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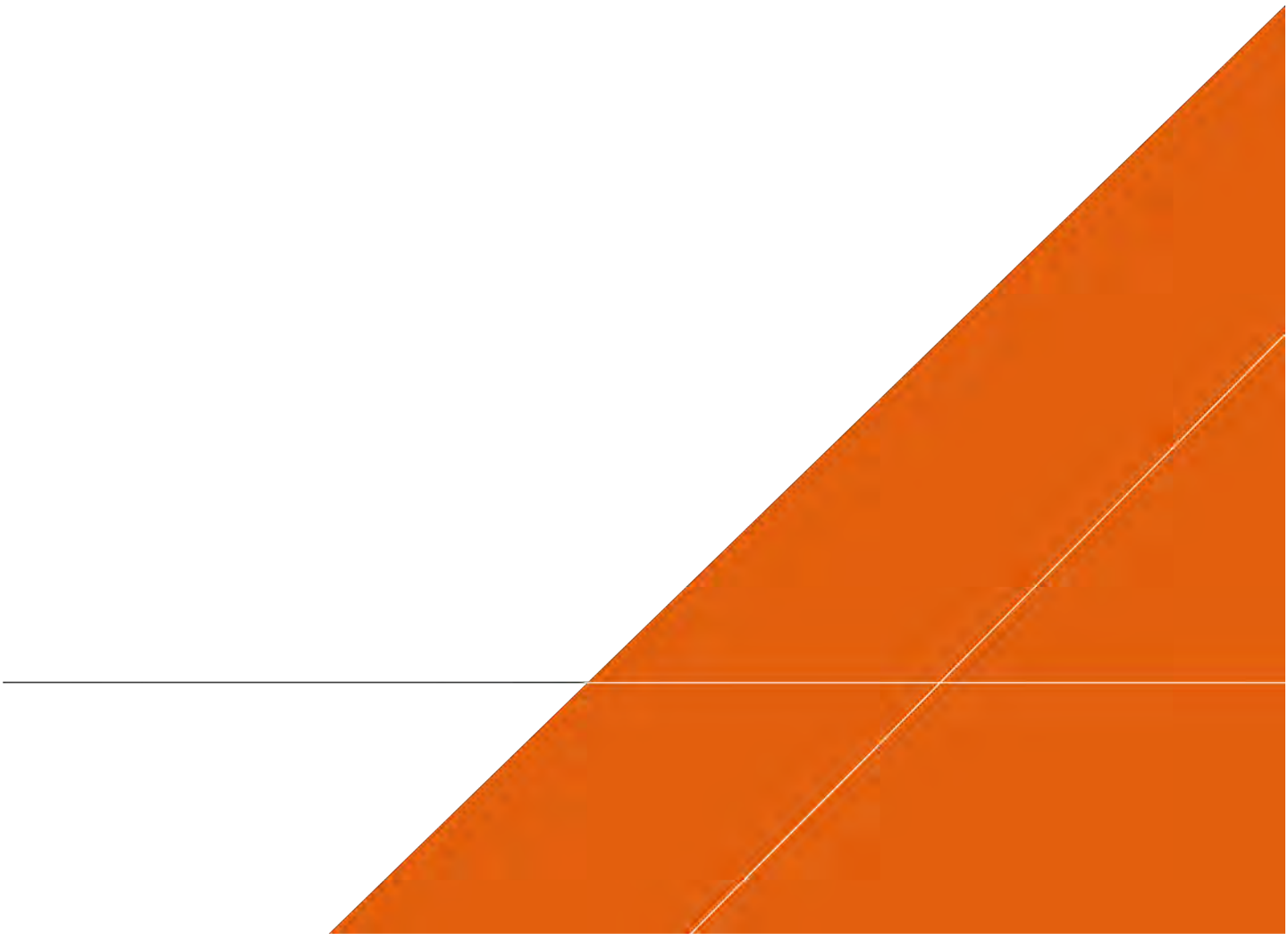
KINGS HILL DEVELOPMENT - WATER AND WASTEWATER INFRASTRUCTURE

Transport Impact Assessment Report

03 OCTOBER 2019



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KINGS HILL DEVELOPMENT – WATER AND WASTEWATER INFRASTRUCTURE

TRANSPORT IMPACT ASSESSMENT

Final Report

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1 INTRODUCTION

1.1 Project background

Kings Hill Development Pty Ltd (KHD) is seeking approval for the development of a water and wastewater supply pipeline and a wastewater pumping station (the Proposal) to support the development of the Kings Hill Urban Release Area (Kings Hill URA). The Kings Hill URA was rezoned in 2010 to support a mix of general residential, mixed use and local centre land uses. It is expected to comprise in excess of 3,500 residential dwellings developed over a 25-year period. Key development features of the Kings Hill URA will also include the provision of utilities and supporting infrastructure, including a Pacific Highway grade separated interchange, stormwater channel and water and wastewater infrastructure. There is currently no water and wastewater infrastructure located within the Proposal site with the capacity to service Kings Hill URA.

1.2 Key terms

The key terms are outlined in Table 1-1.

Table 1-1 Terminology

Term	Definition
Kings Hill URA	Kings Hill Urban Release Area
Proposal	Water and wastewater supply pipeline and a wastewater pumping station to support the Kings Hill URA
Proposal site	The Proposal stretches about 6.7 kilometres between Raymond Terrace in the south and Kings Hill URA in the north

1.3 Proposal site

The Proposal is located within Port Stephens Local Government Area (LGA), approximately 4 kilometres north of Raymond Terrace, 25 kilometres north of Newcastle and 135 kilometres north of Sydney. The Proposal stretches approximately 6.7 kilometres (the Proposal Site) between Raymond Terrace in the south, and Kings Hill URA in the north. The location of the Proposal site is shown in Figure 1-1.

Figure 1-1 Proposal location

The Proposal site includes the footprints of the wastewater pumping station, water pipeline and wastewater pipeline, in addition to buffer areas and temporary construction compounds.

An Environmental Impact Statement (EIS) is to be prepared for the Proposal seeking approval as Designated Development under Part 4 of the *Environmental Planning and Assessment 1979* (EP&A Act). The key components of the Proposal would include:

- Installation of a water and wastewater pipelines, approximately 6.7 kilometres and 4.2 kilometres in length, respectively. These pipelines would be located within a joint corridor. This would require vegetation clearing, trenching and under-boring for the pipes to be laid

- Construction of a wastewater pumping station (WWPS) within the eastern catchment of the Kings Hill URA, including installation of electrical components, mechanical installation of pumps, valves and fittings, and construction of adjacent hardstand areas
- Restoration of area upon completion of pipe laying, including backfilling the trench and restoring all surfaces to their pre-construction condition where practicable
- Connection of the proposed infrastructure to existing Hunter Water services.

The water pipeline would connect to existing Hunter Water infrastructure in the south and the Kings Hill URA in the north, while the wastewater pipeline would connect to the proposed WWPS in Kings Hill URA and existing Hunter Water infrastructure in the south.

A conservative construction vehicle trip distribution was estimated for all accesses, assuming that 31 construction vehicles would enter, and 27 vehicles would exit each access during the AM peak, with flows reversed in the PM peak.

1.4 Relevant legislation, policy and guidelines

To assess the proposed transport impacts and arrangements, the proposal has been assessed against the following legislation, policies and guidelines:

- *Transport Administration Act 1988*
- *Road Transport Act of 2013*
- *Guide to Traffic Generating Developments* (Roads and Maritime Services [Roads and Maritime, formerly Roads and Traffic Authority], Version 2.2, October 2002)
- *AS/NZ 2890.1: Off-street car parking*
- *AS/NZ 2890.2: Off-street commercial vehicle facilities*
- *Department Transport and Main Roads Road Planning and Design Manual: Chapter 5 Traffic Parameters and Human Factors*, August 2004
- *Department Transport and Main Roads Road Planning and Design Manual: Chapter 13 Intersections at Grade*, October 2006
- *Austroads Guide to Road Design Part 4a: Unsignalised and Signalised Intersections* (Austroads, 2009)
- *Highway Capacity Manual*, 2010 (HCM2010)
- *Guide to Traffic Management Part 3: Traffic Studies and Analysis and Highway Capacity Manual* (Austroads, 2016)

1.5 Study objectives

The objective of this transport impact assessment is to estimate, evaluate and mitigate the expected impact resulting from the construction and operational stage of the Proposal on the surrounding road network. The objective also includes compliance with the Secretary's Environmental Assessment Requirements (SEARs) which are summarised in Table 1-2 with the relevant report reference specified.

Table 1-2 SEARs and report reference

Item	Requirement	Section reference
1	Providing details of construction road transport routes and access to the site	Section 3.5 Vehicle access Section 4.2 Access and frontage
2	Providing road traffic predictions for the development during construction	Section 3.4 Project traffic generation

Item	Requirement	Section reference
3	Providing an assessment of impacts to the safety and function of the road network and details of any upgrades required for the development	Section 4 Impact assessment

1.6 Report structure

The remainder of this report is structured as follows:

- **Section 2 Development details** provides an overview of the preliminary construction plan including staging, the preliminary operational plan relating to the maintenance of the Proposal, and documents traffic generation assumptions and forecast volumes
- **Section 3 Existing conditions** assesses the existing traffic, public and active transport networks within the Proposal site
- **Section 4 Impact assessment** assesses the impacts of additional construction traffic vehicles accessing the proposed compound areas during the construction phase
- **Section 5 Preliminary construction traffic management plan** outlines measures that can be implemented to minimise the impacts of construction traffic on road users and the safety environment
- **Section 6 Conclusions and recommendations** presents the overall traffic impact assessment conclusions.

2 EXISTING CONDITIONS

2.1 External road network

The key roads within the Proposal site network are summarised in Table 2-1.

Table 2-1 Key roads within the Proposal site network

Road link name	Number of lanes per direction	Divided (D) / undivided (U)	Posted speed (km/h)
Pacific Highway	2	D	110
Laydown Access Road	1	U	50
Rees James Road	1	U	50
Adelaide Street	1	U	60
Irrawang Street	1	U	50*

*A school zone operates along the road, where the speed limit is reduced to 40 km/h between 8am to 9.30am and 2.30pm to 4pm.

Five new vehicle access roads are considered within the Proposal site, to provide access to the 5 proposed compound areas which are further elaborated on in Section 4 and illustrated in Figure 3-2 of this report. Along the construction traffic route between Raymond Terrace and the proposed wastewater pumping station location, the following key accesses need to be considered:

- Irrawang Street/ Raymond Terrace Senior Citizens & Community Hall car park (south of Access 5)
- Irrawang Street/ William Street (north of Access 5)
- 17 Panorama Close rear access (south of Access 4)
- 8 Rees James Road driveway (opposite Access 3)
- 6 Rees James Road driveway (north of Access 3)
- 36 Rees James Road driveway (opposite Access 2)

2.2 Bus services

The Proposal would be constructed between Raymond Terrace to the south and Kings Hill to the north, running primarily through Rees James Road, Adelaide Street and Irrawang Street. Along the route, bus services are provided towards the south, running primarily through the town centre and neighbouring residential areas.

The following key bus routes service the Raymond Terrace area, and could potentially be impacted by the Proposal:

- Route 136 – Raymond Terrace to Stockton via Medowie
- Route 137 – Raymond Terrace to Lemon Tree Passage via Medowie
- Route 140 – Newcastle to Lakeside Shops via Hexham and Raymond Terrace
- Route 141 – Raymond Terrace Town Service (loop service)
- Route 145 – Newcastle Airport to Stockland Green Hills via Raymond Terrace.

The bus services along route 136, route 137, route 145 and route 141 run along Irrawang Street, where the Proposal would connect to the existing water pumping station. Bus route 140 runs along Adelaide Street and Rees James Road, where the pipeline is proposed to continue until it reaches the proposed wastewater pumping station location. Figure 2-1 illustrates the public bus routes within the Proposal site surrounding area.

Table 2-2 summarises the frequency of public bus services within the Proposal site surrounding area.

Table 2-2 Public bus frequencies within Proposal site surrounding area

Bus service	Weekday frequency (per direction)	Relevant roads
Route 136 – Raymond Terrace to Stockton via Medowie	• 2 services/ hour	Irrawang Street
Route 137 – Raymond Terrace to Lemon Tree Passage via Medowie	• 1 service/ hour during the 6am – 10am morning peak • 1 service/ hour during the 2pm – 6pm afternoon peak • 1 service/ 2 hours during the off-peak periods	Irrawang Street
Route 140 – Newcastle to Lakeside Shops via Hexham and Raymond Terrace	• 2 services/ hour during the 6am – 9am morning peak • 2 services/ hour during the 3pm – 6pm afternoon peak • 1 service/ hour during the off-peak periods	Irrawang Street
Route 141 – Raymond Terrace Town Service (loop service)	• 2 services/ hour	Adelaide Street, Rees James Road
Route 145 – Newcastle Airport to Stockland Green Hills via Raymond Terrace	• 1 service/ hour	Irrawang Street

Source: Transport for NSW bus timetables, valid from 22 July 2019, accessed 16 July 2019

The Raymond Terrace Community Hall, Irrawang Street bus stop (Stop ID: 2324191) may be affected by construction traffic entering and exiting the proposed Access 5 on Irrawang Street, south of William Street. It is not expected that the frequency and service times of the buses would be impacted. As a mitigation it is proposed that the wider community and public transport service providers and users be notified in advance of expected construction activities and durations.

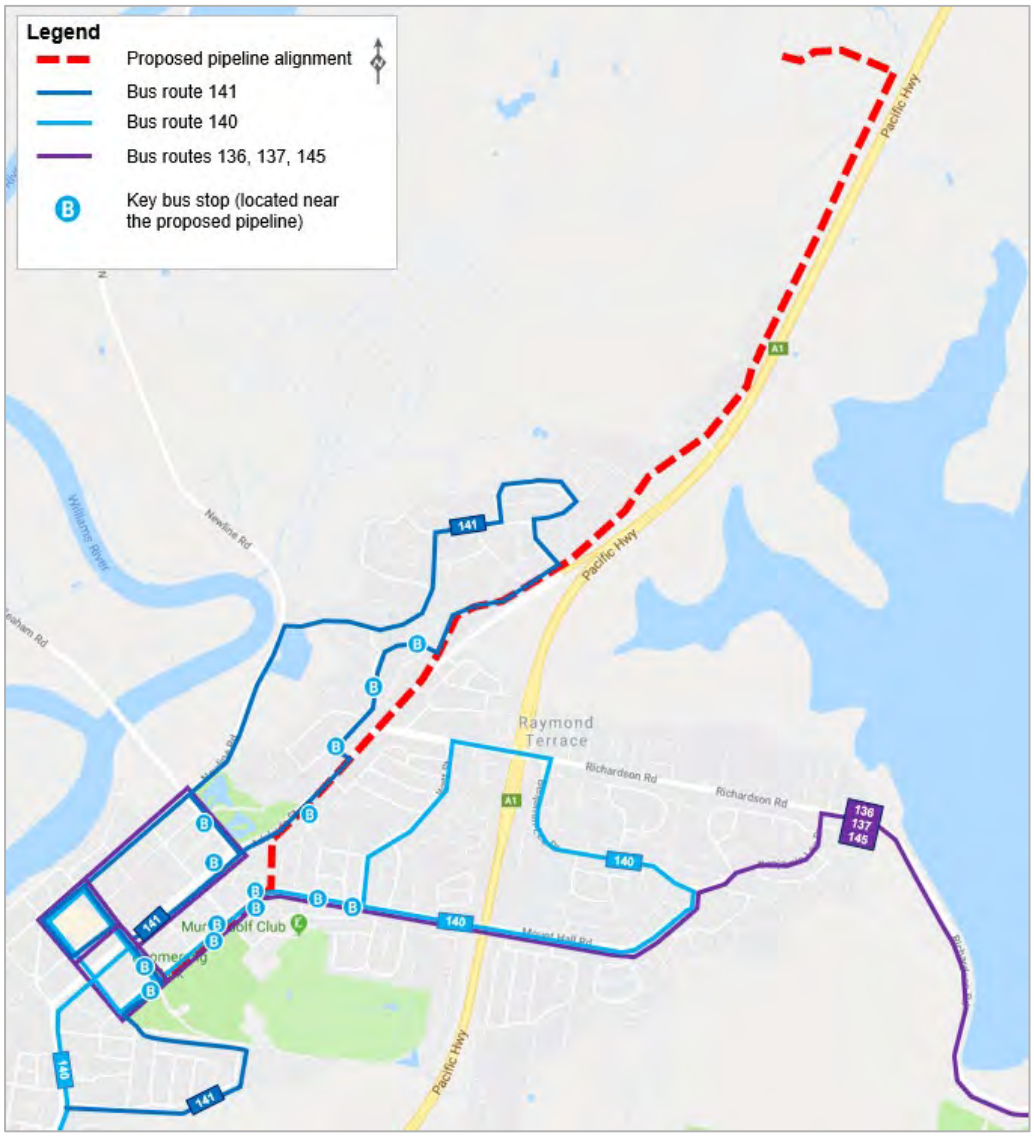


Figure 2-1 Bus routes servicing Raymond Terrace

Source: Transport for NSW bus timetables, valid from 22 July 2019, accessed 16 July 2019

2.2.1 School bus routes

Within Raymond Terrace, Hunter Valley Buses provide school bus services to primary and secondary schools. The following schools are located within the Proposal site and surrounds:

- Irrawang High School
- Irrawang Primary School
- St Brigid's Primary School
- Raymond Terrace Primary School
- Grahamstown Primary School.

The morning and afternoon school bus services are as per each school requires individually. However, due to the location of Irrawang Public School, St Brigid's Primary School and Raymond Terrance Public School, a large proportion of all school buses travel along Rees James Road, Adelaide Street or Irrawang Road to access the schools, and therefore need to be considered in determining the construction traffic impacts of the Proposal. While school buses servicing Grahamstown Public School and Irrawang High

School are not required to use the key roads potentially affected by construction traffic, a high proportion of school bus services use a route travelling via residential areas of Raymond Terrace. Figure 2-2 shows schools within Raymond Terrace that are serviced by school bus routes that may be affected by construction traffic generated by the Proposal.

Figure 2-2 Schools potentially impacted by construction traffic

Source: CDC Bus, Hunter Valley current school bus timetables, accessed 17 July 2019

2.2.2 Long distance coach services

Existing long-distance coach services that may be impacted by construction traffic have been identified based on data provided by Transport for New South Wales, as indicated in Table 2-3.

Table 2-3 Impacted long-distance coach services

Bus service	Weekday frequency (per direction)	Relevant roads
Route 100 – Port Stephens to Sydney Coach	• 1 service/ day	Adelaide Street

Bus service	Weekday frequency (per direction)	Relevant roads
Route 135 – Broadmeadow to Taree Coach	• 1 service/ day	Adelaide Street

2.3 Cycling network

Within Raymond Terrace, cycle paths are provided along Adelaide Street which provides a major north-south connection, and Richardson Road, which provides a major east-west connection across Raymond Terrace for residents. However, the dedicated cycle path on Adelaide Street stops short of the section where the pipeline is proposed. No dedicated cycle paths are provided at any section along the proposed alignment of the proposed pipeline. Figure 2-3 shows cycle paths within Raymond Terrace and the surrounding area.

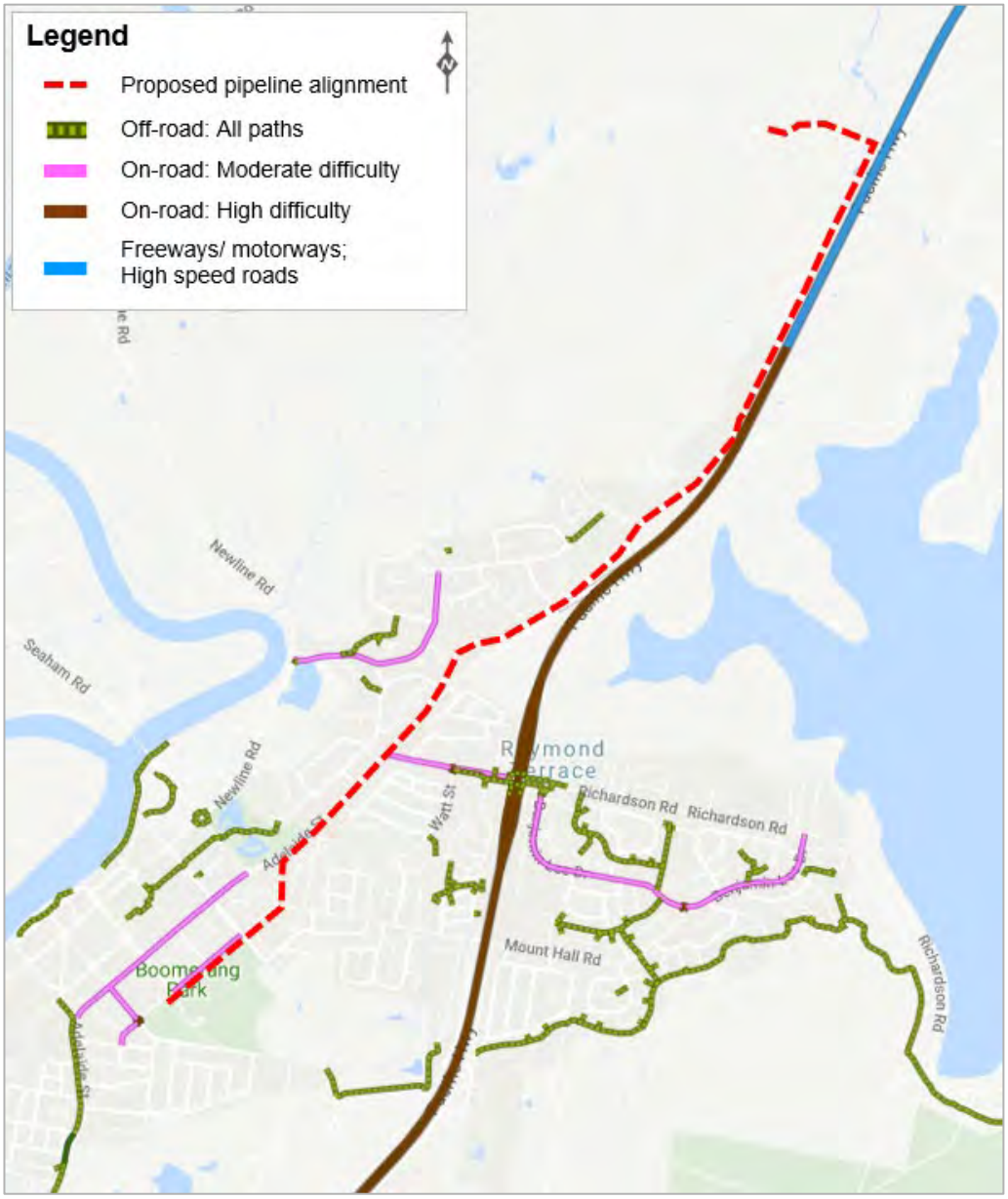


Figure 2-3 Cycle paths in Raymond Terrace and the surrounding area

Source: Roads and Maritime Services Cycleway Finder, last updated 8 June 2018, accessed 15 August 2019

2.4 Pedestrian infrastructure

The proposed construction vehicle route through to the Proposal site generally avoids the retail and dining areas within the town centre expected to generate the highest volumes of pedestrian traffic. Instead, it passes through predominately residential areas on Irrawang Street, Adelaide Street and Rees James Road.

The following pedestrian amenities are provided on key roads:

- No formal pedestrian footpaths are provided on Rees James Road, which runs parallel to the Pacific Highway, and provides access to low density residential dwellings. However, Rees James Road is not expected to service significant volumes of pedestrian traffic as its main use would be to provide a vehicular connection to roads that lead directly into the residential neighbourhood to the west
- Adelaide Street is generally well serviced by pedestrian footpaths on both sides of the road south of Kangaroo Street, and on the eastern side of the road north of Kangaroo Street. It provides pedestrian access to residential neighbourhoods in Raymond Terrace, as well as access to the retail and dining areas within the town centre. High volumes of pedestrian traffic are not expected along Adelaide Street north of William Bailey Street, due to the section servicing primarily low density residential dwellings
- Irrawang Street runs between Boomerang Park and St Brigid's Primary School and Catholic Church, and is affected by a school zone around William Street. A marked foot crossing is provided across Irrawang Street, north of William Street, and a pedestrian footpath is provided along the northern edge (opposite the park)
- Generally, the main generators of pedestrian traffic such as the retail and dining areas within the town centre are located outside of the areas affected by the Proposal. However, some pedestrian traffic can be expected across Irrawang Street near the proposed Access 5, due to its proximity to Boomerang Park.

2.5 Heavy vehicle routes

Within Raymond Terrace and the surrounding area, Pacific Highway, Richardson Road, and Adelaide Street (south of Richardson Road) are designated heavy vehicle routes for trucks up to 26 metres long. Pacific Highway, Richardson Road (west of the Pacific Highway) and Adelaide Street (south of Richardson Road) are designated routes for vehicles up to 4.6 metres high. Figure 2-4 shows the restricted access vehicle map within Raymond Terrace and the surrounding area.

Figure 2-4 Restricted access vehicle map around Raymond Terrace

Source: Roads and Maritime Services Restricted Access Vehicles Map, valid as of 25 July 2019, accessed 15 August 2019

2.6 Traffic data collection

Traffic data was collected from two sources, which included 15-minute spot surveys at key intersections around the Proposal site, and midblock survey data from Port Stephens Council (Council).

Spot surveys were conducted on Monday 22 July 2019 at the following intersections, expected to be impacted by construction traffic:

- I-1: Pacific Highway/ Access road (2.36pm – 2.51pm)
- I-2: Rees James Road/ Link to Pacific Highway (3.18pm – 3.33pm)
- I-3: Rees James Road/ Adelaide Street (3.01pm – 3.16pm)
- I-4: Richardson Road/ Adelaide Street (3.58pm – 4.13pm)
- I-5: Irrawang Street/ William Street (3.40pm – 3.55pm).

The purpose of the spot survey was to ascertain the magnitude of background traffic demand traversing through key intersections that have been identified as potentially impacted by construction traffic generated by the Proposal. The surveys were conducted for 15-minutes of a normal weekday during the off-peak period (2pm to 3pm), noting turning movements at each location.

MetroCount data was also requested from Port Stephens Council. Around Raymond Terrace and the Proposal site, midblock traffic survey data was available for Adelaide Street, east of Rees James Road as shown in Figure 2-5. 24-hour traffic volumes and travel speeds were recorded for the period between 1 July 2011 and 27 July 2011.

The available MetroCount midblock hourly traffic data was used as a basis to estimate peak hourly traffic at the key intersections, where short term spot survey intersection counts were conducted. This provides a high-level estimation of the traffic flows throughout the network.

Figure 2-5 shows the locations of the available intersection and midblock survey data.

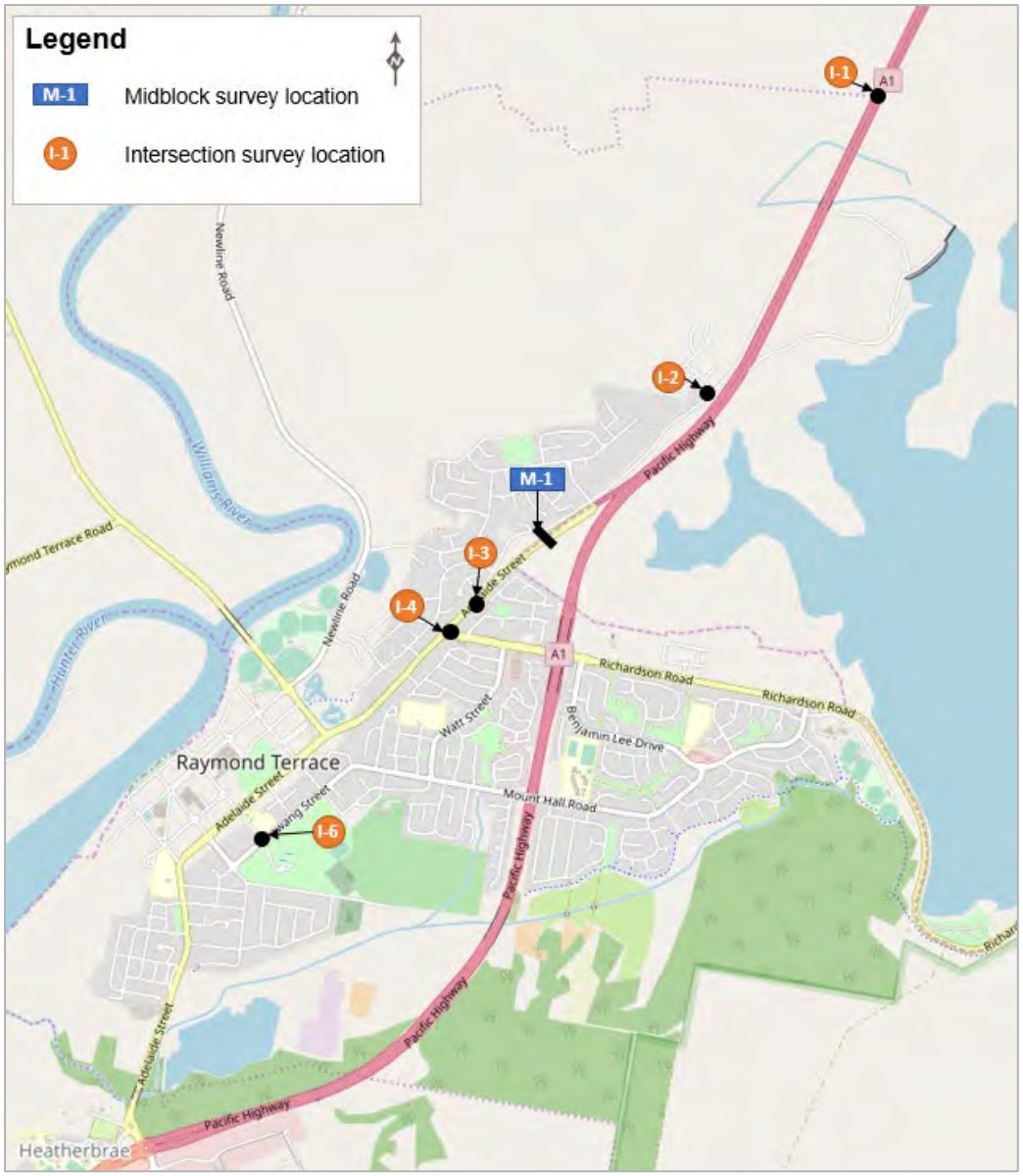


Figure 2-5 Traffic survey locations

2.6.1 Peak hour background traffic estimation process

The 15-minute spot survey counts were converted to representable peak hour counts by means of the following process:

1. Firstly, an hourly volume was derived by means of the following equation in accordance with the *Highway Capacity Manual*, 2010:

   $$PHF = V/(4 \times V15)$$

   Where:

   PHF = Peak hour factor (assumed to be 0.95)

   V = Hourly volume (vehicles per hour [veh/h])

   V15 = Volume during the 15 minutes of analysis hour

2. Secondly, as the volumes would only represent hourly volumes, factors were applied to convert the hourly volumes into AM peak and PM peak hour representable volumes. This was done by deriving a conversion factor based on the ratio between the off-peak hourly volumes (occurring during the hour starting at 2pm) and AM and PM peak volumes of the background traffic data provided by Council. As this data from council is only provided for one location (Adelaide Street) it was assumed to apply the factors to all intersections. This can be equated as:

   $$HTCF = \frac{PHV}{OPV}$$

   Where:

   HT_{CF} = Hourly traffic conversion factor

   PHV = Peak hourly volume (veh/h)

   OPV = Off peak volume (veh/h)

2.7 Intersection traffic flows

Peak hour traffic volumes estimated through the peak hour background traffic estimation process are provided in traffic volume stick diagrams in **Appendix A**. Figure 3-2 shows the proposed locations of new construction vehicle accesses. A summary of the existing peak hour traffic volumes is as follows:

- The Laydown Access Road, providing a connection to Access 1, is estimated to service through traffic volumes of about eight vehicles per hour in the AM peak, and 14 vehicles per hour in the PM peak
- Rees James Road around the proposed Access 2 location services about 21 through vehicles in the AM peak and 55 through vehicles in the PM peak hour
- Rees James Road around the proposed Access 3 and 4 locations service about 67 through vehicles in the AM peak and 120 through vehicles in the PM peak hour
- Irrawang Street around the proposed Access 5 location services about 210 through vehicles in the morning peak and 378 through vehicles in the afternoon peak hour.

3 DEVELOPMENT DETAILS

3.1 Development layout

The Kings Hill Development proposal stretches approximately 6.7 kilometres (the Proposal Site) between Raymond Terrace in the south, and Kings Hill URA in the north. Figure 3-1 illustrates the proposed layout plan with the location of proposed compound areas, alignment of pipeline and associated infrastructure.

Figure 3-1 Kings Hill water and wastewater infrastructure

3.2 Preliminary construction plan

3.2.1 Scheduling and staging

Construction for the Proposal would be likely to begin in the first quarter of the year 2020 and last approximately 9 months. Construction would be likely to occur concurrently in multiple decentralised work zones, and as such work would be at various stages at different points within the Proposal site. Construction in the vicinity of Adelaide Street between William Bailey Street and the Sleepy Hill Motor Inn, as well as construction through Newbury Park would occur between March and August of 2020 only. Construction along the remainder of the alignment would occur year-round.

The final construction program would be determined prior to construction and be subject to the timing of the Kings Hill URA development (separate approvals and market demands).

An indicative sequence of construction is provided in Table 3-1. The construction works have been divided into seven 'works stages', which are interrelated and would potentially overlap. Subject to confirmation from the construction contractor, the order and staging of these construction works periods may change.

Table 3-1 Indicative sequencing of construction works

Works stage	Description
1. Site establishment	• Establishment of formal site access • Establishment of construction compounds and stockpile areas • Installation of construction environmental management measures (e.g. erosion and sediment control) • Delivery of site materials • Installation of site fencing • Survey of alignment and placement of alignment pegs.
2. Vegetation clearing	• Tree protection areas established ("no-go" zones) • Clearing of groundcover and vegetation within the construction footprint and compound areas • Stockpiling of topsoil in compound areas for reuse throughout construction
3. Trenching and underboring	• Excavation of trench • Dewatering of open trench, if necessary • Management of acid sulphate soils • Underboring in certain locations. This process would generally include: – Excavating launch and retrieval pits – Erect under bore rig – Pilot bore – Bore and drag the casing. • Excavated material and topsoil would be stockpiled for reuse or disposed of appropriately if contaminated.
4. Installation of water and wastewater pipelines	• Bedding material placed at the bottom of the trench • Laying of pipes • In the case of under bored areas, pipe would be fed through the casing, the annulus would be grouted, and the pipe would be connected.
5. WWPS construction	• Excavation of a pit and placement of appropriate foundations in the base of the pit • Management of acid sulphate soils

Works stage	Description
	• Dewatering of pit, if necessary • Construction of the concrete wet well • Mechanical installation of pumps, valves and fittings • Installation of electrical components • Construction of adjacent hardstand area.
6. Connection to existing HWC infrastructure	• Commissioning of proposed pipelines • Connection to live water and wastewater systems
7. Site restoration	• Backfill trench using stockpiled excavated material and topsoil • Landscaping and restoration of surfaces to pre-construction condition where practicable • In the case of under bored areas, backfill the launch and retrieval pits • Removal of construction environmental management measures where not required for operation.

3.2.2 Plant and equipment

A range of plant and equipment would be required for the construction of the Proposal. This includes, but is not limited to:

- Excavators
- Tipper trucks
- Light vehicles
- Flat-bed delivery trucks
- Rollers
- Skid steers
- Street sweepers
- Water carts
- Boring machines
- Jackhammers
- Mobile cranes
- Backhoes
- Compactor
- Concrete agitators (or similar)
- Concrete pumps
- Concrete saws
- Air compressors
- Dozers
- Mulchers
- Piling rigs
- Forklifts
- Small earthmoving equipment

- Welder.

3.2.3 Compound areas

A minimum of 5 compounds would be established. These compound areas would be set up during the site establishment stage and would be utilised throughout the construction of the Proposal. The primary compound area would be located within KHD-owned land at the northern extent of the Proposal. Secondary compounds would be located on Hunter Water Corporation-owned land south of Grahamstown Spillway, Rees James Road near Kuranga Avenue, land between Rees James Road and Adelaide Street and adjacent to the existing water pump station on Irrawang Street. The location of the compound areas is illustrated in Figure 1-1.

It is anticipated that the compound areas would generally include, but not be limited to, the following:

- Site shed (office) and amenities
- Staff parking areas
- Equipment storage
- Laydown areas for construction materials (e.g. pipes, fittings, pre-cast concrete components)
- Stockpiling of excavated materials and soil
- Bunded chemical and/or fuel storage areas.

Additional compound areas may be required during construction of the Proposal. The location of these would be determined prior to and during construction. To ensure that associated impacts are minimised, any compound areas would comply with the following criteria for site selection:

- Readily available access to the local road network
- Relatively level land
- Greater than 50 metres from a watercourse
- Greater than 50 metres from threatened species and endangered ecological communities
- Greater than 100 metres from a residential dwelling
- No requirement to remove any native vegetation
- No impact on any heritage items (Indigenous or non-Indigenous)
- Not unreasonably affect the land use of adjacent properties.

Compound areas would be temporary in nature and removed from site upon completion of the works.

3.2.4 Construction hours and workforce

3.2.4.1 Construction hours

The proposed working hours for construction activities (including the delivery of plant and equipment) would be limited to recommended standard hours outlined by *Interim Construction Noise Guideline* (former Department of Environment & Climate Change, 2009) for most of the works, where feasible and reasonable. These standard construction hours are:

- Monday to Friday: 7am to 6pm
- Saturday: 8am to 1pm
- Sunday and public holidays: No work.

In addition to the above, outside of hours works may also include:

- Any works which would not result in audible noise emissions at any nearby sensitive receptors or an outside of hours noise protocol would be prepared

- The delivery of oversized plant and/or structures for which police or other authorities require special arrangements to transport along public roads
- Emergency work to avoid the loss of lives, property and/or to prevent environmental harm
- Maintenance and repair of public infrastructure where disruption to essential services and/or consideration of worker safety do not allow work within standard construction hours
- Public infrastructure works that shorten the length of the project and are supported by noise-sensitive receivers
- Construction works where it can be demonstrated and justified that these works are required to be undertaken outside of standard construction hours (e.g. during connection of water and wastewater infrastructure when shutdowns are necessary).

Extended hours could include the above works and any the considered suitable may be undertaken 24 hours, six days a week.

3.2.4.2 Construction workforce

It is anticipated that up to 55 personnel would be required during the construction of the Proposal. The total construction workforce would include (but not be limited to) the following:

- Tradespeople and construction personnel
- Sub-contractor construction personnel
- Engineers
- Functional and administrative staff.

The construction compounds would consist of a central site shed with approximately five decentralised work zones of which three would be in operation at any one time. Approximately four to five people would be anticipated at the site shed, and six to 10 people at each work zone. Therefore, up to 35 people would be anticipated on site at any one time.

3.2.5 Earthworks

The Proposal would require the excavation of approximately 78,000 cubic metres of excavated material and topsoil during trenching and under boring. Where practicable and subject to its suitability, excavated soil would be reused on-site for foundation preparation, levelling works, access track maintenance and backfilling of trenches and boring pits at the completion of construction.

Excavated soil which is not considered suitable for re-use on site would be temporarily stockpiled within the compound area and then transferred off site. All soil to be transferred off site would be tested and deposited at a suitable collection facility based on its determined category. Fill would be imported to site as required.

Excavated material and topsoil would be stockpiled within designated compound areas. Stockpiling may also occur in the vicinity of the trench within the construction footprint of the Proposal. The stockpiles would be temporary in nature and would be removed at the completion of construction.

3.3 Preliminary operational plan

Table 3-2 provides a description of indicative operational works associated with the Proposal.

Table 3-2 Indicative operational works

Work stage	Description
1. Routine delivery of water	▪ The Proposal would be expected to deliver approximately 1080 megalitres of water to Kings Hill URA per year
2. Routine pumping of wastewater	▪ The Proposal would be expected to pump approximately 1420 megalitres of wastewater away from Kings Hill URA per year
3. Inspection and maintenance of water and wastewater pipelines	▪ Routine maintenance and inspections would be carried out at o Valve, hydrant and/or scour locations o Chlorine injection point o The WWPS ▪ This would occur sporadically throughout the year, or as required in the instance a fault is detected ▪ 1 to 5 personnel expected per inspection/ maintenance activity
4. Inspection and maintenance of chlorine injection point	
5. Inspection and maintenance of the WWPS	

3.4 Project traffic generation

The following sub-section of the report provides details regarding estimated construction and operational generated traffic as a result of the proposed development.

3.4.1 Construction traffic generation and peak periods

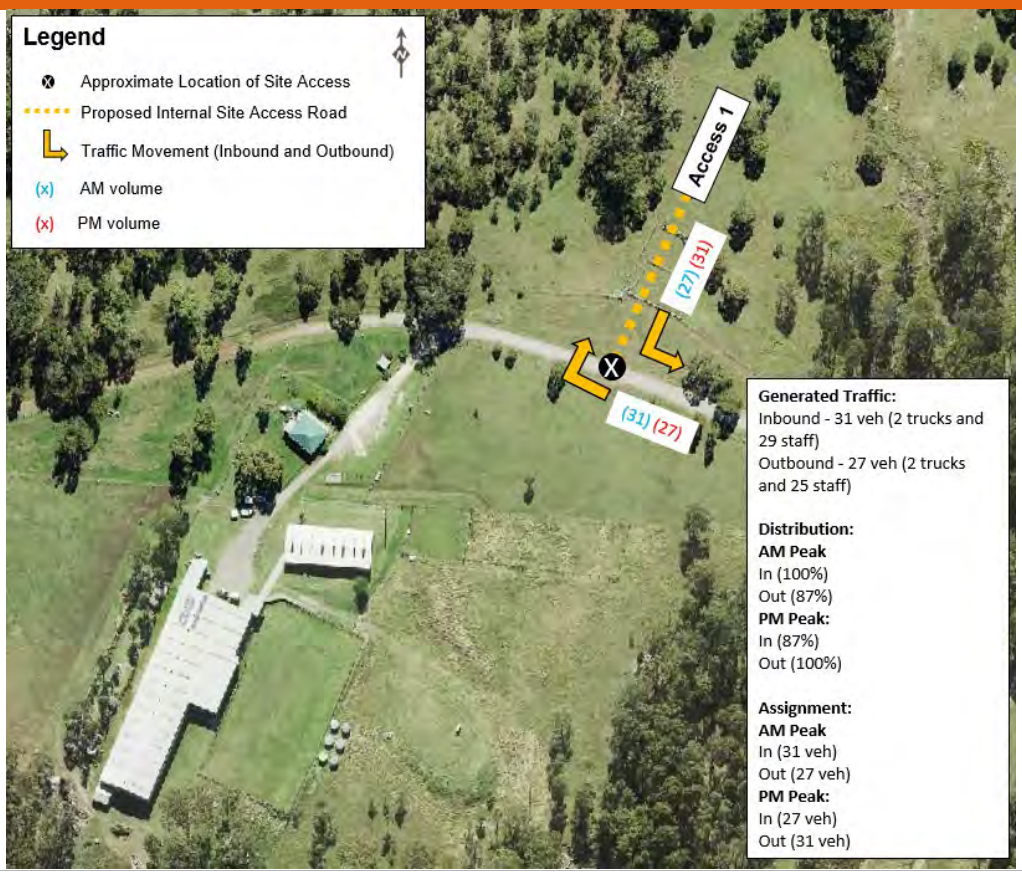
The construction of the Proposal would generate staff and heavy vehicle (material delivery) trips on a daily basis over the course of the construction period. Up to 55 workforce staff would be employed during the construction period, with the potential for up to 35 staff to be on-site (i.e. within the work-zone) at any given time or day throughout the construction period. In addition, trucks bringing materials to the site are estimated at 25 trucks per day the for the construction period. Given the construction work hours it is assumed that an average distribution of two trucks will be generated per hour, coinciding with background AM and PM peak hour traffic.

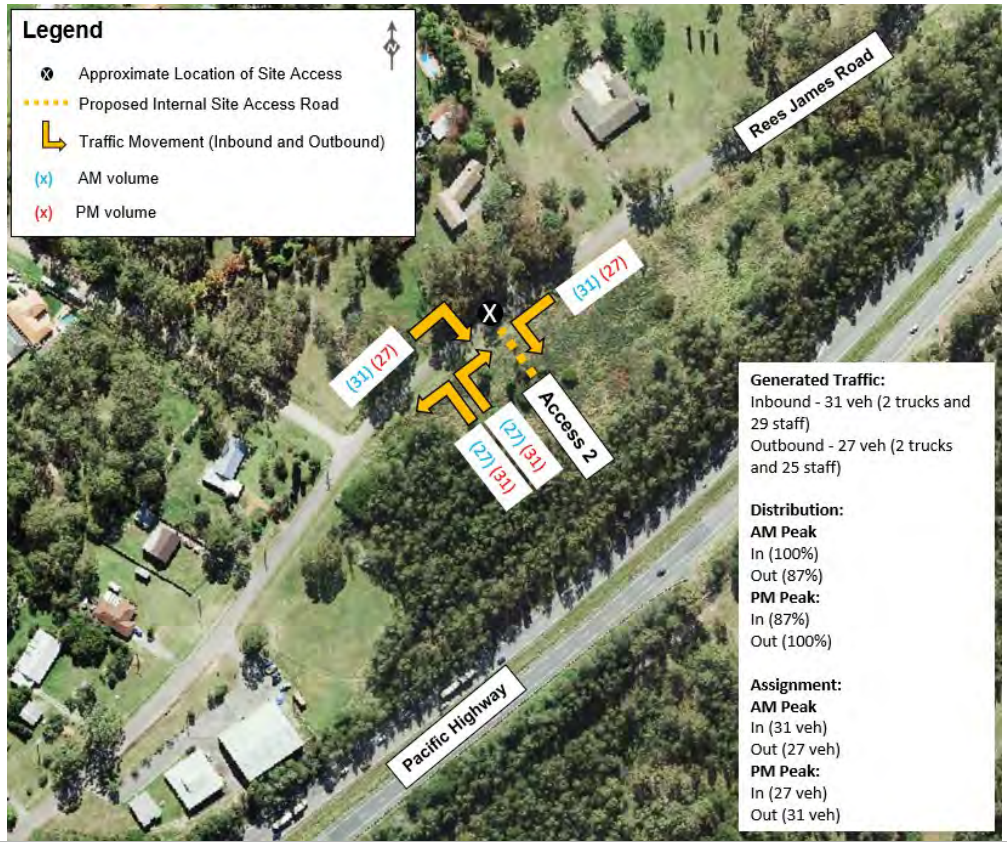
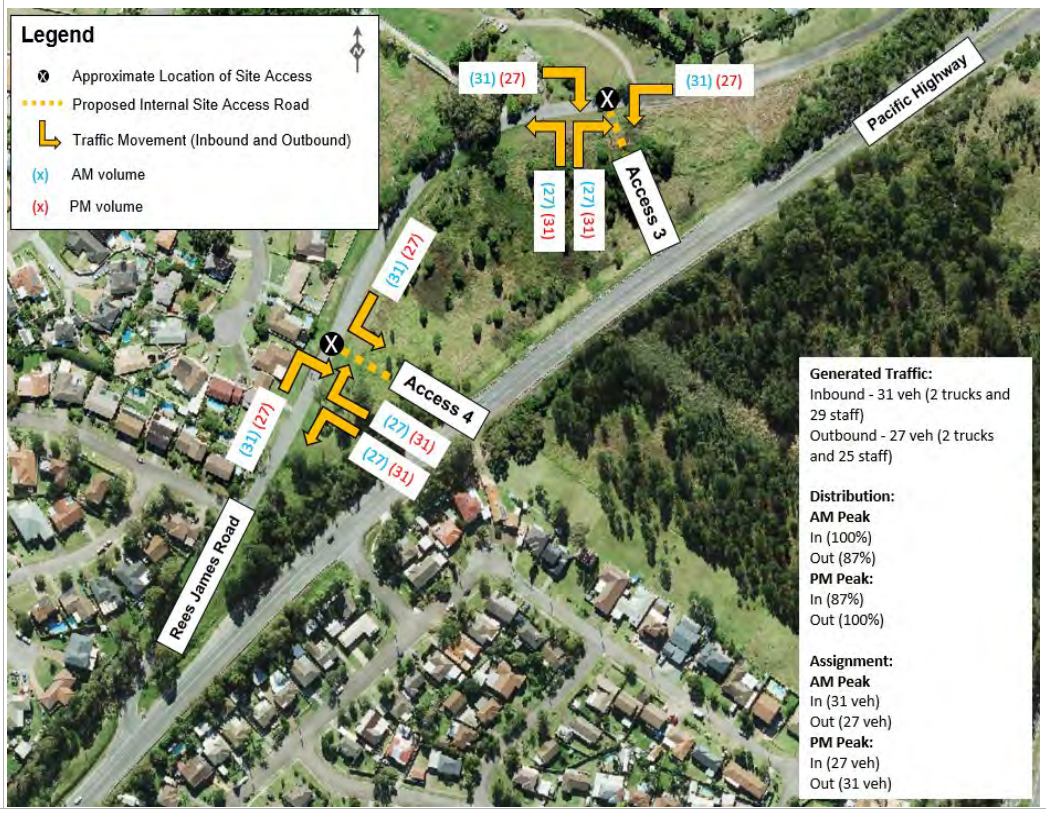
Up to 35 workforce staff would be on site at any given time, as such a daily construction staff generation of 29 vehicle trips (35 divided by an average car occupancy of 1.2 people per vehicle) are assumed. All workforce staff are assumed to be traveling from home to the primary compound area (i.e. the site office) in the morning and then vice versa after the end of each workday.

It is also assumed that workforce would arrive to the site office in the morning, travelling to three work zones consisting of 10 people per work zone, and then back to the site office at the end of the workday. This would generate about 25 vehicle trips (30 divided by an average car occupancy of 1.2 people per vehicle). The remaining vehicles that arrive in the AM assumes that five personnel will remain at the site office. Given the construction work hours (7am to 6pm), it is assumed that these trips would occur outside of normal commuter peaks, however for the purpose of this assessment and to be conservative it was assumed that these trips will coincide with background peak traffic. It should be noted that the trip patterns might change from the assumed, should more detailed construction scheduling information become available closer to the construction stage. It is recommended that the trip patterns be updated and captured accordingly within a detailed Construction Traffic Management Plan.

Due to the preliminary nature of the assessment and the details of construction movements not yet confirmed, construction traffic could occur at any given location and at any given time throughout the construction period. Therefore, to provide a conservative analysis, it is assumed that all construction generated traffic would impact the site compound and stockpiling accesses, intersections and road links at any given point in time. All peak hour construction traffic is therefore assigned to all movements at the proposed construction access locations as a worst-case scenario. The movement-based trip distribution and assignment for both AM and PM peaks is provided in Table 3-3. The difference in directional distribution would mainly account for the workforce traffic (four cars) remaining at the site office. The estimated two peak hour heavy vehicles would travel to and from the compound/stockpiling areas to transport material to and from the site. No differentiation has been made between material which might be stockpiled along the trench, as it is assumed as worst case that the heavy vehicle generated traffic accounts for all material to be stockpiled at the compound areas. Hence, it is assumed that 100 per cent of construction traffic would be travelling inbound (29 workforce vehicles plus two heavy vehicles) and 87 per cent then back in the outbound direction (25 workforce vehicles plus two heavy vehicles).

Table 3-3 Trip Distribution and Assignment (Worst Case Scenario)

Access	Trip Distribution
1	

Access	Trip Distribution
2	
3	

Access	Trip Distribution
4	

3.4.2 Operational phase

3.4.2.1 Maintenance vehicle movements

During operation of the Proposal (i.e. following the completion of the construction stage), the estimated workforce would consist of a small number of workers (i.e. approximately 1-5 staff per maintenance activity). In a worst-case scenario if all workers travel alone, this would equate to 5 (two way) vehicle trips per day to do the required maintenance works. It is not expected that there would be any heavy vehicle movements during the operational stage of the Proposal. It is considered that operational generated traffic would be negligible from a traffic engineering or transport planning perspective and that further analysis of the operational stage would not be required.

3.5 Vehicle access

Access to the site compound areas are proposed to be obtained from the roads as indicated in Table 3-4. Details are also provided regarding the proposed access type, requirements for use and location co-ordinates.

Table 3-4 Site Access Details

Access No.	Co-Ordinates / Approximate Chainage	Location	Access Type	Description of access requirements during construction
1	32°43'29.64"S 151°47'0.24"E	Laydown Access Road, 250m west of the Pacific Highway	Temporary Access	Delivery of construction materials (e.g. pipes, fittings, pre-cast concrete components), Stockpiling of excavated materials and soil, workforce movements
2	32°44'35.16"S 151°46'22.44"E	Rees James Road, about 85m north of Kuranga Avenue		
3	32°44'56.04"S 151°45'48.60"E	Rees James Road, 325m north of Alton Road		
4	32°45'0.36"S 151°45'42.84"E	Rees James Road, 115m north of Alton Road		
5	32°45'55.80"S 151°44'46.32"E	Irrawang Street, 25m south of William Street		

The proposed access locations are illustrated in Figure 3-2.

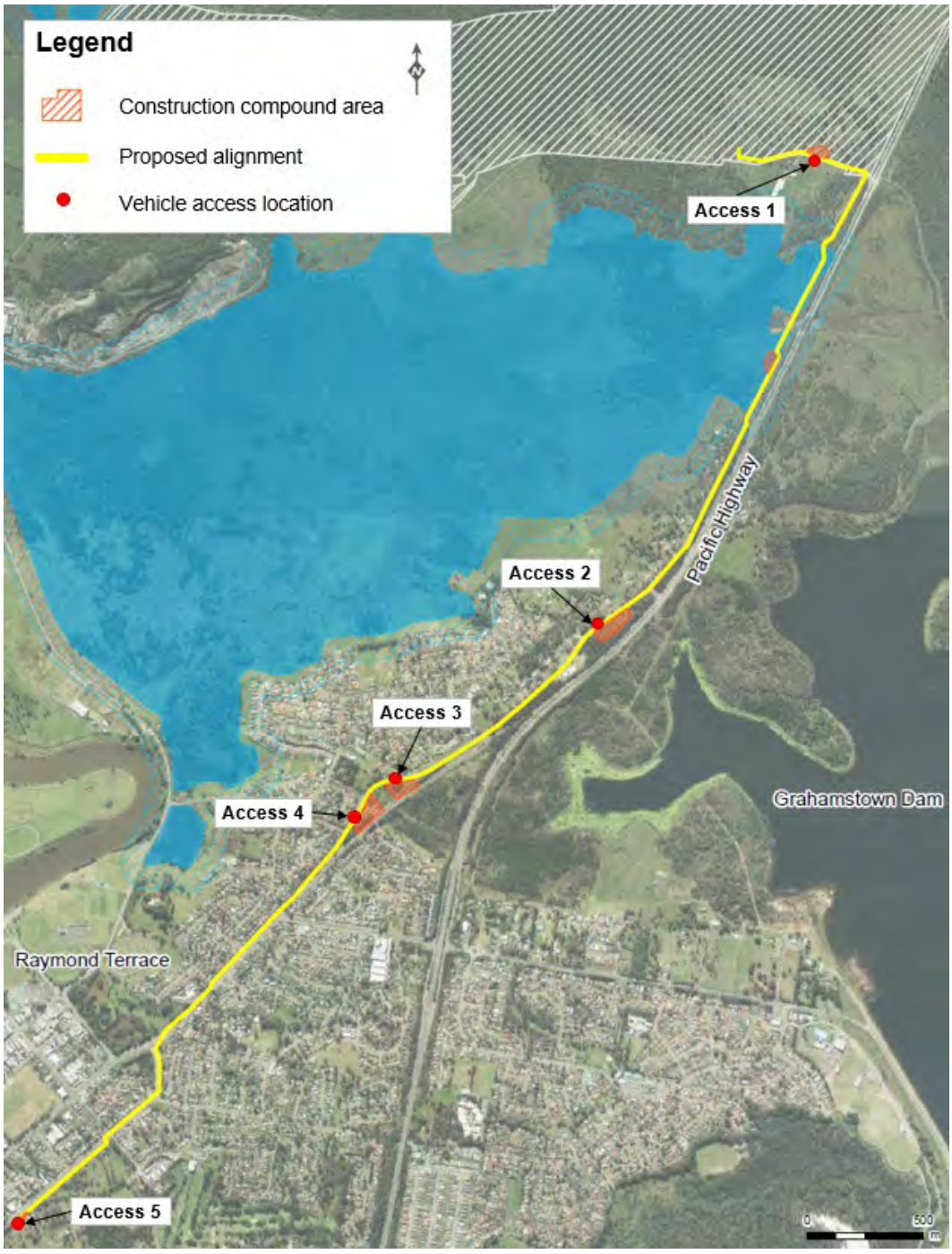


Figure 3-2 Location of Accesses

3.6 Parking provision

It is proposed that temporary staff parking be provided at each work zone. Given the linear alignment of the pipeline and construction work, it is assumed that workers will park within the vicinity of the construction footprint and walk to where construction activities occur. It is recommended that parking on local residential street be avoided. It is also recommended that parking opportunities be recorded within a detailed Construction Traffic Management Plan which also designates parking locations to be used during the construction stage.

4 IMPACT ASSESSMENT

4.1 Intersection impact assessment

At unsignalised intersections with minor roads, where there are relatively low volumes of through and turning vehicles, capacity considerations are usually not significant, and detailed analysis of capacity is not warranted. As a guide, at volumes below the following combinations of maximum hourly volumes at a cross intersection with a two-lane two-way road, capacity analysis is not warranted:

- Major road 400 vehicles per hour, minor road 250 vehicles per hour
- Major road 500 vehicles per hour, minor road 200 vehicles per hour
- Major road 650 vehicles per hour, minor road 100 vehicles per hour.

Comparison between these threshold volumes and the peak hourly volumes on the key roads (**Appendix A**) indicates that the existing traffic volumes on some of the roads are below the threshold volumes above, and as such, there is no capacity concerns regarding the operation of those intersections, however volumes at some of the intersections exceed the thresholds and were further evaluated through a capacity analysis. These intersections include:

- Intersection 1: Pacific Highway/ Laydown Access Road
- Intersection 4: Adelaide Street/ Richardson Road
- Intersection 5: Irrawang Street/ William Street

4.1.1 Analysis criteria

An increase in vehicles through an intersection as a result of the development will likely increase traffic delays. Increases in delays have an economic and social impact on the community through increased travel times, driver impatience (potentially leading to crashes) and the associated economic cost of these delays to private and commercial / heavy vehicle trips. The following input types were taken into consideration as a basis to evaluate existing intersection performance:

- Existing intersection geometry and lane configuration data
- Existing traffic signal phasing and sequence data where required
- Vehicle movement data
- Peak hour traffic volume data

A growth rate of two per cent per annum was applied to the spot counts collected in 2019 to forecast background traffic in 2020, selected due to the urban nature of the area.

The delay-based analysis criteria adopted for the purposes of this assessment are provided in Table 4-1, which is in accordance with the accepted Roads and Maritime method of delay for intersection operation. The table indicates the level of service (LOS) by intersection control type associated with a respective delay per vehicle measured in seconds. A LOS of D or better is generally considered acceptable operation.

Table 4-1 Intersection Analysis Criteria

Level of service	Average delay (sec)	Stop, give way or yield signs	Traffic signals and roundabouts
A	<14	Good operation	Good operation
B	15 to 28	Acceptable delays and spare capacity	Good operation with acceptable delays
C	29 to 42	Satisfactory but accident study required	Satisfactory

Level of service	Average delay (sec)	Stop, give way or yield signs	Traffic signals and roundabouts
D	43 to 56	Near capacity, crash study required	Operating near capacity
E	57 to 70	At capacity requires other control mode	At capacity, at signals, incidents will cause excessive delays
F	>70	At capacity with long delays	At capacity with long delays

LOS is defined in terms of service measures such as speed and travel time, freedom to manoeuvre, traffic interruptions, comfort and convenience. The practical application of LOS to different road environments accounts for factors such as road hierarchy, volume/capacity ratios, terrain types, proportion of heavy vehicles and road gradients. The methodology and LOS criteria were obtained from the *Guide to Traffic Management Part 3: Traffic Studies and Analysis and Highway Capacity Manual 2016*. Each LOS represents a range of operating conditions and the driver's perception of those conditions, and can generally be described as:

- LOS A: Condition of free flow in which individual drivers are virtually unaffected by the presence of others in the traffic stream. Freedom to select desired speeds and to manoeuvre within the traffic stream is extremely high, and the general level of comfort and convenience provided is excellent.
- LOS B: Within the zone of stable flow and drivers still have reasonable freedom to select their desired speed and to manoeuvre within the traffic stream, although the general level of comfort and convenience is a little less than with level of service A.
- LOS C: Within the zone of stable flow, but most drivers are restricted to some extent in their freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience declines noticeably at this level.
- LOS D: Close to the limit of stable flow and is approaching unstable flow. All drivers are severely restricted in their freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience is poor, and small increases in traffic flow will generally cause operational problems.
- LOS E: Occurs when traffic volumes are at or close to capacity, and there is virtually no freedom to select their desired speeds and to manoeuvre within the traffic stream. Flow is unstable and minor disturbances within the traffic stream will cause flow breakdown.
- LOS F: Within the zone of forced flow. With it, the amount of traffic approaching the point under consideration exceeds that which can pass it. Flow breakdown occurs, and queuing and delays result.

Colours adopted to represent the various LOSs are illustrated in Table 4-2.

Table 4-2 LOS colour coding

LOS A
LOS B
LOS C
LOS D
LOS E
LOS F

4.1.2 Intersection impact analysis results

The intersection analysis has been conducted for the following scenarios:

- Scenario 1: Existing conditions (geometry and control) – Future base year 2020 intersection analysis results, AM peak hour without construction traffic
- Scenario 2: Existing conditions (geometry and control) – Future base year 2020 intersection analysis results, PM peak hour without construction traffic
- Scenario 3: Existing conditions (geometry and control) – Future base year 2020 intersection analysis results, AM peak hour with construction traffic
- Scenario 4: Existing conditions (geometry and control) – Future base year 2020 intersection analysis results, PM peak hour with construction traffic

Intersection analysis was conducted using Sidra Intersection Version 8 traffic analysis software suite. The analysis was done for the construction year 2020 to determine the operational impacts the envisaged construction traffic volumes would have on existing intersection operations. The future base year 2020 analysis results representing existing conditions "without" construction traffic for the AM peak hour and PM peak hour are provided in Table 4-3 and Table 4-4 respectively.

Table 4-3 Scenario 1: Existing conditions (geometry and control) – Future base year 2020 intersection analysis results, AM peak hour without construction traffic

Intersection	Existing conditions			
	Queue length (m)	Average delay (s)	Degree of saturation	Level of service (1)
Intersection 1: Pacific Highway/ Laydown Access Road	0	16	0.156	B
Intersection 4: Adelaide Street/ Richardson Road	27	9	0.479	A
Intersection 5: Irrawang Street/ William Street	1	5	0.059	A

Note (1): The level of service is based on the worst movement of the intersection.

It is evident from the analysis results in Table 4-3 that even for the worst movements, the intersections operate within acceptable levels of delay during forecast AM peak base conditions without the addition of construction traffic volumes.

Table 4-4 Scenario 2: Existing conditions (geometry and control) – Future base year 2020 intersection analysis results, PM peak hour without construction traffic

Intersection	Existing conditions			
	Queue length (m)	Average delay (s)	Degree of saturation	Level of service (1)
Intersection 1: Pacific Highway/ Laydown Access Road	2	58	0.282	E
Intersection 4: Adelaide Street/ Richardson Road	164	12	0.887	A
Intersection 5: Irrawang Street/ William Street	3	6	0.107	A

Note (1): The level of service is based on the worst movement of the intersection.

Results from Table 4-4 indicate that Intersection 1 (Pacific Highway / Laydown Access Road) is estimated to experience delays of 58 seconds and subsequent LOS E for the worst movement, which is attributed to the right turn movement from the Laydown Access Road to the Pacific Highway during the PM peak. It is considered that these delays are manageable.

The future base year 2020 analysis results based on existing conditions "with" construction traffic for the AM peak hour and PM peak hour are provided in Table 4-5 and Table 4-6.

Table 4-5 Scenario 3: Existing conditions (geometry and control) – Future base year 2020 intersection analysis results, AM peak hour with construction traffic

Intersection	Proposed conditions			
	Queue length (m)	Average delay (s)	Degree of saturation	Level of service (1)
Intersection 1: Pacific Highway/ Laydown Access Road	3	19	0.156	B
Intersection 4: Adelaide Street/ Richardson Road	28	9	0.494	A
Intersection 5: Irrawang Street/ William Street	2	5	0.073	A

Note (1): The level of service is based on the worst movement of the intersection.

It is evident from the analysis results in Table 4-5 that even for the worst movements, the intersections operate within acceptable levels of delay during existing conditions without the addition of construction traffic volumes.

Table 4-6 Scenario 4: Existing conditions (geometry and control) – Future base year 2020 intersection analysis results, PM peak hour with construction traffic

Intersection	Proposed conditions			
	Queue length (m)	Average delay (s)	Degree of saturation	Level of service (1)
Intersection 1: Pacific Highway/ Laydown Access Road	16	114	0.652	F
Intersection 4: Adelaide Street/ Richardson Road	171	12	0.923	A
Intersection 5: Irrawang Street/ William Street	3	7	0.107	A

Note (1): The level of service is based on the worst movement of the intersection.

Results from Table 4-6 indicate that Intersection 1 (Pacific Highway / Laydown Access Road) is estimated to experience delays of around 114 seconds and subsequently operate at LOS F for the worst movement, which is the right turn movement from the Laydown Access Road to the Pacific Highway when construction traffic is introduced during the PM peak. It is considered that these delays are manageable. However, drivers experiencing long delays could potentially become impatient and turn within insufficient gaps which may have an increased safety risk.

The remainder of the intersections would operate within acceptable levels of delay even for the worst movement when construction traffic is introduced during the PM peak.

The key findings of the construction phase intersection impact assessment are:

- The Adelaide Street/ Richardson Road and Irrawang Street/ William Street intersections would operate within acceptable LOS and delay during both AM and PM peak periods with the introduction of construction traffic.
- The Pacific Highway/ Laydown Access Road intersection would operate at LOS E (delays of 58 seconds) during the PM peak without construction traffic, and LOS F (delays of 114 seconds) during the PM peak with the added construction traffic volumes. This however accounts for the

worst movement, which is the right turn movement from the Laydown Access Road to the Pacific Highway. However, the average delay for the intersection in total is estimated to be 2.4 seconds during the PM peak with construction traffic. It is evident that the intersection would operate at high levels of delay during base conditions in the year 2020 even without additional construction generated traffic. Thus, intersection upgrades are therefore not considered to resolve existing and induced delays resulting from construction generated traffic, as these delays would be short term given the construction schedule. It is anticipated that existing conditions of vehicle delay for the right turn movement would prevail after completion of the construction period which would remain unsatisfactory. It is therefore recommended that traffic management measures be put in place for the duration of construction to manage delays such as avoiding travel of staff during peak background traffic hours and should be detailed in a final TMP prior to construction.

- It should also be noted that these results account for the most conservative scenario, however it is likely that workforce travel will occur outside of these peak hours and even less of an impact can be expected.
- It is considered that the proposed construction generated traffic would have a minimal impact on the existing surrounding road network and that safety would not be compromised as a result of the Proposal.

Detailed movement summary reports of the analyses are provided in **Appendix C** and **Appendix D**.

4.2 Access and frontage

4.2.1 Turn warrants assessment

An assessment has been undertaken of the appropriate treatments for the 5 access points proposed for construction vehicles, based upon the provisions of *Austroads Guide to Road Design - Part 4A: Unsignalised and Signalised Intersections, Section 4.8 (Warrants for BA, AU and CH Turn Treatments)*. The forecast turning movement volumes for the 5 intersections shown in **Appendix A** have been used as the basis of this assessment, with figures recording the results of this assessment shown in **Appendix B**.

Due to the preliminary nature of the assessment and the details of construction movements not yet confirmed, a conservative assessment was conducted in assessing the necessary treatment options. A worst-case scenario was considered, where all accesses were tested with the assumption of all construction vehicles entering and exiting in the same hour.

Based on the expected peak hour traffic volumes, the turn warrants assessment shows that a basic left turn (BAL) treatment and basic right turn (BAR) treatment at each intersection would be sufficient for the access points to all five compounds. Upgrade works are therefore not required.

Figure 4-1 shows basic turn treatments applied to intersections in urban areas.

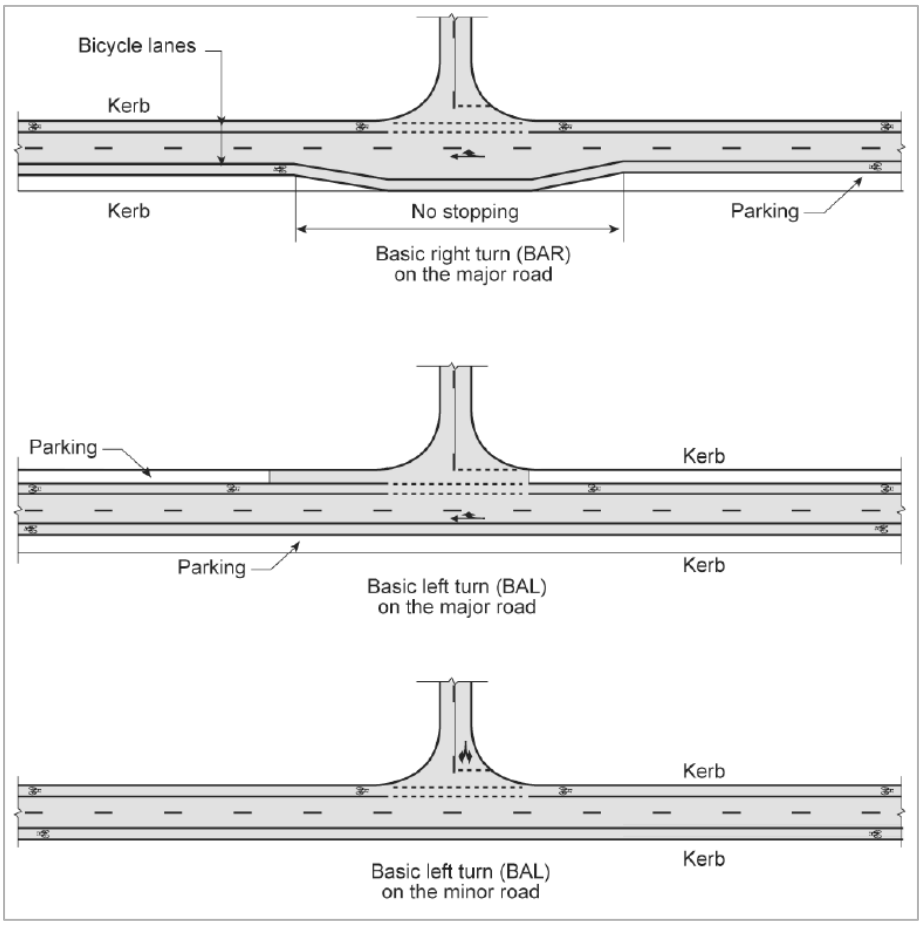


Figure 4-1 Basic turn treatments in urban areas

Source: Austroads Guide to Road Design Park 4A: Unsignalised and Signalised intersections

4.2.2 Absorption capacity assessment

An absorption capacity assessment was conducted in order to calculate the average delay expected to be experienced by construction vehicles entering the wider road network. Absorption capacity in vehicles per hour can be defined as the maximum number of minor stream vehicles that can cross or enter the major stream flow for a single lane random flow. The equation[1] is:

$$C = \frac{(3600 \times qp) \times \exp(-qp \times ta)}{1 - (\exp(-qp \times tf))}$$

Where:

C = Absorption capacity (veh/h)
Cp = Practical absorption capacity (veh/h)
qp = Major stream flow (veh/sec)
tf = Follow-up headway (s)
ta = Critical gap (s)

[1] *Traffic Engineering & Management* (Ogden, K.W & Taylor, S.Y, 1996 - Section 5.1, p422 Department of Civil Engineering, Monash University) as well as in the *Road Planning and Design Manual* (Department of Transport and Main Roads, October 2006).

A conservative assessment was performed, assuming that all construction vehicles would enter and exit the compounds simultaneously, during the network morning and afternoon peak hours. This assessment was conducted for all 5 accesses.

Table 4-7 shows the practical absorption capacity of the accesses, based on major stream traffic volumes, critical gap acceptance and follow-up headway parameters.

Table 4-7 Practical absorption capacity at each compound area access

Compound access	AM peak practical absorption capacity (vehicles per hour [vph])		PM peak practical absorption capacity (vph)	
	Left turn	Right turn	Left turn	Right turn
Access 1	-	543	-	541
Access 2	943	904	930	885
Access 3	950	871	943	829
Access 4	950	871	943	829
Access 5	876	755	814	658

The analyses indicate that the proposed accesses would allow for sufficient absorption capacity to accommodate for the development traffic demand during both AM and PM peak hours.

The average minor vehicle delay to be expected at the accesses for the ingress and egress movements were calculated based on the equations contained and adopted from the *Road Planning and Design Manual* (Department of Transport and Main Roads, October 2006). This is a universal industry accepted analysis procedure within the traffic engineering industry, used to calculate absorption capacity and average delay of an access. This represents the average delay which the minor movement would experience in order to enter or cross a major movement flow. The equation can be found as:

$$Wm = \frac{(qpe^{qptf}\,(e^{qpta} - qpta - 1) + qme^{qpta}\,(e^{qptf} - qptf - 1))}{qp(qpe^{qptf} - qme^{qpta}\,(e^{qptf} - 1)}$$

Where:

Wm = Average dealy to minor stream vehicles (sec)
qp = Major stream flow rate (veh/s)
qm = Minor stream flow rate (veh/s)
tf = Follow-up Headway (s)
ta = Critical Gap (s)

Table 4-8 shows the expected average delays to be experienced by construction vehicles at each access.

Table 4-8 Expected delays for construction vehicles entering wider network from compound areas

Compound access	AM peak average delay (s)		PM peak average delay (s)	
	Left turn	Right turn	Left turn	Right turn
Access 1	-	0.5	-	0.5
Access 2	0.1	0.3	0.2	0.4

Compound access	AM peak average delay (s)		PM peak average delay (s)	
	Left turn	Right turn	Left turn	Right turn
Access 3	0.1	0.4	0.1	0.6
Access 4	0.1	0.4	0.1	0.6
Access 5	0.4	0.1	0.7	1.7

The access analysis results indicate that the construction traffic vehicles would experience insignificant levels of vehicle delay in order to enter the major stream traffic flow. The accesses would operate within acceptable levels of vehicle delay.

4.2.3 Sight distance assessment

4.2.3.1 Safe intersection sight distance

Safe Intersection Sight Distance (SISD) is the minimum sight distance which should be available along the major road at any intersection. An evaluation of the available SISD was done for the proposed compound access locations. The SISD assessment was based on the provisions of *Austroads Guide to Road Design - Part 4A: Unsignalised and Signalised Intersections.* The existing longitudinal grade (vertical alignment) of the major road was measured in Google Earth along each of the compound accesses.

The SISD assessment was performed under the conservative assumption that vehicles travelling along the Laydown Access Road and Rees James Road would travel at about 70 km/h, despite the posted speed being 50 km/h. This assumption is based on midblock traffic surveys conducted at Adelaide Street provided by Council for the purpose of this assessment, where travel speeds of about 80 km/h were recorded despite the posted 60 km/h speed limit. A speed increase of about 20 km/h was accordingly applied to Rees James Road and the Laydown Access Road due to them providing a similar north-south uninterrupted movement. Irrawang Street traffic is assumed to travel at about 50km/h in accordance with the posted speed limit, due to it being located within the Raymond Terrace town centre.

Access 1 is located on the Laydown Access Road, where a downhill grade is observed when travelling towards the east. The SISD is about 182 metres when travelling from the Pacific Highway on the east, and about 168 metres when travelling along the Laydown Access Road from the west. Figure 4-2 shows the sight distances and longitudinal grades at Access 1.

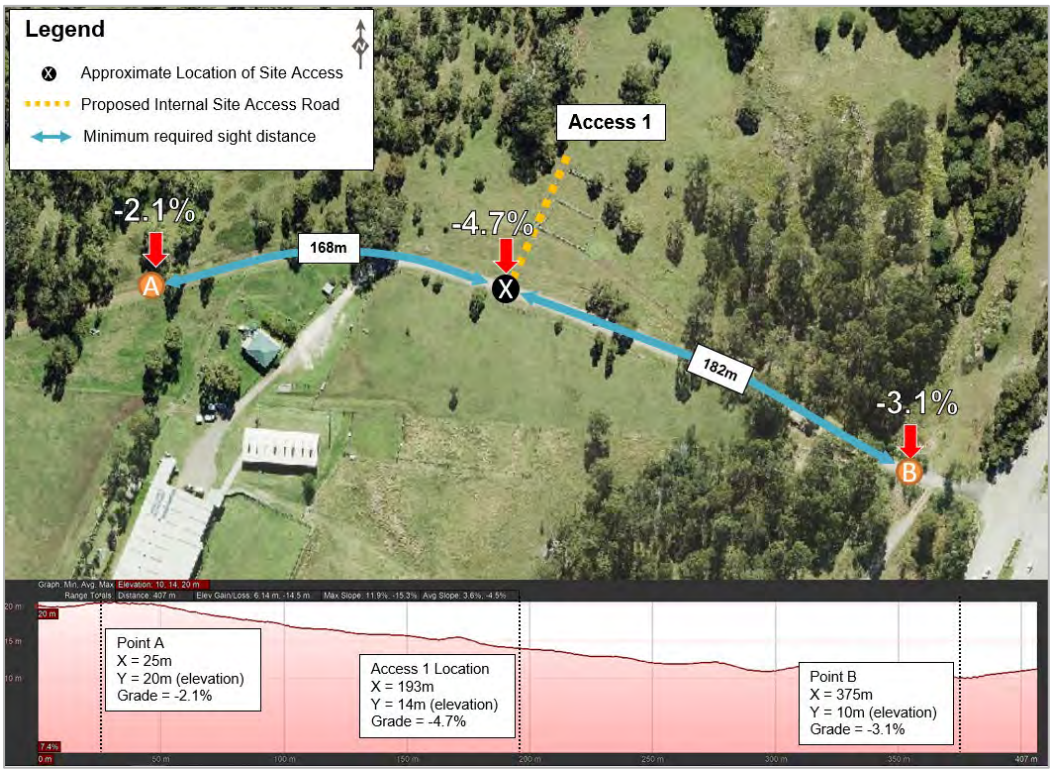


Figure 4-2 Access 1 – sight distances and longitudinal grades

Access 2 is located along Rees James Road, where an uphill grade is observed when travelling in the northern direction. Along this section, the vertical road alignment is relatively flat, with elevation gain of 1m in the 347-metre distance between Point A and Point B as shown in Figure 4-3. The SISD is about 177 metres when travelling along Rees James Road from the south, and about 170 metres when travelling from the north.

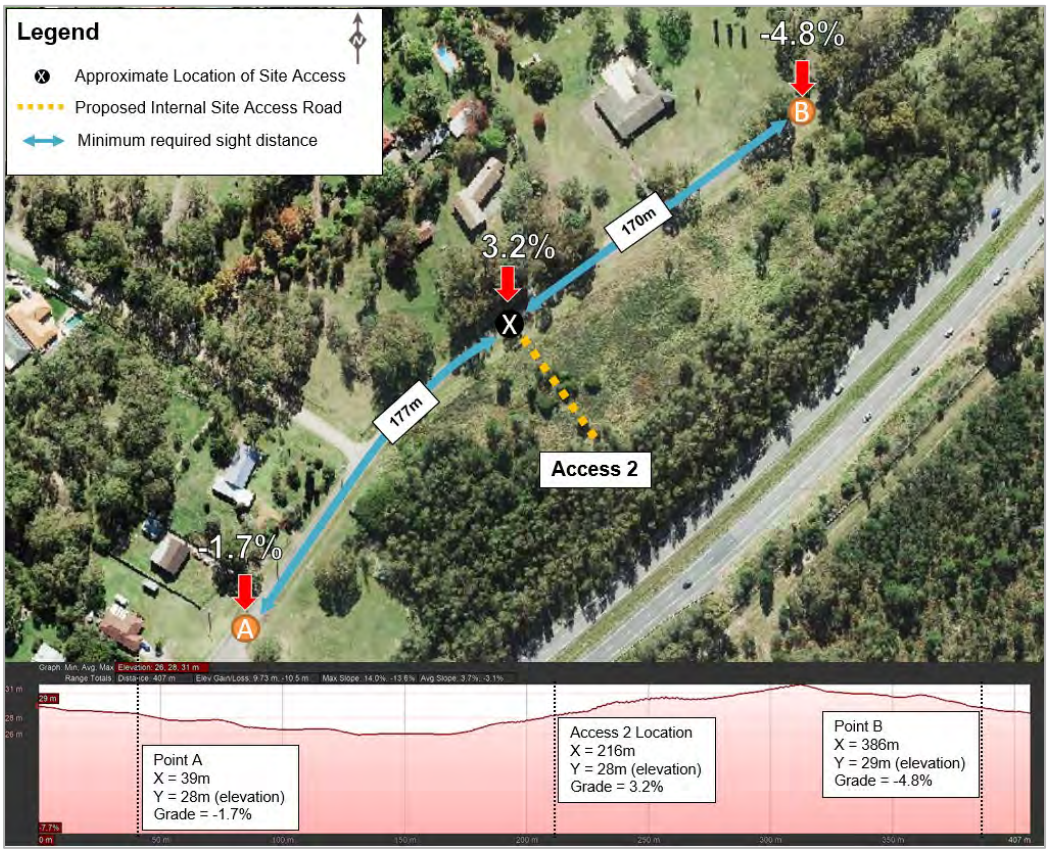


Figure 4-3 Access 2 – sight distances and longitudinal grades

Accesses 3 and 4 are located close to each other along Rees James Road, about 215 metres apart. When considering northbound travel beginning at Point A, Access 4 is located on a downhill grade shortly after the vertical alignment peaks. Access 3 is located along an uphill grade, with a relatively flat vertical alignment when travelling in the direction of Point B. The SISD when approaching Access 3 from the north is about 176 metres, and the SISD of Access 4 when approaching from the south is about 170 metres. Figure 4-4 shows the sight distances and longitudinal grades of accesses 3 and 4.

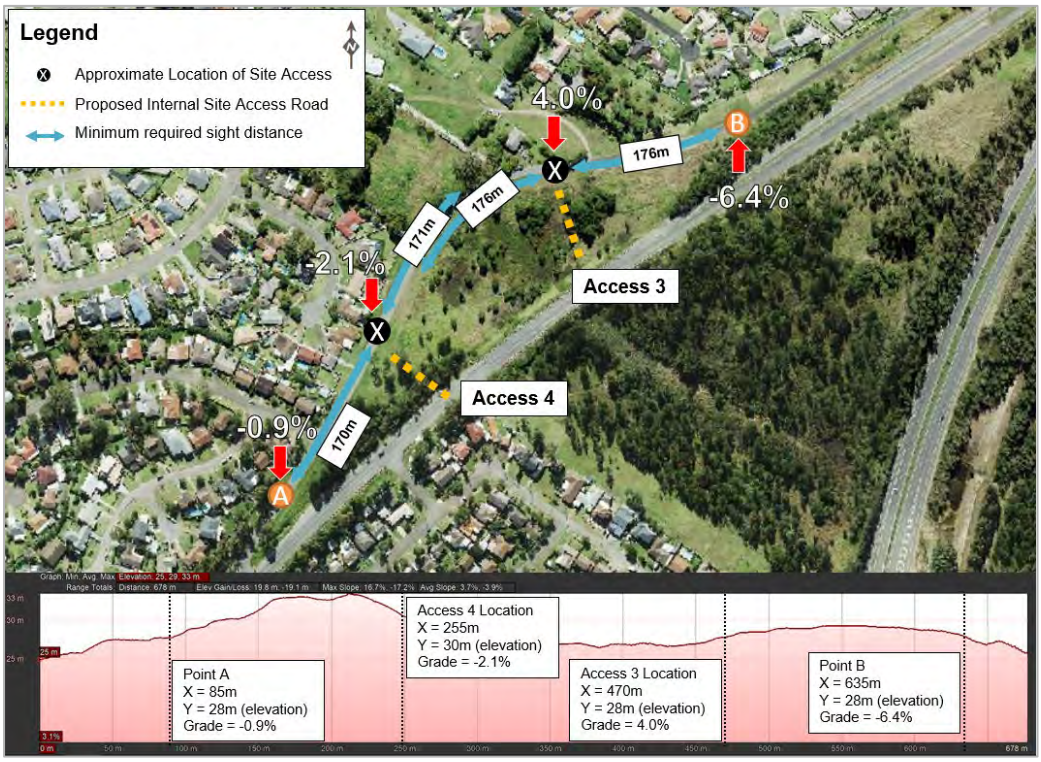


Figure 4-4 Accesses 3 and 4 – sight distances and longitudinal grades

Access 5 is located along Irrawang Street, which passes through the Raymond Terrace town centre. The surrounding vertical road alignment is relatively flat, with an elevation difference of about one metre in the 227 metre section between Point A and Point B. The SISD of the access is about 110 metres when approaching from the south, and about 117 metres when approaching from the north.

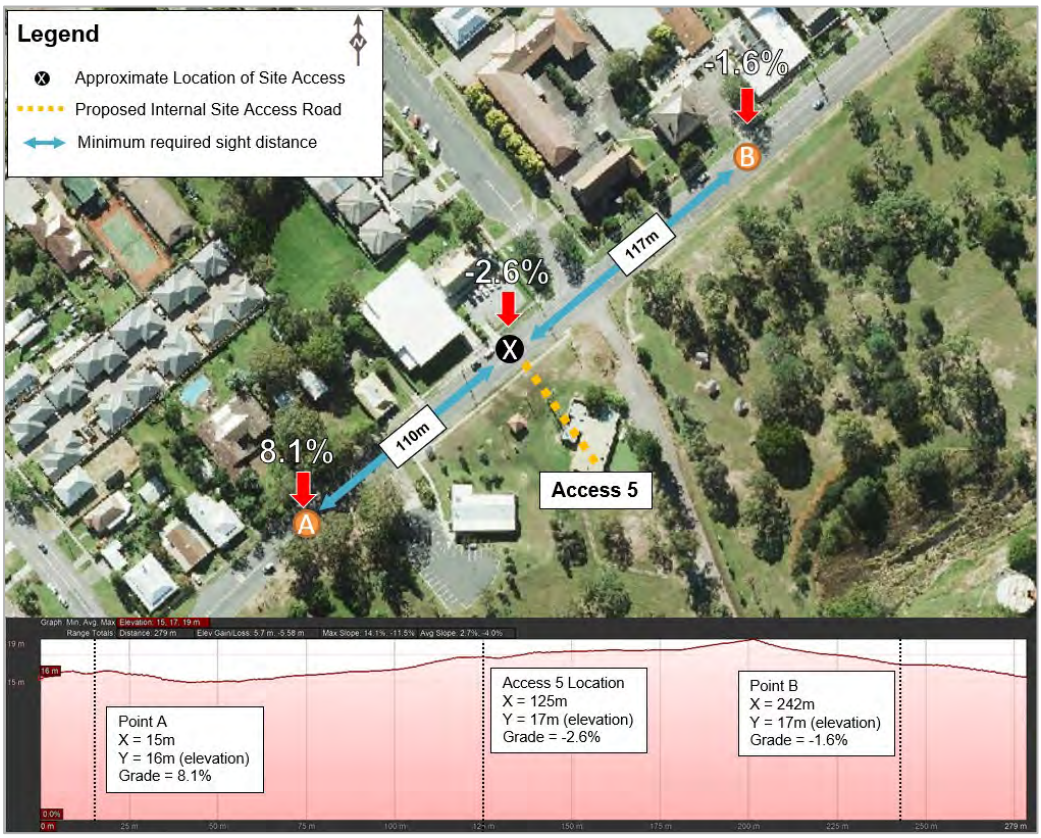


Figure 4-5 Access 5 – sight distances and longitudinal grades

SISD was measured as indicated in Figure 4-6 for each compound area access:

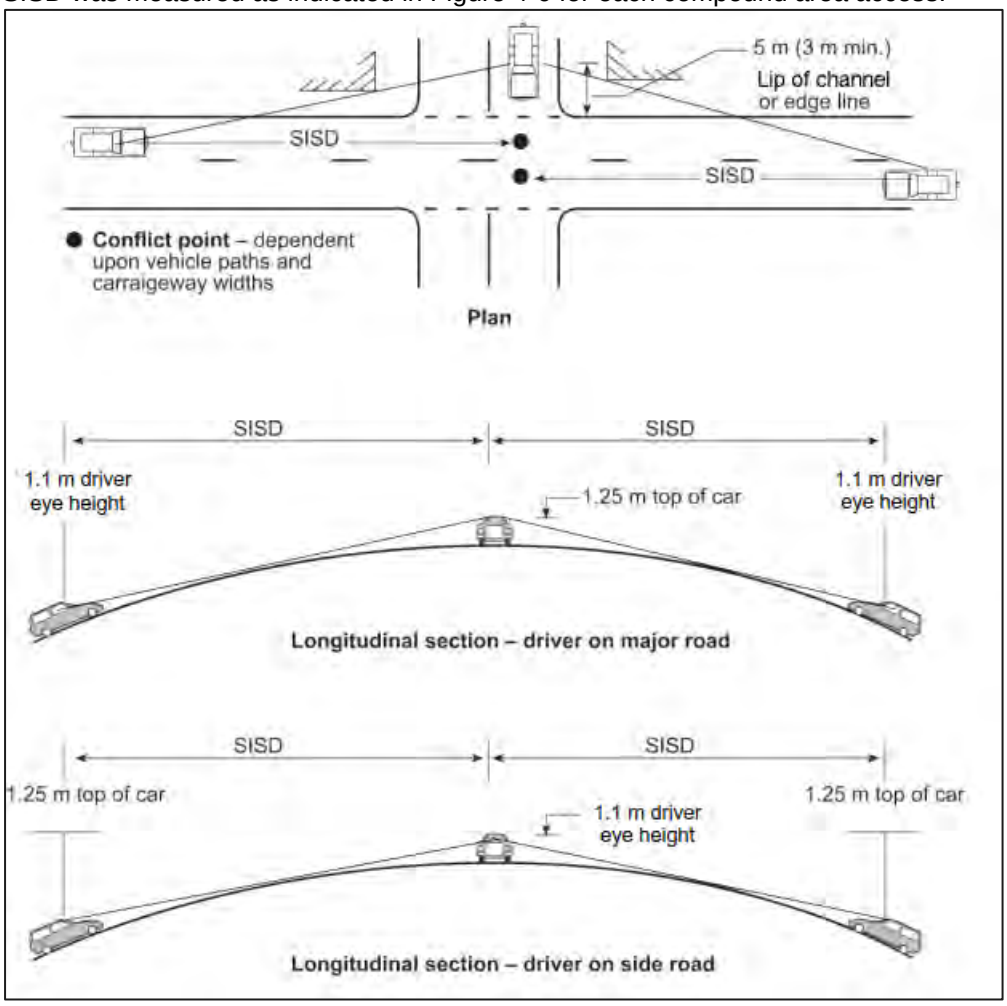


Figure 4-6 Concept of Safe Intersection Sight Distance (SISD)

Visibility of the site accesses are perceived to be available for both directions of travel. The required SISD was determined based on the following equation:

$$SISD = \frac{DT \times V}{3.6} + \frac{V^2}{254\,(d + 0.01 \times a)}$$

Where:

SISD = safe intersection sight distance (m)

DT = decision time (sec) = observation time (3 sec) + reaction time (sec) – refer to AGRD Part 3 (Austroads 2016b) for a guide to values

V = operating (85th percentile) speed (km/h)

d = coefficient of deceleration – refer to Table 3.3 and AGRD Part 3 for a guide to values

a = longitudinal grade in % (in direction of travel: positive for uphill grade, negative for downhill grade) which should be available.

Table 4-9 Compound Access SISD Requirements

Road	Parameter	Direction of Travel	
		To proposed pumping station	From proposed pumping station
Access road (Access 1)	Ot	3	3
	Rt	2.5	2.5
	Dt	5.5	5.5
	V	70	70
	d	0.29	0.29
	a	2.85	-3.33
	SISD Required	**168**	**182**
Rees James Road (Access 2)	Ot	3	3
	Rt	2.5	2.5
	Dt	5.5	5.5
	V	70	70
	d	0.29	0.29
	a	-1.47	1.78
	SISD Required	**177**	**170**
Rees James Road (Access 3)	Ot	3	3
	Rt	2.5	2.5
	Dt	5.5	5.5
	V	70	70
	d	0.29	0.29
	a	-0.93	4
	SISD Required	**176**	**165**
Rees James Road (Access 4)	Ot	3	3
	Rt	2.5	2.5
	Dt	5.5	5.5
	V	70	70
	d	0.29	0.29
	a	1.53	0.93
	SISD Required	**170**	**171**
Irrawang Street (Access 5)	Ot	3	3
	Rt	2.5	2.5
	Dt	5.5	5.5
	V	50	50
	d	0.29	0.29
	a	0.53	-4.47
	SISD Required	**110**	**117**

It was found that the existing available SISD at all five accesses are greater than the minimum required distances for both directions of travel at each of the compound areas.

4.2.3.2 Approach sight distance

Approach Sight Distance (ASD) is calculated the same as for SISD:

$$ASD = \frac{RT \times V}{3.6} + \frac{V^2}{254\,(d + 0.01 \times a)}$$

where

ASD = approach sight distance (m)

RT = reaction time (sec), refer to AGRD Part 3 (Austroads 2016b) for guidance on values

V = operating (85th percentile) speed (km/h)

d = coefficient of deceleration, refer to Table 3.3 and Austroads Guide to Road Design Part 3 for values

a = fa longitudinal grade in % (in direction of travel: positive for uphill grade, negative or downhill grade)

Figure 4-7 illustrates the concept of ASD.

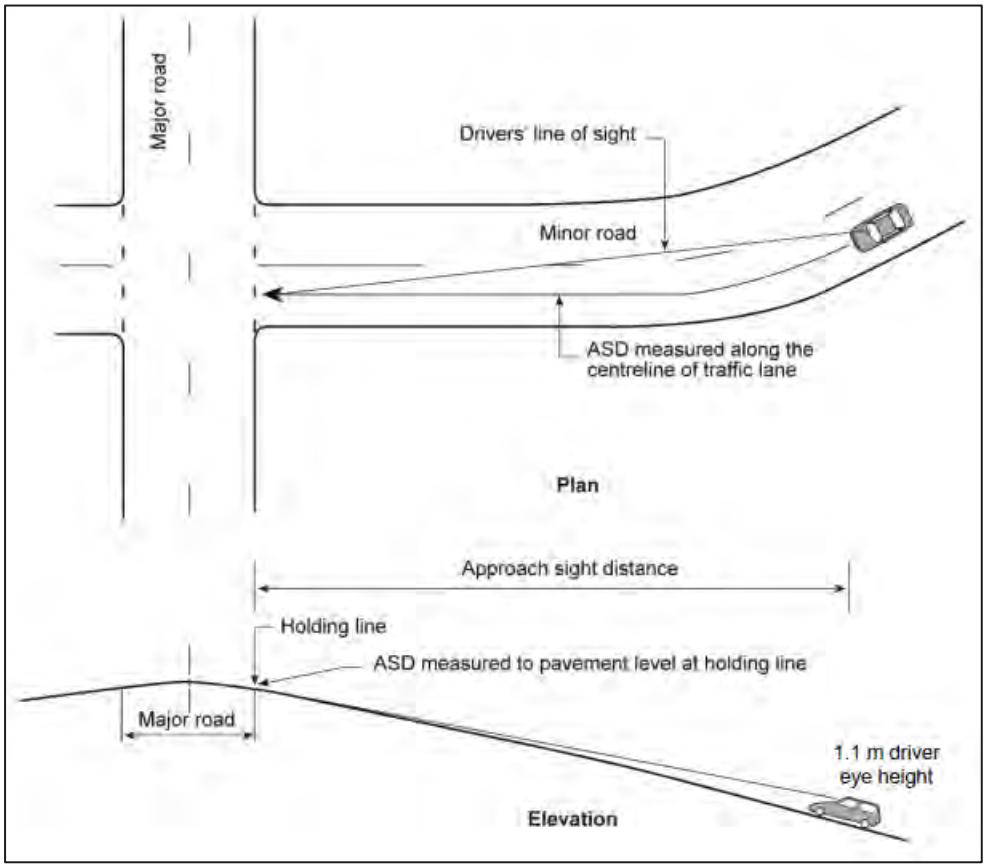


Figure 4-7 Concept of Approach Sight Distance (ASD)

The various sight distance requirements for trucks should be driver eye height of 2.4 metres to pavement level at the stop or holding line (zero metres). Approach sight distances for trucks are numerically the same as the SISD values for trucks provided in Austroads Guide to Road Design Part 3 (Austroads 2016b). The same sight distance requirements were calculated as for SISD.

It was found that the existing ASD is more than the required minim distances and that the proposed accesses would maintain safe sight distance standards.

4.2.4 Circulation roadway

Temporary circulation roadways to the compounds should be designed to accommodate the swept path of the largest design vehicle using the facility plus the specified clearances from the vehicle body to

vertical obstructions and other vehicles. This should be in line with *AS2890.2 Off Street Commercial Vehicle Facilities.*

4.2.5 Access configuration

Based on the analysis findings it is proposed that all compound accesses take the following access configuration should be taken into consideration as illustrated in Figure 4-8, with the assumption that the construction traffic heavy vehicles accessing the compounds would consist of Heavy Rigid Vehicles (HRV's). this would include the provision of a temporary access pavement and no lane lines or right-turn arrows marked on the minor road pavement for a BAR turn treatment. It should be noted that site constraints such as utilities should be taken into consideration during design stages which would ultimately inform the required access arrangements.

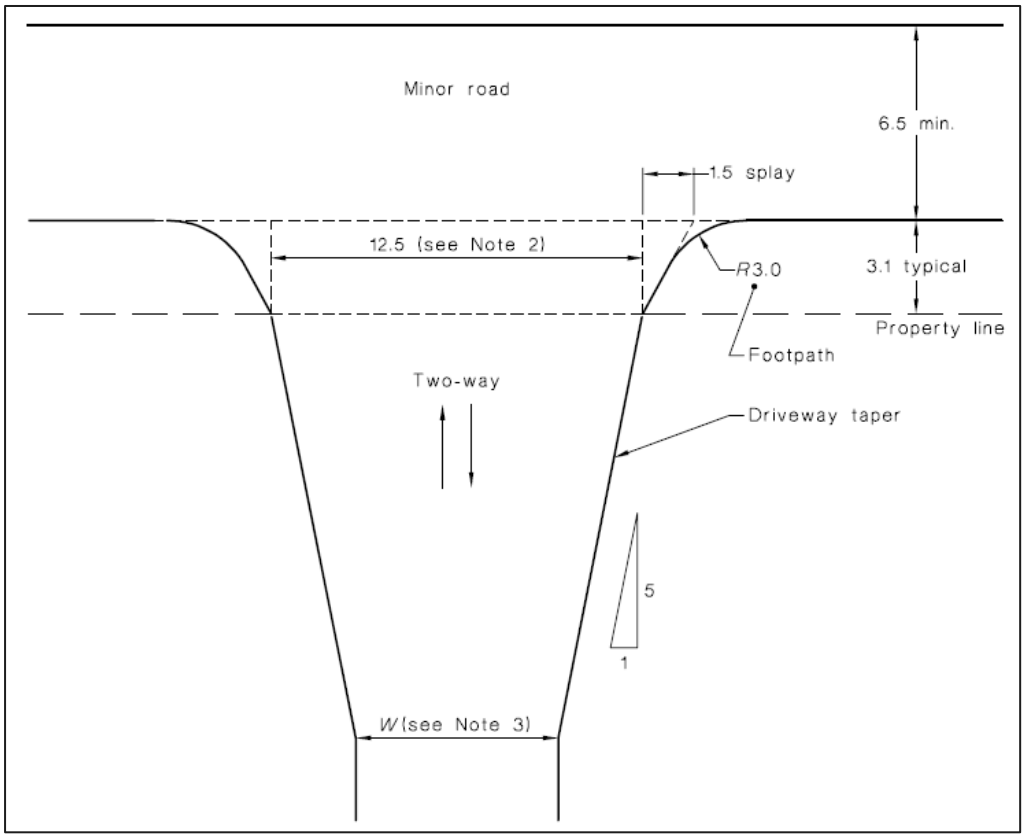


Figure 4-8 Proposed Compound Access Configuration

Source: AS2890.2

Notes:

- Corresponding dimensions for the MRV and SRV are 9 m and 6 m respectively. Larger vehicles may be able to use these narrower driveways depending on the width of public road available for manoeuvring in or out.
- W = width of circulation roadway 6.5m – 8.7m (Table 3.1 of AS2890.2).

5 PRELIMINARY CONSTRUCTION TRAFFIC MANAGEMENT PLAN

5.1 Purpose of Traffic Management Plan (TMP)

The purpose of this preliminary Traffic Management Plan (TMP) is to outline strategies to minimise the impact on all road users who would share the road network with vehicles involved in the construction of the Proposal as well as maintain the safety and efficiency of the road network. The preparation of a final TMP should be developed in relation to the requirements provided by the *Roads and Maritime Services Traffic Control at Work Sites Manual Technical Manual, 27 July of 2018.*

This Preliminary TMP aims to provide basic principles for traffic management to guide project development through the planning and design phases. Additional detail regarding final project traffic volumes and configurations, construction programming, stakeholder communication and traffic guidance schemes would be required to prepare the final TMP. The key objectives to be met by this Preliminary TMP are to:

- Ensure the safety of all road users on the road network, including vehicles, pedestrians and cyclists
- Minimise traffic delays resulting from the development
- Maintain satisfactory property access
- Minimise disruption to adjacent properties
- Minimise disturbance to the environment
- Meet the requirements of legislation and codes of practice regarding traffic management.

5.2 Constraints

5.2.1 Local governments

The Proposal is located in the Port Stephens Local Government Area (LGA). The construction works would entail heavy vehicle movements along Council owned roads. Consultation is required with Council during development of the final TMP addressing concerns such as (but not limited to) access locations, Council owned assets, the surrounding environment, and other transport modes. The TMP shall be updated to include the outcomes of this consultation.

5.2.2 Emergency services

Whilst the emergency services have no vested interest in the work, they would be affected by any traffic management that is put in place. Access along the road network through work sites shall be provided for emergency service vehicles.

The Contractor would be required to liaise closely with all parties regarding the management schemes that would be implemented and when. Records of such notifications and discussions shall be maintained by the Contractor.

5.2.3 Schools, local businesses and surrounding land uses

The Contractor and the Nominated Traffic Control Officer should consult with all the schools and local business owners who may be impacted by the works. It is expected that the project works would be required to ensure all commercial properties shall remain operational at all times. It is also expected that adequate safety measures be put in place to ensure safety is provided to all, especially pedestrians traversing around schools. The location of schools was provided in Section 3.2.1 for reference. St Brigid's Primary School and Irrawang Public School are most likely to be affected by the Proposal. Consultation with these stakeholders would be needed to determine any constraints and the TMP shall be updated to include the outcomes of this consultation.

5.3 Traffic control measures

5.3.1 Transport of over dimensional construction material and equipment

The transport of over dimensional construction material and equipment would be heavily permitted and may be expected to be undertaken with police escort. The transport operations are expected to be planned in detail and in consultation with New South Wales Police Force (NSWPF), recognising and determining whether the scale of oversized vehicle movements would require a significant commitment of police resources to facilitate. The following measures are proposed to manage the overall transport operations and minimise impacts on other road users:

- Develop a regular schedule of road closures comprising a list of specific roads/intersections and closure times and communicate this widely to provide advance warning of closures to road users. If required
- No over-dimension vehicle operations to occur during school bus operating hours which may occur along the routes from where the vehicles would be travelling from
- Transport operations to occur outside of peak hour conditions.

5.3.2 Proposal site traffic management option analysis

Traffic management options for road users (vehicles) have been considered to select the preferred traffic management strategy for the Proposal site. This is for the temporary management of the proposed access upgrade works.

5.4 Traffic management requirements

5.4.1 Signage and delineation

Signage where required, should be displayed during both daytime and at night with the retroreflective material used for the signs meeting the requirement for Class 1W sheeting as specified in AS1906.1. Additional to the requirement for the Class 1W retro-reflectivity all signs shall be free from defects, such as being bent or broken, and be kept free from accumulated dirt, road grime and other contaminants. Only “B” size signs should be used for the T Series signs where there are both sizes “A” and “B” available. This should be updated during development of the final TMP once traffic guidance measures are developed.

Advisory truck turning signage shall be installed at the compound area access locations where heavy vehicle turn movements would occur.

5.4.2 Variable message signs

The use of advisory variable message signs (VMSs) may be used to supplement other traffic signage devices and provide advanced warning of slow-moving heavy vehicles. Where major traffic changes are planned (such as detours and road closures) VMSs should be displayed at least seven days prior to the implementation of the traffic change. Messages displayed on the VMS shall comply with the requirements of the Manual for Uniform Traffic Control Devices Part 3, Clause 3.16.6.

5.4.3 General requirements

The following are considered general requirements which should be taken into consideration through development of the final TMP:

- Identification of all Heavy Vehicle (HV) and Over Dimensional (OD) vehicle haulage routes for all work stages.
- A mechanism to review identified haulage route road conditions prior to the commencement of works
- Mechanisms/agreements (if deemed necessary) to maintain haulage route roads and road infrastructure, including local public roads used by site traffic, during construction works and to reinstate roads to at least pre-construction conditions.
- Qualify and identify any relevant mechanisms for OD vehicle permits and traffic management requirements.
- HV movements should be timed wherever possible to avoid or minimise localised impacts such as avoiding peak traffic zones and school zones between the hours of 7am to 9am and 2pm to 4pm.
- Where oversized vehicles are used, suitable controls and management would be put into place and heavy vehicle permits would be obtained as required.
- Oversized loads would be transported in accordance with relevant Roads and Maritime guidelines.
- Traffic direction control should be used where appropriate in case of open trenching of road crossings. Available measures should be taken to minimise disruption during open trench crossings to no more than one to two days.
- Appropriate management of construction traffic where traffic flow is affected by the construction pipeline, in particular in locations where the pipeline crosses the road or is located along and within the road reserve.
- Appropriate management of the transportation of construction materials to maximise vehicle loads and thereby minimise vehicle movements.
- Heavy vehicle turn signs should be installed at the compound area accesses.
- Installation of specific warning signs at local access roads to the construction corridor to warn existing road users of entering and exiting traffic.
- Appropriate mitigation to be provided where the pipeline crosses property access points or otherwise impacts access to adjoining sites. Wherever possible, all property access crossings would be completed in one day, with any open trenches covered overnight.
- Distribution of warning notices to advise local road users, residents and site owners of scheduled construction activities and the potential impacts they may have on access
- Induction of staff and truck drivers on the requirements of the TMP.

Please note that this is not an exhaustive list, and that the final TMP requirements would be as per those outlined in the development consent.

6 CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

6.1.1 Impact on public transport

Following is a summary of findings relating to the impact on public transport:

- The proposed route for construction traffic is also used for public bus services and school bus services along Irrawang Street, Adelaide Street and Rees James Road, south of Bellevue Street. However, it is not expected that the frequency and service times of these would be impacted. It is proposed that the wider community and public transport service providers and users be notified in advance of expected construction activities and durations.
- Two coach routes service Raymond Terrace, at a frequency of one bus per day. It is therefore unlikely that construction traffic would impact coach services
- Public bus services occur infrequently, at two services per hour or under during the peak periods. It is therefore unlikely that construction traffic would impact these services
- Several schools are located within the Raymond Terrace town centre, each being serviced by school buses that bring students directly to school. Within the Raymond Terrace, St Brigid's Primary School and Irrawang Public School are located along Irrawang Street and Adelaide Street respectively, which would be used for construction vehicle movements. From a safety perspective, construction traffic operators should be made aware of pedestrian movements within a detailed CTMP clearly indicating crossing school crossing locations, walkable desire lines and peak time of pedestrian movement. The CTMP should also indicate how the impact to pedestrians would be managed
- Access 5, proposed to be used for the compound area on Irrawang Street, is located directly adjacent to the Raymond Terrace Community Hall, Raymond Terrace bus stop, and services bus routes 136, 137, 140, 141 and 145. Accesses 3 and 4 are located on Rees James Road, serviced by bus route 141 and school bus services as deemed necessary by the nearby schools. It is not expected that the frequency and service times of these would be impacted. It is proposed that the wider community and public transport service providers and users be notified in advance of expected construction activities and durations.

6.1.2 Impact on active transport

The existing cycle network is limited, with no formal cycling provisions along Irrawang Street, Adelaide Street or Rees James Road. It is expected that there would be no impacts on existing cycling activities and infrastructure.

6.1.3 Road network impact

Following is a summary of findings relating to the impact on intersections:

- The Adelaide Street/Richardson Road and Irrawang Street/ William Street intersections would operate within acceptable levels of service and delay during both AM and PM peak periods with the introduction of construction traffic
- The Pacific Highway/Laydown Access Road intersection would operate at LOS E (delays of 58 seconds) during the PM peak without construction traffic, and LOS F (delays of 114 seconds) during the PM peak with the added construction traffic volumes. This however accounts for the worst movement, which is the right turn movement from the Laydown Access Road to the Pacific Highway. However, the average delay for the intersection in total is estimated to be 2.4 seconds during the PM peak with construction traffic. It is evident that the intersection would operate at high levels of delay during base conditions in the year 2020 even without additional construction generated traffic. Thus, intersection upgrades are therefore not considered to resolve existing and induced delays resulting

from construction generated traffic, as these delays would be short term given the construction schedule. It is anticipated that existing conditions of vehicle delay for the right turn movement would prevail after completion of the construction period which would remain unsatisfactory. It is therefore recommended that traffic management measures be put in place for the duration of construction to manage delays such as avoiding travel of staff during peak background traffic hours and should be detailed in a final TMP prior to construction.

- It should also be noted that these results account for the most conservative scenario, however it is likely that workforce travel will occur outside of these peak hours and even less of an impact can be expected
- It is considered that the proposed construction generated traffic would have a minimal impact on the existing surrounding road network.

6.1.4 Access and frontage

The following summary of findings relating to the impact on accesses are made:

- The analyses indicate that the proposed accesses would allow for sufficient absorption capacity to accommodate for the development traffic demand during both AM and PM peak hours
- The access analysis results indicate that the construction traffic vehicles would experience insignificant levels of vehicle delay in order to enter the major stream traffic flow. The accesses would operate within acceptable levels of vehicle delay
- Turn warrants assessments of the five proposed accesses indicate that only BAL and BAR treatments would be sufficient for all accesses
- It was found that the existing available SISD at all five accesses are greater than the minimum required distances for both directions of travel at each of the compound areas
- The various sight distance requirements for trucks should be driver eye height of 2.4 metres to pavement level at the stop or holding line (zero metres). Approach sight distances for trucks are numerically the same as the SISD values for trucks provided in *Austroads Guide to Road Design Part 3* (Austroads 2016b). The same sight distance requirements were calculated as for SISD. It was found that the existing ASD is more than the required minimum distances and that the proposed accesses would maintain safe sight distance standards.

6.1.5 Parking

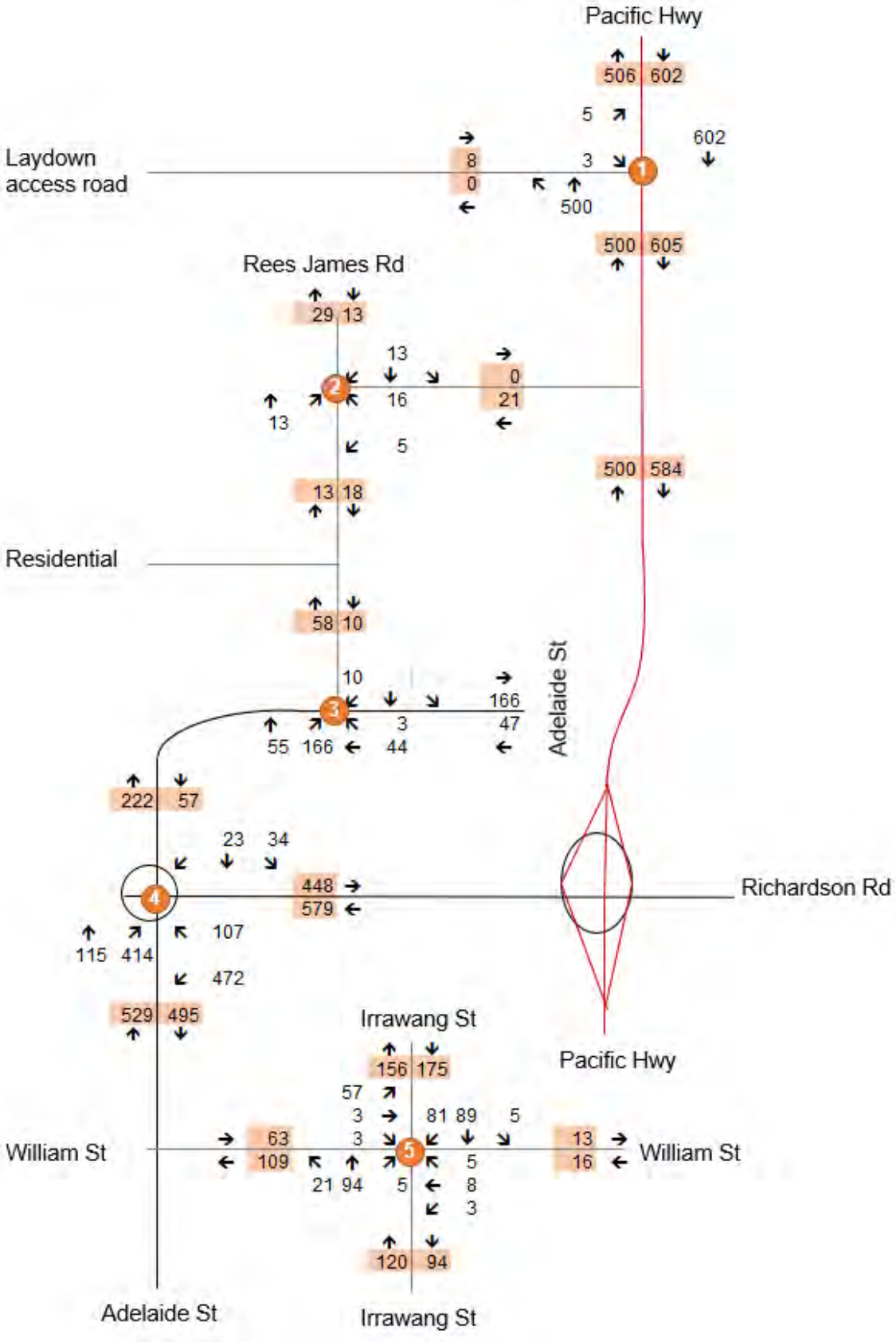
It is proposed that temporary staff parking be provided at each work zone. Given the linear alignment of the pipeline and construction work, it is assumed that workers will park within the vicinity of the construction footprint and walk to where construction activities occur. It is recommended that parking on local residential street be avoided. It is also recommended that parking opportunities be recorded within a detailed Construction Traffic Management Plan which also designates parking locations to be used during the construction stage.

6.2 Recommendation

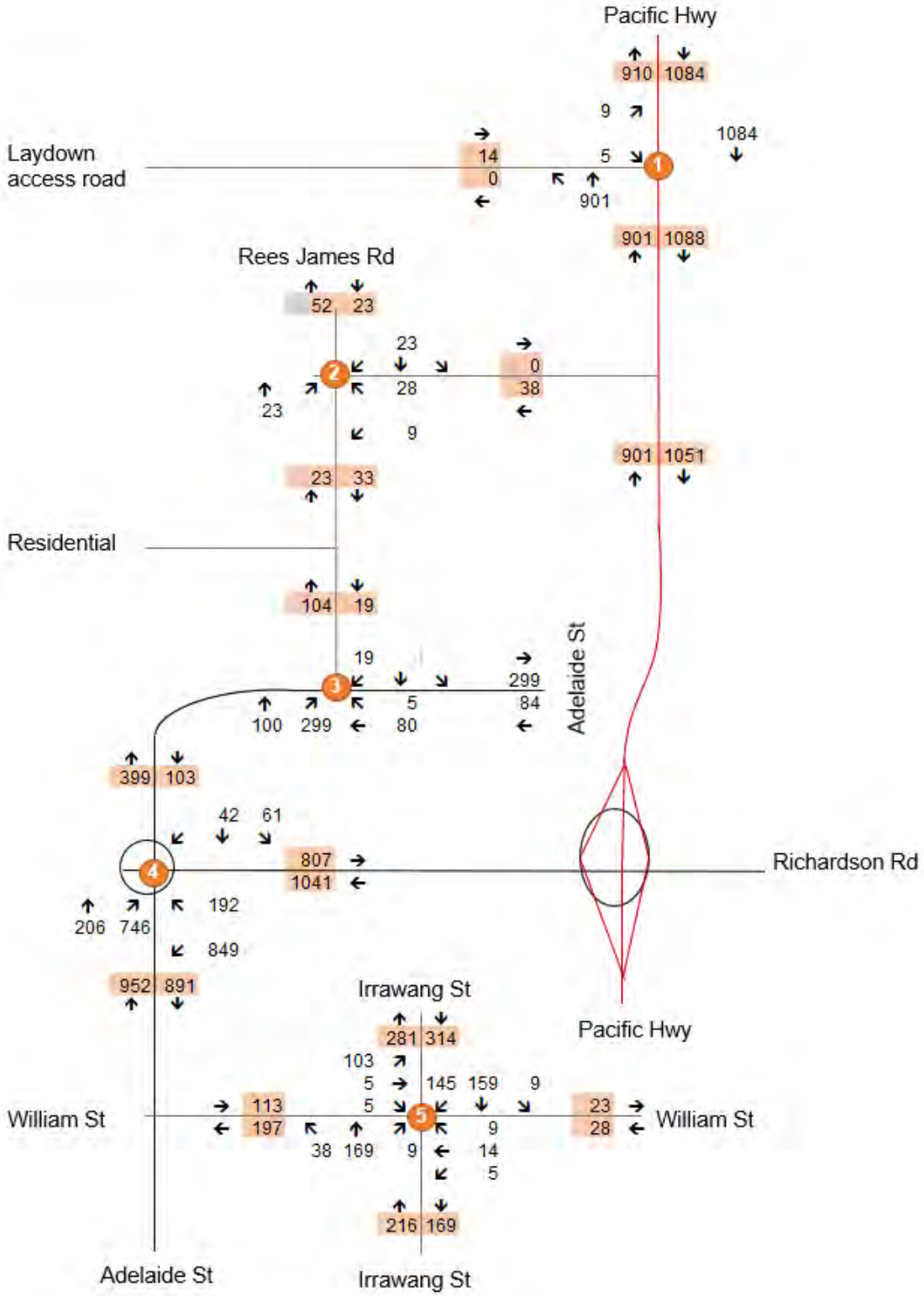
The requirements of the SEARs in relation to traffic and transport have been addressed in this report. It is concluded that subject to the recommendations made in Section 5 and 6 of this report being implemented there are no significant issues which would prevent the Proposal from proceeding.

APPENDIX A STICK DIAGRAMS

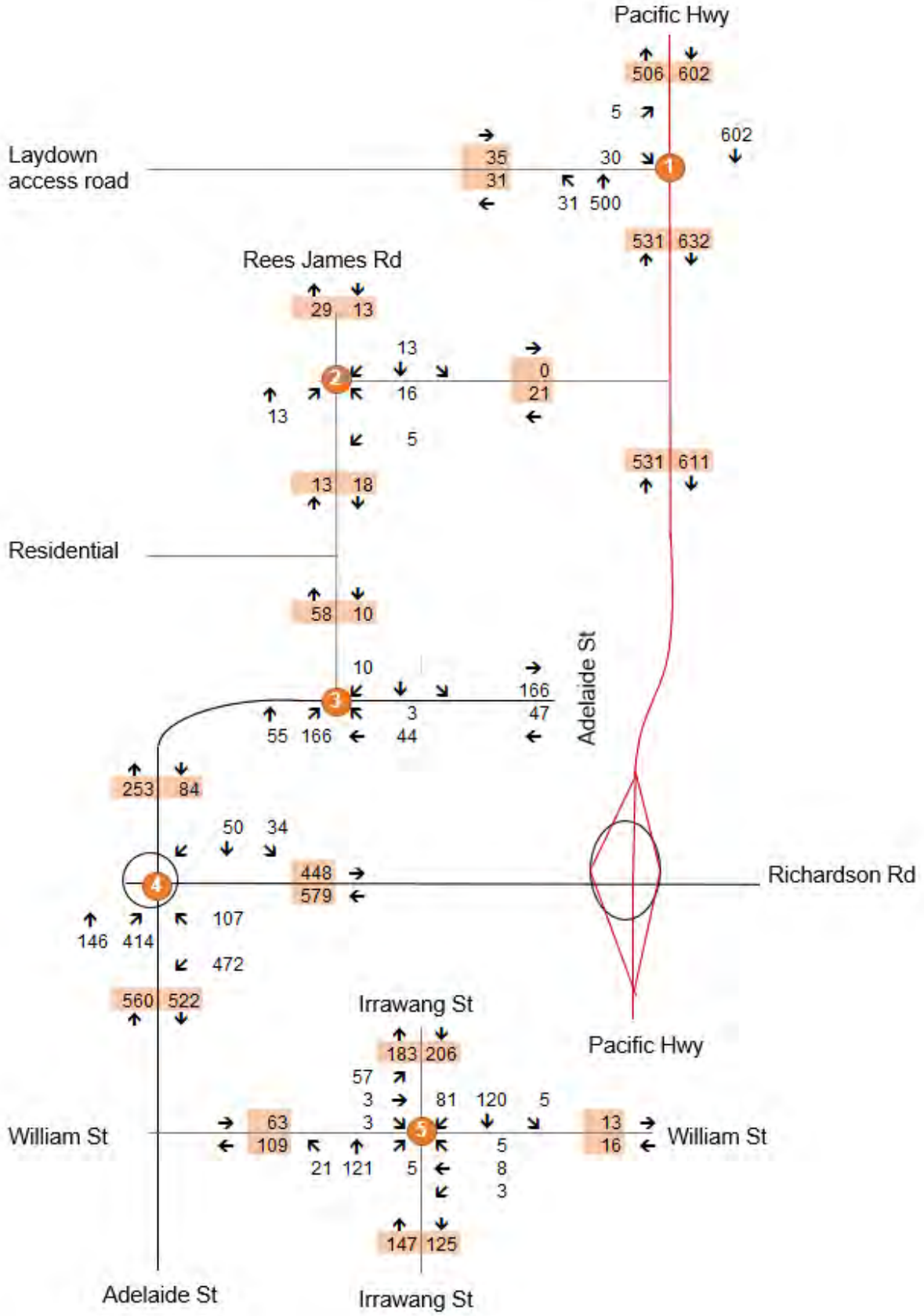
2020 base case 8-9AM peak traffic volumes



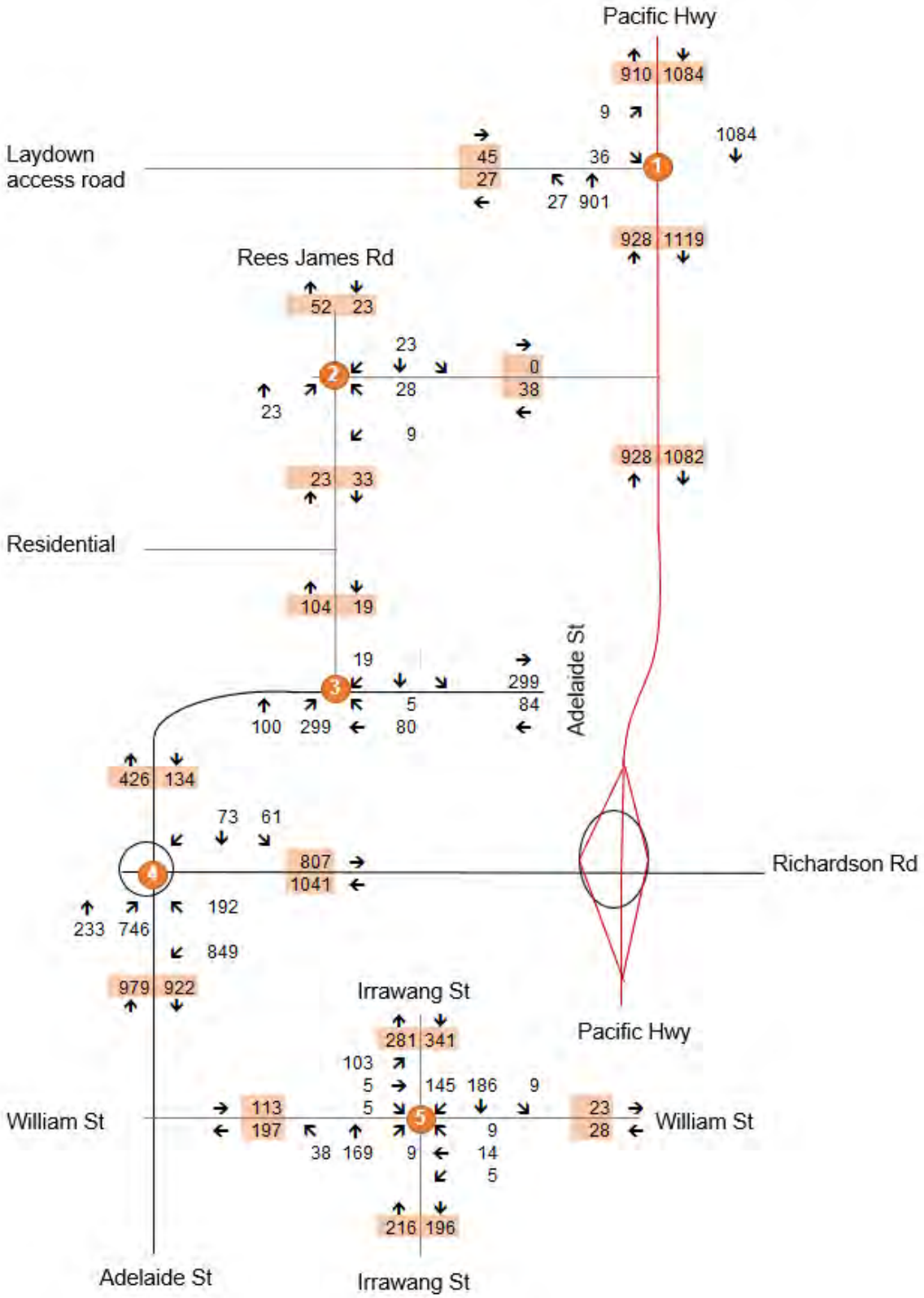
2020 base case 4-5PM peak traffic volumes



2020 base case 8-9AM peak traffic volumes with construction traffic



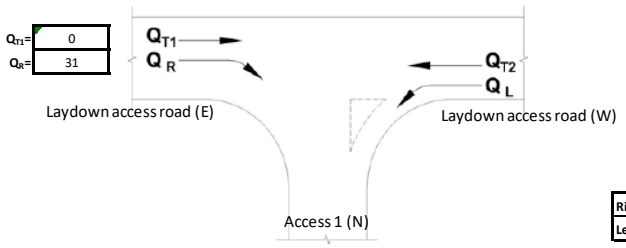
2020 base case 4-5PM peak traffic volumes with construction traffic



APPENDIX B TURN WARRANTS ASSESSMENT

Access 1 turn warrants assessment

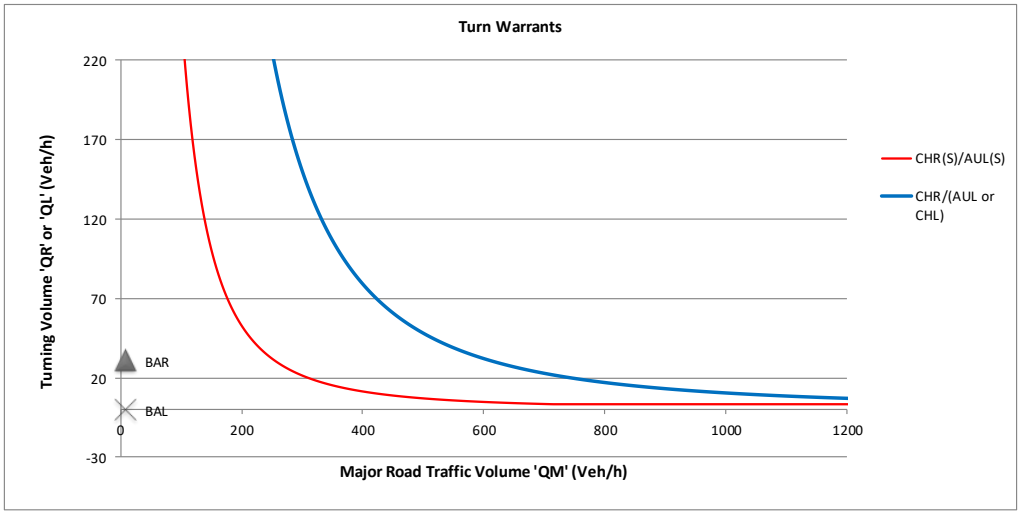
Access 1
2020 Background + Construction (AM Peak) "With Construction"



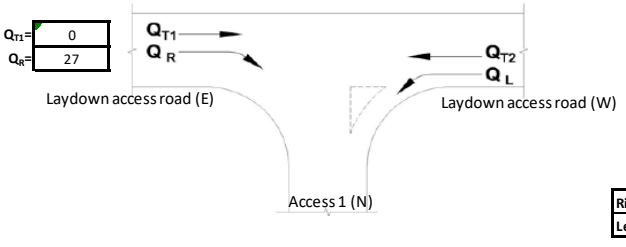
Q_{T2} =	8
Q_L =	0
Splitter Island?	No
Speed Limit?	<100km/h

	Q_M	Q_R/Q_L
Right	8	31
Left	8	0

Righ Turn Treatment Required	BAR
Left Turn Treatment Required	BAL



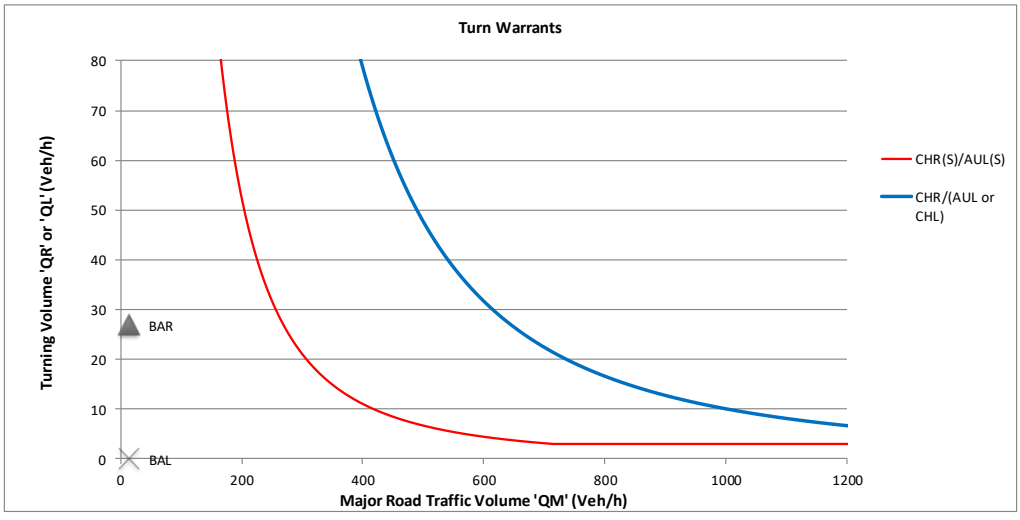
Access 1
2020 Background + Construction (PM Peak) "With Construction"



Q_{T2} =	14
Q_L =	0
Splitter Island?	No
Speed Limit?	<100km/h

	Q_M	Q_R/Q_L
Right	14	27
Left	14	0

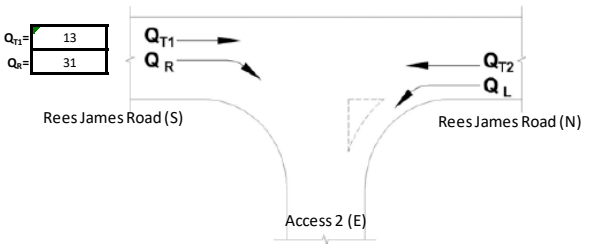
Righ Turn Treatment Required	BAR
Left Turn Treatment Required	BAL



Access 2 turn warrants assessment

Access 2
2020 Background + Construction (AM Peak) "With Construction"

Q_{T1}=	13
Q_R=	31

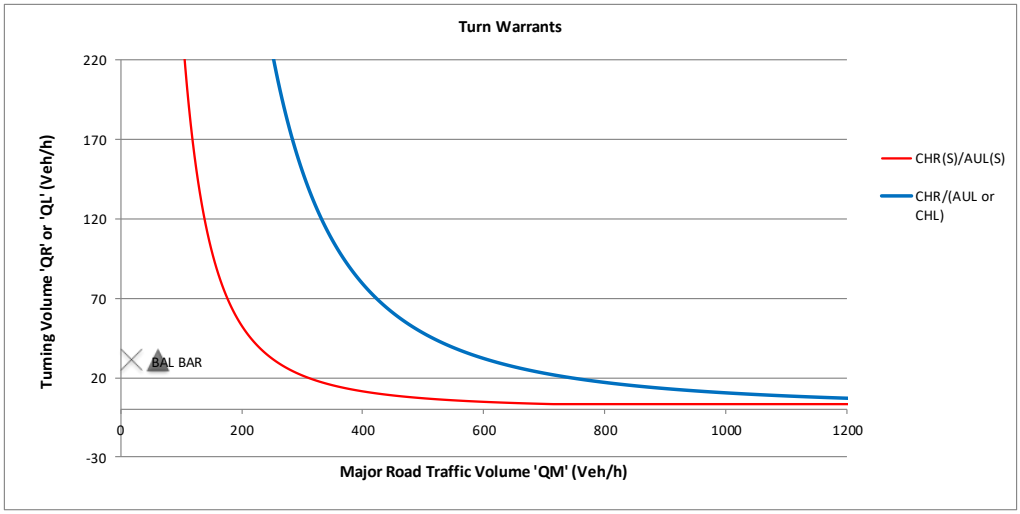


Q_{T2}=	18
Q_L=	31

Splitter Island?	No
Speed Limit?	<100km/h

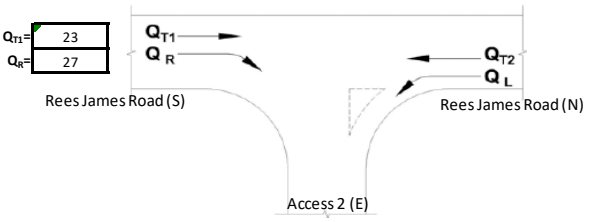
	Q_M	Q_R/Q_L
Right	62	31
Left	18	31

Righ Turn Treatment Required	BAR
Left Turn Treatment Required	BAL



Access 2
2020 Background + Construction (PM Peak) "With Construction"

Q_{T1}=	23
Q_R=	27

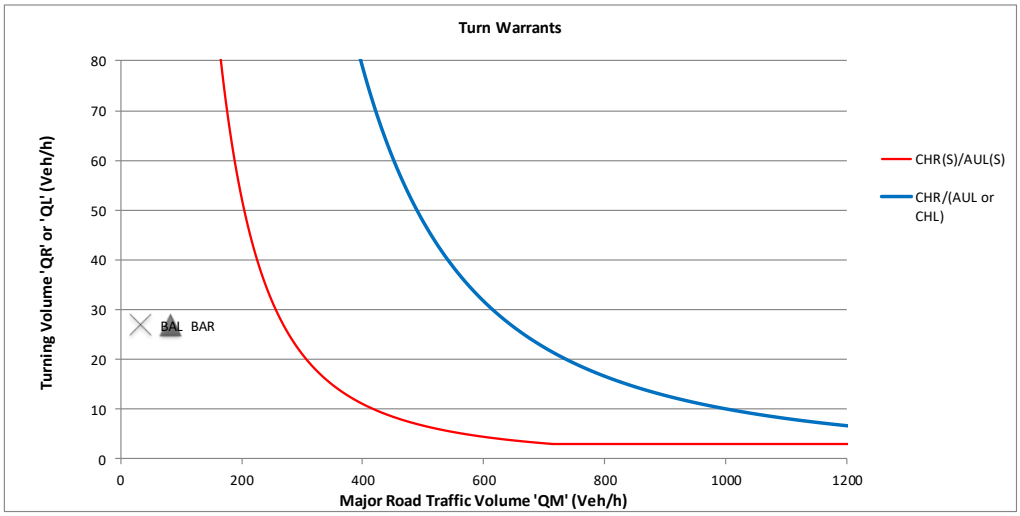


Q_{T2}=	33
Q_L=	27

Splitter Island?	No
Speed Limit?	<100km/h

	Q_M	Q_R/Q_L
Right	83	27
Left	33	27

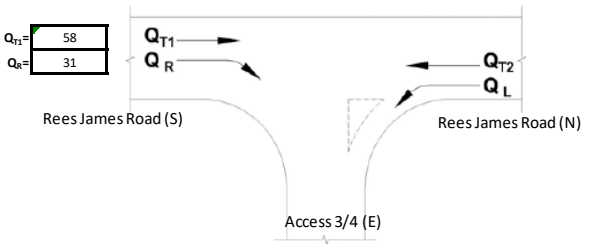
Righ Turn Treatment Required	BAR
Left Turn Treatment Required	BAL



Access 3 and Access 4 turn warrants assessment

Access 3 & 4
2020 Background + Construction (AM Peak) "With Construction"

Q_{T1}=	58
Q_R=	31

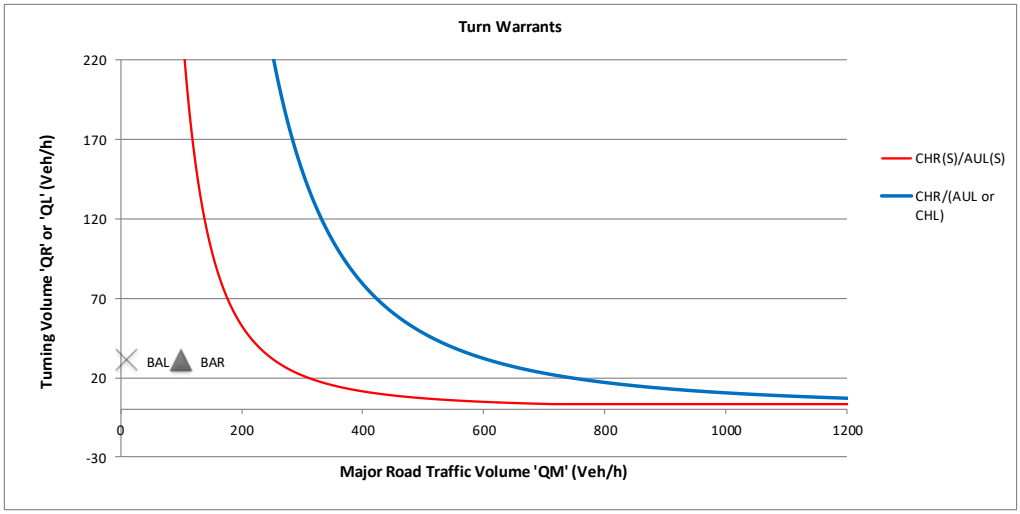


Q_{T2}=	10
Q_L=	31

Splitter Island?	No
Speed Limit?	<100km/h

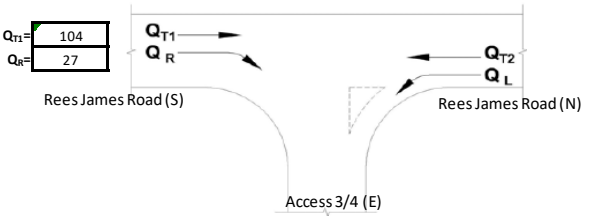
	Q_M	Q_R/Q_L
Right	99	31
Left	10	31

Righ Turn Treatment Required	BAR
Left Turn Treatment Required	BAL



Access 3 & 4
2020 Background + Construction (PM Peak) "With Construction"

Q_{T1}=	104
Q_R=	27

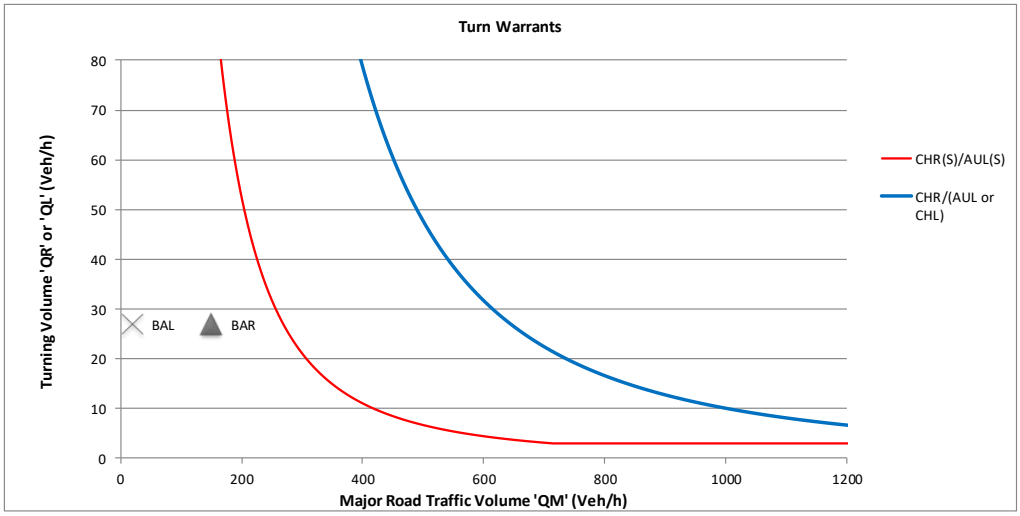


Q_{T2}=	19
Q_L=	27

Splitter Island?	No
Speed Limit?	<100km/h

	Q_M	Q_R/Q_L
Right	150	27
Left	19	27

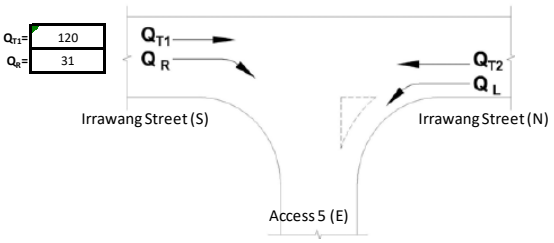
Righ Turn Treatment Required	BAR
Left Turn Treatment Required	BAL



Access 5 turn warrants assessment

Access 5
2020 Background + Construction (AM Peak) "With Construction"

Q_{T1}=	120
Q_R=	31

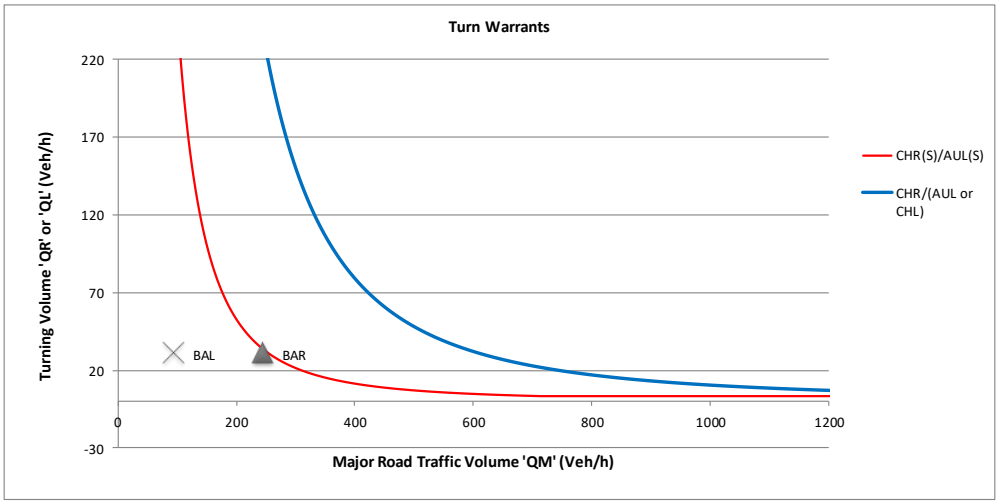


Q_{T2}=	94
Q_L=	31

Splitter Island?	No
Speed Limit?	<100km/h

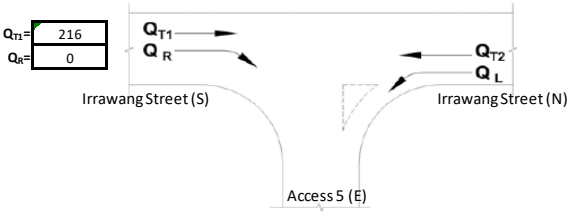
	Q_M	Q_R/Q_L
Right	245	31
Left	94	31

Righ Turn Treatment Required	BAR
Left Turn Treatment Required	BAL



Access 5
2020 Background + Construction (PM Peak) "With Construction"

Q_{T1}=	216
Q_R=	0

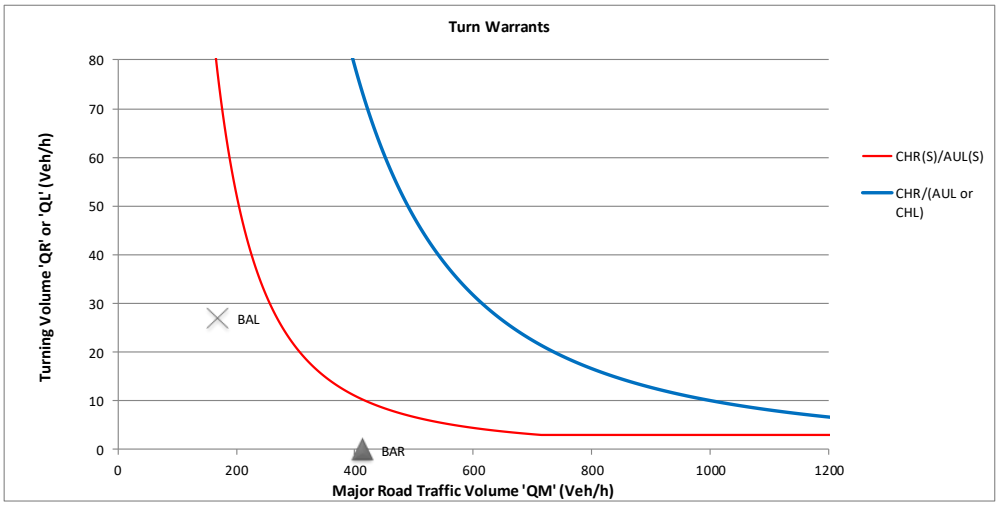


Q_{T2}=	169
Q_L=	27

Splitter Island?	No
Speed Limit?	<100km/h

	Q_M	Q_R/Q_L
Right	412	0
Left	169	27

Righ Turn Treatment Required	BAR
Left Turn Treatment Required	BAL



APPENDIX C SIDRA MODELLING RESULTS (2020 BASE CASE)

LANE SUMMARY

Site: I-1 [I-1: Pacific Hwy/ Laydown access road__2020 AM]

I-1: Pacific Hwy/ Laydown access road
Site Category: (None)
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Pacific Highway													
Lane 1	1	0.0	1944	0.001	100	8.2	LOS A	0.0	0.0	Short	30	0.0	NA
Lane 2	251	6.4	1921	0.131	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Lane 3	251	6.4	1921	0.131	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Lane 4	1	0.0	585	0.002	100	13.5	LOS A	0.0	0.0	Short	80	0.0	NA
Approach	504	6.3		0.131		0.1	NA	0.0	0.0				
North: Pacific Highway													
Lane 1	301	6.1	1924	0.156	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Lane 2	301	6.1	1924	0.156	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Lane 3	1	0.0	710	0.001	100	10.7	LOS A	0.0	0.0	Short	60	0.0	NA
Approach	603	6.1		0.156		0.0	NA	0.0	0.0				
West: Laydown access road													
Lane 1	7	0.0	701	0.010	100	8.0	LOS A	0.0	0.2	Full	250	0.0	0.0
Approach	7	0.0		0.010		8.0	LOS A	0.0	0.2				
Intersection	1114	6.2		0.156		0.1	NA	0.0	0.2				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: I-1 [I-1: Pacific Hwy/ Laydown access road__2020 AM]

I-1: Pacific Hwy/ Laydown access road
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Pacific Highway												
1	L2	1	0.0	0.001	8.2	LOS A	0.0	0.0	0.00	0.67	0.00	69.6
2	T1	502	6.4	0.131	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	109.9
3u	U	1	0.0	0.002	13.5	LOS A	0.0	0.0	0.57	0.67	0.57	71.4
Approach		504	6.3	0.131	0.1	NA	0.0	0.0	0.00	0.00	0.00	109.7
North: Pacific Highway												
8	T1	602	6.1	0.156	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	109.9
9	R2	1	0.0	0.001	10.7	LOS A	0.0	0.0	0.47	0.63	0.47	59.3
Approach		603	6.1	0.156	0.0	NA	0.0	0.0	0.00	0.00	0.00	109.8
West: Laydown access road												
10	L2	5	0.0	0.010	4.8	LOS A	0.0	0.2	0.40	0.55	0.40	57.4
12	R2	2	0.0	0.010	16.1	LOS B	0.0	0.2	0.40	0.55	0.40	57.8
Approach		7	0.0	0.010	8.0	LOS A	0.0	0.2	0.40	0.55	0.40	57.5
All Vehicles		1114	6.2	0.156	0.1	NA	0.0	0.2	0.00	0.01	0.00	109.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LANE SUMMARY

Site: I-1 [I-1: Pacific Hwy/ Laydown access road_2020 PM]

I-1: Pacific Hwy/ Laydown access road
Site Category: (None)
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Pacific Highway													
Lane 1	1	0.0	1944	0.001	100	8.2	LOS A	0.0	0.0	Short	30	0.0	NA
Lane 2	451	6.2	1923	0.234	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Lane 3	451	6.2	1923	0.234	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Lane 4	1	0.0	272	0.004	100	21.3	LOS B	0.0	0.1	Short	80	0.0	NA
Approach	903	6.2		0.234		0.1	NA	0.0	0.1				
North: Pacific Highway													
Lane 1	542	6.2	1923	0.282	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Lane 2	542	6.2	1923	0.282	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Lane 3	1	0.0	432	0.002	100	14.3	LOS A	0.0	0.1	Short	60	0.0	NA
Approach	1085	6.2		0.282		0.0	NA	0.0	0.1				
West: Laydown access road													
Lane 1	15	6.7	179	0.084	100	22.7	LOS B	0.2	1.7	Full	250	0.0	0.0
Approach	15	6.7		0.084		22.7	LOS B	0.2	1.7				
Intersection	2003	6.2		0.282		0.2	NA	0.2	1.7				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: I-1 [I-1: Pacific Hwy/ Laydown access road_2020 PM]

I-1: Pacific Hwy/ Laydown access road
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Pacific Highway												
1	L2	1	0.0	0.001	8.2	LOS A	0.0	0.0	0.00	0.67	0.00	69.6
2	T1	901	6.2	0.234	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	109.8
3u	U	1	0.0	0.004	21.3	LOS B	0.0	0.1	0.80	0.80	0.80	61.9
Approach		903	6.2	0.234	0.1	NA	0.0	0.1	0.00	0.00	0.00	109.7
North: Pacific Highway												
8	T1	1084	6.2	0.282	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	109.8
9	R2	1	0.0	0.002	14.3	LOS A	0.0	0.1	0.66	0.71	0.66	55.0
Approach		1085	6.2	0.282	0.0	NA	0.0	0.1	0.00	0.00	0.00	109.7
West: Laydown access road												
10	L2	10	10.0	0.084	5.2	LOS A	0.2	1.7	0.76	0.75	0.76	39.5
12	R2	5	0.0	0.084	57.7	LOS E	0.2	1.7	0.76	0.75	0.76	40.6
Approach		15	6.7	0.084	22.7	LOS B	0.2	1.7	0.76	0.75	0.76	39.9
All Vehicles		2003	6.2	0.282	0.2	NA	0.2	1.7	0.01	0.01	0.01	108.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LANE SUMMARY

Site: I-4 [I-4: Adelaide St/ Richardson Rd_2020 AM]

I-4: Adelaide St/ Richardson Rd
Site Category: (None)
Roundabout

Lane Use and Performance

	Demand Flows Total veh/h	Demand Flows HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Adelaide Street													
Lane 1[d]	530	6.2	1581	0.335	100	8.0	LOS A	2.3	16.8	Full	200	0.0	0.0
Approach	530	6.2		0.335		8.0	LOS A	2.3	16.8				
East: Richardson Road													
Lane 1[d]	579	6.2	1208	0.479	100	5.3	LOS A	3.7	27.1	Full	320	0.0	0.0
Approach	579	6.2		0.479		5.3	LOS A	3.7	27.1				
North: Adelaide Street													
Lane 1[d]	57	5.3	743	0.077	100	7.2	LOS A	0.4	2.6	Full	300	0.0	0.0
Approach	57	5.3		0.077		7.2	LOS A	0.4	2.6				
Intersection	1166	6.2		0.479		6.6	LOS A	3.7	27.1				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

MOVEMENT SUMMARY

Site: I-4 [I-4: Adelaide St/ Richardson Rd_2020 AM]

I-4: Adelaide St/ Richardson Rd
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Adelaide Street												
2	T1	115	6.1	0.335	5.2	LOS A	2.3	16.8	0.31	0.60	0.31	46.8
3	R2	415	6.3	0.335	8.8	LOS A	2.3	16.8	0.31	0.60	0.31	46.6
Approach		530	6.2	0.335	8.0	LOS A	2.3	16.8	0.31	0.60	0.31	46.6
East: Richardson Road												
4	L2	472	6.1	0.479	4.6	LOS A	3.7	27.1	0.18	0.52	0.18	48.0
6	R2	107	6.5	0.479	8.4	LOS A	3.7	27.1	0.18	0.52	0.18	50.1
Approach		579	6.2	0.479	5.3	LOS A	3.7	27.1	0.18	0.52	0.18	48.5
North: Adelaide Street												
7	L2	34	5.9	0.077	7.1	LOS A	0.4	2.6	0.53	0.64	0.53	48.5
8	T1	23	4.3	0.077	7.3	LOS A	0.4	2.6	0.53	0.64	0.53	47.9
Approach		57	5.3	0.077	7.2	LOS A	0.4	2.6	0.53	0.64	0.53	48.3
All Vehicles		1166	6.2	0.479	6.6	LOS A	3.7	27.1	0.26	0.56	0.26	47.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LANE SUMMARY

Site: I-4 [I-4: Adelaide St/ Richardson Rd_2020 PM]

I-4: Adelaide St/ Richardson Rd
Site Category: (None)
Roundabout

Lane Use and Performance

	Demand Flows Total veh/h	Demand Flows HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Adelaide Street													
Lane 1[d]	953	6.2	1411	0.676	100	9.1	LOS A	7.9	58.1	Full	200	0.0	0.0
Approach	953	6.2		0.676		9.1	LOS A	7.9	58.1				
East: Richardson Road													
Lane 1[d]	1041	6.1	1174	0.887	100	6.4	LOS A	22.2	163.8	Full	320	0.0	0.0
Approach	1041	6.1		0.887		6.4	LOS A	22.2	163.8				
North: Adelaide Street													
Lane 1[d]	104	6.7	425	0.245	100	11.9	LOS A	1.4	10.6	Full	300	0.0	0.0
Approach	104	6.7		0.245		11.9	LOS A	1.4	10.6				
Intersection	2098	6.2		0.887		7.9	LOS A	22.2	163.8				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

MOVEMENT SUMMARY

Site: I-4 [I-4: Adelaide St/ Richardson Rd_2020 PM]

I-4: Adelaide St/ Richardson Rd
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Adelaide Street												
2	T1	207	6.3	0.676	6.2	LOS A	7.9	58.1	0.72	0.65	0.72	45.0
3	R2	746	6.2	0.676	9.9	LOS A	7.9	58.1	0.72	0.65	0.72	44.9
Approach		953	6.2	0.676	9.1	LOS A	7.9	58.1	0.72	0.65	0.72	44.9
East: Richardson Road												
4	L2	849	6.1	0.887	5.8	LOS A	22.2	163.8	0.83	0.46	0.83	45.3
6	R2	192	6.3	0.887	9.2	LOS A	22.2	163.8	0.83	0.46	0.83	47.7
Approach		1041	6.1	0.887	6.4	LOS A	22.2	163.8	0.83	0.46	0.83	45.8
North: Adelaide Street												
7	L2	61	6.6	0.245	11.7	LOS A	1.4	10.6	0.81	0.90	0.81	44.2
8	T1	43	7.0	0.245	12.0	LOS A	1.4	10.6	0.81	0.90	0.81	42.6
Approach		104	6.7	0.245	11.9	LOS A	1.4	10.6	0.81	0.90	0.81	43.6
All Vehicles		2098	6.2	0.887	7.9	LOS A	22.2	163.8	0.78	0.57	0.78	45.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LANE SUMMARY

Site: I-5 [I-5: Irrawang St/ William St_2020 AM]

I-5: Irrawang St/ William St

Site Category: (None)
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Irrawang Street													
Lane 1	120	5.8	2030	0.059	100	1.0	LOS A	0.0	0.3	Full	220	0.0	0.0
Approach	120	5.8		0.059		1.0	NA	0.0	0.3				
East: William Street													
Lane 1	14	0.0	1095	0.013	100	3.8	LOS A	0.0	0.3	Full	180	0.0	0.0
Approach	14	0.0		0.013		3.8	LOS A	0.0	0.3				
North: Irrawang Street													
Lane 1	93	5.4	1867	0.050	100	0.2	LOS A	0.0	0.0	Full	230	0.0	0.0
Lane 2	81	6.2	2113	0.038	100	4.9	LOS A	0.2	1.5	Short	60	0.0	NA
Approach	174	5.7		0.050		2.4	NA	0.2	1.5				
West: William Street													
Lane 1	62	6.5	1420	0.044	100	3.8	LOS A	0.2	1.3	Full	210	0.0	0.0
Approach	62	6.5		0.044		3.8	LOS A	0.2	1.3				
Intersection	370	5.7		0.059		2.2	NA	0.2	1.5				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: I-5 [I-5: Irrawang St/ William St_2020 AM]

I-5: Irrawang St/ William St

Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Irrawang Street												
1	L2	21	4.8	0.059	4.6	LOS A	0.0	0.3	0.03	0.12	0.03	43.7
2	T1	94	6.4	0.059	0.0	LOS A	0.0	0.3	0.03	0.12	0.03	48.4
3	R2	5	0.0	0.059	4.8	LOS A	0.0	0.3	0.03	0.12	0.03	43.6
Approach		120	5.8	0.059	1.0	NA	0.0	0.3	0.03	0.12	0.03	47.3
East: William Street												
4	L2	2	0.0	0.013	3.6	LOS A	0.0	0.3	0.27	0.45	0.27	39.2
5	T1	7	0.0	0.013	3.1	LOS A	0.0	0.3	0.27	0.45	0.27	36.6
6	R2	5	0.0	0.013	4.8	LOS A	0.0	0.3	0.27	0.45	0.27	39.2
Approach		14	0.0	0.013	3.8	LOS A	0.0	0.3	0.27	0.45	0.27	37.9
North: Irrawang Street												
7	L2	5	0.0	0.050	4.6	LOS A	0.0	0.0	0.00	0.03	0.00	48.4
8	T1	88	5.7	0.050	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	49.6
9	R2	81	6.2	0.038	4.9	LOS A	0.2	1.5	0.23	0.50	0.23	39.0
Approach		174	5.7	0.050	2.4	NA	0.2	1.5	0.11	0.25	0.11	44.0
West: William Street												
10	L2	58	6.9	0.044	3.7	LOS A	0.2	1.3	0.19	0.44	0.19	39.2
11	T1	2	0.0	0.044	3.2	LOS A	0.2	1.3	0.19	0.44	0.19	36.5
12	R2	2	0.0	0.044	4.6	LOS A	0.2	1.3	0.19	0.44	0.19	39.1
Approach		62	6.5	0.044	3.8	LOS A	0.2	1.3	0.19	0.44	0.19	39.1
All Vehicles		370	5.7	0.059	2.2	NA	0.2	1.5	0.10	0.24	0.10	43.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LANE SUMMARY

Site: I-5 [I-5: Irrawang St/ William St_2020 PM]

I-5: Irrawang St/ William St

Site Category: (None)
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Irrawang Street													
Lane 1	216	6.0	2016	0.107	100	1.1	LOS A	0.1	0.7	Full	220	0.0	0.0
Approach	216	6.0		0.107		1.1	NA	0.1	0.7				
East: William Street													
Lane 1	28	7.1	816	0.034	100	5.1	LOS A	0.1	0.9	Full	180	0.0	0.0
Approach	28	7.1		0.034		5.1	LOS A	0.1	0.9				
North: Irrawang Street													
Lane 1	170	6.5	1854	0.092	100	0.3	LOS A	0.0	0.0	Full	230	0.0	0.0
Lane 2	145	6.2	1945	0.075	100	5.2	LOS A	0.4	3.0	Short	60	0.0	NA
Approach	315	6.3		0.092		2.5	NA	0.4	3.0				
West: William Street													
Lane 1	111	5.4	1305	0.085	100	4.1	LOS A	0.3	2.5	Full	210	0.0	0.0
Approach	111	5.4		0.085		4.1	LOS A	0.3	2.5				
Intersection	670	6.1		0.107		2.4	NA	0.4	3.0				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: I-5 [I-5: Irrawang St/ William St_2020 PM]

I-5: Irrawang St/ William St

Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Irrawang Street												
1	L2	38	5.3	0.107	4.7	LOS A	0.1	0.7	0.05	0.12	0.05	43.6
2	T1	168	6.0	0.107	0.0	LOS A	0.1	0.7	0.05	0.12	0.05	48.3
3	R2	10	10.0	0.107	5.1	LOS A	0.1	0.7	0.05	0.12	0.05	43.4
Approach		216	6.0	0.107	1.1	NA	0.1	0.7	0.05	0.12	0.05	47.2
East: William Street												
4	L2	4	0.0	0.034	3.9	LOS A	0.1	0.9	0.41	0.55	0.41	38.1
5	T1	14	7.1	0.034	4.3	LOS A	0.1	0.9	0.41	0.55	0.41	35.5
6	R2	10	10.0	0.034	6.8	LOS A	0.1	0.9	0.41	0.55	0.41	37.8
Approach		28	7.1	0.034	5.1	LOS A	0.1	0.9	0.41	0.55	0.41	36.7
North: Irrawang Street												
7	L2	10	10.0	0.092	4.7	LOS A	0.0	0.0	0.00	0.03	0.00	48.1
8	T1	160	6.3	0.092	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	49.6
9	R2	145	6.2	0.075	5.2	LOS A	0.4	3.0	0.33	0.52	0.33	38.6
Approach		315	6.3	0.092	2.5	NA	0.4	3.0	0.15	0.26	0.15	43.9
West: William Street												
10	L2	103	5.8	0.085	4.0	LOS A	0.3	2.5	0.28	0.48	0.28	38.9
11	T1	4	0.0	0.085	4.2	LOS A	0.3	2.5	0.28	0.48	0.28	36.1
12	R2	4	0.0	0.085	6.0	LOS A	0.3	2.5	0.28	0.48	0.28	38.8
Approach		111	5.4	0.085	4.1	LOS A	0.3	2.5	0.28	0.48	0.28	38.8
All Vehicles		670	6.1	0.107	2.4	NA	0.4	3.0	0.15	0.26	0.15	43.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

APPENDIX D SIDRA MODELLING RESULTS (2020 BASE CASE WITH CONSTRUCTION TRAFFIC)

LANE SUMMARY

Site: I-1 [I-1: Pacific Hwy/ Laydown access road_2020 AM_construction]

I-1: Pacific Hwy/ Laydown access road with construction traffic
Site Category: (None)
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Pacific Highway													
Lane 1	31	6.5	1859	0.017	100	8.4	LOS A	0.0	0.0	Short	30	0.0	NA
Lane 2	251	6.2	1923	0.130	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Lane 3	251	6.2	1923	0.130	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Lane 4	1	0.0	585	0.002	100	13.5	LOS A	0.0	0.0	Short	80	0.0	NA
Approach	533	6.2		0.130		0.5	NA	0.0	0.0				
North: Pacific Highway													
Lane 1	301	6.1	1924	0.156	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Lane 2	301	6.1	1924	0.156	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Lane 3	1	0.0	689	0.001	100	10.8	LOS A	0.0	0.0	Short	60	0.0	NA
Approach	603	6.1		0.156		0.0	NA	0.0	0.0				
West: Laydown access road													
Lane 1	34	5.9	279	0.122	100	16.5	LOS B	0.4	2.9	Full	250	0.0	0.0
Approach	34	5.9		0.122		16.5	LOS B	0.4	2.9				
Intersection	1170	6.2		0.156		0.7	NA	0.4	2.9				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: I-1 [I-1: Pacific Hwy/ Laydown access road_2020 AM_construction]

I-1: Pacific Hwy/ Laydown access road with construction traffic
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Pacific Highway												
1	L2	31	6.5	0.017	8.4	LOS A	0.0	0.0	0.00	0.67	0.00	62.9
2	T1	501	6.2	0.130	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	109.9
3u	U	1	0.0	0.002	13.5	LOS A	0.0	0.0	0.57	0.67	0.57	71.4
Approach		533	6.2	0.130	0.5	NA	0.0	0.0	0.00	0.04	0.00	106.3
North: Pacific Highway												
8	T1	602	6.1	0.156	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	109.9
9	R2	1	0.0	0.001	10.8	LOS A	0.0	0.0	0.49	0.63	0.49	59.1
Approach		603	6.1	0.156	0.0	NA	0.0	0.0	0.00	0.00	0.00	109.8
West: Laydown access road												
10	L2	5	0.0	0.122	4.8	LOS A	0.4	2.9	0.73	0.82	0.73	44.4
12	R2	29	6.9	0.122	18.6	LOS B	0.4	2.9	0.73	0.82	0.73	44.0
Approach		34	5.9	0.122	16.5	LOS B	0.4	2.9	0.73	0.82	0.73	44.1
All Vehicles		1170	6.2	0.156	0.7	NA	0.4	2.9	0.02	0.04	0.02	104.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LANE SUMMARY

Site: I-1 [I-1: Pacific Hwy/ Laydown access road_2020 PM_construction]

I-1: Pacific Hwy/ Laydown access road with construction traffic
Site Category: (None)
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Pacific Highway													
Lane 1	27	7.4	1847	0.015	100	8.4	LOS A	0.0	0.0	Short	30	0.0	NA
Lane 2	451	6.2	2367	0.190	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Lane 3	451	6.2	2367	0.190	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Lane 4	1	0.0	272	0.004	100	21.3	LOS B	0.0	0.1	Short	80	0.0	NA
Approach	929	6.2		0.190		0.3	NA	0.0	0.1				
North: Pacific Highway													
Lane 1	542	6.2	2367	0.229	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Lane 2	542	6.2	2367	0.229	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Lane 3	1	0.0	420	0.002	100	14.5	LOS B	0.0	0.1	Short	60	0.0	NA
Approach	1085	6.2		0.229		0.0	NA	0.0	0.1				
West: Laydown access road													
Lane 1	46	6.5	71	0.652	100	99.5	LOS F	2.2	16.4	Full	250	0.0	0.0
Approach	46	6.5		0.652		99.5	LOS F	2.2	16.4				
Intersection	2060	6.2		0.652		2.4	NA	2.2	16.4				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: I-1 [I-1: Pacific Hwy/ Laydown access road_2020 PM_construction]

I-1: Pacific Hwy/ Laydown access road with construction traffic
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Pacific Highway												
1	L2	27	7.4	0.015	8.4	LOS A	0.0	0.0	0.00	0.67	0.00	62.8
2	T1	901	6.2	0.190	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	109.9
3u	U	1	0.0	0.004	21.3	LOS B	0.0	0.1	0.80	0.80	0.80	61.9
Approach		929	6.2	0.190	0.3	NA	0.0	0.1	0.00	0.02	0.00	108.0
North: Pacific Highway												
8	T1	1084	6.2	0.229	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	109.9
9	R2	1	0.0	0.002	14.5	LOS B	0.0	0.1	0.67	0.72	0.67	54.8
Approach		1085	6.2	0.229	0.0	NA	0.0	0.1	0.00	0.00	0.00	109.8
West: Laydown access road												
10	L2	10	10.0	0.652	49.3	LOS D	2.2	16.4	0.96	1.09	1.39	18.9
12	R2	36	5.6	0.652	113.5	LOS F	2.2	16.4	0.96	1.09	1.39	19.0
Approach		46	6.5	0.652	99.5	LOS F	2.2	16.4	0.96	1.09	1.39	19.0
All Vehicles		2060	6.2	0.652	2.4	NA	2.2	16.4	0.02	0.03	0.03	100.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LANE SUMMARY

Site: I-4 [I-4: Adelaide St/ Richardson Rd_2020 AM_construction]

I-4: Adelaide St/ Richardson Rd with construction traffic
Site Category: (None)
Roundabout

Lane Use and Performance

	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Adelaide Street													
Lane 1[d]	561	6.2	1577	0.356	100	7.9	LOS A	2.6	18.8	Full	200	0.0	0.0
Approach	561	6.2		0.356		7.9	LOS A	2.6	18.8				
East: Richardson Road													
Lane 1[d]	579	6.2	1171	0.494	100	5.6	LOS A	3.8	28.1	Full	320	0.0	0.0
Approach	579	6.2		0.494		5.6	LOS A	3.8	28.1				
North: Adelaide Street													
Lane 1[d]	84	6.0	738	0.114	100	7.4	LOS A	0.5	4.0	Full	300	0.0	0.0
Approach	84	6.0		0.114		7.4	LOS A	0.5	4.0				
Intersection	1224	6.2		0.494		6.8	LOS A	3.8	28.1				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

MOVEMENT SUMMARY

Site: I-4 [I-4: Adelaide St/ Richardson Rd_2020 AM_construction]

I-4: Adelaide St/ Richardson Rd with construction traffic
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Adelaide Street												
2	T1	146	6.2	0.356	5.2	LOS A	2.6	18.8	0.33	0.59	0.33	46.8
3	R2	415	6.3	0.356	8.8	LOS A	2.6	18.8	0.33	0.59	0.33	46.7
Approach		561	6.2	0.356	7.9	LOS A	2.6	18.8	0.33	0.59	0.33	46.7
East: Richardson Road												
4	L2	472	6.1	0.494	4.9	LOS A	3.8	28.1	0.28	0.53	0.28	47.6
6	R2	107	6.5	0.494	8.6	LOS A	3.8	28.1	0.28	0.53	0.28	49.7
Approach		579	6.2	0.494	5.6	LOS A	3.8	28.1	0.28	0.53	0.28	48.0
North: Adelaide Street												
7	L2	34	5.9	0.114	7.2	LOS A	0.5	4.0	0.54	0.66	0.54	48.4
8	T1	50	6.0	0.114	7.5	LOS A	0.5	4.0	0.54	0.66	0.54	47.5
Approach		84	6.0	0.114	7.4	LOS A	0.5	4.0	0.54	0.66	0.54	47.9
All Vehicles		1224	6.2	0.494	6.8	LOS A	3.8	28.1	0.32	0.57	0.32	47.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LANE SUMMARY

Site: I-4 [I-4: Adelaide St/ Richardson Rd_2020 PM_construction]

I-4: Adelaide St/ Richardson Rd with construction traffic
Site Category: (None)
Roundabout

Lane Use and Performance

	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Adelaide Street													
Lane 1[d]	980	6.2	1398	0.701	100	9.0	LOS A	8.7	64.4	Full	200	0.0	0.0
Approach	980	6.2		0.701		9.0	LOS A	8.7	64.4				
East: Richardson Road													
Lane 1[d]	1041	6.1	1128	0.923	100	7.4	LOS A	23.2	171.2	Full	320	0.0	0.0
Approach	1041	6.1		0.923		7.4	LOS A	23.2	171.2				
North: Adelaide Street													
Lane 1[d]	135	6.7	418	0.323	100	12.2	LOS A	1.9	14.4	Full	300	0.0	0.0
Approach	135	6.7		0.323		12.2	LOS A	1.9	14.4				
Intersection	2156	6.2		0.923		8.4	LOS A	23.2	171.2				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

MOVEMENT SUMMARY

Site: I-4 [I-4: Adelaide St/ Richardson Rd_2020 PM_construction]

I-4: Adelaide St/ Richardson Rd with construction traffic
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Adelaide Street												
2	T1	234	6.4	0.701	6.3	LOS A	8.7	64.4	0.77	0.65	0.77	44.9
3	R2	746	6.2	0.701	9.9	LOS A	8.7	64.4	0.77	0.65	0.77	44.8
Approach		980	6.2	0.701	9.0	LOS A	8.7	64.4	0.77	0.65	0.77	44.8
East: Richardson Road												
4	L2	849	6.1	0.923	6.8	LOS A	23.2	171.2	1.00	0.54	1.00	44.7
6	R2	192	6.3	0.923	9.8	LOS A	23.2	171.2	1.00	0.54	1.00	47.1
Approach		1041	6.1	0.923	7.4	LOS A	23.2	171.2	1.00	0.54	1.00	45.1
North: Adelaide Street												
7	L2	61	6.6	0.323	12.0	LOS A	1.9	14.4	0.84	0.92	0.84	44.0
8	T1	74	6.8	0.323	12.3	LOS A	1.9	14.4	0.84	0.92	0.84	42.3
Approach		135	6.7	0.323	12.2	LOS A	1.9	14.4	0.84	0.92	0.84	43.1
All Vehicles		2156	6.2	0.923	8.4	LOS A	23.2	171.2	0.88	0.61	0.88	44.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LANE SUMMARY

Site: I-5 [I-5: Irrawang St/ William St_2020 AM_construction]

I-5: Irrawang St/ William St with construction traffic
Site Category: (None)
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Irrawang Street													
Lane 1	147	6.1	2027	0.073	100	0.8	LOS A	0.0	0.3	Full	220	0.0	0.0
Approach	147	6.1		0.073		0.8	NA	0.0	0.3				
East: William Street													
Lane 1	14	0.0	1037	0.013	100	4.0	LOS A	0.0	0.3	Full	180	0.0	0.0
Approach	14	0.0		0.013		4.0	LOS A	0.0	0.3				
North: Irrawang Street													
Lane 1	124	5.6	1865	0.066	100	0.2	LOS A	0.0	0.0	Full	230	0.0	0.0
Lane 2	81	6.2	2062	0.039	100	5.0	LOS A	0.2	1.6	Short	60	0.0	NA
Approach	205	5.9		0.066		2.1	NA	0.2	1.6				
West: William Street													
Lane 1	62	6.5	1380	0.045	100	3.9	LOS A	0.2	1.3	Full	210	0.0	0.0
Approach	62	6.5		0.045		3.9	LOS A	0.2	1.3				
Intersection	428	5.8		0.073		2.0	NA	0.2	1.6				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: I-5 [I-5: Irrawang St/ William St_2020 AM_construction]

I-5: Irrawang St/ William St with construction traffic
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Irrawang Street												
1	L2	21	4.8	0.073	4.7	LOS A	0.0	0.3	0.03	0.09	0.03	43.9
2	T1	121	6.6	0.073	0.0	LOS A	0.0	0.3	0.03	0.09	0.03	48.6
3	R2	5	0.0	0.073	4.9	LOS A	0.0	0.3	0.03	0.09	0.03	43.8
Approach		147	6.1	0.073	0.8	NA	0.0	0.3	0.03	0.09	0.03	47.8
East: William Street												
4	L2	2	0.0	0.013	3.7	LOS A	0.0	0.3	0.32	0.47	0.32	39.1
5	T1	7	0.0	0.013	3.4	LOS A	0.0	0.3	0.32	0.47	0.32	36.4
6	R2	5	0.0	0.013	5.1	LOS A	0.0	0.3	0.32	0.47	0.32	39.0
Approach		14	0.0	0.013	4.0	LOS A	0.0	0.3	0.32	0.47	0.32	37.7
North: Irrawang Street												
7	L2	5	0.0	0.066	4.6	LOS A	0.0	0.0	0.00	0.02	0.00	48.5
8	T1	119	5.9	0.066	0.0	LOS A	0.0	0.0	0.00	0.02	0.00	49.7
9	R2	81	6.2	0.039	5.0	LOS A	0.2	1.6	0.26	0.50	0.26	38.9
Approach		205	5.9	0.066	2.1	NA	0.2	1.6	0.10	0.21	0.10	44.8
West: William Street												
10	L2	58	6.9	0.045	3.8	LOS A	0.2	1.3	0.22	0.45	0.22	39.0
11	T1	2	0.0	0.045	3.4	LOS A	0.2	1.3	0.22	0.45	0.22	36.3
12	R2	2	0.0	0.045	4.9	LOS A	0.2	1.3	0.22	0.45	0.22	39.0
Approach		62	6.5	0.045	3.9	LOS A	0.2	1.3	0.22	0.45	0.22	38.9
All Vehicles		428	5.8	0.073	2.0	NA	0.2	1.6	0.10	0.21	0.10	44.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LANE SUMMARY

Site: I-5 [I-5: Irrawang St/ William St_2020 PM_construction]

I-5: Irrawang St/ William St with construction traffic

Site Category: (None)
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Irrawang Street													
Lane 1	215	6.0	2013	0.107	100	1.1	LOS A	0.1	0.7	Full	220	0.0	0.0
Approach	215	6.0		0.107		1.1	NA	0.1	0.7				
East: William Street													
Lane 1	28	7.1	793	0.035	100	5.3	LOS A	0.1	0.9	Full	180	0.0	0.0
Approach	28	7.1		0.035		5.3	LOS A	0.1	0.9				
North: Irrawang Street													
Lane 1	197	6.6	1855	0.106	100	0.2	LOS A	0.0	0.0	Full	230	0.0	0.0
Lane 2	145	6.2	1946	0.074	100	5.2	LOS A	0.4	3.0	Short	60	0.0	NA
Approach	342	6.4		0.106		2.3	NA	0.4	3.0				
West: William Street													
Lane 1	111	5.4	1301	0.085	100	4.1	LOS A	0.3	2.5	Full	210	0.0	0.0
Approach	111	5.4		0.085		4.1	LOS A	0.3	2.5				
Intersection	696	6.2		0.107		2.4	NA	0.4	3.0				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: I-5 [I-5: Irrawang St/ William St_2020 PM_construction]

I-5: Irrawang St/ William St with construction traffic

Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Irrawang Street												
1	L2	37	5.4	0.107	4.7	LOS A	0.1	0.7	0.05	0.11	0.05	43.6
2	T1	168	6.0	0.107	0.0	LOS A	0.1	0.7	0.05	0.11	0.05	48.3
3	R2	10	10.0	0.107	5.2	LOS A	0.1	0.7	0.05	0.11	0.05	43.4
Approach		215	6.0	0.107	1.1	NA	0.1	0.7	0.05	0.11	0.05	47.2
East: William Street												
4	L2	4	0.0	0.035	4.0	LOS A	0.1	0.9	0.43	0.56	0.43	37.9
5	T1	14	7.1	0.035	4.5	LOS A	0.1	0.9	0.43	0.56	0.43	35.4
6	R2	10	10.0	0.035	7.0	LOS A	0.1	0.9	0.43	0.56	0.43	37.7
Approach		28	7.1	0.035	5.3	LOS A	0.1	0.9	0.43	0.56	0.43	36.6
North: Irrawang Street												
7	L2	10	10.0	0.106	4.7	LOS A	0.0	0.0	0.00	0.03	0.00	48.1
8	T1	187	6.4	0.106	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	49.7
9	R2	145	6.2	0.074	5.2	LOS A	0.4	3.0	0.33	0.52	0.33	38.6
Approach		342	6.4	0.106	2.3	NA	0.4	3.0	0.14	0.24	0.14	44.3
West: William Street												
10	L2	103	5.8	0.085	4.0	LOS A	0.3	2.5	0.28	0.48	0.28	38.9
11	T1	4	0.0	0.085	4.4	LOS A	0.3	2.5	0.28	0.48	0.28	36.1
12	R2	4	0.0	0.085	6.2	LOS A	0.3	2.5	0.28	0.48	0.28	38.8
Approach		111	5.4	0.085	4.1	LOS A	0.3	2.5	0.28	0.48	0.28	38.8
All Vehicles		696	6.2	0.107	2.4	NA	0.4	3.0	0.15	0.25	0.15	43.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.