2 Project Description.

Regardless of the Project's ultimate decommissioning provisions, the decommissioning phase of the Project is unlikely to have an impact on existing transport networks greater in magnitude than during the construction phase. A decommissioning plan will be prepared by the wind farm operator and agreed with the relevant authorities prior to any decommissioning activities. The plan will take into account any new legislation, guidance and best practice to avoid or minimise potential adverse impacts to the road network.

13.5.7 Project related transport networks

This section describes the transport networks expected to be utilised by the Project, namely the road and port networks. These networks are described in the following sections in addition to highlighting the extent of any planned upgrades to the network. As the rail and airport networks are not considered to be significantly affected by the Project, they have not been further considered in this report.

13.5.7.1 Port network

Australia does not manufacture wind turbines; consequently, these components will be sourced from overseas. The turbine components will be shipped to the east coast of Australia for transport to the Project Site via the road network. Several port options exist for transporting the turbine components including the Port of Brisbane, the Port of Bundaberg and the Port of Gladstone. However, for the transport assessments, in view of its location and handling capability, the Port of Brisbane has been identified as part of the transport network for the Project.

For the purpose of the traffic assessments, it has been assumed that construction materials being transported via ocean freight services will be shipped to the Port of Brisbane where they will be transferred onto the road network. The Port of Brisbane is the largest general cargo port in Queensland; hence it is the most likely port to be able to accommodate ships, break bulk cargo and containers of sufficient size. Additionally, the Port of Brisbane is also the closest major port to the Project Site and is well connected via the road network, with major highways certified by DTMR for Higher Mass Limit (HML) vehicles linking both locations.

13.5.7.2 Road network

Transport Corridors

The three principal elements to be transported via the road network are the workforce, construction materials (which includes overland freight of turbine materials & infrastructure) and construction equipment. For the purpose of the assessments, indicative transport routes (referred to as Transport Corridors) for each of these three elements have been developed (as depicted in Figure 13.6a, Figure 13.6b and Figure 13.6c, in Volume 2).

The principal elements of road infrastructure in the region, utilised by the Project are described in Table 13.5 and Table 13.6. Three primary transport corridors have been identified, as shown in Table 13.5, consisting of Transport Corridors TC01, TC02 and TC03. These primary transport corridors are the main transport corridors which will be used for the transportation of workforce, equipment and materials for the Project's construction and operational phases. At Dalby, TC01 splits into four possible transport routes between Dalby and the Project Site providing alternate transport routes for traffic travelling along TC01. The alternative transport routes between Dalby and the Project Site are highlighted in Table 13.6 and consist of TC01A, TC01B, TC01C and TC01D.

Both TC01A and TC01B describe a one-way loop arrangement between Dalby, Jandowae, the Project Site and back to Dalby (via, Dalby-Jandowae Road, Kingaroy-Jandowae Road, Niagara Road and the Bunya Highway). TC01A describes a clockwise loop arrangement and TC01B describes the opposite, anti-clockwise arrangement (as depicted in Figure 13.6a and Figure 13.6b, Volume 2).

TC01C and TC01D both describe two-way routes from Dalby to the Project Site. TC01C involves a route from Dalby to the Project Site via Dalby-Jandowae Road through Jandowae. TC01D involves a route from Dalby to the Project Site via the Bunya Highway (as depicted in Figure 13.6c, Volume 2). All vehicles travelling along both TC01C and TC01D have been assumed to perform a return trip along the same corridor.

The purpose of identifying alternate transport corridors between Dalby and the Project Site is to provide a number of potential routes for the movement of heavy vehicles carrying materials and equipment travelling between Dalby and the Project Site. TC01D also serves the additional purpose of transporting workforce from Bell and the Project Site.

Table 13.5 Primary road transport corridors overview

Transport Corridor	Description	Constituting roads	Principal purpose
TC01	Port of Brisbane to Dalby	Port of Brisbane Road, Gateway Arterial Road; Gateway Extension Motorway, Logan Motorway, Cunningham Highway (Ipswich Motorway), Warrego Highway	Transport of equipment Transport of materials
TC02	Kingaroy to Coopers Gap Wind Farm	Bunya Highway, Niagara Road	Transport of equipment Transport of materials Transport of workforce
TC03	Jandowae to Coopers Gap Wind Farm	Kingaroy-Jandowae Road, Niagara Road	Transport of materials Transport of workforce

Table 13.6 Alternative transport routes

Transport routes	Description	Constituting roads	Principal purpose
TC01A	Dalby to Coopers Gap Wind Farm and back to Dalby (Clockwise, One-Way Loop)	Dalby-Jandowae Road, Kingaroy-Jandowae Road, Niagara Road, Bunya Highway	Transport of equipment Transport of materials
TC01B	Dalby to Coopers Gap Wind Farm and back to Dalby (Anti-Clockwise, One-Way Loop)	Dalby-Jandowae Road, Kingaroy-Jandowae Road, Niagara Road, Bunya Highway	Transport of equipment Transport of materials
TC01C	Dalby to Coopers Gap Wind Farm (via Jandowae)	Dalby-Jandowae Road Kingaroy-Jandowae Road, Niagara Road	Transport of equipment Transport of materials
TC01D	Dalby to Coopers Gap Wind Farm (via Bunya Hwy)	Bunya Highway Niagara Road	Transport of equipment Transport of materials Transport of workforce

It should be noted that the primary transport corridors for the Project extend over three separate DTMR regions: the Metropolitan Region, the Downs South West Region and the Wide Bay Burnett Region. However, the roads falling within the Metropolitan region are predominantly multi-lane, national highway systems (such as the Cunningham Highway, Gateway Extension Motorway and the Logan Motorway).

Along these roads, the Project related traffic is unlikely to have a significant impact on the pavement condition or traffic operation of these roads. This is because the Project related traffic is unlikely to exceed 5% of the background traffic volumes, owing to the generally higher levels of background traffic on these roads. Consequently, only roads along the transport corridors which fall wholly within either the Downs South West or Wide Bay-Burnett regions have been analysed as part of the RIA.

Planned upgrades

The QTRIP details DTMR's upcoming schedule of road works on SCRs in Queensland. The program sets the framework for the Queensland Government in meeting current and future infrastructure needs, and is a requirement of DTMR under the TI Act.

All potential road upgrade works along the roads forming the Project's transport corridors identified from QTRIP, which are contained wholly within the Darling Downs and Wide Bay Burnett Regions, have been listed in Table 13.7. It should be noted that all potential works identified in QTRIP have been reproduced, however it is not known which of these works will overlap with the construction period of the Project. Additionally, all works indicated in QTRIP for 2017-2018 and beyond are indicative only with no guaranteed funding as identified at the time of publication.

Table 13.7 Queensland Transport and Roads Investment Program (Darling Downs and Wide Bay Burnett Regions) – Indicative Road Funding 2016-2017 – 2019-2020

ID	Road	Location	Funding period	Work description
205/16B/10	Warrego Highway (Toowoomba-Dalby)	Acland intersection (43.20 – 44.00)	2016 – 17 to 2019-20	Improve intersection
205/16B/11	Warrego Highway (Toowoomba-Dalby)	Kingsthorpe – Oakey (18.50 – 25.80)	2016 – 17 and 2018-19 to 2019-20	Undertake miscellaneous works
205/16B/4	Warrego Highway (Toowoomba-Dalby)	Nugent Pinch Road – West of Charlton	2016 – 17 to 2019 – 20	Duplicate from two to four lanes
205/16B/6	Warrego Highway (Toowoomba-Dalby)	Charlton – Kingsthorpe (14.10 – 16.20)	2016 – 17 to 2019 – 20	Duplicate from two to four lanes
205/16B/803	Warrego Highway (Toowoomba-Dalby)	0 – 4.50	2016-17	Rehabilitate pavement
205/16B/9	Warrego Highway (Toowoomba-Dalby)	Oakey – Dalby (26.60 – 84.10)	2016-17 to 2017-18	Construct additional lanes
205/16B/910	Warrego Highway (Toowoomba-Dalby)	Charlton	2016-17	Undertake transport planning project
222/16B/6	Warrego Highway (Toowoomba-Dalby)	Dalby eastern access (80.30 – 83.60)	2016-17 to 2017-18	Duplicate from two to four lanes

13.6 Potential impacts

13.6.1 Construction traffic generation

The volumes of traffic that are likely to be generated through the construction of the Project have been preliminarily estimated based on the traffic generation and distribution assumptions as described in the following sections. The major construction activities of the Project and their proposed mode of transport have already been identified in Section 13.5.6. The traffic generated due to the movement of construction equipment, materials and workforces relating to these activities form the basis of the RIA.

Indicative quantities

The total number of workforce as well as the quantities of equipment and materials has been estimated based on information from projects of a similar scale and preliminary assumptions made regarding the construction staging. For the purpose of this study, the transportable quantities were modified to suit the scope of this Project. The methodology used to identify the Project related quantities to be transported generally consisted of linearly pro-rating the transportable quantities from a project of similar magnitude to reflect the current scope of this Project. In conjunction with the pro-rating methodology, a number of further assumptions were also made for the purpose of the traffic assessments and these assumptions are listed below. The resulting indicative quantities of materials to be transported during the construction phase are highlighted in Table 13.8.

- The amount of water likely to be required for the construction activities has not yet been finalised. However, from experience with similar projects, it has been estimated that approximately 250 mega litres may be needed. It is anticipated that the water will come from groundwater bore holes within the Project Site.
- For the purpose of the assessments, a figure of 80% of gravel extracted on site and 20% hauled from external quarries has been adopted. However, the final amount of gravel to be extracted from within the Project Site is dependent on additional geotechnical investigations to be undertaken prior to detailed design of the Project.
- One electrical sub-station is likely to be required for this Project.

Table 13.8 Indicative quantities of to be transported during the construction phase

Construction activity	Total indicative quantity to be transported	Units
Road materials *	**107,700**	Cubic metres (m^3)
Concrete aggregates for footings	**51,300**	Cubic metres (m^3)
Reinforcing steel (two deliveries per turbine)	**228**	Deliveries
Other concrete supplies	**10,260**	Cubic metres (m^3)
Construction water #	**250**	Mega litres
Transformers	**3**	each
High voltage cabling	**146**	Rolls
Turbine blades (Three blades per turbine)	**345**	Each
Turbine nacelles	**115**	Each
Turbine cooling towers	**115**	Each
Turbine hubs	**115**	Each
Tower sections (Three sections per turbine)	**345**	Each
Substation equipment	**132**	Each
Cranes and other heavy equipment	**64**	Each
Peak construction workforce	**350**	Employees

* *For the purposes of this traffic assessment, it has been assumed that 20% of the road materials will be imported with the remaining 80% sourced within Project Site.*

It has been assumed that construction water will be sourced onsite and hence will not require external transportation.

13.6.1.1 Traffic generation assumptions

As the Project is currently still in the planning and early stages of design, a series of assumptions regarding each of the construction activity categories have been made in determining the number of trips generated along each transport corridor.

Construction equipment

It has been assumed for the purpose of the assessments that construction equipment (cranes, heavy earth moving equipment etc.) will be sourced from Brisbane.

Due to the preliminary phase of the Project, detailed delivery dates and logistics plans are not available. However, the deliveries of construction equipment are unlikely to be all at the same time. It is also expected that construction equipment will vary in size, weight and divisibility depending on the type of equipment being transported.

Hence, for the purposes of this traffic assessment, it is reasonable to assume that, apart from construction related heavy vehicles; there will be over-dimensioned vehicles on the external road network which will require obtaining Excess Mass and Dimension Permits for Class 1 heavy vehicles from DTMR. However, these are likely to be occasional trips and infrequent in occurrence and are not expected to occur over the duration of the construction period.

Furthermore, due to their infrequent nature and the overall small magnitude, these trips are not expected to be critical in terms of traffic operation or pavement impact. As a result, they have not been accounted for in the Traffic Operation Impact and Pavement Impact Assessments (5% analysis). However, the likely impacts arising from these trips (such as impacts on traffic safety due to driver fatigue) will be accounted for as part of the overall Road Use management Plan (RUMP). For further discussion on occasional and infrequent trips and mitigation of their impacts on the road network, see Section 13.6.1.

Construction materials

A number of assumptions have been adopted regarding the transport of construction materials and are described below.

- For all construction materials which have been assumed to be hauled via TC01 (such as aggregates and road materials), four separate transport routes (scenarios) have been assessed. These scenarios relate to the transport of construction materials from Dalby to the Project. For each of the four scenarios, it was assumed that TC01 related construction material traffic would utilise TC01A, TC01B, TC01C and TC01D. That is, Scenario 1 comprises of TC01A, Scenario 2 comprises of TC01B, Scenario 3 comprises of TC01C, Scenario 4 comprises of TC01D.
- It has been assumed that any aggregates sourced onsite will be unsuitable for use in concreting. Hence all concrete aggregates have been assumed to be imported from quarries within the region.
- As the Project is still conceptual, it isn't possible to identify exactly which quarry or group of quarries will be utilised for extracting road materials and concrete aggregates for footings. Hence, the traffic related to the transport of road materials and concrete aggregates for footings have been distributed equally among the three primary transport corridors (TC01, TC02 and TC03).
- It has been assumed that reinforcing steel and other concrete supplies (such as cement) are sourced equally between Dalby via TC01 and Kingaroy via TC02.
- There will potentially be two concrete batch pants on site for producing concrete required for foundations, hardstand areas etc. The equipment for these batch plants will be brought on site once, remain on site and then be demobilised as required and hence movements relating to the batch plants themselves are dealt with as occasional, infrequent trips (see section below).
- For the purposes of this traffic assessment it has been assumed that all construction water will be from within the Project Site. The ultimate water source utilised for the Project will be confirmed in subsequent design phases including the required permits from regional councils.
- For the purposes of this traffic assessment it has been assumed that all tower and turbine components will be transported from Brisbane / Port of Brisbane via TC01. Whilst turbines must be sourced internationally via sea, there is potential for the tower sections to be sourced locally from within the region and hence sea transport may not be required. The source of turbine components may be further investigated as part of the assessments in subsequent phases of the Project. However, the deliveries of these components are likely to be limited by the size of the construction fleet and hence are unlikely to be delivered all at once. For the purposes of this assessment, it has been assumed that on the day of the assessment, one of each component type (totalling five components in total; a turbine blade, a nacelle, a cooling tower, a turbine hub and a tower section) will be delivered to the Project Site and stored at a laydown area. Such a transport strategy would ensure that all required components to construct a complete turbine would be present on site at any given time. This would minimise the chance of construction delays on-site as crews would not have to be waiting for components to arrive. Indicative imagery of the progressive transportation of the wind farm components are provided in Chapter 5 Landscape and Visual Assessment.
- It has been assumed that all electrical components such as large transformers, cable spools and sub-station equipment will be transported from Brisbane / Port of Brisbane via TC01. However, as part of the future design, the possibility of these items being sourced from alternative locations may be further investigated. The ultimate decision on where to source the electrical components will be undertaken in subsequent design phases and will depend on various factors, including logistical and economic considerations.
- It has been assumed that some proportion of the road materials are likely to be sourced from within the Project Site. For the purposes of this assessment, it has been assumed that approximately 80% of road materials will be sourced from within the Project Site and the balance of material being imported from quarries within the region. However, the percentage split may change subject to further geotechnical investigation in the subsequent phases.

Construction workforce

A number of assumptions have been adopted regarding the transport of construction workforce, which has been listed below.

- For the purpose of the traffic assessments, it has been assumed that all construction workforce will be Drive-In/Drive-Out (DIDO). No Fly-In/Fly-Out (FIFO) workforce has been assumed for the purpose of the traffic assessments.
- In order to present a conservative estimate, the entire construction workforce is assumed to travel to the Project Site in private vehicles, every day. It has also been assumed that all employees will travel in individual vehicles and with an occupancy of one person per vehicle.
- It has been assumed that all construction crew are based around the townships of Toowoomba, Dalby, Kingaroy, Jandowae and Bell. The construction crew have been assumed to travel to the Project Site via TC01, TC02 and TC03. Furthermore, all workforce utilising TC01 have been assumed to travel from Dalby to the Project Site using the alternative route TC01D. The workforce splits from each of these locations have been assumed to be approximately 10% (Toowoomba), 35% (Dalby), 35% (Kingaroy), 10% (Jandowae) and 10% (Bell). It should be noted that this assumption includes the properties and areas surrounding the townships in addition to within the townships themselves.
- In a typical construction project, the construction workforce is likely to vary throughout the project. However, in order to present a conservative estimate of the potential traffic impact, it has been assumed that on the day of the assessment the peak number of construction workforce (350 employees) will be on site.

Vehicle capacity

In order to estimate the traffic generated by the movement of construction materials and workforce, a number of assumptions also had to be made regarding the capacities of construction vehicles.

- It has been assumed for the purposes of this assessment that all road materials, concrete aggregates and other concrete supplies (such as cement) will be transported in 20 m^3 capacity heavy vehicles, likely consisting of truck-trailers (Austroads Class 9 truck-trailer).
- An assumption has been adopted that all reinforcement steel will be transported in Austroads Class 9 prime-mover with semi-trailer, with a capacity of one delivery of reinforcing steel (enough for one turbine footing) per load.
- The exact specifications of the vehicle which will be utilised to haul the tower and turbine components are as yet unknown. It has therefore been conservatively assumed that they will have a similar number of axles (hence have a similar effect on pavement condition) to a Large Combination vehicle (Austroads Class 12 triple road train). It has also been assumed that the capacity of these trucks is one component per vehicle.
- An assumption has been made that the transmission cabling will be transported on Austroads Class 9 truck-trailers with a capacity of two spools per truck.
- It has been assumed that all sub-station equipment will be transported on Austroads Class 9 truck-trailers with a capacity of one piece of heavy equipment per truck.

Occasional infrequent trips

In addition to regular occurrence trips, such as the movement of workforce, there are likely to be a number of occasional but infrequent trips. These occasional trips mainly relate to the movement of large transformers, cranes and other heavy equipment which are expected to be delivered onsite and remain there for the duration of construction.

These trips will primarily relate to the movement of cranes / other heavy construction equipment as well as the movement of turbine components and power transformers. Of these trips, the movement of the turbine components are likely to occur at regular intervals throughout the duration of the Project.

However, the trips relating to the movement of cranes, transformers and other heavy construction equipment are likely to be occasional, infrequent trips. It is expected that these trips would likely occur at the start of the construction period during the mobilisation period when other Project generated traffic is minimal. The equipment would likely stay on site for the duration of the construction period (approximately two to two and a half years) and then be demobilised again at the end of the construction period. Given the infrequent nature of these trips and also because they are not likely to occur when the majority of other materials are being delivered, it would be inappropriate to consider these trips as occurring during the 'typical' construction day.

As the 5% comparison which forms the basis of the Traffic Operation Impact and Pavement Impact analysis, works on the basis of a 'typical' worst case construction these trips have not been included as part of the 5% comparison. However, the impacts which may arise from these trips (such as traffic safety impacts due to driver fatigue) will be considered as part of the wider RUMP.

Over dimensioned vehicles

It has been assumed that the vehicles carrying the power transformers, cranes, heavy construction equipment and turbine components will be considered to be excess dimension vehicles (including vehicles carrying indivisible loads). It is expected that the transport of these materials will not be possible on conventional heavy vehicles due to their indivisible nature and excess dimensions.

As these excess dimension vehicles are likely to be special purpose vehicles which require a pilot or escort, it is likely that a special permit will be required for the transport of these construction equipment and / or components.

DTMR has developed guidelines and policies to facilitate the movement of large vehicles and vehicles carrying large indivisible articles within Queensland in a safe and efficient manner. The regulation mass and dimension rules are described in the *Transport Operations (Road Use Management — Mass, Dimension and Loading) Regulation 2005*. The guidelines provide an exemption from regulations and are considered a legal authority. These guidelines enable access to the road network, in some cases, without the need for obtaining individual permits.

13.6.2 Traffic distribution

Based on the assumptions stated in Section 13.6, Table 13.9 provides the indicative traffic distribution (for each construction activity) adopted for the traffic assessments.

Table 13.9 Indicative traffic distribution profile for each construction activity

Construction activity	% of total quantity transported	Transported via	Transport Corridor
Road materials	100% (of 20% that is imported)	Quarry Site	TC01, TC02 and TC03
Concrete aggregates for footings	100%	Quarry Site	TC01, TC02 and TC03
Reinforcing steel	50%	Dalby	TC01
	50%	Kingaroy	TC02
Other concrete materials	50%	Dalby	TC01
	50%	Kingaroy	TC02
Transformers	100%	Brisbane	TC01
High voltage cabling	100%	Brisbane	TC01
Turbine blades (Three Blades per turbine)	100%	Port of Brisbane	TC01
Nacelles	100%	Port of Brisbane	TC01
Cooling towers	100%	Port of Brisbane	TC01
Turbine hubs	100%	Port of Brisbane	TC01
Tower sections	100%	Port of	TC01

Construction activity	% of total quantity transported	Transported via	Transport Corridor
		Brisbane	
Substation equipment	100%	Brisbane	TC01
Cranes and other heavy equipment	100%	Brisbane	TC01
Construction workforce	10%	Toowoomba	TC01
	35%	Dalby	TC01
	35%	Kingaroy	TC02
	10%	Jandowae	TC03
	10%	Bell	TC01

13.6.3 Forecast project traffic volumes

To determine the total quantity of material, workforce and equipment transported along each of the transport corridors, the material quantities shown in Table 13.8 were distributed among the transport corridors, as per Table 13.9. The likely, total daily, two-way traffic movements along each transport corridor on the day of the assessment were then estimated by applying the assumptions stated in Section 13.6.1.1. The indicative daily total two-way traffic movements (on the day of the assessment) for TC01, TC02 and TC03, are shown in Table 13.10 to Table 13.12. All traffic volumes shown in these tables are the regular occurrence trips which have also been incorporated into the RIA.

In addition to regular occurrence trips, a number of occasional but infrequent trips are also likely to be generated by the Project. These infrequent trips relate to the movement of heavy transformers, cranes and other heavy equipment. It should be noted that these infrequent trips are not expected to occur every day and hence been excluded from the subsequent traffic assessments.

Table 13.10 Daily Project related traffic volumes on TC01 (two-way)

Construction activity	Total daily two-way vehicle trips			
	Light vehicle trips	Heavy vehicle trips	Over dimensioned vehicle trips	Total trips
Road materials *	0	14	0	**14**
Concrete aggregates for footings *	0	6	0	**6**
Reinforcing steel (two deliveries per turbine) *	0	2	0	**2**
Other concrete supplies *	0	2	0	**2**
High voltage cabling *	0	2	0	**2**
Turbine blades (three blades per turbine) *	0	0	2	**2**
Nacelles *	0	0	2	**2**
Cooling towers *	0	0	2	**2**
Turbine hubs *	0	0	2	**2**
Tower sections (three sections per turbine) *	0	0	2	**2**
Substation equipment *	0	4	0	**4**
Construction workforce #	386	0	0	**386**
Total trips	**386**	**30**	**10**	**426**

Not all activities generate the indicated traffic volumes along the entire length of the transport corridor.

For all activities, the average daily trips have been rounded up to the nearest 2 whole trips (along both directions).

* Four scenarios (TC01A, TC01B, TC01C and TC01D) have been assessed for these activities.

The workforce figure includes 10% of construction workforce travelling from Bell who will specifically travel along TC01D.

Table 13.11 Daily Project related traffic volumes on TC02 (two-way)

Construction activity	Total daily two-way vehicle trips			
	Light vehicle trips	Heavy vehicle trips	Over dimensioned vehicle trips	Total trips
Road materials	0	14	0	**14**
Concrete aggregates for footings	0	6	0	**6**
Reinforcing steel (two deliveries per turbine)	0	2	0	**2**
Other concrete supplies	0	2	0	**2**
High voltage cabling	0	0	0	**0**
Turbine blades (three blades per turbine)	0	0	0	**0**
Nacelles	0	0	0	**0**
Cooling towers	0	0	0	**0**
Turbine hubs	0	0	0	**0**
Tower sections (three sections per turbine)	0	0	0	**0**
Substation equipment	0	0	0	**0**
Construction workforce	246	0	0	**246**
Total Trips	246	24	0	270

Not all activities generate the indicated traffic volumes along the entire length of the transport corridor.

For all activities, the average daily trips have been rounded up to the nearest 2 whole trips (along both directions).

Table 13.12 Daily Project Related Traffic Volumes on TC03 (Two-Way)

Construction activity	Total daily two-way vehicle trips			
	Light vehicle trips	Heavy vehicle trips	Over dimensioned vehicle trips	Total trips
Road materials	0	14	0	**14**
Concrete aggregates for footings	0	6	0	**6**
Reinforcing steel (two deliveries per turbine)	0	0	0	**0**
Other concrete supplies	0	0	0	**0**
High voltage cabling	0	0	0	**0**
Turbine blades (three blades per turbine)	0	0	0	**0**
Nacelles	0	0	0	**0**
Cooling towers	0	0	0	**0**
Turbine hubs	0	0	0	**0**
Tower sections (three sections per turbine)	0	0	0	**0**
Substation equipment	0	0	0	**0**
Construction workforce	70	0	0	**70**
Total Trips	**70**	**20**	**0**	**90**

Not all activities generate the indicated traffic volumes along the entire length of the transport corridor.

For all activities, the average daily trips have been rounded up to the nearest 2 whole trips (along both directions)

13.6.4 Construction phase road impact assessments

The following sections examine the potential impacts of the Project on the surrounding road network during the construction phase. It is anticipated that the road impacts would primarily be during the construction phase as once constructed, the turbines will require minimum external input to operate outside of general maintenance. It is anticipated that only a small number of contingent workforce will be required during the operational phase of the Project to provide general maintenance of the wind farm infrastructure. Furthermore, it is expected that trips generated during the operational phase will primarily consist of light vehicle trips as opposed to the large numbers of heavy vehicle trips required during the construction phase.

As stipulated in GARID; the following traffic analysis is performed as part of the RIA:

- 5% pavement impact – Comparison of existing ESA with Project related ESA
- 5% traffic impact – Comparison of existing traffic with Project related traffic.

In conjunction with the analysis outlined in GARID, the following additional assessment was also performed:

- Traffic impact by magnitude – Comparison of the magnitude of traffic generated by construction of the Project.

13.6.4.1 Traffic operation impact assessment

This section examines the potential impact of the Project generated traffic on the operation of the existing road network during the construction phase in the context of traffic operation. Overall, four scenarios have been assessed for the traffic operation impact assessment. These scenarios consist of the four alternative transport routes (i.e. TC01A, TC01B, TC01C and TC01D) identified for the movement of construction material and equipment between Dalby and the Project Site. TC02 and TC03 are common to all four scenarios.

Scenario 1 and Scenario 2

Scenario 1 and Scenario 2 assume that all traffic relating to the movement of construction material and equipment (i.e. movement of aggregates, road materials and sub-station equipment) between Dalby and the Project Site will use transport route TC01A and TC01B, respectively.

Under Scenario 1, construction traffic along TC01 will access the Project Site via the one-way clockwise loop between Dalby and the Project Site along Dalby-Jandowae Road, Kingaroy-Jandowae Road and Niagara Road via Jandowae. Construction traffic will then exit the Project Site via Niagara Road and back to Dalby via the Bunya Highway.

Under Scenario 2, construction traffic along TC01 will access the Project Site via the one-way anti-clockwise loop. It describes the same route as per Scenario 1, but in the opposite running direction.

Apart from the directional splits along these road sections, the traffic volumes on these routes are the same for both scenarios. As the results of the traffic impact analysis are the same for both Scenario 1 and Scenario 2, only a single summary table has been presented.

Scenario 3

Scenario 3 assumes that all traffic relating to the movement of construction material between Dalby and the Project Site will utilise transport route TC01C. Under this scenario, construction related traffic will travel between Dalby and the Project Site along Dalby-Jandowae Road through Jandowae, Kingaroy-Jandowae Road and Niagara Road.

Scenario 4

Scenario 4 assumes that all traffic relating to the movement of construction material between Dalby and the Project Site will utilise transport route TC01D. This means that under Scenario 4, such traffic is assumed to travel along the Bunya Highway between Dalby and the Project Site and return via the same route.

Traffic operation impact assessment findings

A summary of the results from the traffic operation impact assessments for Scenario 1 / Scenario 2, Scenario 3 and Scenario 4 are presented in Table 13.13, Table 13.14 and Table 13.15 respectively.

Under Scenarios 1 and 2, the results indicate that all segments of the Bunya Highway (45A), Kingaroy-Jandowae Road (424) and Niagara Road (RCR-1) will be equal to or in excess of 5% of the background AADT.

Under Scenario 3, the results indicate that all segments of the Bunya Highway (45A), Kingaroy-Jandowae Road (424) and Niagara Road (RCR-1) as well as some sections of Dalby-Jandowae Road (421), will be equal to or in excess of 5% of the background AADT.

Under Scenario 4, the results indicated that all segments of the Bunya Highway (45A), Kingaroy-Jandowae Road (424) and Niagara Road (RCR-1) will be equal to or in excess of 5% of the background AADT.

The assessment found that under all four scenarios, the Bunya Highway (45A), Kingaroy-Jandowae Road (424) and Niagara Road (RCR-1) are likely to be impacted as a result of the Project. Some parts of Dalby-Jandowae Road (421) are also likely to be affected in certain scenarios. The worst affected road in terms of percentage impact is likely to be Niagara Road (RCR-1), as Niagara road is the main access road connecting the Project to the external road network and hence the terminus point of all transport corridors.

For the purpose of the assessments, light vehicles have been assumed to be the main mode of transport by construction workforce travelling to and from the site each day. As indicated in Table 13.10, Table 13.11 and Table 13.12, the total number of daily two-way trips relating to the movement of workforce is approximately 702 trips in total.

Hence whilst some road sections are likely to be over 5%, the majority of vehicle trips generated by the Project are likely to be light vehicle trips only which are unlikely to significantly impact traffic operations based on the overall magnitude of traffic likely to be generated. Furthermore, the construction traffic generated by the Project will only be generated over a relatively short construction period.

Table 1[illegible].13 Summary of traffic operation impact assessment results – for Scenarios 1 and 2

UTMN section ID	Sub-section ID	Road name	Available traffic data: Count year	Available traffic data: AADT	Available traffic data: Annual growth factor	Existing 2019 traffic data: AADT	Traffic operation impact assessment: Increase in AADT from Existing	Traffic operation impact assessment: Per cent increase in AADT from Existing
18B	18B-1	Warrego Highway (Toowoomba to Dalby)	2015	20,865	2.51%	21,387	189	1%
	18B-2	Warrego Highway (Toowoomba to Dalby)	2015	15,308	1.17%	15,485	189	1%
	18B-3	Warrego Highway (Toowoomba to Dalby)	2015	10,407	1.17%	10,315	109	1%
	18B-4	Warrego Highway (Toowoomba to Dalby)	2015	20,046	0.40%	22,401	188	1%
	18B-5	Warrego Highway (Toowoomba to Dalby)	2015	13,815	1.14%	13,469	189	1%
	18B-6	Warrego Highway (Toowoomba to Dalby)	2015	12,066	0.00%	12,066	186	1%
	18B-7	Warrego Highway (Toowoomba to Dalby)	2015	9,332	0.48%	9,332	189	1%
	18B-8	Warrego Highway (Toowoomba to Dalby)	2015	3,869	0.00%	3,869	189	5%
	18B-9	Warrego Highway (Toowoomba to Dalby)	2015	5,459	0.00%	5,459	189	2%
	18B-10	Warrego Highway (Toowoomba to Dalby)	2015	7,019	0.00%	7,019	189	2%
	18B-11	Warrego Highway (Toowoomba to Dalby)	2015	12,417	0.00%	12,417	189	1%
45A	45A-1	Bunya Highway (Dalby to Kingaroy)	2015	4,007	0.00%	4,007	339	8%
	45A-2	Bunya Highway (Dalby to Kingaroy)	2015	2,276	0.71%	2,407	339	14%
	45A-3	Bunya Highway (Dalby to Kingaroy)	2015	546	1.27%	547	403	68%
	45A-4	Bunya Highway (Dalby to Kingaroy)	2015	306	0.77%	313	403	83%
	45A-5	Bunya Highway (Dalby to Kingaroy)	2015	747	0.00%	747	699	82%
	45A-6	Bunya Highway (Dalby to Kingaroy)	2015	1,088	1.08%	1,098	373	35%
	45A-7	Bunya Highway (Dalby to Kingaroy)	2015	2,409	1.00%	2,513	273	11%
	45A-8	Bunya Highway (Dalby to Kingaroy)	2015	4,554	0.00%	4,551	273	6%
421	421-1	Dalby - Jandowae Road	2015	1,910	2.27%	2,014	45	1%
	421-2	Dalby - Jandowae Road	2015	325	0.00%	325	32	2%
	421-3	Dalby - Jandowae Road	2015	887	0.00%	887	30	3%
424	424-1	Kingaroy-Jandowae Road	2014	110	3.98%	115	118	87%
RCR	RCR-1	Niagara Road	2014	35	0.00%	35	789	2210%

Table 11.16 Summary of traffic operation impact assessment results – for Scenario 1			Available traffic data			Existing 2016 traffic data	Traffic operation impact assessment	
DTMR section ID	Sub-section ID	Road name	Count year	AADT	Annual growth factor	AADT	Increment in AADT from Existing	Per cent increase in AADT from Existing
18B	18B-1	Warrego Highway (Toowoomba to Dalby)	2015	20,563	2.51%	21,357	[illegible]	1%
	18B-2	Warrego Highway (Toowoomba to Dalby)	2015	11,938	1.17%	12,485	[illegible]	1%
	18B-3	Warrego Highway (Toowoomba to Dalby)	2013	12,437	1.17%	13,378	[illegible]	1%
	18B-4	Warrego Highway (Toowoomba to Dalby)	2013	20,343	3.40%	22,481	[illegible]	1%
	18B-5	Warrego Highway (Toowoomba to Dalby)	2011	13,515	1.16%	13,886	[illegible]	1%
	18B-6	Warrego Highway (Toowoomba to Dalby)	2015	12,398	0.00%	12,385	[illegible]	1%
	18B-7	Warrego Highway (Toowoomba to Dalby)	2013	8,332	0.00%	8,332	[illegible]	1%
	18B-8	Warrego Highway (Toowoomba to Dalby)	2015	3,880	0.00%	3,880	[illegible]	3%
	18B-9	Warrego Highway (Toowoomba to Dalby)	2015	5,089	0.00%	5,089	[illegible]	2%
	18B-10	Warrego Highway (Toowoomba to Dalby)	2015	7,618	0.00%	7,618	[illegible]	2%
	18B-11	Warrego Highway (Toowoomba to Dalby)	2013	12,417	0.00%	12,417	[illegible]	1%
45A	45A-1	Bunya Highway (Dalby to Kingaroy)	2013	4,807	0.00%	4,037	316	8%
	45A-2	Bunya Highway (Dalby to Kingaroy)	2013	2279	0.71%	2,407	316	10%
	45A-3	Bunya Highway (Dalby to Kingaroy)	2013	836	1.27%	847	[illegible]	[illegible]
	45A-4	Bunya Highway (Dalby to Kingaroy)	2013	330	0.71%	753	[illegible]	[illegible]
	45A-5	Bunya Highway (Dalby to Kingaroy)	2015	747	0.00%	777	[illegible]	30%
	45A-6	Bunya Highway (Dalby to Kingaroy)	2015	1,888	1.05%	1,898	279	35%

December 2016
Prepared for – AGL Energy Limited – ABN: 74 115 061 375

AECOM Coopers Gap Wind Farm – Transport

Table 11.16 Summary of traffic operation impact assessment results – for Scenario 1			Available traffic data			Existing 2016 traffic data	Traffic operation impact assessment	
DTMR section ID	Sub-section ID	Road name	Count year	AADT	Annual growth factor	AADT	Increment in AADT from Existing	Per cent increase in AADT from Existing
	45A-7	Bunya Highway (Dalby to Kingaroy)	2015	2,488	1.09%	2,515	279	11%
	45A-8	Bunya Highway (Dalby to Kingaroy)	2015	4,634	0.95%	4,701	279	6%
421	421-1	Dalby – Jandowae Road	2013	1,932	2.20%	2,013	46	2%
	421-2	Dalby – Jandowae Road	2013	533	0.00%	533	46	4%
	421-3	Dalby – Jandowae Road	2013	697	0.00%	697	60	9%
424	424-1	Kingaroy – Jandowae Road	2014	131	0.89%	133	156	117%
RDR	RDR-1	Niagara Road	2014	33	0.00%	33	156	2360%

Table 11.[illegible] Summary of traffic operation impact assessment results – for Scenario 4

			Available traffic data			Existing 2018 traffic data	Traffic operation impact assessment	
DTMR section ID	Sub-section ID	Road name	Count year	AADT	Annual growth factor	AADT	Increase in AADT from Existing	Per cent increase in AADT from Existing
18B	18B-1	Warrego Highway (Toowoomba to Dalby)	2015	20,383	2.51%	21,387	[illegible]	1%
	18B-2	Warrego Highway (Toowoomba to Dalby)	2015	15,135	1.17%	15,487	[illegible]	1%
	18B-3	Warrego Highway (Toowoomba to Dalby)	2017	33,427	1.17%	33,213	[illegible]	1%
	18B-4	Warrego Highway (Toowoomba to Dalby)	2015	20,345	3.40%	22,481	[illegible]	1%
	18B-5	Warrego Highway (Toowoomba to Dalby)	2017	13,515	1.18%	13,868	[illegible]	1%
	18B-6	Warrego Highway (Toowoomba to Dalby)	2015	12,385	0.00%	12,598	[illegible]	1%
	18B-7	Warrego Highway (Toowoomba to Dalby)	2015	8,332	0.00%	8,322	[illegible]	1%
	18B-8	Warrego Highway (Toowoomba to Dalby)	2015	3,088	0.00%	3,189	[illegible]	3%
	18B-9	Warrego Highway (Toowoomba to Dalby)	2015	5,489	0.00%	5,165	[illegible]	2%
	18B-10	Warrego Highway (Toowoomba to Dalby)	2017	7,018	0.00%	7,074	[illegible]	2%
	18B-11	Warrego Highway (Toowoomba to Dalby)	2012	12,417	0.00%	12,417	[illegible]	1%
45A	45A-1	Bunya Highway (Dalby to Kingaroy)	2015	4,027	0.00%	4,307	[illegible]	9%
	45A-2	Bunya Highway (Dalby to Kingaroy)	2015	2275	0.71%	2,407	[illegible]	14%
	45A-3	Bunya Highway (Dalby to Kingaroy)	2017	538	1.37%	847	423	30%
	45A-4	Bunya Highway (Dalby to Kingaroy)	2017	380	0.77%	390	428	12%
	45A-5	Bunya Highway (Dalby to Kingaroy)	2015	717	0.00%	747	[illegible]	63%
	45A-6	Bunya Highway (Dalby to Kingaroy)	2015	1,058	1.05%	1,365	273	25%

Table 11.[illegible] Summary of traffic operation impact assessment results – for Scenario 4

			Available traffic data			Existing 2018 traffic data	Traffic operation impact assessment	
DTMR section ID	Sub-section ID	Road name	Count year	AADT	Annual growth factor	AADT	Increase in AADT from Existing	Per cent increase in AADT from Existing
	45A-7	Bunya Highway (Dalby to Kingaroy)	2015	2,488	1.09%	2,715	273	11%
	45A-8	Bunya Highway (Dalby to Kingaroy)	2015	4,594	0.76%	4,851	273	8%
421	421-1	Dalby – Jandowae Road	2017	1,833	0.20%	2,018	0	0%
	421-2	Dalby – Jandowae Road	2013	983	0.00%	985	0	0%
	421-3	Dalby – Jandowae Road	2017	887	0.00%	887	0	0%
424	424-1	Kingaroy – Jandowae Road	2014	105	3.98%	113	80	79%
RDR	RDR-1	Niagara Road	2014	35	0.00%	35	[illegible]	2868%

13.6.4.2 Pavement impact assessment

A preliminary desktop analysis, based on the GARID has been conducted to identify the likely magnitude of pavement impacts on the SCRs and RCRs due to the additional heavy vehicle movements generated by the Project.

Similarly to the Traffic Operation Impact Assessment (see Section 13.6.4.1), four scenarios have been assessed for the Pavement Impact Assessment. These scenarios consist of the four alternative transport routes (i.e. TC01A, TC01B, TC01C and TC01D) identified for the movement of construction material and equipment between Dalby and the Project Site.

Assumptions

For the purpose of pavement impact assessments, assumptions were made to generate the background as well as the development related traffic loadings. For each segment of the road pavement, several parameters were defined based on assumption, estimation or through calculation using appropriate data. These include the average annual daily traffic (AADT) for both the background and the Project related construction traffic, Lane Distribution Factor (LDF), Equivalent Standard Axles per Heavy Vehicle (ESA/HV) and the Directional Factor (DF).

In addition to the assumptions described in Section 13.6, the following assumptions were adopted for the preliminary pavement impact assessments:

- For the purposes of the traffic analysis, an ESA/HV value of 3.2 was adopted for the background traffic for all road segments under investigation (previously indicated by TMR as being appropriate for all roads other than the Bruce Highway). However, this value may be updated during subsequent detailed design phases of the Project when a more detailed pavement impact assessment will be conducted.
- For the construction activities, three vehicle types have been adopted for the Project:
  1. Over Dimensioned / Heavy Mass Limit vehicles (assumed to be similar to Austroads Class 12)
  2. Six-axle, truck-trailer vehicles (Austroads Class 9)
  3. Light vehicles (Austroads Class 1)

  For each of these vehicle types a combined bi-directional ESA/HV value has been adopted and are summarised in Table 13.16.
- As the majority of the transport routes assessed only consist of one traffic lane in each direction, the Lane Distribution Factor (LDF) has been assumed to be equal to one, which signifies that all heavy vehicles will utilise the left hand lane where there is more than one lane in each direction.
- The transport of cranes and other heavy construction equipment and transformers has been assumed to be transported by a mixture of over dimensioned vehicles and six-axle truck-trailer vehicles. However, as these trips are infrequent and not expected to be a daily occurrence they have not been accounted for as part of the PIA (see Section 13.6.1.1 for additional discussion).

Table 13.16 ESA multiplier factors for development traffic

Construction activity	Typical construction vehicle (AustRoads vehicle class)	ESA/HV factor adopted for assessment #
Turbine blades (Three blades per turbine)	Over Dimensioned / Higher Mass Limit Vehicle (Special Permit Vehicle)	12.33
Nacelles		12.33
Cooling towers		12.33
Turbine hubs		12.33
Tower sections (Three sections per turbine)		12.33
Road materials	6 Axle – Truck-Trailer	5.44

Construction activity	Typical construction vehicle (AustRoads vehicle class)	ESA/HV factor adopted for assessment #
Concrete aggregates for footings	(AustRoads Class 9)	5.44
Reinforcing steel (Two deliveries per turbine)		5.44
Other concrete supplies		5.44
High voltage cabling		5.44
Substation equipment		5.44
Peak construction workforce	2 Axle – Short (Light) Vehicles (AustRoads Class 1)	1.00
Occasional trips		
Cranes and other heavy equipment*	Over Dimensioned / Higher Mass Limit Vehicle (Special Permit Vehicle) and 6 Axle – Truck-Trailer (AustRoads Class 9)	Not assessed
Transformers*	6 Axle – Truck-Trailer (AustRoads Class 9)	Not assessed

* As the trips relating to the movement of transformers, cranes and other heavy construction equipment are expected to be infrequent (i.e. occasional trips), they have not been included as part of the pavement impact assessment.

ESA / HV Figures have been derived from allowable axle loading calculations.

The adopted ESA/HV conversion factors are considered to be conservative estimates as a distinction between the laden and unladed direction has not been made. Instead, for the purpose of this assessment, the same ESA multiplier factor has been applied to both directions (denoting vehicles travelling in both directions are laden).

Pavement impact assessment findings

A summary of the results from the pavement impact assessments carried out for Scenarios 1 to 4 are provided in Table 13.17, Table 13.18 and Table 13.19.

The results of the analysis indicate that all segments of the Bunya Highway (45A), Kingaroy-Jandowae Road (424) and Niagara Road and one isolated section of the Warrego Highway (18B-8) will be over 5% of the background ESA under all four scenarios. Under Scenario 1, Scenario 2 and Scenario 3, sections of Dalby-Jandowae Road (421) will also potentially be over 5% of the background AADT. Under all four scenarios, the worst affected road in terms of percentage impact is likely to be Niagara Road (RCR-1), as Niagara road is the main access road for the Project Site. It should also be noted that the very large percentage impact indicated along Niagara Road (RCR-1) is due to the low background traffic volumes. The estimated 2016 two-way traffic volume along Niagara Road is only 38 (58 ESA) vehicles per day.

Based on the estimated traffic generation for the various construction activities, the total number of trips relating to the movement of workforce along the transport corridors is approximately 702 trips in total (as shown in
Table 13.10, Table 13.11 and Table 13.12). For the purpose of the traffic assessments, these trips are assumed to be light vehicles mainly related to construction workforce travelling to and from the Project Site each day.

Hence whilst some road sections are likely to be over 5%, it should be noted that the majority of the trips are likely to be light vehicle trips which are likely to only cause very minor degradation in pavement conditions. Furthermore, due to the relatively short construction duration, the additional ESAs generated by the Project's construction traffic will only be present for a limited duration of time

Table 11.17 Summary of pavement impact assessment – for Scenario 1 and 2

			Available traffic data			Existing' 2016 traffic data		Traffic operation impact assessment	
DTMR section ID	Segment ID	Road name	Count year	AADT	Annual growth factor	AADT	Background traffic ESA	Magnitude of development related ESA	Per cent increase in ESA from Existing
18B	18B-1	Warrego Highway (Toowoomba to Dalby)	2015	20,903	2.21%	21,367	20,072	335	1%
	18B-2	Warrego Highway (Toowoomba to Dalby)	2015	15,300	1.17%	15,485	21,484	335	2%
	18B-3	Warrego Highway (Toowoomba to Dalby)	2015	15,157	1.17%	15,335	12,844	335	3%
	18B-4	Warrego Highway (Toowoomba to Dalby)	2015	20,549	8.40%	22,181	28,318	335	1%
	18B-5	Warrego Highway (Toowoomba to Dalby)	2015	13,110	1.14%	13,859	15,396	325	2%
	18B-6	Warrego Highway (Toowoomba to Dalby)	2015	12,560	3.05%	12,365	16,093	335	2%
	18B-7	Warrego Highway (Toowoomba to Dalby)	2015	6,332	3.65%	6,332	13,284	332	2%
	18B-8	Warrego Highway (Toowoomba to Dalby)	2015	3,659	3.85%	3,859	3,427	335	8%
	18B-9	Warrego Highway (Toowoomba to Dalby)	2015	2,403	0.00%	2,403	3,371	325	8%
	18B-10	Warrego Highway (Toowoomba to Dalby)	2015	7,512	5.85%	7,211	10,618	335	3%
	18B-11	Warrego Highway (Toowoomba to Dalby)	2015	13,117	4.00%	13,317	16,803	330	2%
42A	42A-1	Bunya Highway (Dalby to Kingaroy)	2015	4,081	3.85%	4,181	5,250	460	9%
	42A-2	Bunya Highway (Dalby to Kingaroy)	2015	2275	9.71%	2,497	3,197	460	14%
	42A-3	Bunya Highway (Dalby to Kingaroy)	2015	330	1.37%	347	1,220	590	41%
	42A-4	Bunya Highway (Dalby to Kingaroy)	2015	598	8.17%	553	282	390	80%
	42A-5	Bunya Highway (Dalby to Kingaroy)	2015	747	3.00%	747	1,895	1000	52%
	42A-6	Bunya Highway (Dalby to Kingaroy)	2015	1,004	1.83%	1,020	1,710	332	20%

Table 11.17 Summary of pavement impact assessment – for Scenario 1 and 2

			Available traffic data			Existing' 2016 traffic data		Traffic operation impact assessment	
DTMR section ID	Segment ID	Road name	Count year	AADT	Annual growth factor	AADT	Background traffic ESA	Magnitude of development related ESA	Per cent increase in ESA from Existing
	42A-7	Bunya Highway (Dalby to Kingaroy)	2015	2,409	1.35%	2,017	3,203	332	10%
	42A-8	Bunya Highway (Dalby to Kingaroy)	2015	4,854	0.30%	4,851	3,880	332	8%
421	421-1	Dalby – Jandowae Road	2015	1,918	5.28%	2,019	2,725	340	3%
	421-2	Dalby – Jandowae Road	2015	929	3.60%	929	1,206	340	11%
	421-3	Dalby – Jandowae Road	2015	567	0.50%	567	548	332	14%
424	424-1	Kingaroy – Jandowae Road	2014	103	3.35%	113	198	322	220%
RCR	RCR-1	Bingera Road	2014	33	0.00%	38	58	1998	1709%

Table 13.38 Summary of pavement impact assessment – for Scenario 2

DTMR section ID	Segment ID	Road name	Available traffic data: Count year	Available traffic data: AADT	Available traffic data: Annual growth factor	Existing 2019 traffic data: AADT	Existing 2019 traffic data: Background traffic ESA	Traffic operation impact assessment: Magnitude of development related ESA	Traffic operation impact assessment: Percent increase in ESA from Existing
158	158-1	Warrego Highway (Toowoomba to Dalby)	2015	22,863	2.91%	21,287	26,373	125	1%
	158-2	Warrego Highway (Toowoomba to Dalby)	2015	15,305	1.17%	15,405	21,454	125	2%
	158-3	Warrego Highway (Toowoomba to Dalby)	2015	10,437	1.37%	11,319	12,034	125	3%
	158-4	Warrego Highway (Toowoomba to Dalby)	2015	20,345	5.43%	22,401	26,210	135	1%
	158-5	Warrego Highway (Toowoomba to Dalby)	2015	12,515	1.91%	13,689	18,186	133	2%
	158-6	Warrego Highway (Toowoomba to Dalby)	2015	12,098	0.00%	17,098	16,595	108	4%
	158-7	Warrego Highway (Toowoomba to Dalby)	2015	9,332	0.00%	9,332	13,284	125	3%
	158-8	Warrego Highway (Toowoomba to Dalby)	2015	3,609	0.00%	3,609	5,427	117	6%
	158-9	Warrego Highway (Toowoomba to Dalby)	2015	5,469	0.00%	5,469	8,171	103	4%
	158-10	Warrego Highway (Toowoomba to Dalby)	2015	7,319	0.00%	7,019	10,515	100	3%
	158-11	Warrego Highway (Toowoomba to Dalby)	2015	12,411	0.00%	12,411	10,024	125	2%
454	454-1	Bunya Highway (Dalby to Kingaroy)	2015	4,087	0.00%	4,087	5,231	117	6%
	454-2	Bunya Highway (Dalby to Kingaroy)	2015	2279	0.71%	2,407	1,197	117	10%
	454-3	Bunya Highway (Dalby to Kingaroy)	2015	658	1.37%	687	1,120	367	33%
	454-4	Bunya Highway (Dalby to Kingaroy)	2013	306	0.77%	315	932	387	41%
	454-5	Bunya Highway (Dalby to Kingaroy)	2013	741	0.00%	747	1,283	1005	67%
	454-6	Bunya Highway (Dalby to Kingaroy)	2015	1,264	1.05%	1,006	1,548	322	42%

Table 13.38 Summary of pavement impact assessment – for Scenario 2

DTMR section ID	Segment ID	Road name	Available traffic data: Count year	Available traffic data: AADT	Available traffic data: Annual growth factor	Existing 2019 traffic data: AADT	Existing 2019 traffic data: Background traffic ESA	Traffic operation impact assessment: Magnitude of development related ESA	Traffic operation impact assessment: Percent increase in ESA from Existing
	454-7	Bunya Highway (Dalby to Kingaroy)	2015	2,468	1.00%	2,613	1,283	122	10%
	454-8	Bunya Highway (Dalby to Kingaroy)	2013	4,834	0.96%	4,651	1,655	122	6%
421	421-1	Dalby – Jandowae Road	2013	1,910	5.20%	2,011	2,123	387	11%
	421-2	Dalby – Jandowae Road	2015	525	0.00%	329	1,283	287	33%
	421-3	Dalby – Jandowae Road	2015	687	0.00%	687	846	287	38%
424	424-1	Kingaroy Jandowae Road	2014	105	3.00%	113	138	485	318%
RCR	RCR-1	Noggers Road	2014	35	0.00%	35	38	1163	3048%

Table 11.18 Summary of operational impact assessment – for Scenario 4

			Available traffic data			'Existing' 2018 traffic data		Traffic operation impact assessment	
DTMR section ID	Segment ID	Road name	Count year	AADT	Annual growth factor	AADT	Background traffic ESA	Magnitude of development related ESA	Percent increase in ESA from Existing
18B	18B-1	Warrego Highway (Toowoomba to Dalby)	2015	20,603	2.0%	21,397	21,813	335	1%
	18B-2	Warrego Highway (Toowoomba to Dalby)	2015	15,308	1.2%	15,488	21,484	335	2%
	18B-3	Warrego Highway (Toowoomba to Dalby)	2015	14,457	1.2%	10,579	12,834	335	4%
	18B-4	Warrego Highway (Toowoomba to Dalby)	2015	35,649	0.4%	12,480	29,210	335	1%
	18B-5	Warrego Highway (Toowoomba to Dalby)	2015	13,215	1.1%	13,558	13,980	335	3%
	18B-6	Warrego Highway (Toowoomba to Dalby)	2015	12,685	0.0%	12,608	16,815	335	2%
	18B-7	Warrego Highway (Toowoomba to Dalby)	2015	9,332	0.0%	9,932	13,264	335	3%
	18B-8	Warrego Highway (Toowoomba to Dalby)	2015	5,091	0.0%	5,589	3,427	335	6%
	18B-9	Warrego Highway (Toowoomba to Dalby)	2015	5,405	0.0%	5,405	8,773	335	4%
	18B-10	Warrego Highway (Toowoomba to Dalby)	2015	7,019	0.0%	7,019	15,815	335	3%
	18B-11	Warrego Highway (Toowoomba to Dalby)	2015	13,217	0.0%	13,417	16,604	333	2%
45A	45A-1	Bunya Highway (Dalby to Kingaroy)	2015	4,091	0.0%	4,091	5,330	663	12%
	45A-2	Bunya Highway (Dalby to Kingaroy)	2015	2275	3.7%	2,451	3,387	663	18%
	45A-3	Bunya Highway (Dalby to Kingaroy)	2015	506	1.4%	547	1,226	672	55%
	45A-4	Bunya Highway (Dalby to Kingaroy)	2015	595	0.9%	593	950	673	71%
	45A-5	Bunya Highway (Dalby to Kingaroy)	2015	747	0.0%	747	1,085	1005	92%
	45A-6	Bunya Highway (Dalby to Kingaroy)	2015	1,024	1.1%	1,050	1,299	432	33%

Table 11.18 Summary of operational impact assessment – for Scenario 4

			Available traffic data			'Existing' 2018 traffic data		Traffic operation impact assessment	
DTMR section ID	Segment ID	Road name	Count year	AADT	Annual growth factor	AADT	Background traffic ESA	Magnitude of development related ESA	Percent increase in ESA from Existing
	45A-7	Bunya Highway (Dalby to Kingaroy)	2015	2,432	1.1%	2,512	1,203	432	14%
	45A-8	Bunya Highway (Dalby to Kingaroy)	2015	4,634	0.4%	4,661	6,088	332	8%
421	421-1	Dalby – Jandowae Road	2015	1,913	0.2%	2,019	1,733	0	0%
	421-2	Dalby – Jandowae Road	2015	528	0.0%	528	1,295	0	0%
	421-3	Dalby – Jandowae Road	2015	607	0.0%	607	943	0	0%
424	424-1	Kingaroy-Jandowae Road	2014	109	4.0%	113	146	176	121%
SCR	SCR-1	Niagara Road	2014	35	0.0%	35	35	1183	2340%

13.6.5 Operational phase impact assessment

During the operational phase, the expected impact on the regional road network will be limited to the movement of operational and maintenance workforce. It is anticipated that only a small workforce will be required during the operational phase of the Project to provide general maintenance of the Project infrastructure. This workforce has been assumed to travel to the Project Site each day via private vehicles with no carpooling.

For the purpose of the traffic assessments, it has been assumed that the operational workforce will follow the same distribution assumption adopted for the construction workforce. The distribution proportions of the workforce are 10% (Toowoomba), 35% (Dalby), 35% (Kingaroy), 10% (Jandowae) and 10% (Bell). As the only trips are expected to be a small number of light vehicle trips, the potential impact of operational traffic along any of the SCRs is not considered to be significant in terms of pavement or traffic operational impacts.

Along the RCRs, the operational traffic may potentially exceed 5% of the background ESA and background AADT along Niagara Road (RCR-1). This may occur because of the low background traffic volumes along this road rather than a large number of Project generated trips. Moreover, the order of magnitude of the traffic impact is likely to be significantly less compared to during the construction phase. As such, if the appropriate construction phase mitigation measures are implemented, then it is expected that they will also be sufficient to ameliorate any traffic impacts during the operational phase.

In addition to regular maintenance workforce, from time to time, major maintenance may be required. During these particular maintenance tasks, additional workforce may be required at the Project Site. There is also a potential requirement for additional construction equipment and materials during these times. However, these major maintenance tasks are likely to be temporary in nature and are not expected to be a regular occurrence. DTMR and other relevant authorities will be consulted prior to any major maintenance events and appropriate temporary traffic management measures will be implemented. Additionally, the distribution as well as the total workforce requirements will be further refined (as required) in the subsequent design phases.

13.6.6 Intersection analysis

The impacts of the Project on road intersections have not been considered in detail at this stage of the Project's development. This is because detailed intersection analysis is deemed not warranted until the Project generated traffic volumes, vehicle routes and vehicle types (size and type of heavy vehicles, especially over-size and over-mass vehicles) are better defined. A summary of the intersection types and key intersections affected by the transport corridors assumed for this assessment are summarised in the sections below. Once the construction activities and the overall freight task associated with the Project is better defined in future design phases, subsequent to consultation DTMR and Regional Councils, more detailed intersection analysis may be undertaken.

13.6.6.1 External road network intersections

The key transport corridors for the transportation of materials, workforce and equipment assumed for this assessment have been identified in Section 13.5.7.2. From these transport corridors, key intersections have been identified which might potentially be affected by the Project related traffic. These key intersections are:

1. Warrego Highway / Bunya Highway.
2. Bunya Highway / Niagara Road.
3. Kingaroy-Jandowae Road / Niagara Road.
4. Dalby-Jandowae Road (High Street) / George Street (Kingaroy-Jandowae Road).
5. Kingaroy-Jandowae Road / George Street.

The intersection at Warrego Highway / Bunya Highway is currently a four-approach signalised intersection with two lanes per approach.

The intersection at Bunya Highway / Niagara Road is a sealed T-intersection with no additional protected turning pockets or deceleration lanes.

The intersection at Kingaroy-Jandowae Road / Niagara Road is a sealed T-intersection with no additional protected turning pockets or deceleration lanes.

The remaining two intersections at Dalby-Jandowae Road / George Street and at Kingaroy-Jandowae Road / George Street are priority intersections.

At this stage of the Project a detailed intersection analysis is not warranted as the Project generated traffic has been estimated at a concept level. In future design phases additional intersection analysis may be undertaken if requested by DTMR and regional councils once the Project's transport requirements are further refined. The types of intersection analysis which may be undertaken (if any) could include, capacity analysis, turning lane warrant analysis and / or swept path analysis.

13.6.6.2 Site access

Based on the assumed transport corridors outlined in Section 13.5.7.2 and for the purpose of this assessment, it has been assumed that access to the Project Site will primarily be provided along Niagara Road (RCR-1). Moreover, in view of the spread of the Project Site, it is anticipated that more than one site access will be required, with some site accesses possibly along other local council roads.

At this stage of the Project, detailed construction scheduling and transport logistics plans have not yet been completed. As a result, final details such as the volume of additional traffic, movements at the site access points as well as during which time frame have not been considered. The assessment presented throughout this chapter primarily focused on the traffic impacts at a road-link level (five percent comparison). In the detailed design stage and prior to the commencement of construction, once the finer details of construction are better understood, these assumptions will be reviewed and updated if necessary.

However whilst detailed assessment has not been undertaken, owing to the relatively low overall traffic volumes, it is not anticipated that site access intersections will experience significant capacity issues. Furthermore, as numerous site access locations are likely to be utilised, the Project generated traffic will be spread over more than one site access.

As such, the primary impact at the site access locations is likely to be operational safety as the Project will increase the number of turning heavy vehicles at these minor intersections. In subsequent design phases, as the site access arrangements and traffic volumes per access location are better understood, intersection safety checks will be undertaken. This will include reviewing available crash data at each location as well as determining the adequacy of the sight lines. Traffic management measures such as additional signage and advanced warning of turning heavy vehicles will also be considered.

13.6.7 Other road impacts

As part of the traffic and transport impact assessments, other road impacts were also considered. The impacts include the operation of school bus routes as well as stock routes and are briefly discussed in this section.

13.6.7.1 School bus routes

A preliminary review of the school bus routes based on information that was readily available online indicated that there are a number of school bus routes which intersect the proposed transport corridors. It should be noted that this preliminary search is not exhaustive and prior to the commencement of construction activities, regional councils and bus operators will be consulted and mitigation measures identified to minimise the impacts on the school bus routes.

The majority of the school bus routes identified are around the major towns and population centres along the transport corridors (namely Dalby, Cooranga, Bell, and Kingaroy). It is not expected that school bus routes will be adversely affected as a result of the Project due to the short operational period of the school buses during the day.

School bus operators will be consulted as part of the community communication strategy and made aware of the various construction activities. The contractors will also be made aware of the presence of school bus routes and their operational hours as part of the Project induction process.

In subsequent stages, traffic management plans will be developed for the various construction activities affecting the existing traffic operations and included as part of a RUMP and/or Traffic Management Plan (TMP). This will include identifying the possible impacts on school bus routes and if required, temporary traffic mitigation measures to be provided during the construction phase. However, based on the relatively low number of heavy vehicle movements expected per day, the impacts on school bus routes are expected to be minimal. Following discussions with key stakeholders such as regional councils and bus operators, if it is deemed to be necessary, potential mitigation measures such as restricting or controlling movement of heavy vehicles during the school bus hours will be imposed where possible.

A summary of the identified school bus routes which intersect the Project Transport corridors are summarised in Table 13.20.

Table 13.20 Potentially affected school bus routes

Bus service ID	Service name	Operator	Impacting Transport Corridor
S123	Bowenville to Dalby State High School	Bowenville Motors	TC01
P147	Irvingdale to Dalby State School	Stonestreet's Coaches	TC01
S152	Kaimkillenbun to Dalby State High School	A.J. & M.A. Johnston	TC01
P218	Nandi to Dalby State School	Brigalow Park Pty Ltd	TC01
P353	Spring Meadows to Dalby South State School	Stonestreet's Coaches	TC01
P378	Oakleigh Park to Dalby South State School	Oakleigh Park Pty Ltd	TC01
P492	Malakoff to Dalby State School	Stonestreet's Coaches	TC01
S525	Bell to Dalby State High School	Stonestreet's Coaches	TC01
P585	Norbell to Bell State School	G.L. & C.M. Patch	TC01
P756	St Ruth to Dalby South State School	Stonestreet's Coaches	TC01
P1389	Branch Creek to Dalby South State School	Stonestreet's Coaches	TC01
S113	Cooranga and Bell to Bell State School	D.S. & L.J. Caldwell	TC01 and TC02
S16	Kumbia to Kingaroy State School	Coast & Country Buses	TC02
S664	Kumbia to Kingaroy State High School	Coast & Country Buses	TC02
P729	Stuart Valley to Taabinga State School and Kingaroy State School	A.R. & T.M. Peebles	TC02
P1724	Taabinga Village to Taabinga State School - Kingaroy	Edenvale Enterprises Pty Ltd	TC02
S136	Bushgrove to Jandowae State School	D.J. Schultz	TC03

Source Reference: [illegible]

13.6.7.2 Stock routes

As discussed in Section 13.5.2, SBRC identifies, within PSP No. 8 of the former Kingaroy Shire Council (2006) Planning Scheme, a Stock Route that runs through the Project Site. This route runs along the road reserve of Ironpot Creek Road from the intersection of Niagara Road / Ironpot Creek Road to the intersection of Ironpot Creek Road / Sarum Road where it continues north along Sarum Road out of the Project Site.

As Ironpot Creek Road and Sarum Road are not part of the Project transport corridors, it is not expected that the Project will adversely impact these roads. However, during the subsequent stages of this Project, discussions will be held with relevant Regional Councils and other affected parties regarding the Project's potential impact on stock routes in order to identify whether any further investigations are required.

13.6.7.3 Tourism routes

With the exception of the major, state-controlled roads such as the Warrego Highway there is unlikely to be substantial amount of tourist traffic along the Project's transport corridors. Given the relatively low numbers of heavy vehicle traffic generated by the Project and that major, disruptive movements such as OSOM movements will be minimised and undertaken during the least disruptive times, it is not expected that the project will cause undue impact on tourist routes.

13.6.8 Summary of road impacts

13.6.8.1 Construction phase impacts

In summary, the results of the traffic and transport assessments indicated that during the construction phase, the potential impacts caused by the Project on the road network are likely to consist of two elements:

- Impacts to the pavement condition.
- Impacts to the traffic operation.

In order to identify the locations of these potential impacts, pavement and traffic operation analysis were carried out (i.e. 5% comparison analysis) for the identified transport corridors. In terms of pavement and traffic operation impacts, the analysis indicated that four sections of the identified transport corridors are likely to be affected during the construction phase of the Project. These road sections are Bunya Highway (45A), Dalby-Jandowae Road (421), Kingaroy-Jandowae Road (424) and Niagara Road (RCR-1). The other road sections investigated, such as the Warrego Highway were found to be below 5% of the existing baseline levels in both the traffic impact and pavement impact assessments.

Along the affected road sections, the vast majority of additional Project related traffic volumes are expected to be from the movement of workforce. These trips are expected to be light vehicle trips only as opposed to heavy vehicle trips which typically have a much larger impact on pavement condition due to their higher ESA per vehicle value. Along Niagara Road (RCR-1), the analysis also shows a large percentage increase in ESA and AADT during the construction phase of the Project. However, this increase is primarily due to the very low background traffic along Niagara Road and the movement of construction work force which typically has a lower pavement impact due to the majority of vehicles generated being light vehicles (low ESA per vehicle value).

Based on the assumed transport corridors, five key intersections have been identified which will be affected by the Project related traffic. These key intersections are:

1. Warrego Highway / Bunya Highway
2. Bunya Highway / Niagara Road
3. Kingaroy Jandowae Road / Niagara Road
4) Dalby-Jandowae Road (High Street) / George Street (Kingaroy-Jandowae Road)
5) Kingaroy-Jandowae Road / George Street.

No detailed intersection assessment has been performed at this preliminary assessment stage although based on the magnitude of overall traffic expected to be generated by the Project, intersection capacity is not expected to be a significant concern. Further to discussion with DTMR and Regional Councils, and if required, detailed intersection analysis may be undertaken during the subsequent design phases.

13.6.8.2 Operational phase impacts

During the operational phase, the only expected impact on the regional road network is the movement of operational workforce. The operational workforce is expected to be minimal as the turbines are largely self-regulated once maintained. Furthermore, some of the operational staffs are likely to be offsite staff working remotely (not required to be onsite).

The minimal volume of operational traffic may exceed 5% of the background ESA and background AADT along Niagara Road (RCR-1). However this is due to the relatively low background traffic volume along Niagara Road (estimated to be around 77 vehicles per day in 2016) and not necessarily due to the volume of operational traffic; hence the impact is not expected to be significant, especially compared to the construction phase.

13.6.9 Port impacts

The Queensland port network has the potential to be impacted as a result of the Project only during the transport of wind turbine components through the Port of Brisbane. However, the total number of wind turbines expected to be constructed is up to 115 wind turbines over a period of approximately two to two and a half years.

It is not expected that the transport of all wind turbine components will occur at once. This is unlikely to be a feasible strategy due to the significant size and weight of the turbine and tower components and consequently the large number of shipping vessels and size of the holding yards that would be required. A more likely transport strategy would be to import the wind turbine and tower components at a rate consistent with the rate at which the wind turbines are able to be transported and constructed on site. Such a transportation strategy will spread the overall freight task over the construction period and hence greatly reduce the overall shipping and storage requirements at Queensland ports.

As a result, the impacts of the Project on Queensland ports are not expected to be significant. Detailed port freight logistics will be investigated prior to the commencement of construction by the shipping contractor. These investigations will be undertaken in consultation with the port authorities as part of regular commercial negotiations prior to the commencement of shipments.

13.6.10 Airport impacts

It is not expected at this stage that the Project will utilise Fly-in/Fly-Out workforces for either the construction or operations phases. All transport of materials and equipment is also expected to be through the use of overland freight services. As such, this Project is not forecast to increase the number of regional flights during either the construction or operations phases. Furthermore, the project is not located within close proximity to an airport and the turbine towers will are not considered to pose any significant hazard to aircraft.

Consequently, this Project is not expected to adversely impact the operation of Queensland Airports or pose a significant hazard to aircraft and hence no further detailed assessment on air transport has been undertaken. For further information on potential impacts to airports refer to Chapter 8 Aviation.

13.6.11 Rail impacts

This Project will not utilise rail freight for either the construction or operations phases. All freight movements (such as the movement of equipment or materials) will be undertaken overland and hence the Project will not generate any additional rail traffic. As the Project is not expected to have any additional impact on the Queensland rail network, no further detailed assessment on rail transport have be carried out as part of the traffic and transport assessment.

13.6.11.1 Impacts at rail crossings

As the transport corridors and the Project generated traffic volumes have not yet been finalised, detailed assessment of the Project's impacts at rail crossings have not been undertaken at this stage of the Project. Whilst this Project will temporarily increase road traffic (mainly during the construction phase), it is not expected to increase rail traffic. At this stage of the Project, it is expected that the overall magnitude of development generated traffic in comparison to the background traffic volumes as well as the temporary nature of the additional traffic (which is largely limited to the construction phase only), is unlikely to significantly impact existing level crossings.

In subsequent design phases, once the Project's transport corridors and traffic volumes have been confirmed, the likelihood of impacts at road-rail crossings will be discussed with the relevant network authorities including DTMR and Queensland Rail. Subsequent to these discussions, if it is deemed to be required by the road and / or rail infrastructure managers, additional investigation may be undertaken (if required).

No new rail crossings are proposed as part of this Project.

13.6.12 Other transport impacts

This section highlights other transport related impacts which might arise from the Project, but are not directly attributable to the road, rail, port or airport networks. These other impacts, as well as their applicability to this Project, have been listed in Table 13.21.

Table 13.21 Table of Other Transport Impacts

Predicted impact	Applicability
Severance Severance is a perception that a road is more difficult or possibly less safe to cross. Increased severance can result in the isolation of areas of a settlement or individual properties. However, it is important to note that the impact is largely a function of traffic volumes, rather than one of vehicle composition amongst traffic.	The Project Site is located in a rural environment where there is not expected to be any significant pedestrian demands. The only locations along the Project's transport corridors where the pedestrian volumes may be significant are through regional towns such as Dalby or Jandowae. However, coupled with a 12 hour working day, it is considered that the Project will not generate sufficient traffic volumes for severance to be a major impact. Consequently, the impact of severance is not considered to be significant.
Driver delay Driver delay is that experienced by non-development related road users on the surrounding roads and particularly as a consequence of slow moving traffic associated with construction.	The majority of traffic generated by the Project will be light vehicles only. It is not considered that the light vehicle traffic generation will be of sufficient magnitude to significantly impact background vehicle delays. It is acknowledged however that there may be an element of localised delays directly attributable to construction traffic, especially as a result of heavy and over-sized and over-mass vehicle movements. The overall impact of these movements is not considered to be significant given that deliveries will be timed to minimise disruption and will be undertaken in consultation with DTMR, affected councils and other stakeholders such as emergency services, as required.
Pedestrian delay and pedestrian amenity Pedestrian delay is affected by changes in traffic volume, HGV movements and traffic speed. Pedestrian delay also depends on the existing level of pedestrian activity, visibility and current infrastructure provision. There is no threshold against which pedestrian delay is assessed. Pedestrian amenity can be affected by traffic volumes and the distance between pedestrians on a footway and passing traffic.	The Project Site is located in a rural environment where there is not expected to be any significant pedestrian demands with the exception of through regional towns. The majority of heavy and particularly over-size and over-mass deliveries are expected to be undertaken outside of normal hours when disruptions to pedestrian and vehicular traffic will be minimal. The remaining heavy vehicle movements which are undertaken during normal hours are likely to be spread out over 12 hours of construction per day. Hence the impacts relating to Pedestrian Delay and Pedestrian Amenity are considered to be not significant.
Fear and intimidation The degree of fear and intimidation experienced by pedestrians is affected by the volume of passing traffic, the proportion of HGV traffic and its proximity to pedestrians.	As there is unlikely to be significant pedestrian activity along the majority of this Project's transport corridors, pedestrian fear and intimidation is not expected to be a significant issue along these sections of road. However, in and around regional population centres such as Dalby or Jandowae, this impact may be significant over short, discrete timeframes. This could

Predicted impact	Applicability
	include times of concentrated heavy vehicle movements or while an over-size / over-mass vehicle movement is taking place. The majority of the daily traffic generated by the Project is expected to be light vehicles related to workforces; hence the impacts of pedestrian fear and intimidation are not considered to be significant when considered across the whole construction period.
Accidents and safety Road accidents are attributable to a variety of local factors and as such do not provide a threshold to determine significance but relies more on the assessor to use their own judgement.	Based on the overall level of traffic generation and predominantly light vehicle composition, it is considered unlikely that the Project will increase the number of accidents or impact road safety by itself. However, the increased generation of heavy vehicles, especially turning heavy vehicles at intersections may potentially have an impact on accident rates. Furthermore, as this Project may potentially require construction workforces or contractors to drive long distances to complete some deliveries (Port of Brisbane to site and then back), driver fatigue may also adversely impact road safety. However the low magnitude of construction traffic and the relatively limited duration they are generated over should be kept in mind. These two elements of the Project have the potential to cause some localised impacts on road safety and hence mitigation measures are provided in Section 13.7.
Mishandling of hazardous materials and spills Due to the number of construction equipment and heavy machinery likely to be required on-site, the transportation and/or storage of hazardous materials such as fuel, chemicals and lubricants are likely to be required. Fuels and chemicals can pose a fire and/or explosive hazard. They can also be environmentally damaging in the event of a major spill or leak, especially if they manage to enter local creeks or waterways.	Mishandling or accidental spillage of hazardous materials such as fuel or chemicals required for construction can have major environmental consequences. Whilst it is not considered likely, if it eventuates, the potential impact could be is considered to be significant if it eventuates. Mitigation is therefore provided in Section 13.7.

13.7 Mitigation measures

13.7.1 Road Use Management Plan

As stated in the DTMR's GARID, *"the Road Use Management Plan (RUMP) is a plan specifically for managing road related issues and is based on negotiation with industry to best manage current and future increases in district road use/access by specific freight commodities and specific types of heavy vehicles to alleviate and manage adverse traffic management risks and road impacts"*.

The purpose of developing a RUMP for the Project is to identify, if required, appropriate traffic and transport management strategies for the use of the SCRs and, where necessary, RCRs over the construction phase of the Project. The intended objective of these strategies are to minimise the impact on the efficiency of the SCR and RCR networks as well as the operational safety of the Project related vehicles accessing the construction sites.

13.7.1.1 Preliminary RUMP

A preliminary RUMP will be developed for the Project at the subsequent detailed design stage in consultation with the relevant authorities, including DTMR and emergency services such as the Queensland Police Service. The assessments presented throughout this chapter will form the basis for the development of various strategies in managing the potential transport impacts from the construction phase of this Project, all of which will be documented in the preliminary RUMP. As the project progresses, if any assessment is revised or additional assessment is undertaken (if required by DTMR or affected regional councils), the RUMP will be updated to effectively capture the changes.

The preliminary RUMP will also include strategies to deal with safe temporary access to/from public roads and construction sites as well as safe decommissioning of any stockpile sites over the construction phase of the Project. Temporary and permanent traffic arrangements will also be developed (if required) and included as part of the TMP that will be implemented during the various stages of the Project. The framework for the preliminary RUMP will be in accordance with the 'Guideline for preparing a Road Use Management Plan' (DTMR, 2012).

13.7.2 Other management plans

A Driver Fatigue Management Plan and Emergency Response/Disaster Management Plan will be prepared as part of the overall Project and will be provided to the workforce as part of the Project induction process.

The Driver Fatigue Management Plan will set out any restrictions on travel times and specify durations for drivers operating within and outside of the Study Area as well as the Project Site. As trip schedules and drivers rosters are some of the key factors in managing driver fatigue, the Driver Fatigue Management Plan will apply to the all staff and contractors working on the Project.

In addition to driver fatigue, due to the number of heavy construction machinery and equipment expected to be on site, the transportation hazardous materials such as fuel, lubricants and chemicals needs to be considered. To ameliorate any potential impacts of the movement of fuel or other hazardous materials, all hazardous materials used on site will be managed in accordance with the relevant Australian Standards.

Industry best practices will be observed for activities relating to the transportation, storage and handling of environmentally hazardous substances such as fuel, throughout the Project. Only licensed contractors will be used, specific procedures will be developed for loading, unloading and handling the materials and all transport activities will comply with the requirements of the Australian Dangerous Goods (ADG) Code.

Throughout the Project's construction phase, any fuel or chemical spill will be monitored regularly to make sure that there is no adverse impact on environmentally sensitive areas such as creeks and rivers, along the transport routes. The RUMP developed for this Project will also include strategies to minimise the effects of a product spill as a result of the Project's transport activities during the construction phase. Subsequent to discussion with the relevant authorities, if required, a separate Spill Prevention and Response Plan (SPRP) may also be developed by the contractor and included as part of the Project's RUMP.

13.7.3 Summary of mitigation strategies and management measures

Table 13.22 provides a summary of the proposed mitigation strategies and management measures for the potential traffic and transport impacts identified for the Project.

Table 13.22 Mitigation and management measures for potential impacts on the transport network

Project phase	Mitigation or management measure
Design phase	• Ongoing consultation will be undertaken with DTMR, relevant regional councils and other agencies such as Queensland Police Services and Emergency Services • Investigate detailed design solutions to minimise impact on existing roads and stock routes • Suitable vehicular access, manoeuvring areas and parking for the ongoing operation and maintenance activities associated with the wind farm will be

Project phase	Mitigation or management measure
	proved at the detailed design phase. ▪ Establish infrastructure agreements with DTMR and regional councils.
Construction phase - traffic safety and deterioration in road conditions	▪ Development of a RUMP prior to the commencement of construction and implemented as part of the CEMP. The purpose of the RUMP is to demonstrate how road impacts generated by the Project, particularly from heavy vehicle use, will be managed. Consultation with the DTMR, relevant regional councils and other agencies such as Queensland Police Services and Emergency Services will be undertaken as part of this plan ▪ Finalise impact mitigation strategies comprising a combination of road use management strategies, such as variable message signs, bussing workers, avoiding peak hour traffic especially near schools/bus routes and fatigue management strategies, and infrastructure strategies where required ▪ A TMP will be prepared in accordance with the latest edition of the 'Manual of Uniform Traffic Control Devices: Part 3 – Works on Roads' and DTMR's specification "MRTS02 – Provision for traffic" prior to the commencement of construction. Road safety measures will take into consideration speed restrictions, driver fatigue, in-vehicle communications, signage, demarcations, maintenance, safety checks, and interaction with public transport, transport of hazardous and dangerous goods and emergency response and disaster management.
Operational phase - traffic safety	▪ Develop and implement operational traffic management measures including driver fatigue management.

13.8 Residual Impacts

Based on the traffic and transport assessments, two key potential impacts have been identified:

- Impacts on the pavement condition as a result of the Project
- Impacts on the traffic operation as a result of the Project.

In order to alleviate the potential impacts on regional transport infrastructure, a number of mitigation measures have been identified in Table 13.22. Measures to mitigate Project related impacts will include the development of a RUMP and TMP prior to the commencement of construction.

In the subsequent detailed design phases of the Project, once the potential traffic operation and pavement impacts are further understood, mitigation measures will be further discussed and agreed upon with the relevant authorities including DTMR and Western Downs and South Burnett Regional Councils as required. It is considered that once adequate mitigation measures are agreed upon and implemented, they will adequately address any potential Project related impacts. Residual impacts after the implementation of the agreed mitigation measures are expected to be negligible and not significant over the construction period.

13.9 Cumulative Impacts

At the time of carrying out traffic and transport assessments for the Project, there may be other projects in the region which are at the planning, design or construction stages. Some of these projects may potentially generate road traffic along the transport corridors expected to be utilised by the Project. In order to appreciate the cumulative impact on the regional transport infrastructure, the traffic generation estimations from these developments have been considered for the purposes of calculating the future year background traffic.

For the purpose of the assessments, only developments which have been declared a 'coordinated project' by the Coordinator-General, requiring the submission of an Environmental Impact Statement (EIS), where published traffic volumes are readily available, have been considered.

Only one such development was identified as potentially having a cumulative impact on the Project transport corridors:

- New Acland Coal Mine Expansion - Stage 3 (proposed by New Acland Coal Pty Ltd).

The terms of reference for the original proposal's EIS was finalised by the Coordinator-General in October 2007. Subsequent to this, in November 2009, New Acland Coal submitted an EIS covering the New Acland Coal Mine Expansion – Stage 3 project.

The New Acland Coal Mine is an open cut coal mine located approximately 35 km north-west of Toowoomba. Owing to its close proximity to Toowoomba, the EIS submitted in 2009 indicated that the Project is likely to generate road traffic along the Warrego Highway (along TC01), both due to construction activities and mine operations.

However in response to concerns raised by the Queensland State Government about the project's potential impacts, the project was modified and reduced in scope. The modified project proposal is now approximately 63% or 2,300 hectares smaller than the original proposal (*New Acland Coal Mine Stage 3: Project Overview*).

As a result of the project modifications, the proponent has submitted a revised EIS in early 2014. Based on the EIS, the proponent has provided estimated, development generated traffic volumes. Along the Warrego Highway (between Toowoomba and Dalby), the proponent estimated that a maximum of approximately 220 vehicles per day (50 heavy vehicles and 170 light vehicles) may be generated during the peak construction phase (2016). This additional traffic likely to be generated by the New Acland Coal Mine Expansion project is considered to be additional background traffic along the Warrego Highway, which has not been captured by the historic traffic counts.

In order to provide a conservative, worst-case estimate of the overall traffic impact, this additional background traffic has not been added onto the historical background traffic for the purposes of the 5% assessment. Based on the assessment undertaken, this project is not expected to adversely impact either the traffic operation or pavement condition of this section of the Warrego Highway – 18B (i.e. less than 5%) even without taking into account the additional background traffic. As such, the cumulative impacts of both projects are not expected to be significant along the affected road sections (18B).

The South Burnett Coal Project (proposed by MRV Tarong Basin Coal Pty Ltd) was declared a 'coordinated project' on 18 August 2016. The project is located approximately 35 km east of the Coopers Gap Wind Farm Project and proposes to utilise the D'Aguilar Highway via Kilcoy during construction. The indicative transport route for the transport of equipment and materials to the Coopers Gap Project Site is the Warrego Highway via Dalby (Section 13.5.7.2), and does not require use of the D'Aguilar Highway. Cumulative impacts on local roads will be limited due to the distance between the projects. As such, the cumulative impacts of both projects are not expected to be significant.

13.10 Summary and conclusions

Traffic and transport assessments require consideration of a range of matters relevant to State and local government approvals.

In terms of impact on Queensland's road network, the traffic and transport assessments reveal that during the construction phase the potential impacts caused by the Project are likely to consist of two elements:

- Impacts to the pavement condition
- Impacts to the traffic operation

During the construction phase, the assessment indicated that the potential impacts under both elements are likely to be along four roads; the Bunya Highway (45A), Dalby-Jandowae Road (421), Kingaroy-Jandowae Road (424) and Niagara Road (RCR-1). Along these roads, both the Project related ESA and traffic volumes are expected to exceed 5% of the respective background ESA and traffic volumes.

Of these roads, the analysis also shows a large percentage increase in ESA and AADT along Niagara Road (RCR-1) during the construction phase of the Project. Niagara Road is the main access road for the Project and hence will be utilised by all Project related vehicles. It is noted that the large percentage increases are mainly due to the low background traffic volume along Niagara Road.

Through the development of a RUMP and TMPs, mitigation measures will be established for the Project to assist in minimising the extent of road traffic and pavement impacts. These plans will be prepared prior to the commencement of construction in consultation with DTMR, regional councils and other authorities and implemented as part of the CEMP. Other management strategies such as a Driver Fatigue Management Plan and an Emergency Management Plan will also be implemented to minimise the potential for incidents.

During the operational phase, as the wind turbines are largely self-operating once constructed, the only impact on the road network is expected to be due to from the maintenance workforce. A small number of inspection and maintenance workforce trips are expected on a regular basis during the operational phase. However, the volumes of these trips (and consequent traffic impacts) are expected to be significantly less than during the construction phase.

As the wind turbines are not manufactured in Australia, the wind turbine components will likely be sourced from overseas. As a result, the Queensland port network has the potential to be impacted during the transport of wind turbine components through the Port of Brisbane. The movement of these components will be further refined at the detailed design stage and will include discussions between AGL and the Port of Brisbane on the likely arrangements.

The total number of wind turbines expected to be constructed is up to 115 over a period of approximately two to two and a half years. It is not expected that the transport of all wind turbine components will occur at once and instead a transport strategy which spreads the delivery of turbines over the construction period is likely to be adopted. As the transportation of turbine components is likely to be spread over approximately two to two and a half years, the impacts of the Project on Queensland ports are not expected to be high; hence detailed analysis has not been undertaken.

Instead, prior to the commencement of construction, the freight logistics for the Project will be further investigated and carried out in consultation with the Port of Brisbane.

The Queensland Rail network is not expected to be used during the construction or operational phases of the Project as all construction materials, equipment and workforce is anticipated to be transported either by road or by sea. As a result detailed impact assessment on rail infrastructure has not been undertaken.

The Project will not utilise any air transport services as all Project related workforce, during the construction and operational phase, are assumed to be Drive-In/Drive-Out trips from the surrounding population centres. In addition, all construction equipment and materials are expected to be transported either by road or by sea. Hence no regional, commercial airports are expected to be impacted as a result of the Project.

In the subsequent detailed design phases of the Project, once the potential impacts on the road and port network are further defined and understood, any potential mitigation measures will be further discussed and agreed upon with the relevant authorities including DTMR and Western Downs and South Burnett Regional Councils as required. Any residual impacts which may remain after the implementation of any agreed mitigation measures are expected to be negligible and not significant over the construction period.

ANNEXURE 2 – DULACCA WIND FARM DEVELOPMENT APPROVAL

Australian Government

Department of Agriculture, Water and the Environment

APPROVAL

Dulacca Renewable Energy Project, Dulacca, QLD, (EPBC 2018/8368)

This decision is made under sections 130(1) and 133(1) of the *Environment Protection and Biodiversity Conservation Act 1999 (Cth).* Note that section 134(1A) of the **EPBC Act** applies to this approval, which provides in general terms that if the approval holder authorises another person to undertake any part of the action, the approval holder must take all reasonable steps to ensure that the other person is informed of any conditions attached to this approval, and that the other person complies with any such condition.

Details

Person to whom the approval is granted (approval holder)	RES Australia Pty Ltd
ACN or ABN of approval holder	ABN 55 106 637 754
Action	To construct and operate a wind farm and associated infrastructure, approximately 7 km east of the township of Dulacca, in the Western Downs Regional Council Local Government Area, Queensland. [See EPBC Act referral 2018/8368]

Approval decision

My decisions on whether or not to approve the taking of the action for the purposes of each controlling provision for the action are as follows.

Controlling Provisions

Listed Threatened Species and Communities	
Section 18	Approve
Section 18A	Approve
Listed migratory species	
Section 20	Approve
Section 20A	Approve

Period for which the approval has effect

This approval has effect until 1 August 2055.

Decision-maker

Name and position	Andrew McNee Assistant Secretary Environment Assessments Queensland and Sea Dumping Branch Department of Agriculture, Water and the Environment
Signature	[signature]
Date of decision	21 August 2020

Conditions of approval

This approval is subject to the conditions under the EPBC Act as set out in ANNEXURE A.

ANNEXURE A – CONDITIONS OF APPROVAL

Part A – Conditions specific to the action

Maximum clearing limits

1. To minimise impacts to the **Dulacca Woodland Snail**, the approval holder must not **clear** more than a total of 1.49 hectares (ha) of **Dulacca Woodland Snail habitat**, and this clearing must be in the **Key impact areas for Dulacca Woodland Snail habitat** within the **project area.**

2. The approval holder must undertake pre-clearance surveys of all areas to be **cleared**, to identify any **protected matters**, prior to undertaking **clearing**. All pre-clearance surveys must be undertaken by a **suitably qualified ecologist** and undertaken in accordance with the **Department's survey guidelines**.

3. Prior to the **commencement of the action**, the approval holder must publish a Final Layout Plan showing in detail the final layout of the action within the **project area**. The Final Layout Plan must specify the extent (in hectares) and locations of all **protected matters** and/or their habitat. The Final Layout Plan must demonstrate that the proposed placement of infrastructure has avoided **impacts** on **protected matters** as informed by pre-clearance surveys and the advice of a **suitably qualified ecologist**. The Final Layout Plan must remain published on the **website** for the period this approval has effect.

4. The approval holder must not **construct** more than 43 wind turbines within the **project area**. Each turbine must not exceed 250 metres (m) tip height, as specified in the **Preliminary documentation**.

Project area

5. The approval holder must implement the **Vegetation and Fauna Management Plan** within 10 m of any area disturbed as part of the action shown in the Final Layout Plan for the duration of this approval. In particular, the approval holder must:

    a. prior to the **commencement of the action**, undertake **weed** management control across all areas within the **project area** subject to disturbance;

    b. during the **construction**, undertake **weed** management control across all areas within the **project area** subject to disturbance to promptly suppress outbreaks;

    c. upon the cessation of disturbance, undertake **weed** control within disturbed areas until such time that **weed** presence in these areas cannot be attributed to disturbance associated with **construction** activities; and

    d. undertake **weed** management and control within 1 m of any **project infrastructure** at ground level for the rest of the period of effect of this approval. The weed management and control must minimise the risk of and potential for **weed** cover occurring, suppress any outbreak that occurs, and remove any **weeds** that may occur.

6. To minimise risk of injury or mortality of **EPBC Act listed threatened species** and **EPBC Act listed migratory species** as a result of turbine strike within the **project area**, the approval holder must implement the **Bird and Bat Management Plan (BBMP)** for the duration of this approval. In particular, the approval holder must engage a **suitably qualified ecologist** to undertake:

    a. bird and bat utilisation surveys over a period of at least 24 months (or another timeframe agreed to in writing by the **Department**) prior to the **first full operation**, including at least two surveys undertaken at or adjacent to survey points and reference sites (as identified in the **BBMP**) over at least one wet season and one dry season in succession;

b. bird and bat utilisation surveys over a period of at least 24 months commencing within 3 months after **first full operation**, including at least one survey undertaken at or adjacent to survey points and reference sites (as identified in the **BBMP**) over at least two wet seasons and two dry seasons in succession; and

c. **turbine strike monitoring** in accordance with the **BBMP** at monitoring sites identified in the **BBMP**, and at all **high-risk turbines** identified as required under condition 9, for a minimum of 24 contiguous months within 30 months after **first full operation**.

7. The approval holder must conduct at least one survey for the presence of the **White-throated Needletail** and **Fork-tailed Swift** and in respect of each species, in each 12-month period of bird and bat utilisation surveys (as required under condition 6) during the **migratory periods** of the **White-throated Needletail** and **Fork-tailed Swift**.

8. The approval holder must report on the results of the bird and bat utilisation surveys required under condition 6 in each annual **compliance report** required under condition 27 until all bird and bat utilisation surveys have been completed and so reported.

9. To inform **turbine strike monitoring**, the approval holder must engage a **suitably qualified ecologist** to:

   a. assign a **risk profile** to each turbine within the **project area** prior to **first full operation** using the results of the bird and bat utilisation surveys required under condition 6(a); and

   b. re-assign a turbine to be a **high-risk turbine** within five **business days** if, during the bird and bat utilisation surveys required under condition 6(a), or any other monitoring or incidental observation during **operation**, one or more individual/s of an **EPBC Act listed threatened species** or **EPBC Act listed migratory species** is detected within the **vicinity** of that turbine.

10. Upon completion of the bird and bat utilisation surveys required under condition 6, the approval holder must engage a **suitably qualified ecologist** to revise the **BBMP** to include the following:

    a. the results of the bird and bat utilisation surveys required under condition 6;

    b. the **risk profile** of each turbine within the **project area**; and

    c. any additional or improved **mitigation measures** (including timing, frequency and longevity) that will be implemented to ensure that **impacts** on **EPBC Act listed threatened species** and **EPBC Act listed migratory species** are minimised.

    The revision of the **BBMP** must be completed within 3 months of the completion of the bird and bat utilisation surveys required under condition 6.

    Note: Condition 25 specifies when the revised **BBMP** must be published on the **website**.

11. The approval holder must implement the revised **BBMP** revised in accordance with condition 10 from the date that the revised **BBMP** is published on the **website**. If subsequently the revised **BBMP** is revised under s143 of the **EPBC Act**, the approval holder must implement the revised **BBMP** revised under s143 of the **EPBC Act** from the date the revised **BBMP** is approved by the **Minister**.

12. If an **impact trigger** is reached or exceeded, the approval holder must provide a report to the **Minister** on the steps taken and outcomes of implementing the relevant commitments in the **adaptive management framework** in the first annual **compliance report** required under condition 27 that follows each instance of reaching or exceedance of an **impact trigger** and/or the

implementation of **mitigation measures**. Each such report must include details of the **mitigation measures** that have been or will be implemented and an assessment of their likely effectiveness.

13. If the **Minister** writes to the approval holder stating that he/she considers that the **mitigation measures** will not prevent further reaching or exceedance of an **impact trigger**, then the approval holder must curtail the operation of any wind turbine that presents an ongoing risk of reaching or exceeding an **impact trigger** within an identified **period of risk** to the **impacted EPBC Act listed threatened species** or **EPBC Act listed migratory species** until such time as alternate **mitigation measures** can be identified to support the ongoing operation of the turbine. Where **mitigation measures** cannot be identified, the approval holder must engage a **suitably qualified person** to develop a species-specific **curtailment** protocol for the turbine to allow the turbine to be operated for periods outside of identified **period of risk** to the **impacted** species.

14. Any request to the **Minister** by the approval holder to cease or reduce a **curtailment** required under condition 13 must include an **evidence-based** assessment by a **suitably qualified ecologist** demonstrating how the ceasing or reducing of the **curtailment** will not reasonably be expected to result in any subsequent reaching or exceedance of an **impact trigger**.

Environmental Offsets

15. To compensate for the **clearance** of 1.49 ha of **Dulacca Woodland Snail habitat**, the approval holder must:

    a. secure a legal agreement with the landowner to protect at least 3 ha of the **Hermitage Property Offset area** as described in the **Biodiversity Offset Plan (BOP)**, prior to the **commencement of the action.** The approval holder must ensure the **Hermitage Property Offset area** is **legally secured** within 6 months of the **commencement of the action**;

    b. provide the **Department** with written evidence demonstrating that the **Hermitage Property Offset area** has been **legally secured**, and **shapefiles** of the offset attributes of the **Hermitage Property Offset Area**, within 20 **business days** of **legally securing** the **Hermitage Property Offset area**; and

    c. allow grazing on the **Hermitage Property Offset area** only between the months of April and October in any year if and when grass cover exceeds 60% and 850 kg/ha pasture biomass and only allow low to moderate grazing, for the purposes of fuel reduction. To prevent **impacts** to regeneration, the approval holder must not allow grazing at any other time.

16. The approval holder must implement the **BOP** at the **Hermitage Property Offset area** for the duration of the approval to restore **Dulacca Woodland Snail habitat** to the BioCondition attribute targets prescribed within the **BOP**.

17. The approval holder must achieve the following BioCondition attributes across the **Hermitage Property Offset area** by the end of **year 10** and subsequently maintain or exceed these attributes within the **benchmark** for **Regional Ecosystem** 11.9.1 for the remainder of the period of effect of the approval:

    a. average recruitment of dominant canopy species greater than 75% of the **benchmark** for **Regional Ecosystem** 11.9.1;

    b. average native plant species richness at >25% to 90% of the **benchmark** for **Regional Ecosystem** 11.9.1;

    c. tree canopy median height of greater than 40% of the **benchmark** height (>6 m);

d. average tree canopy cover >50% or ≤200% of the **benchmark** for **Regional Ecosystem** 11.9.1;

e. average native perennial grass cover at ≥25% or <50% of the **benchmark** for **Regional Ecosystem** 11.9.1;

f. non-native plants comprise less than 5% of vegetation cover;

g. the abundance of non-native species is no greater than baseline levels; and

h. **species stocking rate** of the **Dulacca Woodland Snail** increased from baseline by 50% of the **modelled quality scenario with offset** as described in the **BOP**.

18. The approval holder must engage a **suitably qualified ecologist** to complete an assessment of the **Hermitage Property Offset area** within 3 months after the end of each of **year 5**, **year 10**, **year 15** and **year 20.** Each assessment must set out the opinion of the **suitably qualified ecologist** and provide the evidence on which the opinion is based, as to whether the BioCondition attributes specified in the **BOP** in respect of the particular period (including, for **year 10**, those required under condition 17) have been achieved and, in respect of subsequent periods, are likely to be achieved. The findings of each assessment must be published on the **website** within 1 month of completion and provided to the **Department** within five (5) **business days** of being published on the **website**.

19. If any of the BioCondition attributes specified in the **BOP** and under condition 17 in respect of **Year 10** have not been met at the end of **Year 10**, or the **suitably qualified ecologist** has advised that any BioCondition attributes required for the subsequent periods is not likely to be achieved by the end of **Year 10**, the approval holder must, within 6 months of the end of **Year 10**, submit a revised version of the **BOP** to the **Department** for the **Minister**'s approval, revised on the advice of the **suitably qualified ecologist** and including:

a. details of the potential or actual cause(s) of the non-achievement of required BioCondition attributes;

b. details of the corrective action/s that the approval holder commits to undertake in order to achieve all outstanding BioCondition attributes;

c. an assessment of the likely effectiveness of the proposed corrective action/s;

d. proposed timeframes for reporting to the **Department** the results of implementing of the corrective actions; and

e. contingency measures that will be implemented if monitoring suggests that the corrective action/s are not being effective.

20. If a revised version of the **BOP** has not been approved by the **Minister** within 12 months of the end of **Year 10**, the approval holder must cease the action until a revised version of the **BOP** is approved by the **Minister**.

Note: The **Department** will, within 6 weeks of receiving the revised **BOP**, provide the approval holder written comments detailing any changes that the **Department** considers need to be made to the revised **BOP** before it can recommend approval of the revised **BOP** to the **Minister** (or delegate of the **Minister**).

Part B – Standard administrative conditions

Notification of date of commencement of the action

21. The approval holder must notify the **Department** in writing of the date of **commencement of the action** within 10 **business days** after the date of **commencement of the action.**

22. If the **commencement of the action** does not occur within 5 years from the date of this approval, then the approval holder must not **commence the action** without the prior written agreement of the **Minister**.

Compliance records

23. The approval holder must maintain accurate and complete **compliance records**.

24. If the **Department** makes a request in writing, the approval holder must provide electronic copies of **compliance records** to the **Department** within the timeframe specified in the request, or another timeframe agreed to in writing by the **Department** subsequent to the receipt of a written request from the approval holder.

Note: **Compliance records** may be subject to audit by the **Department** or an **independent** auditor in accordance with section 458 of the **EPBC Act**, and or used to verify compliance with the conditions. Summaries of the result of an audit may be published on the **Department**'s website or through the general media.

Preparation and publication of plans

25. The approval holder must:

    a. submit **plans** electronically to the **Department**;

    b. publish each **plan** on the **website** within 20 **business days** of the date of this approval, or of the date that the **plan** is revised or, if required, approved by the **Minister**, unless otherwise agreed to in writing by the **Minister**;

    c. exclude or redact **sensitive ecological data** from **plans** published on the **website** or provided to a member of the public; and

    d. keep **plans** published on the **website** until the end date of this approval.

26. The approval holder must ensure that any **monitoring data** (including **sensitive ecological data**), surveys, maps, and other spatial and metadata required under a **plan** and conditions of this approval, is prepared in accordance with the **Department's** *Guidelines for biological survey and mapped data* (2018) and submitted electronically to the **Department** in accordance with the requirements of the **plan** and conditions.

Annual compliance reporting

27. The approval holder must prepare a **compliance report** for each 12-month period following the date of **commencement of the action**, or otherwise in accordance with an annual date that has been agreed to in writing by the **Minister**. The approval holder must:

    a. publish each **compliance report** on the **website** within 60 **business days** following the relevant 12-month period;

    b. notify the **Department** by email that a **compliance report** has been published on the **website** and provide the weblink for the **compliance report** within five **business days** of the date of publication;

    c. keep all **compliance reports** publicly available on the **website** until this approval expires;

d. exclude or redact **sensitive ecological data** from **compliance reports** published on the **website**; and

e. where any **sensitive ecological data** has been excluded from the version published, submit the full **compliance report** to the **Department** within 5 **business days** of publication.

Note: **Compliance reports** may be published on the **Department**'s website.

Reporting non-compliance

28. The approval holder must notify the **Department** in writing of any: **incident**; non-compliance with the conditions; or non-compliance with the commitments made in **plans**. The notification must be given as soon as practicable, and no later than two **business days** after becoming aware of the **incident** or non-compliance. The notification must specify:

   a. any condition which is or may be in breach;

   b. a short description of the **incident** and/or non-compliance; and

   c. the location (including co-ordinates), date, and time of the **incident** and/or non-compliance. In the event the exact information cannot be provided, provide the best information available.

29. The approval holder must provide to the **Department** the details of any **incident** or non-compliance with the conditions or commitments made in **plans** as soon as practicable and no later than 10 **business days** after becoming aware of the **incident** or non-compliance, specifying:

   a. any corrective action or investigation which the approval holder has already taken or intends to take in the immediate future;

   b. the potential **impacts** of the **incident** or non-compliance; and

   c. the method and timing of any remedial action that will be undertaken by the approval holder.

Independent audit

30. The approval holder must ensure that **independent audits** of compliance with the conditions are conducted as requested in writing by the **Minister**.

31. For each **independent audit**, the approval holder must:

   a. provide the name and qualifications of the independent auditor and the draft audit criteria to the **Department**;

   b. only commence the **independent audit** once the audit criteria have been approved in writing by the **Department**; and

   c. submit an audit report to the **Department** within the timeframe specified in the approved audit criteria.

32. The approval holder must publish the audit report on the **website** within 10 **business days** of receiving the **Department's** approval of the audit report and keep the audit report published on the **website** until the end date of this approval.

Completion of the action

33. Within 30 **business days** after the **completion of the action**, the approval holder must notify the **Department** in writing and provide **completion data**.

Part C - Definitions

Adaptive management framework means the steps to be implemented as a result of an **impact trigger** being met, as specified within the **BBMP.**

Benchmark means the quantitative value for the relevant BioCondition attribute specified for each **Regional Ecosystem** by the Queensland Herbarium, as described in *the BioCondition Benchmarks for the Brigalow Belt Bioregion (10/1/2019)* or a subsequent version approved by the Queensland Government).

Biodiversity Offset Plan (BOP) means the *Dulacca Renewable Energy Project – Biodiversity Offset Plan* dated 28 May 2020, or a subsequent and current version approved by the **Minister**.

Bird and Bat Management Plan (BBMP) means the *Dulacca Renewable Energy Project – Bird and Bat Management Plan* dated May 2020.

Business day means a day that is not a Saturday, a Sunday or a public holiday in the state or territory of the action.

Clear/cleared/clearing/clearance means the cutting down, felling, thinning, logging, removing, killing, destroying, poisoning, ringbarking, uprooting or burning of vegetation (but not including **weeds** – see the *Australian weeds strategy 2017 to 2027* for further guidance).

Commencement of the action/commence the action means the first instance of any specified activity associated with the action including **clearing** and **construction**. **Commencement of the action/commence the action** does not include minor physical disturbance necessary to:

(a) undertake geotechnical surveys, pre-clearance surveys, monitoring programs, and weed management activities under condition 5(a);

(b) install signage and/or temporary fencing to prevent unapproved use of the project site (as defined in the **preliminary documentation**); and

(c) protect environmental and property assets from fire, **weeds** and pests, including maintenance or use of existing surface access tracks.

Completion of the action means the time at which all approved conditions have been fully met.

Completion data means an environmental report and spatial data information clearly detailing how the conditions of this approval have been met. The **Department's** preferred spatial data format is **shapefile**. This includes, but is not limited to the:

(a) area of each **EPBC Act listed migratory species** and **EPBC Act listed threatened species** habitat **cleared**; and

(b) quality of each **EPBC Act listed migratory species** and **EPBC Act listed threatened species** habitat in the offset area at the end date of this approval.

Compliance records means all documentation or other material in whatever form required to demonstrate compliance with the conditions of approval in the approval holder's possession or that are within the approval holder's power to obtain lawfully.

Compliance report/s means written reports:

(a) providing accurate and complete details of compliance, **incidents**, and non-compliance with the conditions and **plans**;

(b) consistent with the **Department's** *Annual Compliance Report Guidelines* (2014) (or subsequent revision) for annual compliance reports;

(c) include a **shapefile** of any **impact** on any habitat for **EPBC Act listed threatened species** and **EPBC Act listed migratory species** undertaken within the relevant 12-month period; and

(d) identifying the version/s of the **plans** prepared and in existence in relation to the conditions of this approval during the relevant 12-month period.

Construct/ion/ed means the erection of a building or structure that is or is to be fixed to the ground and wholly or partially fabricated on-site; the alteration, maintenance, repair or demolition of any building or structure; preliminary site preparation work which involves breaking of the ground; the laying of pipes and other prefabricated materials in the ground, and any associated excavation work; but excluding geotechnical surveys, pre-clearance surveys, the installation of temporary fences and signage, and measures required to protect environmental and property assets from fire, weeds and pests, including maintenance or use of existing surface access tracks.

Curtail/curtailment means the temporary stopping of an individual wind turbine where additional **mitigation measures** will not prevent further reaching or exceedance of an **impact trigger** for an **EPBC Act listed migratory species** or **EPBC Act listed threatened species** at the turbine during an identified **period of risk** and where additional **mitigation measures** are not immediately available to address the risk of the **impact trigger** being again reached or exceeded.

Department means the Australian Government agency responsible for administering the **EPBC Act**.

Department's survey guidelines mean the **Department's** approved Survey Guidelines for Nationally Threatened Species.

Dulacca Woodland Snail means the Dulacca Woodland Snail (*Adclarkia dulacca*) listed as a threatened species under the **EPBC Act**.

Dulacca Woodland Snail habitat means any vegetation that provides habitat suitable for the **Dulacca Woodland Snail**, including the **Regional Ecosystem** 11.9.1, or as described in the *Conservation Advice Adclarkia dulacca Dulacca woodland snail* (2016). **Dulacca Woodland Snail habitat** within the **project area** is shown in **Appendix B**.

EPBC Act means the *Environment Protection and Biodiversity Conservation Act 1999* (Cth).

EPBC Act listed migratory species means the migratory fauna species listed under the **EPBC Act** for which this approval has effect, including:

(a) Fork-tailed Swift (*Apus pacificus*); and/or

(b) White-throated Needletail (*Hirundapus caudacutus*).

EPBC Act listed threatened species means the threatened flora and fauna species listed under the **EPBC Act** for which this approval has effect, including:

(a) Dulacca Woodland Snail (*Adclarkia dulacca*); and/or

(b) White-throated Needletail (*Hirundapus caudacutus*).

Evidence-based means an approach that emphasises the practical application of the findings of the best available current research. It can include the data, reports, records, modelling, protocols, standards, methods or **mitigation measures**, literature or other information supporting the demonstration of compliance and/or avoidance or minimisation of an **impact**.

First full operation means the first date the electricity network operator allows all Dulacca Renewable Energy Project wind turbines to simultaneously operate and export electricity up to the maximum output.

Fork-tailed Swift means the Fork-tailed Swift (*Apus pacificus*) listed as a migratory species under the **EPBC Act**.

Hermitage Property Offset area means the offset site proximate to the **project area** that contains suitable values and can wholly and effectively accommodate the offset obligation, as specified in the **BOP**.

High-risk turbine means any turbine that any **EPBC Act listed threatened species** or **EPBC Act listed migratory species** have been detected within the **vicinity** of the turbine where the turbine does not meet the definition of a **low-risk turbine**. A **high-risk turbine** may be downgraded to a **low-risk turbine** if no **EPBC Act listed threatened species** or **EPBC Act listed migratory species** are detected within the **vicinity** of the turbine for a minimum of two years.

Impact/s/ed (verb) means to cause any measurable direct or indirect disturbance or harmful change as a result of any activity associated with the action. **Impact** (noun) means any measurable direct or indirect disturbance or harmful change as a result of any activity associated with the action.

Impact trigger means one (1) identified **EPBC Act listed threatened species** or **EPBC Act listed migratory species** (or recognisable parts thereof) evidently killed by turbine strike in the **project area**.

Incident means any event which has the potential to, or does, **impact** on any **protected matter**.

Independent means a person(s) that does not have an individual or by employment or family affiliation, any conflicting or competing interests with the approval holder; the approval holder's staff, representatives or associated persons; or the project, including any personal, financial, business or employment relationship, other than receiving payment for undertaking the role for which the condition requires an independent person.

Independent audit/s means an audit conducted by an **independent** and **suitably qualified person** as detailed in the *EPBC Act Independent audit and Audit Report Guidelines* (2015), or subsequent revision.

Key impact areas for Dulacca Woodland Snail habitat means the 7 areas marked with red cross-hatching and designated as 'Key Impact Area' as shown in **Appendix B**.

Legally secure/d/ing means to secure a legal agreement under relevant Queensland legislation, in relation to a site, to provide enduring protection for the site against development incompatible with conservation.

Low-risk turbine means any turbine that has been assigned as a **low-risk turbine** if **EPBC Act listed threatened species** or **EPBC Act listed migratory species** have not been detected within the **vicinity** of the turbine for a minimum of two years.

Migratory period means each period during which either the **White-throated Needletail** or the **Fork-tailed Swift** are likely to be present in Australia, as described in the *Conservation Advice* Hirundapus caudacutus *White-throated Needletail* (2019) (or the subsequent currently authorised version) and the Species Profile and Threats Database (SPRAT) profile for the Fork-tailed Swift *Apus pacificus*.

Minister means the Australian Government Minister administering the **EPBC Act** including any delegate thereof.

Mitigation measures means measures developed by the proponent to mitigate any potential or additional reaching or exceeding of **impact triggers**.

Monitoring data means the data required to be recorded under the conditions of this approval.

Modelled quality scenario with offset means the modelled quality scenario with offset predicted results and associated scores as listed in Appendix C of the **BOP**.

Operation means all activities required to facilitate the generation of electricity from the wind farm occurring subsequent to the **first full operation** of the wind farm.

Period of risk means each period during which either the **White-throated Needletail** or the **Fork-tailed Swift** are likely to be present relevant to the **project area**, as described in the *Conservation Advice* Hirundapus caudacutus *White-throated Needletail* (2019) (or the subsequent currently authorised version) and the Species Profile and Threats Database (SPRAT) profile for the Fork-tailed Swift *Apus pacificus*, and as supported by the findings of utilisation surveys conducted in accordance with conditions 6 & 7.

Plan/s means any of the documents required to be submitted to the Department, implemented by the approval holder and/or **published** on its **website** in accordance with these conditions.

Preliminary documentation means the Dulacca Renewable Energy Project EPBC 2018/8368 - Preliminary documentation, dated 29 May 2020.

Project area means the total area where the **construction** and **operation** of the action will be undertaken, labelled as 'study area' in **Appendix A**.

Project infrastructure means any building, structure, fencing, access track, hardstand, laydown area **constructed** or upgraded as part of the wind farm and necessary to support the **operation** of the project.

Protected matter/s means a matter protected under a controlling provision in Part 3 of the **EPBC Act** for which this approval has effect.

Publish/ed/ing means make publicly available on the **website** for the duration of this approval.

Regional Ecosystem means a vegetation community in a bioregion that is consistently associated with a particular combination of geology, landform and soil as classified by the Queensland Government under the *Vegetation Management Act 1999* (Qld).

Risk profile means the risk of an individual wind turbine having an **impact** on an **EPBC Act listed threatened species** or **EPBC Act listed migratory species**.

Sensitive ecological data means data as defined in the Australian Government Department of the Environment *Sensitive ecological data – Access and Management Policy V1.0* (2016), or subsequent revision.

Shapefile means location and attribute information of the action provided in an Esri shapefile format. Shapefiles must contain '.shp', '.shx', '.dbf' files and a '.prj' file that specifies the projection/geographic coordinate system used. Shapefiles must also include an '.xml' metadata file that describes the shapefile for discovery and identification purposes.

Species stocking rate means the usage and/or density of the **Dulacca Woodland Snail** at the **Hermitage Property Offset area** as identified within the modelled offset quality scenarios within the **BOP**.

Suitably qualified ecologist means a person who has professional qualifications and at least three years of work experience designing and implementing surveys for the **EPBC Act listed threatened species** and/or **EPBC Act listed migratory species** and their habitat, and can give an authoritative

independent assessment and advice on the presence and habitat requirements of the **EPBC Act listed threatened species** and/or **EPBC Act listed migratory species** using relevant protocols, standards, methods and/or literature.

Suitably qualified person means a person who has professional qualifications, training, skills and/or experience related to the nominated subject matter and can give authoritative **independent** assessment, advice and analysis on performance relative to the subject matter using the relevant protocols, standards, methods and/or literature.

Turbine strike monitoring means the formal carcass searches as specified within the **BBMP**.

Vegetation and Fauna Management Plan means the *Dulacca Renewable Energy Project – Vegetation and Fauna Management Plan* dated 26 May 2020.

Vicinity means within a 350-metre radius of the turbines.

Website means a set of related web pages located under a single domain name attributed to the approval holder and available to the public.

Weed means the invasive weeds specified in the **Vegetation and Fauna Management Plan**.

White-throated Needletail means the White-throated Needletail (*Hirundapus caudacutus*) listed as a listed threatened and migratory species under the **EPBC Act**.

Year 5 means the period within five years from the date of the **commencement of the action**.

Year 10 means the period within ten years from the date of the **commencement of the action**.

Year 15 means the period within fifteen years from the date of the **commencement of the action**.

Year 20 means the period within twenty years from the date of the **commencement of the action**.

APPENDIX A

Figure 1: Project area (labelled as 'Study Area')

APPENDIX B

Figure 2: Dulacca Woodland Snail Habitat clearing limit (labelled as 'Key Impact Area') within the project area (labelled as 'Study Area')

ANNEXURE 3 – KABAN WIND FARM TRAFFIC IMPACT ASSESSMENT

AECOM Imagine it. Delivered.

Kaban Green Power Hub
Neoen Australia Pty Ltd
21-Dec-2017

Traffic Impact Assessment

Kaban Green Power Hub

Traffic Impact Assessment

Kaban Green Power Hub

Client: Neoen Australia Pty Ltd

ABN: 34 614 169 096

Prepared by

AECOM Australia Pty Ltd
Level 8, 540 Wickham Street, PO Box 1307, Fortitude Valley QLD 4006, Australia
T +61 7 3553 2000 F +61 7 3553 2050 www.aecom.com
ABN 20 093 846 925

21-Dec-2017

Job No.: 60526526

AECOM in Australia and New Zealand is certified to ISO9001, ISO14001 AS/NZS4801 and OHSAS18001.

Quality Information

Document	Traffic Impact Assessment
Ref	60528526 p:\605x\60528526\6. draft docs\6.1 reports\ss\tia\211217 60528526_kabangreenpowerhub_tia_rev0.docx
Date	21-Dec-2017
Prepared by	Preeti Singh
Reviewed by	Andrew Barrie

Revision History

Rev	Revision Date	Details	Authorised	
			Name/Position	Signature
A	21-Nov-2017	Draft for Client Comment	Mark Herod Project Manager	
0	21-Dec-2017	Final	Mark Herod Project Manager	

Table of Contents

Glossary

AADT	Annual Average Daily Traffic
AUL	Auxiliary left turn treatment
BAL	Basic left turn treatment
BAR	Basic right turn treatment
CHL	Channelised left turn treatment
CHR	Channelised right turn treatment
ESA	Equivalent Standard Axles
GARID	Guidelines for Assessment of Road Impacts of Development
HV	Heavy Vehicle
SCR	State-controlled road
SARs	Standard Axle Repetitions
SIDRA	Intersection analysis software
SISD	Safe Intersection Sight Distance
TIA	Traffic Impact Assessment
TMR	Department of Transport and Main Roads
TRC	Tablelands Regional Council

1.0 Introduction and Approach

1.1 Project Overview

AECOM Australia Pty Ltd (AECOM) have been commissioned by Neoen Australia Pty Ltd (Neoen) to undertake a Traffic Impact Assessment (TIA) for a proposed wind farm development known as the Kaban Green Power Hub (the Project). The Project is proposed to be constructed over a 12 month period in 2019, and be located on Lot 1 RP735194 and 2 on RP735194, as well as part of Lots 35 on CWL391, and Lots 33 and 34 on CWL374 (referred to as the Study Area), near Kaban, Queensland.

This TIA was undertaken in order to determine the potential impact that the construction and operation phases of the Project may have on the traffic operations of the surrounding road network. The outcomes of the TIA will be used in support of the Development Application which will be assessed by the State Assessment Referral Agency (SARA).

1.2 Methodology

The assessment methodology adopted for this TIA is summarised in the following key tasks:

- Broadly identify the existing transport infrastructure which may be impacted by the Project.
- Estimate the traffic generation associated with the construction and operation phases of the Project and the distribution of this traffic on the identified road network, including but not limited to the movement of turbine blades, nacelles, hubs and tower sections, in addition to the construction workforce.
- Assess the potential impact of the Project on the surrounding transport infrastructure during the construction and operation phases.
- Identify potential mitigation and management strategies to be implemented during the construction and operation phases to offset the impact of the Project (if required).

As outlined above, the adopted methodology centres on establishing a background, "without development" traffic scenario for the identified transport routes, and comparing this with a scenario including the Project generated traffic, i.e. the "with development" scenario. The process allows for the assessment of the traffic impacts of the Project in terms of road safety, access, intersections, link capacity, pavement and other infrastructure. Following this, if required, potential mitigation and management measures are formulated to address the potential traffic impacts caused by the Project.

1.2.1 Traffic Impact Assessment

The operational performance of the road network in the vicinity of the Project was assessed to understand the potential traffic impacts in terms of the percentage increase in traffic from the existing conditions and to identify the magnitude of the additional Project related traffic.

The development traffic volumes for both the construction and operational phases of the Project were calculated based on expected operational information provided and/or confirmed by Neoen (see **Appendix A**). The traffic volumes generated by the Project were then compared to the level of background traffic along the identified transport corridors to determine the likely level of impact. Where the Project generated traffic equals or exceeds 5% of the background traffic levels, the traffic operation of that road is considered to be impacted and consideration of how to best mitigate these impacts is required.

In addition to establishing the impact of the Project generated traffic on the surrounding road network, further assessment was also undertaken to assess the effect of additional traffic on the operation of the proposed main vehicle access to the Project site via the Tumoulin Road / Condon Road intersection.

1.2.2 Pavement Impact Assessment

A preliminary desktop pavement impact assessment was undertaken based on the existing background traffic data available for the relevant road sections. The heavy vehicle component of the Average Annual Daily Traffic (AADT) was calculated for the construction and operation period by adopting the background heavy vehicle percentages from the traffic data provided by the Department of Transport and Main Roads (TMR).

The development traffic volumes for the various construction stages were calculated based on the indicative construction activities and timelines (see **Section 4.2**). These traffic volumes were converted into Equivalent Standard Axles (ESA) based on the assumed heavy vehicle (HV) classes used on the Project and the appropriate ESA/HV rate for each vehicle class.

An ESA is a unit measurement which converts the wheel loads of traffic to an equivalent number of standard loads which is usually expressed in terms of the equivalent number of 80 kilo-Newtons (kN) single axle load. The ESA for the background HV component was calculated based on the HV splits provided for the relevant road sections.

Where the number of ESA of the additional Project related traffic equals or exceeds 5% of the background ESA, the pavement is considered to be impacted and further assessment is required. It should be noted that the 5% pavement comparison assessment is only designed to highlight potential areas of pavement impact, where further detailed investigation is required and is not by itself a conclusive remaining pavement life analysis.

1.3 Data Sources

The following data sources have been utilised in the preparation of this assessment:

- Data summarising the expected construction and operational phase activities, traffic movements and timings for the Project traffic as confirmed by Neoen. This data has been included for reference in **Appendix A**.
- Background traffic data for the relevant sections of the State-Controlled road network used to undertake this assessment was taken from historical AADT road segment report provided by TMR's ARMIS division. This data has been included for reference in **Appendix B**.

2.0 Development Context

2.1 Site Location

The proposed Study Area is located on Lot 1 RP735194 and 2 RP735194, as well as part of Lots 35 CWL391, Lot 33 34 CWL374 and Lot 34 CWL374 near Kaban, Queensland. These allotments are situated approximately 65 km west of Innisfail and 82 km south-west of Cairns. The location of the Study Area is shown in **Figure 1** below.

Figure 1 Study Area Location

2.2 Project Transport Routes

This section describes the road transport networks expected to be utilised by the Project.

- Turbine components (including blades, nacelles, cooling towers, hubs and tower sections) will be imported from overseas and will be transported by road to the Project site from the Port of Cairns.
- Gravel and concrete supplies not sourced on site will be imported from local businesses in Ravenshoe and transported by road to the Project site.
- Construction and operational phase workers will travel to site each day from nearby regional centres of Atherton and Ravenshoe.

Preliminary discussions were undertaken with the TMR Cairns office to identify key constraints for the proposed haulage operation to assist in identifying the optimal haulage route for the transport of the turbine components from the port facilities in Cairns to the Project site. Based on these discussions the following transport route was identified, as shown diagrammatically in **Figure 2**:

- Tingira Street, Cairns
- Aumuller Street, Cairns
- Bruce Highway (10P Innisfail – Cairns)
- Palmerston Highway (21A Innisfail – Ravenshoe)
- Malanda Millaa Millaa Road (641)
- East Evelyn Road (6404)
- Kennedy Highway (32B Mareeba - Ravenshoe)
- Tumoulin Road (6605)
- Condon Road, Kaban
- Hollands Road, Kaban

In addition to the turbine components, it is anticipated that the transport of concrete and gravel materials, as well as workers travelling to the Project site from Ravenshoe will access the Project via Tumoulin Road (6605).

Finally, it is expected that the following route will be utilised by workers travelling from Atherton to the Study Area, as also identified in **Figure 2**:

- Kennedy Highway (32B Mareeba - Ravenshoe)
- Tumoulin Road (6605)

Figure 2 Road network of relevance to the Project

2.2.1 Relevant Road Network

Based on the information provided above, the following sections of the road network were identified as relevant to this TIA.

2.2.1.1 Tingira Street, Cairns

Tingira Street provides the primary connection between the Port of Cairns and the Bruce Highway, via Aumuller Street. The link currently operates as a two-way two lane road, with provision of a wide carriageway (approximately 17 m) which is typical for industrial access class roads catering for a higher percentage of heavy vehicle movements.

No traffic volume data was currently available for Tingira Street, and as a result a conservative AADT of 500 vehicles per day (including 20% heavy vehicles) has been adopted for the purposes of this assessment.

2.2.1.2 Aumuller Street, Cairns

Aumuller Street provides a 600 m connection between Tingira Street in the east and the Bruce Highway to the west. The link generally provides a two way, two lane, median divided carriageway, with provision of centre median and shoulder parking in the section to the east of Cook Street. Further to this it is noted that a railway level crossing is located at the western end of Aumuller Street, approximately 50 m to the east of the intersection with Ray Jones Drive (Bruce Highway).

Traffic volume data was also currently unavailable for Aumuller Street, so a conservative AADT of 500 vehicles per day (including 20% heavy vehicles) was again adopted for the purposes of this assessment.

2.2.1.3 Bruce Highway (10P Innisfail – Cairns)

The Bruce Highway is part of the National Highway Network and joins Brisbane in the south to Cairns in the north. Travelling approximately 1,700 km this road is the primary road transport route for both passenger and road freight vehicles along the east coast of Queensland. The highway is typically a two way, two lane road with a posted speed limit of 100-110 km/h, except through the sections in built up areas through townships. The road is also an approved 23 and 25 m B-Double route.

Traffic volume data for the Bruce Highway was provided by the ARMIS division of TMR, and is provided in **Table 1**.

2.2.1.4 Palmerston Highway (21A Innisfail – Ravenshoe)

This section of the Palmerston Highway is a state controlled, east-west link connecting Innisfail to the township of Millaa Millaa. The road is approximately 54.5 km long, and is typically a two way two lane undivided road with. The highway is typically a two way, two lane road with a posted speed limit of 80-100 km/h. The road is also an approved 23 m and 25 m B-Double route.

Traffic volume data for the Palmerston Highway was provided by the ARMIS division of TMR and is provided in **Table 1**.

2.2.1.5 Malanda Millaa Millaa Road (641)

Malanda Millaa Millaa Road is a state controlled link connecting the township of Millaa Millaa to the Malanda township. The road is approximately 20.2 km long and is typically a two way two lane undivided road. The road has sections of steep vertical grade and curved horizontal alignment, with a posted limit of 100 km/hr and reduced speed limits in areas of severely curved geometry. The road is also an approved 23 m and 25 m B-Double route. Traffic volume data for Malanda Millaa Millaa Road was provided by the ARMIS division of TMR and is provided in **Table 1**.

2.2.1.6 East Evelyn Road (6404)

East Evelyn Road is a state controlled link connecting the township of Millaa Millaa to the Kennedy Highway. The road is approximately 10.7 km long and is typically a two way two lane road. Similar to the Malanda Millaa Millaa Road, East Evelyn Road has sections of steep vertical grade and curved horizontal alignment, with a posted limit of 100 km/hr, and reduced speed limits in areas of severely curved geometry. The road is also an approved 23 m and 25 m B-Double route. Traffic volume data for East Evelyn Road was provided by the ARMIS division of TMR and is provided in **Table 1**.

2.2.1.7 Kennedy Highway (32B Mareeba – Ravenshoe)

The Kennedy Highway is a state controlled link which runs between Smithfield in the north and the Gulf Developmental Road in the south. The road is approximately 243 km long, and is typically two way two lane road. The speed limit is typically 80 km/hr along the specified route in this assessment.

The Kennedy Highway between East Evelyn Road and Tumoulin Road is an approved 23 m and 25 m B-Double route, which coincides with the anticipated heavy vehicle route between Cairns and the Project site. The Kennedy Highway between Tolga to East Evelyn Road is not to be used by road trains or B-doubles. This extent coincides with the route taken by workers moving between Atherton and the Project site. Traffic volume data for the Kennedy Highway was provided by the ARMIS division of TMR and is provided in **Table 1**.

2.2.1.8 Tumoulin Road (6605)

Tumoulin Road is a state controlled link which connects the township of Ravenshoe with to the township of Herberton via the Kennedy Highway. The road is approximately 21 km long, and is typically a two way two lane road with a speed limit of 100 km/hr.

Traffic volume data for Tumoulin Road was provided by the ARMIS division of TMR and is provided in **Table 1**.

2.2.1.9 Condon Road, Kaban

Condon Road is a rural, local government road approximately 2.6 km long, providing a connection between Tumoulin Road and the Project site, via Hollands Road. Currently, the majority of the link is an unsealed gravel road with a typical width of approximately 4-4.5 m, however a sealed formation of approximately 6 m wide is provided on the last 100 m on the approach to the Tumoulin Road. A rail level crossing is also noted to be located on Condon Road, approximately 50 m from its intersection with Tumoulin Road.

Condon Road is understood to provide vehicular access to a small number of rural properties, with the unsealed sections of the link expected to operate as a two way, one lane road, while the slight increase in width provided by the sealed formation is expected to allow for two way, two lane operation.

No traffic volume data was currently available for Condon Road, and as a result, a conservative AADT estimate of 50 vehicles per day (including 10% heavy vehicles) has been adopted for the purposes of this assessment.

2.2.1.10 Hollands Road, Kaban

Hollands Road is another rural local government road that is proposed to be utilised as part of the connection of the Project site to Condon Road. The link currently provides access to a small number of rural properties and operates as an unsealed (gravel) two way, one lane road with a typical width of approximately 3.5 m-4 m.

Current traffic volume data was also not available for Hollands Road, with a conservative AADT estimate of 50 vehicles per day (including 10% heavy vehicles) again adopted for the purposes of this assessment.

3.0 Development Details

3.1 Development Layout

The Project will be developed across a number of allotments, including Lot 1 RP735194 and Lot 2 RP735194, as well as parts of Lot 35 CWL391, Lot 33 CWL374 and Lot 34 CWL374. The Project has a Study Area of approximately 1,330 hectares (ha) with access proposed to be provided via Hollands Road and Condon Road, from Tumoulin Road.

An extract of the proposed plan of development is provided in **Appendix C**. This layout identifies the proposed site access points and access road alignments, as well as the expected locations of the turbines, meteorology masts, substations, battery storage areas and construction and operational phase compound areas.

3.2 Preliminary Construction Plan

Based on information provided by Neoen, it is understood that construction of the Project is expected to commence in 2019, and is expected to involve the following construction activities over a 12 month period:

- Site establishment, including delivery of plant and site materials and components
- Construction of site access roads and site areas (laydown areas, batch plants and site compounds)
- Construction of up to 29 wind turbines, including turbine footings, transportation of turbine components and turbine erection
- Construction of substation and battery storage infrastructure
- Site establishment and construction of operation and maintenance facility.

Information confirmed by Neoen also identified that the construction program would consist of a 6 day work week (i.e. 24 day working month), with typically 12 hour work days. During certain construction activities, such as foundation pours and turbine lifts, works may be required to run longer than 12 hours for safety and quality purposes.

The anticipated timing of the construction activities for the Project are shown graphically in **Figure 3**, with further details provided in **Section 4.2**. It is noted that the dates and timeframes adopted for this assessment are indicative only and subject to change.

Figure 3 Proposed Development Program for the Project

3.3 Vehicle Access

As previously identified, it is proposed that access to the Project site from the external road network will be gained using Hollands Road and Condon Road via the intersection of Tumoulin Road / Condon Road. Currently the intersection is priority (Give Way) controlled and provides one traffic lane in both directions of travel on both the minor (Condon Road) and major (Tumoulin Road) approaches, with no designated turning lanes provided for movements entering Condon Road.

It is anticipated that the southern approach of this intersection will be used by the large heavy vehicles transporting turbine blades and components, as well as other heavy vehicles supplying construction materials from both Cairns and Ravenshoe. Staff travelling from Ravenshoe will also utilise the southern approach to the intersection.

While the northern approach of the intersection is expected to be utilised by staff travelling between Atherton and the Project site. The current intersection configuration is shown in **Figure 4** below.

Figure 4 Tumoulin Road / Condon Road Intersection Layout

To determine the appropriateness of the proposed main access point, an assessment of Safe Intersection Site Distances (SISD) at the Tumoulin Road / Condon Road intersection was undertaken. The SISD for the major road (Tumoulin Road) at this intersection has been calculated as per Equation 2 of Austroads *Guide to Road Design Part 4A: Unsignalised and Signalised Intersections* (2017). Based on an assumed design speed on 110 km/hr, the SISD was calculated as approximately 330 m for heavy vehicles.

Site inspections were undertaken on Friday 29 September 2017 to investigate the feasible and safe use of the proposed Project site access location. Based on this inspection it was determined that vehicles (including heavy vehicles) approaching from the north would have sight distances in excess of the requirement (330 m), as shown in **Figure 5**.

The southern approach was noted to have restricted sight lines due to adjacent vegetation around the approach curve to the intersection, as shown in **Figure 6**. However, it is anticipated that adequate sight distance will be available on the southern approach once vegetation clearing works are undertaken on the western side of the road to provide the required sight triangles to the intersection.

The additional traffic management controls, such as advanced warning advisory "truck turning" signage, could be provided on the Tumoulin Road approaches during the construction phase to further delineate the access intersection and reduce the potential for conflicts between construction traffic and opposing traffic.

Figure 5 Tumoulin Road / Condon Road- Looking North

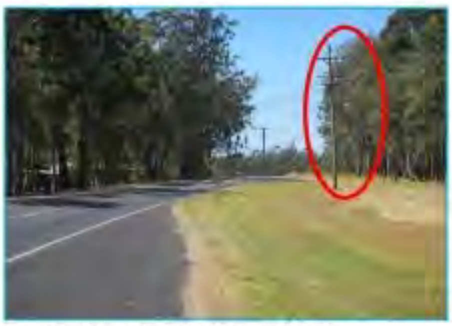


Figure 6 Tumoulin Road / Condon Road - Looking South

Based on the assessments identified above, and subject to the completion of visibility (vegetation) clearing on the southern approach, the Tumoulin Road / Condon Road intersection would be an acceptable access location and provide safe and efficient access to/from the Project site and the external road network for the traffic associated with the Project.

In addition to its location, the configuration of the proposed main site access at the Tumoulin Road / Condon Road was also investigated, with further details of the assessment into the required intersection treatment provided in **Section 5.2** of this report.

3.4 Internal Site Facilities

The current plan of development indicates the concept design alignments for the proposed internal access tracks and the locations for the operations and maintenance facility and construction compounds, noting that positioning and alignment of this infrastructure is preliminary only and may shift slightly (within 100m) during subsequent phases of design development.

Further to this it is noted that additional details regarding these elements of the site will be developed in subsequent design stages and that the design of internal access roads and parking facilities will be carried out in accordance with the requirements of all relevant standards, guidelines and policies.

4.0 Traffic Estimates

4.1 Background Traffic

4.1.1 Daily Traffic Volumes

The background traffic volumes for the road sections relevant to the Project were developed using the available AADT segment data provided by TMR, which is included for reference in **Appendix B**.

Based on the data provided by Neoen, it is anticipated that the traffic volumes generated during the construction phase of the Project will far exceed the operational phase traffic volumes. As such, the construction phase was taken as the period of peak traffic generation for the Project site, with the following assessments therefore considering the estimated traffic (background and construction) for 2019 only.

The historical five year growth rates (average growth rate, compounded annually) for the relevant road sections were applied to the expected background traffic volumes on the road in order to estimate background traffic in the proposed year of construction (2019). If the provided traffic data indicated that negative growth would be present on any given segment, the growth rate was taken to be zero.

A summary of the forecast background traffic volumes for each of the relevant road segments at the adopted design horizons for the proposed transport routes are provided in **Table 1** and **Table 2** below.

Table 1 Forecast Future Background AADT Traffic Volumes – Cairns to Kaban, including Ravenshoe to Kaban

Road (North to South)	Counter ID	Count Year	5-Yr Growth (per annum)	Background AADT	
				Count Year	2019
Bruce Highway (10P)	110030	2016	4%	30,656	34,589
	111635	2015	2%	38,575	41,091
	110025	2016	3%	34,648	37,612
	111632	2016	5%	20,343	23,230
	110032	2016	3%	18,254	19,749
	111648	2016	1%	10,849	11,180
	111647	2016	2%	7,404	7,752
	110001	2016	2%	5,923	6,372
	110040	2014	0%*	7,028	7,028
Palmerston Highway (21A)	111678	2016	0%*	4,026	4,026
	111525	2016	0%*	1,954	1,954
	110218	2016	1%	2,169	2,218
	110004	2016	2%	1,340	1,439
Malanda Millaa Millaa Road (641)	111646	2016	4%	2,090	2,361
East Evelyn Road (6404)	110077	2016	0%*	416	416
Kennedy Highway (32B)	111616	2016	2%	635	682
Tumoulin Road (6605)	111582	2016	0%*	3,569	3,569
	110559#	2016	2%	809	847

* Negative Historical Growth Rate has been revised to 0.0% for purpose of analysis

Full extent not affected

Table 2 Forecast Future Background AADT Traffic Volumes – Atherton to Kaban

Road (North to South)	Counter ID	Count Year	5-Yr Growth (per annum)	Background AADT	
				[illegible]	[illegible]
Kennedy Highway (32B)	111585	2016	3%	7,549	8,226
	110003	2016	2%	1,606	1,729
Tumoulin Road (6605)	110559#	2016	2%	809	847

** Negative Historical Growth Rate has been revised to 0.0% for purpose of analysis

Full extent not affected

4.1.2 Annual Pavement Loading

In addition to the current traffic volumes, estimates were generated for the forecast background pavement loadings for each of the identified road segments. Traffic loads on the pavement are defined in terms of ESA for granular pavements and Standard Axle Repetitions (SAR) for other pavement types. For this assessment, it was assumed that all relevant road segments will be granular pavements.

The ESA for the heavy vehicle component of background traffic was calculated based on the heavy vehicle percentages specified in the AADT segment data for the following vehicle types:

- Trucks and buses (Austroads Vehicle Class 1 – 5)
- Articulated vehicles (Austroads Vehicle Class 6 – 10)
- Road trains (Austroads Vehicle Class 10 – 12)

The ESAs/HV values used in the assessment were derived from TMR guidelines for axle mass limits in Queensland, with the assumption that 50% of heavy vehicles would be fully loaded (inbound to site), and 50% unloaded (outbound). Further to this, in order to be conservative, the average ESA/HV value within the broader vehicle class groupings was used, with the values adopted for the assessment identified below, with reference to **Figure 7**:

- Trucks and buses: 2.073 ESAs/HV
- Articulated vehicles: 3.211 ESAs/HV
- Road trains: 4.743 ESAs/HV.

	Vehicle Classes	Vehicle Configuration	Total Fully Loaded ESA	Unloaded ESA	Average ESA
Trucks & Buses	**Class 3**				
	2 Axle Rigid Truck		3.005	0.539	1.772
	Class 4				
	3 Axle Rigid Truck		3.588	0.499	2.043
	Class 5 (assumed load sharing)				
	4 Axle Twin Steer Rigid Truck		*4.133*	*0.671*	*2.402*
Articulated	**Class 6**				
	3 Axle Semitrailer		4.488	0.597	2.543
	Class 7				
	4 Axle Semitrailer		5.071	0.557	2.814
	Class 8				
	5 Axle Semitrailer		5.655	0.516	3.085
	Class 9				
	6 Axle Semitrailer		4.969	0.514	2.741
	Class 10				
	2 Axle Rigid Truck and 2 Axle Dog Trailer		5.972	0.655	3.313
	3 Axle Rigid Truck and 3 Axle Dog Trailer		7.138	0.574	3.856
	4 Axle Rigid Truck and 4 Axle Dog Trailer		*7.721*	*0.534*	*4.127*
Road Train	7 Axle B-Double		7.721	0.534	4.127
	8 Axle B-Double		7.035	0.532	3.783
	9 Axle B-Double		6.349	0.530	3.439
	Class 11				
	B Triple		7.730	0.545	4.137
	Type 1 Road Train		8.416	0.547	4.481
	Class 12				
	Type 2 Road Train		*11.863*	*0.580*	*6.221*
	BAB Quad		11.177	0.578	5.877
	ABB Quad		11.177	0.578	5.877

Figure 7 Heavy Vehicle Class - Loaded and Unloaded ESAs

Adopting these values, an estimate of the forecast background ESAs for each of the relevant road segments for the proposed year of construction was established, as summarised in **Table 3** below.

Table 3 Forecast Future Background Annual ESAs – Cairns to Kaban, including Ravenshoe to Kaban

Road (North to South)	Counter ID	Count Year	1B Trucks & Buses (%)	1C Articulated Vehicles (%)	1D Road Trains (%)	Background Annual ESA (2019)
Tingira Street, Cairns	NA	NA	Assumed 20% HV			131,267
Aumuller Street, Cairns	NA	NA	Assumed 20% HV			131,267
Bruce Highway (10P)	110030	2016	5.03%	0.97%	0.45%	1,978,870
	111635	2015	4.15%	0.70%	0.43%	1,933,062
	110025	2016	4.87%	1.07%	0.44%	2,143,889
	111632	2016	6.96%	1.82%	0.75%	2,020,268
	110032	2016	6.18%	1.51%	0.66%	1,498,505
	111648	2016	7.22%	2.34%	0.77%	1,066,285
	111647	2016	8.79%	3.17%	1.06%	945,732
	110001	2016	8.40%	3.43%	1.48%	824,410
	110040	2014	8.32%	3.11%	1.24%	849,410
Palmerston Highway (21A)	111678	2016	7.35%	1.54%	0.45%	327,890
	111525	2016	11.66%	4.72%	0.80%	307,524

Road (North to South)	Counter ID	Count Year	1B Trucks & Buses (%)	1C Articulated Vehicles (%)	1D Road Trains (%)	Background Annual ESA (2019)
	110218	2016	12.24%	6.73%	3.46%	513,210
	110004	2016	13.05%	6.68%	2.12%	307,603
Malanda Millaa Millaa Road (641)	111646	2016	10.52%	5.69%	3.09%	471,656
East Evelyn Road (6404)	110077	2016	11.65%	6.80%	4.85%	104,750
Kennedy Highway (32B)	111616	2016	7.83%	3.12%	1.00%	77,126
Tumoulin Road (6605)	111582	2016	6.41%	1.23%	0.06%	228,225
	110559#	2016	2%	10.02%	1.96%	87,138

** Negative Historical Growth Rate has been revised to 0.0% for purpose of analysis
# Full extent not affected

Table 4 Forecast Future Background ESAs – Atherton to Kaban

Road (North to South)	Counter ID	Count Year	1B Trucks & Buses (%)	1C Articulated Vehicles (%)	1D Road Trains (%)	Background Annual ESA (2019)
Kennedy Highway (32B)	111585	2016	3.99%	0.43%	0.00%	289,767
	110003	2016	10.11%	2.87%	0.87%	216,380
Tumoulin Road (6605)	110559#	2016	10.02%	1.96%	0.24%	87,138
Condon Road, Kaban	NA	NA	Assumed 10% HV			6,563
Hollands Road, Kaban	NA	NA	Assumed 10% HV			6,563

** Negative Historical Growth Rate has been revised to 0.0% for purpose of analysis
# Full extent not affected

4.2 Project Traffic Generation and Distribution

It is expected that there will be two different periods of traffic generation for the Project site, being the construction and operational phases. The traffic generation and distribution during both of these phases of the Project are discussed in the sections below.

4.2.1 Construction Phase

Neoen confirmed the following information regarding the proposed construction phase of the Project.

- Construction will commence in 2019 (pending approvals), with all construction activities to be completed in 12 months across a 24-day month and a 12-hr day
- Peak construction workforce will comprise of approximately 150 personnel
- Workers will travel to and from the Project site each day from towns including Atherton, Ravenshoe or Tumoulin
- Workers will be transported to the worksite by a combination of bus (15 person capacity) and personal vehicle (2-3 per vehicle) movements
- Turbine equipment will be transport by road to the Project site from the Port of Cairns.

The main traffic generating activities occurring within the construction phase of the Project are the construction materials delivery and the daily construction staff movements. Further details of these activities, including expected traffic generation and distribution are provided in the following sections

4.2.1.1 Materials Delivery Movements

It is understood that the major components for the Project are likely to be manufactured overseas, and transported from the Port of Cairns to the site via the Bruce Highway, Palmerston Highway, Malanda Millaa Millaa Road, East Evelyn Road, Kennedy Highway, Tumoulin Road and then via Condon Road and Hollands Road.

Concrete materials and road gravel required for the construction of internal access roads and substation and battery storage areas will be transported to the Project site from Ravenshoe along the same route the major components will travel between Ravenshoe and the Project site. It is expected that an off-site batch plant located in Ravenshoe will be utilised during the construction phase.

Quantities of equipment and materials were estimated based on information provided by Neoen and are generally consistent with wind farm projects of a similar magnitude, noting the following assumptions:

- 100% of concrete supplies (including aggregates) will be sourced off-site.
- 80% of road gravel materials are expected to be sourced on site, with the remaining 20% sourced off-site.
- 100% of the required construction water for road construction and dust suppression will be sourced off-site

A summary of the estimated number of vehicle movements on each of the identified transport routes required to deliver the components and materials across the construction period by task is presented in **Table 5** and **Table 6**.

Table 5 Material Delivery Movements – Cairns to Kaban

ID	Duration (Days)	Task	Cairns 1	2	3	4	5	6	7	8	9	10	11	12
A	48	Mobilisation	43	43										
B	56	Access Roads / Site Areas		[illegible]	[illegible]	[illegible]	[illegible]							
C	56	Turbine Footings				[illegible]	[illegible]	[illegible]	[illegible]					
D	48	Turbine Transportation						[illegible]	[illegible]					
E	56	Turbine Erection							[illegible]	[illegible]	[illegible]	[illegible]		
F	56	Substations / Battery Storage					23	23	23	23				
G	67	Cabling								[illegible]	[illegible]	[illegible]	[illegible]	
H	28	Finalisation / Demobilisation												[illegible]
		Total Vehicle Movements (One-Way)	43	43	8	8	23	195	195	32	9	9	9	136
		Peak Daily Movements (One-Way)	*2*	*2*	*0*	*0*	*2*	*8*	*8*	*2*	*1*	*1*	*1*	*8*

Table 6 Material Delivery Movements – Ravenshoe to Kaban

ID	Duration (Days)	Task	Ravenshoe 1	2	3	4	5	6	7	8	9	10	11	12
A	48	Mobilisation	0	0										
B	56	Access Roads / Site Areas		384	384	384	384							
C	56	Turbine Footings				[illegible]	[illegible]	[illegible]	[illegible]					
D	42	Turbine Transportation						[illegible]	[illegible]					
E	56	Turbine Erection							[illegible]	[illegible]	[illegible]	[illegible]		
F	56	Substations / Battery Storage					0	0	0	0				
G	56	Cabling								[illegible]	[illegible]	[illegible]	[illegible]	
H	24	Finalisation / Demobilisation												[illegible]
		Total Vehicle Movements (One-Way)	0	584	584	1024	1024	808	808	0	0	0	0	0
		Peak Daily Movements (One-Way)	*0*	*41*	*41*	*78*	*78*	*35*	*35*	*0*	*0*	*0*	*0*	*0*

Table 7 Material Delivery Movements - Total

ID	Duration (Days)	Task	Total 1	2	3	4	5	6	7	8	9	10	11	12
A	48	Mobilisation	43	43										
B	56	Access Roads / Site Areas		[illegible]	384	[illegible]	384							
C	56	Turbine Footings				[illegible]	[illegible]	[illegible]	[illegible]					
D	42	Turbine Transportation						[illegible]	[illegible]					
E	56	Turbine Erection							[illegible]	[illegible]	[illegible]	[illegible]		
F	56	Substations / Battery Storage					23	23	23	23				
G	70	Cabling								[illegible]	[illegible]	[illegible]	[illegible]	
H	24	Finalisation / Demobilisation												[illegible]
		Total Vehicle Movements (One-Way)	43	627	584	1024	1047	995	995	32	9	9	9	135
		Peak Daily Movements (One-Way)	*3*	*44*	*41*	*78*	*78*	*45*	*45*	*3*	*1*	*1*	*1*	*8*

As shown in **Table 5**, the maximum number of vehicle movements expected to be generated as part of the material delivery activities from Cairns is 10 return heavy vehicle movements per day in months 6 and 7. As shown in **Table 6**, the maximum number of vehicle movements expected to be generated as part of the material delivery activities from Ravenshoe is 76 return heavy vehicle movements per day in month 4.

Table 7 shows the total material delivery movements expected to be generated as part of the Project. The maximum number of vehicle movements is expected to be 78 return heavy vehicle movements per day in month 5, which equates to approximately 7 heavy vehicle movements per hour to/from Ravenshoe. Similar peak movements are expected to occur for only two months (month 4 and 5) of the Project's construction phase, with the remaining months expected to have movements in the range of 1 – 45 vehicles per day.

4.2.1.2 Construction Staff Movements

It is anticipated that the peak number of construction workers on site will be approximately 150 staff, and it is expected that all staff will travel to site from the nearby townships of Atherton and Ravenshoe.

It is also understood that the majority of the construction staff movements will be made to/from site using mini buses, with the remaining construction staff expected to carpool in groups of 2-3 and travelling to site in personal light vehicles.

For the purpose of estimating the construction staff related traffic movements to/from the Project site, the following assumptions (based on the information above) have been made:

- 50% of staff will travel to/from Atherton daily
- 50% of staff will travel to/from Ravenshoe daily
- 75% of staff will travel to/from the construction site via mini buses (with 15 staff per vehicle)
- 25% of staff will travel to/from the construction site in carpools of 2-3 using personal light vehicles.

Therefore, during the peak construction period when the full 150 workers are expected to be on site, the resultant daily and peak hour construction staff vehicle movements are expected to be as follows:

Table 8 Construction Staff Movement Summary

Movement	Daily Volumes (Round Trip)		AM Peak Hour (Inbound to Site)		PM Peak Hour (Outbound From Site)	
	Bus	LV	Bus	LV	Bus	LV
To / From Atherton	8	16	4	8	4	8
To / From Ravenshoe	8	16	4	8	4	8

4.2.1.3 Summary of Peak Construction Phase Movements

For the purpose of the assessment it has been conservatively assumed that the peak period for material delivery movements and the peak period for construction staff movements will coincide. Based on this assumption the following traffic volume estimates for the Project can be established:

Daily Movements (in the peak month)

- Staff vehicles to/from Atherton: 12 vehicles (4 bus and 8 light vehicles).
- Staff vehicles to/from Ravenshoe: 12 vehicles (4 bus and 8 light vehicles).
- Heavy vehicles to/from Ravenshoe: 78 vehicles.
- Heavy vehicles to/from Cairns: 10 vehicles.

AM Peak Movements (in the peak month)

- Staff vehicles from Atherton: 12 vehicles (4 bus and 8 light vehicles).
- Staff vehicles from Ravenshoe: 12 vehicles (4 bus and 8 light vehicles).
- Heavy vehicles from Ravenshoe or Cairns: 7 vehicles.

PM Peak Movements (in the peak month)

- Staff vehicles to Atherton: 12 vehicles (4 mini buses and 8 light vehicles).
- Staff vehicles to Ravenshoe: 12 vehicles (4 mini buses and 8 light vehicles).
- Heavy vehicles to Ravenshoe or Cairns: 7 vehicles.

4.2.2 Operational Phase

Information regarding the expected staff numbers associated with the operational phase of the Project has been estimated based on typical rates for similar operations. For this assessment, it has been assumed that 5 full-time staff that reside locally will be required for the operational phase of the Project. Assuming they will travel in light vehicles or 4WD to the Project site, with the same car occupancy rate assumed for the construction staff, this would generate a maximum of 14 round trip movements per week, or approximately 3 round trip movements per day.

5.0 Traffic Impact Assessment

5.1 Road Link Assessment

To determine whether the Project would have a 'significant' impact on the traffic operation of the surrounding road network, the traffic volumes expected to be generated by the Project were compared to the forecast base traffic volumes on the road network in the identified construction year (2019).

5.1.1 Construction Phase

The daily traffic volumes expected to be generated by the Project construction activities will be comprised of staff movements to and from the Project site, as well as vehicle movements associated with the transport of materials and the transport of turbine components from the Port of Cairns as discussed in the sections above. Peak staff movements were estimated to be 12 daily return trips to Ravenshoe and Atherton respectively, while the peak material delivery movements associated with the Project were identified to be 10 round trips per day between Cairns and the Project site and 78 round trips on the section of Tumoulin Road between Ravenshoe and site access intersection.

Table 9 Peak Traffic Comparison – Cairns to Kaban, including Ravenshoe to Kaban

Road Description	Counter ID	Background AADT	Development Traffic	% Increase
Tingira Street, Cairns	NA	500*	20	4.00%
Aumuller Street, Cairns	NA	500*	20	4.00%
Bruce Highway (10P)	110030	34,589	20	0.06%
	111635	41,091	20	0.05%
	110025	37,612	20	0.05%
	111632	23,230	20	0.09%
	110032	19,749	20	0.10%
	111648	11,180	20	0.18%
	111647	7,752	20	0.26%
	110001	6,372	20	0.31%
	110040	7,028	20	0.28%
Palmerston Highway (21A)	111678	4,026	20	0.50%
	111525	1,954	20	1.02%
	110218	2,218	20	0.90%
	110004	1,439	20	1.39%
Malanda Millaa Millaa Road (641)	111646	2,361	20	0.85%
East Evelyn Road (6404)	110077	416	20	4.81%
Kennedy Highway (32B)	111585	8,226	24	0.29%
	110003	1,729	24	1.39%
	111616	682	20	2.93%
Tumoulin Road (6605)	111582	3,569	180	**5.04%**
	110559#	847	180	**21.26%**
	110559##	847	24	2.83%
Condon Road, Kaban	NA	50*	204	**408.00%**
Hollands Road, Kaban	NA	50*	204	**408.00%**

South of Tumoulin Road / Condon Road Intersection / ## North of Tumoulin Road / Condon Road Intersection. / * Assumed background AADT as per **Section 2.2.1**

As shown in **Table 9**, the addition of the forecast peak construction traffic volumes from the Project is shown to have a negligible impact on the majority of road segments along the identified transport route. Sections which have an increase in traffic volumes of 5% or more include:

- Tumoulin Road (5.04%)
- Tumoulin Road, southern approach to Condon Road (21.26%).
- Condon Road, Kaban (408.00%)
- Hollands Road, Kaban (408.00%)

For Tumoulin Road, it is noted that this peak rate of traffic volume increase is only anticipated to occur for a maximum of 3-4 months, with the remaining construction period expected to generate considerably lower daily traffic volumes that are expected to fall below the 5% trigger. Further to this, while it is noted that the introduction of Project related traffic (construction phase) does increase the traffic volumes along this section of Tumoulin Road, the peak daily volumes is approximately 1027 vehicles per day (vpd), which is comfortably within the limits of operation for a two way, two lane, sealed rural road (typically 12, 000 vpd). As such, it is not anticipated that these additional Project volumes will lead to a significant impact on the traffic operation of this section of Tumoulin Road.

The local government controlled Condon and Hollands Road however are shown to significantly exceed the recommended 5% threshold (based on an assumed existing AADT of 50 vpd), with a peak increase in daily traffic volumes during the Project's construction phase of 408.00%. While this large percentage increase is primarily due to the low background or existing traffic volumes anticipated on these roads, the Project is still expected to lead to a peak increase of 204 vpd for approximately 2 months, approximately 130 vpd for approximately 4 months and then between 50-60 vpd for the remainder of the construction period, the large percentage of which are heavy vehicles. These additional volumes are anticipated to negatively impact the operation of the existing narrow two way, one lane configurations of both Condon Road and Hollands Road, raising concerns regarding the ability of vehicles travelling in opposite directions to safely pass. As such, measures may need to be implemented on these road sections to mitigate the impacts of the additional traffic volumes associated with the Project. These could include:

- Provide upgrade works to the narrow one lane sections of both Condon and Hollands Road to provide the recommended minimum pavement width of 5.5m for rural roads <100vpd as per Table D.17 of FNQROC Design Manual D1 Road Geometry (see **Figure 8** below). This additional width is proposed to improve the safety of vehicles and provide capacity for vehicles travelling in opposing directions to pass. Further to this, due to the short duration of construction works (12 months) for the Project and the negligible traffic volumes generated during its operational phase, no sealing works are proposed to be undertaken as part of the pavement widening works.

Table D1.4 Rural Road Elements [8]

Traffic Volume or Road Class	<100VPD [6]	100 – 999 [5]	1000 - 2999 (or rural collector)	>3000 (or sub-arterial)
Road Reserve (flat terrain ≤ 5%)	20m	20m	25m	To be designed in accordance with AUSTROADS or DMR design guidelines
Road Reserve [2] (Undulating/Hilly > 5%)	25m	25m	30m	
Formation	8m	8m	10m	
Pavement Width	5.5m	6.5m	8m	
Seal Width	4.5 [1,7]	6.5m	8m (incl. 0.5m sealed shoulders)	
Shoulders [9]	1.25m Approved Select material	0.75m gravel	1m gravel	
Desirable Speed Environment	100kph	100kph	100kph	
Design Speed for Individual Elements (Minimum)	80kph	80kph	80kph	

Figure 8 FNQROC Rural Road Design Criteria

- Alternatively, traffic management measures, such as traffic controllers or temporary signals, could be implemented along the lengths of Condon and Hollands Road to restrict the traffic to one direction of travel at a time, enabling the current narrow configurations of the roads to be utilised by Project traffic without the requirement to pass opposing traffic flows.

Therefore, conditional to the provision of appropriate mitigation measures on the relevant sections of Condon Road and Holland Road, it can be expected that there will be adequate "capacity" in each of the road segments along the identified transport routes to cater for the additional trips generated by the Project, and that the traffic impacts on the mid-block operation of each of the relevant road segments can be considered minimal.

5.1.2 Operational Phase

As previously identified, it is anticipated that the operational phase of the Project will have a peak generation of 14 round trip movements per week, or approximately 3 round trip movements per day, with these movements expected to originate locally and be made in either light truck or 4WD vehicles.

These volumes are very low and clearly equate to an increase in traffic volume on the surrounding road network of well below 5%. Based on this, it can be seen that the traffic impacts of the ongoing operation of the Project beyond 2019 can be considered negligible and no further traffic assessment of the relevant road links is deemed necessary.

5.2 Intersection Assessment

This section includes a review of the impacts of the additional traffic volumes generated by the Project on the operation of the proposed access intersection at Tumoulin Road / Condon Road. Based on the expected peak hour traffic volume forecasts, this intersection has the potential to be impacted from Project generated traffic.

The assessment only considered the traffic volumes generated during the construction phase of the Project as this was identified as the peak period of traffic generation from the site.

5.2.1 Traffic Volumes

In order to establish the traffic volumes at this intersection, the daily traffic volumes on Tumoulin Road were converted to a peak hour traffic volume by applying a 15% factor, in line with typical peak hour to AADT factors for a rural road as presented in Table 5.2 of TMR's *Road Planning and Design Manual*. Based on the application of this rate, the bi-directional peak hour traffic volume on Tumoulin Road (Site 110559) was estimated to be approximately 127 vehicles per hour (2019), or approximately 63 vehicles in each direction assuming a 50/50 directional split. In addition, in the absence of current count data at the intersection, two additional vehicles movements have been assumed for each of the turn movements at the intersection during the peak hours to represent existing traffic movements.

For the purposes of the assessment it has been assumed that the relevant peak hours for traffic movements at the proposed site access during the construction phase will coincide with the arrival and departure of Project staff. Based on the volumes previously identified in **Section 0**, this equates to the following AM and PM peak hours during the construction phase (i.e. background and development traffic volumes) as shown in **Figure 9** and **Figure 10** respectively.

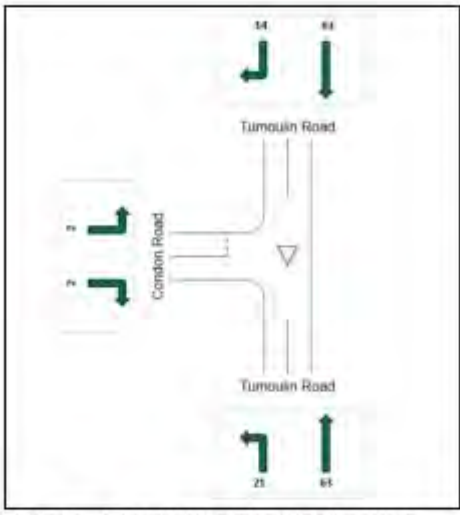


Figure 9 AM Peak Access Intersection Movements (total vehicles / hour)

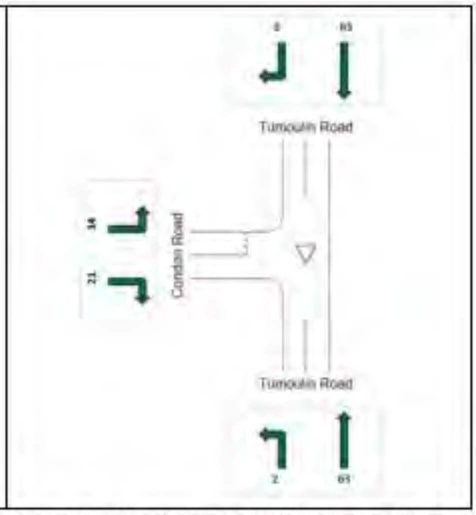


Figure 10 PM Peak Access Intersection Movements (total vehicles / hour)

AADT Site 110559 used for background volumes

5.2.2 Turn Warrants Assessment

A turn warrants assessment was undertaken for the estimated construction phase turning movements at the Tumoulin Road / Condon Road intersection into the site access to establish potential turn treatment requirements. The traffic volumes outlined above were utilised to assess the turn warrants at the proposed access intersections, based on the limits presented in TMR's *Supplement, Traffic and Road Use Management, Volume 1 – Guide to Traffic Management, Part 6: Intersections, Interchanges and Crossings* (2015).

This assessment is presented in **Figure 11** below, with further information provided in **Appendix D**.

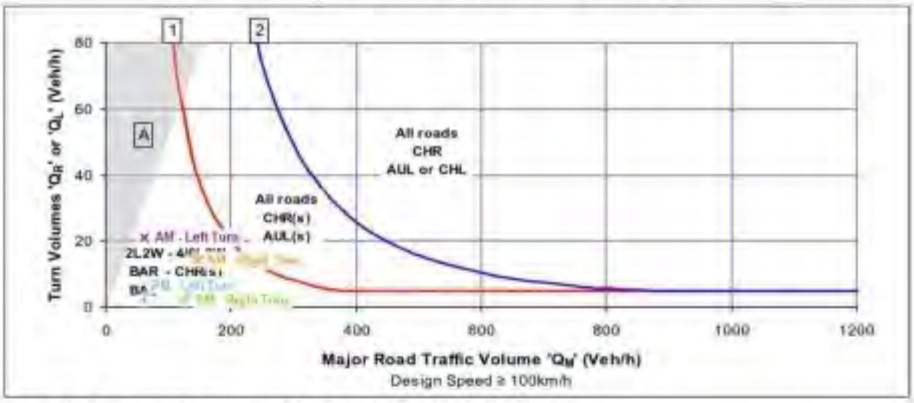


Figure 11 Turn warrants assessment for Tumoulin Road / Condon Road

Figure 11 shows that the expected construction phase traffic volumes at the Tumoulin Road / Condon Road intersection were shown to warrant Basic Right Turn (BAR) and Basic Left Turn (BAL) treatments for turning vehicles on Tumoulin Road, noting the relatively small turning and opposing traffic volumes forecast.

However, due to the temporary nature of the construction movements at the intersection as a result of the short construction time period for the Project (12 months), it considered that the construction of

BAL / BAR turn treatments at the access intersection is not necessary, and that the existing configuration of the Tumoulin Road / Condon Road intersection is expected to be adequate to cater for the proposed "in construction" traffic volumes.

Further to this, if requested, additional traffic management controls such as advisory "truck turning" signage could be provided on the approaches to the intersection during the construction phase of the Project to further delineate the access locations and reduce the potential for conflicts between construction traffic and opposing traffic movements.

5.2.3 Design Vehicle Swept Path

While it is noted that an oversized heavy vehicle configuration is proposed to be utilised to transport the large turbine components for the Project between the port facilities in Cairns and the Project site, the geometric requirements of these transport vehicles has not been considered as part of this assessment, with a separate preliminary route assessment undertaken to identify the temporary works requirements (including asset relocation and formation widenings) to accommodate the short term operation of these vehicles along the identified transport route.

Notwithstanding this, the proposed site access via the existing intersection of Condon Road with Tumoulin Road will be utilised by a number of other heavy vehicles during the proposed construction period, namely 19 m Articulated Vehicle (AV) and truck and trailer combinations. Preliminary swept path analysis was undertaken for these heavy vehicle movements over the current configuration of the intersection, the results of which (refer **Figure 12** below) indicated that the heavy vehicles would require the entire width of the minor Condon Road approach to complete the required turn movements. Further details of the swept path analysis undertaken can be seen in **Appendix E**.

Figure 12 19 m Articulated Vehicle Swept Paths – Existing Intersection Extents

As such it is recommended that the minor works be provided on the south-western corner of the intersection to widen the "throat" of the minor Condo Road approach to provide sufficient extents to contain the incoming heavy vehicle movements within the inbound traffic lane, reducing the potential for conflict with vehicles travelling in the opposite direction on Condon Road. The approximate extents of these intersection widening works and the revised entry vehicle swept path are shown in **Figure 13** below.

Figure 13 19m Articulated Vehicle Swept Paths – Modified Intersection Extents

Based on the information provided above, it can be seen that, on condition of the provision of the identified minor widening works, that the proposed site access intersection (Tumoulin Road / Condon Road) will be appropriate to cater for the typical vehicle movements[1] associated with the construction phase of the Project.

[1] Note that further temporary works at the intersection are anticipated to be required to accommodate the turbine component transport vehicles, with further details of these movements provided in the preliminary route assessment undertaken for the Project.

5.3 Operation of Rail Level Crossings

5.3.1 Aumuller Street Crossing

Figure 14 Rail Level Crossing (North Coast Line) – Aumuller Street, Cairns

As shown in **Figure 14** above, the existing configuration of the rail level crossing of Aumuller Street across the North Coast line currently provides vehicle control measures including flashing lights and boom gates.

Based on the traffic forecasts shown in **Table 9** above, it can be seen that the peak Project construction movements expected to utilise the crossing is 20 vehicles per day, or approximately 2 per hour (1 in each direction). Further to this, it is not anticipated that any vehicle movements associated with the Project will utilise the crossing outside the proposed 12 month construction period. As such, it is not expected that the additional movements generated by the Project will significantly impact the operation of the crossing and that the current crossing configuration (control measures) can be considered adequate.

5.3.2 Condon Road Crossing

Figure 15 Rail Level Crossing – Condon Road, Tumoulin

Figure 15 identifies the current configuration of the open level rail crossing provided on Condon Road in Tumoulin. It is understood that the rail line at the crossing is only infrequently used (typically one movement in each direction on Sundays) as part of the Ravenshoe Heritage Steam Railway, which operates between Ravenshoe and Tumoulin as part of local tourist operations.

While the Project is identified to generate 98 additional traffic movements over the crossing at the peak of construction operations, based on the infrequent nature of the train movements (typically outside the proposed working week for construction), the relatively short timeframe for the increased traffic movements during construction (12 months) and the negligible traffic volumes expected over the crossing during the operational phase of the Project the existing configuration (and controls) of the crossing is anticipated to be appropriate to cater for traffic associated with the Project.

Further to the comments above, it is recommended that further discussion be undertaken with the relevant rail authorities regarding each of the level crossings identified above to establish the requirements for any further investigations, including the Australian Level Crossing Assessment Model (ALCAM).

Notwithstanding this, due to short timeframes identified for construction (12 months) and the negligible traffic volumes generated during the operational phase of the Project it is not anticipated that any permanent control measures at any rail crossings are required to be provided as part of the development of the Project.

6.0 Preliminary Pavement Impact Assessment

A preliminary desktop analysis was undertaken to identify the likely magnitude of pavement impacts on the relevant road network due to the additional heavy vehicle movements generated by the Project. Where the pavement loadings of the additional Project related traffic equals or exceeds 5% of the background loadings, the pavement is considered to be significantly impacted. It should be noted that the 5% pavement comparison assessment is only designed to highlight potential areas of pavement impact and is not by itself a conclusive analysis on the likely impact to the road network.

6.1.1 Construction Phase

The assessment of potential pavement impacts of the Project involved comparison of the annual ESA associated with the background traffic volumes on the road link with the expected ESA from the development traffic over the construction phase of the Project.

Table 10 shows the assumed vehicle classes that are likely to be used throughout the construction phase of the Project by their associated task and their average ESAs/HV. As stated in **Section 4.1.2**, the average ESAs assumes that the vehicles arrive to the Project site fully loaded and then travel back on the same route unloaded.

Further to this, it is noted that the exact configuration of the heavy vehicle configuration proposed to transport the large turbine components is yet to be confirmed. Therefore, for the purpose of this assessment, the average ESAs/HV value for a typical Type 2 Road Train configuration has been conservatively adopted to estimate the traffic loadings generated by the turbine component transport activities.

Table 10 Assumed vehicle class and ESA values for development traffic

Vehicle Class	Vehicle Configuration	Tasks	Average ESAs/HV
6 Axle Semitrailer		Transportation of reinforcing steel, as well as components for the establishment of batch plants, construction compound, battery storage and operations and maintenance facility	2.741
4 Axle Rigid Truck and 4 Axle Dog Trailer		Transportation of concrete aggregates, high voltage cable rolls, road materials (pavement and subgrade) and gravel	4.127
Type 2 Road Train	** INDICATIVE ONLY – VEHICLE CLASS IDENTIFIED FOR PRELIMINARY VEHICLE LOADING ASSESSMENT	Transportation of turbine blades, nacelles, cooling towers, turbine hubs and tower sections, as well as cranes and meteorology masts	6.221

A summary of the expected increase in ESAs along the relevant road links as a result of the Project generated traffic is provided in **Table 11**, with high level ESA calculations provided for reference in **Appendix F**.

Table 11 Pavement Comparison, Cairns to Kaban (including Ravenshoe to Kaban)

Road (North to South)	AADT Counter	Background Annual ESA	Project Generated Annual ESA	% Increase
Tingira Street, Cairns	NA	131,267	5,700	4.34%
Aumuller Street, Cairns	NA	131,267	5,700	4.34%
Bruce Highway (10P)	110030	1,978,870	5,700	0.29%
	111635	1,933,062	5,700	0.29%
	110025	2,143,889	5,700	0.27%
	111632	2,020,268	5,700	0.28%
	110032	1,498,505	5,700	0.38%
	111648	1,066,285	5,700	0.53%
	111647	945,732	5,700	0.60%
	110001	824,410	5,700	0.69%
	110040	849,410	5,700	0.67%
Palmerston Highway (21A)	111678	327,890	5,700	1.74%
	111525	307,524	5,700	1.85%
	110218	513,210	5,700	1.11%
	110004	307,603	5,700	1.85%
Malanda Millaa Millaa Road (641)	111646	471,656	5,700	1.21%
East Evelyn Road (6404)	110077	104,750	5,700	5.44%
Kennedy Highway (32B)	111585	289,767	0	0
	110003	216,380	0	0
	111616	77,126	5,700	7.39%
Tumoulin Road (6605)	111582	228,225	38,301	16.78%
	110559#	87,138	38,301	43.95%
	110559**	87,138	0	0
Condon Road, Kaban	NA	6,563	38,301	583.56%
Hollands Road, Kaban	NA	6,563	38,301	583.56%

South of Tumoulin Road / Condon Road intersection.

** North of Tumoulin Road / Condon Road intersection.

As shown in **Table 11** above, the addition of the construction phase ESAs generated by the Project was shown to be less than 5% for the majority of road segments. The following road segments have construction phase ESAs that are expected to exceed the 5% trigger:

- East Evelyn Road, between Malanda Millaa Millaa Road and Kennedy Highway (5.44%)
- Kennedy Highway, between East Evelyn Road and Tumoulin Road (7.39%)
- Tumoulin Road, between the Kennedy Highway and Condon Road (16.78% - 43.95%)
- Condon Road, Kaban (583.56%)
- Hollands Road, Kaban (583.56%).

Whilst the increase in ESA on these sections could be deemed significant based on the typical 5% increase trigger, the impact of the Project on the existing road pavements along these links is anticipated to be minimal for the following reasons:

- The large percentage increase calculated for Tumoulin Road, south of the Condon Road intersection, is primarily due to the low background traffic volumes on the link. It is noted that the estimated daily traffic volume during construction is only 1027 vehicles per day, including a peak Project generation of approximately 90 vehicle movements (78 heavy vehicle) per day along this section of road.
- The percentage impact along the Kennedy Highway, between East Evelyn Road and Tumoulin Road is again primarily due to the low background volume, noting that the estimated daily traffic volume for this section is approximately 702 vehicles per day, with the Project anticipated to generate no more than 20 heavy vehicle movements per day.
- The percentage impact along East Evelyn Road is again primarily due to the low background volume, noting that the estimated daily traffic volume for this section is approximately 436 vehicles per day, with the Project anticipated to generate no more than 20 heavy vehicle movements per day.
- The proposed construction activities are only expected to occur over a period of 12 months, with negligible traffic volumes associated with the ongoing operational phase of the Project. Considering the potential impact is over a relatively short timeframe and is not an ongoing impact, the heavy vehicle movements associated with the Project are not expected to induce undue degradation of the existing sealed road pavements.
- The largest percentage increase (584%) in vehicle loadings is identified on Condon Road and Hollands Road, which are unsealed rural roads that cater for very minor traffic flows associated with adjacent properties. Due to the unsealed nature of the existing pavements along these road sections, the typical impact assessment method based on vehicle loadings is not relevant, with the key considerations regarding the impact caused by additional heavy traffic volumes relating to the potential increase in frequency of maintenance (grading) and rehabilitation (gravel re-sheeting) works associated with the increased traffic.

  It is therefore recommended that mitigation measures be undertaken to offset the potential impacts of the Project on the unsealed pavement sections of both Condon Road and Hollands Road. Whilst further discussions with Council will be required to establish the acceptable mitigation measures, it is noted that such measures may include taking responsibility for the maintenance works along these road sections during the construction period for the Project, with works being undertaken to ensure compliance with Council's maintenance intervention standards.

7.0 Road Safety, Environment and Amenity Assessment

7.1 Road Safety

The majority of the road sections included in the identified transport routes for the Project are part of approved B-double routes. As such, it can reasonably be expected that that these roads could be safely used by the majority of heavy vehicles likely to be generated by the Project during the construction phase, which are expected to be limited to 19 m articulated vehicles (semi-trailers) and rigid truck and trailer combinations.

It is however noted that special oversized transport vehicles are proposed to be utilised to transport the turbine components to the Project site from the Port of Cairns. These transport movements are proposed to be undertaken under special permits and with designated escort vehicles. A preliminary route assessment has also been undertaken for the proposed turbine component transport movements, which identifies the conflict or pinch points along the proposed transport route and identifies where modifications or temporary works are required to the existing road environment to accommodate the proposed transport vehicle. The provision of the identified modification works and the completion of the movements under escort are anticipated to significantly minimise the safety implications of the component haulage operation.

The site access investigations outlined in **Section 3.3** concluded that adequate SISD is available for vehicles from the north approach of the Tumoulin Road / Condon Road intersection, and that adequate sight distances are expected to be available on the south approach to the intersection upon the completion of minor vegetation clearing on western side of the carriageway.

In addition, the assessment of the two key rail level crossings on Aumuller Street and Condon Road identified that the existing configuration (and controls) were expected to be adequate to cater for the additional traffic volumes generated by the Project.

Further to this, the implementation of the proposed minor upgrade works to the Tumoulin Road / Condon Road intersection and the mitigation measures identified to improve the mid-block operation of Condon Road and Hollands Road are expected to improve the safety of vehicle movements and minimise the potential conflicts associated with the additional traffic movements associated with the Project.

Based on this, it is not expected that the proposed construction or operational phases of the Project will lead to any significant reductions in operational safety of the surrounding road network.

7.2 Environment and Amenity

The primary environmental and amenity concern relating to the forecast increase in traffic volumes as a result of construction and operational phases of the Project is the possibility for a corresponding increase in traffic noise along the proposed vehicle transport routes.

However, the majority of the proposed transport routes associated with the Project travel through rural areas with limited residential properties. This coupled with the minor increases in traffic volumes and the proposed use of existing heavy vehicle routes has led to the conclusion that the anticipated noise and amenity impacts of the Project will be negligible.

8.0 Summary and Conclusions

8.1 Traffic Impacts

It was identified that the traffic generated during the construction activities of the Project would likely utilise the state-controlled road network, including sections of the Bruce Highway, Palmerston Highway and Kennedy Highway, as well as Malanda Millaa Millaa Road, East Evelyn Road and Tumoulin Road. From this, two primary routes were identified:

- Cairns to the Project site, including vehicle movements travelling from Ravenshoe to the Project site
- Atherton to the Project site

It was established that relatively low volumes of traffic were expected to be generated by the Project throughout both the construction and operational phases along each of the primary routes, with maximum daily traffic movements (round trip) in the order of 10 vehicles per day between Cairns and the Project site, 40 vehicles per day between Ravenshoe and the Project site, and 9 vehicles per day between Atherton and the Project site.

The traffic impact assessment of the affected road network showed that the relatively low volumes associated with the Project typically had minor impact on the traffic operations of the road segments along the identified transport routes, with the expected increases in traffic volumes not exceeding the 5% threshold to be considered significant for the majority of the road sections. For the sections where the 5% threshold was exceeded, it was deemed that this was primarily due to the low background traffic along these sections and that the forecast "in construction" traffic volumes were generally within the operating limits of the respective road segments.

It was identified however that the additional traffic volumes generated by the Project would lead to a significant impact on the traffic operation of the local government controlled, rural sections of Condon and Hollands Road, with a peak increase in daily traffic volumes during the Project's construction phase of 196%. These additional traffic volumes are anticipated to negatively impact the operation of the existing narrow two way, one lane configurations of both Condon Road and Hollands Road, raising concerns regarding the ability of vehicles travelling in opposite directions to safely pass along the route.

It is therefore recommended that measures be implemented on the Condon and Hollands Road sections to mitigate the impacts of the additional traffic volumes associated with the Project. These could include:

- Provide upgrade works to the narrow one lane sections of both Condon and Hollands Road to provide the recommended minimum pavement width of 5.5m for rural roads <100vpd as per Table D.17 of FNQROC Design Manual D1 Road. The additional width is proposed to improve the safety of vehicles and provide capacity for vehicles travelling in opposing directions to pass. However due to the short duration of construction works (12 months) for the Project and the negligible traffic volumes generated during its operational phase, it is noted that no sealing works are proposed to be undertaken as part of the potential pavement widening works.
- Alternatively, significant traffic management measures, such as traffic controllers or temporary signals, could be implemented along the lengths of Condon and Hollands Road to restrict the traffic to one direction of travel at a time, enabling the current narrow configurations of the roads to be utilised by Project traffic without the requirement to pass opposing traffic flows.

Therefore, conditional to the provision of appropriate mitigation measures on the relevant sections of Condon Road and Holland Road, it can be expected that there will be adequate "capacity" in each of the road segments along the identified transport routes to cater for the additional trips generated by the Project, and that the traffic impacts on the mid-block operation of each of the relevant road segments can be considered minimal.

In regards to the operation of the main site access intersection at Tumoulin Road / Condon Road, the turn warrants assessment undertaken established that while the peak traffic volumes forecast at the intersection was shown to warrant Basic Right Turn (BAR) and Basic Left Turn (BAL) treatments for turning vehicles on Tumoulin Road, based on the temporary nature (12 months) of the construction movements at the intersection the requirement to construct such turn treatments at the intersection was not necessary. It was noted however that if requested, additional traffic management controls such as advisory "truck turning" signage could be provided on the approaches to the intersection during the construction phase of the Project to further delineate the access locations and reduce the potential for conflicts between construction traffic and opposing traffic movements.

Finally, the review of the design vehicle swept paths at the intersection identified a requirement for minor intersection widening works to the south-wester corner of the Tumoulin Road / Condon Road intersection to provide sufficient extents to contain the incoming heavy vehicle movements within the inbound traffic lane, reducing the potential for conflict with vehicles travelling in the opposite direction on Condon Road.

8.2 Pavement Impacts

A preliminary desktop pavement impact assessment for the relevant road network was undertaken for the construction phase of the Project. The assessment showed that the impact did not exceed the 5% threshold to be considered significant for the majority of the assessed road sections. Although some segment exceeded the 5% threshold, it is anticipated that the impact on the pavement along these links will not be significant due to the following reasons:

- Low background traffic volumes using the link
- Low number of heavy vehicle movements expected to be generated by the Project
- Relatively short construction timeframes for the Project.

Large increases (approximately 475%) in vehicle loadings were however identified on the rural unsealed sections of Condon Road and Hollands Road. Due to the unsealed nature of the existing pavements along these roads it is noted that the typical impact assessment method based on vehicle loadings is not generally applicable, and that the key consideration would relate to the potential increase in frequency of maintenance (grading) and rehabilitation (gravel re-sheeting) works associated with the increase in traffic volumes.

It is therefore recommended that mitigation measures be undertaken to offset the potential impacts of the Project on the unsealed pavement sections of both Condon Road and Hollands Road. Whilst further discussions with Council will be required to establish the acceptable mitigation measures, it is noted that such measures may include taking responsibility for the maintenance works along these road sections during the construction period for the Project, with works being undertaken to ensure compliance with Council's maintenance intervention standards.

8.3 Road Safety, Environment and Amenity

In regards to the safety assessment for the Project, it is noted that all of the State Controlled Roads that have been identified to form part of the proposed heavy vehicle haulage route for the Project are currently approved B-Double routes, and as such it could reasonably be expected that each of these roads could be safely used by the standard heavy vehicles used as part of the construction phase of the Project.

Due to the abnormally sized design vehicle (approximately 92 m) that will be used to transport the turbine blades to the Project site from the Port of Cairns, a separate Route Assessment has been undertaken. This document details pinch points along the route where modifications to the existing road environment may be required in order for the design vehicle to safely pass.

A preliminary assessment of the Tumoulin Road / Condon Road intersection SISD was undertaken, which showed that heavy vehicles would require approximately 332 m of sight distance. This SISD is achieved on the north approach of the intersection. However, vegetation located on the left hand side of the south approach may impede the sight distance of vehicles travelling on this approach. As a result, removal or trimming of this vegetation may be required.

In addition, the assessment of the two key rail level crossings on Aumuller Street and Condon Road identified that the existing configuration (and controls) were expected to be adequate to cater for the additional traffic volumes generated by the Project.

Further to this, the implementation of the proposed minor upgrade works to the Tumoulin Road / Condon Road intersection and the mitigation measures identified to improve the mid-block operation of Condon Road and Hollands Road are expected to improve the safety of vehicle movements and minimise the potential conflicts associated with the additional traffic movements associated with the Project.

The primary environmental and amenity concern relating to the forecast increase in traffic volumes as a result of construction and operational phases of the Project is the possibility for a corresponding increase in traffic noise along the proposed vehicle transport routes. The minor increases in traffic volumes and the proposed use of existing heavy vehicle routes has led to the conclusion that the anticipated noise and amenity impacts as a result of the Project will be negligible.

8.4 Conclusion

In light of the information provided above it is considered that subject to the provision of the identified mitigation measures the Project will have a minimal impact on the traffic operation and road pavements of the surrounding road network under the proposed construction and operational conditions considered in this TIA.

Appendix A

Kaban Green Power Hub Operational Information (Neoen)

Site Properties

Site Components

Element	Qty	Unit
Number of Turbines	29	ea
Length of Access Road	19,000	m
Number of Substations	1	ea
Number of Site Laydown Areas	3	ea
Number of Site Batch Plant Areas	2	ea
Number of Site Construction Compound Areas	2	ea
Number of Site Battery Storage Areas	1	ea
Number of Site Operational and Maintenance Facility Areas	2	ea
Number of Meteorology Masts	4	ea

Site Areas (Each Area)

Element	Qty	Unit
Substation Area	10,000	m2
Laydown Area	10,000	m2
Batch Plant Area	10,000	m2
Construction Compound Area	10,000	m2
Battery Storage Area	40,000	m2
Operational and Maintenance Facility	10,000	m2

Material Assumptions

Element	Qty	Unit
Road Width	8	m
Road Pavement Depth	0.1	m
Road Subgrade Depth	0.4	m
Substation Area Gravel Depth	0.3	m
Laydown Area Gravel Depth	0.6	m
Batch Plant Area Gravel Depth	0.3	m
Construction Compound Area Gravel Depth	0.3	m
Battery Storage Area Gravel Depth	0.3	m
Operational and Maintenance Facility Gravel Depth	0.3	m
Water for dust suppression	1	ML
Water for hardstands	0.5	ML

Site Component Vehicle Movements

Element	Task	Qty per Turbine	Unit	Site Qty	Vehicle Type	Vehicle Capacity	Movements
Concrete for footings	C	600	m3	17400	Concrete Truck	5.4	3222
Reinforcing steel for footings	C	2	each	58	Semi	1	58
High Voltage Cable Rolls	G	1.25	each	36.25	Truck Trailer	1	36
Turbine Blades	D	3	each	87	Special	1	87
Turbine Nacelles	D	1	each	29	Special	1	29
Turbine Cooling Towers	D	1	each	29	Special	1	29
Turbine Hubs	D	1	each	29	Special	1	29
Tower Sections	D	3	each	87	Special	1	87
Misc. Cranes and other heavy equipment (A)	A	1	each	29	Special	1	29
Misc. Cranes and other heavy equipment (H)	H	1	each	29	Special	1	29
Meteorology masts	D	1	Mast	4	Special	1	4
						Total	3639

Additional Material / Component Quantities

Element	Task	Qty per Unit	Unit	Site Qty	Vehicle Type	Vehicle Capacity	Movements
Substation establishment	F	40	per Area	40	Semi	1	40
Construction compound establishment (A)	A	56	per Area	112	Semi	2	56
Construction compound establishment (H)	H	56	per Area	112	Semi	2	56
Battery storage establishment	F	50	per Area	50	Semi	1	50
Operational and maintenance facility establishment	H	50	per Area	50	Semi	1	50
Water for road construction and dust suppression	B	1	per km	19	Body Truck	0.015	1267
Water for hardstands	B	0.5	per turbine	14.5	Body Truck	0.015	967
						Total	2483

Construction Materials

Element	Task	Qty per Unit	Unit	Site Qty	Vehicle Type	Vehicle Capacity	20% Movements	80% Movements	100%
Road Pavement	B		m3	15200	Truck Trailer	20	152	608	760
Road Subgrade	B		m3	60800	Truck Trailer	20	608	2432	3040
Substation Area Gravel	B		m3	3000	Truck Trailer	20	30	120	150
Laydown Area Gravel	B		m3	18000	Truck Trailer	20	180	720	900
Construction Compound Area Gravel	B		m3	6000	Truck Trailer	20	60	240	300
Battery Storage Area Gravel	B		m3	12000	Truck Trailer	20	120	480	600
Operational and Maintenance Facility Area Gravel	B		m3	6000	Truck Trailer	20	60	240	300
% Gravel Materials Sourced Onsite		80%							
% Gravel Materials Imported		20%							

Appendix B

Traffic Count Data

TARS

Traffic Analysis and Reporting System

AADT Segment Analysis Report (Complete)

Road Section: 10F - BRUCE HIGHWAY (INNISFAIL - CAIRNS)

Traffic Year: 2016

Road Segments Summary - All Vehicles

Region	Segment Start Tdist	Segment End Tdist	Site	Site Tdist	Description	AADT G	AADT A	AADT B	VKT (Millions) G	VKT (Millions) A	VKT (Millions) B	Data Year	Page
403	[illegible]	[illegible]	[illegible]	[illegible]	Railway Crossing - Innisfail	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2016	3
403	[illegible]	[illegible]	[illegible]	[illegible]	Council Bdry - 100m Nth of Clifford Rd	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2016	4
403	[illegible]	[illegible]	[illegible]	[illegible]	Nth Johnstone R. 300m N of Palmerston Hy	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2014	5
403	[illegible]	[illegible]	[illegible]	[illegible]	300m North of Harvey Ck	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2016	6
403	[illegible]	[illegible]	[illegible]	[illegible]	200m north of Mulgrave River Bridge	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2016	7
403	[illegible]	[illegible]	[illegible]	[illegible]	300 m North of Gillies Highway	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2016	8
403	[illegible]	[illegible]	[illegible]	[illegible]	Meringa, 500m N of Cairns Rd Gordonvale	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2016	9
403	[illegible]	[illegible]	[illegible]	[illegible]	Stoney Creek - Edmonton	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2016	10
403	[illegible]	[illegible]	[illegible]	[illegible]	Blackfellow Creek	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2016	11
403	[illegible]	[illegible]	[illegible]	[illegible]	Skeleton Creek	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2016	12
403	[illegible]	[illegible]	[illegible]	[illegible]	Crowley St. at White Rock	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2012	13
403	[illegible]	[illegible]	[illegible]	[illegible]	North Abut Chinamans Creek Bridge	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2016	14
403	[illegible]	[illegible]	[illegible]	[illegible]	Comport Street - 100m North of Buchan St	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2016	15
								Totals	[illegible]	[illegible]	[illegible]		

TARS

Traffic Analysis and Reporting System

AADT Segment Analysis Report (Complete)

Road Section: 10F - BRUCE HIGHWAY (INNISFAIL - CAIRNS)

Traffic Year: 2016

Road Segments Summary - Heavy Vehicles only

[illegible]

Region	Segment Start Tdist	Segment End Tdist	Site	Site Tdist	Description	HV AADT G AADT	G HV %	A AADT	A HV %	B AADT	B HV %	HV VKT (Millions) G	A	B	Data Year	Page
403	[illegible]	[illegible]	[illegible]	[illegible]	Railway Crossing - Innisfail	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3
403	[illegible]	[illegible]	[illegible]	[illegible]	Council Bdry - 100m Nth of Clifford Rd	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4
403	[illegible]	[illegible]	[illegible]	[illegible]	Nth Johnstone R. 300m N of Palmerston Hy	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2014	5
403	[illegible]	[illegible]	[illegible]	[illegible]	300m North of Harvey Ck	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	6
403	[illegible]	[illegible]	[illegible]	[illegible]	200m north of Mulgrave River Bridge	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	7
403	[illegible]	[illegible]	[illegible]	[illegible]	300 m North of Gillies Highway	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	8
403	[illegible]	[illegible]	[illegible]	[illegible]	Meringa, 500m N of Cairns Rd Gordonvale	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	9
403	[illegible]	[illegible]	[illegible]	[illegible]	Stoney Creek - Edmonton	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	10
403	[illegible]	[illegible]	[illegible]	[illegible]	Blackfellow Creek	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	11
403	[illegible]	[illegible]	[illegible]	[illegible]	Skeleton Creek	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	12
403	[illegible]	[illegible]	[illegible]	[illegible]	Crowley St. at White Rock										2012	13
403	[illegible]	[illegible]	[illegible]	[illegible]	North Abut Chinamans Creek Bridge	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	14
403	[illegible]	[illegible]	[illegible]	[illegible]	Comport Street - 100m North of Buchan St	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	15
											Totals					

AADT Segment Report

Road Section 10P - Bruce Highway (Innisfail - Cairns)
Traffic Year 2016

Road Segments Summary - All Vehicles

Region	Segment Start TDist	Segment End TDist	Site	Site TDist	Description	AADT G	AADT A	AADT B	VKT (Millions) G	VKT (Millions) A	VKT (Millions) B	Data Year	Page
403	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
403	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
403	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
403	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
403	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
403	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
403	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
403	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
403	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
403	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
403	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
403	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
								Totals	[illegible]	[illegible]	[illegible]		

Road Segments Summary - Heavy Vehicles only

[illegible]

Region	Segment Start TDist	Segment End TDist	Site	Site TDist	Description	HV AADT G AADT	HV AADT G HV %	HV AADT A AADT	HV AADT A HV %	HV AADT B AADT	HV AADT B HV %	HV VKT (Millions) G	HV VKT (Millions) A	HV VKT (Millions) B	Data Year	Page
403	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
403	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
403	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
403	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
403	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
403	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
403	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
403	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
403	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
403	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]										[illegible]	[illegible]
403	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
403	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
											Totals					

Traffic Analysis and Reporting System

AADT Segment Report

Road Section 10P - Bruce Highway (Innisfail - Cairns)
Traffic Year 2016

Road Segments Summary - All Vehicles

Region	Segment Start TDist	Segment End TDist	Site	Site TDist	Description	AADT G	AADT A	AADT B	VKT (Millions) G	VKT (Millions) A	VKT (Millions) B	Data Year	Page
403	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
403	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
403	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
403	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
403	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
403	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
403	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
403	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
403	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
403	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
403	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
403	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
403	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
								Totals	[illegible]	[illegible]	[illegible]		

Traffic Analysis and Reporting System

AADT Segment Report

Road Section 10P - Bruce Highway (Innisfail - Cairns)

Traffic Year 2014

Road Segments Summary - Heavy Vehicles only

VKT fields are calculated only if traffic class data is available for all sites

Region	Segment Start TDist	Segment End TDist	Site	Site TDist	Description	HV AADT G AADT	G HV %	A AADT	A HV %	B AADT	B HV %	HV VKT (Millions) G	A	B	Data Year	Page
403	0.000 km	2.060 km	111571	1.050 km	Railway Crossing - Innisfail	513	8.32%	305	8.41%	1,051	8.49%	0.49710	0.52393	1.45943	2014	3
403	2.060 km	4.425 km	111598	2.760 km	Goondi Bend - 100m Nth of Cairns Rd	357	11.98%	384	11.57%	1,141	11.46%	0.30402	0.33629	0.94725	2014	4
403	4.425 km	16.200 km	110040	5.400 km	Nth Johnstone R. 300m N of Palmerston Hy	481	12.57%	430	12.83%	886	12.73%	2.20800	2.45418	4.62051	2014	5
403	16.200 km	34.330 km	110001	29.071 km	500m North of Harvey Ck	389	14.26%	392	14.04%	780	14.17%	2.10402	4.28853	3.54302	2014	6
403	34.330 km	52.020 km	111347	63.826 km	200m north of Mulgrave River Bridge	502	14.44%	462	13.87%	966	10.57%	1.60486	1.62471	2.56985	2014	7
403	[illegible]	[illegible]	111548	64.426 km	500 m North of Gillies Highway	583	10.89%	525	13.27%	1,060	10.52%	0.41141	0.38703	0.75084	2014	8
403	[illegible]	[illegible]	110032	69.120 km	Meringa, 950m N of Cairns Rd Gordonvale	703	0.47%	716	3.59%	1,419	0.49%	0.99700	1.01653	2.01403	2014	9
403	[illegible]	[illegible]	111633	72.626 km	Stoney Creek - Edmonton	787	8.38%	777	8.25%	1,564	8.37%	1.05458	1.31075	2.08971	2014	10
403	[illegible]	[illegible]	110025	74.585 km	Mill Rd (TRACS site on entry Edmonton)	1,603	6.86%	1,030	8.11%	3,086	6.05%	0.85604	0.66468	1.35433	2014	11
403	[illegible]	[illegible]	111535	76.690 km	Skeleton Creek	975	5.22%	1,038	3.84%	2,014	3.43%	1.12372	1.11629	3.32281	2014	12
403	79.210 km	81.470 km	110035	80.310 km	Crinway Ck, Barbour Rd										2012	13
403	81.470 km	84.240 km	110050	82.580 km	Nth Rd Chinaman Creek Bridge	948	6.78%	972	7.23%	1,920	7.10%	0.95627	0.98051	1.94718	2014	14
403	84.240 km	[illegible]	111590	84.690 km	Gordon Street - [illegible]	457	4.45%	395	4.73%	850	4.63%	0.18150	0.13713	0.32867	2014	15
											Totals					

Traffic Analysis and Reporting System

AADT Segment Report

Road Section 10P - Bruce Highway (Innisfail - Cairns)

Traffic Year 2013

Road Segments Summary - All Vehicles

Region	Segment Start TDist	Segment End TDist	Site	Site TDist	Description	AADT G	AADT A	AADT B	VKT (Millions) G	A	B	Data Year	Page
203	0.000 km	2.060 km	111571	1.050 km	Railway Crossing - Innisfail	6,173	6,311	12,708	5.98527	5.34091	10.59026	2012	3
203	2.060 km	4.425 km	111598	2.760 km	Goondi Bend - 100m Nth of Cairns Rd	5,084	4,300	9,384	3.09815	4.22187	8.52016	2013	4
203	4.425 km	16.200 km	110040	5.400 km	Nth Johnstone R. 300m N of Palmerston Hy	3,823	3,722	7,375	19.00017	23.42152	39.60719	2013	5
203	16.200 km	34.330 km	110001	29.073 km	500m North of Harvey Ck	2,623	2,788	5,597	36.48066	34.36076	71.44166	2013	6
203	34.330 km	53.620 km	111347	63.825 km	200m north of Mulgrave River Bridge	3,620	3,546	7,208	12.22605	13.20566	24.49420	2013	7
203	53.620 km	65.840 km	111548	64.428 km	500 m North of Gillies Highway	5,060	4,870	9,890	3.70272	3.55088	7.28937	2013	8
203	65.840 km	69.791 km	110032	69.120 km	Meringa, 950m N of Cairns Rd Gordonvale	9,588	9,316	18,904	11.39889	11.46843	22.85919	2013	9
203	69.791 km	74.435 km	111633	72.420 km	Stoney Creek - Edmonton	9,570	9,325	18,485	7.98886	11.90840	21.89018	2013	10
203	74.435 km	76.050 km	110025	74.392 km	Mill Rd (TRACS site nth entry Edmonton)	16,419	16,180	32,518	5.55815	9.37332	18.93117	2013	11
203	76.050 km	79.210 km	111535	76.690 km	Skeleton Creek	16,217	19,016	35,253	21.01149	20.79196	41.79545	2013	12
203	79.210 km	81.470 km	110035	79.310 km	Crinway Ck, Barbour Rd	24,817	24,770	49,087	20.22409	20.43277	40.55681	2013	13
203	81.470 km	84.240 km	110050	82.679 km	Nth Rd Chinaman Creek Bridge	12,149	13,093	26,132	12.55828	12.47801	27.10016	2013	14
203	84.240 km	85.490 km	111590	84.679 km	Gordon Street - 100m North of [illegible] St	3,023	3,334	17,418	3.58840	3.33055	6.92098	2013	15
								Totals	177.42038	175.31812	352.05641		

Traffic Analysis and Reporting System
AADT Segment Report
Road Section 10P - Bruce Highway (Innisfail - Cairns)
Traffic Year 2013

Road Segments Summary - Heavy Vehicles only
HVT totals are calculated only if traffic class data is available for all sites

Region	Segment Start TDist	Segment End TDist	Site	Site TDist	Description	HV AADT G AADT	G HV %	A AADT	A HV %	B AADT	B HV %	HV VKT (Millions) G	A	B	Data Year	Page
200	0.000 km	2.080 km	111571	1.030 km	Railway Crossing - Innisfail	500	8.74%	388	8.85%	1,103	9.53%	0.82034	0.54906	1.07050	2013	3
200	2.080 km	4.435 km	111228	2.785 km	Ground Bend - 100m North Lillford Rd	286	11.72%	347	11.87%	1,131	11.85%	0.18600	0.10443	0.29149	2013	4
200	4.435 km	19.258 km	110640	4.465 km	[illegible]	475	13.45%	480	13.46%	959	15.06%	2.36196	2.38897	5.44127	2013	5
200	19.258 km	24.295 km	110001	35.070 km	300m North of Harvey Ck	396	14.13%	381	14.07%	795	14.10%	2.13402	4.82131	10.03720	2013	6
200	54.590 km	65.822 km	111447	61.820 km	250m south of Mulgrave River Bridge	342	14.58%	342	14.37%	1,094	14.87%	1.60857	1.40857	3.05273	2013	7
200	65.022 km	65.842 km	111448	65.120 km	58k m North of Gillies Highway	543	16.01%	524	16.76%	1,097	16.79%	0.44000	0.35035	0.79875	2013	8
200	65.842 km	68.731 km	110032	64.100 km	Meringa 580m N of Cairns Rd Gordonvale	580	8.20%	709	8.47%	1,294	8.49%	0.90944	0.89002	1.97578	2013	9
200	68.731 km	74.455 km	111032	72.830 km	Stoney Creek - Edmonton	745	9.02%	741	9.07%	1,486	9.07%	1.36497	1.37736	2.74233	2013	10
200	74.455 km	76.056 km	110025	74.555 km	Mill Rd (TRADS site ...) Edmonton	1,032	6.58%	1,073	10.85%	2,105	3.73%	0.80801	0.87946	1.68258	2013	11
200	76.056 km	79.210 km	111535	76.830 km	Skeleton Creek	902	5.20%	1,013	5.62%	1,915	5.46%	1.11380	1.18939	2.29349	2013	12
200	79.210 km	81.475 km	110005	79.910 km	Crowley Ck at White Rock										2013	13
200	81.475 km	84.210 km	110080	82.670 km	North Aloomba/Chinamans Creek Bridge	826	6.60%	784	7.41%	1,582	7.72%	2.53067	0.78885	1.59010	2013	14
200	84.210 km	85.400 km	111588	84.670 km	Comport Street - 110m North of Buchan St	486	5.20%	424	5.95%	910	5.23%	0.15200	0.18886	0.34094	2013	15
											Totals					

Traffic Analysis and Reporting System
AADT Segment Report
Road Section 10P - Bruce Highway (Innisfail - Cairns)
Traffic Year 2012

Road Segments Summary - All Vehicles

Region	Segment Start TDist	Segment End TDist	Site	Site TDist	Description	AADT G	A	B	VKT (Millions) G	A	B	Data Year	Page
200	0.000 km	4.435 km	111571	1.030 km	Railway Crossing - Innisfail	6,261	6,552	12,915	10.30220	10.85464	21.00728	2012	2
200	4.435 km	60.822 km	110001	35.070 km	300m North of Harvey Ck	2,844	2,747	5,593	61.86980	59.58462	121.19447	2012	3
200	60.822 km	68.731 km	110032	65.120 km	Meringa, 580m N of Gordonvale	5,231	5,214	10,445	17.19229	17.71383	33.90685	2012	4
200	68.731 km	74.455 km	111032	72.830 km	Stoney Creek - Edmonton	8,651	8,430	17,081	14.89208	14.55511	29.61720	2012	5
200	74.455 km	76.050 km	110025	74.555 km	Mill Rd (TRADS site ...) Edmonton	15,807	15,286	31,093	9.20244	8.90012	18.10457	2012	6
200	76.050 km	79.210 km	111535	76.830 km	Skeleton Creek	15,488	15,511	30,474	28.09914	31.80750	94.03843	2012	7
200	79.210 km	81.475 km	110005	79.910 km	Crowley Ck at White Rock	24,917	24,770	49,687	20.85480	20.45877	40.99890	2012	8
200	81.470 km	84.210 km	110080	82.670 km	North Aloomba/Chinamans Creek Bridge	13,452	13,133	26,587	13.65875	12.93445	25.38183	2012	9
200	84.210 km	85.400 km	111588	84.670 km	Comport Street - 110m North of Buchan St	9,076	7,859	16,931	3.61708	3.12632	0.70508	2012	10
								Totals	174.06170	175.72816	364.91990		

Road Segments Summary - Heavy Vehicles only
HVT totals are calculated only if traffic class data is available for all sites

Region	Segment Start TDist	Segment End TDist	Site	Site TDist	Description	HV AADT G AADT	G HV %	A AADT	A HV %	B AADT	B HV %	HV VKT (Millions) G	A	B	Data Year	Page
200	0.000 km	4.435 km	111571	1.030 km	Railway Crossing - Innisfail	452	7.13%	461	7.13%	919	7.11%	0.73459	0.75950	1.49439	2012	2
200	4.435 km	60.822 km	110001	35.070 km	300m North of Harvey Ck	390	13.51%	375	13.56%	769	13.75%	8.00031	8.00250	15.98342	2012	3
200	60.822 km	68.731 km	110032	65.120 km	Meringa, 580m N of Gordonvale	487	9.31%	461	8.85%	1,408	8.82%	1.40771	1.40077	2.80048	2012	4
200	68.731 km	74.455 km	111032	72.830 km	Stoney Creek - Edmonton	420	4.87%	432	5.02%	843	4.94%	0.73419	0.72506	1.45986	2012	5
200	74.455 km	76.050 km	110025	74.555 km	Mill Rd (TRADS site ...) Edmonton	945	5.98%	935	6.07%	1,879	6.02%	0.88016	0.84926	1.01041	2012	6
200	76.050 km	79.210 km	111535	76.830 km	Skeleton Creek	795	4.13%	835	4.32%	1,607	1.24%	0.90542	0.94988	1.85551	2012	7
200	79.210 km	81.470 km	110005	79.910 km	Crowley Ck at White Rock										2012	8
200	81.470 km	84.210 km	110080	82.670 km	North Aloomba/Chinamans Creek Bridge	874	6.49%	838	6.38%	1,712	6.74%	0.85593	0.87228	1.71502	2012	9
200	84.210 km	85.400 km	111588	84.670 km	Comport Street - 110m North of Buchan St	286	3.17%	285	3.07%	571	3.37%	0.11459	0.11229	0.22717	2012	10
											Totals					

Traffic Analysis and Reporting System
AADT Segment Analysis Report (Complete)
Road Section 21A PALMERSTON HIGHWAY (INNISFAIL-RAVENSHOE)
Traffic Year 2018

TARS

Road Segments Summary - All Vehicles

Region	Segment Start TDist	Segment End TDist	Site	Site TDist	Description	AADT G	AADT A	AADT B	VKT (Millions) G	VKT (Millions) A	VKT (Millions) B	Data Year	Page
400	0.000 km	0.898 km	111579	6.227 km	Ravenshoe	2,014	2,012	4,026	0.07019	0.05947	1.21996	2018	2
400	0.898 km	7.770 km	111525	1.480 km	1 km East of Dodds Road	983	995	1,954	2.46574	2.49544	4.96118	2018	3
400	7.770 km	20.050 km	110218	12.100 km	East of Bora Ground Road	1,079	1,050	2,105	[illegible]	2.17000	[illegible]	2018	4
400	20.030 km	34.040 km	110094	46.600 km	100m East of Brooks Rd. 12km s of Millaa	693	651	1,340	8.43173	8.42287	16.87840	2018	5
400	54.540 km	76.606 km	111606	66.470 km	Nth Abut Beatrice River Bridge-Old Palm	117	132	250	1.00774	1.14800	2.15632	2018	6
								Totals	17.20592	17.83306	35.16851		

Road Segments Summary - Heavy Vehicles only
VKT totals are calculated only if traffic class data is available for all sites

Region	Segment Start TDist	Segment End TDist	Site	Site TDist	Description	HV AADT G AADT	G HV %	A AADT	A HV %	B AADT	B HV %	HV VKT (Millions) G	HV VKT (Millions) A	HV VKT (Millions) B	Data Year	Page
400	0.000 km	0.898 km	111579	6.227 km	Ravenshoe	190	9.35%	100	0.89%	300	3.45%	0.06162	0.05528	0.12402	2018	2
400	0.898 km	7.770 km	111525	1.480 km	1 km East of Dodds Road	171	17.10%	150	17.87%	323	16.58%	0.42980	0.39377	0.82369	2018	3
400	7.770 km	20.050 km	110218	12.100 km	East of Bora Ground Road	240	22.43%	255	30.77%	490	25.50%	1.15808	1.17500	2.30159	2018	4
400	20.030 km	34.040 km	110094	46.600 km	100m East of Brooks Rd. 12km s of Millaa	144	21.85%	152	23.32%	299	22.35%	1.78126	1.88822	3.66148	2018	5
400	54.540 km	76.606 km	111606	66.470 km	Nth Abut Beatrice River Bridge-Old Palm	9	7.69%	12	9.02%	21	8.40%	0.07065	0.10341	0.15447	2018	6
											Totals	3.47914	3.60793	7.06700		

Traffic Analysis and Reporting System
AADT Segment Report
Road Section 21A Palmerston Highway (Innisfail-Ravenshoe)
Traffic Year 2015

TARS

Road Segments Summary - All Vehicles

Region	Segment Start TDist	Segment End TDist	Site	Site TDist	Description	AADT G	AADT A	AADT B	VKT (Millions) G	VKT (Millions) A	VKT (Millions) B	Data Year	Page
400	0.000 km	0.898 km	111579	6.227 km	Ravenshoe	2,032	1,985	4,041	0.67258	0.65183	1.32432	2015	2
400	0.898 km	7.770 km	111525	1.480 km	1 km East of Dodds Road	1,071	1,048	2,119	2.68627	2.62858	5.31585	2014	3
400	7.770 km	20.050 km	110218	12.100 km	East of Bora Ground Road	1,087	1,080	2,152	4.85060	3.06070	7.86977	2012	4
400	20.030 km	34.040 km	110094	46.600 km	100m East of Brooks Rd. 12km s of Millaa	593	640	1,233	7.60740	7.81673	15.80416	2013	5
400	54.540 km	76.606 km	111606	66.470 km	Nth Abut Beatrice River Bridge-Old Palm	120	139	249	1.05697	1.12430	2.18724	2015	6
								Totals	16.96323	17.33648	34.27160		

Road Segments Summary - Heavy Vehicles only
VKT totals are calculated only if traffic class data is available for all sites

Region	Segment Start TDist	Segment End TDist	Site	Site TDist	Description	HV AADT G AADT	G HV %	A AADT	A HV %	B AADT	B HV %	HV VKT (Millions) G	HV VKT (Millions) A	HV VKT (Millions) B	Data Year	Page
400	0.000 km	0.898 km	111579	6.227 km	Ravenshoe	183	8.97%	183	9.15%	366	9.06%	0.06001	0.05968	0.11932	2015	2
400	0.898 km	7.770 km	111525	1.480 km	1 km East of Dodds Road	157	14.66%	155	14.79%	313	14.77%	0.39387	0.38878	0.78255	2014	3
400	7.770 km	20.050 km	110218	12.100 km	East of Bora Ground Road	218	20.05%	226	21.22%	441	20.50%	1.61078	1.06617	0.97503	2015	4
400	20.030 km	34.040 km	110094	46.600 km	100m East of Brooks Rd. 12km s of Millaa	143	23.25%	154	24.06%	297	25.67%	1.76885	1.50486	3.67363	2010	5
400	54.540 km	76.606 km	111606	66.470 km	Nth Abut Beatrice River Bridge-Old Palm	14	11.57%	15	10.61%	29	11.64%	0.12298	0.08784	0.21082	2015	6
											Totals	3.05577	2.50011	5.50944		

Traffic Analysis and Reporting System

AADT Segment Report

Road Section 21A [illegible] Highway [illegible]

Traffic Year 2014

Road Segments Summary - All Vehicles

Region	Segment Start TDist	Segment End TDist	Site	Site TDist	Description	AADT G	AADT A	AADT B	VKT (Millions) G	VKT (Millions) A	VKT (Millions) B	Data Year	Page
400	0.000 km	0.898 km	11[illegible]	6.227 km	[illegible]	2,044	2,0[illegible]	4,0[illegible]	0.6[illegible]	0.[illegible]	1.[illegible]	2014	2
400	0.898 km	7.770 km	11[illegible]	1.480 km	1 km East of [illegible] Road	1,071	1,046	2,1[illegible]	2.6[illegible]	2.62[illegible]	5.3[illegible]	2014	2
400	7.770 km	20.0[illegible] km	11[illegible]	12.1[illegible] km	East of [illegible] Road	1,1[illegible]	1,0[illegible]	2,1[illegible]	4.84[illegible]	[illegible]	1[illegible]	2014	4
400	20.0[illegible] km	54.540 km	11[illegible]	46.[illegible] km	[illegible]	6[illegible]	6[illegible]	1,2[illegible]	7.4[illegible]	7.[illegible]	1[illegible]	2014	5
400	54.540 km	75.[illegible] km	11[illegible]	[illegible] km	[illegible] River Bridge [illegible]	1[illegible]	11[illegible]	2[illegible]	1.02[illegible]	1.04[illegible]	2.[illegible]	2014	6
								Total	18.2[illegible]	17.[illegible]	[illegible]		

Road Segments Summary - Heavy Vehicles only

[illegible]

Region	Segment Start TDist	Segment End TDist	Site	Site TDist	Description	HV AADT G AADT	HV AADT G HV %	HV AADT A AADT	HV AADT A HV %	HV AADT B AADT	HV AADT B HV %	HV VKT (Millions) G	HV VKT (Millions) A	HV VKT (Millions) B	Data Year	Page
400	0.000 km	0.898 km	11[illegible]	6.027 km	[illegible]	1[illegible]	[illegible]%	1[illegible]	[illegible]%	[illegible]	[illegible]%	0.0[illegible]	0.0[illegible]	0.1[illegible]	2014	2
400	0.898 km	7.770 km	11[illegible]	1.480 km	1 km East of [illegible] Road	1[illegible]	[illegible]%	1[illegible]	[illegible]%	31[illegible]	[illegible]%	0.[illegible]	0.[illegible]	0.[illegible]	2014	3
400	7.770 km	20.0[illegible] km	11[illegible]	12.1[illegible] km	East of [illegible] Road	[illegible]	[illegible]%	[illegible]	[illegible]%	[illegible]	[illegible]%	[illegible]	1.0[illegible]	2.0[illegible]	2014	4
400	20.0[illegible] km	54.540 km	11[illegible]	46.[illegible] km	[illegible]	144	[illegible]%	152	[illegible]%	2[illegible]	[illegible]%	1.[illegible]	1.[illegible]	3.[illegible]	2014	5
400	54.540 km	75.[illegible] km	11[illegible]	[illegible] km	[illegible] River Bridge [illegible]	1[illegible]	[illegible]%	[illegible]	[illegible]%	1[illegible]	[illegible]%	0.[illegible]	0.[illegible]	0.1[illegible]	2014	6
											Total	[illegible]	[illegible]	[illegible]		

Traffic Analysis and Reporting System

AADT Segment Report

Road Section 21A [illegible] Highway [illegible]

Traffic Year 2013

Road Segments Summary - All Vehicles

Region	Segment Start TDist	Segment End TDist	Site	Site TDist	Description	AADT G	AADT A	AADT B	VKT (Millions) G	VKT (Millions) A	VKT (Millions) B	Data Year	Page
300	0.000 km	0.898 km	11[illegible]	6.227 km	[illegible]	2,141	2,145	4,2[illegible]	0.70[illegible]	0.7[illegible]	1.4[illegible]	2013	2
300	0.898 km	7.770 km	11[illegible]	1.480 km	1 km East of [illegible] Road	1,1[illegible]	1,140	2,2[illegible]	2.84[illegible]	2.9[illegible]	5.7[illegible]	2013	2
300	7.770 km	20.0[illegible] km	11[illegible]	12.1[illegible] km	East of [illegible] Road	1,1[illegible]	1,1[illegible]	2,2[illegible]	5.17[illegible]	5.2[illegible]	11.4[illegible]	2013	4
300	20.0[illegible] km	54.540 km	11[illegible]	46.[illegible] km	[illegible]	6[illegible]	6[illegible]	1,2[illegible]	7.64[illegible]	7.6[illegible]	15.[illegible]	2013	5
300	54.540 km	75.[illegible] km	11[illegible]	[illegible] km	[illegible] River Bridge [illegible]	1[illegible]	1[illegible]	2[illegible]	0.97[illegible]	1.0[illegible]	1.9[illegible]	2013	6
								Total	17.24[illegible]	17.5[illegible]	[illegible]		

Road Segments Summary - Heavy Vehicles only

[illegible]

Region	Segment Start TDist	Segment End TDist	Site	Site TDist	Description	HV AADT G AADT	HV AADT G HV %	HV AADT A AADT	HV AADT A HV %	HV AADT B AADT	HV AADT B HV %	HV VKT (Millions) G	HV VKT (Millions) A	HV VKT (Millions) B	Data Year	Page
300	0.000 km	0.898 km	11[illegible]	6.027 km	[illegible]	1[illegible]	[illegible]%	1[illegible]	[illegible]%	[illegible]	[illegible]%	0.0[illegible]	0.0[illegible]	0.1[illegible]	2013	2
300	0.898 km	7.770 km	11[illegible]	1.480 km	1 km East of [illegible] Road	1[illegible]	[illegible]%	1[illegible]	[illegible]%	3[illegible]	[illegible]%	0.[illegible]	0.[illegible]	0.[illegible]	2013	3
300	7.770 km	20.0[illegible] km	11[illegible]	12.1[illegible] km	East of [illegible] Road	[illegible]	[illegible]%	[illegible]	[illegible]%	[illegible]	[illegible]%	1.[illegible]	1.[illegible]	2.[illegible]	2013	4
300	20.0[illegible] km	54.540 km	11[illegible]	46.[illegible] km	[illegible]	1[illegible]	[illegible]%	1[illegible]	[illegible]%	3[illegible]	[illegible]%	1.[illegible]	1.[illegible]	3.[illegible]	2013	5
300	54.540 km	75.[illegible] km	11[illegible]	[illegible] km	[illegible] River Bridge [illegible]	[illegible]	[illegible]%	[illegible]	[illegible]%	1[illegible]	[illegible]%	0.0[illegible]	0.0[illegible]	0.1[illegible]	2013	6
											Total	[illegible]	[illegible]	7.[illegible]		

Traffic Analysis and Reporting System
AADT Segment Analysis Report (Complete)
Road Section 32B - KENNEDY HIGHWAY (MAREEBA - RAVENSHOE)
Traffic Year: 2016

TARS

Road Segments Summary - All Vehicles

Region	Segment Start TDist	Segment End TDist	Site	Site TDist	Description	AADT G	AADT A	AADT B	VKT (Millions) G	VKT (Millions) A	VKT (Millions) B	Data Year	Page
400	0.000 km	25.490 km	110033	12.995 km	Walkamin, 100m north of Wilga St	3,085	3,032	6,111	24.70...	25.2...	[illegible]	2016	2
400	25.490 km	29.510 km	111528	28.030 km	Tinaroo Scrub	5,119	4,896	[illegible]	7.5...	7.2...	14.8...	2016	3
400	29.510 km	31.380 km	110044	30.482 km	Priors Ck Atherton, 30m nth of bridge	6,276	6,1..	12,437	4....	4....	[illegible]	2016	4
400	31.380 km	35.040 km	111385	31.500 km	100m south of Mabel Street	3,784	3,795	7,540	[illegible]	[illegible]	10.0...	2016	5
400	35.040 km	81.380 km	110003	41.750 km	East Barron, 11km Sth of Atherton	801	808	1,609	7.27047	7....	15....	2016	6
400	81.380 km	82.212 km	111618	80.050 km	Evelyn Central	270	320	590	[illegible]	[illegible]	[illegible]	2016	7
								Totals	53.6...	54.7...	110....		

Road Segments Summary - Heavy Vehicles only
VKT totals are calculated only if traffic class data is available for all sites

Region	Segment Start TDist	Segment End TDist	Site	Site TDist	Description	HV AADT G AADT	G HV %	A AADT	A HV %	B AADT	B HV %	HV VKT (Millions) G	HV VKT (Millions) A	HV VKT (Millions) B	Data Year	Page
400	0.000 km	25.490 km	110033	12.995 km	Walkamin, 100m north of Wilga St	371	11.80%	361	11.9..%	731	11.95%	[illegible]	[illegible]	[illegible]	2016	2
400	25.490 km	29.510 km	111528	28.030 km	Tinaroo Scrub	384	7.50%	336	6.9..%	717	7.0..%	[illegible]	[illegible]	[illegible]	2016	3
400	29.510 km	31.380 km	110044	30.482 km	Priors Ck Atherton, 30m nth of bridge	332	5.29%	330	5.4..%	662	5.32%	[illegible]	[illegible]	[illegible]	2016	4
400	31.380 km	35.040 km	111385	31.500 km	100m south of Mabel Street	180	4.41%	155	5.15%	351	4.73%	[illegible]	[illegible]	[illegible]	2016	5
400	35.040 km	81.380 km	110003	41.750 km	East Barron, 11km Sth of Atherton	[illegible]	[illegible]	108	13.40%	215	13.54%	[illegible]	[illegible]	[illegible]	2016	6
400	81.380 km	82.212 km	111618	80.050 km	Evelyn Central	43	[illegible]	49	15.21%	92	14.4..%	[illegible]	[illegible]	[illegible]	2016	7
											Totals	[illegible]	[illegible]	[illegible]		

Traffic Analysis and Reporting System
AADT Segment Report
Road Section 32B - Kennedy Highway (Mareeba - Ravenshoe)
Traffic Year: 2015

TARS

Road Segments Summary - All Vehicles

Region	Segment Start TDist	Segment End TDist	Site	Site TDist	Description	AADT G	AADT A	AADT B	VKT (Millions) G	VKT (Millions) A	VKT (Millions) B	Data Year	Page
400	0.000 km	25.490 km	110033	12.995 km	Walkamin, 100m north of Wilga St	2,863	2,811	5,674	[illegible]	[illegible]	[illegible]	2015	2
400	25.490 km	29.510 km	111558	28.030 km	Tinaroo Scrub	4,948	4,894	9,852	7.2...	7.2...	14.51408	2015	3
400	29.510 km	31.380 km	110044	30.482 km	Priors Ck Atherton, 30m nth of bridge	6,109	6,1..	12,2..	[illegible]	[illegible]	[illegible]	2015	4
400	31.380 km	35.040 km	111385	31.500 km	100m south of Mabel Street	3,725	3,745	7,480	4.37...	[illegible]	[illegible]	2015	5
400	35.040 km	81.380 km	110003	41.750 km	East Barron, 11km Sth of Atherton	[illegible]	[illegible]	1,6..	7....	[illegible]	15....	2015	6
400	81.380 km	82.212 km	111618	80.050 km	Evelyn Central	300	286	[illegible]	[illegible]	[illegible]	[illegible]	2015	7
								Totals	[illegible]	[illegible]	[illegible]		

Road Segments Summary - Heavy Vehicles only
VKT totals are calculated only if traffic class data is available for all sites

Region	Segment Start TDist	Segment End TDist	Site	Site TDist	Description	HV AADT G AADT	G HV %	A AADT	A HV %	B AADT	B HV %	HV VKT (Millions) G	HV VKT (Millions) A	HV VKT (Millions) B	Data Year	Page
400	0.000 km	25.490 km	110033	12.995 km	Walkamin, 100m north of Wilga St	295	10.3..%	280	9.9..%	575	10.1..%	[illegible]	[illegible]	[illegible]	2015	2
400	25.490 km	29.510 km	111558	28.030 km	Tinaroo Scrub	345	7.1..%	351	7.1..%	696	7.1..%	[illegible]	[illegible]	[illegible]	2015	3
400	29.510 km	31.380 km	110044	30.480 km	Priors Ck Atherton, 30m nth of bridge										2015	4
400	31.380 km	35.040 km	111385	31.500 km	100m south of Mabel Street	176	4.72%	188	5.02%	364	4.87%	[illegible]	[illegible]	[illegible]	2015	5
400	35.040 km	81.380 km	110003	41.750 km	East Barron, 11km Sth of Atherton	[illegible]	12.8..%	121	14.0..%	[illegible]	13.0..%	[illegible]	[illegible]	[illegible]	2015	6
400	81.380 km	82.212 km	111618	80.050 km	Evelyn Central	45	15.0..%	49	15.5..%	94	13.4..%	[illegible]	[illegible]	[illegible]	2015	7
											Totals					

Traffic Analysis and Reporting System
AADT Segment Report
Road Section 32B - Kennedy Highway (Mareeba - Ravenshoe)
Traffic Year 2014

Road Segments Summary - All Vehicles

Region	Segment Start TDist	Segment End TDist	Site	Site TDist	Description	AADT G	AADT A	AADT B	VKT (Millions) G	VKT (Millions) A	VKT (Millions) B	Data Year	Page
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2014	2
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2014	3
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2014	4
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2014	5
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2014	6
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2014	7
								Totals	[illegible]	[illegible]	[illegible]		

Road Segments Summary - Heavy Vehicles only

VKT totals are calculated only if traffic class data is available for all sites.

Region	Segment Start TDist	Segment End TDist	Site	Site TDist	Description	HV AADT G AADT	G HV %	A AADT	A HV %	B AADT	B HV %	HV VKT (Millions) G	A	B	Data Year	Page
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2014	2
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2014	3
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]										2014	4
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2014	5
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2014	6
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2014	7
											Totals					

Traffic Analysis and Reporting System
AADT Segment Report
Road Section 32B - Kennedy Highway (Mareeba - Ravenshoe)
Traffic Year 2013

Road Segments Summary - All Vehicles

Region	Segment Start TDist	Segment End TDist	Site	Site TDist	Description	AADT G	AADT A	AADT B	VKT (Millions) G	VKT (Millions) A	VKT (Millions) B	Data Year	Page
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2013	2
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2013	3
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2013	4
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2013	5
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2013	6
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2013	7
								Totals	[illegible]	[illegible]	[illegible]		

Road Segments Summary - Heavy Vehicles only

VKT totals are calculated only if traffic class data is available for all sites.

Region	Segment Start TDist	Segment End TDist	Site	Site TDist	Description	HV AADT G AADT	G HV %	A AADT	A HV %	B AADT	B HV %	HV VKT (Millions) G	A	B	Data Year	Page
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2013	2
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2013	3
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]										2013	4
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2013	5
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2013	6
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2013	7
											Totals					

Traffic Analysis and Reporting System

AADT Segment Report

Road Section 32B Kennedy Highway (Mareeba - Ravenshoe)

Traffic Year 2012

Road Segments Summary - All Vehicles

Region	Segment Start TDist	Segment End TDist	Site	Site TDist	Description	AADT G	AADT A	AADT B	VKT (Millions) G	VKT (Millions) A	VKT (Millions) B	Data Year	Page
[illegible]	0.000 km	25.490 km	110032	12.990 km	Walkamin 10km north of Biggs St	2,749	2,679	5,428	23.37528	24.92591	50.29130	2012	2
[illegible]	25.490 km	29.810 km	111368	28.030 km	Tolga Scrub	4,769	4,704	9,473	7.17182	7.07388	14.24550	2012	3
[illegible]	29.810 km	31.388 km	110044	30.480 km	Priors Ck Atherton 40m us main road bridge	5,622	5,576	11,198	8.55208	3.96217	1.23441	2012	4
[illegible]	31.380 km	35.040 km	111580	31.900 km	100m south of Mabel Street	2,072	4,948	7,080	6.17286	6.46790	13.85940	2012	5
[illegible]	35.040 km	82.210 km	110063	41.790 km	East Barron, 11km Sth of Atherton	724	751	1,475	12.46604	13.30986	25.39670	2012	6
								Totals	54.31885	54.91907	109.03981		

Road Segments Summary - Heavy Vehicles only

VKT totals are calculated only if traffic class data is available for all sites [illegible]

Region	Segment Start TDist	Segment End TDist	Site	Site TDist	Description	HV AADT G AADT	HV AADT G HV %	HV AADT A AADT	HV AADT A HV %	HV AADT B AADT	HV AADT B HV %	HV VKT (Millions) G	HV VKT (Millions) A	HV VKT (Millions) B	Data Year	Page
[illegible]	0.000 km	25.490 km	110033	12.990 km	Walkamin 100m north of Biggs St	322	11.71%	308	11.36%	627	11.55%	2.00894	2.03787	5.00051	2012	2
[illegible]	25.490 km	29.810 km	111368	28.030 km	Tolga Scrub	338	7.46%	350	7.50%	703	7.48%	0.53035	0.55084	1.08019	2012	3
[illegible]	29.810 km	31.380 km	110044	30.480 km	Priors Ck Atherton 40m north of bridge										2012	4
[illegible]	31.380 km	35.040 km	111580	31.900 km	100m south of Mabel Street	164	4.24%	173	4.21%	337	4.22%	0.21919	0.23111	0.45030	2012	5
[illegible]	35.040 km	82.210 km	110063	41.790 km	East Barron 11km Sth of Atherton	88	12.15%	84	11.18%	172	11.66%	1.51509	1.44652	2.96152	2012	6
											Totals					

Traffic Analysis and Reporting System

AADT Segment Analysis Report (Complete)

Road Section 641 - MILLAA MILLAA - MALANDA ROAD

Traffic Year 2016

TARS

Road Segments Summary - All Vehicles

Region	Segment Start TDist	Segment End TDist	Site	Site TDist	Description	AADT G	AADT A	AADT B	VKT (Millions) G	VKT (Millions) A	VKT (Millions) B	Data Year	Page
403	0.000 km	3.270 km	111040	1.300 km	Millaa Millaa Golf Club	1,036	1,034	2,070	1.23602	1.23600	2.46452	2016	2
403	3.270 km	22.850 km	111509	20.290 km	Williams Creek - Millaa Millaa Malanda Rd	1,532	1,241	2,889	10.97838	10.89957	21.67935	2016	3
								Totals	12.21480	12.13657	24.27341		

Road Segments Summary - Heavy Vehicles only

VKT totals are calculated only if traffic class data is available for all sites

Region	Segment Start TDist	Segment End TDist	Site	Site TDist	Description	HV AADT G AADT	HV AADT G HV %	HV AADT A AADT	HV AADT A HV %	HV AADT B AADT	HV AADT B HV %	HV VKT (Millions) G	HV VKT (Millions) A	HV VKT (Millions) B	Data Year	Page
403	0.000 km	3.270 km	111040	1.300 km	Millaa Millaa Golf Club	200	19.31 %	215	19.92 %	419	19.60 %	0.23917	0.23005	0.46939	2016	2
403	3.270 km	22.850 km	111509	20.290 km	Williams Creek - Millaa Millaa Malanda Rd	216	13.92 %	226	14.07 %	440	14.28 %	1.52752	1.59666	3.13658	2016	3
											Totals	1.76662	1.84630	3.61595		

Traffic Analysis and Reporting System

AADT Segment Report

Road Section 641 - Millaa Millaa - Malanda Road

Traffic Year 2015

TARS

Road Segments Summary - All Vehicles

Region	Segment Start TDist	Segment End TDist	Site	Site TDist	Description	AADT G	AADT A	AADT B	VKT (Millions) G	VKT (Millions) A	VKT (Millions) B	Data Year	Page
403	0.000 km	3.270 km	111040	1.300 km	Millaa Millaa Golf Club	934	954	1,888	1.11479	1.13807	2.25340	2013	2
403	3.270 km	22.650 km	111509	20.290 km	Williams Creek - Millaa Millaa Malanda Rd	1,473	1,485	2,958	10.41955	10.51818	20.93474	2015	3
								Totals	11.53434	11.71083	23.24810		

Road Segments Summary - Heavy Vehicles only

VKT totals are calculated only if traffic class data is available for all sites

Region	Segment Start TDist	Segment End TDist	Site	Site TDist	Description	HV AADT G AADT	HV AADT G HV %	HV AADT A AADT	HV AADT A HV %	HV AADT B AADT	HV AADT B HV %	HV VKT (Millions) G	HV VKT (Millions) A	HV VKT (Millions) B	Data Year	Page
403	0.000 km	3.270 km	111040	1.300 km	Millaa Millaa Golf Club	184	19.75 %	195	20.22 %	377	19.97 %	0.21961	0.23230	0.44997	2013	2
403	3.270 km	22.650 km	111509	20.250 km	Williams Creek - Millaa Millaa Malanda Rd	208	14.12 %	224	[illegible]	430	14.35 %	1.47123	1.58451	3.05554	2015	3
											Totals	1.69084	1.81480	3.50551		

Queensland Government

Traffic Analysis and Reporting System
AADT Segment Report
Road Section 641 - Millaa Millaa - Malanda Road
Traffic Year 2014

TARS

Road Segments Summary - All Vehicles

Region	Segment Start TDist	Segment End TDist	Site	Site TDist	Description	AADT G	AADT A	AADT B	VKT (Millions) G	VKT (Millions) A	VKT (Millions) B	Data Year	Page
403	0.000 km	3.270 km	111040	1.360 km	Millaa Millaa Golf Club	873	908	1,782	1.04400	1.08371	2.12810	2014	2
403	3.270 km	22.650 km	111509	20.290 km	Williams Creek - Millaa Millaa/Malanda Rd	1,288	1,410	2,799	8.76171	9.87388	18.73560	2014	3
								Totals	10.80400	11.05700	21.80372		

Road Segments Summary - Heavy Vehicles only
VKT totals are calculated only if traffic class data is available for all sites

Region	Segment Start TDist	Segment End TDist	Site	Site TDist	Description	HV AADT G AADT	HV AADT G HV %	HV AADT A AADT	HV AADT A HV %	HV AADT B AADT	HV AADT B HV %	HV VKT (Millions) G	HV VKT (Millions) A	HV VKT (Millions) B	Data Year	Page
403	0.000 km	3.270 km	111040	1.360 km	Millaa Millaa Golf Club	167	19.09%	177	19.49%	344	19.29%	0.19932	0.21120	0.41036	2014	2
403	3.270 km	22.650 km	111509	20.290 km	Williams Creek - Millaa Millaa/Malanda Rd	180	13.04%	190	14.11%	373	13.58%	1.27327	1.40767	2.69055	2014	3
											Totals	1.47253	1.61882	3.09135		

Queensland Government

Traffic Analysis and Reporting System
AADT Segment Report
Road Section 641 - Millaa Millaa - Malanda Road
Traffic Year 2013

TARS

Road Segments Summary - All Vehicles

Region	Segment Start TDist	Segment End TDist	Site	Site TDist	Description	AADT G	AADT A	AADT B	VKT (Millions) G	VKT (Millions) A	VKT (Millions) B	Data Year	Page
303	0.000 km	3.270 km	111040	1.360 km	Millaa Millaa Golf Club	911	921	1,832	1.08732	1.09925	2.18656	2013	2
303	3.270 km	22.650 km	111509	20.290 km	Williams Creek - Millaa Millaa/Malanda Rd	1,301	1,305	2,606	9.20288	9.23113	18.43405	2012	3
								Totals	10.29021	10.33038	20.62060		

Road Segments Summary - Heavy Vehicles only
VKT totals are calculated only if traffic class data is available for all sites

Region	Segment Start TDist	Segment End TDist	Site	Site TDist	Description	HV AADT G AADT	HV AADT G HV %	HV AADT A AADT	HV AADT A HV %	HV AADT B AADT	HV AADT B HV %	HV VKT (Millions) G	HV VKT (Millions) A	HV VKT (Millions) B	Data Year	Page
303	0.000 km	3.270 km	111040	1.360 km	Millaa Millaa Golf Club	184	20.20%	181	20.14%	373	20.47%	0.21961	0.22717	0.44708	2013	2
303	3.270 km	22.650 km	111509	20.290 km	Williams Creek - Millaa Millaa/Malanda Rd	176	13.53%	132	14.73%	303	14.15%	1.24497	1.35522	2.61035	2012	3
											Totals	1.46458	1.58019	3.05578		

Queensland Government

Traffic Analysis and Reporting System

AADT Segment Analysis Report (Complete)

Road Section 8404 - EAST EVELYN ROAD

Traffic Year 2016

TARS

Road Segments Summary - All Vehicles

Region	Segment Start TDist	Segment End TDist	Site	Site TDist	Description	AADT G	AADT A	AADT B	VKT (Millions) G	VKT (Millions) A	VKT (Millions) B	Data Year	Page
403	0.000 km	10.723 km	110077	0.609 km	McHugh Rd, 20m east of Corduroy Ck	208	210	418	0.80026	0.82182	1.62818	2016	2
								Totals	0.80026	0.82182	1.62818		

Road Segments Summary - Heavy Vehicles only

VKT totals are calculated only if traffic class data is available for all sites.

Region	Segment Start TDist	Segment End TDist	Site	Site TDist	Description	HV AADT G AADT	HV AADT G HV %	HV AADT A AADT	HV AADT A HV %	HV AADT B AADT	HV AADT B HV %	HV VKT (Millions) G	HV VKT (Millions) A	HV VKT (Millions) B	Data Year	Page
403	0.000 km	10.723 km	110077	0.609 km	McHugh Rd, 20m east of Corduroy Ck	48	23.08%	49	23.33%	97	23.20%	0.18787	0.19178	0.37965	2016	2
											Totals	0.18787	0.19178	0.37965		

Queensland Government

Traffic Analysis and Reporting System

AADT Segment Report

Road Section 8404 - East Evelyn Road

Traffic Year 2015

TARS

Road Segments Summary - All Vehicles

Region	Segment Start TDist	Segment End TDist	Site	Site TDist	Description	AADT G	AADT A	AADT B	VKT (Millions) G	VKT (Millions) A	VKT (Millions) B	Data Year	Page
403	0.000 km	10.723 km	110077	0.609 km	McHugh Rd, 20m east of Corduroy Ck	211	217	428	0.82583	0.84932	1.67515	2015	2
								Totals	0.82583	0.84932	1.67515		

Road Segments Summary - Heavy Vehicles only

VKT totals are calculated only if traffic class data is available for all sites.

Region	Segment Start TDist	Segment End TDist	Site	Site TDist	Description	HV AADT G AADT	HV AADT G HV %	HV AADT A AADT	HV AADT A HV %	HV AADT B AADT	HV AADT B HV %	HV VKT (Millions) G	HV VKT (Millions) A	HV VKT (Millions) B	Data Year	Page
403	0.000 km	10.723 km	110077	0.609 km	McHugh Rd, 20m east of Corduroy Ck	57	27.01%	56	25.81%	113	26.40%	0.22309	0.21918	0.44227	2015	2
											Totals	0.22309	0.21918	0.44227		

Road Segments Summary - All Vehicles

Region	Segment Start TDist	Segment End TDist	Site	Site TDist	Description	AADT G	AADT A	AADT B	VKT (Millions) G	VKT (Millions) A	VKT (Millions) B	Data Year	Page
403	0.000 km	10.723 km	110077	0.609 km	McHugh Rd 200m east of Corduroy Ck	215	219	434	0.84148	0.85714	1.69862	2014	2
								Totals	0.84148	0.85714	1.69862		

Road Segments Summary - Heavy Vehicles only

VKT totals are calculated only if traffic class data is available for all sites.

Region	Segment Start TDist	Segment End TDist	Site	Site TDist	Description	HV AADT G AADT	HV AADT G HV %	HV AADT A AADT	HV AADT A HV %	HV AADT B AADT	HV AADT B HV %	HV VKT (Millions) G	HV VKT (Millions) A	HV VKT (Millions) B	Data Year	Page
403	0.000 km	10.723 km	110077	0.609 km	McHugh Rd 200m east of Corduroy Ck	53	24.65%	55	25.11%	108	24.88%	0.20744	0.21526	0.42270	2014	2
											Totals	0.20744	0.21526	0.42270		

Road Segments Summary - All Vehicles

Region	Segment Start TDist	Segment End TDist	Site	Site TDist	Description	AADT G	AADT A	AADT B	VKT (Millions) G	VKT (Millions) A	VKT (Millions) B	Data Year	Page
203	0.000 km	10.723 km	110077	0.609 km	McHugh Rd 200m east of Corduroy Ck	284	283	567	1.11155	1.10763	2.21918	2013	2
								Totals	1.11155	1.10763	2.21918		

Road Segments Summary - Heavy Vehicles only

VKT totals are calculated only if traffic class data is available for all sites.

Region	Segment Start TDist	Segment End TDist	Site	Site TDist	Description	HV AADT G AADT	HV AADT G HV %	HV AADT A AADT	HV AADT A HV %	HV AADT B AADT	HV AADT B HV %	HV VKT (Millions) G	HV VKT (Millions) A	HV VKT (Millions) B	Data Year	Page
203	0.000 km	10.723 km	110077	0.609 km	McHugh Rd 200m east of Corduroy Ck	54	19.01%	50	17.67%	104	18.34%	0.21130	0.19583	0.40705	2013	2
											Totals	0.21130	0.19583	0.40702		

Traffic Analysis and Reporting System

AADT Segment Analysis Report (Complete)

Road Section 6893 TUMOULIN ROAD

Traffic Year 2016

Road Segments Summary - All Vehicles

Region	Segment Start Tdist	Segment End Tdist	Site	Site Tdist	Description	AADT G	AADT A	AADT B	VKT (Millions) G	VKT (Millions) A	VKT (Millions) B	Data Year	Page
400	0.000 km	19.536 km	110059	6.800 km	South of Kapan Road	409	400	809	2.93135	2.88085	5.79522	2015	2
400	19.536 km	21.381 km	111562	20.430 km	100m west of Ashton Street	1,794	1,775	3,569	1.13344	1.12147	2.25490	2015	3
								Totals	4.05484	3.98838	8.12216		

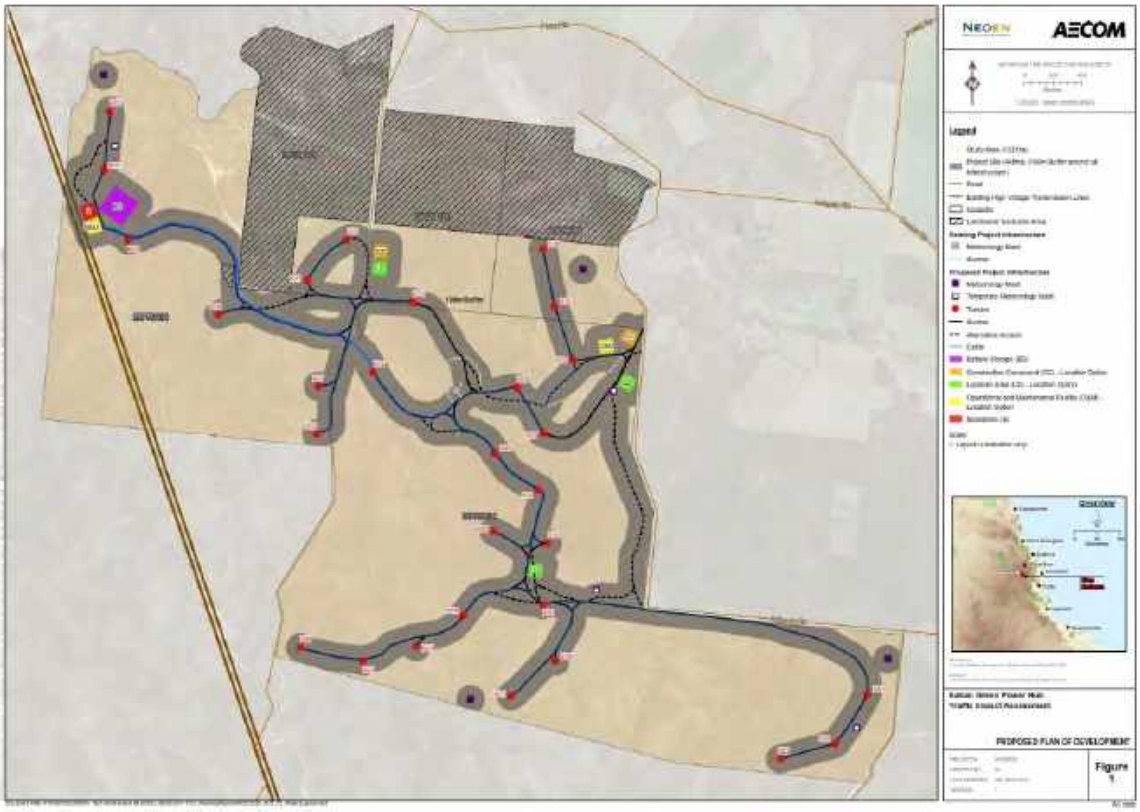
Road Segments Summary - Heavy Vehicles only

VKT totals are calculated only if traffic class data is available for all sites.

Region	Segment Start Tdist	Segment End Tdist	Site	Site Tdist	Description	HV AADT G AADT	HV AADT G HV %	HV AADT A AADT	HV AADT A HV %	HV AADT B AADT	HV AADT B HV %	HV VKT (Millions) G	HV VKT (Millions) A	HV VKT (Millions) B	Data Year	Page
400	0.000 km	19.536 km	110091	6.850 km	South of Kapan Road	50	12.22%	52	12.95%	102	12.61%	0.35600	0.37289	0.73100	2016	2
400	19.536 km	21.387 km	111592	20.405 km	150m west of Austin Street	136	7.58%	133	7.51%	272	7.58%	0.09215	0.08990	0.17843	2016	3
											Totals	0.44851	0.46289	0.90950		

Appendix C

Proposed Plan of Development (Neoen)



NEOEN
AECOM
Legend
PROPOSED PLAN OF DEVELOPMENT
Figure 1

Appendix D

Tumoulin Road / Condon Road Turn Warrants Assessment

AECOM

Turn Warrant Assessment

Intersection:	**Tumoulin Road / Condon Road** (Major Road / Minor Road)		
Year / Peak:	**2019 AM & PM Peak Hours**	Scenarios:	**Background**

Assessment based on TMR Supplement, Traffic and Road Use Management, Volume 1 - Guide to Traffic Management, Part 6: Intersections, Interchanges and Crossings (April 2016). This warrant assessment applies only to turning movements from the major road only.

	AM Peak	PM Peak
Q_{T1} =	63	63
Q_R =	14	2

	AM Peak	PM Peak
Q_{T2} =	63	63
Q_L =	21	2

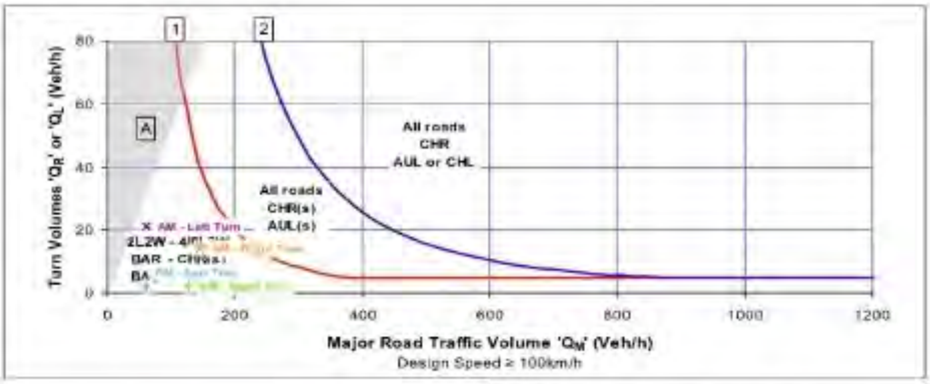
Splitter Island? No

Design speed (km/h) 110

Graph	Q_M	Q_R/Q_L
AM Peak		
Right	148	14
Left	63	21
PM Peak		
Right	129	2
Left	63	2

Figure 2.3.6-1 – Warrants – major road turn treatments – normal design domain

(a)



Legend

BAR	Basic Right Turn	BAL	Basic Left Turn
CHR(S)	Channelised Right Turn (short)	AUL(S)	Auxiliary Left Turn (short)
CHR	Channelised Right Turn	AUL	Auxiliary Left Turn
		CHL	Channelised Left Turn

Recommended treatments:

Right Turn	
Left Turn	

Comments:

Prepared by:	P. Singh
Reviewed by:	A. Barrie
Date:	

Appendix E

Tumoulin Road / Condon Road Intersection - Swept Path Assessment

NOT TO BE USED
FOR CONSTRUCTION

KABAN GREEN POWER HUB
EXISTING INTERSECTION EXTENTS
19m AV SWEPT PATHS
60528526-SK-01

LEGEND

NOT TO BE USED
FOR CONSTRUCTION

KABAN GREEN POWER HUB
PROPOSED INTERSECTION EXTENTS
19m AV SWEPT PATHS
60528526-SK-02

Appendix F

Project Pavement Loading (ESAs) Calculations

BACKGROUND ESA CALCULATIONS

Road (North to South)	AADT Counter	Base Year AADT	Est. AADT (2019)	% HV	1B Trucks and Buses	1C Articulated Vehicles	1D Road Trains	Heavy Vehicle Split - AADT: 1B Trucks and Buses	Heavy Vehicle Split - AADT: 1C Articulated Vehicles	Heavy Vehicle Split - AADT: 1D Road Trains	Heavy Vehicle Split - ESA: 1B Trucks and Buses	Heavy Vehicle Split - ESA: 1C Articulated Vehicles	Heavy Vehicle Split - ESA: 1D Road Trains	AADT - ESA (2019)
Tingira Street			500	20%										350
Aumuller Street			500	20%										350
Bruce Highway (10P)	110030	30,656	34,559	6.66%	5.03%	0.97%	0.45%	1740	336	156	3606	1077	738	5,422
	111635	38,575	41,091	5.41%	4.15%	0.70%	0.43%	1705	288	177	3534	924	838	5,296
	110025	34,646	37,612	6.48%	4.87%	1.07%	0.44%	1832	402	165	3796	1292	785	5,874
	111632	20,343	23,230	8.99%	6.96%	1.82%	0.75%	1617	423	174	3351	1358	826	5,535
	110032	18,254	19,749	8.41%	6.18%	1.51%	0.66%	1221	298	130	2530	958	618	4,105
	111648	10,649	11,180	10.21%	7.22%	2.34%	0.77%	807	262	86	1673	840	408	2,921
	111647	7,404	7,752	12.67%	8.79%	3.17%	1.06%	681	246	82	1412	789	390	2,591
	110001	5,923	6,372	15.24%	8.40%	3.43%	1.46%	535	219	94	1109	702	447	2,259
	110040	7,029	7,028	12.75%	8.32%	3.11%	1.24%	585	219	87	1212	702	413	2,327
Palmerston Highway (21A)	111678	4,035	4,026	9.46%	7.35%	1.54%	0.45%	296	62	18	613	199	86	898
	111525	1,954	1,954	16.56%	11.66%	4.72%	0.80%	228	92	16	472	295	74	843
	110218	2,169	2,218	22.58%	12.24%	6.73%	3.46%	271	149	77	563	479	364	1,406
	110004	1,340	1,439	22.09%	13.05%	6.66%	2.12%	188	96	31	389	309	145	843
Malanda Millaa Millaa Road (641)	111646	2,090	2,361	19.62%	10.52%	5.69%	3.09%	248	134	73	515	431	348	1,292
East Evelyn Road (6404)	110077	416	416	23.32%	11.65%	6.80%	4.85%	48	28	20	100	91	96	287
Kennedy Highway (32B)	111616	636	682	14.49%	7.83%	3.12%	1.00%	53	21	7	111	68	32	211
Tumoulin Road (6605)	111562	3,599	3,589	7.65%	6.41%	1.23%	0.06%	229	44	2	474	141	10	625
	110589	809	847	12.89%	10.02%	1.98%	0.24%	85	17	2	176	53	10	239
Kennedy Highway (32B)	111565	7,549	8,225	4.60%	3.99%	0.43%	0.00%	328	35	0	680	114	0	794
	110003	1,606	1,729	13.64%	10.11%	2.87%	0.67%	175	50	15	362	156	71	593
Tumoulin Road (6605)	110589	809	847	12.89%	10.02%	1.98%	0.24%	85	17	2	176	53	10	239
Condon Road			50	10%										18
Hollands Road			50	10%										18

Values based on assumptions

[illegible]

Total Daily Vehicle Movements

Cairns — No days per week 5

ID	Duration (Days)	TASK		Cairns 1	2	3	4	5	6	7	8	9	10	11	12
A	48	Mobilisation		6	6										
B	96	Access Roads / Site Areas			0	0	0	0							
C	96	Turbine Footings					[illegible]	[illegible]	[illegible]	[illegible]					
D	48	Turbine Transportation							[illegible]	[illegible]					
E	96	Turbine Erection								[illegible]	[illegible]	[illegible]	[illegible]		
F	96	Substation / Battery Storage						4	4	4	4				
G	96	Cabling									[illegible]	[illegible]	[illegible]	[illegible]	
H	24	Finalisation / Demobilisation													[illegible]
		Workforce		0	0	0	0	0	0	0	0	0	0	0	0
		Total Daily Vehicle Movements		6	6	0	0	4	**20**	**20**	6	2	2	2	16
		Daily Vehicle Movements (not incl. staff)		6	6	0	0	4	20	20	6	2	2	2	16

Atherton

ID	Duration (Days)	TASK		Atherton 1	2	3	4	5	6	7	8	9	10	11	12
A	48	Mobilisation		0	0										
B	96	Access Roads / Site Areas			0	0	0	0							
C	96	Turbine Footings					[illegible]	[illegible]	[illegible]	[illegible]					
D	48	Turbine Transportation							[illegible]	[illegible]					
E	96	Turbine Erection								[illegible]	[illegible]	[illegible]	[illegible]		
F	96	Substations / Battery Storage						0	0	0	0				
G	96	Cabling									[illegible]	[illegible]	[illegible]	[illegible]	
H	24	Finalisation / Demobilisation													[illegible]
		Workforce		24	24	24	24	24	24	24	24	24	24	24	24
		Total Daily Vehicle Movements		24	24	24	24	24	24	24	24	24	24	24	24
		Daily Vehicle Movements (not incl. staff)		0	0	0	0	0	0	0	0	0	0	0	0

Ravenshoe

ID	Duration (Days)	TASK		Ravenshoe 1	2	3	4	5	6	7	8	9	10	11	12
A	48	Mobilisation		0	0										
B	96	Access Roads / Site Areas			82	82	82	82							
C	96	Turbine Footings					[illegible]	[illegible]	[illegible]	[illegible]					
D	48	Turbine Transportation							[illegible]	[illegible]					
E	96	Turbine Erection								[illegible]	[illegible]	[illegible]	[illegible]		
F	96	Substations / Battery Storage						0	0	0	0				
G	96	Cabling									[illegible]	[illegible]	[illegible]	[illegible]	
H	24	Finalisation / Demobilisation													[illegible]
		Workforce		24	24	24	24	24	24	24	24	24	24	24	24
		Total Daily Vehicle Movements		24	106	106	176	176	94	94	24	24	24	24	24
		Daily Vehicle Movements (not incl. staff)		0	82	82	152	152	70	70	0	0	0	0	0

Cairns and Ravenshoe

	1	2	3	4	5	6	7	8	9	10	11	12
Total Daily Vehicle Movements	30	112	106	176	**180**	114	114	30	26	26	26	40
Daily Vehicle Movements (not incl. staff)	6	88	82	152	156	90	90	6	2	2	2	16
Staff Vehicle Movements	24	24	24	24	24	24	24	24	24	24	24	24

Cairns and Ravenshoe and Atherton

	1	2	3	4	5	6	7	8	9	10	11	12
Total Daily Vehicle Movements	54	136	130	200	**204**	138	138	54	50	50	50	64
Daily Vehicle Movements (not incl. staff)	6	88	82	152	158	90	90	6	2	2	2	16
Staff Vehicle Movements	48	48	48	48	48	48	48	48	48	48	48	48

PROJECT SUMMARY

[illegible]	Road (North to South)	AADT Counter	Development Traffic	% Increase AADT	Development Traffic - EIA	% Increase AADT - EIA
Cairns	Tingira Street	[redacted]	20	4.00%	5,700	4.34%
	Aumuller Street	[redacted]	20	4.00%	5,700	4.34%
	Bruce Highway (10F)	110050	20	0.08%	5,700	0.26%
		111585	20	0.35%	5,700	0.29%
		110025	20	0.03%	5,700	0.27%
		111552	20	0.09%	5,700	0.16%
		110052	20	0.10%	5,700	0.38%
		111948	20	0.18%	5,700	0.53%
		111947	20	0.26%	5,700	0.60%
		110000	20	0.31%	5,700	0.69%
		110040	20	0.28%	5,700	0.67%
	Palmerston Highway (21A)	111678	20	0.50%	5,700	1.74%
		111525	20	1.02%	5,700	1.85%
		110218	20	0.80%	5,700	1.11%
		110004	20	1.56%	5,700	1.85%
	Malanda Millaa Millaa Road (641)	111948	20	0.85%	5,700	1.21%
	East Evelyn Road (6404)	110077	20	4.81%	5,700	5.44%
	Kennedy Highway (32B)	111618	20	2.93%	5,700	7.30%
Cairns + Ravenshoe	Tumoulin Road (6805)	111562	180	5.04%	38,501	16.78%
		110059	180	21.29%	38,501	43.45%
Atherton	Kennedy Highway (32B)	111583	24	0.29%	0	0.00%
		110303	24	1.59%	0	0.00%
	Tumoulin Road (6805)	110059	24	2.85%	0	0.00%
Cairns + Ravenshoe + Atherton	Crosston Road	[redacted]	204	408.00%	38,501	583.58%
	Hollands Road	[redacted]	204	408.00%	38,501	583.58%

Appendix J

Transport Route Assessment

AECOM Imagine it. Delivered.

Preliminary Transport Route Assessment
Neoen Australia Pty Ltd
21-Dec-2017
Doc No. 60526526-RE-TRA-01

Kaban Green Power Hub

Preliminary Transport Route Assessment

Kaban Green Power Hub

Preliminary Transport Route Assessment

Client: Neoen Australia Pty Ltd

ABN: 31117519570

Prepared by

AECOM Australia Pty Ltd
Level 8, 540 Wickham Street, PO Box 1307, Fortitude Valley QLD 4006, Australia
T +61 7 3553 2000 F +61 7 3553 2050 www.aecom.com
ABN 20 093 846 925

21-Dec-2017

Quality Information

Document Kaban Green Power Hub

Ref 60528526

Date 21-Dec-2017

Prepared by Herman Joubert

Reviewed by Andrew Barrie

Revision History

Rev	Revision Date	Details	Authorised	
			Name/Position	Signature
A	30-Oct-2017	Draft for Client Comment	Mark Herod Project Manager	
0	21-Dec-2017	Final	Mark Herod Project Manager	

Table of Contents

4.24 Pinch Point 24 – Kennedy Highway / Moore Street

A swept path analysis was conducted for pinch point number 24 which is located on a horizontal curve and through the intersection of Kennedy Highway and Moore Street. The preliminary findings of the assessment are provided in **Table 26**.

Table 26 Pinch Point 24 – Kennedy Highway / Moore Street

Pinch Point ID	Street 1	Street 2	Approx. Lat	Approx. Long	Aspect of Conflict
24	Kennedy Highway	Moore Street	17°36'44.10"S	145°23'31.20"E	Intersection and Curve

Locality

Swept Path Analysis

Site Visit Photos Dated: [illegible]

Envisaged Conflicts and Potential Mitigation Measures

Moore Street is considered narrow with an estimated carriageway width of 5m and no provision for road shoulders. The front and rear wheels of the vehicle would marginally encroach onto the road verge along the curve before straightening out, and are expected to conflict with 6 x guideposts and 1 x sign.

The vehicle would also make use of both lanes, with the blade encroaching further into the adjacent verge area, conflicting with a further 4 guideposts.

Mitigation measures would include the temporary removal of the signs and guideposts, as well as temporary pavement widening around the curve.

Road Safety Risks

The intersection is considered un-conventional with no clear indication of the position of the intersection, control or type. The side road intersects at an estimated 45 degree angle with no through and right turn separation on the mainline. This may be a safety risk to through movement vehicles behind the transporting trucks as well as oncoming traffic. Driver confusion may also be caused. The vehicle would have to make use of both lanes along Moore Street being in conflict with oncoming traffic. Informal driveways obtain access from Moore Street.

Impacts on Community

Road users largely consist of general traffic and commercial vehicles. Acreages and residential uses are within immediate vicinity of the route. Heavy vehicle noise might impact the immediate surroundings.

Managing Road-user Inconvenience

Use pilot vehicle and police escorts to warn opposing vehicles and to create a clearway along Moore Street. Travel outside of peak times. Undertake appropriate engagement/consultation activities to inform the community on transport operation schedule, timeframes, likely impacts and proposed mitigation measures to manage road user expectations. Reduce compression braking to minimise noise.

4.25 Pinch Point 25 – Grigg Street / Ascham Street

A swept path analysis was conducted for pinch point number 25 which is located on a horizontal curve and traversing through the intersection of Grigg Street and Ascham Street. The preliminary findings of the assessment are provided in **Table 27**.

Table 27 Pinch Point 25 – Grigg Street / Ascham Street

Pinch Point ID	Street 1	Street 2	Approx. Lat	Approx. Long	Aspect of Conflict
25	Grigg Street	Ascham Street	17°38'32.66"S	145°28'1.46"E	Intersection and Curve

Locality

Swept Path Analysis

Site Visit Photos Dated: [illegible]

Envisaged Conflict and Potential Mitigation Measures

There is no conflict envisaged for this swept path movement along the horizontal curvature or through the intersection. The design vehicle is expected to be able to traverse without any conflict across the bridge and around the curve.

No mitigation measures expected to be required.

Road Safety Risks

The vehicle would cross North Cedar Creek via a bridge which has pedestrian walkways on both sides. Pedestrians also cross Moore Street at random. The vehicle would make use of multiple lanes around the curve through the intersection which would be in conflict with opposing traffic such as right turning vehicles from Moore Street and through traffic.

Impacts on Community

Road users largely consist of general traffic and commercial vehicles. Pedestrian activity was observed within the town of Ravenshoe, crossing Grigg and Moore Street at random. Heavy vehicle noise might impact the immediate surroundings consisting of commercial and residential uses.

Managing Road-user Inconvenience

Use pilot vehicle and police escorts to warn opposing vehicles and pedestrians. Travel outside of peak times. Do the trip at night where feasible to avoid vehicular and pedestrian conflict. Undertake appropriate engagement/consultation activities to inform the community on transport operation schedule, timeframes, likely impacts and proposed mitigation measures to manage road user expectations. Reduce compression braking to minimise noise.

4.26 Pinch Point 26 – Grigg Street / Wakooka Street

A swept path analysis was conducted for pinch point number 26, located along a horizontal curve and the intersection of Grigg Street and Wakooka Street. The preliminary findings of the assessment are provided in **Table 26**.

Table 26 Pinch Point 26 – Grigg Street / Wakooka Street

Pinch Point ID	Street 1	Street 2	Approx. Lat.	Approx. Long.	[illegible]
26	Grigg Street	Wakooka Street	17°38'14.77"S	145°[illegible]"E	Intersection

Locality

Swept Path Analysis

Site Visit Photos Dated: [illegible]

Envisaged Conflict and Potential Mitigation Measures

There is no conflict envisaged for this swept path movement along the horizontal curvature or through the intersection. There is expected to be sufficient number of lanes and kerb to kerb roadway width to accommodate the required movements.

No mitigation measures expected to be required.

Road Safety Risks	Impacts on Community	Managing Road-user Expectations
Slow moving vehicle transporting abnormal load length traversing along a horizontal curvature and through an intersection where opposing vehicle movements occur. Pedestrians cross at random.	Road users largely consist of general traffic and commercial vehicles. Traffic volumes observed were low, given the rural nature of the road. Pedestrian activity was observed within the town of Ravenshoe, crossing Grigg Street at random. Heavy vehicle noise might impact the immediate surroundings.	Use pilot vehicle and police escorts to warn opposing vehicles. Travel outside of peak times. Do the trip at night where feasible to avoid vehicular and pedestrian conflict. Have back up drivers when fatigue sets in. Reduce compression braking to minimise noise. Undertake appropriate engagement/consultation activities to inform the community on transport operation schedule, timeframes, likely impacts and proposed mitigation measures to manage road user expectations.

4.27 Pinch Point 27 – Tumoulin Road Horizontal Curvature

A swept path analysis was conducted for pinch point number 27 which is located along a horizontal curve of Tumoulin Road. The preliminary findings of the assessment are provided in **Table 26**.

Table 26 Pinch Point 27 – Tumoulin Road Horizontal Curvature

Pinch Point ID	Street 1	Street 2	Approx. Lat.	Approx. Long.	[illegible]
27	Tumoulin Road	-	17°39'22.80"S	145°26'10.55"E	Curve

Locality

Swept Path Analysis

Site Visit Photos Dated: [illegible]

Envisaged Conflict and Potential Mitigation Measures

There is no conflict envisaged for this swept path movement along the horizontal curvature of Palmerston Highway. There is expected to be sufficient number of lanes and kerb to kerb roadway width to accommodate the required movements.

No mitigation measures expected to be required.

Road Safety Risks	Impacts on Community	Managing Road-user Expectations
The vehicle would make use of both lanes around the curves which would be in conflict with opposing traffic. Narrow shoulders are evident with minimal space allowed for vehicle recovery. The verge drop is steep which would make it difficult for vehicles to stay clear off the roadway when the transport vehicle needs to pass. Rainy conditions may cause excessive storm water runoff and sedimentary spill over from cuttings onto the roadway due to [illegible] drainage infrastructure which may impact skid resistance.	Road users largely consist of general traffic and commercial vehicles. Traffic volumes observed were low.	Use pilot vehicle and police escorts to warn opposing vehicles or to stop vehicles on straight sections where the vehicle would not require opposing traffic lane. Travel during night time where feasible. Plan appropriate [illegible] areas for [illegible] to avoid dangerous situations and speeding. Plan trip during good and clear weather conditions. Undertake appropriate engagement/consultation activities to inform the community on transport operation schedule, timeframes, likely impacts and proposed mitigation measures to manage road user expectations.

4.28 Pinch Point 28 – Tumoulin Road / Condon Road

A swept path analysis was conducted for pinch point number 28 which is located at the intersection of Tumoulin Road and Condon Road. The preliminary findings of the assessment are provided in **Table 30**.

Table 30 Pinch Point 28 – Tumoulin Road / Condon Road Intersection

Pinch Point ID	Street 1	Street 2	Approx. Lat.	Approx. Long.	Type of Conflict
28	Tumoulin Road	Condon Road	17°33'53.27"S	145°27'13.06"E	Intersection

Locality

Swept Path Analysis

Site Visit Photos Dated: 24/04/2017

Envisaged Conflict and Potential Mitigation Measures

The swept path analysis indicates that the vehicle would conflict with: 8 x guideposts, 3 x signs, 1 x wooden fence and vegetation. The rear bogy of the vehicle would have to traverse onto the unsurfaced ground opposite the intersection within the road verge.

Mitigation might include the temporary removal of the signs and permanent removal or trimming of the trees located within the road reserve. Mitigation may also include providing a temporary road surface such as a traversable compacted and graded gravel surface. This would require temporary earth and pavement works to be traversable. Sufficient at grade width of the railway crossing is anticipated to be available to accommodate for the swept path of the vehicle.

The suitability for the rear wheels to use the vacant land adjacent to the intersection would need to be confirmed with the relevant road authority (TMR).

Road Safety Risks	Impacts on Community	Managing Road user Expectations
The vehicle would traverse across both lanes in the direction of oncoming traffic in order to complete the turn. The rear bogy of the vehicle would traverse onto the vacant land opposite the intersection which can be of a safety risk to pedestrians, although no pedestrian activity was observed during the site visit on this vacant land. The vehicle would also have to cross a rail level crossing just after the intersection. Steep edge drops are evident.	Road users largely consist of general traffic and commercial vehicles. The surrounding environment consists of acreages with residential units. Heavy vehicle noise might impact the immediate surroundings.	Use pilot vehicle and police escorts. Travel outside of peak times. Use temporary lighting where existing lighting infrastructure is impacted. Do the trip at night where feasible to avoid vehicular conflict. Ensure minimal delays occur while traversing over the level crossing. Reduce compression braking to minimise noise. Provide temporary signage indicating level crossing. Undertake appropriate engagement/consultation activities to inform the community on transport operation schedule, timeframes, likely impacts and proposed mitigation measures to manage road user expectations.

5.0 Summary and conclusions

As identified above, while the majority of the identified pinch points are expected to require minor or no mitigation works to accommodate the proposed transport vehicles, a number of locations were shown to potentially require major works to accommodate the transport vehicles, noting the requirement for further assessment by the transport operator once the final configuration of the transport vehicle and load are confirmed.

Notwithstanding this, based on the preliminary assessment undertaken it is considered that a feasible transport route from the Port of Cairns to the Project site is available, subject to resolving the potential conflicts with the relevant stakeholders, and conducting the identified works and implementing appropriate mitigation measures where required.

Table 31 outlines which of the investigated locations have been identified to require mitigation works.

Table 31 Summary Table

			Potential Conflicts											
ID	Street 1	Street 2	Signs	Lights	Traffic Signals	Power Pole	Kerb	Drain	Pavement	Vegetation	Guardrails	Guideposts	Fence	Verge works
2	Tingira Street	Aumuller Street	3	1			Y		Y[1]	Y		1		Y
3	Aumuller Street	Ray Jones Drive	2	2					Y			5		
8	Bruce Highway	Palmerston Highway	3	3			Y			Y				Y
9	Palmerston Highway	Shaw Road	8			2		Y	Y			4		Y
12	Palmerston Highway	-								Y				
14	Palmerston Highway	-	16									8		
15	Palmerston Highway	-	30									30		
16	Palmerston Highway	-									Y[2]			Y
19	Malanda Millaa Millaa Road	East Evelyn Road	3	4										Y[2]
21	East Evelyn Road	Sluice Creek	4									3		
22	East Evelyn Road	-	5						Y			5		Y[2]
23	East Evelyn Road	Kennedy Highway	13						Y	Y		22		Y[2]
24	Kennedy Highway	Moore Street	1						Y			6		
28	Tumoulin Road	Condon Road	3						Y	Y		8	Y	

[1] *Parking may also be a potential conflict*

[2] *Identifies locations where additional clearance checks are to be completed by transport operator once vehicle configuration and load clearances are confirmed.*

5.1 Additional Route Studies

In the subsequent design stages of the project, a number of additional investigations are recommended. These investigations are to be completed by the chosen contractor for the transport of the wind turbine blades. These investigations should consider:

- Final selection of wind turbine blade dimensions (by Neoen);
- Selection of truck and trailer/rear bogie model;
- Second turn path analysis with actual vehicle dimensions to be used;
- A Road Safety Audit (RSA) on both the transport route and any road designs/changes being constructed to accommodate the truck;
- Analysis of vertical geometry restraints along the full corridor;
- Identification of all intersections along the route that will require traffic control during the transport process;
- Identification and subsequent consultation of all stakeholders / land owners impacted within the route;
- Road surface / pavement assessment;
- Structural assessment of bridge and or culvert crossings.

5.2 Consultation and Approvals

It is recommended that consultation with DTMR and the relevant local government agencies be undertaken during the Project development. Parallel to further route analysis studies, stakeholder consultation and a number of plans will also need to be developed. These plans include:

- Road-Use Management Plan (RUMP)
  - To identify and develop the appropriate traffic and transport management strategies for State Controlled Routes (SCR's) and, where necessary, Rural Controlled Routes (RCR's)
- Traffic Management Plans (TMP)
  - To develop plans for temporary and permanent traffic arrangements (if required)
- Driver Fatigue Management Plan
  - To develop appropriate restrictions on travel times and specify durations for drivers operating within and outside of the route (includes pilot vehicles, etc.)
- Emergency Response/Disaster Management Plan
  - Specific procedures developed for loading, unloading and handling the turbine blades. These procedures are required to comply with the Australian Dangerous Goods (ADG) Code
- Spill Prevention and Response Plan (SPRP)
  - Any fuel or chemical spill is to be monitored regularly to make sure that there is no adverse impact on environmentally sensitive areas (e.g., creeks and rivers).

An approximate time line for developing these plans, including the appropriate consultation and actions to complete these plans, have been identified in **Table 32.**

5.3 Heavy Vehicle Permitting

The issues identified in the route analysis are issues that ultimately need to be addressed by TMR's Heavy Vehicle Office in the form of permitting and road-use management.

The process for these permits will require the transport vehicle to first be selected by the contractor, which then allows for the optimal transport route to be finalised. This route confirmation will allow the project to enter the Heavy Vehicle Permitting stage. As the transportation procedure will involve works or modifications to state controlled roads, appropriate mitigation strategies will be developed and subsequently approved as per the requirements of Section 33 of the *Transport Infrastructure Act 1994*.

Table 32 Timeline for Consultation and Approvals

Project phase	Plans to be Developed	Action Required
Detailed Design phase	• Preliminary Road Use Management Plan (RUMP)[1]	• Ongoing consultation with relevant local authorities, including the Department of Transport and Main Roads (TMR), the Queensland Police Service (QPS) and Emergency Services • Investigate detailed design solutions to: – Minimise the impact on the efficiency of the route networks – Ensure the operational safety of the transport vehicles – Provide safe temporary access to/from public roads • Establish infrastructure agreements with TMR and regional councils.
Finalised Design / Pre Transport Stage	• Road-Use Management Plan (RUMP) • Preliminary Traffic Management Plans (TMP) – Emergency Response/Disaster Management Plan – Spill Prevention and Response Plan (SPRP) – Driver Fatigue Management Plan	• Consultations to continue with the parties listed • Finalise impact mitigation strategies comprising a combination of road use management strategies, such as variable message signs, avoiding peak hour traffic especially near schools/bus routes and fatigue management strategies, and infrastructure strategies where required • Traffic Management Plans will be prepared in accordance with the latest edition of the 'Manual of Uniform Traffic Control Devices Part 3 – Works on Roads' and TMR's specification "MRTS02 – Provision for traffic" prior to the commencement of the blade transport. Road safety measures will take into consideration speed restrictions, driver fatigue, in-vehicle communications, signage, demarcations, maintenance, safety checks, and interaction with public transport, transport of hazardous and dangerous goods and emergency response and disaster management.
Transport Stage	• Traffic Management Plans (TMP) – Emergency Response/Disaster Management Plan – Spill Prevention and Response Plan (SPRP) – Driver Fatigue Management Plan	• Develop and implement operational traffic management measures including driver fatigue management.

[1] *Preliminary and Final versions to be developed as per 'Guideline for preparing a Road Use Management Plan (GRUMP) (TMR, 2012)*

Appendix A

Swept Path Print Outs

Figure 12 Swept Path Pinch Point 1 with 83.5m Blade

Figure 13 Swept Path Pinch Point 2 with 83.5m Blade

Figure 14 Swept Path Pinch Point 3 with 83.5m Blade

Figure 15 Swept Path Pinch Point 4 with 83.5m Blade

Figure 16 Swept Path Pinch Point 5 with 83.5m Blade

Figure 17 Swept Path Pinch Point 6 with 83.5m Blade

Figure 18 Swept Path Pinch Point 7 with 83.5m Blade

Figure 19 Swept Path Pinch Point 8 and 9 with 83.5m Blade

Figure 20 Swept Path Pinch Point 18 with 83.5m Blade

Figure 21 Swept Path Pinch Point 11 with 83.5m Blade

Figure 22 Swept Path Pinch Point 12 with 83.5m Blade

Figure 23 Swept Path Pinch Point 13 with 83.5m Blade

Figure 24 Swept Path Pinch Point 14 with 83.5m Blade

Figure 25 Swept Path Pinch Point 15 with 83.5m Blade

Figure 26 Swept Path Pinch Point 16 with 83.5m Blade

Figure 27 Swept Path Pinch Point 17 with 83.5m Blade

Figure 28 Swept Path Pinch Point 18 with 83.5m Blade

Figure 29 Swept Path Pinch Point 19 with 83.5m Blade

Figure 30 Swept Path Pinch Point 20 with 83.5m Blade

Figure 31 Swept Path Pinch Point 21 with 83.5m Blade

Figure 32 Swept Path Pinch Point 22 with 83.5m Blade

Figure 33 Swept Path Pinch Point 23 with 83.5m Blade

Figure 34 Swept Path Pinch Point 24 with 83.5m Blade

Figure 35 Swept Path Pinch Point 25 with 83.5m Blade

Figure 36 Swept Path Pinch Point 26 with 83.5m Blade

Figure 37 Swept Path Pinch point 27 with 83.5m Blade

Figure 38 Swept Path Pinch Point 28 with 83.5m Blade

ANNEXURE 4 – KABAN WIND FARM DEVELOPMENT APPROVAL

Australian Government
Department of Agriculture, Water and the Environment

APPROVAL

Kaban Green Power Hub, Kaban, Queensland (EPBC 2018/8289)

This decision is made under sections 130(1) and 133(1) of the *Environment Protection and Biodiversity Conservation Act 1999 (Cth)*. Note that section 134(1A) of the **EPBC Act** applies to this approval, which provides in general terms that if the approval holder authorises another person to undertake any part of the action, the approval holder must take all reasonable steps to ensure that the other person is informed of any conditions attached to this approval, and that the other person complies with any such condition.

Details

Person to whom the approval is granted (approval holder)	Neoen Australia Pty. Ltd.
ABN of approval holder	ABN 57 160 905 706
Action	To construct and operate a wind farm with up to 29 turbines and associated infrastructure 80 km south-west of Cairns, in Kaban, far north Queensland; as described in the referral received by the Department on 17 October 2018 [See EPBC Act referral 2018/8289].

Approval decision

My decisions on whether or not to approve the taking of the action for the purposes of each controlling provision for the action are as follows.

Controlling Provisions

Listed Threatened Species and Communities	
Section 18	Approve
Section 18A	Approve

Listed migratory species	
Section 20	Approve
Section 20A	Approve

Period for which the approval has effect

This approval has effect until 3 April 2051.

Decision-maker

Name and position	Andrew McNee Assistant Secretary Assessments and Governance Branch Department of Agriculture, Water and the Environment
Signature	[signature]
Date of decision	21 April 2020

Conditions of approval

This approval is subject to the conditions under the EPBC Act as set out in ANNEXURE A.

ANNEXURE A – CONDITIONS OF APPROVAL

Part A – Conditions specific to the action

Maximum clearing limits

1. To minimise impacts on **EPBC Act listed threatened species and communities**, the approval holder must not **clear** more than 129 hectares (ha) of habitat for **EPBC Act listed threatened species and communities** within the **project area**, including no more than:
    (a) 95.2 ha of **Prostanthera habitat**.
    (b) 3 ha of **Magnificent Brood Frog habitat**.
    (c) 61.2 ha of **Greater Glider habitat**.
    (d) 100 ha of **Northern Quoll habitat**, including no more than 5.6 ha of **Northern Quoll denning habitat**.

EPBC Act listed threatened and migratory species management

2. The approval holder must implement the **Vegetation Management Plan** and **Fauna Management Plan** for the duration of this approval.
3. The approval holder must report against each performance criterion specified in the **Vegetation Management Plan** and **Fauna Management Plan** and provide an evaluation of the effectiveness of the measures implemented to avoid and mitigate impacts of the action on **EPBC Act listed threatened species and communities** and **EPBC Act listed migratory species** in each annual **compliance report** required under condition 35.
4. To minimise **impacts** on *Prostanthera clotteniana*, the approval holder must undertake **pre-clearance surveys** of all potential **Prostanthera habitat**. The approval holder must prevent any direct or indirect impacts to any Prostanthera clotteniana individual.

Turbine strike monitoring and management

5. During **operation**, the approval holder must implement the **Bird and Bat Management Plan**.
6. To inform the **risk profile** of each turbine, the approval holder must undertake bird and bat utilisation surveys, including:
    (a) Prior to **commissioning**, the approval holder must undertake pre-commissioning bird and bat utilisation surveys over a period of at least 24 months, including at least one survey undertaken at or adjacent to each proposed wind turbine location in each of at least one wet season and one dry season in succession.
    (b) Commencing within 3 months after **commissioning**, the approval holder must undertake post-commissioning bird and bat utilisation surveys over a period of at least 24 months, including at least one survey at or adjacent to each wind turbine in each of at least two wet seasons and two dry seasons in succession.
7. At least one survey in each 12 month period of bird and bat utilisation surveys required under condition 6 must be conducted within the **migratory period** of each **EPBC Act listed migratory species**.
8. The approval holder must report on the results of the bird and bat utilisation surveys required under condition 6 in each annual **compliance report** required under condition 35 until all bird and bat utilisation surveys have been reported on.

Attachment A

9. All bird and bat utilisation surveys must be conducted by a **suitably qualified ecologist**.

10. Prior to **commissioning**, the approval holder must assign a **risk profile** to each turbine within the **project area** using the results of the pre-commissioning bird and bat utilisation surveys required under condition 6(a).

11. If, during bird and bat utilisation surveys required under condition 6 or during any other monitoring or incidental observation during **operation**, one or more individual of an **EPBC Act listed bird or bat species** is detected within the **vicinity** of a **low-risk turbine**, the approval holder must assign that turbine to be a **high-risk turbine** within five **business days** of the detection.

12. During **operation**, the approval holder must include a list of the **risk profiles** of each turbine within the **project area** in each annual **compliance report** required under condition 35.

13. During **operation**, the approval holder must undertake turbine strike monitoring in accordance with the **Bird and Bat Management Plan** at monitoring sites identified in the **Bird and Bat Management Plan** and at all **high-risk turbines** identified as required under conditions 10 and 11.

14. The approval holder must annually evaluate the effectiveness of the measures implemented to avoid and mitigate **impacts** of turbine collision on **EPBC Act listed bird and bat species** and report on that evaluation, and performance against the **impact triggers**, in each annual **compliance report** required under condition 35.

15. If an **impact trigger** is reached or exceeded, the approval holder must implement the adaptive management procedure described in the **Bird and Bat Management Plan**. The approval holder must, on each occasion that an **impact trigger** is reached or exceeded, report on the steps taken and outcomes of implementing the adaptive management procedure, including details of the mitigation measures that have been or will be implemented and an assessment of their likely effectiveness in the first annual **compliance report** required under condition 35 following an **impact trigger** being reached or exceeded.

16. Within 20 **business days** of an **impact trigger** being reached or exceeded, if application of the adaptive management procedure required under condition 15 identifies, in respect of any wind turbine or number of wind turbines, that additional mitigation measures are required but no alternative mitigation measures can or will be implemented; and

    (a) If the additional mitigation measures are required in respect of the Ghost Bat or Spectacled Flying-fox, the approval holder must cease to operate any wind turbine that contributed to reaching or exceeding an **impact trigger** between sunset and sunrise each day; and/or

    (b) If the additional mitigation measures are required in respect of any nocturnal **EPBC Act listed migratory species**, the approval holder must cease to operate any wind turbine that contributed to reaching or exceeding an **impact trigger** between sunset and sunrise each day during the **migratory period** of any **EPBC Act listed migratory species** for which an **impact trigger** has been reached or exceeded; and/or

    (c) If the additional mitigation measures are required in respect of any diurnal **EPBC Act listed migratory species**, the approval holder must cease to operate any wind turbine that contributed to reaching or exceeding an **impact trigger** between sunrise and sunset each day during the **migratory period** of any **EPBC Act listed migratory species** for which an **impact trigger** has been reached or exceeded; and/or

    (d) If the additional mitigation measures are required in respect of any cathemeral **EPBC Act listed migratory species** or any **EPBC Act listed migratory species** for which diel activity is unknown, the approval holder must cease to operate any wind turbine that contributed to reaching or exceeding an **impact trigger** the **migratory period** of any **EPBC Act listed migratory species** for which an **impact trigger** has been reached or exceeded.

17. Any request by the approval holder to cease or reduce the curtailment required under condition 16 must demonstrate how the ceasing or reducing of the curtailment will not result in any additional **impact** on **EPBC Act listed bird and bat species**.

Environmental offsets

18. To compensate for the **clearance** of **Magnificent Brood Frog habitat** and **Greater Glider habitat** as specified in condition 1(b)-(c), the approval holder must legally secure all environmental offsets proposed in the **Offset Area Management Plan** within 12 months of the **commencement of the action**. The **Offset Area Management Plan** must be attached to the legal mechanism used to **legally secure** the offset areas.

19. The approval holder must notify the Department within five **business days** of the legal security mechanism for each offset area being executed.

20. The legal mechanism used to **legally secure** the offset areas must remain in force for at least the duration of this approval.

21. To ensure that the offsets required under condition 18 provide a conservation gain in accordance with the **EPBC Act Environmental Offsets Policy**, the **completion criteria** must be achieved within 20 years of the **commencement of the action** and then be maintained or improved for the duration of the approval.

22. To ensure that the offsets required under condition 18 provide ongoing habitat for the Magnificent Brood Frog and Greater Glider, the key habitat features identified in the **Offset Area Management Plan** must be maintained or improved for the duration of the approval.

23. To ensure that the **completion criteria** will be achieved, performance against **performance targets** must be reported in each annual **compliance report** required under condition 35.

24. If a **performance target** is not met at the completion of each five year period, the approval holder must, on each occasion that a **performance target** is not met, report on the corrective action/s that will be implemented and an assessment of their likely effectiveness in the first annual **compliance report** required under condition 35 following a **performance target** not being met and all subsequent **compliance reports** required under condition 35 for the life of the approval.

25. If any of the **completion criteria** are not met within 20 years of the **commencement of the action**, the approval holder must, within 10 **business days** of the 20th anniversary of the **commencement of the action**, notify the **Department** of the **completion criteria** that have not been met. Within 6 months of the 20th anniversary of the **commencement of the action**, if the approval holder has not met all of the **completion criteria**, the approval holder must submit a supplementary Offset Area Management Plan that details the additional and/or revised management measures that will be implemented and/or alternative offset or offsets that will be provided to compensate for the failed offset and submit it to the **Department** to be approved in writing by the **Minister**. If approved in writing by the **Minister**, the approval holder must implement the approved supplementary Offset Area Management Plan.

26. At least 12 months and no more than 24 months following **commissioning**, the approval holder must submit a Residual Impacts Report which details the actual residual **impact** of the action on **Magnificent Brood Frog habitat** and **Greater Glider habitat** to the Department. The Residual

Impacts Report must be informed by a scientifically robust program of monitoring that has been endorsed by an **independent suitably qualified amphibian expert** and conducted by a **suitably qualified ecologist**. The Residual Impacts Report must be prepared by an **independent suitably qualified ecologist**.

27. If the actual residual **impact** of the action on **Magnificent Brood Frog habitat** or **Greater Glider habitat** is greater than the **impact** of the action on **Magnificent Brood Frog habitat** or **Greater Glider habitat** already offset, the approval holder must provide an environmental offset to compensate for the additional residual **impact** consistent with the **EPBC Act Environmental Offsets Policy**. The approval holder must, within 60 **business days** of submitting the Residual Impacts Report required under condition 26, submit a supplementary Offset Area Management Plan to the **Department** to be approved in writing by the **Minister**. If approved in writing by the **Minister**, the approval holder must implement the approved supplementary Offset Area Management Plan.

28. The supplementary Offset Area Management Plan, whether submitted under the requirements of condition 23 or condition 25, must include:

    (a) Details to demonstrate how the offset compensates for the residual **impact** on **Magnificent Brood Frog habitat** and **Greater Glider habitat** in accordance with the principles of the **EPBC Act Environmental Offsets Policy**;

    (b) A description of the offset, including location, size, condition, environmental values present and surrounding land uses;

    (c) Baseline data and other supporting evidence that documents the presence of each **listed threatened species** and the quality of each **listed threatened species** habitat within the offset area;

    (d) An assessment of **site habitat quality** using a method agreed to in writing by the **Department**;

    (e) Details of how the offset area will provide connectivity with other habitats and biodiversity corridors and/or will contribute to a larger strategic offset for each **listed threatened species**;

    (f) Maps and **shapefiles** to clearly define the location and boundaries of the offset area, accompanied by **offset attributes**;

    (g) Specific offset completion criteria derived from the **site habitat quality** to demonstrate the improvement in the quality of each **listed threatened species** habitat in the offset area over the duration of this approval;

    (h) Details of the management actions, and timeframes for implementation, to be carried out to meet the offset completion criteria;

    (i) Interim performance targets that set targets at appropriate intervals for progress towards achieving the offset completion criteria;

    (j) Details of the nature, timing and frequency of monitoring to inform progress against achieving the interim performance targets (the frequency of monitoring must be sufficient to track progress towards each set of interim performance targets, and sufficient to determine whether the offset area is likely to achieve those interim performance targets in adequate time to implement all necessary corrective actions);

    (k) Proposed timing for the submission of monitoring reports which provide evidence demonstrating whether the interim performance targets have been achieved;

(l) Timing for the implementation of corrective actions if monitoring activities indicate the interim performance targets will not or have not been achieved;

(m) Evidence of how the management actions and corrective actions take into account relevant **approved conservation advices** and are consistent with relevant **recovery plans** and **threat abatement plans**; and

(n) Details of the legal mechanism for **legally securing** the offset area, such that legal security remains in force over the offset area for at least the duration of this approval.

Part B – Standard administrative conditions

Notification of date of commencement of the action

29. The approval holder must notify the **Department** in writing of the date of **commencement of the action** and the date of **commissioning** within 10 **business days** after the date of **commencement of the action**. The approval holder must notify the **Department** in writing of the date of **commissioning** within 10 **business days** after the date of **commissioning**.

30. If the **commencement of the action** does not occur within 5 years from the date of this approval then the approval holder must not **commence the action** without the prior written agreement of the **Minister**.

Compliance records

31. The approval holder must maintain accurate and complete **compliance records**.

32. If the **Department** makes a request in writing, the approval holder must provide electronic copies of **compliance records** to the **Department** within the timeframe specified in the request.

Note: **Compliance records** may be subject to audit by the **Department** or an independent auditor in accordance with section 458 of the **EPBC Act**, and or used to verify compliance with the conditions. Summaries of the result of an audit may be published on the **Department**'s website or through the general media.

Preparation and publication of plans

33. The approval holder must:

(a) submit **plans** electronically to the **Department**;

(b) publish each **plan** on the website within 20 **business days** of the date of this approval, unless otherwise agreed to in writing by the **Minister** or, if a **plan** requires the approval of the **Minister**, within 20 **business days** of the date of the **Minister** approving the **plan**;

(c) exclude or redact **sensitive ecological data** from **plans** published on the website or provided to a member of the public; and

(d) keep **plans** published on the **website** until the end date of this approval.

34. The approval holder must ensure that any **monitoring data** (including **sensitive ecological data**), surveys, maps, and other spatial and metadata required under a **plan** and conditions of this approval, is prepared in accordance with the **Department's** *Guidelines for biological survey and*

mapped data (2018) and submitted electronically to the **Department** in accordance with the requirements of the **plan** and conditions.

Annual compliance reporting

35. The approval holder must prepare a **compliance report** for each 12-month period following the date of **commencement of the action**, or otherwise in accordance with an annual date that has been agreed to in writing by the Minister. The approval holder must:

    (a) publish each **compliance report** on the **website** within 60 **business days** following the relevant 12-month period;

    (b) notify the **Department** by email that a **compliance report** has been published on the **website** and provide the weblink for the **compliance report** within five **business days** of the date of publication;

    (c) keep all **compliance reports** publicly available on the **website** until this approval expires;

    (d) exclude or redact **sensitive ecological data** from **compliance reports** published on the website; and

    (e) where any **sensitive ecological data** has been excluded from the version published, submit the full **compliance report** to the **Department** within five **business days** of publication.

Note: **Compliance reports** may be published on the **Department**'s website.

Reporting non-compliance

36. The approval holder must notify the **Department** in writing of any: **incident**; non-compliance with the conditions; or non-compliance with the commitments made in **plans**. The notification must be given as soon as practicable, and no later than two **business days** after becoming aware of the **incident** or non-compliance. The notification must specify:

    (a) any condition which is or may be in breach;

    (b) a short description of the **incident** and/or non-compliance; and

    (c) the location (including co-ordinates), date, and time of the **incident** and/or non-compliance. In the event the exact information cannot be provided, provide the best information available.

37. The approval holder must provide to the **Department** the details of any **incident** or non-compliance with the conditions or commitments made in **plans** as soon as practicable and no later than 10 **business days** after becoming aware of the **incident** or non-compliance, specifying:

    (a) any corrective action or investigation which the approval holder has already taken or intends to take in the immediate future;

    (b) the potential impacts of the **incident** or non-compliance; and

    (c) the method and timing of any remedial action that will be undertaken by the approval holder.

Independent audit

38. The approval holder must ensure that **independent audits** of compliance with the conditions are conducted as requested in writing by the Minister.

39. For each **independent audit**, the approval holder must:

(a) provide the name and qualifications of the independent auditor and the draft audit criteria to the **Department**;

(b) only commence the **independent audit** once the audit criteria have been approved in writing by the **Department**; and

(c) submit an audit report to the **Department** within the timeframe specified in the approved audit criteria.

40. The approval holder must publish the audit report on the **website** within 10 **business days** of receiving the **Department's** approval of the audit report and keep the audit report published on the **website** until the end date of this approval.

Completion of the action

41. Within 30 days after the **completion of the action**, the approval holder must notify the **Department** in writing and provide **completion data**.

Part C - Definitions

In these conditions, except where contrary intention is expressed, the following definitions are used:

Approved conservation advices means a conservation advice approved by the **Minister** under section 266B(2) of the **EPBC Act**.

Bird and Bat Management Plan means the *Kaban Green Power Hub – Bird and Bat Management Plan* dated 10 February 2020.

Business day means a day that is not a Saturday, a Sunday or a public holiday in the state or territory of the action.

Clear/cleared/clearing means the cutting down, felling, thinning, logging, removing, killing, destroying, poisoning, ringbarking, uprooting or burning of vegetation (but not including weeds – see the Australian weeds strategy 2017 to 2027 for further guidance).

Commencement of the action/commence the action means the first instance of any specified activity associated with the action including **clearing** and **construction**. **Commencement of the action/commence the action** does not include minor physical disturbance necessary to:

(a) undertake pre-clearance surveys or monitoring programs;

(b) install signage and/or temporary fencing to prevent unapproved use of the project site (as defined in the **preliminary documentation**); and

(c) protect environmental and property assets from fire, weeds and pests, including maintenance or use of existing surface access tracks.

Commissioning/commissioned means all activities, including turning of turbines, after the components of the first complete wind turbine are installed.

Completion criteria means the performance criteria as stated in the **Offset Area Management Plan**.

Completion of the action means the time at which all approved conditions have been fully met.

Completion data means an environmental report and spatial data information clearly detailing how the conditions of this approval have been met. The **Department's** preferred spatial data format is **shapefile**. This includes, but is not limited to the:

(a) area of each **listed threatened species and community** habitat **cleared**; and

(b) quality of each **listed threatened species and community** habitat in the offset area at the end date of this approval.

Compliance records means all documentation or other material in whatever form required to demonstrate compliance with the conditions of approval in the approval holder's possession or that are within the approval holder's power to obtain lawfully.

Compliance reports means written reports:

(a) providing accurate and complete details of compliance, **incidents**, and non-compliance with the conditions and **plans**;

(b) consistent with the **Department's** *Annual Compliance Report Guidelines* (2014) (or subsequent revision);

(c) include a **shapefile** of any **impact** on any habitat for **listed threatened species** undertaken within the relevant 12-month period; and

(d) identifying the version/s of the **plans** prepared and in existence in relation to the conditions of this approval during the relevant 12-month period.

Construction means the erection of a building or structure that is or is to be fixed to the ground and wholly or partially fabricated on-site; the alteration, maintenance, repair or demolition of any building or structure; preliminary site preparation work which involves breaking of the ground; the laying of pipes and other prefabricated materials in the ground, and any associated excavation work; but excluding the installation of temporary fences and signage.

Department means the Australian Government agency responsible for administering the **EPBC Act**.

EPBC Act means the *Environment Protection and Biodiversity Conservation Act 1999* (Cth).

EPBC Act Environmental Offsets Policy means the **EPBC Act** *Environmental Offsets Policy* (2012), or subsequent revision, including the **Offset Assessment Guide**.

EPBC Act listed migratory species means the migratory fauna species listed under the **EPBC Act** for which this approval has effect, including:

(a) White-throated Needletail (*Hirundapus caudacutus*);

(b) Fork-tailed Swift (*Apus pacificus*);

(c) Oriental Cuckoo (*Cuculus optatus*);

(d) Latham's Snipe (*Gallinago hardwickii*);

(e) Black-faced Monarch (*Monarcha melanopsis*);

(f) Satin Flycatcher (*Myiagra cyanoleuca*);

(g) Rufous Fantail (*Rhipidura rufifrons*).

EPBC Act listed bird or bat species means the **EPBC Act listed threatened species** and **EPBC Act listed migratory species** for which this approval has effect that are bird or bat species.

EPBC Act listed threatened species means the threatened flora and fauna species listed under the **EPBC Act** for which this approval has effect, including:

(a) *Prostanthera clotteniana* (Prostanthera);

(b) Magnificent Brood Frog (*Pseudophryne covacevichae*);

(c) Greater Glider (*Petauroides volans*);

(d) Northern Quoll (*Dasyurus hallucatus*);

(e) Spectacled Flying-fox (*Pteropus conspicillatus*);

(f) Ghost bat (*Macroderma gigas*).

Fauna Management Plan means the *Kaban Green Power Hub – Fauna Management Plan* dated 14 February 2020.

Greater Glider habitat means all areas of eucalypt forests or woodlands that contain hollow-bearing trees, designated 'Great glider, red goshawk and black footed tree-rat' in Appendix D.

High-risk turbine means any turbine that any **EPBC listed threatened species** or **EPBC listed migratory species** that are bird or bat species have been detected within 350 metres radius of the turbine.

Impact/s/ed (verb) means to cause any measurable direct or indirect disturbance or harmful change as a result of any activity associated with the action. **Impact** (noun) means any measurable direct or indirect disturbance or harmful change as a result of any activity associated with the action.

Impact trigger means the identification, accounting for scavenger rate and searcher efficiency, within 180 m of any wind turbine or number of wind turbines of:

(a) any **EPBC Act listed threatened bat species** (or recognisable parts thereof); or

(b) 0.05% of the population of any **EPBC Act listed migratory species**:

i. 10 individuals (or recognisable parts thereof) of the White-throated Needletails (*Hirundapus caudacutus*);

ii. 100 individuals (or recognisable parts thereof) of the Fork-tailed Swift (*Apus pacificus*);

iii. 1,000 individuals (or recognisable parts thereof) of the Oriental Cuckoo (*Cuculus optatus*);

iv. 1,500 individuals (or recognisable parts thereof) of the Latham's Snipe (*Gallinago hardwickii*);

v. 460 individuals (or recognisable parts thereof) of the Black-faced Monarch (*Monarcha melanopsis*);

vi. 1,700 individuals (or recognisable parts thereof) of the Satin Flycatcher (*Myiagra cyanoleuca*);

vii. 4,800 individuals (or recognisable parts thereof) of the Rufous Fantail (*Rhipidura rufifrons*).

Incident means any event which has the potential to, or does, **impact** on any **protected matter**.

Independent means a person(s) that does not have an individual or by employment or family affiliation, any conflicting or competing interests with the approval holder, the approval holder's staff, representatives or associated persons; or the project, including any personal, financial, business or employment relationship, other than receiving payment for undertaking the role for which the condition requires an independent person.

Independent audit/s means an audit conducted by an **independent** and **suitably qualified person** as detailed in the ***EPBC Act*** *Independent Audit and Audit Report Guidelines* (2015), or subsequent revision.

Attachment A

Legally secure/ing means to secure a legal agreement under relevant Queensland legislation, in relation to a site, to provide enduring protection for the site against development incompatible with conservation.

Low-risk turbine A turbine is considered to be a **low-risk turbine** if **EPBC listed bird or bat species** are not detected within 350 metres radius of the turbine for a minimum of two years.

Magnificent Brood Frog habitat means all areas of seeps and drainage channels in eucalypt forests or woodlands with an understorey containing *Themeda triandra*, designated 'Magnificent Brood Frog low suitable habitat' and 'Magnificent Brood Frog high suitable habitat' in Appendix C.

Migratory period means the period of time during which each **EPBC Act listed migratory species** is likely to be found in north-eastern Australia, in accordance with the movement patterns for each **EPBC Act listed migratory species** as described in the Department's Species Profile and Threats database or another source endorsed by the Department.

Minister means the Australian Government Minister administering the **EPBC Act** including any delegate thereof.

Monitoring data means the data required to be recorded under the conditions of this approval.

Northern Quoll denning habitat means all areas of rocky outcrops and escarpments, designated 'Northern quoll habitat – Den' in Appendix E.

Northern Quoll habitat means all areas of eucalypt forests or woodlands, designated 'Northern quoll habitat – Den' and 'Northern quoll habitat – Foraging' in Appendix E.

Offset Area Management Plan means the *Kaban Green Power Hub – Offset Area Management Plan* dated 20 February 2020.

Offset Assessment Guide means the guidance document titled *How to use the Offsets assessment guide*, which includes the requirements for **habitat quality scores**, provided by the **Department** to assist users of the **EPBC Act Environmental Offsets Policy**.

Operation means all activities from the date the wind farm is **commissioned**.

Performance targets means the five-yearly habitat quality completion criteria as stated in the **Offset Area Management Plan**.

Plan/s means any of the documents required to be submitted to the **Department**, implemented by the approval holder and/or published on its **website** in accordance with these conditions.

Preliminary documentation means the *Kaban Green Power Hub EPBC 2018/8289 - Preliminary Documentation*, dated 10 December 2019, provided to the **Department** on 11 December 2019.

Project area means the area where the construction and operation of the action will be undertaken, designated 'project site' in Appendix A.

Prostanthera habitat means all areas of eucalypt forests or woodlands on granite or shallow clay rhyolite-derived soils, designated '*Prostanthera clotteniana* habitat' in Appendix B.

Protected matter/s means a matter protected under a controlling provision in Part 3 of the **EPBC Act** for which this approval has effect.

Recovery plan means a recovery plan made or adopted by the **Minister** under the **EPBC Act**.

Attachment A

Sensitive ecological data means data as defined in the Australian Government Department of the Environment *Sensitive Ecological Data – Access and Management Policy V1.0* (2016), or subsequent revision.

Shapefile means location and attribute information of the action provided in an Esri shapefile format. Shapefiles must contain '.shp', '.shx', '.dbf' files and a '.prj' file that specifies the projection/geographic coordinate system used. Shapefiles must also include an '.xml' metadata file that describes the shapefile for discovery and identification purposes.

Suitably qualified amphibian expert means a person with at least a postgraduate degree (or equivalent) in a suitable area (such as herpetology) and a minimum of 10 years relevant experience in amphibian monitoring, including at least one year of experience in Australia.

Suitably qualified ecologist means a person who has professional qualifications and at least three years of work experience designing and implementing surveys for the **listed threatened species** and their habitat, and can give an authoritative assessment and advice on the presence and habitat requirements of the **listed threatened species** using relevant protocols, standards, methods and/or literature.

Suitably qualified person means a person who has professional qualifications, training, skills and/or experience related to the nominated subject matter and can give authoritative independent assessment, advice and analysis on performance relative to the subject matter using the relevant protocols, standards, methods and/or literature.

Threat abatement plans means a threat abatement plan made or adopted by the **Minister** under the **EPBC Act**.

Risk profile means the risk of an individual wind turbine having an impact on an **EPBC listed bird and bat species**. A turbine is considered to be a **high-risk turbine** if **EPBC listed threatened species** or **EPBC listed migratory species** that are bird or bat species are detected within 350 metres radius of the turbine. A turbine is considered to be a **low-risk turbine** if **EPBC listed bird or bat species** are not detected within 350 metres radius of the turbine for a minimum of two years. A **high-risk turbine** may be downgraded to a **low-risk turbine** if no **EPBC listed threatened species** or **EPBC listed migratory species** that are bird or bat species are detected within the **vicinity** of the turbine for a minimum of two years.

Vegetation Management Plan means the *Kaban Green Power Hub – Vegetation Management Plan* dated 10 February 2020.

Vicinity means within 350 metres radius of the turbine.

Website means a set of related web pages located under a single domain name attributed to the approval holder and available to the public.

APPENDICES

Appendix A: Project area

Appendix B: Prostanthera habitat

Appendix C: Magnificent Brood Frog habitat

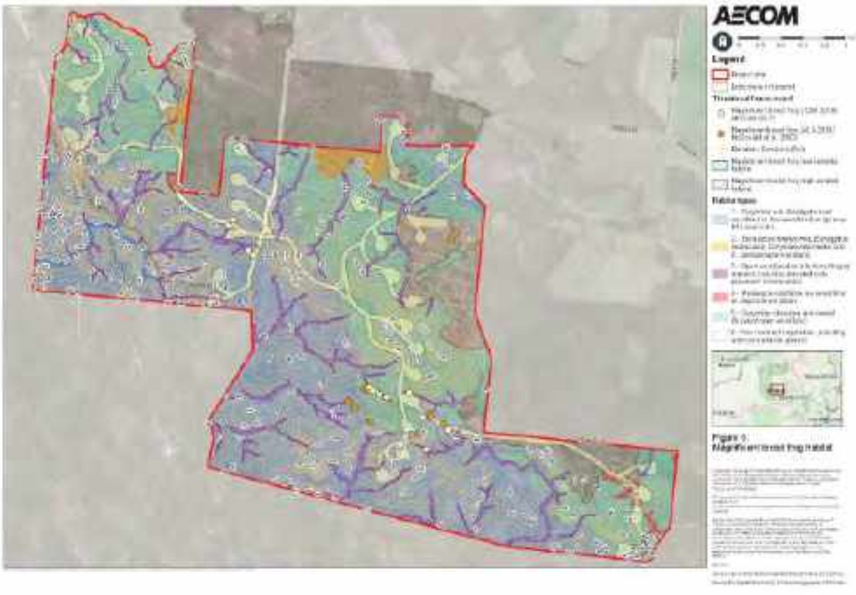
Appendix D: Greater Glider habitat

Appendix E: Northern Quoll habitat and Northern Quoll denning habitat

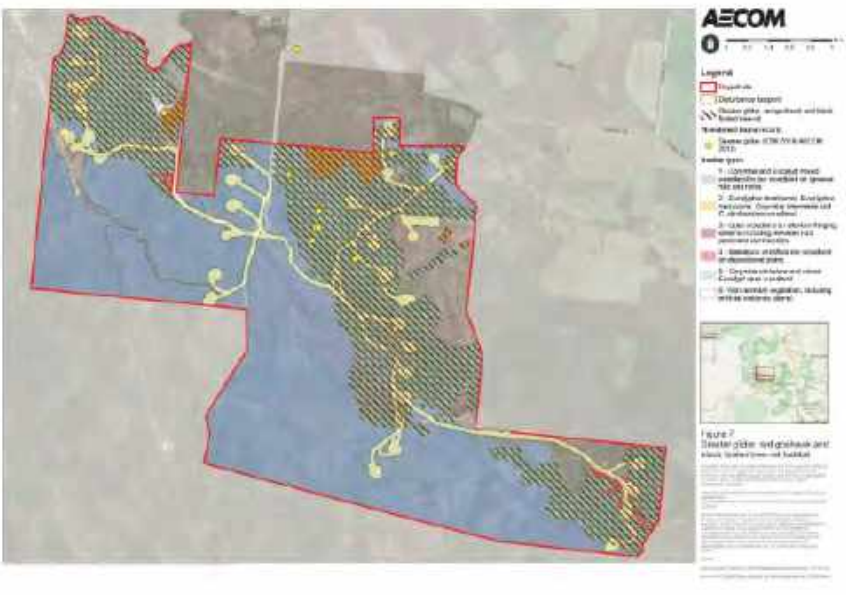
Appendix A: Project area

Appendix B: Prostanthera habitat

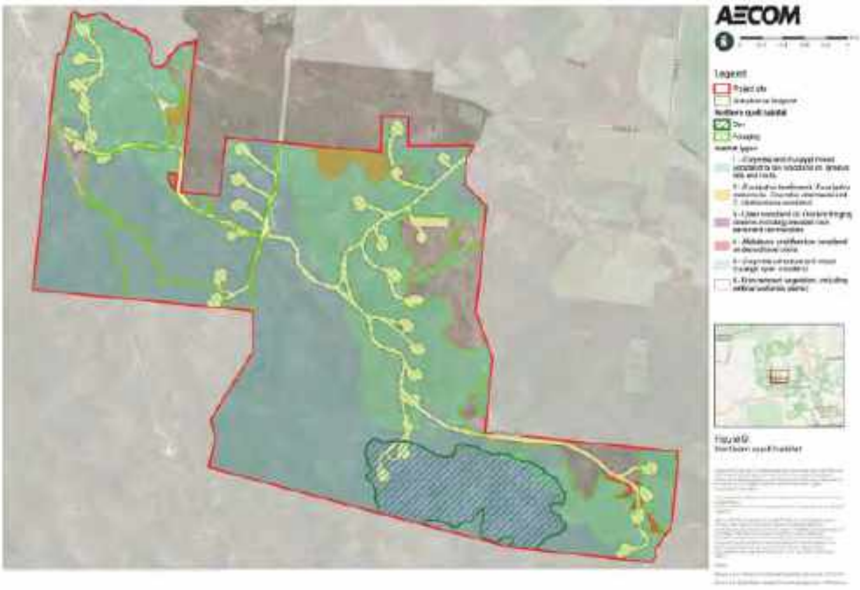
Appendix C: Magnificent Brood Frog habitat



Appendix D: Greater Glider habitat



Appendix E: Northern Quoll habitat and Northern Quoll denning habitat



ANNEXURE 5: Typical vehicle combinations used in wind farm component transportation

Image	Type of Combination	Wind farm Component	Mass (t)	Dimensions		
				Length (m)	Width (m)	Height (m)
	Prime Mover, Dolly and Jinker	Blade	54t	76	4.5	5.2
	Block Truck, Block Truck and Drawn Platform	Nacelle	171	46	4.3	5.3
	Prime Mover dolly and Jinker	Mid	81.5	39.95	4.5	5.3
	Prime Mover and Low Loader	Base Tower	94	26	4.3	5.2
	Prime Mover, Dolly and Low Loader	Hub	100	28	4.6	4.8
	Prime Mover and Low Loader	Mid Tower	88	28	4.3	5.2

NHVR: Vehicle combinations for wind farm component transportation

QTLC
QUEENSLAND TRANSPORT AND LOGISTICS COUNCIL

Queensland Transport and Logistics Council
310 Edward Street
Brisbane QLD 4000
E: ceo@qtlc.com.au
W: www.qtlc.com.au