TWEED VALLEY HOSPITAL PROJECT

FOR

NSW HEALTH
INFRASTRUCTURE

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Acronyms

AADT: Annual Average Daily Traffic
ABS: Australian Bureau of Statistics
AS: Australian Standards
ASD: Approach Sight Distance
AUL: Auxiliary Left Turn
AV: Articulated Vehicle
CTMP: Construction Traffic Management Plan
DOS: Degree of Saturation

EIS: Environmental Impact Statement
EVP: Emergency Vehicle Priority
EVT: Evening Vehicle Trip Generation
HRV: Heavy Rigid Vehicle
ITE: Institute of Transportation Engineers
LATM: Local Area Traffic Management
LOS: Level of Service
MGSD: Minimum Gap Sight Distance
MRV: Medium Rigid Vehicle
MVT: Morning Vehicle Trip Generation
PVT: Peak Vehicle Trips
RCV: Refuse Collection Vehicle
RMS: Roads and Maritime Services
SEARs: Secretary's Environmental Assessment Requirements
SISD: Safe Intersection Sight Distance
SRV: Small Rigid Vehicle
SSD: State Significant Development
SVMP: Service Vehicle Management Plan
TCS: Traffic Control Site
TDC: Traffic Data and Control
TfNSW: Transport for New South Wales
TMR: Department of Transport and Main Roads
TRAC: Tweed Regional Aquatic Centre
TSTM: Tweed Strategic Transport Model

Appendices

Appendix A: Project Masterplan
Appendix B: Traffic Surveys
Appendix C: Network Diagrams
Appendix D: SIDRA Movement Summaries
Appendix E: Preliminary CTMP

1. OVERVIEW

1.1 DESCRIPTION OF THE PROPOSAL

1.1.1 Overview

On 13 June 2017, the NSW Government announced the allocation of $534 million for the development of a new state-of-the art hospital on a greenfield site in the Tweed, to be known as Tweed Valley Hospital (Project). The Project is located on a portion of 771 Cudgen Road, Cudgen, legally described as Lot 102 DP 870722 (Project Site).

This assessment has been prepared to accompany a State Significant Development Application (SSD) for the Tweed Valley Hospital which will be assessed under Part 4 of the Environmental Planning and Assessment Act. The Project has been established based on the following supporting documentation:

- Tweed Valley Hospital Business Case;
- Tweed Valley Hospital Masterplan; and
- Tweed Valley Hospital Concept Proposal and design.

The Tweed Valley Hospital Project for which a staged approval is sought consists of:

- Delivery of a new Level 5 major referral hospital to provide the health services required to meet the needs of the growing population of the Tweed-Byron region, in conjunction with the other hospitals and community health centres across the region;
- Master planning for additional health, education, training and research facilities to support these health services, which will be developed with service partners over time. These areas will be used initially for construction site/ compound and at-grade car parking; and
- Delivery of the supporting infrastructure required for the new hospital, including green space and other amenities, campus roads and car parking, external road upgrades and connections, utilities connections, and other supporting infrastructure.

The development application pathway for the Project consists of a staged Significant Development Application under section 4.22 of the Environmental Planning and Assessment Act 1979 (EP&A Act) which will consist of:

- A concept development application and detailed proposal for Stage 1 (early and enabling works); and
- A second development application for Stage 2 works which will include detailed design, construction and operation of the Tweed Valley Hospital.

A detailed description of the proposed staging of the Project is provided in the following sections.

Concept Proposal and Stage 1 Early Works

This component (and EIS) seeks approval for a Concept Proposal of the Tweed Valley Hospital and Stage 1 early and enabling works.

The Concept Proposal is informed by service planning to 2031/2032 and has an expected gross floor area in the range 55,000m^2 to 65,000m^2. The hospital is expected to include (with more detail to be confirmed/provided at Stage 2) the following components/ services:

- A main entry and retail area;
- Administration Services;
- Ambulatory Services;
- Acute and Sub-Acute in-patient units;
- Paediatrics;
- Intensive Care Unit;
- Close Observation Unit;
- Mental Health Services;

- Maternity Unit;
- Renal Dialysis;
- Pathology;
- Pharmacy;
- Cancer Services including Day Oncology and Radiation Oncology;
- Emergency Department;
- Integrated Interventional Services;
- Interventional Cardiology;
- Medical Imaging;
- Mortuary;
- Back of house Services;
- Car parking; and
- Future expansion areas.

Stage 1 includes:

- Early and enabling works (for site clearance and preparation), generally comprising:
  - Construction compound for Stage 1 Works
  - Augmentation and connection of permanent services for the new facility (water,
  - sewer, electricity, telecommunications)
  - General clearance of vegetation within the footprint of the hospital construction works
  - including tree stumps
  - Chipping of cleared vegetation (excluding weed species) to use on-site for ground
  - stabilisation/ erosion control, or off-site disposal (as required)
  - Bulk earthworks to establish the required site levels and create a stable landform in
  - preparation for hospital construction
  - Piling and associated works
  - Stormwater and drainage infrastructure for the new facility
  - Rehabilitation and revegetation of part of the wetland area
  - Construction of internal road ways for use during construction and in preparation for
  - final road formations in Stage 2
  - Retaining walls.

The concept Masterplan is attached as Appendix A. A full set of Architectural plans are attached to the EIS.

Stage 2: Hospital Delivery - Main Works and Operation

Stage 2 (which will be subject to a separate application) would include the detailed design, construction and operation of the Tweed Valley Hospital. Stage 2 will be subject to a separate application following Stage 1.

Subsequent Stages: Potential Future Expansion

Any subsequent stages would be subject to a separate application(s) as required and would be related to works for potential future expansion of the facility. Details of this are unknown at this stage and would be developed as required.

1.2 APPLICATION AND STUDY PROCESS

1.2.1 Overview

This report assesses traffic and transport requirements to accompany the EIS for the SSD application for the Tweed Valley Hospital. The assessment has been undertaken to address the Secretary's Environmental Assessment Requirements (SEARs). Performance Outcome 17 of SEARS relates to Transport and Traffic and dictates that transport and traffic must be assessed for both construction and operational phases of the Project.

This assessment details the process required for construction traffic management and assesses the operational transport and traffic impacts. Key guidelines referenced for use during the assessment include:

- Guide to Traffic Generating Developments (Roads and Maritime Services)
- EIS Guidelines – Road and Related Facilities (DoPI)
- Cycling Aspects of Austroads Guides
- NSW Planning Guidelines for Walking and Cycling
- Austroads Guide to Traffic Management Part 12: Traffic Impacts of Development
- Standards Australia AS2890.3 (Bicycle Parking Facilities).

Table 1.1 details the SEARs requirements for the Concept Proposal and references relevant sections within this report that address each requirement. Table 1.2 details the SEARs requirements for Stage 1 works and references relevant sections within this report that address each requirement. These are intended to be quick references to key sections only. Each item should be considered with the context of this report in its entirety.

Table 1.1: SEARs – Transport and Accessibility (Concept Proposal)

Requirement	Relevant Report Section
Include a transport and accessibility impact assessment, which details, but is not limited to the following:	
details of the current daily and peak hour vehicle, existing and future public transport networks and pedestrian and cycle movement provided on the road network located adjacent to the proposed development	3.6, 3.11, 3.12, 3.5.4
details of estimated total daily and peak hour (AM, PM and weekend) trips generated by the proposal (volume and distribution), including vehicle, public transport, pedestrian and bicycle trips	5.2
details of the projected growth rate of the local daily peak hour traffic (AM, PM and weekend) in the locality	3.7.2
the impact of the proposed development on the existing and future local road network (considering a 10-year horizon)	5.3
the adequacy of existing public transport or any future public transport infrastructure within the vicinity of the site, pedestrian and bicycle networks and associated infrastructure to meet the likely future demand of the proposed development	5.5, 5.6.3, 5.6.4
measures to integrate the development with the existing/future public transport network	5.6.4
the impact of trips generated by the development on nearby intersections particularly, Tweed Road / Cudgen Road and Chinderah Road interchange with Pacific Highway	5.3
consideration of the cumulative impacts from other approved developments in the vicinity, and the need/associated funding for, and details of, upgrades or road improvement works, if required (Traffic modelling is to be undertaken using SIDRA network modelling for current and future years)	3.5, 3.7.2, 3.7, 5.3, 5.6.2 *(see Note 1)*
the identification of infrastructure required to ameliorate any impacts on traffic efficiency and road safety impacts associated with the proposed development, including details on improvements required to affected intersections including any intersection upgrades (if needed), additional bus stops or bus bays	3.7, 5.3, 5.6
the strategy in relation to travel demand management measures to minimise the impact on general traffic and bus operations	5.5, 5.6
details of any strategies to provide supplementary transport services, including shuttle services or autonomous vehicles connecting the future hospital to the existing relevant retail / health precincts	4.3.8, 5.5.1, 5.5.3

Requirement	Relevant Report Section
the proposed walking and cycling access arrangements and connections to public transport services	3.12.1, 5.5.2
the strategies for proposed bicycle parking provision, including end of trip facilities, in secure, convenient, accessible areas close to main entries incorporating lighting and passive surveillance in relation to the future development	4.4.4
details of the parking strategy, including the number of on-site car parking spaces that will be for staff and visitors and justification for the level of car parking provided on-site, including details of the management of those car parking area including accessibility and fees	4.4
an assessment of road and pedestrian safety adjacent to the proposed development and the details of required road safety measures and personal safety in line with Crime Prevention through Environmental Design	3.8, 3.12.2, 5.6
the strategies regarding emergency vehicle access, service vehicle access, delivery and loading arrangements and estimated service vehicle movements (including vehicle type and the likely arrival and departure times) and where relevant, separation of these streams.	4.3, 4.4.3
site distance measurements at proposed site access locations	4.3.2
swept path of longest vehicles accessing the site.	4.3.9, 4.4.3

Table 1.2: SEARs – Transport and Accessibility (Stage 1 Works)

Requirement	Relevant Report Section
The EIS for the Stage 1 works must address the following specific matters:	
A Transport Impact Assessment must be prepared that reassess the transport impacts of Stage 1 works within the context of the assessment undertaken for the concept proposal.	6
Detail access arrangements for the Stage 1 works and measures to mitigate any associated pedestrian, cyclist or traffic impacts.	6
Prepare a preliminary Construction Traffic and Pedestrian Management Plan (CTPMP) to demonstrate the proposed management of the impact in relation to construction traffic addressing the following: ▪ assessment of cumulative impacts associated with other construction activities (if any) ▪ an assessment of road safety at key intersection and locations subject to heavy vehicle construction traffic movements and high pedestrian activity ▪ details of construction program detailing the anticipated construction duration and highlighting significant and milestone stages and events during the construction process ▪ details of anticipated peak hour and daily construction vehicle movements to and from the site ▪ details of on-site car parking and access arrangements of construction vehicles, construction workers to and from the site, emergency vehicles and service vehicles ▪ details of temporary cycling and pedestrian access during construction ▪ details of vehicle routes, numbers of trucks by type, hours of operation, access management and traffic control measures for all phases of Stage 1.	6 *(see Note 2 & 3)*

Notes:

1. *The assessment considers key future developments in the area, namely the Kings Forest and Gales-Kingscliff developments (as identified in Section 3.5.2). Traffic growth rates and distributions utilised considered the Tweed Strategic Transport Model and consideration was given to future road upgrades and planning identified in the Tweed Road Development Strategy*
2. *Section 6 provides all available preliminary information / assumptions for construction of Stage 1 including a preliminary CTPMP*
3. *Public and active transport (walking and cycling) trips generated by construction activities are expected to be low. Regardless, the Project Site is well serviced by alternate transport including eastbound and westbound bus stops on Cudgen Road and shared path facilities on Cudgen Road and Turnock Street on the Project Site frontage (refer Section 3.11.2 and 3.12.1).*

2. INTRODUCTION

2.1 BACKGROUND

The proposed Project is for a new hospital in the Tweed Shire. On 30 June 2018, following a comprehensive expression of interest (EOI), due diligence and community consultation process that considered more than 50 potential sites, the NSW Government announced the Project Site for the new hospital on land to the west of Kingscliff. The Project Site is located off Cudgen Road between Tweed Coast Road and Turncock Street. The Project is considered a SSD and critical social infrastructure.

2.2 SCOPE OF REPORT

The scope of this study included the following:

- a review of the Project Site, including existing operations and accesses;
- collection of traffic survey data for the surrounding road network;
- a review of the proposed Project and land zoning requirements;
- a review and assessment of the existing road network and traffic conditions;
- an assessment of traffic safety in the vicinity of the Project Site;
- an assessment of public transport, pedestrian and cycling networks and connectivity surrounding the Project Site. This will include a summary of infrastructure to support the proposed Project (e.g. provision of footpaths, pedestrian crossings, bicycle paths);
- an assessment of the proposed Project's traffic generation and the distribution onto the external road network, and any impacts and mitigation measures that are required to support the Project (e.g. intersection / road upgrades);
- an assessment of access locations and requirements; and
- an assessment of existing public transport provisions / services and upgrades required to support the Project (e.g. provision of additional bus stops and bus services).

2.3 KEY ISSUES AND OBJECTIVES

The key issues and objectives of this assessment include:

- maintaining safety standards;
- maximising traffic and transport efficiencies;
- traffic impact mitigation;
- management of environmental impacts through facilitating green travel plans, active and alternate transport and minimising private vehicle dependencies; and
- catering for needs of the broader community through facilitating access by multiple transport modes, including private vehicles; public transport, community transport and active transport.

3. GENERAL DATA COLLECTION AND EXISTING CONDITIONS

3.1 PROJECT SITE DESCRIPTION AND PROPOSED ACTIVITY

The Concept Proposal is informed by service planning to 2031/2032 and has an expected gross floor area in the range 55,000m^2 to 65,000m^2. The hospital is expected to include various associated components/ services. For the purpose of the traffic and parking components of this assessment the following projected growth scenario has been used based on benchmarking from other NSW regional hospitals:

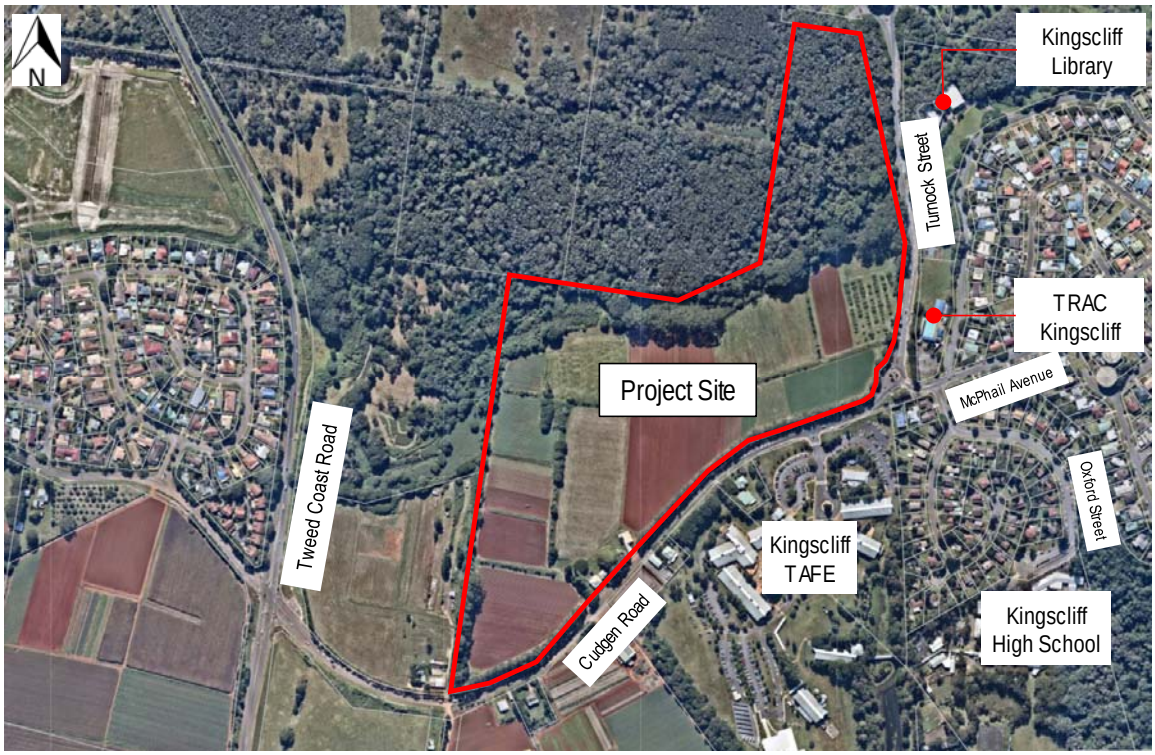
- 430 beds and 1,050 staff by Year 2032.

3.2 PROJECT SITE LOCATION

The Project Site location is 771 Cudgen Road, Cudgen NSW. The Project Site is described as Lot 102 DP 870722 and has a site area of 23.23 HA. The Project Site locality is shown in Figure 3.1 and the Project Site is shown in Figure 3.2

Source: Google Maps

Figure 3.1: Project Site Locality

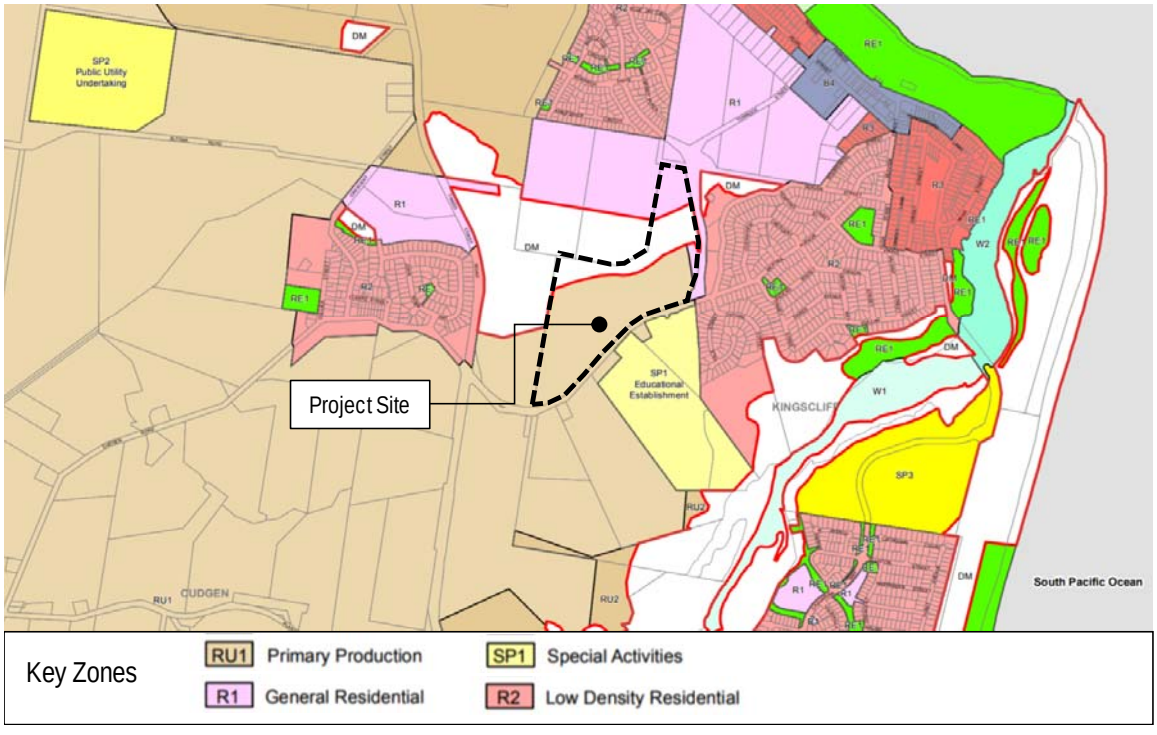


Source: Nearmap

Figure 3.2: Project Site

3.2.1 Current Land Use and Zoning

The Project Site is currently zoned as RU1 Primary Production and includes a small section of R1 General Residential along the eastern boundary. The Project Site currently includes a single detached dwelling, sheds and is used for agricultural purposes. The surrounding land zoning is for R1 General Residential, SP1 Special Activities Educational Establishment and R2 Low Density Residential. Figure 3.3 shows the land zoning of the Project Site and surrounding area.



Source: Modified from the Tweed Local Environmental Plan 2014

Figure 3.3: Land Zoning

3.3 EXISTING SITE ACCESS

The Project Site has four existing access locations. Access is provided to the residential dwelling and to the detached shed. All accesses are to a rural standard of crossover. The access locations are shown in Figure 3.4. Figure 3.5 show the typical access arrangement to the Project Site.

Source: Tweed Shire Council

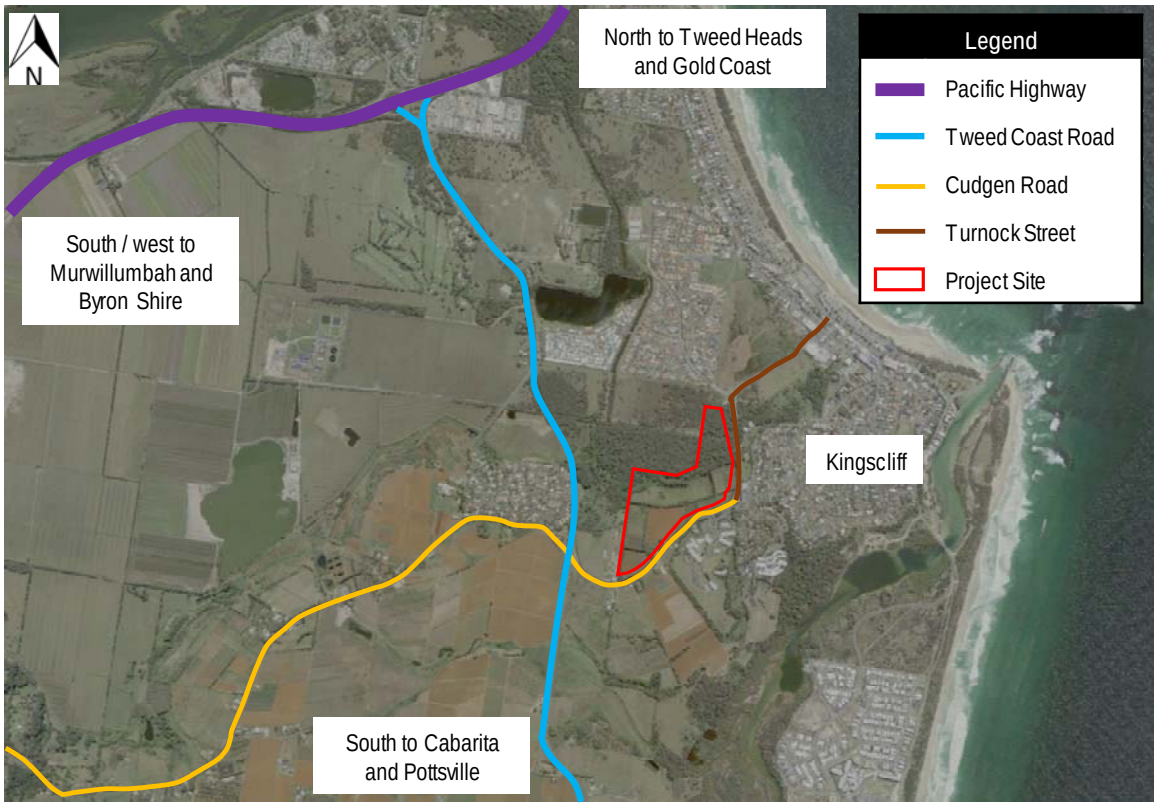
Figure 3.4: Existing Access Locations – Aerial

Figure 3.5: Typical Form of Existing Accesses

3.4 EXISTING TRAFFIC AND ROAD CONDITIONS

3.4.1 Surrounding Road Network and Road Hierarchy

The surrounding roadwork is shown in Figure 3.6.



Source: SIX Maps

Figure 3.6: Surrounding Road Network

Pacific Highway

The Pacific Highway is a RMS controlled highway connecting Sydney and Brisbane. In the vicinity of the Project Site, the Pacific Highway is a four-lane divided road with a posted speed limit of 110 km/h. Further north (approximately 2km from the Tweed Coast Road interchange) the posted speed is 100km/h and consists of a six-lane cross-section as north to South Tweed Heads, then four-lane divided to the Queensland border.

The Pacific Highway includes an interchange with Tweed Coast Road and incorporates a dual lane roundabout configuration.

Typical sections of the Pacific Highway are shown in Figures 3.7 and 3.8.

Figure 3.7: Pacific Highway Typical Section South of Tweed Coast Road (northbound)

Figure 3.8: Pacific Highway Typical Section North of Tweed Coast Road (northbound)

Tweed Coast Road

Tweed Coast Road is a north-south rural arterial road connecting coastal towns including Pottsville, Hastings Point, Cabarita, Casuarina and Kingscliff. The posted speed limit is generally 80 km/h which is reduced to 60 km/h in the vicinity of Cudgen Road intersection and the Pacific Highway. The typical cross section of Tweed Coast Road is two-lane undivided. Tweed Coast Road is classified as a regional road under the jurisdiction of Tweed Shire Council. Tweed Coast Road carries predominantly commuter traffic, with a tidal flow pattern (northbound in the morning, southbound in the afternoon). It is understood some rural properties have approvals to operate tractors and machinery on Tweed Coast Road.

A typical section of Tweed Coast Road is shown in Figures 3.9.

Figure 3.9: Tweed Coast Road Typical Section North of Cudgen Road (southbound)

Cudgen Road

Cudgen Road is an undivided two lane rural collector / distributor road connecting Kingscliff to the east with Cudgen and Tweed Valley Way to the west. In the vicinity of the Project Site, the posted speed limit is 60km/h. Cudgen Road fronts the Project Site on its southern side. Cudgen Road is under the jurisdiction of Tweed Shire Council. Dominant traffic flows on Cudgen Road are primarily related to commuter and school traffic movements. It is understood some rural properties have approvals (understood to be issued by NSW Police) to operate tractors and machinery on Cudgen Road and Tweed Coast Road. It is also understood that trucks service some non-residential properties and do so via restricted manoeuvring to/from Cudgen Road.

A typical section of Cudgen Road is shown in Figures 3.10.

Figure 3.10: Cudgen Road Typical Section East of Tweed Coast Road (westbound)

Turnock Street

Turnock Street is an undivided two lane rural arterial road connecting Kingscliff to the east with Cudgen Road to the west. In the vicinity of the Project Site the posted speed limit is 60km/h. Turnock Street fronts the Project Site on its eastern side. Turnock Street is under the jurisdiction of Tweed Shire Council.

A typical section of Turnock Street is shown in Figures 3.11.

Figure 3.11: Turnock Street Typical Section North of Cudgen Road (southbound)

3.4.2 Parking Controls

The road network immediately surrounding the Project Site consists predominantly of rural arterial or local access and collector streets. There are no formalised parking facilities on-street in the area.

3.4.3 Current and Proposed Roadworks – Short Term

No significant roadworks were being undertaken during site inspections or at the time of traffic surveys. Further, no road upgrades are understood to be planned for the immediate future in the area other than maintenance works. This was confirmed against Tweed Shire Council's capital works schedule for maintenance and capacity upgrades.

Notwithstanding, future planned upgrades are identified with Council's Tweed Road Development Strategy (TRDS) which are outlined in Section 3.5 and Council has identified that planning and funding investigations of the Tweed Coast Road duplication are underway.

3.5 FUTURE PLANNING AND TRANSPORT NETWORK CONSIDERATIONS

3.5.1 Overview

There are several future planning and transport network considerations for the subject area, specifically relating to future network capacity upgrades, new road connections and developments.

3.5.2 Proposed Developments in the Vicinity

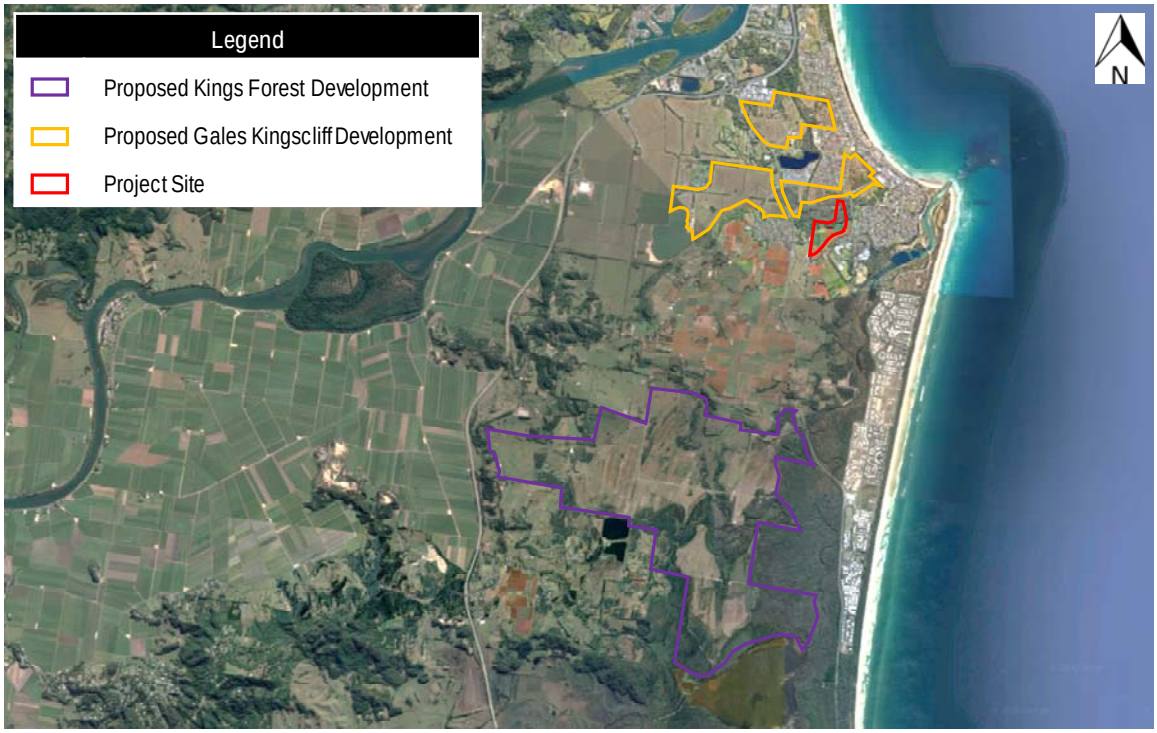
The key developments proposed in the area include the Kings Forest and Gales-Kingscliff developments. The Kings Forest development site is located to the south of the Project Site. Kings Forest is considered to be a State Significant Site and is identified to be one of the largest contributors to new housing and employment in the Tweed Shire over the next 25 years. The site proposes a mixture of land uses including residential, commercial, neighbourhood and community facilities. The site is expected to comprise of:

- 4,500 detached dwellings as well as mix of other residential dwellings (townhouses, terraces etc.) with an estimated residential population in the order of 11,000 residents;
- a mixed-use Town Centre and two Neighbourhood Centres;
- community and education facilities over 12.7 hectares;
- employment land covering 3.4 hectares; and
- recreational and open space areas.

The proposed Kings Forest development will rely significantly on Tweed Coast Road as the main traffic route between Kings Forest and the Pacific Highway.

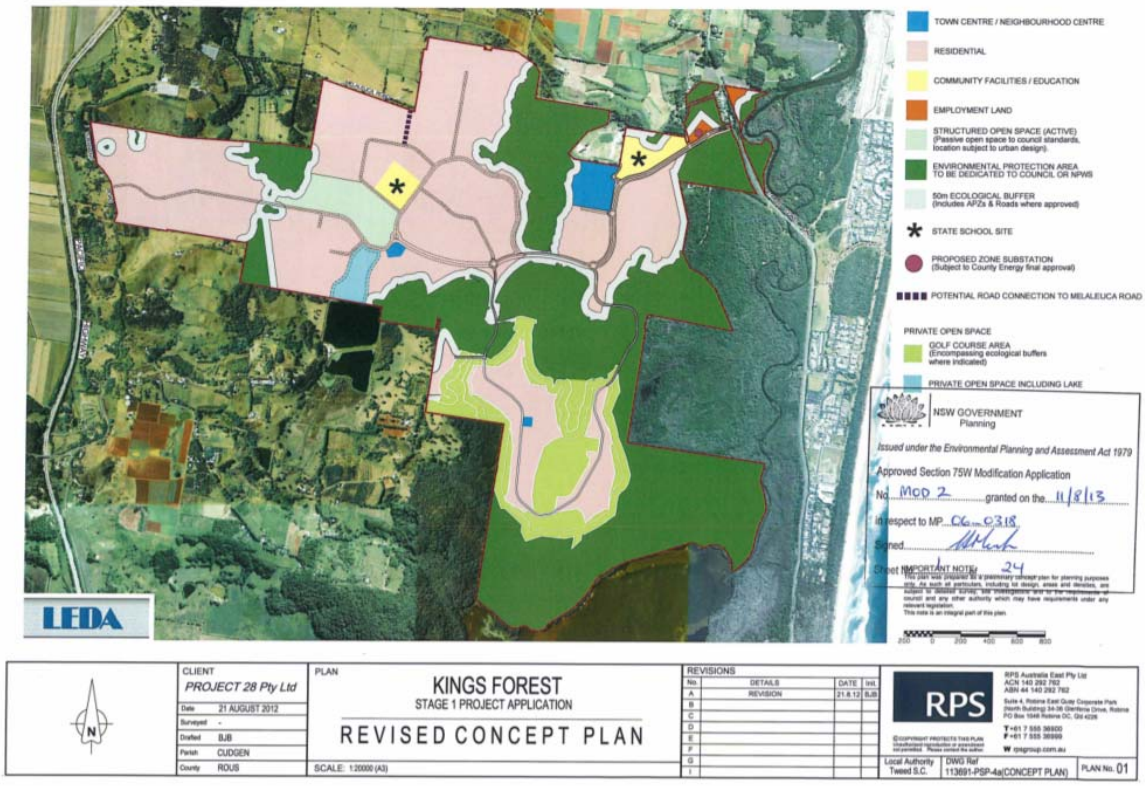
The Gales-Kingscliff Development site is located to the north of the Project Site. It is understood that the proposal is still in planning stages. The site proposes a mixture of land uses including residential, commercial, neighbourhood and community facilities.

The locality of the Kings Forest and Gales-Kingscliff developments with respect to the Project Site is shown in Figure 3.12. Concept plans for the Kings Forest and Gales-Kingscliff Developments are shown in Figures 3.13 and 3.14, respectively.



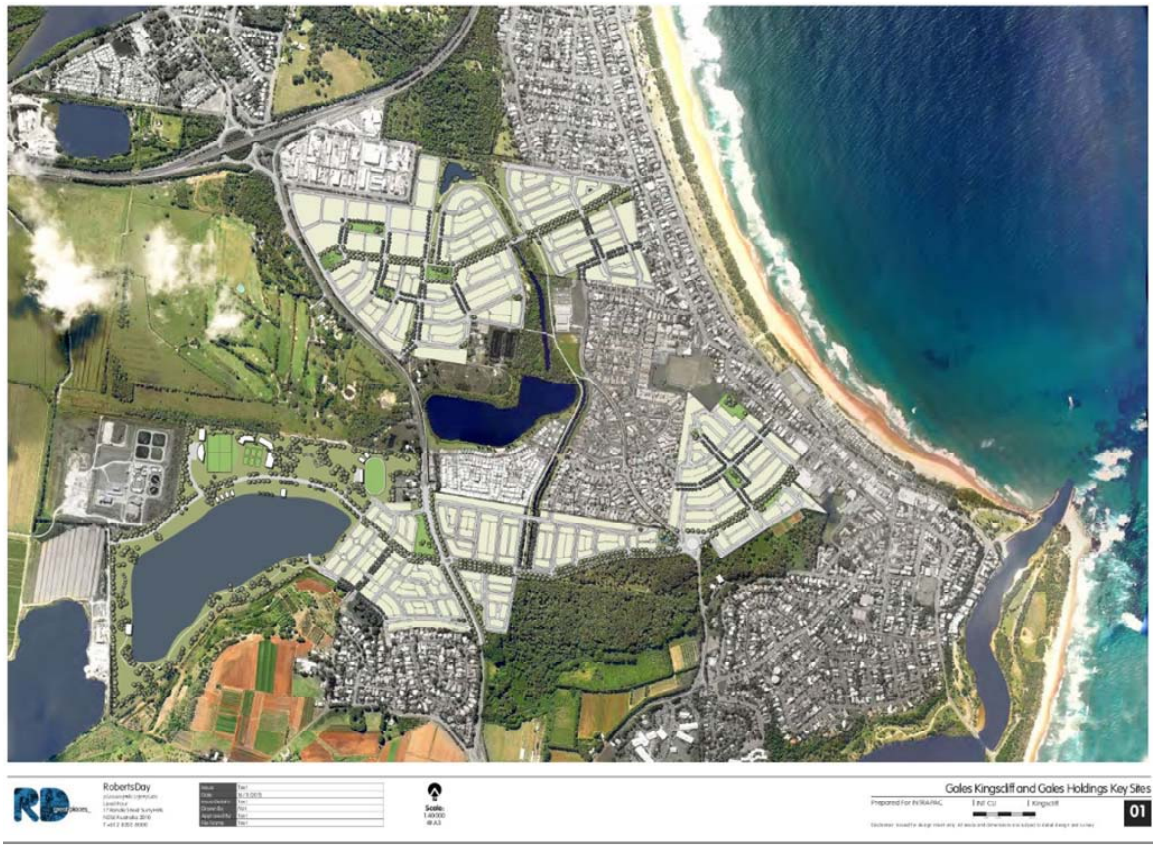
Source: Google Maps

Figure 3.12: Locality of Proposed Surrounding Development (Indicative)



Source: Tweed Shire Council – Major Developments: Kings Forest

Figure 3.13: Concept for Proposed Kings Forest Development



Source: www.galeskingscliff.com.au

Figure 3.14: Concept for Proposed Gales-Kingscliff Development

In addition to the proposed Kings Forest and Gales-Kingscliff developments there are expected to be other development applications, approvals and construction in the coming years for Kingscliff. In this regard,

Tweed Shire Council recently published the draft Kingscliff Locality Plan which is currently out for public consultation.

3.5.3 Tweed Shire Council's Transport Network Planning

Tweed Shire Council's transport network planning for the area has been developed in the form of the draft Kingscliff Locality Plan, Development Control Plan and the TRDS. The purpose of the draft Kingscliff Locality Plan and the Development Control Plan is to provide a 30-year vision and planning framework to guide the future growth and expansion of the Kingscliff locality.

The TRDS recently underwent a review in 2017 and considered:

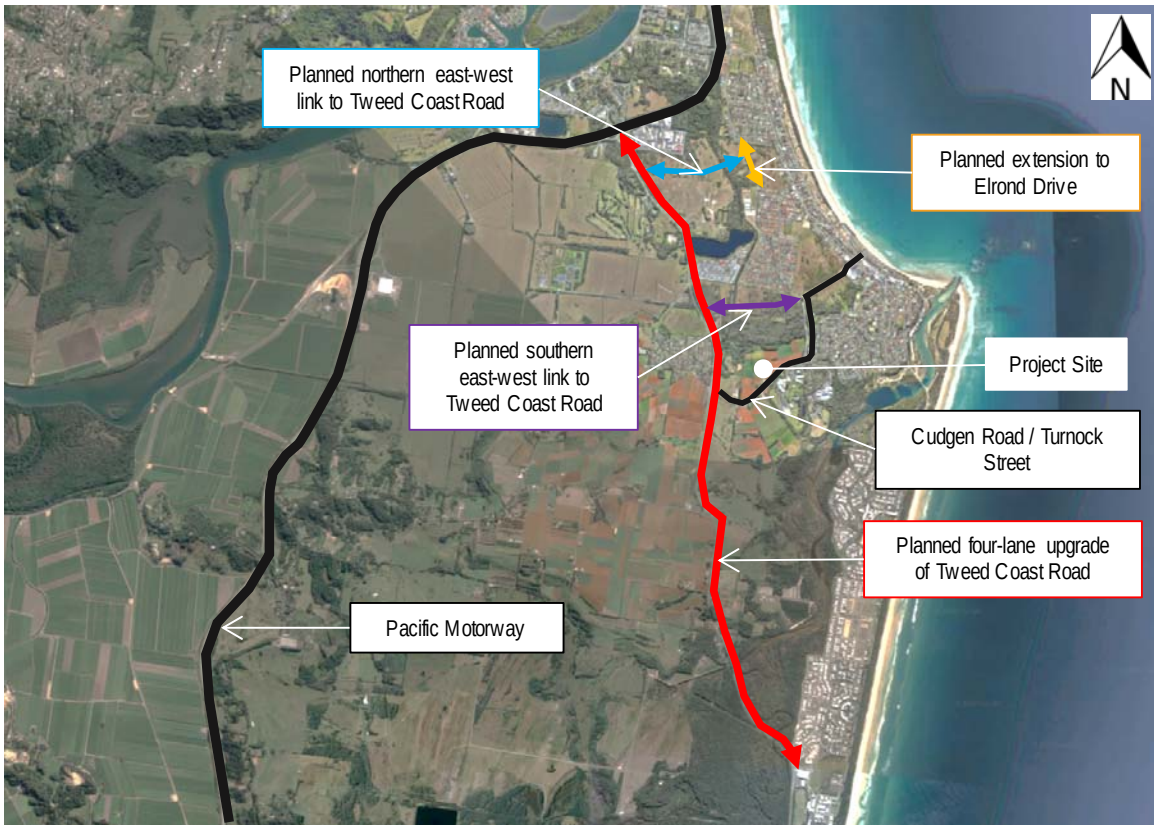
- the existing road network (in terms of capacity, efficiency and safety);
- existing and forecast network capacity constraints; and
- growth in the Tweed Shire for a 25-30-year planning horizon.

The TRDS identifies a number of road capacity upgrades for the immediate area surrounding the Project Site including:

- four-lane upgrade of Tweed Coast Road between the Pacific Highway and Casuarina;
- a new east-west connection associated with the northern component of the Gales Kingscliff development linking Tweed Coast Road to Kingscliff Street;
- the north-south extension of Elrond Drive associated with the northern component of Gales Kingscliff, allowing for a connection of Beach Street through to Ozone Street;
- a new east-west connection associated with the southern component of the Gales Kingscliff development extending Turnock Street to Tweed Coast Road linking Tweed Coast to Kingscliff Street;
- reconfiguration of the Morton Street intersection from Tweed Coast Road and improvements for access for Chinderah Industrial Estate; and
- improvements to the Pacific Highway / Tweed Coast interchange in consultation with RMS.

The various road network upgrades are based on the network capacity requirements and projected traffic growth within the area. While timing is not set for commencement of works, funding for road upgrades is provided by Section 94 developer contributions, and funding allocations from state and federal government sources. In this regard it is understood that Tweed Shire Council is in the process of planning the four-lane upgrade of Tweed Coast and is applying for funding grants to assist with the delivery of the works.

Figure 3.15 provides an overview of network planning and capacity upgrades in the locality as identified in the TRDS. It is noted that the specific alignments of road extensions is strategic in nature only and subject to further detailed planning and design.



Source: Google Maps

Figure 3.15: Overview of Network Planning in the Locality

3.5.4 Current and Proposed Bikeways

An existing off-road shared path runs along the Project Site frontage. The pathway connects to residential areas west of Tweed Coast Road and to Kingscliff in the east. Broader network connections are provided to the Banora Point / Tweed Heads area to the north and to Casuarina / Pottsville to the south. Following a review of Tweed Shire Council's capital works schedule, it is understood that there are no planned new cycleways in the immediate area in the short-term. It is noted that future planning for Tweed Coast Road will include a combination of on and off-road cycle facilities extending from Casuarina to Chinderah. The existing bicycle network in proximity to the Project Site is shown in Figure 3.16.

Source: Tweed Shire Council Cycleways and Footpaths 2017

Figure 3.16: Surrounding Bicycle Network

Figure 3.17: Existing Off-road Bicycle Path Fronting Project Site

Figure 3.18: Existing Separated On-road Bicycle Path on Turnock Street

3.6 EXISTING TRAFFIC FLOWS (BACKGROUND TRAFFIC)

3.6.1 Traffic Surveys

Turning movement surveys were undertaken by Traffic Data and Control (TDC) on Thursday 31 May 2018 for the following intersections:

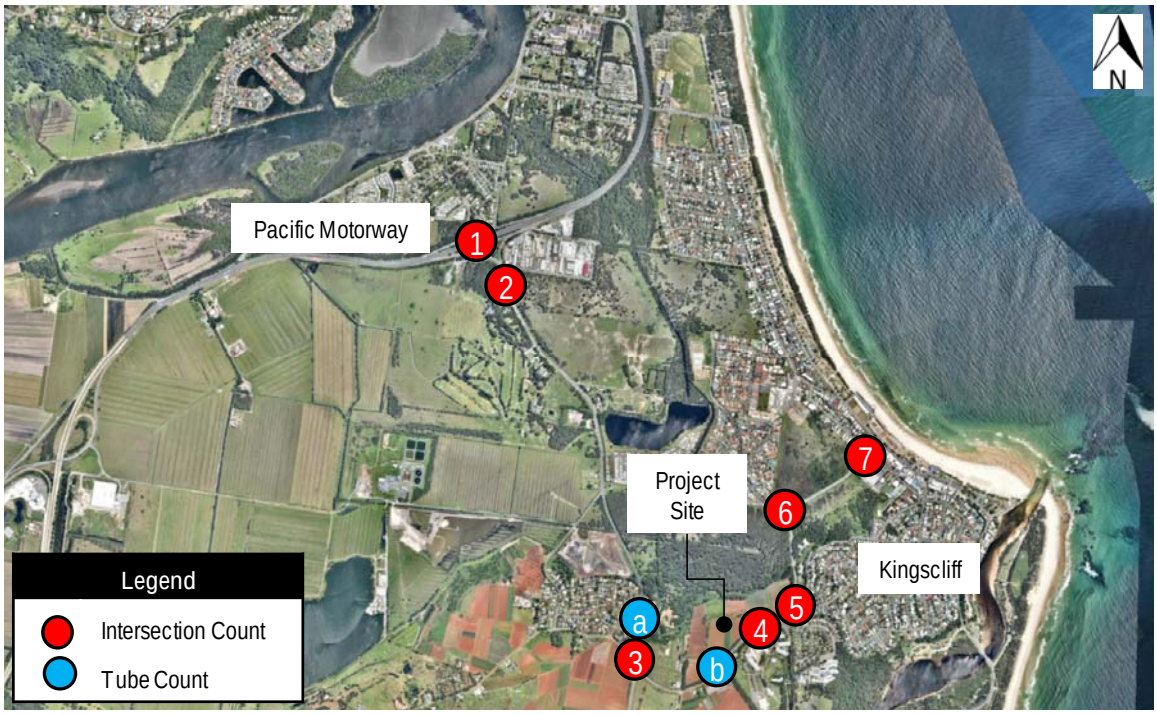
1. Pacific Highway / Tweed Coast Road interchange;
2. Tweed Coast Road / Morton Street priority-controlled intersection;
3. Tweed Coast Road / Cudgen Road signalised intersection;
4. Cudgen Road / Kingscliff TAFE access;
5. Cudgen Road / Turnock Street roundabout;
6. Turnock Street / Elrond Drive roundabout; and
7. Turnock Street / Pearl Street roundabout.

The survey period was between 7:00AM and 10:00AM and between 2:00PM and 6:00PM. Tube count surveys were also undertaken at the following locations

a. Tweed Coast Road to the north of Cudgen Road; and

b. Cudgen Road to the east of Tweed Coast Road.

The tube counts were undertaken for a 7-day period, 24-hours a day starting on Thursday 31 May 2018. Figure 3.19 illustrates the traffic survey locations.



Source: Nearmap

Figure 3.19: Traffic Survey Locations

Peak hour periods for each intersection were identified as follows:

1. Pacific Highway / Tweed Coast Road interchange:
    - 8:00AM – 9:00AM; and
    - 3:15PM – 4:15PM.
2. Tweed Coast Road / Morton Street priority-controlled intersection;
    - 8:00AM – 9:00AM; and
    - 3:15PM – 4:15PM.
3. Tweed Coast Road / Cudgen Road signalised intersection;
    - 8:00AM – 9:00AM; and
    - 3:15PM – 4:15PM.
4. Cudgen Road / Kingscliff TAFE access;
    - 8:00AM – 9:00AM; and
    - 2:45PM – 3:45PM.
5. Cudgen Road / Turnock Street roundabout;
    - 8:00AM – 9:00AM; and
    - 2:45PM – 3:45PM.
6. Turnock Street / Elrond Drive roundabout; and
    - 8:15AM – 9:15AM; and
    - 3:00PM – 4:00PM.
7. Turnock Street / Pearl Street roundabout.
    - 8:15AM – 9:15AM; and
    - 3:00PM – 4:00PM.

Peak hour periods on Cudgen Road at the Project Site frontage (based on the tube count data) were 8:00AM – 9:00AM and 2:45PM – 3:45PM.

The full set of traffic surveys are presented in Appendix B. Network diagrams demonstrating peak hour traffic volumes are presented in Appendix C.

3.6.2 AADT Volumes and 85th Percentile Speed

Average Annual Daily Traffic (AADT) was derived from the tube count surveys undertaken for Cudgen Road and Tweed Coast Road. The 85th percentile speed was taken from all recorded speed data during the seven-day period (the highest daily 85th percentile speed was recorded). Table 3.1 summarises the AADT and 85th percentile speed.

Table 3.1: AADT and Speed Data

	Location	Description	AADT	Recorded 85th Percentile Speed	Post Speed Limit
a	Tweed Coast Road	to the north of Cudgen Road	17,757	82.3km/h	60km/h*
b	Cudgen Road	To the east of Tweed Coast Road and fronting the Project Site	11,774	67.5km/h	60km/h

Note: the section of Tweed Coast Road from approximately 300m north of the Cudgen Road intersection to near Lot 130 Tweed Coast Road is 80km/h. The tube count was undertaken within the 60km/h zone.

It is noted that the 85th percentile speeds are significantly higher than the posted speed on Tweed Coast Road (around 80km/h). This is expected to be due to the proximity to the 80km/h speed zone just to the north of count location. The vehicle speeds do however indicate that even with relatively high volumes for a two-lane road, there does not appear to be any significant flow breakdown which would be associated with reduced Level of Service. Even during the isolated peak periods, the 85th percentile speeds were still in the order of 70km/h. The full set of tube count data including 85th percentile speeds is presented in Appendix B.

3.6.3 Existing Traffic Generation

Traffic generation rates for the existing development were sourced from:

- RMS Guide to Traffic Generating Developments – Technical Direction 2013.

The existing development's peak hour and daily traffic generation is summarised in Table 3.2.

Table 3.2: Existing Development Traffic Generation

Development Component	Yield	Rate (daily)	Rate (peak)	Unit	Daily Trips	Trips in Peak Hour
Detached Dwelling	1	7.4	0.78	dwelling	7.4	0.78

It is noted that the Project Site also includes a farm component. However, given the scale of the farm component, site layout and access (i.e. unformal accesses and limited on-site parking) combined with site observations, this element of the existing development is expected to generate low traffic volumes. Conservatively assessing the farming component to generate similar traffic to that of the existing residential dwelling, the site's total traffic is calculated to be in the order of:

- 2 trips in the peak hour; and
- 15-daily trips

3.6.4 Background Heavy Vehicle Volumes

The traffic surveys undertaken recorded peak hour heavy vehicle volumes for turning movements at each intersection surveyed. Heavy vehicle volumes were also recorded (daily) as part of the tube count surveys. Heavy vehicle percentages relative to AADT are as follows:

- 8.8% of AADT on Tweed Coast Road; and
- 5.0% of AADT on Cudgen Road.

The heavy vehicle percentage includes light trucks and heavy trucks and is relative to total traffic. For the purpose of modelling the percentage of heavy vehicles was calculated for each turning movement in Year 2018. These percentages were maintained for all traffic modelling scenarios. The full set of traffic surveys with heavy vehicle counts are presented in Appendix B.

3.7 BACKGROUND TRAFFIC MODELLING

3.7.1 Modelling Process

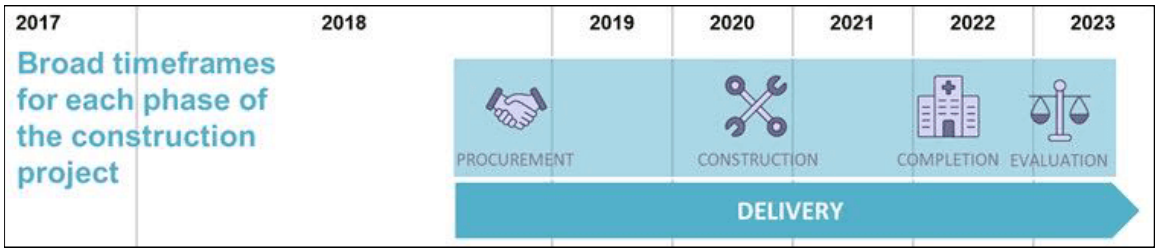
The following process has been used to assess the background traffic:

- identifying key intersections for assessment;
- undertaking traffic surveys for the key intersections subject to this assessment in order to ascertain background traffic volumes for the AM and PM peak hours;
- forecasting future year background traffic volumes at the anticipated year of opening and 10-year design horizon; and
- undertaking intersection modelling for key intersections. SIDRA Intersection 7 was used for the intersection modelling.

Key intersections were identified based on the Project Site location, surrounding road network and road hierarchies and a thorough understanding of traffic and network operations in the area. Intersections identified for assessment are as follows:

1. Pacific Highway / Tweed Coast Road interchange;
2. Tweed Coast Road / Cudgen Road signalised intersection;
3. Cudgen Road / Kingscliff TAFE access;
4. Cudgen Road / Turnock Street roundabout;
5. Turnock Street / Elrond Drive roundabout; and
6. Turnock Street / Pearl Street roundabout.

Based on the broad Project delivery timeframes the Project is expected to be completed in Year 2022. Based on these time frames, Year 2023 has therefore been assessed as the conservative year of opening with Year 2033 as the 10-year design horizon. The Project delivery time frames are presented in Figure 3.20.



Source: http://www.tweedvalleyhospital.health.nsw.gov.au/

Figure 3.20: Project Delivery Timeline

3.7.2 Traffic Growth Rates

The following factors were considered in determining the surrounding road network background growth:

- existing capacity and volumes;
- future capacity upgrades;
- future provision of alternate routes;
- population growth in the region; and
- future developments in the area.

Historical growth trends are not considered to be a realistic reflection of expected growth over the next 5-15 years. Historically the local road network and in particular Tweed Coast Road has experienced periods of significant growth driven by the Tweed Coast Release Areas including Salt and Casuarina. However, in recent years there have been no developments of significant scale. It is however noted that the aforementioned developments of Kings Forest Estate and Gales-Kingscliff will increase traffic volumes on Tweed Coast Road and the surrounds. Noting Kings Forest has approval to proceed, however has not yet done so and Gales-Kingscliff has not yet been approved, timing of these developments is not defined and any impacts to traffic growth is considered to occur in a staged manner over an extended period of time. In addition, these large scale developments will also coincide with the construction of new linkages which will likely impact route choice.

For the purpose of this assessment, background traffic growth has been differentiated between the north-south corridor of Tweed Coast Road and the east-west corridor of Cudgen Road. Tweed Coast Road serves as a north-south rural arterial road connecting a number of small coastal towns to the Pacific Highway. Cudgen Road provides access to Kingscliff from Tweed Coast Road. While both roads have a two-lane cross section and similar capacity, Cudgen Road currently carries in the order of 35% less traffic on a daily basis than Tweed Coast Road. In this regard, carrying capacity has an influence on growth (i.e. when capacity is reached, flow breakdown and reduced travel speeds occur. Drivers adjust to some degree by changing time of trips, reducing discretionary trips and choosing alternate routes.

With consideration to the above, traffic growth in the area was assessed by corridor, based on the traffic surveys (i.e. 2018 tube count volumes) and 2041 volumes from the Tweed Strategic Transport Model (2041 medium yield "base" scenario). This 2041 scenario does not include any infrastructure upgrades (e.g. such as the two east west connections from Tweed Coast Road to Kingscliff) that will change route choice or potentially reduce traffic past the Project Site frontage. The strategic model considers future planning and development (e.g. such as Kings Forest and the Gales-Kingscliff Developments). Table 3.3 shows the 2018 tube count volumes and 2041 Tweed Strategic Transport Model volumes used for the calculation of growth rates.

Table 3.3: AADT Volume Comparison

Location	Description	2018 Tube Count AADT	2041 Strategic Model AADT*
Tweed Coast Road	to the north of Cudgen Road	17,757	21,340
Cudgen Road	To the east of Tweed Coast Road and fronting the Project Site	11,774	17,480

** Base scenario (i.e. no infrastructure upgrades)*

Based on these volumes, the following traffic growth volumes were used for calculating future background volumes:

- 1.73% p.a. compounding for the Cudgen Road / Turnock Street corridor and turning movements at the Tweed Coast Road / Cudgen Road intersection; and
- 0.80% p.a. compounding for the Tweed Coast Road Corridor.

Year 2023 and 2033 Background Traffic Volumes are presented in Appendix C.

3.7.3 Pacific Highway / Tweed Coast Road Interchange

Analysis of the Pacific Highway / Tweed Coast Road interchange was undertaken using SIDRA Intersection 7 for the Year 2023 (year of opening) and Year 2033 (10-year design horizon) background traffic volumes. The existing geometric layout for the intersection was used.

The layout of the intersection used in SIDRA is shown in Figure 3.21.

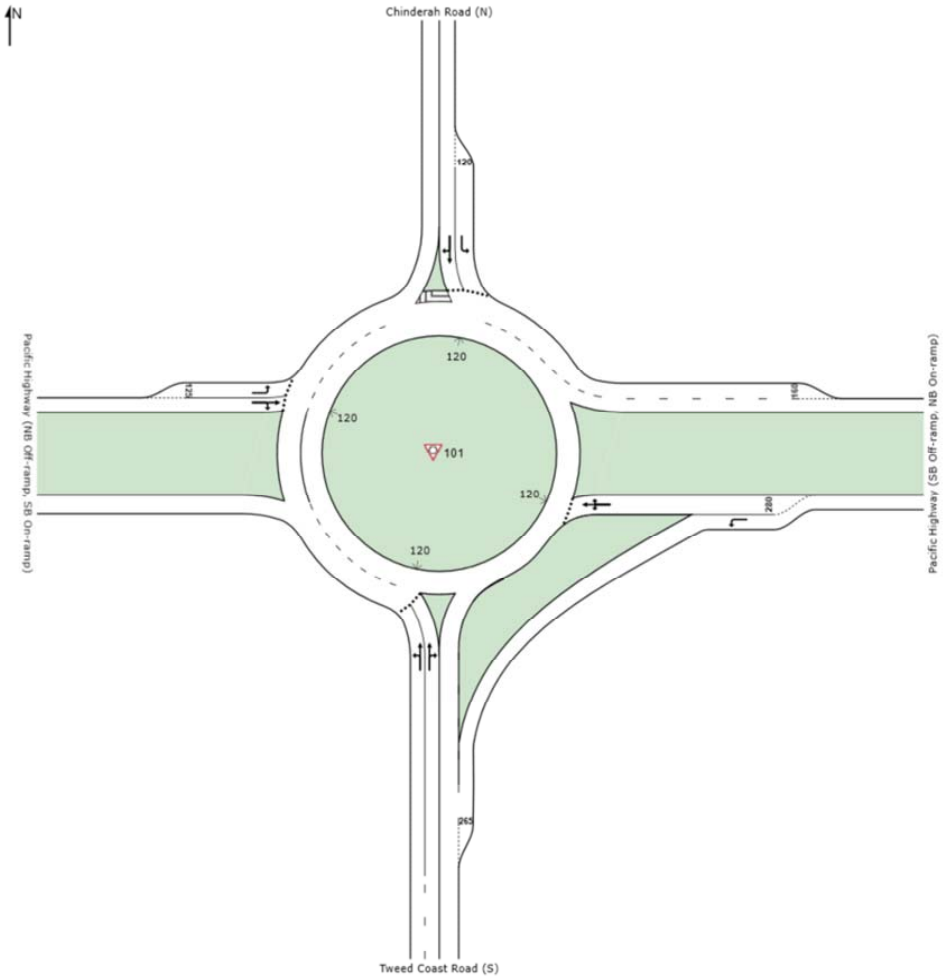


Figure 3.21: Pacific Highway / Tweed Coast Road SIDRA Intersection Layout

The results of the analysis for background traffic volumes are summarised in Tables 3.4 and 3.5. A copy of the SIDRA movement summaries is provided in Appendix D.

Table 3.4: Pacific Highway / Tweed Coast Road Interchange SIDRA Results Summary (Year 2023 Background Traffic Volumes)

Approach	Year 2023 AM Peak					Year 2023 PM Peak			
	OD Movement	DOS	Ave Delay (s)	LOS	95%ile Queue (m)	DOS	Ave Delay (s)	LOS	95%ile Queue (m)
South: Tweed Coast Road (S)	L2	0.088	3.1	LOS A	4.1	0.093	3.1	LOS A	4.4
	T1	0.088	3.3	LOS A	4.1	0.093	3.5	LOS A	4.4
	R2	0.535	10.5	LOS B	35.9	0.439	10.3	LOS B	27.2
	Approach	0.535	9.7	LOS A	35.9	0.439	9.3	LOS A	27.2
East: Pacific Highway (SB Off-ramp, NB On-ramp)	L2	0.301	2.1	LOS A	16.4	0.352	2.1	LOS A	18.9
	T1	0.301	3	LOS A	16.4	0.352	2.9	LOS A	18.9
	R2	0.301	9.9	LOS A	16.4	0.352	9.7	LOS A	18.9
	Approach	0.301	2.9	LOS A	16.4	0.352	2.9	LOS A	18.9
North: Chinderah Road (N)	L2	0.078	7	LOS A	5	0.057	4.5	LOS A	3.2
	T1	0.166	6.5	LOS A	13.5	0.112	4	LOS A	7.5
	R2	0.166	11.7	LOS B	13.5	0.112	8.7	LOS A	7.5
	Approach	0.166	8.5	LOS A	13.5	0.112	5.5	LOS A	7.5
West: Pacific Highway (NB Off-ramp, SB On-ramp)	L2	0.109	6.7	LOS A	4.7	0.087	5.4	LOS A	3.3
	T1	0.148	5.6	LOS A	7.4	0.106	4.6	LOS A	4.7
	R2	0.148	12.6	LOS B	7.4	0.106	11.6	LOS B	4.7
	Approach	0.148	10.5	LOS B	7.4	0.106	9.2	LOS A	4.7
All Vehicles		0.535	6.7	LOS A	35.9	0.439	5.7	LOS A	27.2

Table 3.5: Pacific Highway / Tweed Coast Road Interchange SIDRA Results Summary (Year 2033 Background Traffic Volumes)

Approach	Year 2033 AM Peak					Year 2033 PM Peak			
	OD Movement	DOS	Ave Delay (s)	LOS	95%ile Queue (m)	DOS	Ave Delay (s)	LOS	95%ile Queue (m)
South: Tweed Coast Road (S)	L2	0.097	3.2	LOS A	4.6	0.101	3.2	LOS A	4.9
	T1	0.097	3.4	LOS A	4.6	0.101	3.6	LOS A	4.9
	R2	0.59	10.8	LOS B	41.7	0.484	10.5	LOS B	31.4
	Approach	0.59	9.9	LOS A	41.7	0.484	9.5	LOS A	31.4
East: Pacific Highway (SB Off-ramp, NB On-ramp)	L2	0.328	2.2	LOS A	18.4	0.384	2.2	LOS A	21.5
	T1	0.328	3.1	LOS A	18.4	0.384	3	LOS A	21.5
	R2	0.328	10	LOS A	18.4	0.384	9.8	LOS A	21.5
	Approach	0.328	2.9	LOS A	18.4	0.384	2.9	LOS A	21.5
North: Chinderah Road (N)	L2	0.098	8.8	LOS A	6.5	0.068	5.3	LOS A	4
	T1	0.207	8.3	LOS A	17.9	0.133	4.8	LOS A	9.5
	R2	0.207	13.5	LOS B	17.9	0.133	9.5	LOS A	9.5
	Approach	0.207	10.3	LOS B	17.9	0.133	6.3	LOS A	9.5
West: Pacific Highway (NB Off-ramp, SB On-ramp)	L2	0.13	7.4	LOS A	5.8	0.103	5.8	LOS A	4.1
	T1	0.175	6.2	LOS A	9.2	0.122	4.9	LOS A	5.7
	R2	0.175	13.2	LOS B	9.2	0.122	11.9	LOS B	5.7
	Approach	0.175	11.2	LOS B	9.2	0.122	9.6	LOS A	5.7
All Vehicles		0.59	7	LOS A	41.7	0.484	5.9	LOS A	31.4

As demonstrated in Table 3.4 and 3.5, the intersection is shown to operate within acceptable performance limits in terms of degree of saturation, average delay and 95th percentile queue for a roundabout intersection in the Year 2023 and 2033 background traffic scenarios.

3.7.4 Tweed Coast Road / Cudgen Road signalised intersection

The existing geometric layout for the intersection was used. The intersection was modelled as an isolated intersection with a single diamond overlap and split side streets, based on the Traffic Control Site (TCS) plan. Given that assessment is being undertaken for a future scenario (i.e. Year 2023), it is unlikely that current time settings are relevant. As such the intersection has been modelled with an “Optimum Cycle Time”.

The layout of the intersection used in SIDRA is shown in Figure 3.22.

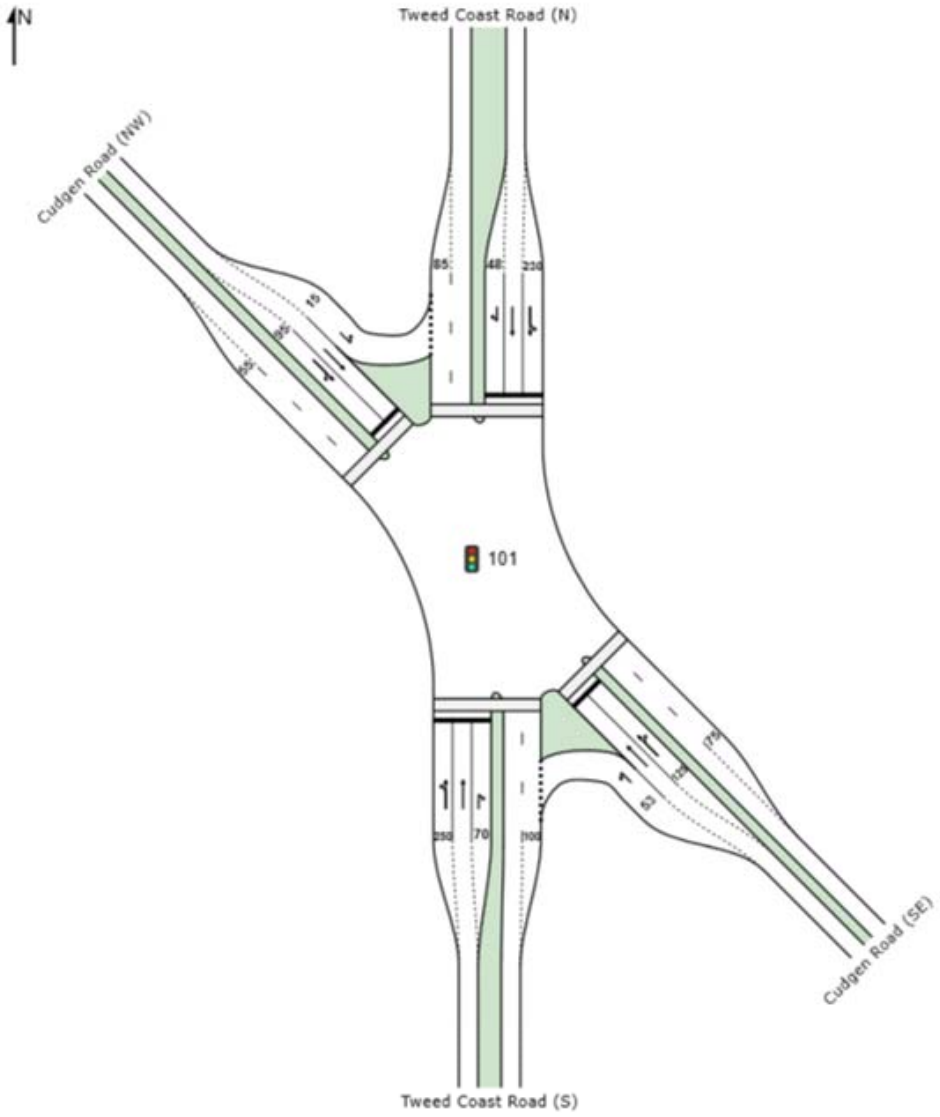


Figure 3.22: Tweed Coast Road / Cudgen Road SIDRA Intersection Layout - Existing

The results of the analysis for background traffic volumes are summarised in Table 3.6. A copy of the SIDRA movement summaries is provided in Appendix D.

Table 3.6: Tweed Coast Road / Cudgen Road Intersection SIDRA Results Summary (Year 2023 Background Traffic Volumes) - Existing

Approach		Year 2023 AM Peak				Year 2023 PM Peak			
	OD Movement	DOS	Ave Delay (s)	LOS	95%ile Queue (m)	DOS	Ave Delay (s)	LOS	95%ile Queue (m)
South: Tweed Coast Road (S)	L1	0.428	39.8	LOS C	72.6	0.428	39.8	LOS C	72.6
	T1	0.897	48.9	LOS D	180.1	0.897	48.9	LOS D	180.1
	R3	0.804	44.6	LOS D	100.6	0.804	44.6	LOS D	100.6
	Approach	0.897	47.2	LOS D	180.1	0.897	47.2	LOS D	180.1
SouthEast: Cudgen Road (SE)	L3	0.095	8.8	LOS A	9.2	0.095	8.8	LOS A	9.2
	T1	0.277	39.8	LOS C	39.4	0.277	39.8	LOS C	39.4
	R1	0.938	73.7	LOS F	197.5	0.938	73.7	LOS F	197.5
	Approach	0.938	54.7	LOS D	197.5	0.938	54.7	LOS D	197.5
North: Tweed Coast Road (N)	L1	0.939	69.7	LOS E	261	0.939	69.7	LOS E	261
	T1	0.489	38.1	LOS C	86.7	0.489	38.1	LOS C	86.7
	R3	0.073	23.9	LOS B	5.9	0.073	23.9	LOS B	5.9
	Approach	0.939	58.1	LOS E	261	0.939	58.1	LOS E	261
NorthWest: Cudgen Road (NW)	L3	0.071	20.4	LOS B	10.5	0.071	20.4	LOS B	10.5
	T1	0.947	71.4	LOS F	62	0.947	71.4	LOS F	62
	R1	0.947	82.4	LOS F	62	0.947	82.4	LOS F	62
	Approach	0.947	60.4	LOS E	62	0.947	60.4	LOS E	62
All Vehicles		0.947	53.6	LOS D	261	0.947	53.6	LOS D	261

As demonstrated in Table 3.6, the intersection is shown to operate outside acceptable performance limits in terms of degree of saturation, average delay and 95th percentile queue for a signalised intersection in the Year 2023 background traffic scenario. Traffic volumes through the intersection are demonstrated to exceed the capacity of the intersection. North and southbound through volumes are relatively high, as are the southbound left-turn to Cudgen Road (i.e. vehicles travelling to Kingscliff) and north-westbound right turn onto Tweed Coast Road (i.e. vehicles travelling to the Pacific Highway from Kingscliff). The main capacity constraints relate to the key movements (i.e. insufficient stand-up lanes northbound and southbound and capacity for the major turning movements).

Further to the above the capacity limitations on Tweed Coast Road are well known, and a four-lane upgrade of Tweed Coast Road from the Pacific Highway to Casuarina is a priority within Council's future infrastructure planning. This includes upgrades to the capacity of this intersection. For further details on Councils planning, refer Section 3.5.

For the purpose of this intersection analysis, it is not expected that the four-lane upgrade of Tweed Coast Road will be completed by Year 2023, however pending funding sources, Council may seek to upgrade Tweed Coast Road to coincide with the Project. As such options testing was undertaken to assess the upgrades required for the intersection to operate within acceptable performance limits under background traffic growth conditions. The upgrades have been named as "Upgrade 1" and identified are as follows:

- Addition of a 100m southbound left-turn lane on Tweed Coast Road;
- Phase sequence change to allow the southbound left-turn to overlap with the westbound right-turn (i.e. possible with the provision of dedicated southbound left-turn lane);
- Lane discipline change for the two approach lanes on the south-eastern approach:
  - Change of the left through lane to a through and right lane;
  - Change of the right through and right lane to a right only lane;
- Extension of the south-eastern short departure lane from approximately 75m to approximately 150m; and
- Extension of the northbound departure lane from approximately 85m to approximately 100m; and
- Conversion of the north-western leg departure to a single lane (no physical changes. i.e. through provision of chevron line marking). With the lane discipline changes on the south-eastern approach, there is only one lane travelling through to the north-western departure lane.

Figure 3.23 shows the upgraded SIDRA layout relative to the existing layout.

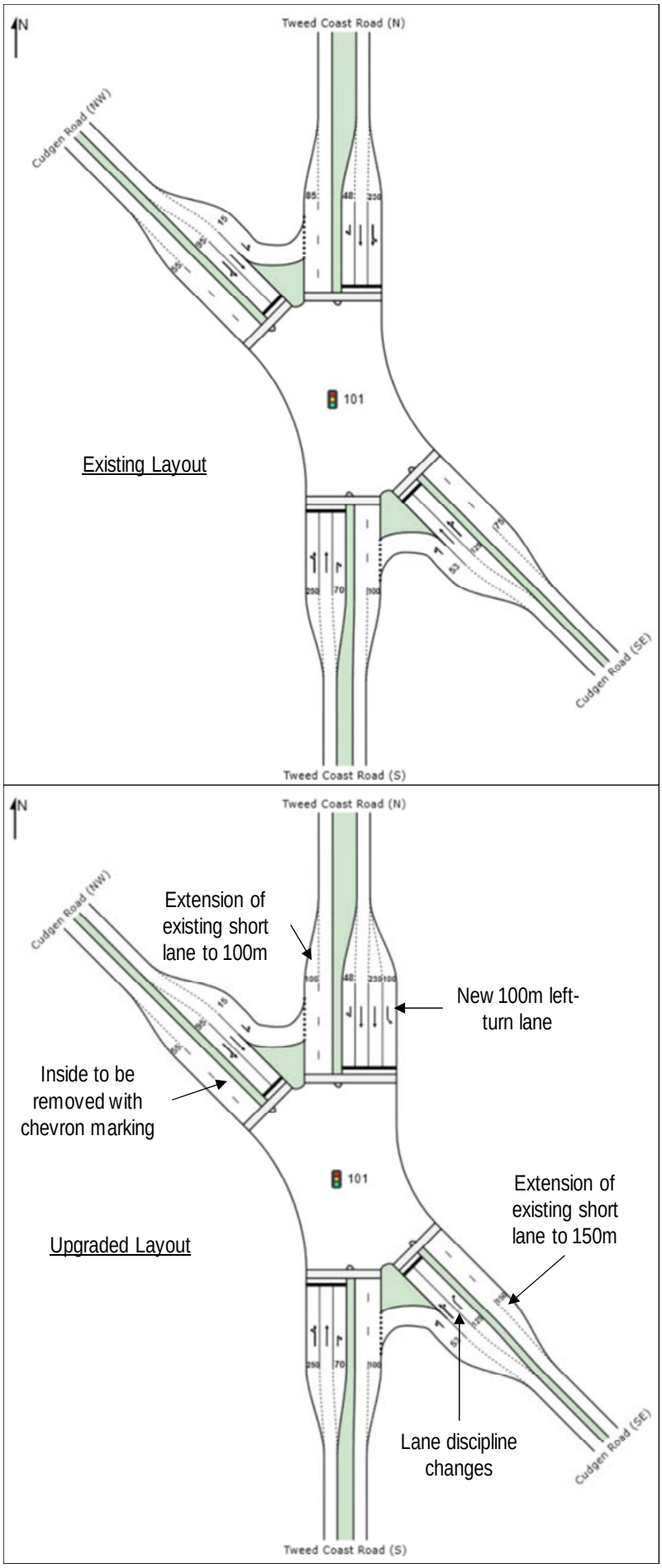


Figure 3.23: Tweed Coast Road / Cudgen Road SIDRA Intersection Layout – Upgrade 1

The results of the analysis for background traffic volumes with Upgrade 1 are summarised in Table 3.7.

Table 3.7: Tweed Coast Road / Cudgen Road Intersection SIDRA Results Summary (Year 2023 Background Traffic Volumes) – Upgrade 1

Approach	Year 2023 AM Peak					Year 2023 PM Peak			
	OD Movement	DOS	Ave Delay (s)	LOS	95%ile Queue (m)	DOS	Ave Delay (s)	LOS	95%ile Queue (m)
South: Tweed Coast Road (S)	L1	0.468	35.5	LOS C	59.5	0.304	27.7	LOS B	26.9
	T1	0.851	38.6	LOS C	139.5	0.554	24.5	LOS B	53.2
	R3	0.667	23.6	LOS B	59.4	0.503	24.5	LOS B	22.5
	Approach	0.851	33.6	LOS C	139.5	0.554	24.6	LOS B	53.2
SouthEast: Cudgen Road (SE)	L3	0.095	8.3	LOS A	6.8	0.187	11.1	LOS A	17.5
	T1	0.512	35.4	LOS C	55.1	0.499	27	LOS B	44.8
	R1	0.862	48.6	LOS D	113.3	0.841	37.8	LOS C	91.9
	Approach	0.862	38.3	LOS C	113.3	0.841	29	LOS C	91.9
North: Tweed Coast Road (N)	L1	0.609	15.4	LOS B	79.8	0.481	11.6	LOS A	37.7
	T1	0.484	35.5	LOS C	47.7	0.905	35.5	LOS C	121.9
	R3	0.073	21.3	LOS B	4.8	0.163	21.3	LOS B	9
	Approach	0.609	21.9	LOS B	79.8	0.905	25.7	LOS B	121.9
NorthWest: Cudgen Road (NW)	L3	0.067	16.4	LOS B	7.7	0.052	12.4	LOS A	4.2
	T1	0.776	49.4	LOS D	34.2	0.505	35.4	LOS C	20.8
	R1	0.776	54.9	LOS D	34.2	0.505	40.1	LOS C	20.8
	Approach	0.776	42.1	LOS C	34.2	0.505	31	LOS C	20.8
All Vehicles		0.862	31.9	LOS C	139.5	0.905	26.8	LOS B	121.9

As demonstrated in Table 3.7, with the upgrades detailed above, the intersection is shown to operate within acceptable performance limits in terms of degree of saturation, average delay and 95th percentile queue for a signalised intersection in the Year 2023 background traffic scenarios. In the PM peak the intersection, while operating at LOS B, is considered to be operating at practical capacity with DOS 0.905. In the AM peak some lanes perform at LOS D, however overall the intersection is operate at or within acceptable performance limits in the morning peak based on the overall DOS and LOS.

It is noted that further upgrades in Year 2023 (year of opening) are required to cater for the design traffic volumes (i.e. with the Tweed Valley Hospital). These are referred to as Upgrade 2 and are detailed in Section 5.3.3.

There are a number of factors that require consideration for the 10-year design horizon (and beyond) on this section of Tweed Coast Road, including:

- the four-lane upgrade of Tweed Coast Road;
- future planned east-west connections from Tweed Coast Road to Kingscliff (which may or may not be completed by 2033);
- surrounding urban releases including Kings Forest and Gales Kingscliff; and
- existing capacity constraints at the intersection.

Based on discussions with Tweed Shire Council officers, it is not considered appropriate to provide significant additional turning capacity to and from Cudgen Road over and above that identified in Figure 3.23. This is due to the future capacity that will be added on Tweed Coast Road, at the intersection and through alternate east-west links to the north.

The 10-year design horizon (Year 2033) background traffic volumes have been assessed with:

- a four-lane cross section on Tweed Coast Road;
- 150m southbound left-turn lane;
- 200m south-eastbound departure lane;
- 200m northbound right-turn lane; and
- a short northbound left turn lane.

The four-lane Tweed Coast Road intersection is referred to as Upgrade 3. Figure 3.24 shows the upgraded SIDRA layout.

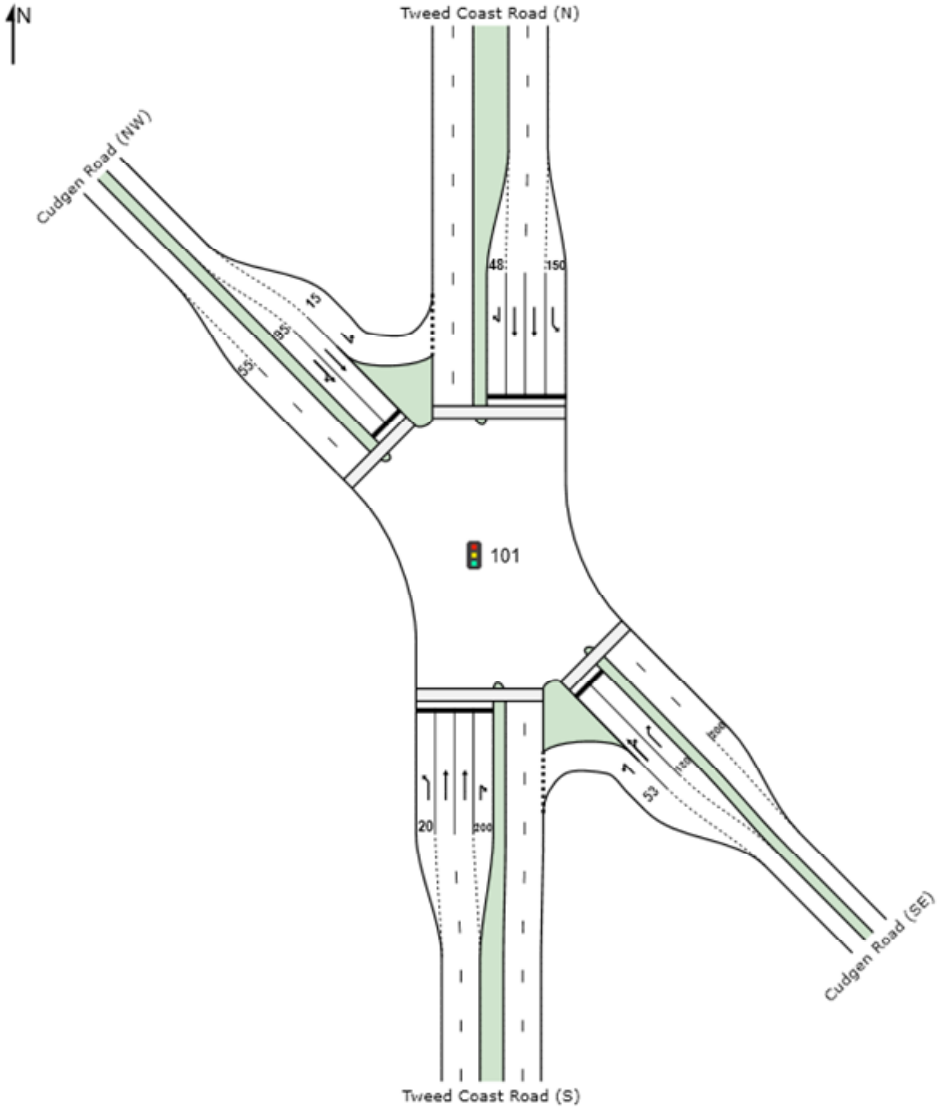


Figure 3.24: Tweed Coast Road / Cudgen Road SIDRA Intersection Layout – Upgrade 3

The results of the analysis for background traffic volumes with Upgrade 3 are summarised in Table 3.8.

Table 3.8: Tweed Coast Road / Cudgen Road Intersection SIDRA Results Summary (Year 2023 Background Traffic Volumes) – Upgrade 3

Approach		Year 2023 AM Peak				Year 2023 PM Peak			
	OD Movement	DOS	Ave Delay (s)	LOS	95%ile Queue (m)	DOS	Ave Delay (s)	LOS	95%ile Queue (m)
South: Tweed Coast Road (S)	L1	0.041	17.3	LOS B	5.7	0.019	18	LOS B	2.1
	T1	0.463	22.7	LOS B	79	0.456	25.8	LOS B	43
	R3	0.907	58.3	LOS E	144.1	0.794	44.5	LOS D	44.9
	Approach	0.907	35	LOS C	144.1	0.794	30.8	LOS C	44.9
SouthEast: Cudgen Road (SE)	L3	0.112	8	LOS A	7.1	0.215	10.4	LOS A	19.5
	T1	0.92	55.8	LOS D	118.6	0.798	33	LOS C	83.6
	R1	0.92	60	LOS E	118.5	0.798	37.1	LOS C	83
	Approach	0.92	49	LOS D	118.6	0.798	29.3	LOS C	83.6
North: Tweed Coast Road (N)	L1	0.801	21.7	LOS B	127.5	0.608	12.9	LOS A	52.9
	T1	0.311	31.2	LOS C	36.9	0.783	31.4	LOS C	87.5
	R3	0.216	47.8	LOS D	11.5	0.344	38.5	LOS C	16.7
	Approach	0.801	25.5	LOS B	127.5	0.783	24.4	LOS B	87.5
NorthWest: Cudgen Road (NW)	L3	0.081	13	LOS A	7.5	0.058	11.3	LOS A	4.5
	T1	0.88	55.2	LOS D	40.9	0.537	35.9	LOS C	22.2
	R1	0.88	59.5	LOS E	40.9	0.537	40.3	LOS C	22.3
	Approach	0.88	45.6	LOS D	40.9	0.537	30.9	LOS C	22.3
All Vehicles		0.92	36.6	LOS C	144.1	0.798	27.6	LOS B	87.5

As demonstrated in Table 3.8, with the upgrades detailed above, the intersection is shown to exceed practical capacity in the AM Peak. It is noted that DOS is just outside the typically accepted DOS of 0.90 and some lanes perform at LOS D or E.

Turning movements (particularly right turning movements) are one of the critical factors that affect the performance of signalised intersections. Turning movements reduce green time for through movements and increase overall delays. As discussed above, it is not considered appropriate to provide significant additional turning capacity (including but not limited to a southbound left-slip or northbound right-turns) at the intersection given the future capacity that will be added on Tweed Coast Road, at the intersection and through alternate east-west links to the north.

Cudgen Road currently carries relatively high through traffic, with the dominant turning movements at the Tweed Coast Road / Cudgen Road intersection being the north-westbound right-turn and the southbound left-turn. Without additional east-west links connecting between Tweed Coast Road and Kingscliff to the north, traffic volumes will continue to increase on this link. However, strategic modelling indicates that traffic volumes on Cudgen Road will be significantly reduced with the provision of additional east-west links which provide additional capacity and more direct route choice. For comparison 2041, AADT on Cudgen Road from the Tweed Strategic Transport Model for the Base Scenario (i.e. no infrastructure upgrade) and Scenario 2 (with the inclusion of the two east-west links and four lane upgrade of Tweed Coast Road) were compared to the 2018 AADT recorded as part of the traffic surveys. This comparison is presented in Table 3.9.

Table 3.9: AADT Volume Comparison on Cudgen Road

2041 AADT – Survey	2041 AADT – Base Scenario (without Tweed Coast Road Upgrade and east-west links to the north)	2041 AADT – Scenario 2 (with Tweed Coast Road Upgrade and east-west links to the north)
11,774vpd	17,480vpd	12,200vpd

As demonstrated, the 2041 volumes with the provision of the east-west links are significantly lower (30%) than without the future road links in place. The volumes are comparable to the 2018 surveys (3-4% higher). On this basis, turning volumes at the Cudgen Road / Tweed Coast Road intersection will be significantly reduced once the future planned links are provided and are expected to return to levels currently exhibited on Cudgen Road.

3.7.5 Cudgen Road / Kingscliff TAFE Access

Analysis of the Cudgen Road / Kingscliff TAFE access intersection was undertaken using SIDRA Intersection 7 for the Year 2023 (year of opening) and Year 2033 (10-year design horizon) background traffic volumes. The existing geometric layout for the intersection was used. Given the form of the intersection being a "seagull intersection", the intersection was modelled in SIDRA as two intersections in a network (i.e. each stage of the intersection is separated), following standard SIDRA methodology. While the southern approach (TAFE approach) is not delineated as having two approach lanes, the width of the approach lane accommodates two vehicles to prop side by side simultaneously (i.e. a right turning vehicle and a left turning vehicle). To reflect this the intersection was modelled with a short-left lane.

The layout of the intersection network used in SIDRA is shown in Figure 3.25.

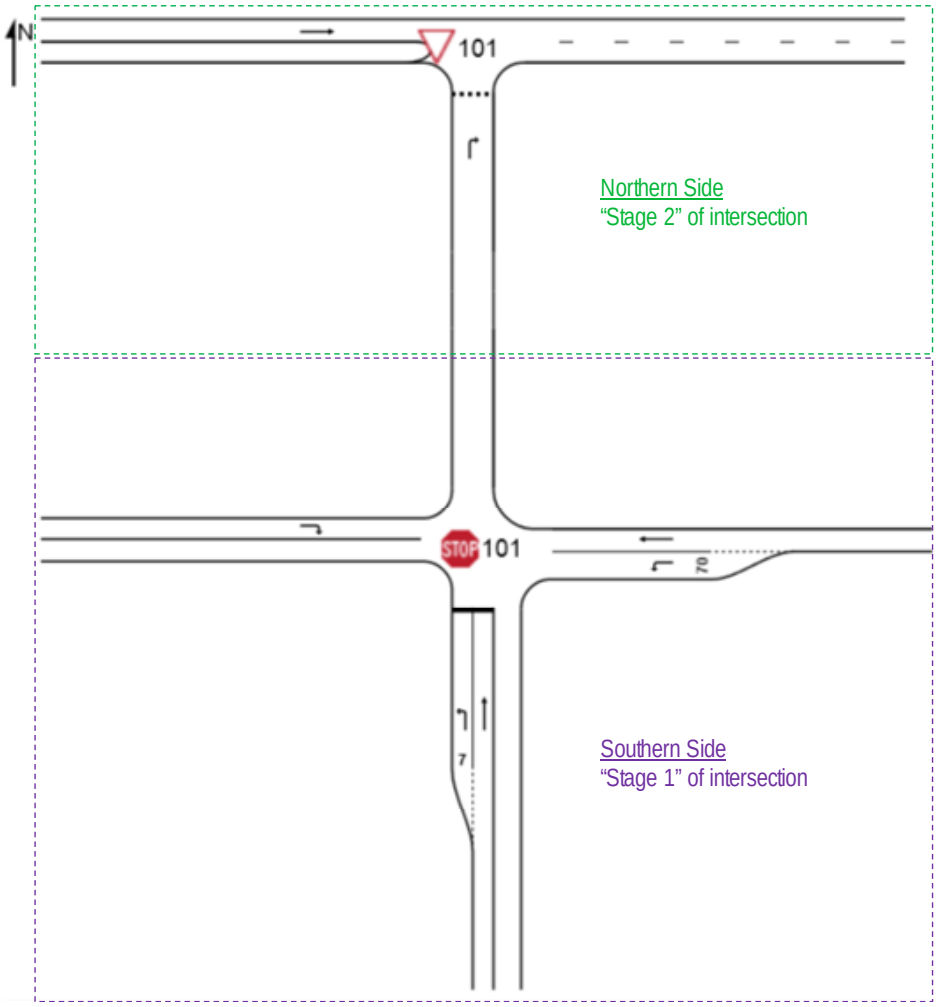


Figure 3.25: Cudgen Road / Kingscliff TAFE Access SIDRA Intersection Layout

The results of the analysis for background traffic volumes are summarised in Tables 3.10 and 3.11. A copy of the SIDRA movement summaries is provided in Appendix D.

Table 3.10: Cudgen Road / Kingscliff TAFE Access SIDRA Results Summary (Year 2023 Background Traffic Volumes)

Approach		Year 2023 AM Peak				Year 2023 PM Peak			
	OD Movement	DOS	Ave Delay (s)	LOS	95%ile Queue (m)	DOS	Ave Delay (s)	LOS	95%ile Queue (m)
South: TAFE Access (S)	L2	0.052	9.2	LOS A	1.3	0.168	9.8	LOS A	4.4
	T1	0.02	18.2	LOS B	0.5	0.091	14.4	LOS A	2.4
	Approach	0.052	10.3	LOS A	1.3	0.168	10.9	LOS A	4.4
East: Cudgen Road €	L2	0.034	5.6	LOS A	0	0.006	5.6	LOS A	0
	T1	0.317	0	LOS A	0	0.331	0	LOS A	0
	Approach	0.317	0.5	NA	0	0.331	0.1	NA	0
West: Cudgen Road (W)	R2	0.35	11.3	LOS A	12	0.036	9.4	NA	0.9
	T1	0.401	0	LOS A	0	0.361	0	LOS A	0
	Approach	0.401	11.3	LOSA	12	0.361	9.4	LOS A	0.9
South: Median Storage Area	R2	0.008	5	LOS A	0.2	0.361	0	LOS A	0
	Approach	0.008	5	LOS A	0.2	0.361	0	NA	0
All Vehicles		0.401	3.5	N/A	12	0.361	2.3	NA	4.4

Table 3.11: Cudgen Road / Kingscliff TAFE Access SIDRA Results Summary (Year 2033 Background Traffic Volumes)

Approach		Year 2033 AM Peak				Year 2033 PM Peak			
	OD Movement	DOS	Ave Delay (s)	LOS	95%ile Queue (m)	DOS	Ave Delay (s)	LOS	95%ile Queue (m)
South: TAFE Access (S)	L2	0.073	10.5	LOS A	1.8	0.244	11.8	LOS A	6.6
	T1	0.034	24.7	LOS B	0.8	0.143	18.2	LOS B	3.7
	Approach	0.073	12.4	LOS A	1.8	0.244	13.3	LOS A	6.6
East: Cudgen Road €	L2	0.04	5.6	LOS A	0	0.007	5.6	LOS A	0
	T1	0.377	0	LOS A	0	0.393	0	LOS A	0
	Approach	0.377	0.5	NA	0	0.393	0.1	NA	0
West: Cudgen Road (W)	R2	0.511	15	LOS B	19.9	0.052	10.9	LOS A	1.3
	T1	0.476	0	LOS A	0	0.428	0	LOS A	0
	Approach	0.511	15	N/A	19.9	0.428	10.9	NA	1.3
South: Median Storage Area	R2	0.013	6.6	LOS A	0.3	0.066	5.5	LOS A	1.4
	Approach	0.013	6.6	LOS A	0.3	0.066	5.5	LOS A	1.4
All Vehicles		0.511	4.5	NA	19.9	0.428	2.8	NA	6.6

As demonstrated in Table 3.10 and 3.11, the intersection is shown to operate within acceptable performance limits in terms of degree of saturation, average delay and 95th percentile queue for a roundabout intersection in the Year 2023 and 2033 background traffic scenarios.

3.7.6 Cudgen Road / Turnock Street roundabout

Analysis of the Cudgen Road / Turnock Street / Elrond Drive intersection was undertaken using SIDRA Intersection 7 for the Year 2023 (year of opening) background traffic volumes. The existing geometric layout for the intersection was used. Analysis beyond the year of opening for background traffic was not assessed as the Tweed Valley Hospital proposes to take access from the intersection, therefore modifying the intersection geometry. Further analysis of the intersection was undertaken with the proposed new intersection layout and design traffic volumes in Section 5.2.

The layout of the intersection used in SIDRA is shown in Figure 3.26.

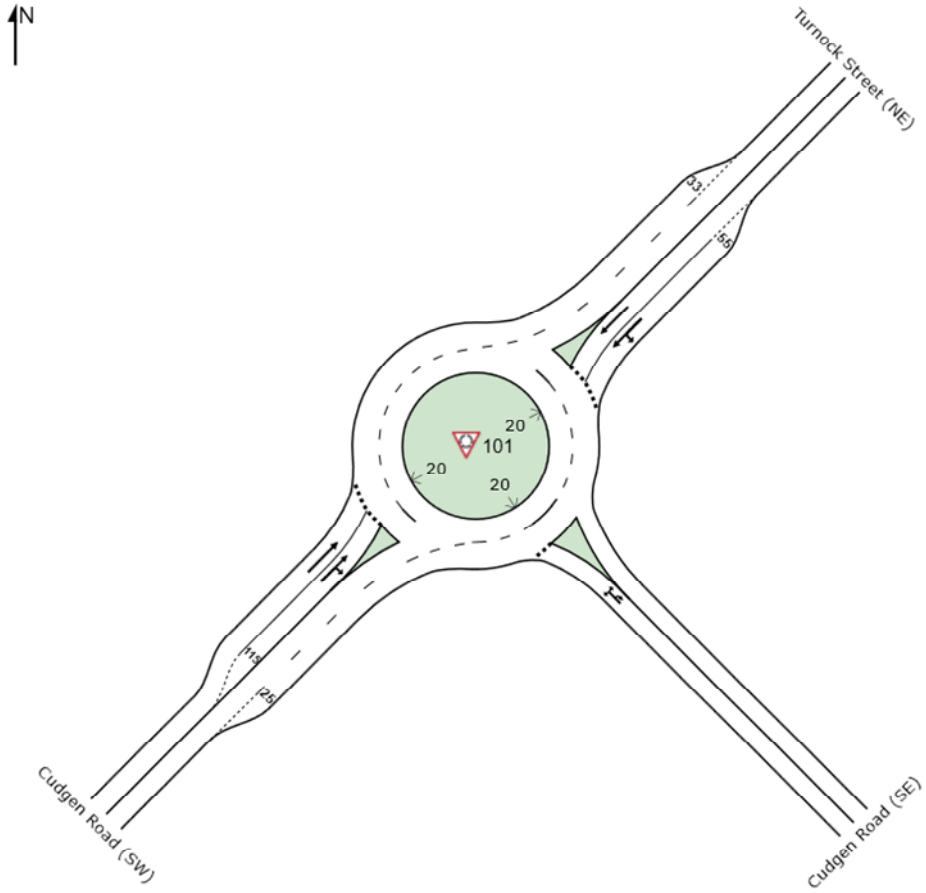


Figure 3.26: Cudgen Road / Turnock Street SIDRA Intersection Layout

The results of the analysis are summarised in Table 3.12. A copy of the SIDRA movement summaries is provided in Appendix D.

Table 3.12: Cudgen Road / Turnock Street SIDRA Results Summary (Year 2023 Background Traffic Volumes)

Approach	Year 2023 AM Peak					Year 2023 PM Peak			
	OD Movement	DOS	Ave Delay (s)	LOS	95%ile Queue (m)	DOS	Ave Delay (s)	LOS	95%ile Queue (m)
SouthEast: Cudgen Road (SE)	L2	0.59	4.6	LOS A	39.4	0.522	5	LOS A	30.6
	R2	0.59	9.1	LOS A	39.4	0.522	9.5	LOS A	30.6
	U	0.59	10.9	LOS A	39.4	0.522	11.2	LOS A	30.6
	Approach	0.59	5.4	LOS A	39.4	0.522	5.8	LOS A	30.6
NorthEast: Turnock Street (NE)	L2	0.138	7.5	LOS A	5.4	0.107	8	LOS A	3.8
	T1	0.193	7.1	LOS A	8.3	0.223	6.3	LOS A	9.2
	Approach	0.193	7.2	LOS A	8.3	0.223	6.7	LOS A	9.2
SouthWest: Cudgen Road (SW)	T1	0.49	5	LOS A	30.4	0.447	4.7	LOS A	26.6
	R2	0.49	9.4	LOS A	30.4	0.447	9.3	LOS A	26.6
	Approach	0.49	7.9	LOS A	30.4	0.447	7.3	LOS A	26.6
All Vehicles		0.59	6.8	LOS A	39.4	0.522	6.6	LOS A	30.6

As demonstrated in Table 3.12, the intersection is shown to operate within acceptable performance limits in terms of degree of saturation, average delay and 95th percentile queue for a roundabout intersection in the Year 2023 background traffic scenarios.

3.7.7 Turnock Street / Elrond Drive roundabout

Analysis of the Turnock Street / Elrond Drive intersection was undertaken using SIDRA Intersection 7 for the Year 2023 (year of opening) and Year 2033 (10-year design horizon) background traffic volumes. The existing geometric layout for the intersection was used.

The layout of the intersection used in SIDRA is shown in Figure 3.27.

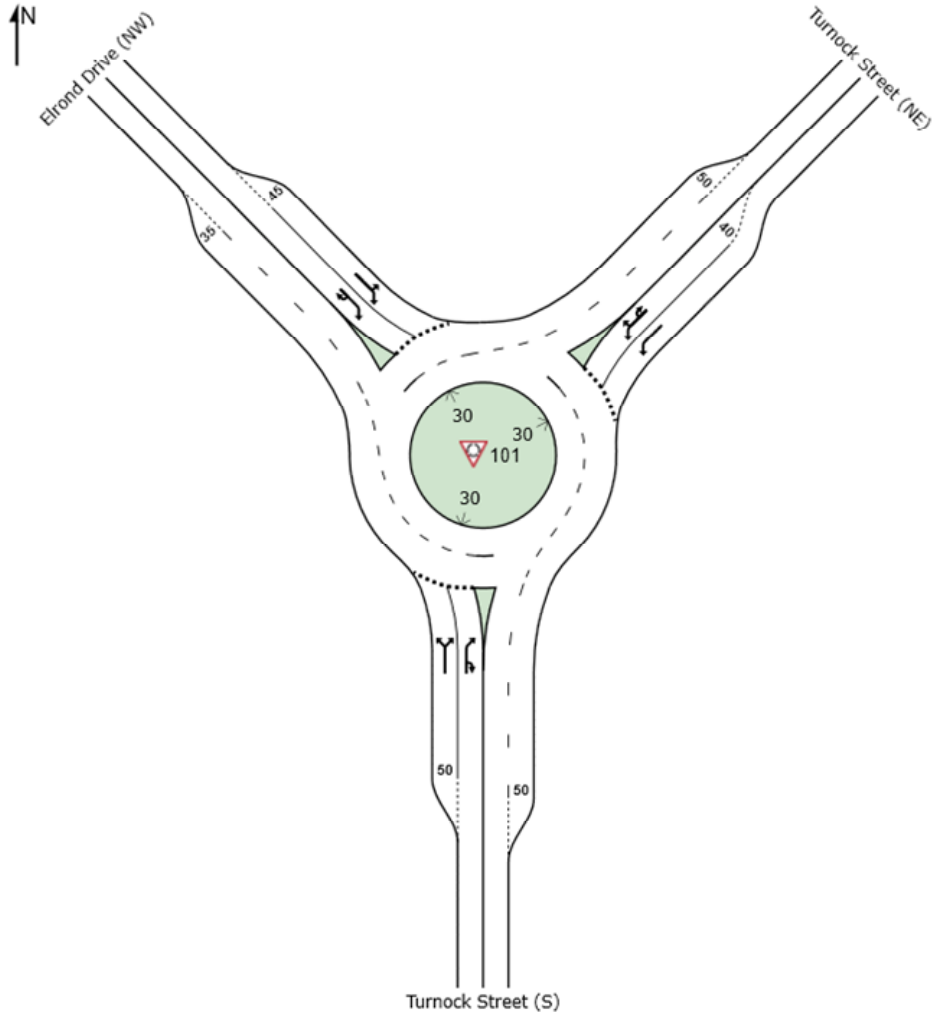


Figure 3.27: Turnock Street / Elrond Drive SIDRA Intersection Layout

The results of the analysis are summarised in Tables 3.13-3.14. A copy of the SIDRA movement summaries is provided in Appendix D.

Table 3.13: Turnock Street / Elrond Drive SIDRA Results Summary (Year 2023 Background Traffic Volumes)

Approach	Year 2023 AM Peak					Year 2023 PM Peak			
	OD Movement	DOS	Ave Delay (s)	LOS	95%ile Queue (m)	DOS	Ave Delay (s)	LOS	95%ile Queue (m)
South: Turnock Street (S)	L1	0.092	3.4	LOS A	2.8	0.115	3.5	LOS A	3.4
	R1	0.18	8.2	LOS A	6	0.203	8.3	LOS A	6.7
	U	0.18	11.7	LOS A	6	0.203	11.8	LOS A	6.7
	Approach	0.18	7.2	LOS A	6	0.203	6.8	LOS A	6.7
NorthEast: Turnock Street (NE)	L1	0.13	3.5	LOS A	4.2	0.163	3.3	LOS A	5.6
	R2	0.13	9.5	LOS A	4.2	0.163	9.4	LOS A	5.6
	U	0.13	11.8	LOS A	4.2	0.163	11.7	LOS A	5.6
	Approach	0.13	4.8	LOS A	4.2	0.163	5.1	LOS A	5.6
NorthWest: Elrond Drive (NW)	L2	0.07	4.6	LOS A	2	0.045	4.7	LOS A	1.3
	R1	0.077	8.9	LOS A	2.3	0.046	8.9	LOS A	1.4
	U	0.077	12.4	LOS A	2.3	0.046	12.4	LOS A	1.4
	Approach	0.077	7	LOS A	2.3	0.046	7	LOS A	1.4
All Vehicles		0.18	6.4	LOS A	6	0.203	6.2	LOS A	6.7

Table 3.14: Turnock Street / Elrond Drive SIDRA Results Summary (Year 2033 Background Traffic Volumes)

Approach	Year 2033 AM Peak					Year 2033 PM Peak			
	OD Movement	DOS	Ave Delay (s)	LOS	95%ile Queue (m)	DOS	Ave Delay (s)	LOS	95%ile Queue (m)
South: Turnock Street (S)	L1	*0.111*	3.4	LOS A	3.5	0.139	3.6	LOS A	4.2
	R1	0.216	8.2	LOS A	7.5	0.243	8.4	LOS A	8.5
	U	0.216	11.7	LOS A	7.5	0.243	11.9	LOS A	8.5
	Approach	0.216	7.2	LOS A	7.5	0.243	6.9	LOS A	8.5
NorthEast: Turnock Street (NE)	L1	0.157	3.6	LOS A	5.3	0.196	3.4	LOS A	7
	R2	0.157	9.5	LOS A	5.3	0.196	9.4	LOS A	7
	U	0.157	11.9	LOS A	5.3	0.196	11.7	LOS A	7
	Approach	0.157	4.9	LOS A	5.3	0.196	5.1	LOS A	7
NorthWest: Elrond Drive (NW)	L2	0.087	4.8	LOS A	2.5	0.055	4.9	LOS A	1.7
	R1	0.095	9.1	LOS A	2.9	0.057	9.1	LOS A	1.8
	U	0.095	12.5	LOS A	2.9	0.057	12.6	LOS A	1.8
	Approach	0.095	7.2	LOS A	2.9	0.057	7.2	LOS A	1.8
All Vehicles		0.216	6.5	LOS A	7.5	0.243	6.3	LOS A	8.5

As demonstrated in Table 3.13 and 3.14, the intersection is shown to operate within acceptable performance limits in terms of degree of saturation, average delay and 95th percentile queue for a roundabout intersection in the Year 2023 and 2033 background traffic scenarios.

3.7.8 Turnock Street / Pearl Street roundabout

Analysis of the Turnock Street / Pearl Street intersection was undertaken using SIDRA Intersection 7 for the Year 2023 (year of opening) and Year 2033 (10-year design horizon) background traffic volumes. The existing geometric layout for the intersection was used.

The layout of the intersection used in SIDRA is shown in Figure 3.28.

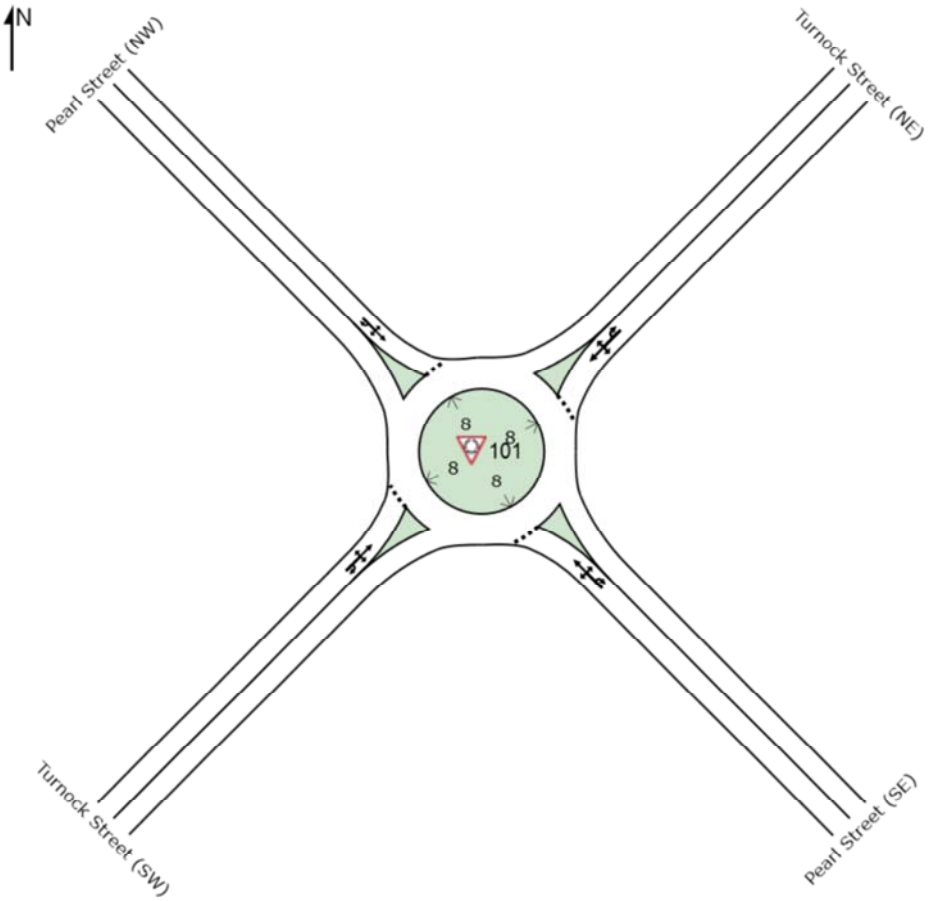


Figure 3.28: Turnock Street / Pearl SIDRA Intersection Layout

The results of the analysis are summarised in Tables 3.15 and 3.16. A copy of the SIDRA movement summaries is provided in Appendix D.

Table 3.15: Turnock Street / Pearl Street Intersection SIDRA Results Summary (Year 2023)

Approach	Year 2023 AM Peak					Year 2023 PM Peak			
	OD Movement	DOS	Ave Delay (s)	LOS	95%ile Queue (m)	DOS	Ave Delay (s)	LOS	95%ile Queue (m)
SouthEast: Pearl Street (SE)	L2	0.517	4.8	LOS A	32	0.58	5	LOS A	38
	T1	0.517	4.4	LOS A	32	0.58	4.7	LOS A	38
	R2	0.517	7.3	LOS A	32	0.58	7.7	LOS A	38
	U	0.517	8.4	LOS A	32	0.58	8.8	LOS A	38
	Approach	0.517	5.4	LOS A	32	0.58	5.6	LOS A	38
NorthEast: Turnock Street (NE)	L2	0.172	6.3	LOS A	7.2	0.159	5.8	LOS A	6.5
	T1	0.172	6	LOS A	7.2	0.159	5.7	LOS A	6.5
	R2	0.172	9	LOS A	7.2	0.159	8.7	LOS A	6.5
	U	0.172	10.4	LOS A	7.2	0.159	10.1	LOS A	6.5
	Approach	0.172	6.5	LOS A	7.2	0.159	6	LOS A	6.5
NorthWest: Pearl Street (NW)	L2	0.364	8	LOS A	18.4	0.334	7.5	LOS A	16.8
	T1	0.364	8	LOS A	18.4	0.334	7.6	LOS A	16.8
	R2	0.364	10.9	LOS A	18.4	0.334	10.4	LOS A	16.8
	U	0.364	12.3	LOS A	18.4	0.334	11.8	LOS A	16.8
	Approach	0.364	9	LOS A	18.4	0.334	8.7	LOS A	16.8
SouthWest: Turnock Street (SW)	L2	0.487	10	LOS A	28.4	0.477	9.3	LOS A	27.3
	T1	0.487	9.8	LOS A	28.4	0.477	9.2	LOS A	27.3
	R2	0.487	12.9	LOS A	28.4	0.477	12.5	LOS A	27.3
	U	0.487	14.1	LOS A	28.4	0.477	13.6	LOS A	27.3
	Approach	0.487	10.9	LOS A	28.4	0.477	9.9	LOS A	27.3
All Vehicles		0.517	7.7	LOS A	32	0.58	7.3	LOS A	38

Table 3.16: Turnock Street / Pearl Street Intersection SIDRA Results Summary (Year 2033)

Approach	Year 2033 AM Peak					Year 2033 PM Peak			
	OD Movement	DOS	Ave Delay (s)	LOS	95%ile Queue (m)	DOS	Ave Delay (s)	LOS	95%ile Queue (m)
SouthEast: Pearl Street (SE)	L2	0.637	5.8	LOS A	46.6	0.718	7.5	LOS A	66.7
	T1	0.637	5.3	LOS A	46.6	0.718	7.1	LOS A	66.7
	R2	0.637	8.2	LOS A	46.6	0.718	10.1	LOS A	66.7
	U	0.637	9.3	LOS A	46.6	0.718	11.2	LOS A	66.7
	Approach	0.637	6.4	LOS A	46.6	0.718	8	LOS A	66.7
NorthEast: Turnock Street (NE)	L2	0.221	7	LOS A	9.7	0.203	6.4	LOS A	8.7
	T1	0.221	6.7	LOS A	9.7	0.203	6.2	LOS A	8.7
	R2	0.221	9.7	LOS A	9.7	0.203	9.2	LOS A	8.7
	U	0.221	11.1	LOS A	9.7	0.203	10.6	LOS A	8.7
	Approach	0.221	7.1	LOS A	9.7	0.203	6.6	LOS A	8.7
NorthWest: Pearl Street (NW)	L2	0.478	10.1	LOS A	27.8	0.435	8.6	LOS A	23.3
	T1	0.478	10.1	LOS A	27.8	0.435	8.7	LOS A	23.3
	R2	0.478	12.9	LOS A	27.8	0.435	11.4	LOS A	23.3
	U	0.478	14.4	LOS A	27.8	0.435	12.9	LOS A	23.3
	Approach	0.478	11.1	LOS A	27.8	0.435	9.8	LOS A	23.3
SouthWest: Turnock Street (SW)	L2	0.664	16.1	LOS B	52.7	0.65	14.7	LOS B	50.4
	T1	0.664	15.9	LOS B	52.7	0.65	14.6	LOS B	50.4
	R2	0.664	19.1	LOS B	52.7	0.65	18	LOS B	50.4
	U	0.664	20.2	LOS B	52.7	0.65	19	LOS B	50.4
	Approach	0.664	17	LOS B	52.7	0.65	15.3	LOS B	50.4
All Vehicles		0.664	10.2	LOS A	52.7	0.718	10	LOS A	66.7

As demonstrated in Table 3.15 and 3.16, the intersection is shown to operate within acceptable performance limits in terms of degree of saturation, average delay and 95th percentile queue for a roundabout intersection in the Year 2023 and 2033 background traffic scenarios.

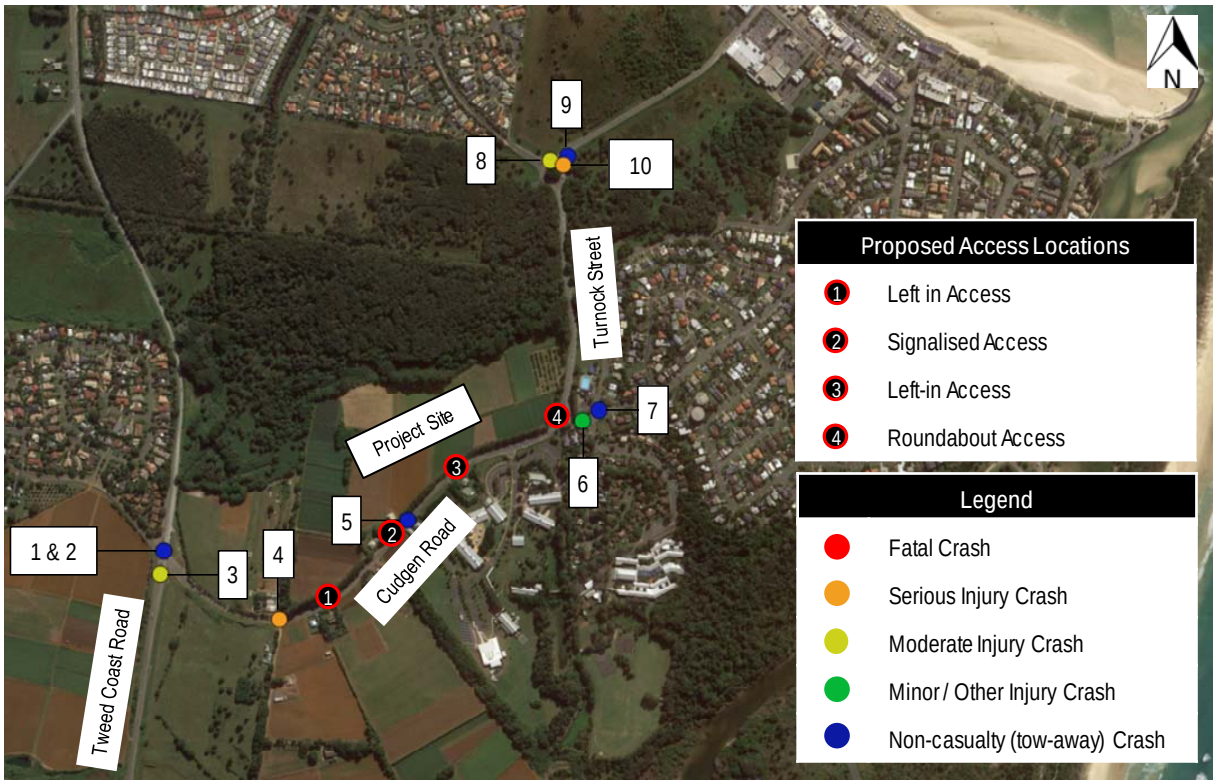
3.8 TRAFFIC SAFETY

3.8.1 Crash History

Crash data was obtained from Transport for NSW (TfNSW) to assess crash occurrence and identify existing deficiencies within proximity to the proposed external access intersection locations and at existing nearby intersections. Crash data was obtained for the following road sections:

- Cudgen Road from Turnock Street to Tweed Coast Road (including the eastbound approach to the Tweed Coast Road / Cudgen Road intersection);
- Turnock Street from Cudgen Road to Elrond Drive; and
- Tweed Coast Road in proximity to the Tweed Coast Road / Cudgen Road intersection (approximately 250m on each approach).

Crash data was obtained for the five-year period between 2013 and 2017. Crash data for 2017 was noted by TfNSW as being 95% complete. Figure 3.29 illustrates the recorded crash locations and severity whilst Table 3.17 provides further details relating to each crash.



Source: TfNSW and Google Maps

Figure 3.29: TfNSW Crash Data Summary for Surrounding Roads (2013-2017)

Table 3.17: TfNSW Crash Data Summary for Surrounding Roads (2013-2017)

#	Year	Severity	RUM	Description	Lighting / Weather	Key Direction	Contributing Factors
1	2017	Non-casualty	81	Off bend into object	Dark / wet / raining	West	Speeding
2	2015	Moderate Injury	80	Off bend	Dark / dry / fine	North	Unknown
3	2014	Moderate Injury	30	Rear end	Daylight / dry / fine	South	Unknown
4	2013	Serious Injury	80	Off bend	Dark / dry / fine	West	Speeding
5	2014	Non-casualty	32	Right rear	Daylight / dry / fine	East	Unknown
6	2015	Minor / other injury	40	U-turn	Daylight / dry / fine	West	Unknown
7	2017	Non-casualty	87	Off bend	Daylight / dry / fine	South	Speeding
8	2014	Moderate Injury	10	Cross traffic	Daylight / dry / fine	South	Unknown
9	2014	Non-casualty	73	Off road into object	Darkness / dry / fine	West	Unknown
10	2015	Serious Injury	72	Off road to right	Daylight / dry / fine	West	Fatigue

The crash data does not demonstrate a significantly high crash rate for the section of Cudgen Road or Turnock Street between Tweed Coast Road and Elrond Drive. There are no crash clusters or identified crash trends at any of the proposed site access locations.

It is noted that RMS has previously raised concern with traffic safety at the Pacific Highway / Tweed Coast Road interchange, particularly around the westbound left-turn from the off-ramp to Tweed Coast Road. It is understood that Tweed Shire Council recently obtained Blackspot funding for this location, with works undertaken in August 2018 (including provision of a new median, line marking and provision of a skid resistant pavement).

3.9 EXISTING PARKING SUPPLY AND DEMAND

3.9.1 On-Street and Off-Street Parking

No on-street parking is provided along the Project Site frontage on either Cudgen Road or Turnock Street. The cross-sections of both roads are predominantly rural in nature and include one travel lane in each direction, with no on-street parking and limited shoulder provisions. Nearby residential streets including McPhail Avenue, Cudgen Road (north of McPhail Avenue) and Oxford Street include on-street parking provision. Surrounding land uses including Kingscliff TAFE, Kingscliff High School, Tweed Regional Aquatic Centre, Kingscliff Library and residential dwellings include off-street parking. On-street parking is primarily utilised during school periods by students and pick-up / drop-off along Oxford Street and Cambridge Court. The on-street parking in these areas is unrestricted. Figures 3.30-3.32 shows the on-street parking and typical utilisation during the day on a weekday.

Figure 3.30: McPhail Avenue Cross Section and Observed On-street Parking

Figure 3.31: Cudgen Road (north of McPhail Avenue) Cross Section and Observed On-street Parking

Figure 3.32: Oxford Street Cross Section and Observed On-street Parking

3.9.2 Existing Parking Demand

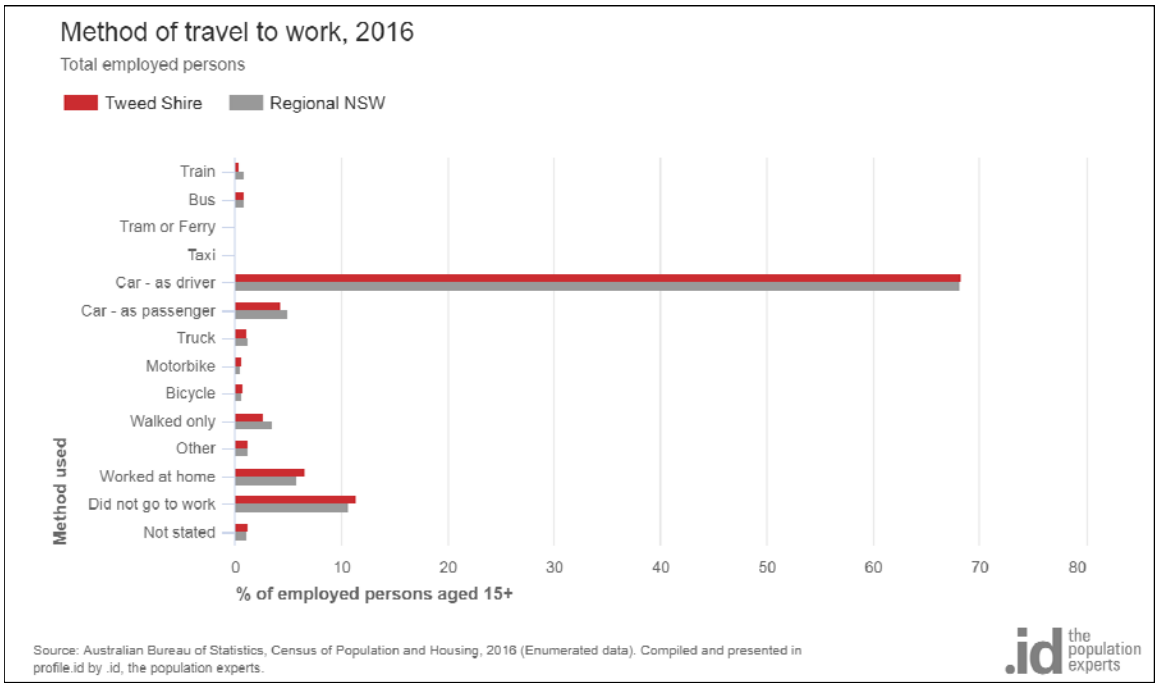
A review of the existing operations and land uses on the Project Site combined with site observations indicates that there is little existing parking demand for the current site operations. All current operations on the Project Site are expected to cease as a result of the Tweed Valley Hospital.

3.9.3 Pick-up and Set Down Areas

There are no existing pick-up or set down areas for the Project Site.

3.10 MODAL SPLIT

Australian Bureau of Statistics (ABS) data prepared and compiled by profile.id was reviewed to compare typical travel modes used in the Tweed Shire (refer Figure3.33).



Source: ABS and profile.id

Figure 3.33: Method of Travel to Work – Tweed Shire 2016

For those that travelled to work, travelling by private vehicle as the driver was the most common method (68.3%), followed by private vehicle as a passenger (4.4%). Active transport (walking and cycling) and public transport (bus) were the other main transport methods although utilisation was low (0.9-2.7%).

The Roads and Maritime Services (RMS) Guide to Traffic Generating Developments 2002 surveyed travel modes for trips to hospitals and identified the that "the mean proportion of people who travelled to the site by vehicle was 87.4%, with a range of 67.3% - 98.2%. Average vehicle occupancy was found to be 1.3 persons per car."

3.11 PUBLIC TRANSPORT

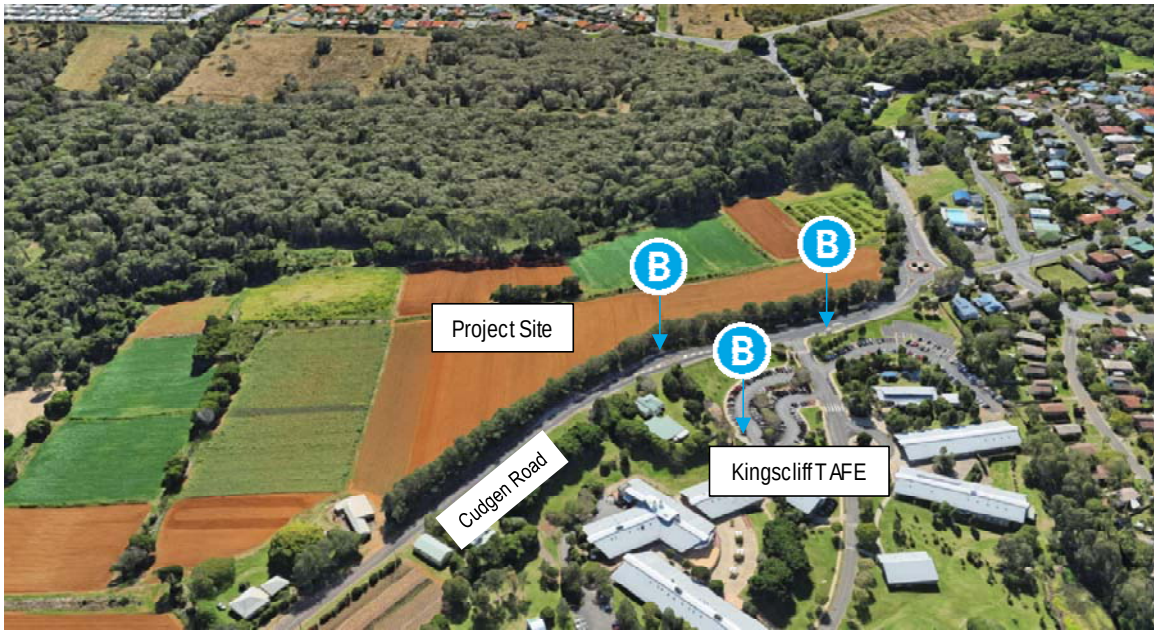
3.11.1 Rail Stations and Services

The Tweed Shire has no operational rail stations or services. The nearest rail services are located to the north in the City of Gold Coast with the closest heavy rail station located at Varsity Lakes. The most southern Gold Coast Light Rail stage is currently located in Broadbeach. The NSW regional services terminates in Casino and continues north of Casino via bus.

There is no planning in the short-medium future for rail services to extend into the Tweed Shire.

3.11.2 Bus Stops and Services

Two existing bus stops are located on Cudgen Road fronting the Project Site (eastbound and westbound). These stops service the adjacent Kingscliff TAFE Campus, TRAC Kingscliff, Kingscliff Library and immediate residential catchment. Both stops have shelters and seating. Footpaths connections are provided to each bus stop and a pedestrian refuge crossing is provided on Cudgen Road. The eastbound stop is located directly adjacent a pedestrian refuge crossing (i.e. pedestrians cross into the bus stop) and the westbound stop is located in the left turn lane to the TAFE. Figures 3.34 and 3.35 shows the existing bus stop infrastructure. It is noted that Route 601 also terminates within the TAFE site during teaching terms.



Source: Google Maps & TfNSW

Figure 3.34: Existing Bus Stop Infrastructure

Figure 3.35: Existing Eastbound Bus Stop and Pedestrian Refuge Crossing

Figure 3.36: Existing Westbound Bus Stop

The existing bus stops are serviced by the Route 603 on an hourly basis. Route 603 provides connection between the following locations:

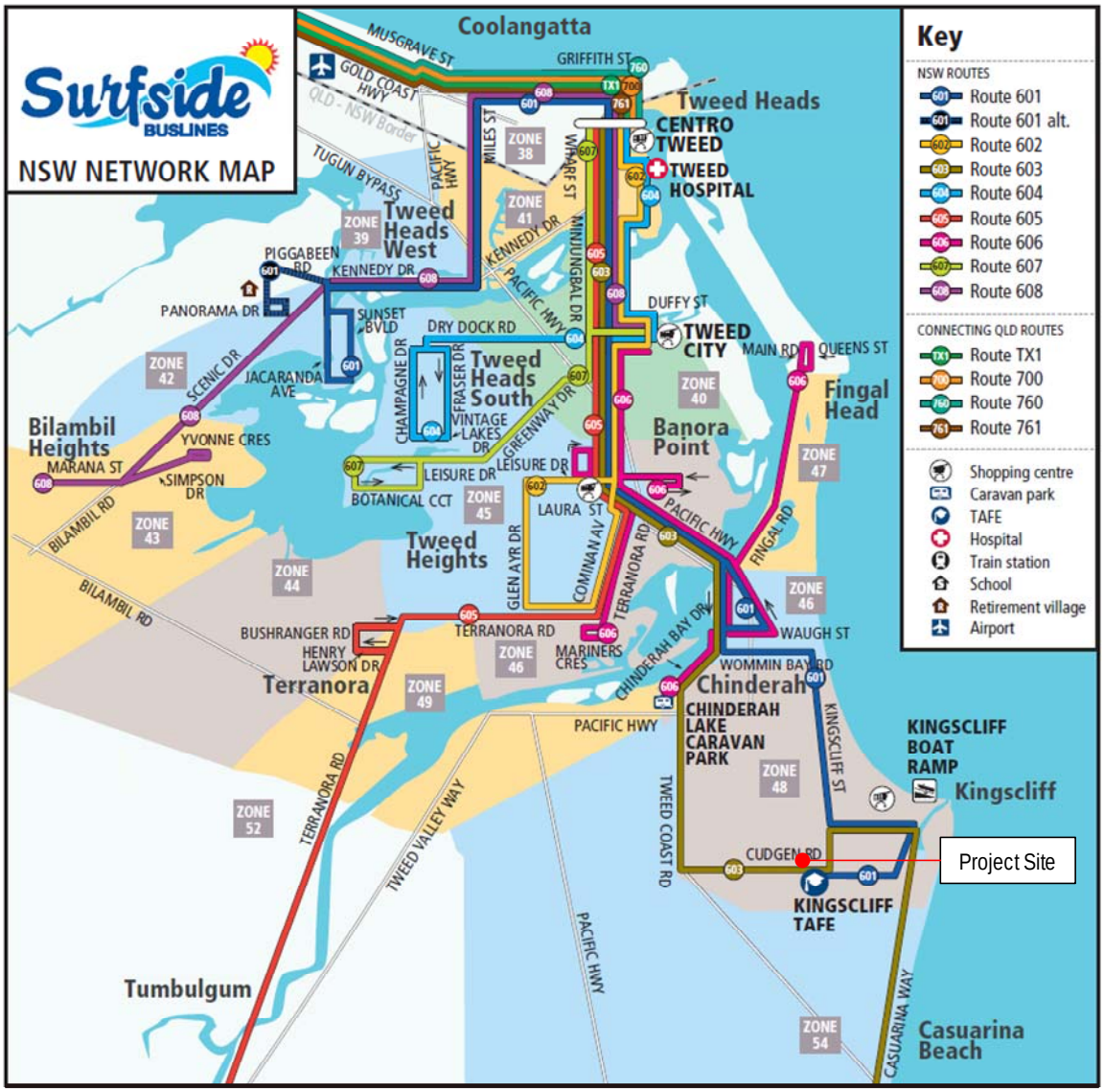
- Tweed Heads
- Tweed City;
- Chinderah;
- Cudgen;
- Kingscliff;
- Salt;
- Casuarina;
- Bogangar;
- Cabarita;
- Hastings Point; and
- Pottsville.

Kingscliff TAFE is also serviced by Route 601. Route 601 provides connection between the following locations

- Kingscliff;

- Chinderah;
- Tweed City;
- Tweed Heads;
- Coolangatta; and
- West Tweed.

Surfside have noted that Route 601 terminates within Kingscliff TAFE and does not continue past the Project Site. Surfside also noted issues with the service when the TAFE is closed, and the access is gated, restricting the bus from turning around on the site. The existing bus service routes are presented in Figure 3.37.



Source: Surfside Buslines

Figure 3.37: Existing Bus Service Routes

3.11.3 Commuter Parking

There is no existing commuter parking supply or demands in the area.

3.12 PEDESTRIAN NETWORK

3.12.1 Pedestrian Routes and Infrastructure

An existing off-road shared path is provided along the Project Site frontage. The pathway connects to residential areas west of Tweed Coast Road and to Kingscliff in the east. The existing network in proximity

to the Project Site is shown in Figure 3.38. Note that the off-road cycle ways shown in the figure are shared pathways suitable for pedestrians.

Source: Tweed Shire Council Cycleways and Footpaths 2017

Figure 3.38: Surrounding Pathway Network

3.12.2 Pedestrian Conflict Points

Pedestrian crossings across Cudgen Road and Turnock Street are all unsignalised crossings. The location of the refuge crossing on Cudgen Road to the west of the Kingscliff TAFE access conflicts with the location of the eastbound stop and is considered to be a safety issue.

4. PROPOSED PROJECT

4.1 THE PROJECT

The Project is for a new hospital for the Tweed Shire. The Project Site for the Tweed Valley Hospital is to the west of Kingscliff on 771 Cudgen Road, Cudgen NSW. The Project is expected to include a range of services and services (as detailed in Section 1.1). For the purpose of this assessment the following is expected:

- 430 beds and 1,050 staff by Year 2032 (based on benchmarking).

It should be noted that the Tweed Valley Hospital yields have not been finalised at this stage of the Project. The above is the latest available information and is appropriate for the purpose of the SSD application for a Concept Proposal.

The Project is considered SSD and critical social infrastructure. The Project Masterplan is presented in Appendix A.

4.2 TRAVEL TIME ASSESSMENT

Travel times were calculated for the various population sectors across the Tweed Local Government Area. For the purpose of access to health services, the QLD suburbs were excluded from the travel time calculations. The model used for the travel time assessment was the Tweed Strategic Transport Model (TSTM) which is approved for use by Tweed Shire Council. Travel times were based on the morning peak period using a 2041 design year. The model used to extract travel times includes forecast population growth and traffic demand growth as well as planned future road network upgrades. Figure 4.1 summarises travel time by proportion of the Tweed Shire population. Travel times and associated travel routes to key population centres is also presented in Figure 4.2.

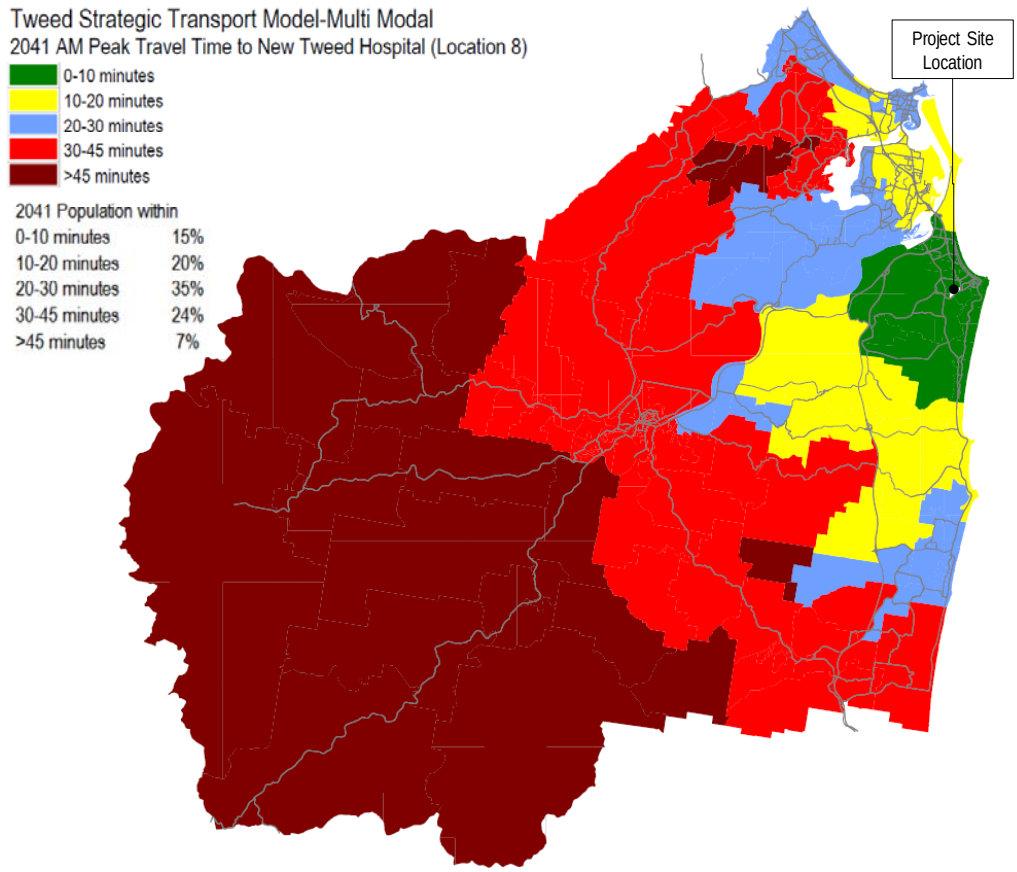


Figure 4.1: Travel Time to Project Site by Area

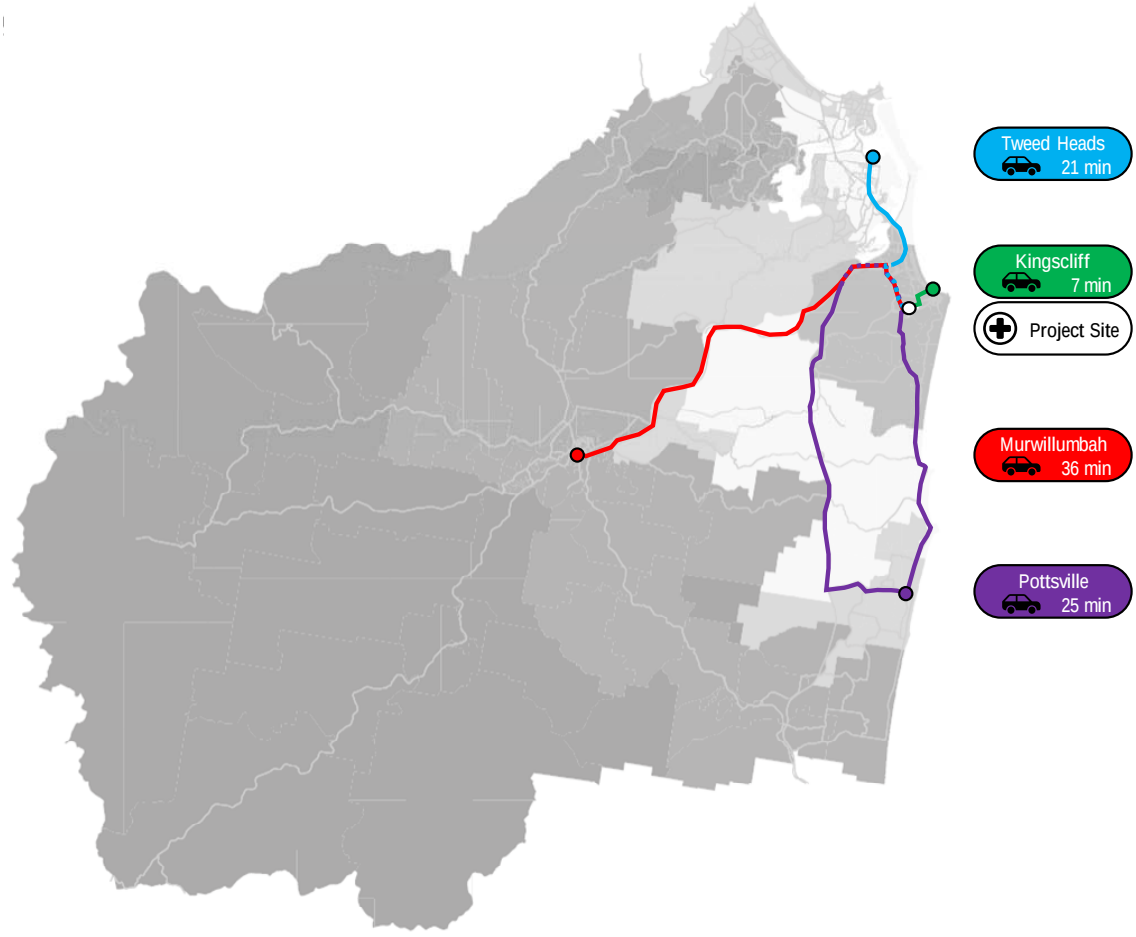


Figure 4.2: Travel Time to Project Site by Population Centre

The proposed Tweed Valley Hospital is well located with respect to current and forecast population centres, with a travel time of less than 30 minutes for nearly 70% of the Tweed Shire population.

4.3 Access and Internal Circulation Assessment

4.3.1 Access Locations

The Tweed Valley Hospital provides a total of four access locations as follows:

- Access A: Left-in only from Cudgen Road at the eastern boundary. The access is provided with an Auxiliary Left turn (AUL) treatment. This is a limited access only and provides access to the staff car park and dedicated access for ambulances and service vehicles;
- Access B: Signalised all movements access to Cudgen Road. This is the site's primary access and provides access for staff, ambulances and visitors. The signalised nature and design of the intersection provides a high level of pedestrian amenity, providing pedestrian connectivity to the westbound bus stop, Kingscliff TAFE and surrounding residential areas. The signalised access has been designed as an intersection and to cater for design traffic volumes in the 10-year design horizon (i.e. Year 2033). Detailed assessment of the intersection has been undertaken in Section 5.2.4. The specific location of access intersection is dictated by a number of factors including the requirement to provide sufficient vegetation buffer from overspray on adjacent farmland and to align with the TAFE frontage to Cudgen Road to allow for a potential future upgrade to a four-leg intersection as part of future expansion or development on the TAFE site. This future upgrade would allow for conversion of the existing TAFE access from a "seagull" to a left-in / left-out configuration;
- Access C: Left-in only from Cudgen Road west of the Kingscliff TAFE access. The access is provided with a short Auxiliary Left turn (AUL(s)) treatment. This access provides access to staff and visitor car parking as well as for more direct access to the transit set-down. The access is important in reducing unnecessary trips on the internal road adjacent the main entry; and
- Access D: All movements access to Cudgen Road / Turnock Street in the form of a fourth leg to the existing Turnock Street / Cudgen Road intersection. This access provides access for staff, visitors and

service vehicles. The access has been designed as an expansion to the existing roundabout and to cater for design traffic volumes in the 10-year design horizon (i.e. Year 2033). Detailed assessment of the intersection has been undertaken in Section 5.2.6. The roundabout is located approximately 110m from the TAFE access. In this regard it is noted that this separation is an existing arrangement. Volumes turning left-into the site at this location are expected to be relatively low given the three other accesses to the west. The addition of a fourth leg is also not expected to result in any significant weaving or issues with vehicles turning right from the TAFE and then left into the site. This volume is expected to be very low and from a route choice perspective it is more likely that vehicles will turn left and use the hospitals main access.

The site access locations are illustrated in Figure 4.3. For further details refer to the Masterplan presented in Appendix A.

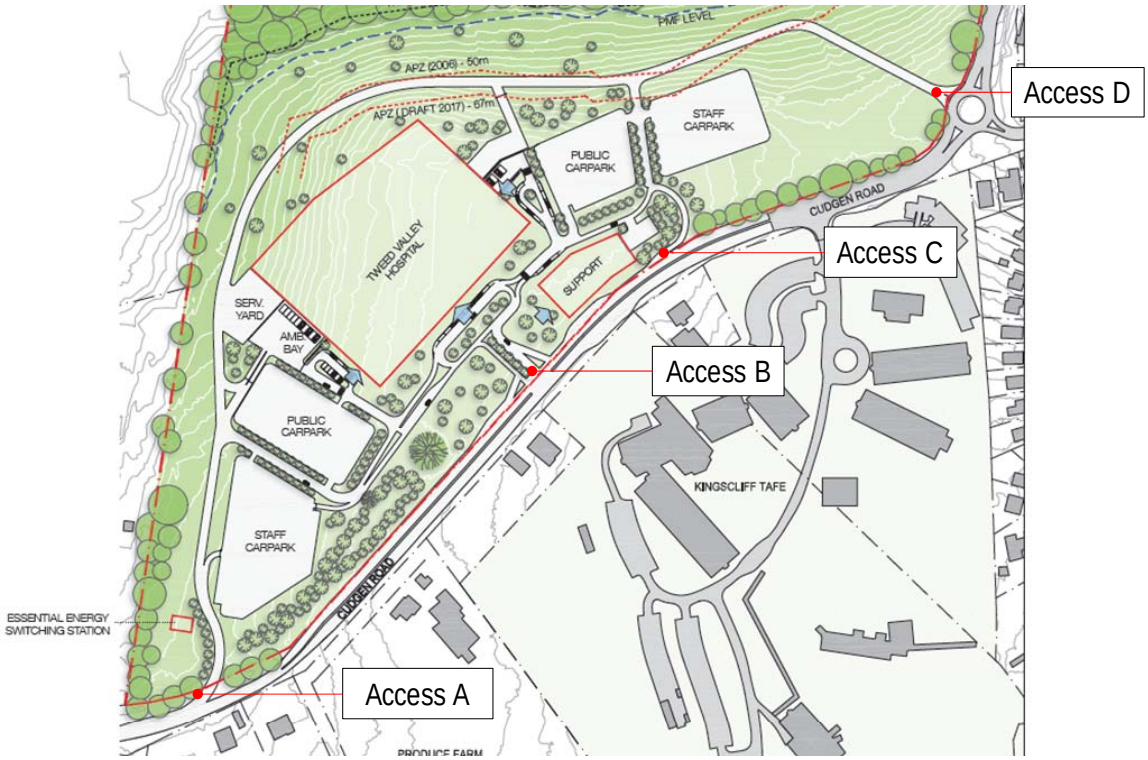


Figure 4.3: Site Access Locations

4.3.2 Access Sight Distance Assessment

Sight distance requirements and compliance for each access are summarised below. Each access in unique in terms of sight distance requirements due to the various intersection forms as stipulated in Austroads Guide to Road Design. A reaction time of 1.5-2.0 seconds has been adopted and varying design speeds have been adopted with 70km/h adopted for Cudgen Road based on the 60km/h posted speed and recorded 85th percentile speeds which was as 67.5km/h). For the internal approach to intersection a design speed of 40km/h was used noting the low speed internal road environment. A right-turn circulating speed of 30km/h was used for the roundabout consistent with typical speeds identified by Austroads.

Access A

Access A is left-in only and has no conflict points. Access A will be clearly signed and will primarily be used by drivers familiar with the site and access (staff, delivery drivers, ambulances etc). The access includes a auxiliary left turning lane to cater for diverging and decelerating traffic. A stopping sight distance of approximately 80m is available to the start of the taper which is consistent with the stopping sight distance requirement of 81m-83m (absolute minimum requirement with 2.0 second reaction time to desirable minimum with a 1.5 second reaction time). Considering there are no conflict points and an auxiliary lane is provided to cater for diverging and decelerating traffic, the available sight distance is sufficient.

Access B

Access B is the primary signalised intersection. An approach sight distance requirement (ASD) of approximately 40m is available which complies with the minimum requirement of 34m for a design speed of 40km and reaction time of 1.5 seconds.

While the intersection is signalised, the desirable Safe Intersection Sight Distance (SISD) requirement of 151m is achieved in both directions on Cudgen Road. This allows sufficient sight distance in the instance that a vehicle stalls in the middle of the intersection, fails to stop at a red light leaving the site and for vehicles turning left onto Cudgen Road.

The minimum gap sight distance (MGSD) of 97m is achieved for the unsignalised left-turn onto Cudgen Road.

Access C

Access C is left-in only and has no conflict points. A minimum stopping sight distance of 81-83m is achieved to the start of the taper.

Access D

Access D utilises the existing Turnock Street / Cudgen Road roundabout intersection. The existing approaches to the roundabout are well delineated with line-marking, medians and advanced warning signage. Minor vegetation trimming is recommended on the Project Site frontage to improve sight lines (when approaching from the west). Approach sight distances to the roundabout in the order of the required 83-92m are available on the Cudgen Road (west) and Turnock Street (north) and it is clearly evident prior to these points that the roundabout is ahead with the provision of large directional and advanced warning signage. Approach sight distances for the Cudgen Road (eastern) approach exceed the desirable 73m.

Sight distances for vehicles circulating on the roundabout and approaching are achieved on each existing approach. Sight distances for the new (i.e. access) to vehicles entering from the right require confirmation during detail design and will be subject to vegetation trimming / removal.

4.3.3 Service and Emergency Vehicle Access and Circulation

The primary emergency vehicle access to the Project Site from the west is via Access A and the internal circulation road. For access from the east the main access point is via Access B. The northern ring-road provides a direct route via Access D. The Tweed Valley Hospital layout and access provisions do however allow for emergency vehicle access via all four access locations. Emergency vehicle egress is via Access B and D. The emergency vehicle drop-off / pick-up area and primary, internal roads and access intersections has the potential to cater for an Emergency Vehicle Priority (EVP) system if required, which could allow for emergency vehicle priority on egress and ingress by:

- metering the internal elongated roundabout and priority-controlled intersection to give priority to emergency vehicles; and
- allowing for phase “green flushes” on the signalised access to clear queued vehicles and to give the emergency vehicle priority movement.

For egress, the priority could be called by a number of mechanisms including a physical push button, loop detectors or by a signal transmitted from the vehicle. For ingress the system would rely on a signal from the vehicle.

It is noted that, Queensland’s Department of Transport and Main Roads (TMR) has an EVP system that has already been implemented on many intersections and emergency vehicles across Queensland. In addition, it is understood that RMS currently operate a similar system at the Minjungbal Drive / Dry Dock Road signalised intersection in proximity to the Tweed Heads Fire Station. It is expected that similar technology will be available for the RMS intelligent traffic management system “SCATS” by the Project’s year of opening. It is recommended that this be implemented at the Tweed Coast Road / Cudgen Road Intersection to further improve emergency vehicle access to the Project Site site from the external network.

A service loading yard is provided at the western side of the main Tweed Valley Hospital building and caters for servicing and refuse collection. Service vehicle ingress is provided via Access A for vehicles from the west and via Access D for vehicles from the east. All service vehicle egress is via Access D. Service vehicles will utilise the northern internal ring road to minimise service vehicle movements on the internal road fronting the main entrance.

Project Site access, internal circulation and egress movement paths are shown in Figures 4.4 and 4.5. For further details on the emergency and servicing facilities refer to the Masterplan provided as Appendix A.

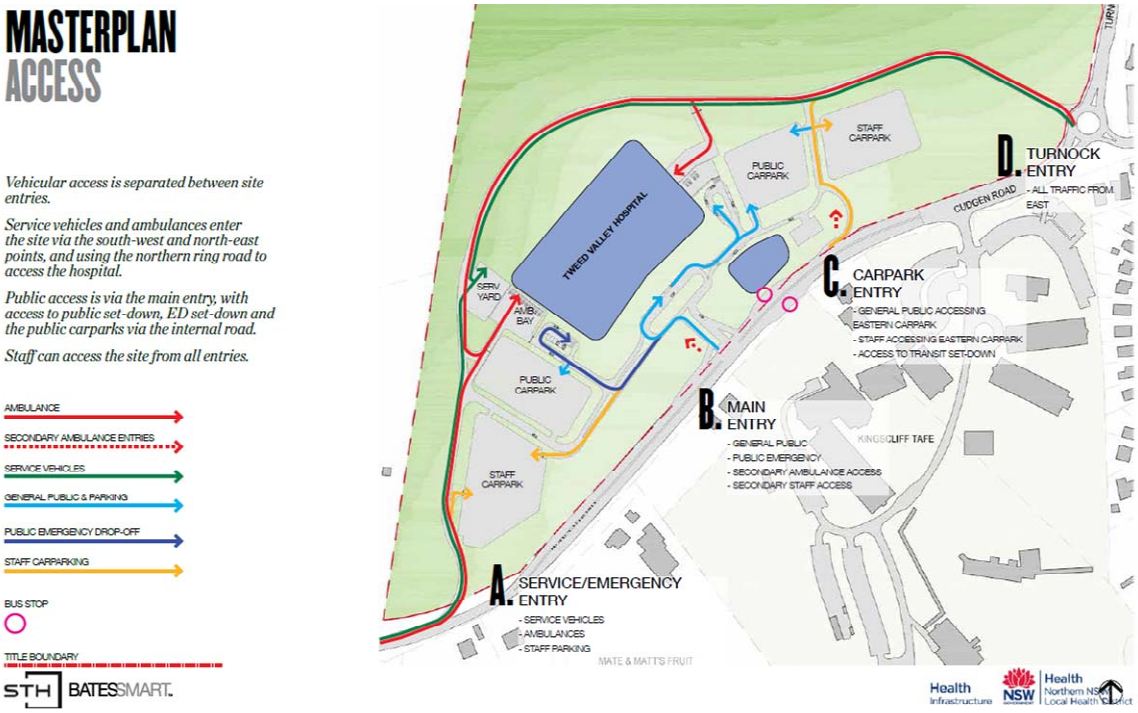


Figure 4.4: Vehicle Access Routes

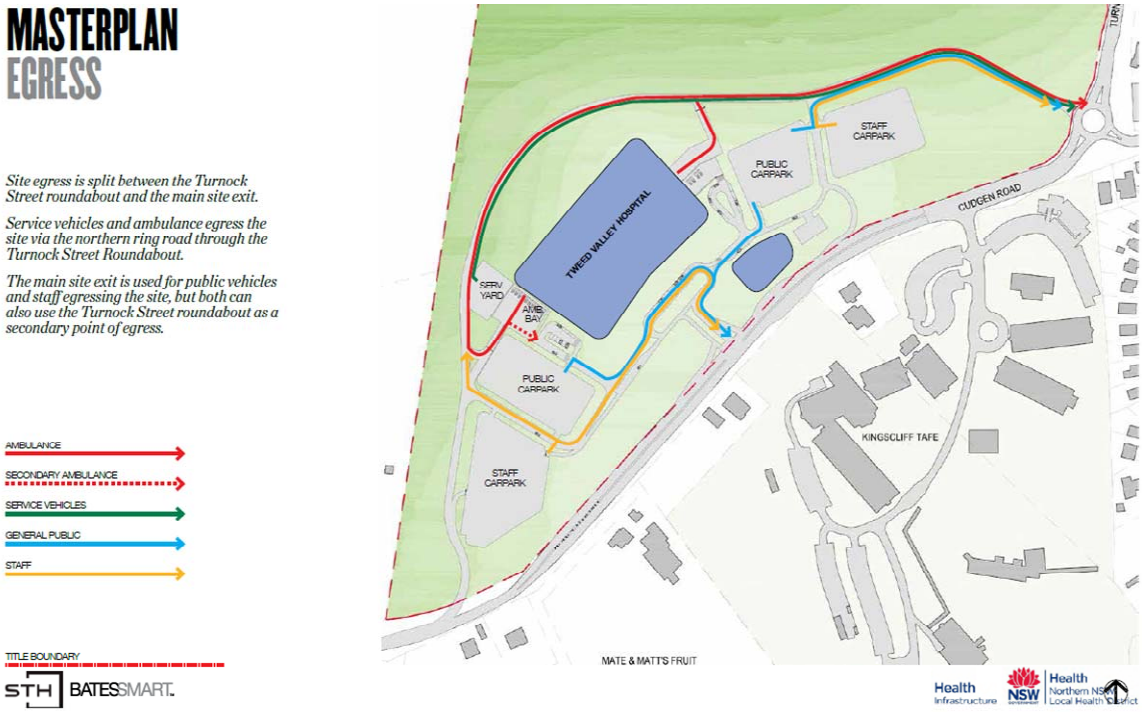


Figure 4.5: Vehicle Egress Routes

4.3.4 Access Queuing Assessment

Access B has two approach lanes and two departure lanes with over 100m of queuing distance provided. Queuing was modelled as part of the access intersection modelling. For design traffic in Year 2033, the egress 95th percentile queues approach 40m, which is contained within the available queuing distance and

does not impact the internal westbound through lane. Queuing on ingress will be lower than on egress on the basis that opposing volumes on the internal road will be significantly lower than on Cudgen Road and ingress is distributed via four accesses while egress is via two. The separation of approximately 40m is sufficient to cater for ingress queues and depending on internal line marking and priority allocation additional queuing can be provided. On this basis queues will not impact Cudgen Road at this access.

Access D has significant queuing distance (more than 200m) and no external queuing issues are expected at this access.

Access A and C are left in only and ingressing vehicles have priority into the Project Site. A minimum of 50m of queuing distance is available. No external queuing issues are expected at these access locations.

4.3.5 General Public Parking and Circulation

General public car parking has been provided on the eastern and western sides of the Tweed Valley Hospital and are the closest car parking facilities to the main hospital building. Access and egress for the general public car parks is via Access B, C and D. General public parking access and circulation paths are shown in Figures 4.4 and 4.5.

For further details on the general public parking facilities refer to the Masterplan provided as Appendix A.

4.3.6 General Public Emergency Drop-off

General public emergency drop-off is provided at the western side fronting the primary access to the Project Site. A dedicated indented drop-off bay is provided as is a small supply of 90-degree parking. Access to the drop-off is primarily via Access B, although access D also provides a secondary access.

General public emergency drop-off and circulation paths are shown in Figures 4.4 and 4.5.

For further details on the general public drop-off facilities refer to the Masterplan provided as Appendix A.

4.3.7 Staff Access and Circulation

Dedicated staff car parking is provided on the western and eastern sides of the hospital. For the western car park staff access is provided via Access A and Access B. For the eastern carpark access is provided via Access C and D. Staff access and circulation paths are shown in Figures 4.4 and 4.5.

For further details on the staff parking facilities refer to the Masterplan provided as Appendix A.

4.3.8 Public Transport Access

Public transport to the Project Site will be via bus, with all bus infrastructure located on the Project Site frontage on Cudgen Road. For further details on Public Transport refer Section 5.5.4.

The Project will also cater for access for Community Transport and aged care transport in terms of standard cars / vans (i.e. B85 and B99 vehicles) as well as mini-buses (e.g. SRV) via the main accesses.

4.3.9 Internal Road Geometry

The internal road geometry has been generally designed to comply with Australian Standards AS2890.1 (Off-street parking) and AS2890.2 (Off-street commercial vehicle facilities). It is however noted that architectural plans for the Masterplan are high-level and while the design has considered the Australian Standards requirements, much of the detail is not shown. In this regard, further detailed analysis of the internal road geometry should be undertaken in future design stages to ensure compliance with the standards. Specific requirements are as follows:

- Circulation roads are to be a minimum of 6.5m to cater for service vehicles. Additional width is likely required at curves and at internal intersections and should be checked with swept paths; and
- Maximum grades for internal circulation roadways should not exceed 15.4% and the maximum rate of change should not exceed 6.25% in 10m travel (for AV circulation) or in 7m of travel (to cater for any other service vehicle movements).

4.4 PARKING

4.4.1 Car Parking Requirements and Provision

An important consideration when planning for the car parking provision is to achieve a balance between parking demand and providing an oversupply. It is widely acknowledged that provision of parking relates directly to car parking utilisation and traffic generation. Providing additional parking beyond the requirement will unnecessarily increase parking demand and private vehicle utilisation.

Table 4.1 details Council's car parking requirements stipulated within Section A2 – Site Access and Parking Code.

Table 4.1: Tweed Valley Hospital Car Parking Requirements

Land Use	Yield	Required Parking Rate	Parking Requirement
Hospital (visitor)	430 beds	0.8 spaces / bed	344
Hospital (staff)		0.8 spaces / bed	344

The proposal shall incorporate in the order of 700 car parking spaces across four car parking areas. Car parking is separated into two dedicated staff car parks and two dedicated public car parks. Some additional short-term parking is provided around the Emergency Department set down area.

For comparison, the peak parking accumulation (PPA) was calculated based on the rate stipulated within the RMS Guide to Traffic Generating Developments. The rate is based on historical surveys undertaken at hospital developments and provides an indication of peak parking demands. The PPA rate is shown below:

- $PPA = -19.56 + 0.85\ B + 0.27\ ASDS$

Based on this rate, the PPA is 630 car parking spaces. This is below Council's requirement and below the proposed provision which indicates that the parking supply is sufficient to cater for demand.

The above considers the ultimate parking requirement in Year 2032, however the Tweed Valley Hospital is likely to commence operations in Year 2022/2023 with a lower yield (currently understood to be 407 beds). In this regard, the initial parking supply provided at time of opening should cater for the requirement as a minimum (i.e. 652 spaces).

While not proposed as part of this application, the site layout and future planning caters for additional parking provision in the form of overflow parking on the site to the north-east of the main building (prior to the provision of allied health and other ancillary land uses being provided.

4.4.2 Management of Car Parking Facilities

A car parking management plan will be developed as part of Stage 2. Initial consultation for the development of the car parking management plan and management strategies has commenced and will continue through to Stage 2. The car parking management plan will detail any parking fees which will follow a typical tariff system as used across NSW. It is expected that management of car parking will be similar to the system used at the Lismore Base Hospital Uralba Street car park, which includes:

- boom gate access;
- structured fee for various time periods;
- multiple payment methods;
- operation 24 hours a day, seven days a week; and
- concession parking for eligible visitors.

Physical restrictions (i.e. boom gates) will only be placed on parking areas. Internal roads and patient drop-off areas will not be restricted.

As an example, the fee structure used at the Lismore Base Hospital Uralba Street car park is as follows:

- 0-15 minutes: FREE;
- 15 minutes – 1 hour: $3.00;

- 1-2 hours: $5.00;
- 2-3 hours: $6.00;
- 3-4 hours: $7.00; and
- 4+ hours (daily maximum): $8.00.

4.4.3 Servicing and Refuse Requirements

Based on information provided by HI, it is understood that the largest vehicle required for the Tweed Valley Hospital is a 19m AV for oxygen and gas deliveries and smaller service vehicles for a range of other deliveries and servicing requirements (e.g. linen, medical supplies, food, equipment). The servicing yard is located on the north-eastern side of the main hospital buildings with access via Access A or D. The servicing yard will cater for a range of standard service vehicles including:

- 19m AV;
- 12.5m HRV;
- 8.8m MRV; and
- 6.4m SRV.

Detailed refuse collection requirements are not known at this preliminary stage and it is therefore recommended that the Project cater for a range of possible refuse collection methods (e.g. "ro-ro" bins, bulk bins and wheelie bins). The largest Refuse Collection Vehicle (RCV) is typically not more than 10.2m in length. The Tweed Valley Hospital will also require collection of medical waste. Medical waste vehicles are expected to be smaller than typical refuse vehicles.

The Tweed Valley Hospital also requires servicing by ambulance. A 6.4m SRV has been assumed as the representative standard design vehicle for an ambulance. An ambulance service area has been provided on the sites south-western side. The ambulance service area includes eight dedicated ambulance parking spaces.

Council's Section A2 – Site Access and Parking Code does not specify a minimum class of service vehicle for hospitals, although stipulates a service vehicle parking requirement of one space per 30 beds. On this basis the service vehicle parking requirement equates to 14 spaces. The Project is considered to provide sufficient service vehicle parking with 10 ambulance bays at the emergency department, a further four ambulance bays at the transit set-down area and provision for a range of service vehicles in the dedicated servicing yard. Servicing (other than by ambulances / emergency vehicles) and refuse collection is expected to occur at various times across a typical day or typical week.

It is however noted that architectural plans for the Masterplan are high-level and while the design has considered the Australian Standards requirements, much of the detail is not shown. In this regard, further detailed analysis and swept path assessment should be undertaken to ensure manoeuvrability of service vehicles in the service areas and on internal access roads. This will be undertaken for Stage 2 which involves detailed design, construction (main works) and operation of the hospital.

It is recommended that the Tweed Valley Hospital operate a Service Vehicle Management Plan (SVMP) that dictates standard servicing and refuse collection procedures and may incorporate timetables and schedules for that specify when certain deliveries can occur. At this stage service vehicle frequencies are not defined. The SVMP will be prepared as part of Stage 2.

4.4.4 Bicycle Parking Requirements and Provision

Table 4.2 details Council's bicycle parking requirements stipulated within Section A2 – Site Access and Parking Code.

Table 4.2: Tweed Valley Hospital Bicycle Parking Requirements

Land Use	Yield	Required Parking Rate	Parking Requirement
Hospital (visitor)	430 beds	1 bicycle space / 30 beds	14
Hospital (staff)		1 bicycle space / 15 beds	29

The Masterplan does not show bicycle parking and this would be further considered at Stage 2. Bicycle spaces should be provided in accordance with Australian Standards AS2890.3:

- Visitor Bicycle Parking – should be provided as Class 3 Facilities. This is recommended to consist of simple bicycle racks on the ground level near entrances; and
- Staff Bicycle Parking – should be provided as Class 2 Facilities. Racks should be provided undercover and in a secure location. Staff should also have access to end of trip facilities (showers, changing facilities and lockers).

4.4.5 Car Parking Geometry Assessment

The internal car parking geometry has been generally designed to comply with Australian Standards AS2890.1 (Off-street parking) and AS2890.2 (Off-street commercial vehicle facilities). It is however noted that architectural plans for the Masterplan are high-level and while the design has considered the Australian Standards requirements, much of the detail is not shown. In this regard, further detailed analysis of the internal geometry should be undertaken in future designs stages (i.e. Stage 2) to ensure compliance with the standards. Specific requirements are detailed in Table 4.3.

Table 4.3: On-Site Parking Geometric Layout Requirements

Design Element	Requirement
General Car Parking Facilities	
Car Parking Bays (User Class 3)*	2.6m x 5.4m
Parallel Car Parking Bays	2.1m x 6.1m
PWD Parking Bays (User Class 4)	2.4m x 5.4m with adjacent shared area of same dimensions
Parking Aisle (90-Degree Parking)	5.8m minimum (6.2m preferred)
Parking Aisle (Parallel Parking)	3.6m
Clearance Adjacent to Vertical Obstructions	0.3m
Car Parking Aisle Width Clearance	Additional 0.3m aisle width for single sided parking aisles
Internal Roadways (One-Way)	3.6m (light vehicles) and 4.1m (heavy vehicles)
Internal Roadways (Two-Way)	6.5m (heavy vehicles)
Grades (Entry)	Max 1:20 for first 6m into site (for passenger vehicle accesses and service vehicles up to an MRV) and max 1:20 for first 9.5m into site (for 19m AV accesses)
Grades (Circulation and Parking Areas)	Max 1:20
Car Parking Ramps	Max 1:5 with transitions
Service Vehicle Facilities	
SRV parking	3.5m x 6.4m
MRV parking	3.5m x 8.8m
HRV parking	3.5m x 12.5m
AV parking	3.5m x 19m
Height Clearance (travelling path for all service vehicles)	4.5m to overhead structure / services
Servicing Height (refuse vehicles)	Typically 6.5m (6.4m servicing height plus 100mm clearance) to overhead structure / services
Grades Parking Areas	Max 1:20
Circulation roads	Max 1:6.5 (15.4%) grade and max rate of change should not exceed 1:16 (6.25%) in 10m travel (for AV circulation) or in 7m of travel (to cater for any other service vehicle movements)
Bicycle Facilities	
Bicycle Parking	0.5m x 1.8m x 1.5m aisle

** Note: dedicated staff car parking could be provided as Class 1A (2.4m wide)*

5. IMPACT OF PROPOSED PROJECT

5.1 TRANSPORT CONSULTATION UNDERTAKEN

In conjunction with assessing the traffic impact of the proposed Tweed Valley Hospital, consultation was undertaken with a number of stakeholders, including:

- Tweed Shire Council - discussions with Manager Engineering Services in regard to:
  - site access intersection upgrades and integration with the adjacent road network;
  - external traffic operations and likely impacts associated with the inclusion of the hospital;
  - future road network infrastructure planning in proximity to the Project Site and changes to travel patterns;
  - pedestrian and active transport connections;
  - public transport facilities and integration with existing services;
  - parking facilities on-site in line with standard requirements and consideration to other recent Health Infrastructure developments in regional NSW.
- RMS in regard to:
  - existing operations of state-controlled roads in proximity to the Project Site;
  - expected intersection operations with the inclusion of the hospital;
  - notification of the expected signalised intersection form on Cudgen Road;
- Surfside Buslines and TfNSW:
  - location of the Project Site with respect to existing bus services and stops located at the neighbouring Kingscliff TAFE;
  - review of bus stop location options both within and external to the site and what impacts this has on site operations, bus movements, traffic conflicts and route planning; and
  - potential for updates to bus services and incorporation into current route planning being undertaken for the Tweed Shire by TfNSW and Surfside.

5.2 TWEED VALLEY HOSPITAL TRAFFIC

5.2.1 Tweed Valley Hospital Traffic Generation

The Roads and Maritime Service (RMS) *Guide to Traffic Generating Developments* was used to calculate the Project's peak hour traffic generation. The RMS guide specifies three peak period traffic generation rates for hospitals as follows:

- Vehicle Trip Generation in the Morning Commuter Peak Hour (MVT) – this provides an indication of development traffic generation during the typical morning peak hour which typically occurs around 8am – 9am;
- Vehicle Trip Generation in the Evening Commuter Peak Hour (EVT) – this provides an indication of development traffic generation during the typical evening peak hour which typically occurs around 5pm – 6pm; and
- Peak Vehicle Trips (PVT) – this provides an indication of peak development traffic generation. While the time was found to vary, the most common time for the PVT to occur was 3pm-4pm. The PVT incorporates a staff shift change.

The MVT, EVT and PVT traffic volumes for the Project are presented in Table 5.1.

Table 5.1: Tweed Valley Hospital Traffic Generation (Peak Hour)

Land Use	Yield	Peak	Peak Hour Trip Rate	Peak Hour Trips
Hospital	430 beds and 1,050 staff (ASDS)	MVT	MVT=-10.21+0.47B+0.06ASDS	255
		EVT	EVT=-2.84+0.25B+0.4ASDS	525
		PVT	PVT=-14.69+0.69B+0.31ASDS	608

Due to the location of the Project Site with respect to Kingscliff TAFE and Kingscliff High School, the afternoon commuter peak period occurs around 3pm-4pm (refer Section 3.6) which is earlier than typical commuter peak periods. As such both the developments EVT and PVT generation were assessed against

the same period (i.e. commuter peak). This allowed for a conservative assessment and allowed for a sensitivity comparison by assessing different traffic splits.

The RMS *Guide to Traffic Generating Developments* does not provide daily traffic generation rates. In lieu of this the Institute of Transportation Engineers (ITE) daily rate of 11.81 trips/bed/day was used to estimate daily traffic generation. The daily traffic volumes are presented in Table 5.2.

Table 5.2: Tweed Valley Hospital Traffic Generation (Daily)

Land Use	Yield	Daily Trip Rate	Daily Trips
Hospital	430 beds	11.81 trips/bed/day	5,078

The daily traffic generation aligns with typical traffic profiles where peak hour traffic is approximately 10% of daily volumes.

5.2.2 Tweed Valley Hospital Traffic Splits

An "IN:OUT" directionality split of "70%:30%" was adopted for the EVT peak and vice versa in the EVT peak. As a sensitivity test an "IN:OUT" split of "50%:50%" was used for the PVT which considers a staff changeover.

5.2.3 Seasonal Factors

The Tweed Shire is recognised as having a strong tourism market and Kingscliff is a coastal tourism destination. The surveyed volumes are considered to be representative of typical peak conditions on the basis:

- of the Project Site location and surrounding developments (i.e. Kingscliff TAFE, Kingscliff High School and Cudgen Public School); and
- that the peak periods identified are commuter and school peaks (i.e. distinct morning and afternoon peaks). Holiday traffic associated with seasonal factors is typically spread through the day and is influenced by many factors (e.g. accommodation check-in and check-out times).

5.2.4 Alternate Transport Generation and Movements

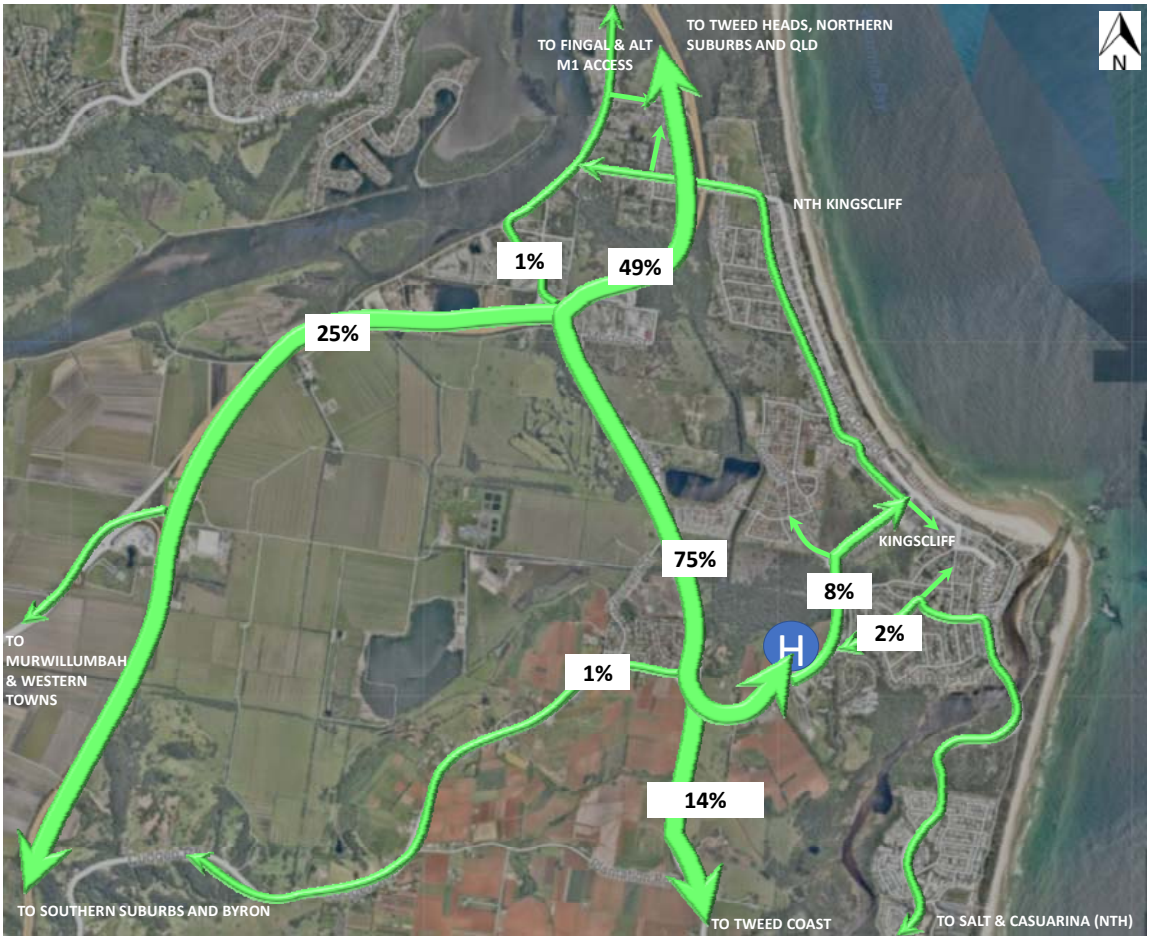
Based on the mode splits identified in Section 3.10 and the estimated daily traffic generation the Tweed Valley Hospital is estimated to generate in the order of 150-300 daily pedestrian trips and in the order of 50 cyclist trips. Pedestrians and cyclists are expected to predominantly originate to the east (Kingscliff) and use the existing pedestrian pathway network. A small proportion may originate from the suburban area west of Tweed Coast Road.

Considering the journey to work mode share and potential visitor / patient trips the Tweed Valley Hospital is expected to generate in the order of 150 public transport trips (bus), with potential for additional trip generation with future service enhancements.

5.2.5 Traffic Distribution and Assignment

Traffic distribution on the surrounding network was based on distributions from the Tweed Strategic Transport Model (with the Tweed Valley Hospital on the Project Site) and using a first principals assessment which considered population centres and densities across the Tweed Shire. Distribution via the various site accesses was based on proportion of car parking accessed via a particular access, expected route choice based on arrival or departure direction and access type (e.g. left-in ingress only accesses can only be used for access in certain scenarios). Figure 5.1 shows the major traffic routes and distributions.

The Project traffic assignment and MVT, EVT and PVT traffic volumes for Year 2023 and 2033 is presented in Appendix C.



Source: Nearmap

Figure 5.1: Traffic Routes and Distributions

5.3 DESIGN TRAFFIC MODELLING

5.3.1 Design Traffic Modelling Process

The design traffic assessment was undertaken for the same intersections assessed under the background traffic scenarios. A new intersection is proposed for the primary access to Cudgen Road which is only modelled in the design scenarios. Another point of access is proposed via an additional leg to the existing Cudgen Road / Turnock Street roundabout.

Design traffic consists of forecast background traffic and Tweed Valley Hospital traffic for Year 2023 (year of opening) and Year 2033 (10-year design horizon) for the MVT, EVT and PVT peak scenarios.

5.3.2 Pacific Highway / Tweed Coast Road Interchange

Analysis of the Pacific Highway / Tweed Coast Road interchange was undertaken using SIDRA Intersection 7 for the Year 2023 (year of opening) and Year 2033 (10-year design horizon) design traffic volumes. The existing geometric layout for the intersection was used consistent with the background traffic modelling.

The results of the analysis for design traffic volumes are summarised in Tables 5.3-5.5. A copy of the SIDRA movement summaries is provided in Appendix D.

Table 5.3: Pacific Highway / Tweed Coast Road Interchange SIDRA Results Summary (Year 2023 MVT and EVT Design Traffic Volumes)

Approach	Year 2023 AM Peak - MVT					Year 2023 PM Peak - EVT			
	OD Movement	DOS	Ave Delay (s)	LOS	95%ile Queue (m)	DOS	Ave Delay (s)	LOS	95%ile Queue (m)
South: Tweed Coast Road (S)	L2	0.103	3.1	LOS A	4.8	0.163	3.2	LOS A	8.1
	T1	0.103	3.3	LOS A	4.8	0.163	3.6	LOS A	8.1
	R2	0.559	10.6	LOS B	38.5	0.547	10.5	LOS B	37.4
	Approach	0.559	9.6	LOS A	38.5	0.547	9.1	LOS A	37.4
East: Pacific Highway (SB Off-ramp, NB On-ramp)	L2	0.328	2.2	LOS A	18.2	0.377	2.2	LOS A	20.8
	T1	0.328	3.2	LOS A	18.2	0.377	3	LOS A	20.8
	R2	0.328	10	LOS B	18.2	0.377	9.9	LOS A	20.8
	Approach	0.328	2.9	LOS A	18.2	0.377	2.9	LOS A	20.8
North: Chinderah Road (N)	L2	0.087	8.7	LOS A	5.8	0.076	7.7	LOS A	4.8
	T1	0.187	8.2	LOS A	15.9	0.149	7.1	LOS A	11.6
	R2	0.187	13.4	LOS B	15.9	0.149	11.8	LOS B	11.6
	Approach	0.187	10.1	LOS B	15.9	0.149	8.6	LOS A	11.6
West: Pacific Highway (NB Off-ramp, SB On-ramp)	L2	0.111	6.9	LOS A	4.9	0.102	6.6	LOS A	4.3
	T1	0.207	6	LOS A	10.8	0.172	5.8	LOS A	8.7
	R2	0.207	13	LOS B	10.8	0.172	12.8	LOS B	8.7
	Approach	0.207	11.3	LOS B	10.8	0.172	10.9	LOS B	8.7
All Vehicles		0.559	6.9	LOS A	38.5	0.547	6.3	LOS A	37.4

Table 5.4: Pacific Highway / Tweed Coast Road Interchange SIDRA Results Summary (Year 2033 MVT and EVT Design Traffic Volumes)

Approach	Year 2033 AM Peak - MVT					Year 2033 PM Peak - EVT			
	OD Movement	DOS	Ave Delay (s)	LOS	95%ile Queue (m)	DOS	Ave Delay (s)	LOS	95%ile Queue (m)
South: Tweed Coast Road (S)	L2	0.163	3.2	LOS A	8.1	0.173	3.3	LOS A	8.8
	T1	0.163	3.6	LOS A	8.1	0.173	3.7	LOS A	8.8
	R2	0.547	10.5	LOS B	37.4	0.594	10.7	LOS B	42.6
	Approach	0.547	9.1	LOS A	37.4	0.594	9.3	LOS A	42.6
East: Pacific Highway (SB Off-ramp, NB On-ramp)	L2	0.377	2.2	LOS A	20.8	0.409	2.2	LOS A	23.3
	T1	0.377	3	LOS A	20.8	0.409	3.1	LOS A	23.3
	R2	0.377	9.9	LOS A	20.8	0.409	10	LOS A	23.3
	Approach	0.377	2.9	LOS A	20.8	0.409	3	LOS A	23.3
North: Chinderah Road (N)	L2	0.076	7.7	LOS A	4.8	0.094	9.4	LOS A	6.2
	T1	0.149	7.1	LOS A	11.6	0.186	8.8	LOS A	15.2
	R2	0.149	11.8	LOS B	11.6	0.186	13.6	LOS B	15.2
	Approach	0.149	8.6	LOS A	11.6	0.186	10.4	LOS B	15.2
West: Pacific Highway (NB Off-ramp, SB On-ramp)	L2	0.102	6.6	LOS A	4.3	0.122	7.2	LOS A	5.3
	T1	0.172	5.8	LOS A	8.7	0.198	6.3	LOS A	10.4
	R2	0.172	12.8	LOS B	8.7	0.198	13.3	LOS B	10.4
	Approach	0.172	10.9	LOS B	8.7	0.198	11.4	LOS B	10.4
All Vehicles		0.547	6.3	LOS A	37.4	0.594	6.5	LOS A	42.6

Table 5.5: Pacific Highway / Tweed Coast Road Interchange SIDRA Results Summary (Year 2023 and 2033 PVT Design Traffic Volumes)

Approach	Year 2023 PM Peak - PVT					Year 2033 PM Peak - PVT			
	OD Movement	DOS	Ave Delay (s)	LOS	95%ile Queue (m)	DOS	Ave Delay (s)	LOS	95%ile Queue (m)
South: Tweed Coast Road (S)	L2	0.151	3.1	LOS A	7.5	0.161	3.3	LOS A	8.2
	T1	0.151	3.5	LOS A	7.5	0.161	3.7	LOS A	8.2
	R2	0.531	10.5	LOS B	36.1	0.577	10.7	LOS B	41.2
	Approach	0.531	9.1	LOS A	36.1	0.577	9.3	LOS A	41.2
East: Pacific Highway (SB Off-ramp, NB On-ramp)	L2	0.401	2.3	LOS A	23	0.434	2.3	LOS A	25.8
	T1	0.401	3.2	LOS A	23	0.434	3.3	LOS A	25.8
	R2	0.401	10	LOS B	23	0.434	10.2	LOS B	25.8
	Approach	0.401	3	LOS A	23	0.434	3	LOS A	25.8
North: Chinderah Road (N)	L2	0.074	7.7	LOS A	4.7	0.092	9.4	LOS A	6.1
	T1	0.152	7.2	LOS A	11.8	0.188	8.9	LOS A	15.4
	R2	0.152	11.9	LOS B	11.8	0.188	13.7	LOS B	15.4
	Approach	0.152	8.7	LOS A	11.8	0.188	10.4	LOS B	15.4
West: Pacific Highway (NB Off-ramp, SB On-ramp)	L2	0.097	6.2	LOS A	4.1	0.115	6.8	LOS A	5
	T1	0.209	5.6	LOS A	10.6	0.237	6.1	LOS A	12.5
	R2	0.209	12.7	LOS B	10.6	0.237	13.2	LOS B	12.5
	Approach	0.209	11	LOS B	10.6	0.237	11.4	LOS B	12.5
All Vehicles		0.531	6.3	LOS A	36.1	0.577	6.5	LOS A	41.2

As demonstrated in Tables 5.3-5.5, the intersection is shown to operate within acceptable performance limits in terms of degree of saturation, average delay and 95th percentile queue for a roundabout intersection in the Year 2023 and 2033 design traffic scenarios.

5.3.3 Tweed Coast Road / Cudgen Road Signalised Intersection

The background traffic modelling (refer Section 3.7) identified that the Tweed Coast Road intersection operates outside acceptable performance limits under background traffic volumes in Year 2023. A number of capacity upgrades were identified to bring the operations within performance thresholds. These upgrades referred to as “Upgrade 1” are outlined in Section 3.7.4.

For design traffic modelling, design volumes were first assessed against the Upgrade 1 layout to determine if these are sufficient to cater for design traffic.

The results of the analysis for design traffic volumes with Upgrade 1 are summarised in Tables 5.6 and 5.7. A copy of the SIDRA movement summaries is provided in Appendix D.

Table 5.6: Tweed Coast Road / Cudgen Road Intersection SIDRA Results Summary (Year 2023 MVT and EVT Design Traffic Volumes) – Upgrade 1

Approach	Year 2023 AM Peak					Year 2023 PM Peak			
	OD Movement	DOS	Ave Delay (s)	LOS	95%ile Queue (m)	DOS	Ave Delay (s)	LOS	95%ile Queue (m)
South: Tweed Coast Road (S)	L1	0.459	36.5	LOS C	62.2	0.329	32.3	LOS C	31.5
	T1	0.835	39	LOS C	142.8	0.598	29.3	LOS C	62.1
	R3	0.765	29.4	LOS C	76.4	0.678	30.3	LOS C	34
	Approach	0.835	35.5	LOS C	142.8	0.678	29.7	LOS C	62.1
SouthEast: Cudgen Road (SE)	L3	0.101	8	LOS A	6.9	0.228	11	LOS A	24.4
	T1	0.545	36.8	LOS C	64.8	0.553	25.7	LOS B	73.8
	R1	0.917	56.3	LOS D	146	0.93	46.9	LOS D	190.6
	Approach	0.917	43.8	LOS D	146	0.93	36.4	LOS C	190.6
North: Tweed Coast Road (N)	L1	0.741	16.6	LOS B	115.9	0.545	11.2	LOS A	53.4
	T1	0.452	37.8	LOS C	50.1	0.94	44.8	LOS D	146.6
	R3	0.071	21.5	LOS B	5	0.19	25.8	LOS B	11
	Approach	0.741	22.4	LOS B	115.9	0.94	29.1	LOS C	146.6
NorthWest: Cudgen Road (NW)	L3	0.068	17.3	LOS B	8.3	0.061	16.5	LOS B	6
	T1	0.829	53.4	LOS D	37.2	0.581	41.6	LOS C	24.4
	R1	0.829	59.6	LOS E	37.2	0.581	46.5	LOS D	24.4
	Approach	0.829	45.5	LOS D	37.2	0.581	36.7	LOS C	24.4
All Vehicles		0.917	34	LOS C	146	0.94	32.2	LOS C	190.6

Table 5.7: Tweed Coast Road / Cudgen Road Intersection SIDRA Results Summary (Year 2023 PVT Design Traffic Volumes) – Upgrade 1

Approach	Year 2023 PM Peak - PVT				
	OD Movement	DOS	Ave Delay (s)	LOS	95%ile Queue (m)
South: Tweed Coast Road (S)	L1	0.329	32.3	LOS C	31.5
	T1	0.598	29.3	LOS C	62.1
	R3	0.714	30.2	LOS C	38.9
	Approach	0.714	29.7	LOS C	62.1
SouthEast: Cudgen Road (SE)	L3	0.22	11.3	LOS A	24.2
	T1	0.541	26.4	LOS B	69.8
	R1	0.91	44.3	LOS D	169.3
	Approach	0.91	34.5	LOS C	169.3
North: Tweed Coast Road (N)	L1	0.674	12.3	LOS A	74.3
	T1	0.948	46.2	LOS D	149.7
	R3	0.177	24.7	LOS B	10.7
	Approach	0.948	28.7	LOS C	149.7
NorthWest: Cudgen Road (NW)	L3	0.058	16	LOS B	5.8
	T1	0.589	41.6	LOS C	24.8
	R1	0.589	46.6	LOS D	24.8
	Approach	0.589	36.7	LOS C	24.8
All Vehicles		0.948	31.3	LOS C	169.3

As demonstrated in Tables 5.6 and 5.7, the intersection is shown to exceed acceptable performance limits in terms of overall DOS and a number of lanes are operating LOS D or E across all design traffic scenarios in Year 2023.

Options testing was undertaken to assess further upgrades (i.e. relative to Upgrade 1 and maintaining the capacity upgrades in Upgrade 1) required for the intersection to operate within acceptable performance limits. The upgrades named “Upgrade 2” are as follows:

- Extension of the northbound departure lane to approximately 200m; and
- Extension of the southbound departure lane to approximately 150m.

Figure 5.2 shows the upgraded SIDRA layout.

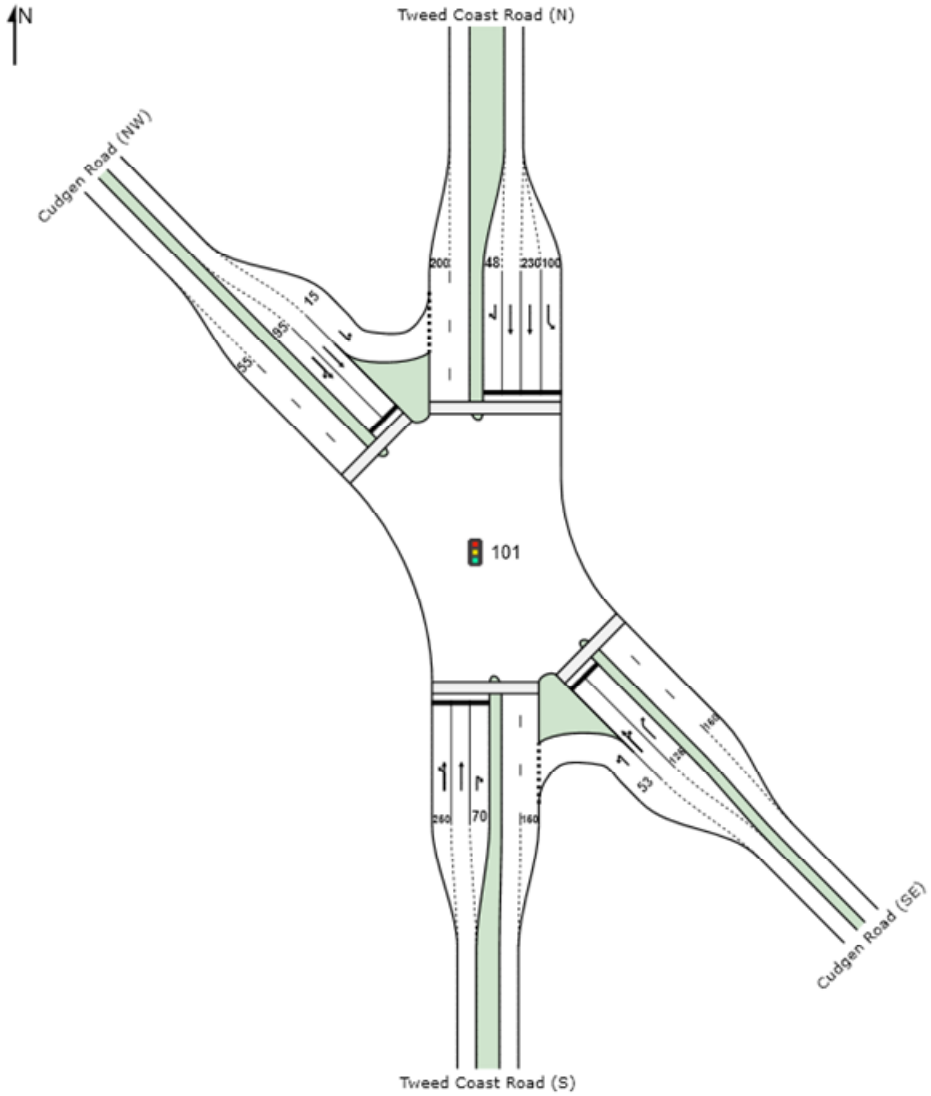


Figure 5.2: Tweed Coast Road / Cudgen Road SIDRA Intersection Layout – Upgrade 2

The results of the analysis for Year 2023 background traffic volumes with Upgrade 2 are summarised in Tables 5.8 and 5.9.

Table 5.8: Tweed Coast Road / Cudgen Road Intersection SIDRA Results Summary (Year 2023 MVT and EVT Design Traffic Volumes) – Upgrade 2

Approach		Year 2023 AM Peak - MVT				Year 2023 PM Peak - EVT			
	OD Movement	DOS	Ave Delay (s)	LOS	95%ile Queue (m)	DOS	Ave Delay (s)	LOS	95%ile Queue (m)
South: Tweed Coast Road (S)	L1	0.511	31.7	LOS C	42	0.511	31.7	LOS C	42
	T1	0.511	27.2	LOS B	42.3	0.511	27.2	LOS B	42.3
	R3	0.599	26.5	LOS B	29.2	0.599	26.5	LOS B	29.2
	Approach	0.599	27.1	LOS B	42.3	0.599	27.1	LOS B	42.3
SouthEast: Cudgen Road (SE)	L3	0.227	10.5	LOS A	21	0.227	10.5	LOS A	21
	T1	0.876	37	LOS C	118	0.876	37	LOS C	118
	R1	0.876	41.2	LOS C	120.8	0.876	41.2	LOS C	120.8
	Approach	0.876	33.6	LOS C	120.8	0.876	33.6	LOS C	120.8
North: Tweed Coast Road (N)	L1	0.621	12.3	LOS A	54	0.621	12.3	LOS A	54
	T1	0.856	33.3	LOS C	97.2	0.856	33.3	LOS C	97.2
	R3	0.17	23	LOS B	9.6	0.17	23	LOS B	9.6
	Approach	0.856	23.5	LOS B	97.2	0.856	23.5	LOS B	97.2
NorthWest: Cudgen Road (NW)	L3	0.053	12.9	LOS A	4.4	0.053	12.9	LOS A	4.4
	T1	0.508	35.4	LOS C	21	0.508	35.4	LOS C	21
	R1	0.508	40.2	LOS C	21	0.508	40.2	LOS C	21
	Approach	0.508	31.1	LOS C	21	0.508	31.1	LOS C	21
All Vehicles		0.876	28.2	LOS B	120.8	0.876	28.2	LOS B	120.8

Table 5.9: Tweed Coast Road / Cudgen Road Intersection SIDRA Results Summary (Year 2023 PVT Design Traffic Volumes) – Upgrade 2

Approach		Year 2023 PM Peak - PVT			
	OD Movement	DOS	Ave Delay (s)	LOS	95%ile Queue (m)
South: Tweed Coast Road (S)	L1	0.443	33.6	LOS C	47.8
	T1	0.443	29.1	LOS C	47.8
	R3	0.737	31.7	LOS C	41.2
	Approach	0.737	30	LOS C	47.8
SouthEast: Cudgen Road (SE)	L3	0.212	10.4	LOS A	22.2
	T1	0.732	30.6	LOS C	104.2
	R1	0.732	34.9	LOS C	112
	Approach	0.732	28.6	LOS C	112
North: Tweed Coast Road (N)	L1	0.639	11.8	LOS A	73.8
	T1	0.837	37.5	LOS C	109.4
	R3	0.161	24.8	LOS B	11.1
	Approach	0.837	24.4	LOS B	109.4
NorthWest: Cudgen Road (NW)	L3	0.054	12.9	LOS A	4.9
	T1	0.626	44.7	LOS D	26.6
	R1	0.626	49.8	LOS D	26.6
	Approach	0.626	38.4	LOS C	26.6
All Vehicles		0.837	27.6	LOS B	112

As demonstrated in Tables and 5.8 and 5.9, with the Upgrade 2, the intersection is shown to operate within acceptable performance limits in terms of degree of saturation, average delay and 95th percentile queue for a signalised intersection in the Year 2023 design traffic scenarios. During the PM Peak with PVT volumes, some lanes are noted to operate at LOS D based on delay, however overall the intersection is considered to operate within acceptable limits.

There are a number of factors that require consideration for the 10-year design horizon (and beyond) on this section of Tweed Coast Road (including upgrade of Tweed Coast Road to a four-lane cross section and future provision of new east-west links from Tweed Coast Road to Kingscliff. Due to these considerations, it is not appropriate to provide significant additional turning capacity at the intersection. As such, the intersection has been assessed with the Upgrade 3 layout (i.e. four lane cross-section and minor turning capacity improvements).

The results of the analysis for design traffic volumes with the Upgrade 3 layout are summarised in Tables 5.10 and 5.11.

Table 5.10: Tweed Coast Road / Cudgen Road Intersection SIDRA Results Summary (Year 2033 MVT and EVT Design Traffic Volumes) – Upgrade 3

Approach		Year 2033 AM Peak - MVT				Year 2033 PM Peak - EVT			
	OD Movement	DOS	Ave Delay (s)	LOS	95%ile Queue (m)	DOS	Ave Delay (s)	LOS	95%ile Queue (m)
South: Tweed Coast Road (S)	L1	0.048	23.7	LOS B	7.5	0.022	23.5	LOS B	2.8
	T1	0.56	32.2	LOS C	102.4	0.495	32.5	LOS C	53.4
	R3	0.929	69.5	LOS E	184.5	0.905	60.7	LOS E	68.7
	Approach	0.929	45.5	LOS D	184.5	0.905	41	LOS C	68.7
SouthEast: Cudgen Road (SE)	L3	0.117	8.1	LOS A	9	0.254	10.9	LOS A	28.9
	T1	0.7	37.6	LOS C	106.9	0.904	45.1	LOS D	144.5
	R1	0.7	42.1	LOS C	116.6	0.904	49.1	LOS D	184.6
	Approach	0.7	34.8	LOS C	116.6	0.904	39.6	LOS C	184.6
North: Tweed Coast Road (N)	L1	0.92	43.8	LOS D	227.6	0.647	12.9	LOS A	78.9
	T1	0.423	42.8	LOS D	46.8	0.863	43.7	LOS D	117.4
	R3	0.193	52.6	LOS D	13	0.342	44.7	LOS D	20.1
	Approach	0.92	43.8	LOS D	227.6	0.863	29.7	LOS C	117.4
NorthWest: Cudgen Road (NW)	L3	0.087	15.1	LOS B	9.4	0.067	15.5	LOS B	7
	T1	0.912	66.6	LOS E	50.2	0.66	45.7	LOS D	28.1
	R1	0.912	70.8	LOS F	50.2	0.66	50.2	LOS D	28.2
	Approach	0.912	54.8	LOS D	50.2	0.66	39.5	LOS C	28.2
All Vehicles		0.929	43	LOS D	227.6	0.905	35.8	LOS C	184.6

Table 5.11: Tweed Coast Road / Cudgen Road Intersection SIDRA Results Summary (Year 2033 PVT Design Traffic Volumes) – Upgrade 3

Approach		Year 2033 AM Peak - MVT			
	OD Movement	DOS	Ave Delay (s)	LOS	95%ile Queue (m)
South: Tweed Coast Road (S)	L1	0.021	23.1	LOS B	2.8
	T1	0.429	31.4	LOS C	53.8
	R3	0.905	62.7	LOS E	80.8
	Approach	0.905	41.6	LOS C	80.8
SouthEast: Cudgen Road (SE)	L3	0.245	11	LOS A	29
	T1	0.938	56.8	LOS E	157.9
	R1	0.938	60.7	LOS E	199.6
	Approach	0.938	48.2	LOS D	199.6
North: Tweed Coast Road (N)	L1	0.759	14.2	LOS A	111
	T1	0.75	36.3	LOS C	108.3
	R3	0.306	45.2	LOS D	20.7
	Approach	0.759	25.8	LOS B	111
NorthWest: Cudgen Road (NW)	L3	0.064	15	LOS B	7
	T1	0.71	49.3	LOS D	30
	R1	0.71	53.8	LOS D	30.7
	Approach	0.71	42.2	LOS C	30.7
All Vehicles		0.938	37	LOS C	199.6

As demonstrated in Tables 5.10 and 5.11, with Upgrade 3 the intersection is shown to operate at or just outside the accepted performance thresholds for a signalised intersection. A number of lanes are shown to operate at LOS D or E. Overall delay and level of service is within acceptable performance limits.

As discussed as part of the background traffic modelling for this intersection (refer Section 3.7.4) the above results do not consider the inclusion of the additional future planned east-west links between Tweed Coast Road and Kingscliff which will reduce turning volumes on Cudgen Road and improve intersection operations.

The intersection modelling for the Tweed Coast Road / Cudgen Road intersection indicates that a number of upgrades and improvements are required for the intersection to operate within acceptable performance limits for background traffic volumes in the year of opening (Year 2023) including:

- Addition of a 100m southbound left-turn lane on Tweed Coast Road;
- Phase sequence change to allow the southbound left-turn to overlap with the westbound right-turn (i.e. possible with the provision of dedicated southbound left-turn lane);
- Lane discipline change for the two approach lanes on the south-eastern approach:
  - Change of the left through lane to a through and right lane;
  - Change of the right through and right lane to a right only lane;
- Extension of the south-eastern short departure lane from approximately 75m to approximately 150m; and
- Extension of the northbound departure lane from approximately 85m to approximately 100m; and
- Conversion of the north-western leg departure to a single lane (no physical changes. i.e. through provision of chevron line marking). With the lane discipline changes on the south-eastern approach, there is only one lane travelling through to the north-western departure lane.

Further upgrades are required to cater for the additional Project traffic in Year 2023, including:

- Extension of the northbound departure lane to approximately 200m; and
- Extension of the southbound departure lane to approximately 150m.

Any works associated with the Tweed Coast Road / Cudgen Road intersection should be commensurate with Council's ultimate plans for Tweed Coast Road. As such it is understood that Health Infrastructure are in discussions with Council on the required intersection form.

5.3.4 Cudgen Road / Site Access

The primary site access has been designed as a signalised intersection to cater for the design traffic volumes (i.e. background volumes and Tweed Valley Hospital volumes) and to provide suitable pedestrian amenity (i.e. signalised pedestrian crossings across the access and across Cudgen Road). In designing the access, intersection performance limits were considered (in terms of degree of saturation, LOS, delays and queues). A key consideration was ensuring queues do not impact adjacent intersections or other site accesses. The access intersection comprises of:

- a T-intersection with the site access and Cudgen Road;
- two through lanes in each direction on Cudgen Road (with the inclusion of short kerbside approach and departure lanes);
- a 150m north-eastbound stand-up approach lane on Cudgen Road;
- a 100m north-eastbound stand-up departure lane on Cudgen Road;
- a 150m south-westbound stand-up departure lane on Cudgen Road;
- a short-left slip on the south-western approach (i.e. for the left turn into the site);
- dual right-turns and a left slip lane on the north-western approach (i.e. site access approach);
- a single north-westbound departure lane (i.e. into the site); and
- pedestrian crossings on the north-western and north-eastern legs. This arrangement allows for efficient signal phasing by allowing the south-eastbound right-turns to run complimentary with the pedestrian crossing on the north-eastern approach.

In addition to the access intersection capacity requirements, the RMS Traffic Signal Design: Section 2 – Warrants was considered when assessing the suitability of a signalised access intersection, noting that the warrants are emphasised as being a guide only. The signalised access is further deemed appropriate on the basis of:

- Traffic Demand – major road flows exceeding 600 vehicles / hour in each direction during the peak hours and the minor road flows exceeding 200 vehicles in an hour (year of opening). Based on growth projections, through volumes on Cudgen Road are also continued to grow beyond year of opening; and

- Pedestrian Safety – major road flows exceeding 600 vehicles / hour in each direction during the peak hours. While specific pedestrian volumes associated with the hospital are not known, the proposed hospital will generate a significant increase in pedestrian demand including the demand for crossing Cudgen Road. The demand for crossing is generated by the westbound bus stop (noting the proposed new bus stop will located in close proximity to the intersection, the eastbound bus stop (for pedestrians crossing from the opposite residential developments and Kingscliff TAFE) and by the residential areas to the east of the Project Site. Consideration has also been given to the expected increase in "slow walkers" associated with a hospital including the elderly and people with disabilities who require larger gaps in traffic to safely cross.

The layout of the intersection used in SIDRA is shown in Figure 5.3.

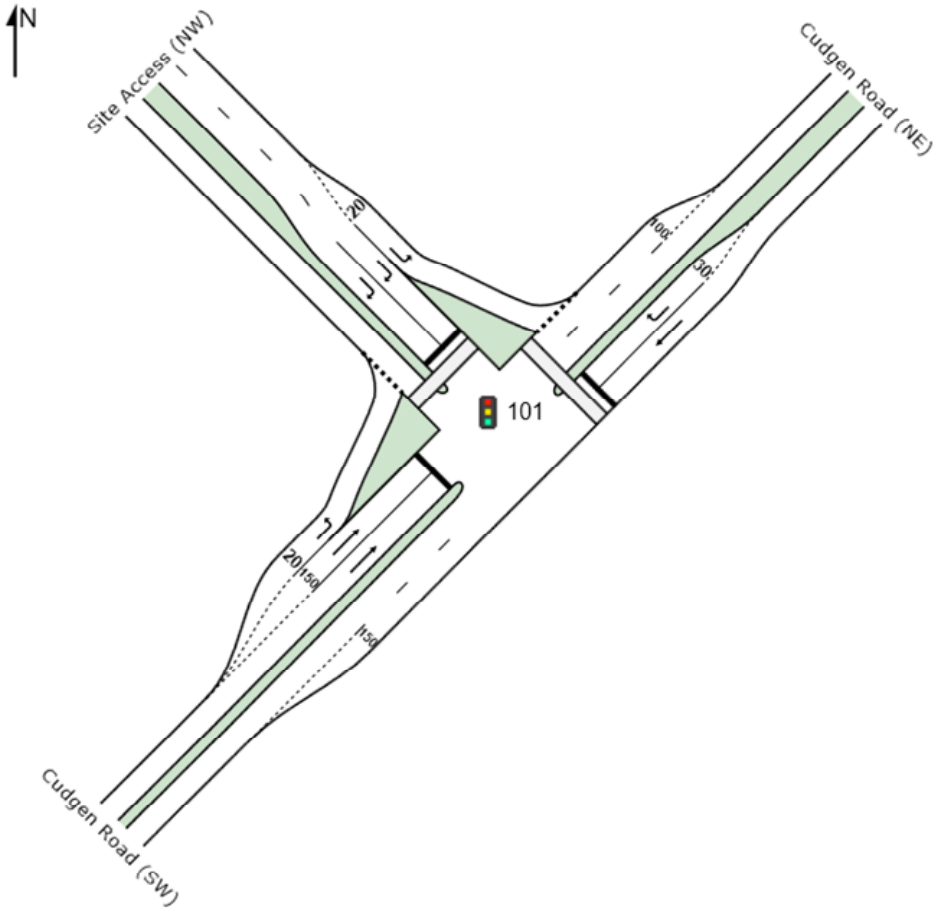


Figure 5.3: Cudgen Road / Site Access SIDRA Intersection Layout

The intersection was modelled with a lagging south-westbound right-turn phase sequence. The south-westbound right-turn filters in A Phase. The intersection was modelled with an 80 second cycle time. The phase sequence is presented in Figure 5.4.

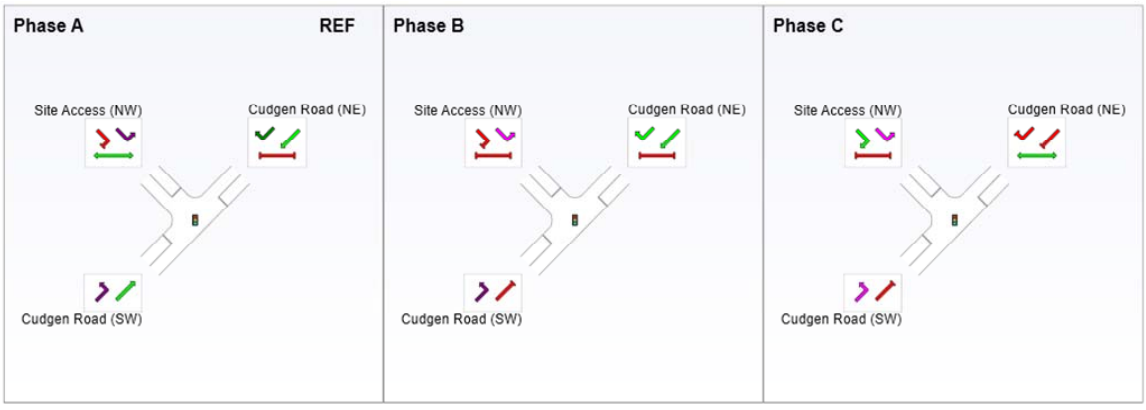


Figure 5.4: Cudgen Road / Site Access Phase Sequence.

The results of the analysis for design traffic volumes for the Cudgen Road / Site Access Intersection are summarised in Tables 5.12 - 5.14. A copy of the SIDRA movement summaries is provided in Appendix D.

Table 5.12: Cudgen Road / Site Access SIDRA Results Summary (Year 2023 MVT and EVT Design Traffic Volumes)

Approach	Year 2023 AM Peak - MVT					Year 2023 PM Peak - EVT			
	OD Movement	DOS	Ave Delay (s)	LOS	95%ile Queue (m)	DOS	Ave Delay (s)	LOS	95%ile Queue (m)
NorthEast: Cudgen Road (NE)	T1	0.524	5.1	LOS A	84.6	0.616	5.7	LOS A	113.3
	R2	0.032	15.4	LOS B	1.5	0.02	13.7	LOS A	1.1
	Approach	0.524	5.3	LOS A	84.6	0.616	5.8	LOS A	113.3
NorthWest: Site Access (NW)	L2	0.007	2.9	LOS A	0.4	0.028	2.2	LOS A	1.4
	R2	0.139	34.7	LOS C	8.2	0.576	37.3	LOS C	36.6
	Approach	0.139	31.6	LOS C	8.2	0.576	34.2	LOS C	36.6
SouthWest: Cudgen Road (SW)	L2	0.024	7	LOS A	0.7	0.021	7	LOS A	0.6
	T1	0.53	10.7	LOS A	100.2	0.438	9.9	LOS A	76.8
	Approach	0.53	10.6	LOS A	100.2	0.438	9.7	LOS A	76.8
All Vehicles		0.53	9.2	LOS A	100.2	0.616	11.4	LOS A	113.3

Table 5.13: Cudgen Road / Site Access SIDRA Results Summary (Year 2033 MVT and EVT Design Traffic Volumes)

Approach	Year 2033 AM Peak - MVT					Year 2033 PM Peak - EVT			
	OD Movement	DOS	Ave Delay (s)	LOS	95%ile Queue (m)	DOS	Ave Delay (s)	LOS	95%ile Queue (m)
NorthEast: Cudgen Road (NE)	T1	0.621	5.7	LOS A	112	0.718	6.6	LOS A	151.2
	R2	0.039	21.6	LOS B	2	0.023	15.3	LOS B	1.2
	Approach	0.621	5.9	LOS A	112	0.718	6.7	LOS A	151.2
NorthWest: Site Access (NW)	L2	0.008	6.4	LOS A	0.6	0.03	3	LOS A	1.7
	R2	0.119	34.6	LOS C	7	0.576	37.3	LOS C	36.6
	Approach	0.119	31.9	LOS C	7	0.576	34.3	LOS C	36.6
SouthWest: Cudgen Road (SW)	L2	0.023	7	LOS A	0.7	0.021	7	LOS A	0.6
	T1	0.723	12.1	LOS A	162.9	0.516	10.4	LOS A	96.4
	Approach	0.723	12	LOS A	162.9	0.516	10.3	LOS A	96.4
All Vehicles		0.723	10.1	LOS A	162.9	0.718	11.6	LOS A	151.2

Table 5.14: Cudgen Road / Site Access SIDRA Results Summary (Year 2023 and 2033 PVT Design Traffic Volumes)

Approach	Year 2023 PM Peak - PVT					Year 2033 PM Peak - PVT			
	OD Movement	DOS	Ave Delay (s)	LOS	95%ile Queue (m)	DOS	Ave Delay (s)	LOS	95%ile Queue (m)
NorthEast: Cudgen Road (NE)	T1	0.618	5.6	LOS A	108.8	0.723	6.4	LOS A	145.4
	R2	0.043	14.4	LOS A	2.4	0.05	16.1	LOS B	2.6
	Approach	0.618	5.8	LOS A	108.8	0.723	6.6	LOS A	145.4
NorthWest: Site Access (NW)	L2	0.024	2.5	LOS A	1.2	0.026	3.3	LOS A	1.4
	R2	0.474	36.7	LOS C	29.6	0.474	36.7	LOS C	29.6
	Approach	0.474	33.7	LOS C	29.6	0.474	33.7	LOS C	29.6
SouthWest: Cudgen Road (SW)	L2	0.041	7	LOS A	1.2	0.04	7.1	LOS A	1.4
	T1	0.474	10.1	LOS A	85.5	0.554	10.7	LOS A	106.9
	Approach	0.474	9.9	LOS A	85.5	0.554	10.4	LOS A	106.9
All Vehicles		0.618	10.8	LOS A	108.8	0.723	11.1	LOS A	145.4

As demonstrated in Tables 5.12-5.14, the intersection is shown to operate within acceptable performance limits in terms of degree of saturation, average delay and 95th percentile queue for a signalised intersection in the Year 2023 and 2033 design traffic scenarios. The 95th percentile queues on Cudgen Road extend approximately 150m. Queues on Cudgen Road do not impact adjacent intersections (i.e. the TAFE access intersection to the north east and the Tweed Coast Road / Cudgen Road intersection to the south-west).

As previously noted in the background traffic analysis, once the future planned east-west links between Kingscliff and Tweed Coast Road are provided, background through traffic volumes on Cudgen Road are expected to reduce to levels currently represented in 2018 count data, which will improve the access intersection performance.

5.3.5 Cudgen Road / Kingscliff TAFE Access

Analysis of the Cudgen Road / Kingscliff TAFE access intersection was undertaken using SIDRA Intersection 7 for the Year 2023 (year of opening) and Year 2033 (10-year design horizon) design traffic volumes. The existing geometric layout for the intersection was used consistent with the background traffic modelling.

The results of the analysis for design traffic volumes are summarised in Table 5.15-5.17. A copy of the SIDRA movement summaries is provided in Appendix D.

Table 5.15: Cudgen Road / Kingscliff TAFE SIDRA Results Summary (Year 2023 MVT and EVT Design Traffic Volumes)

Approach	Year 2023 AM Peak - MVT					Year 2023 PM Peak - EVT			
	OD Movement	DOS	Ave Delay (s)	LOS	95%ile Queue (m)	DOS	Ave Delay (s)	LOS	95%ile Queue (m)
South: TAFE Access (S)	L2	0.054	9.5	LOS A	1.4	0.206	11.5	LOS A	5.3
	T1	0.022	19.4	LOS B	0.5	0.119	18	LOS B	3.1
	Approach	0.054	10.8	LOS A	1.4	0.206	13	LOS A	5.3
East: Cudgen Road €	L2	0.034	5.6	LOS A	0	0.006	5.6	LOS A	0
	T1	0.335	0	LOS A	0	0.392	0	LOS A	0
	Approach	0.335	0.5	NA	0	0.392	0.1	NA	0
West: Cudgen Road (W)	R2	0.369	12	LOS A	12.8	0.044	10.9	LOS A	1.1
	T1	0.403	0	LOS A	0	0.373	0	LOS A	0
	Approach	0.403	12	NA	12.8	0.373	10.9	NA	1.1
South: Median Storage Area	R2	0.009	5	LOS A	0.2	0.044	10.9	LOS A	1.1
	Approach	0.009	5	LOS A	0.2	0.373	0	LOS A	0
All Vehicles		0.403	3.6	NA	12.8	0.392	2.4	NA	5.3

Table 5.16: Cudgen Road / Kingscliff TAFE SIDRA Results Summary (Year 2033 MVT and EVT Design Traffic Volumes)

Approach	Year 2033 AM Peak - MVT					Year 2033 PM Peak - EVT			
	OD Movement	DOS	Ave Delay (s)	LOS	95%ile Queue (m)	DOS	Ave Delay (s)	LOS	95%ile Queue (m)
South: TAFE Access (S)	L2	0.078	11	LOS A	1.9	0.309	14.8	LOS B	8.6
	T1	0.037	26.6	LOS B	0.9	0.192	23.9	LOS B	4.9
	Approach	0.078	13	LOS A	1.9	0.309	16.9	LOS B	8.6
East: Cudgen Road €	L2	0.04	5.6	LOS A	0	0.007	5.6	LOS A	0
	T1	0.394	0	LOS A	0	0.455	0	LOS A	0
	Approach	0.394	0.5	NA	0	0.455	0.1	NA	0
West: Cudgen Road (W)	R2	0.543	16.2	LOS B	21.4	0.065	13	LOS A	1.6
	T1	0.479	0	LOS A	0	0.44	0	LOS A	0
	Approach	0.543	16.2	NA	21.4	0.44	13	NA	1.6
South: Median Storage Area	R2	0.543	16.2	LOS B	21.4	0.069	5.7	LOS A	1.4
	Approach	0.543	16.2	LOS B	21.4	0.069	5.7	LOS A	1.4
All Vehicles		0.543	4.7	NA	21.4	0.455	3.1	NA	8.6

Table 5.17: Cudgen Road / Kingscliff TAFE SIDRA Results Summary (Year 2023 and 2033 PVT Design Traffic Volumes)

Approach	Year 2023 PM Peak - PVT					Year 2033 PM Peak - PVT			
	OD Movement	DOS	Ave Delay (s)	LOS	95%ile Queue (m)	DOS	Ave Delay (s)	LOS	95%ile Queue (m)
South: TAFE Access (S)	L2	0.203	11.3	LOS A	5.2	0.302	14.5	LOS A	8.4
	T1	0.116	17.6	LOS B	3	0.187	23.3	LOS B	4.8
	Approach	0.203	12.8	LOS A	5.2	0.302	16.5	LOS B	8.4
East: Cudgen Road €	L2	0.006	5.6	LOS A	0	0.007	5.6	LOS A	0
	T1	0.387	0	LOS A	0	0.45	0	LOS A	0
	Approach	0.387	0.1	NA	0	0.45	0.1	NA	0
West: Cudgen Road (W)	R2	0.043	10.7	LOS A	1.1	0.064	12.8	LOS A	1.5
	T1	0.371	0	LOS A	0	0.439	0	LOS A	0
	Approach	0.371	10.7	NA	1.1	0.439	12.8	NA	1.5
South: Median Storage Area	R2	0.047	4.5	LOS A	1	0.068	5.7	LOS A	1.4
	Approach	0.047	4.5	LOS A	1	0.068	5.7	LOS A	1.4
All Vehicles		0.387	2.4	NA	5.2	0.45	3.1	NA	8.4

As demonstrated in Table 5.15-5.17, the intersection is shown to operate within acceptable performance limits in terms of degree of saturation, average delay and 95th percentile queue for a roundabout intersection in the Year 2023 and 2033 design traffic scenarios.

5.3.6 Cudgen Road / Turnock Street Roundabout

Analysis of the Cudgen Road / Turnock Street / Elrond Drive intersection was undertaken using SIDRA Intersection 7 for the Year 2023 (year of opening) and Year 2033 Design traffic volumes. The existing geometric layout for the intersection was generally used, noting that a north-western leg has been added for the site access. The new intersection leg has a single approach lane and a single departure lane.

The layout of the intersection used in SIDRA is shown in Figure 5.5.

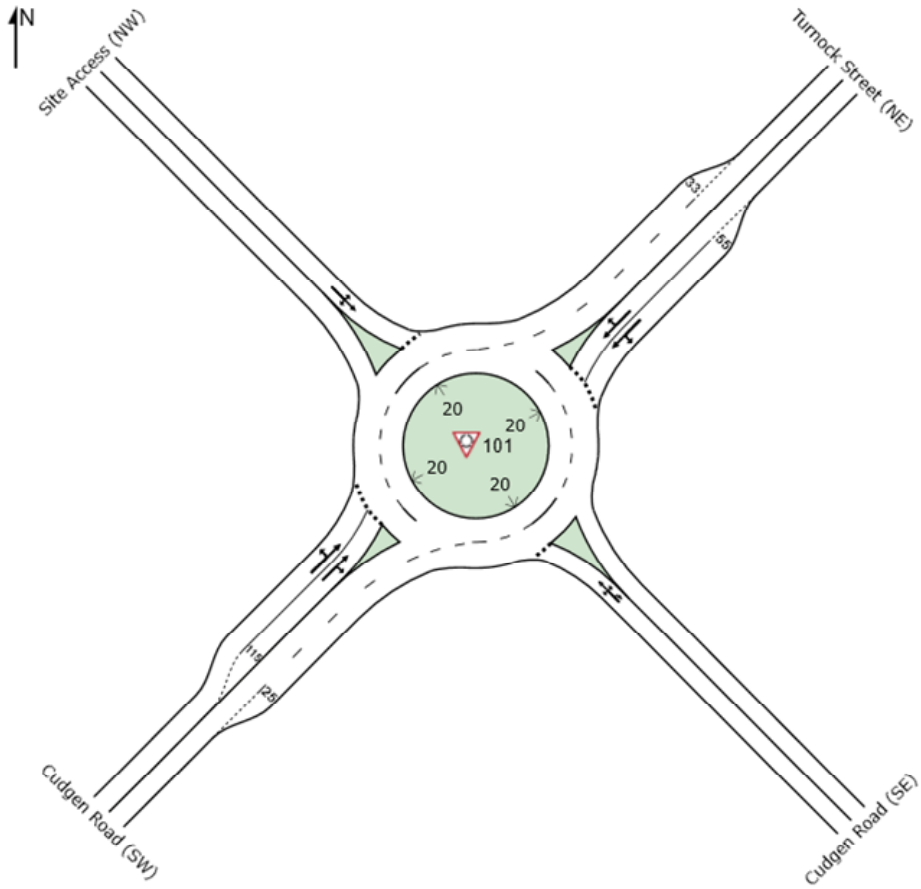


Figure 5.5: Cudgen Road / Turnock Street SIDRA Intersection Layout (With Access)

The results of the analysis are summarised in Tables 5.18-5.20. A copy of the SIDRA movement summaries is provided in Appendix D.

Table 5.18: Cudgen Road / Turnock Street SIDRA Results Summary (Year 2023 MVT and EVT Design Traffic Volumes)

Approach	Year 2023 AM Peak - MVT					Year 2023 PM Peak - EVT			
	OD Movement	DOS	Ave Delay (s)	LOS	95%ile Queue (m)	DOS	Ave Delay (s)	LOS	95%ile Queue (m)
SouthEast: Cudgen Road (SE)	L2	0.624	5.2	LOS A	42.2	0.609	7.9	LOS A	41.8
	T1	0.624	5.2	LOS A	42.2	0.609	7.8	LOS A	41.8
	R2	0.624	9.7	LOS A	42.2	0.609	12.3	LOS A	41.8
	U	0.624	11.5	LOS A	42.2	0.609	14	LOS A	41.8
	Approach	0.624	6	LOS A	42.2	0.609	8.7	LOS A	41.8
NorthEast: Turnock Street (NE)	L2	0.146	7.8	LOS A	5.6	0.123	9.4	LOS A	4.4
	T1	0.215	7.3	LOS A	9.4	0.258	7.1	LOS A	11
	R2	0.215	11.8	LOS A	9.4	0.258	11.8	LOS A	11
	Approach	0.215	7.6	LOS A	9.4	0.258	7.7	LOS A	11
NorthWest: Site Access (NW)	L2	0.044	6.5	LOS A	1.5	0.207	6.7	LOS A	7.4
	T1	0.044	6	LOS A	1.5	0.207	6.3	LOS A	7.4
	R2	0.044	10.3	LOS A	1.5	0.207	10.6	LOS A	7.4
	Approach	0.044	9.8	LOS A	1.5	0.207	10.1	LOS A	7.4
SouthWest: Cudgen Road (SW)	L2	0.158	5.4	LOS A	6.2	0.148	5.1	LOS A	5.8
	T1	0.5	5.1	LOS A	31.4	0.468	4.8	LOS A	29.1
	R2	0.5	9.5	LOS A	31.4	0.468	9.4	LOS A	29.1
	Approach	0.5	7.9	LOS A	31.4	0.468	7.3	LOS A	29.1
All Vehicles		0.624	7.2	LOS A	42.2	0.609	8	LOS A	41.8

Table 5.19: Cudgen Road / Turnock Street SIDRA Results Summary (Year 2033 MVT and EVT Design Traffic Volumes)

Approach	Year 2023 AM Peak - MVT					Year 2023 PM Peak - EVT			
	OD Movement	DOS	Ave Delay (s)	LOS	95%ile Queue (m)	DOS	Ave Delay (s)	LOS	95%ile Queue (m)
SouthEast: Cudgen Road (SE)	L2	0.767	8.6	LOS A	79.8	0.756	12.2	LOS A	73.5
	T1	0.767	8.5	LOS A	79.8	0.756	12	LOS A	73.5
	R2	0.767	13	LOS A	79.8	0.756	16.6	LOS B	73.5
	U	0.767	14.8	LOS B	79.8	0.756	18.3	LOS B	73.5
	Approach	0.767	9.3	LOS A	79.8	0.756	12.9	LOS A	73.5
NorthEast: Turnock Street (NE)	L2	0.195	8.8	LOS A	8.1	0.159	10.3	LOS A	5.9
	T1	0.283	8.2	LOS A	13.5	0.331	7.9	LOS A	15.2
	R2	0.283	12.7	LOS A	13.5	0.331	12.6	LOS A	15.2
	Approach	0.283	8.5	LOS A	13.5	0.331	8.5	LOS A	15.2
NorthWest: Site Access (NW)	L2	0.052	7.8	LOS A	1.8	0.238	7.9	LOS A	8.8
	T1	0.052	7.3	LOS A	1.8	0.238	7.5	LOS A	8.8
	R2	0.052	11.6	LOS A	1.8	0.238	11.8	LOS A	8.8
	Approach	0.052	11.1	LOS A	1.8	0.238	11.3	LOS A	8.8
SouthWest: Cudgen Road (SW)	L2	0.192	5.6	LOS A	7.9	0.179	5.4	LOS A	7.3
	T1	0.608	5.3	LOS A	45.7	0.565	5.1	LOS A	40.8
	R2	0.608	9.8	LOS A	45.7	0.565	9.6	LOS A	40.8
	Approach	0.608	8.2	LOS A	45.7	0.565	7.5	LOS A	40.8
All Vehicles		0.767	8.7	LOS A	79.8	0.756	9.6	LOS A	73.5

Table 5.20: Cudgen Road / Turnock Street SIDRA Results Summary (Year 2023 and 2033 PVT Design Traffic Volumes)

Approach	Year 2023 PM Peak - PVT					Year 2033 PM Peak - PVT			
	OD Movement	DOS	Ave Delay (s)	LOS	95%ile Queue (m)	DOS	Ave Delay (s)	LOS	95%ile Queue (m)
SouthEast: Cudgen Road (SE)	L2	0.606	7.7	LOS A	41.4	0.753	11.9	LOS A	72.9
	T1	0.606	7.6	LOS A	41.4	0.753	11.7	LOS A	72.9
	R2	0.606	12.2	LOS A	41.4	0.753	16.3	LOS B	72.9
	U	0.606	13.9	LOS A	41.4	0.753	18	LOS B	72.9
	Approach	0.606	8.5	LOS A	41.4	0.753	12.6	LOS A	72.9
NorthEast: Turnock Street (NE)	L2	0.125	9.3	LOS A	4.4	0.161	10.3	LOS A	5.9
	T1	0.268	7	LOS A	11.5	0.342	7.8	LOS A	15.8
	R2	0.268	11.7	LOS A	11.5	0.342	12.5	LOS A	15.8
	Approach	0.268	7.7	LOS A	11.5	0.342	8.5	LOS A	15.8
NorthWest: Site Access (NW)	L2	0.168	6.5	LOS A	5.9	0.194	7.8	LOS A	7.1
	T1	0.168	6.1	LOS A	5.9	0.194	7.3	LOS A	7.1
	R2	0.168	10.4	LOS A	5.9	0.194	11.6	LOS A	7.1
	Approach	0.168	9.9	LOS A	5.9	0.194	11.1	LOS A	7.1
SouthWest: Cudgen Road (SW)	L2	0.149	5.2	LOS A	5.7	0.18	5.5	LOS A	7.3
	T1	0.469	4.9	LOS A	28.7	0.57	5.1	LOS A	40.7
	R2	0.469	9.4	LOS A	28.7	0.57	9.7	LOS A	40.7
	Approach	0.469	7.3	LOS A	28.7	0.57	7.6	LOS A	40.7
All Vehicles		0.606	7.9	LOS A	41.4	0.753	9.5	LOS A	72.9

As demonstrated in Tables 5.18-5.20, the intersection (with the inclusion of an additional leg for site access) is shown to operate within acceptable performance limits in terms of degree of saturation, average delay and 95th percentile queue for a roundabout intersection in the Year 2023 and 2033 design traffic scenarios.

There is potential for line marking changes at the intersection including priority and circulating lane changes (i.e. spiral) to improve lane allocations and reduce merging and weaving in proximity to the roundabout.

5.3.7 Turnock Street / Elrond Drive roundabout

Analysis of the Turnock Street / Elrond Drive intersection was undertaken using SIDRA Intersection 7 for the Year 2023 (year of opening) and Year 2033 (10-year design horizon) design traffic volumes. The existing geometric layout for the intersection was used consistent with the background traffic modelling.

The results of the analysis for design traffic volumes are summarised in Table 5.21-5.23. A copy of the SIDRA movement summaries is provided in Appendix D.

Table 5.21: Turnock Street / Elrond Drive Intersection SIDRA Results Summary (Year 2023 MVT and EVT Design Traffic Volumes)

Approach	Year 2023 AM Peak - MVT					Year 2023 PM Peak - EVT			
	OD Movement	DOS	Ave Delay (s)	LOS	95%ile Queue (m)	DOS	Ave Delay (s)	LOS	95%ile Queue (m)
South: Turnock Street (S)	L1	0.094	3.4	LOS A	2.9	0.119	3.5	LOS A	3.5
	R1	0.183	8.2	LOS A	6.1	0.223	8.3	LOS A	7.6
	U	0.183	11.7	LOS A	6.1	0.223	11.8	LOS A	7.6
	Approach	0.183	7.2	LOS A	6.1	0.223	7	LOS A	7.6
NorthEast: Turnock Street (NE)	L1	0.135	3.5	LOS A	4.4	0.164	3.3	LOS A	5.7
	R2	0.135	9.5	LOS A	4.4	0.164	9.4	LOS A	5.7
	U	0.135	11.8	LOS A	4.4	0.164	11.7	LOS A	5.7
	Approach	0.135	4.8	LOS A	4.4	0.164	5.1	LOS A	5.7
NorthWest: Elrond Drive (NW)	L2	0.071	4.6	LOS A	2	0.046	4.8	LOS A	1.4
	R1	0.078	8.9	LOS A	2.3	0.047	9	LOS A	1.5
	U	0.078	12.4	LOS A	2.3	0.047	12.5	LOS A	1.5
	Approach	0.078	7	LOS A	2.3	0.047	7.1	LOS A	1.5
All Vehicles		0.183	6.4	LOS A	6.1	0.223	6.3	LOS A	7.6

Table 5.22: Turnock Street / Elrond Drive Intersection SIDRA Results Summary (Year 2033 MVT and EVT Design Traffic Volumes)

Approach		Year 2033 AM Peak - MVT				Year 2033 PM Peak - EVT			
	OD Movement	DOS	Ave Delay (s)	LOS	95%ile Queue (m)	DOS	Ave Delay (s)	LOS	95%ile Queue (m)
South: Turnock Street (S)	L1	0.112	3.4	LOS A	3.5	0.142	3.6	LOS A	4.3
	R1	0.219	8.2	LOS A	7.6	0.264	8.4	LOS A	9.4
	U	0.219	11.7	LOS A	7.6	0.264	11.9	LOS A	9.4
	Approach	0.219	7.2	LOS A	7.6	0.264	7	LOS A	9.4
NorthEast: Turnock Street (NE)	L1	0.162	3.6	LOS A	5.5	0.197	3.4	LOS A	7.1
	R2	0.162	9.5	LOS A	5.5	0.197	9.4	LOS A	7.1
	U	0.162	11.9	LOS A	5.5	0.197	11.7	LOS A	7.1
	Approach	0.162	4.9	LOS A	5.5	0.197	5.1	LOS A	7.1
NorthWest: Elrond Drive (NW)	L2	0.087	4.9	LOS A	2.5	0.057	5.1	LOS A	1.8
	R1	0.095	9.1	LOS A	2.9	0.058	9.2	LOS A	1.9
	U	0.095	12.5	LOS A	2.9	0.058	12.7	LOS A	1.9
	Approach	0.095	7.2	LOS A	2.9	0.058	7.3	LOS A	1.9
All Vehicles		0.219	6.5	LOS A	7.6	0.264	6.4	LOS A	9.4

Table 5.23: Turnock Street / Elrond Drive Intersection SIDRA Results Summary (Year 2023 and 2033 PVT Design Traffic Volumes)

Approach		Year 2023 PM Peak - PVT				Year 2033 PM Peak - PVT			
	OD Movement	DOS	Ave Delay (s)	LOS	95%ile Queue (m)	DOS	Ave Delay (s)	LOS	95%ile Queue (m)
South: Turnock Street (S)	L1	0.118	3.5	LOS A	3.5	0.142	3.6	LOS A	4.3
	R1	0.22	8.3	LOS A	7.4	0.261	8.4	LOS A	9.3
	U	0.22	11.8	LOS A	7.4	0.261	11.9	LOS A	9.3
	Approach	0.22	6.9	LOS A	7.4	0.261	7	LOS A	9.3
NorthEast: Turnock Street (NE)	L1	0.174	3.3	LOS A	6.1	0.206	3.4	LOS A	7.5
	R2	0.174	9.4	LOS A	6.1	0.206	9.4	LOS A	7.5
	U	0.174	11.7	LOS A	6.1	0.206	11.7	LOS A	7.5
	Approach	0.174	5	LOS A	6.1	0.206	5.1	LOS A	7.5
NorthWest: Elrond Drive (NW)	L2	0.045	4.8	LOS A	1.4	0.056	5	LOS A	1.8
	R1	0.047	9	LOS A	1.5	0.058	9.2	LOS A	1.9
	U	0.047	12.5	LOS A	1.5	0.058	12.7	LOS A	1.9
	Approach	0.047	7.1	LOS A	1.5	0.058	7.3	LOS A	1.9
All Vehicles		0.22	6.2	LOS A	7.4	0.261	6.3	LOS A	9.3

As demonstrated in Table 5.21-5.23, the intersection is shown to operate within acceptable performance limits in terms of degree of saturation, average delay and 95th percentile queue for a roundabout intersection in the Year 2023 and 2033 design traffic scenarios.

As mentioned in the background modelling assessment, there is potential for future line marking changes at the intersection including priority and circulating lane changes (i.e. spiral) to reduce merging and weaving in proximity to the roundabout, particularly with the inclusion of new road links to the north which will reduce the function of Cudgen Road and Turnock Street as a through route

5.3.8 Turnock Street / Pearl Street roundabout

Analysis of the Turnock Street / Pearl Street intersection was undertaken using SIDRA Intersection 7 for the Year 2023 (year of opening) and Year 2033 (10-year design horizon) design traffic volumes. The existing geometric layout for the intersection was used consistent with the background traffic modelling.

The results of the analysis for design traffic volumes are summarised in Tables 5.24-5.26. A copy of the SIDRA movement summaries is provided in Appendix D.

Table 5.24: Turnock Street / Pearl Intersection SIDRA Results Summary (Year 2023 MVT and EVT Design Traffic Volumes)

Approach	Year 2023 AM Peak - MVT					Year 2023 PM Peak - EVT			
	OD Movement	DOS	Ave Delay (s)	LOS	95%ile Queue (m)	DOS	Ave Delay (s)	LOS	95%ile Queue (m)
SouthEast: Pearl Street (SE)	L2	0.529	4.9	LOS A	33.2	0.591	5.1	LOS A	39.2
	T1	0.529	4.5	LOS A	33.2	0.591	4.8	LOS A	39.2
	R2	0.529	7.4	LOS A	33.2	0.591	7.8	LOS A	39.2
	U	0.529	8.5	LOS A	33.2	0.591	8.9	LOS A	39.2
	Approach	0.529	5.5	LOS A	33.2	0.591	5.7	LOS A	39.2
NorthEast: Turnock Street (NE)	L2	0.174	6.4	LOS A	7.3	0.162	6	LOS A	6.7
	T1	0.174	6.1	LOS A	7.3	0.162	5.8	LOS A	6.7
	R2	0.174	9.1	LOS A	7.3	0.162	8.8	LOS A	6.7
	U	0.174	10.5	LOS A	7.3	0.162	10.2	LOS A	6.7
	Approach	0.174	6.5	LOS A	7.3	0.162	6.2	LOS A	6.7
NorthWest: Pearl Street (NW)	L2	0.375	8.1	LOS A	19.1	0.347	7.7	LOS A	17.6
	T1	0.375	8.1	LOS A	19.1	0.347	7.8	LOS A	17.6
	R2	0.375	11	LOS A	19.1	0.347	10.5	LOS A	17.6
	U	0.375	12.4	LOS A	19.1	0.347	12	LOS A	17.6
	Approach	0.375	9.1	LOS A	19.1	0.347	8.9	LOS A	17.6
SouthWest: Turnock Street (SW)	L2	0.497	10.2	LOS A	29.6	0.514	9.9	LOS A	31.4
	T1	0.497	10	LOS A	29.6	0.514	9.8	LOS A	31.4
	R2	0.497	13.1	LOS A	29.6	0.514	13.1	LOS A	31.4
	U	0.497	14.3	LOS A	29.6	0.514	14.2	LOS A	31.4
	Approach	0.497	11.1	LOS A	29.6	0.514	10.6	LOS A	31.4
All Vehicles		0.529	7.8	LOS A	33.2	0.591	7.6	LOS A	39.2

Table 5.25: Turnock Street / Pearl Intersection SIDRA Results Summary (Year 2033 MVT and EVT Design Traffic Volumes)

Approach	Year 2033 AM Peak - MVT					Year 2033 PM Peak - EVT			
	OD Movement	DOS	Ave Delay (s)	LOS	95%ile Queue (m)	DOS	Ave Delay (s)	LOS	95%ile Queue (m)
SouthEast: Pearl Street (SE)	L2	0.652	6.2	LOS A	50.3	0.731	7.9	LOS A	70.6
	T1	0.652	5.7	LOS A	50.3	0.731	7.5	LOS A	70.6
	R2	0.652	8.6	LOS A	50.3	0.731	10.6	LOS A	70.6
	U	0.652	9.7	LOS A	50.3	0.731	11.6	LOS A	70.6
	Approach	0.652	6.8	LOS A	50.3	0.731	8.4	LOS A	70.6
NorthEast: Turnock Street (NE)	L2	0.224	7	LOS A	9.9	0.207	6.5	LOS A	8.9
	T1	0.224	6.8	LOS A	9.9	0.207	6.3	LOS A	8.9
	R2	0.224	9.8	LOS A	9.9	0.207	9.4	LOS A	8.9
	U	0.224	11.2	LOS A	9.9	0.207	10.8	LOS A	8.9
	Approach	0.224	7.2	LOS A	9.9	0.207	6.7	LOS A	8.9
NorthWest: Pearl Street (NW)	L2	0.493	10.4	LOS A	29.4	0.451	9	LOS A	25
	T1	0.493	10.4	LOS A	29.4	0.451	9.1	LOS A	25
	R2	0.493	13.3	LOS A	29.4	0.451	11.9	LOS A	25
	U	0.493	14.7	LOS B	29.4	0.451	13.3	LOS A	25
	Approach	0.493	11.4	LOS A	29.4	0.451	10.3	LOS A	25
SouthWest: Turnock Street (SW)	L2	0.678	16.6	LOS B	55.2	0.692	16.1	LOS B	57.9
	T1	0.678	16.4	LOS B	55.2	0.692	16	LOS B	57.9
	R2	0.678	19.6	LOS B	55.2	0.692	19.4	LOS B	57.9
	U	0.678	20.7	LOS B	55.2	0.692	20.4	LOS B	57.9
	Approach	0.678	17.5	LOS B	55.2	0.692	16.8	LOS B	57.9
All Vehicles		0.678	10.6	LOS A	55.2	0.731	10.8	LOS A	70.6

Table 5.26: Turnock Street / Pearl Intersection SIDRA Results Summary (Year 2023 and 2033 PVT Design Traffic Volumes)

Approach		Year 2023 PM Peak - PVT				Year 2033 PM Peak - PVT			
	OD Movement	DOS	Ave Delay (s)	LOS	95%ile Queue (m)	DOS	Ave Delay (s)	LOS	95%ile Queue (m)
SouthEast: Pearl Street (SE)	L2	0.602	5.2	LOS A	40.3	0.743	8.4	LOS A	74.6
	T1	0.602	4.9	LOS A	40.3	0.743	8	LOS A	74.6
	R2	0.602	7.9	LOS A	40.3	0.743	11	LOS A	74.6
	U	0.602	9	LOS A	40.3	0.743	12.1	LOS A	74.6
	Approach	0.602	5.8	LOS A	40.3	0.743	8.9	LOS A	74.6
NorthEast: Turnock Street (NE)	L2	0.163	6	LOS A	6.7	0.208	6.6	LOS A	9
	T1	0.163	5.8	LOS A	6.7	0.208	6.4	LOS A	9
	R2	0.163	8.8	LOS A	6.7	0.208	9.4	LOS A	9
	U	0.163	10.3	LOS A	6.7	0.208	10.8	LOS A	9
	Approach	0.163	6.2	LOS A	6.7	0.208	6.8	LOS A	9
NorthWest: Pearl Street (NW)	L2	0.355	7.7	LOS A	18.1	0.46	9.1	LOS A	26
	T1	0.355	7.8	LOS A	18.1	0.46	9.3	LOS A	26
	R2	0.355	10.6	LOS A	18.1	0.46	12	LOS A	26
	U	0.355	12	LOS A	18.1	0.46	13.5	LOS A	26
	Approach	0.355	9	LOS A	18.1	0.46	10.5	LOS A	26
SouthWest: Turnock Street (SW)	L2	0.515	9.9	LOS A	31.6	0.696	16.3	LOS B	58.8
	T1	0.515	9.8	LOS A	31.6	0.696	16.2	LOS B	58.8
	R2	0.515	13.1	LOS A	31.6	0.696	19.6	LOS B	58.8
	U	0.515	14.2	LOS A	31.6	0.696	20.6	LOS B	58.8
	Approach	0.515	10.6	LOS A	31.6	0.696	17	LOS B	58.8
All Vehicles		0.602	7.7	LOS A	40.3	0.743	11.1	LOS A	74.6

As demonstrated in Tables 5.24-5.26, the intersection is shown to operate within acceptable performance limits in terms of degree of saturation, average delay and 95th percentile queue for a roundabout intersection in the Year 2023 and 2033 design traffic scenarios.

5.4 Impact on Traffic Safety

While higher traffic volumes inherently increases crash risk, the Project manages the impact to traffic safety by:

- providing formalised access with suitable capacity to ensure safe and efficient operations and designed to meet the relevant standards;
- improving pedestrian safety by providing a signalised crossing across Cudgen Road; and
- reducing existing deficiencies on the immediate road network (e.g. removal of the existing safety deficient eastbound bus stop which conflicts with the adjacent pedestrian refuge).

It is noted that the proposed Access D introduces a potential weave for vehicles egressing Kingscliff TAFE, however volumes turning left-into the site at this location are expected to be relatively low given the three other accesses to the west. The addition of a fourth leg is also not expected to result in any significant weaving or issues with vehicles turning right from the TAFE and then left into the site. This volume is expected to be very low and from a route choice perspective it is more likely that vehicles will turn left and use the hospitals main access.

5.5 Public and Active Transport

5.5.1 Public Transport Demand

The Project will generate additional demand for public transport facilities in the area and it is understood that catering for public transport demands was an issue raised during public consultation for the Project Site selection. During site observations deficiencies were observed with the existing infrastructure. The existing eastbound stop conflicts with a pedestrian refuge crossing and the westbound stop is located in the left turn lane for the TAFE access. For further details refer Section 3.11.

Details of recommended infrastructure upgrades for bus stop facilities are provided in Section 5.5.4.

With the inclusion of the proposed bus stop infrastructure and future route modifications, the public transport network and infrastructure will suitable service the Tweed Valley Hospital.

Access for community and aged care transport vehicles (B99 vehicles, mini-busses) has been catered for within the site geometry. Strategies for relocating existing community and aged car transport form the existing hospital to the new hospital as well as provision of new services will be investigated as part of Stage 2.

5.5.2 Active Transport

The Project Site is well serviced by the existing active (i.e. walking and cycling) transport network, including pathways along the Project Site frontage, connections to residential areas to the west and residential, commercial, community and education areas to the east. Active transport access will be further improved with a new signalised crossing on Cudgen Road (i.e. site's main access intersection) and pathway connection on the southern side of the Cudgen Road between the existing pathway, new bus stop and signalised crossing.

5.5.3 Green Travel Plan

A Green Travel Plan will be prepared as part of Stage 2 to support and maximise the use of alternate travel modes including walking, cycling, public transport and car sharing.

More specifically the Green Travel Plan will include:

- development of a Transport Access Guide (TAG) detailing:
  - bus stop locations;
  - bus routes and service times;
  - community transport services;
  - pedestrian and cycle routes;
  - bicycle parking and end of trip facility locations;
  - PWD parking locations;
- objectives and targets for alternate transport utilisation;
- actions required to achieve the objectives;
- governance support;
- a monitoring and review process; and
- a process for incorporating and considering potential future transport modes or changes to existing modes (such as on-demand services, autonomous vehicles and electric vehicle facilities).

5.6 RECOMMENDED WORKS

5.6.1 Improvements to Site Access and Circulation

The Project Site is a greenfield site. All accesses and internal circulation roads will be provided as new infrastructure. As such, no "improvements" to existing access and circulation infrastructure are proposed.

5.6.2 Intersection Improvements

Upgrades to external intersections have been identified for the Tweed Coast Road / Cudgen Road intersection to increase capacity. A series of upgrades have been identified:

- upgrades required to cater for Background Traffic volumes in 2023; and
- upgrades required to cater for Design Traffic volumes (Tweed Valley Hospital plus background) in 2023.

The intersection will require further upgrades by 2033. It is expected that the four-lane upgrade of Tweed Coast Road will be completed by this time by Council.

Upgrades identified to cater for background traffic in 2023 are summarised as follows:

- Addition of a 100m southbound left-turn lane on Tweed Coast Road;
- Phase sequence change to allow the southbound left-turn to overlap with the westbound right-turn (i.e. possible with the provision of dedicated southbound left-turn lane);
- Lane discipline change for the two approach lanes on the south-eastern approach:
  - Change of the left through lane to a through and right lane;
  - Change of the right through and right lane to a right only lane;
- Extension of the south-eastern short departure lane from approximately 75m to approximately 150m; and
- Extension of the northbound departure lane from approximately 85m to approximately 100m; and
- Conversion of the north-western leg departure to a single lane (no physical changes. i.e. through provision of chevron line marking). With the lane discipline changes on the south-eastern approach, there is only one lane travelling through to the north-western departure lane.

Additional upgrades identified to cater for Tweed Valley Hospital traffic are summarised as follows:

- Extension of the northbound departure lane to approximately 200m; and
- Extension of the southbound departure lane to approximately 150m.

Further upgrades are expected to be undertaken as part of the four-lane upgrade of Tweed Coast Road. The specific capacity requirements and ultimate design of the intersection is expected to be refined as part of future planning and detailed design of the corridor upgrade.

It is understood that Tweed Shire Council has no planning for "interim" works at the intersection (i.e. prior to the four-lane upgrade of Tweed Coast Road). In this regard, upgrades undertaken in the interim should be commensurate with planning for the ultimate design scenario (i.e. with the four-lane upgrade).

5.6.3 Pedestrian Facility Improvements

New signalised pedestrian crossing facilities will be provided as part of the signalised access intersection for the Tweed Valley Hospital. The signalised crossing across Cudgen Road will improve pedestrian safety and amenity for existing pedestrians and new pedestrians generated by the Project. A new pedestrian connection will be provided on the southern side of Cudgen Road near the existing TAFE access, connecting the existing footpath with the new westbound bus stop and the new signalised access intersection.

5.6.4 Public Transport Facility Improvements

To cater for the public transport demand generated by the Project, provide direct public transport access for the Project and to resolve deficiencies with the existing bus stop infrastructure, two new bus stops will be provided on Cudgen Road, to the east of the primary signalised access intersection. The bus stops will be indented, minimising impact to through traffic and will include shelters and seating. The existing bus stops will be removed once the new facilities are provided. The proposed bus stops are shown on the Masterplan presented in Appendix A.

Preliminary discussions with Surfside Buslines identified that they are open to modification / extension of Route 601 which currently terminates within Kingscliff TAFE (particularly given existing issues which result when the TAFE is closed and gates at the access are locked). Changes to the route may include:

- extension of the route to terminate within the Project Site (i.e. using the site's primary signalised access and turning around at the sites internal roundabout);
- continuation of the service west along Cudgen Road and north on Tweed Coast Road; or
- once provided, utilising the future planned east-west links between Tweed Coast Road and Kingscliff.

It is understood that TfNSW in coordination with Surfside are in the process of a service planning review. In addition, TfNSW are currently trialling On-Demand services across Greater Sydney including the Central Coast and Illawarra regions. Tweed Valley Hospital's inclusion within any updates to the service planning and the inclusion of On-Demand services will occur over the coming years in consultation with TfNSW, Surfside and other transport operators.

5.6.5 Provision of LATM Measures

Following a review of the speed environment (refer Section 3.6) and traffic safety (Section 3.8) as well as the Project, Local Area Traffic Management (LATM) measures are not considered warranted for the surrounding road network.

5.6.6 Funding of Proposed Improvement Measures

All transport "enabling works" will be funded by Health Infrastructure as part of the Project. Enabling works include:

- the four site access intersections on Cudgen Road; and
- provision of the new bus stops and associated infrastructure.

It is understood that Health Infrastrcture will work with Tweed Shire Council and RMS on the delivery external traffic infrastructure commensurate with future planning for the surrounding road network.

5.6.7 Way Finding Signage

It is recommended that as part of future planning that a way finding signage scheme be developed including:

- External Signage: directing visitors to the hospital from the broader road network (Pacific Highway, Tweed Coast Road, Cudgen Road, Turnock Street);
- Access Signage: clearly identifying the access points and access purpose (e.g. "Staff and Emergency Vehicle Access Only"); and
- Internal Signage: directing visitors and staff to the various drop-off and parking areas within the site.

5.6.8 Noise Attenuation Measures

Appropriate noise attenuation measures for traffic and servicing should be provided and required as part of the Project approvals. It is understood that noise attenuation requirements are being assessed by the acoustic consultant Acoustic Studio.

6. CONSTRUCTION TRAFFIC MANAGEMENT CONSIDERATIONS

6.1 OVERVIEW

Assessment of construction parking and traffic should be considered with the context and current stage of the of the proposal (i.e. the EIS is seeking approval for the Concept Proposal and Stage 1 early and enabling works). Detailed construction methodologies and documentation are prepared by the construction contractor. Key considerations are detailed as follows:

- construction does not typically require a Transport Impact Assessment, as the nature of construction is temporary;
- in order to commence construction, the construction contractor is required to have in place all relevant approvals and applications with Tweed Shire Council (e.g. Construction Certificate, approval for Temporary or Partial Road Closure Including Road Related Areas); and
- if oversize and/or over mass vehicles and loads are required, approval is required from RMS.

6.2 CONSTRUCTION TRAFFIC MANAGEMENT PLAN

All construction traffic and any impacts to the external road network due to works on Cudgen Road, Turnock Street or in providing construction access to the Project Site will be managed under a Construction Traffic Management Plan (CTMP) and traffic control plan (TCP). These should be prepared in accordance with the Roads and Maritime Services (formerly RTA) *Traffic Control at Work Sites* manual. The construction contractor will be required to develop and seek approval for the implementation of a CTMP prior to commencement of construction to ensure safe and efficient management of traffic.

For the purpose of this assessment a preliminary CTMP is attached as Appendix E. The CTMP is for information only and is not for implementation. A formalised CTMP is needed prior to the start of construction.

Key construction traffic management considerations are summarised within Section 6 of this report.

6.3 CONSTRUCTION PARKING

The Project Site is expected to have sufficient area to cater for construction parking on-site in the form of temporary hardstand parking. Access to these parking areas will be provided via a temporary site access or accesses. Once one of the main accesses is completed it is expected that this can be used for access to the temporary parking areas.

6.4 CONSTRUCTION TRAFFIC VOLUMES

Traffic generated as a result of construction works for Stage 1 are expected to include:

- Heavy vehicle movements for the delivery and removal of construction equipment and machinery, spoil and waste management;
- Small and medium sized vehicles for material delivery; and
- Light vehicles for movement of construction personnel, including contractors, labour force and supervisor / management staff.

Construction traffic volumes have been estimated based on expected construction traffic volumes for the New Maitland Hospital EIS, given the similar scale (New Maitland Hospital has a gross floor area of approximately 60,000m^2). Estimated construction traffic movements are summarised in Table 6.1.

Table 6.1: Estimated Daily Construction Traffic

Vehicle Type	Estimated Average Vehicles Accessing Site (average per day)	Estimate of Average Daily Trips (i.e. two-way movements)
Heavy Vehicles	35	70
Light Vehicles	55	110
Total	90	180

While construction traffic is expected to be spread throughout a typical day, as a worst-case assessment it is estimated that 20% of heavy vehicles and a 100% of light vehicles could arrive / depart in a peak hour. This equates to in the order of 125 peak hour trips.

6.5 INTERSECTION OPERATIONS

Construction works for Stage 1 is estimated to generate additional traffic movements (in the order of 180 trips per day). This may result in some additional delays at key intersections on the haulage route and key travel routes. It is recommended that heavy vehicle movements take place outside the commuter and school peak periods. It is likely that much of the labour force will arrive prior to the typical AM peak period.

Where required, vehicle movements (e.g. along the Project Site frontage and at site access locations) will be managed under the afore mentioned CTPMP.

6.6 ALTERNATE TRANSPORT ACCESS

Public and active transport (walking and cycling) trips generated by construction activities are expected to be low. Regardless, the Project Site is well serviced by alternate transport including eastbound and westbound bus stops on Cudgen Road and shared path facilities on Cudgen Road and Turnock Street on the Project Site frontage (refer Section 3.11.2 and 3.12.1). The existing infrastructure will adequately cater for any additional demand generated by construction activities.

6.7 PUBLIC TRANSPORT IMPACTS

There is expected to be minimal impacts to public transport during construction works associated with Stage 1. In subsequent stages new bus stops will be provided, however the existing nearby bus stops can be utilised until new bus stops are operational.

Some minor travel time delays may occur to bus services as a result of additional construction vehicles and particularly heavy vehicles on the surrounding road network.

6.8 ACTIVE TRANSPORT IMPACTS

There is expected to be minimal impacts to pedestrians and cyclists in the area during construction due to the observed low pedestrian and cyclist movements. Any impacts to pedestrian pathways or cycle routes will be managed under the CTMP. During construction of the site accesses the existing pathway on the northern side of Cudgen Road will be impacted and, in some sections, will require removal and re-instatement of the path. The CTMP will detail interim pedestrian routes.

6.9 HAULAGE ROUTES

Haulage routes have not been confirmed at this stage, however the main access / haulage routes are expected to be via Cudgen Road, Tweed Coast Road and the Pacific Highway. Given expected construction volumes, impacts are expected to be minimal.

Haulage of material should be managed through the scheduling of deliveries and availability of fleet to minimise the number of haulage and delivery vehicles during peak periods.

7. SUMMARY AND CONCLUSIONS

The key findings from the traffic impact assessment for the proposed Tweed Valley Hospital located at 771 Cudgen Road, Cudgen NSW are as follows:

- the Concept Proposal is informed by service planning to 2031/2032 and has an expected gross floor area in the range of 55,000m^2 to 65,000m^2;
- access to the Project Site is proposed via four new accesses including a primary all-movements signalised access on Cudgen Road, a secondary all-movements access by way of an additional leg to the Cudgen Road / Tweed Coast Road roundabout and two left-in only access on Cudgen Road;
- the Project provides in the order of 700 car parking spaces, with the potential to cater for additional parking on-site (i.e. overflow parking) if required;
- the Project requires 29 staff bicycle parking spaces and 14 visitor bicycle parking spaces;
- the Project requires servicing from a range of service vehicles (ranging from an SRV to a 19m AV) and refuse collection vehicles;
- the Project's car parks and internal circulation roads have been designed with consideration to relevant Australian Standards (AS2890.1, AS2890.2 and AS2890.6), however given the high-level nature of the Masterplan further assessment of specific geometry including swept path analysis is required to ensure compliance and suitable manoeuvring;
- the Tweed Valley Hospital is estimated to generate a maximum of 603 peak hour trips and in the order of 5,000 trips per day;
- the proposed accesses have been designed to cater for design traffic volumes (including ensuring access intersections operate within acceptable performance limits);
- the Tweed Valley Hospital is not expected to generate any internal queues that will impact the external road network;
- the external road network and intersections are expected to cater for the future background and design traffic scenarios, with the exception of the Tweed Coast Road / Cudgen Road intersection. A range of capacity and performance upgrades have been identified to cater for background traffic and design traffic scenarios in Year 2023 including the addition of a turning lane, extension of stand-up lanes, lane discipline and phase changes. Further upgrades are required in Year 2033 including the four-lane upgrade of Tweed Coast Road, which is expected to be completed by 2033;
- the Project proposes two new indented bus bays on Cudgen Road and associated infrastructure, replacing the existing bus stops. There is potential for extension of Surfside Buslines Route 601 to improve public transport services to the Project Site and resolve existing issues with the current termination of the service. Tweed Valley Hospital's inclusion within any updates to the service planning and the inclusion of On-Demand services will occur over the coming years in consultation with TfNSW, Surfside and other transport operators;
- transport enabling works including the four access intersections will be funded by Health Infrastructure;
- it is understood that Health Infrastructure will work with Tweed Shire Council and RMS on the delivery external traffic infrastructure commensurate with future planning for the surrounding road network;
- Construction parking will be catered for on the Project Site by way of temporary hardstand parking facilities;
- all construction traffic and any impacts to the external road network due to works on Cudgen Road or Turnock Street will be managed under a CTMP; and
- the existing public and active transport infrastructure will adequately cater for any additional demand generated by construction activities (trips of this nature are expected to be low).