Traffic Impact Assessment

Enfield Intermodal Logistics Centre; Cosgrove Road, Enfield
MOD 14

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Client: Goodman Property Services (Aust.) Pty Ltd

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Revision History

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1 Introduction

1.1 Overview

Ason Group has been engaged by Goodman Property Services (Aust) Pty Ltd (Goodman) to prepare a Traffic Impact Assessment (TIA) in relation to modifications to the approved warehouse/industrial development at the Enfield Intermodal Logistics Centre (ILC), Cosgrove Road, Enfield (the Site). The Site is located within the Strathfield Municipal Council LGA.

This TIA report provides an assessment of the relevant traffic, transport and parking implications of the Proposal. A response to the relevant Secretary's Environmental Assessment Requirements is provided in **Appendix A**.

1.2 Report Structure

The report is structured as follows:

- Section 2 describes the existing land use, network conditions and public transport connections
- Section 3 provides a summary of the proposed development
- Section 4 outlines the transport planning context, including summary of original Project Application and associated traffic studies
- Section 5 outlines the relevant parking requirements applicable to the proposed development.
- Section 6 assesses the operational traffic impacts of the development including the Site's projected trip generation and forecasted network performance
- Section 7 summarises implications for freight rail movements
- Section 8 discusses construction impacts as a result of the Modification
- Section 9 provides a summary of the key conclusions.

1.3 References

In preparing this TIA, Ason Group has referenced key planning documents, these include:

- Strathfield Consolidated Development Control Plan (SCDCP2005)
- Strathfield Local Environmental Plan (2012)
- Sinclair Knight Merz Pty Ltd (SKM), *Traffic Impact Assessment Intermodal Logistics Centre, Enfield, July 2005 (SKM TIA)*
- Transport and Urban Planning Pty Ltd, *Traffic Monitoring Program Report and Traffic Audit of Enfield Intermodal Logistics Centre for NSW Ports,* August 2017
- Urbis, *Request for Secretary's Environmental Assessment Requirements MP05_0417 Enfield Intermodal Logistics Centre (MOD 14)*, September 2017

This TIA also references general access, traffic and parking guidelines, including:

- Roads and Maritime Services, *Guide to Traffic Generating Developments* (RMS Guide)
- Roads and Maritime Services, *Guide to Traffic Generating Developments Updated traffic surveys* (TDT 2013/04a), August 2013
- Australian Standard 2890.1: Parking Facilities – Off Street Car Parking (AS 2890.1)
- Australian Standard 2890.2: Parking Facilities – Off Street Commercial Vehicle Facilities (AS 2890.2)

2 Existing Conditions

2.1 Site Details

2.1.1 Site & Location

The Site is located within Strathfield Municipal Council LGA in Strathfield South approximately 4.0 kilometres south of Strathfield and 13 kilometres south-west of Sydney CBD. It has an area of 593,200m^2 with frontages to industrial buildings to the north, Cosgrove Road to the east, Punchbowl Road to the south and Wentworth Street to the west. The Enfield Intermodal Logistics Centre includes the active Enfield Intermodal Terminal (IMT), future empty container storage areas, an existing warehouse and southern precinct and 30 hectares of remaining developable industrial zoned land.

The Enfield ILC is located within the Metropolitan Freight Network (MFN), which is a dedicated rail freight line between Port Botany past the Site and towards Sefton Junction (for southbound services) as shown below in **Figure 1**. This rail line has the ability to operate 24 hours a day without interruption from passenger rail services, which generally take priority for shared passenger/freight rail lines.

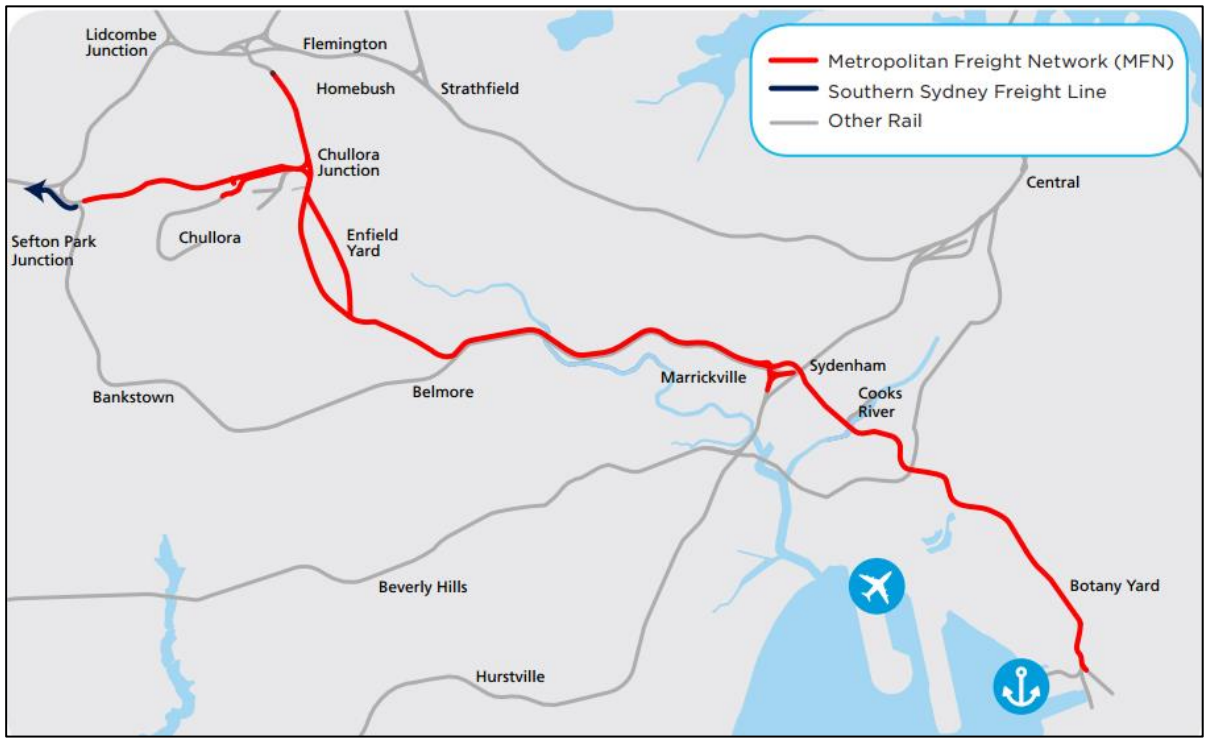

Figure 1: Sydney Metropolitan Freight Network

A Site Plan is presented in **Figure 2** which provides an appreciation of the site and the existing conditions.

2.1.2 Existing Land Use

The Site is currently zoned IN1 General Industrial under Strathfield Local Environment Plan 2012 and is legally described as Lots 1-23 in DP 1183316

The intermodal terminal portion of the Site (Enfield Intermodal Terminal (IMT)) is currently operational, with a regular rail shuttle service moving containers between Port Botany and the IMT. The IMT facilitates transfer of freight cargo received by rail from Port Botany to trucks for distribution to markets in inner and mid-western Sydney, or by rail to regional and / or interstate destinations. Containers received for distribution throughout Sydney are either transported to off-site importers via articulated truck or processed on-site with their contents then distributed via light truck to their end destination.

The ILC is still being developed, with the anticipated developments (warehouses, light industrial, etc.) yet to be constructed.

According to the August 2017 Audit Report, the current annual throughput is in the order of 50,000 twenty-foot equivalent units (TEUs) per annum. This is approximately (16.7%) of the projected annual throughput envisaged by the approved project application of 300,000 TEUs per annum.

Having regard for the above, the forecast peak traffic associated with the ILC has yet to be realised on the surrounding road network.

2.1.3 Existing Site Access

The existing site can be accessed via the following routes:

- Mainline Road from Wentworth Street which provides full turning movements
- Turnout Drive from Cosgrove Road which permits full turning movements in, but restricts left turn movements in and right turn movements out for trucks.

Figure 2: Site and Road Hierarchy

2.2 Road Hierarchy

The key roads providing in the vicinity of the site are summarised below:

- Hume Highway / Liverpool Road – A classified RMS Highway (HW2) that generally runs in an east-west direction to the north of the Site and carries approximately 53,000 vehicles per day (bidirectional). It generally carries 3 lanes of traffic in each direction and is subject to a speed limit of 60km/hr.
- Roberts Road –A classified state main road (MR200) that traverses in the north-south direction to the west of the site. It generally carries 3 lanes of traffic in each direction and 44,000 vehicles per day (based on survey data). A speed limit of 70km/hr applies to Roberts Road. It forms one of the primary access routes to the site via a signalised intersection with Norfolk Road.
- Punchbowl Road – A classified state main road (MR549) that traverses in the east-west direction to the south of the site carries approximately and carries 26,900 vehicles per day. It generally carries 2 lanes of traffic in each direction. A speed limit of 60km/hr applies to this road.
- Cosgrove Road – An unclassified RMS regional road (RR7062) that traverses the north-south direction and forms the eastern site frontage between Liverpool Road to the north and Punchbowl Road to the south and carries an estimated 11,820 vehicles per day (from peak hour survey data). It generally carries a single lane of traffic in each direction in addition to kerbside parking. A speed limit of 60km/hr applies to this road.
- Norfolk Road – a local road that generally runs in the east-west direction to the west of the site. It acts as the connecting street between Wentworth Street and Roberts Road and carries a single lane of traffic in both directions and 3,160 vehicles per day (from peak hour survey data). A speed limit of 50km/hr applies. Turning restriction at the intersection of Roberts Road / Norfolk Road are intended to prevent east-west movements from the industrial areas around Wentworth Street (including the subject site) and the residential areas west of Roberts Road.
- Wentworth Street – a local road that generally runs in the north-south direction. It carries a single lane of traffic in both directions in addition to kerbside parking and applies a speed limit of 50km/hr
- Mainline Road – a local private road, generally within the Site, that provides a connection between the ILC and Wentworth Street. It provides a bridge crossing over the rail line, which was constructed as part of the Project under the original consent.
- Turnout Drive – a local private road within the site which provides a connection between Mainline Road and Cosgrove Road. All vehicles exiting Turnout Drive to the east must travel north on Cosgrove Road having regard for the slip lane and splitter island at that intersection.

The Site has access to the road network generally through the intersections:

1) Roberts Road / Norfolk Road which operates as a
   - Four-way signalised intersection;
   - Three through lanes for north-south travel;
   - Single right-turn bays from Roberts Road into Norfolk Road east and west;
   - Left turn slip lane from Roberts Road to Norfolk Road (east);
   - Dual right- turn bay lanes from Norfolk Road (east) to Roberts Road;
   - Single left turn lane from Norfolk Road (east to west) to Roberts Road; and
   - Single right-turn from Norfolk Road (west) to Roberts Road.
2) Hume Highway / Cosgrove Road which operates as:
   - Signalised T-junction;
   - Two eastbound and three westbound through lanes at the intersection;
   - Single right-turn bay on Hume Highway (west) to Cosgrove Road; and
   - Single left and right-turn lanes on the Cosgrove Road (south) approach.
3) Site access to Cosgrove Road (from Turnout Drive) which operates as:
   - Priority-controlled intersection;
   - All entry movements, with the provision of right-turn bay from Cosgrove Road; and
   - Left-out only from Turnout Drive (west) to Cosgrove Road.
4) Punchbowl Road / Cosgrove Road which operates as:
   - Signalised T-junction;
   - Two through lanes for east-west travel along Punchbowl Road;
   - Left-turn slip lane into Cosgrove Road from Punchbowl Road;
   - Single right-turn bay into Cosgrove Road from Punchbowl Road; and
   - Shared left and right-turn lane and dedicated right-turn lane on Cosgrove Road (north) on Punchbowl Road.

Key intersections that provide access to/from the Site to the arterial road network are the Roberts Road / Norfolk Road and Hume Highway / Cosgrove Road intersections. The Punchbowl Road / Cosgrove Road intersection is significant for future employee access, although heavy vehicle inbound movements are restricted from travelling on the southern parts of Cosgrove Road from the ILC.

The existing geometry at key intersections is presented in **Figure 3**.

Figure 3: Key Local Access Intersections

2.3 Existing Intersection Performance

The performance of the key intersections has been analysed using the SIDRA Intersection computer program. SIDRA modelling outputs a range of performance measures, in particular:

- *Average Vehicle Delay (AVD)* – The AVD (or average delay per vehicle in seconds) for intersections also provides a measure of the operational performance of an intersection and is used to determine an intersection's Level of Service (see below). For signalised intersections, the AVD reported relates to the average of all vehicle movements through the intersection. For priority (Give Way, Stop & Roundabout controlled) intersections, the AVD reported is that for the movement with the highest AVD.
- *Level of Service (LOS)* – This is a comparative measure that provides an indication of the operating performance, based on AVD.

The following table provides a recommended baseline for assessment as per the RMS Guide.

Table 1: RMS Level of Service Criteria

Level of Service	Average Delay per Vehicle (secs/veh)	Traffic Signals, Roundabout	Give Way and Stop Signs
A	less than 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays & spare capacity	Acceptable delays & spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity & accident study required
E	57 to 70	At capacity; at signals, incidents will cause excessive delays. Roundabouts require other control mode	At capacity, requires other control mode
F	More than 70	Unsatisfactory and requires additional capacity.	Unsatisfactory and requires other control mode or major treatment.

The local network performance is provided in **Table 2** which presents the SIDRA intersection modelling results of the key intersections under the existing "baseline" scenario.

Table 2: Existing (2017) Network Performance

Intersection	Control Type	Period	Intersection Delay	Level of Service
Liverpool Rd / Cosgrove Rd	Signals	AM	24.4	B
		PM	37.0	C
Roberts Rd / Norfolk Rd	Signals	AM	77.0	F
		PM	74.3	F
Punchbowl Rd / Cosgrove Rd	Signals	AM	25.5	B
		PM	27.9	B

Note: 1) The above performance includes existing traffic volumes associated with the Enfield IMT, estimated to be in the order of 16.7% of approved volumes.

Relevant SIDRA Outputs are attached at **Appendix D**.

It is evident that the Cosgrove Road intersections operate with acceptable delays and Level of Service during both peak periods. Extensive queues are observed on the Cosgrove Road approach to Hume Highway (Liverpool Road).

The intersection of Norfolk Road / Roberts Road experiences higher delays, with a Level of Service F and considerable queuing on northern and southern approaches of Roberts Road during both peak periods. The poor Level of Service is attributed to existing background traffic, particularly light commuter traffic experienced during both peaks. Queues within Norfolk Road are more moderate having regard for the reduced volumes.

Notwithstanding, the most relevant use of this analysis is to compare these results with that which might occur as a result of the subject development. Forecast network performance is discussed further in Section 6.3.

2.4 Public Transport Access

2.4.1 Mode Share

Current mode share for persons employed within the locality (Travel Zone 984) are summarised in Figure 4.

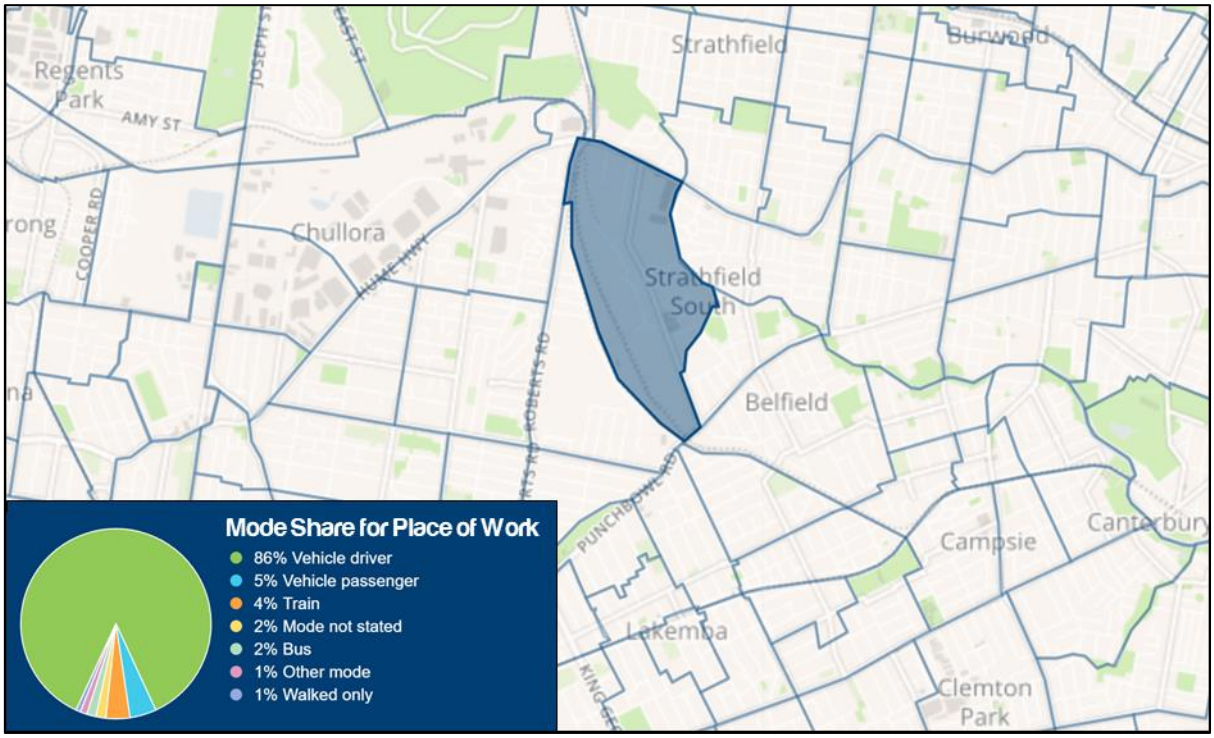

Figure 4: Current Journey-to-Work Mode Share

It is evident that only a small proportion of employees within the locality cycle or use public transport for travel to/from the precinct. Furthermore, it is noted that this data includes sites located much closer to rail and bus services than the subject site. Accordingly, staff associated with the subject site could be expected to rely more heavily on 'vehicle driver' and 'vehicle passenger' travel modes.

The key rail and bus services local to the Site are presented **Figure 5** and summarised below.

2.4.2 Railway Services

The *Integrated Public Transport Service Planning Guidelines, Sydney Metropolitan Area* (Transport for NSW, December 2013) state that rail services influence the travel mode choices of areas within 800 metres walk (approximately 10 minutes) of a railway station. The closest stations are approximately 2.3 km from the site and include Lakemba and Belmore Railway Station on the T3 Bankstown line.

2.4.3 Bus Services

Having regard to the standard bus travel, the *Integrated Public Transport Service Planning Guidelines* state that bus services influence the travel mode choices of sites within 400 metres (approximately 5 minutes) of a bus stop. Nearby bus stops are 700 metres or more away and provide connections to Liverpool, Bankstown, Burwood, Hurstville, Strathfield and Greenacre. However, as is evidenced by the travel mode data summarised in Section 2.4.1, these services are unlikely to be used by employees due to their distance from the site.

In summary, the Site has poor access to public transport services with greater than 400m walking distance to bus stops on the surrounding roads. Furthermore, there are no cycle routes in close proximity to the Site. As such, existing (and future) employees predominantly drive to the Site.

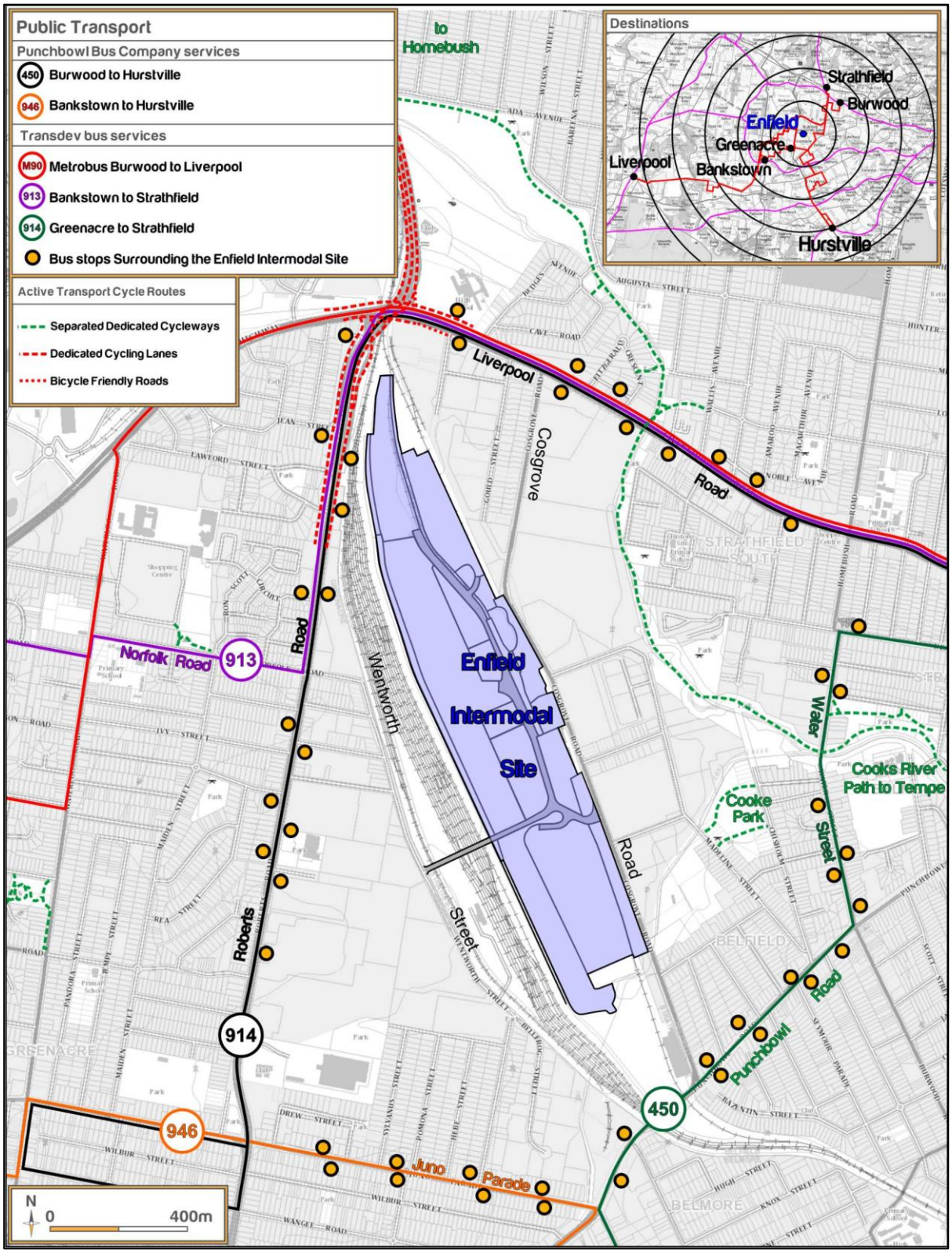

Figure 5: Public Transport Network

2.5 Road Safety Review

Road crashes in the vicinity of the Site have been reviewed for the latest 5-year reporting period between 2012-2016. A summary of the results for the various road sections within the study area is summarised in **Table 3**.

Table 3: Road Crash Summary

Road Name	Between		Segment Length (km)	Total Crashes	Injury Crashes	% Total Crashes
Roberts Road	Liverpool Rd	Juno Pde	2.46	49	33	26%
Liverpool Rd	Wallis Ave	Roberts Rd	0.99	91	58	49%
Punchbowl Rd	Patricia St	Juno Pde	0.73	14	12	7%
Cosgrove Rd	Liverpool Rd	Punchbowl Rd	2.22	24	20	13%
Norfolk Rd	Wentworth St	Roberts Rd	0.17	0	0	0%
Wentworth St	Norfolk Rd	cul-de-sac	1.57	9	4	5%
Mainline Rd	cul-de-sac	Wentworth St	1.34	0	0	0%
Turnout Dr	Cosgrove Rd	Mainline Rd	0.16	0	0	0%

Note: Data obtained from Centre for Road Safety's Interactive Crash Statistics Data

There were a total of 187 crashes on the road segments investigated, resulting in a total of 127 injuries (accounting for multiple injury crashes). Crash rates were highest on Liverpool Road which is likely a result of high traffic volumes combined with a number of unsignalised intersections along its length.

No fatalities were reported during the 5-year period.

3 Overview of Proposal

The development has been the subject of a Major Project assessment (MP05_0147) and approvals under the previous Part 3A process (now State Significant Development), including a number of subsequent modifications.

NSW Ports in conjunction with Goodman now seek to modify the current approval, as follows:

- Extend 24/7 operating hours across "Precinct E"
- Increase in the overall warehouse building floor area by 11,641m^2
- Permit warehouse and distribution uses
- Removal of restrictions on the use of the warehouse buildings to permit truck-to-truck movements for those warehouses with no direct interface with rail sidings.
- Precinct B will operate as small unit industrial tenancies.

A summary of the proposed building areas per Precinct is provided below.

Table 4: Proposed Development Schemes

Land Use	Location	Proposed Building Area (m^2)
Warehouse	A	62,600
	B	7,384
	C	10,487
	D	11,460
	E	7,604
	F	9,620
	G	-
	H	16,475
	I	-
TOTAL		125,630

Note: Precinct D (Toll Lease Area) is currently unrestricted and permits truck-to-truck movements. Accordingly, the operational character of this Precinct with be unchanged

Reference should be made to the plans prepared by SBA Architects, which are submitted separately. A copy of the relevant plans is reproduced (at a reduced scale) for context below.

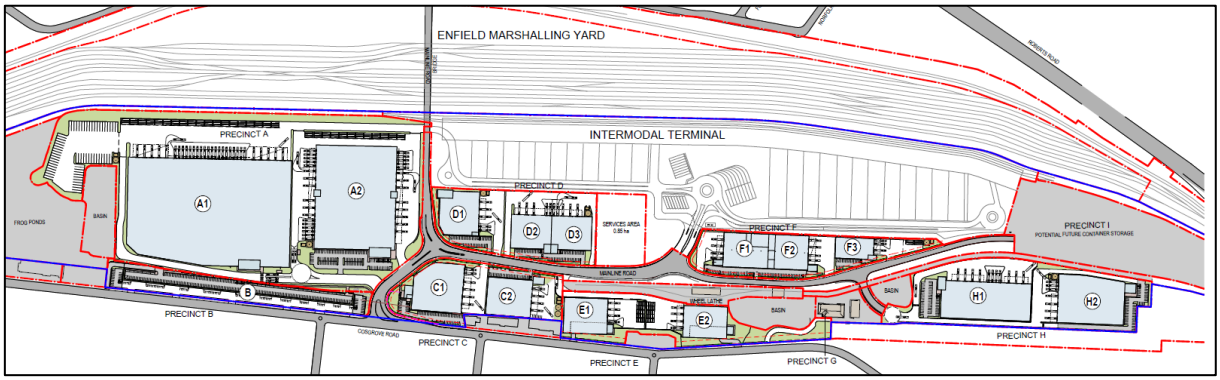

Figure 6: Site Masterplan

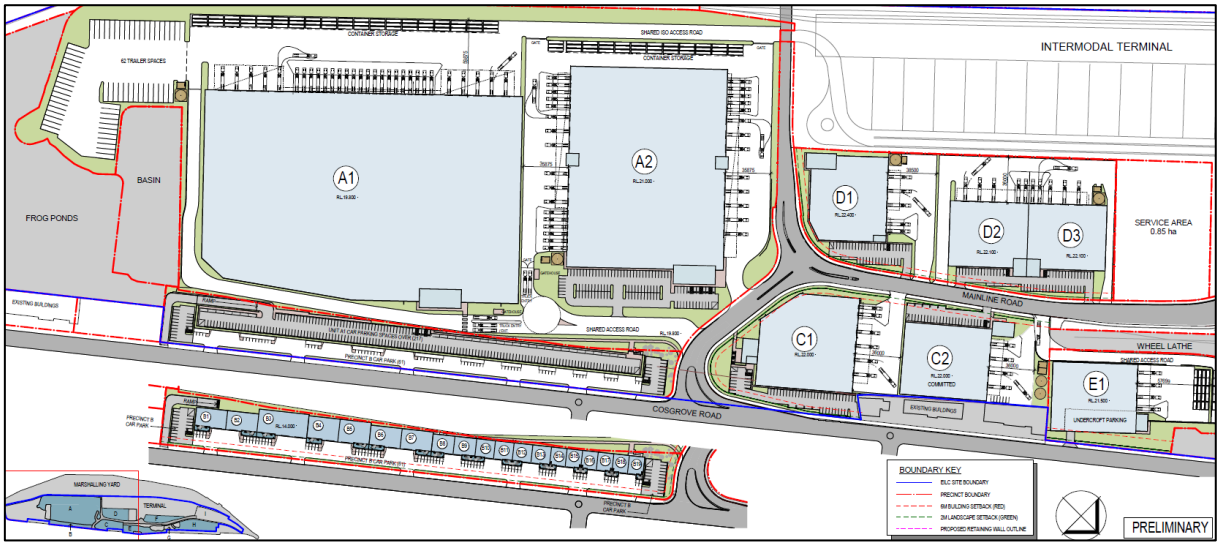

Figure 7: Site Plan South

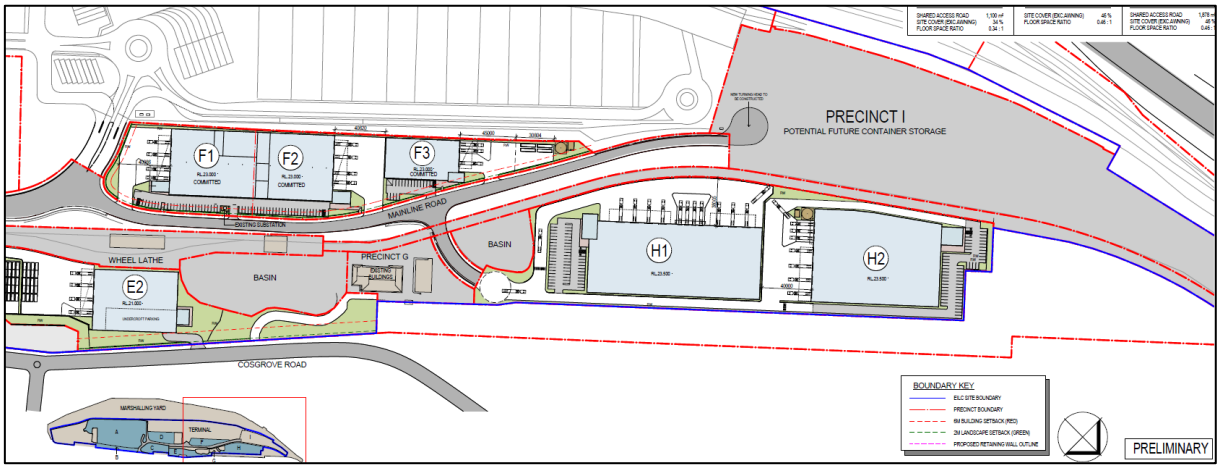

Figure 8: Site Plan North

4 Transport Planning Context

4.1 Site Significance

4.1.1 NSW Freights and Ports Strategy

The *NSW Freight and Ports Strategy* (Nov 2013) is a core component of the State's overall strategic planning framework. The Strategy provides a framework for industry, all levels of government and stakeholders to guide investment and other decisions to enhance freight logistics in NSW. It is noted that the plan is consistent with the objectives of the *NSW Long Term Transport Master Plan*.

A number of actions have been developed as part of the strategy. The Enfield ILC satisfies the outcomes of these actions by:

- Fostering intermodal terminal network development through increasing the share of import / export container movements by rail, and
- Increasing the utilisation of the dedicated freight rail network to/from Port Botany to address restrictions imposed by other freight lines which share rail infrastructure with passenger trains.

The development warehouse and distribution centres adjacent to the Enfield ILC is intended to attract private operators seeking to take advantage of the available rail infrastructure and utilise freight rail services as opposed to road freight to move containers to/from Port Botany and/or the wider freight network.

4.1.2 Draft Greater Sydney Regional Plan 2017

The Draft Greater Sydney Region Plan, released by Greater Sydney Commission (GSC), is intended to update the NSW Government's previous *A Plan for Growing Sydney* (2014). It includes 10 key directions to realise the vision for 2056, as follows:

1. A city supported by infrastructure – infrastructure supporting new development
2. A city for people – celebrating diversity and putting people at the heart of planning
3. Housing the city – giving people housing choices
4. A city of great places – designing places for people
5. Jobs and skills for the city – creating conditions for a stronger economy
6. A well-connected city – developing a more accessible and walkable city
7. A city in its landscape – valuing green spaces and landscape
8. An efficient city – using resources wisely
9. A resilient city – adapting to a changing world
10. A collaborative city - working together to grow a Greater Sydney

The Greater Sydney Commission (GSC) prioritises the need to improve the efficiency of the freight network and identifies the ILC as integral to enabling growth of trade through the ports. The role of the ILC, as identified by the GSC, is that it would act as extensions of the port to the inland by enabling large volumes of containerised freight to be rapidly transferred by rail closer to the catchments of delivery and/or distribution.

4.1.3 Draft Eastern District Plan

The subject site is located at the western edge of the Eastern City District, with the context of the site within this District demonstrated in **Figure 9**. This figure identifies the key industrial and urban services land and freight assets within the District.

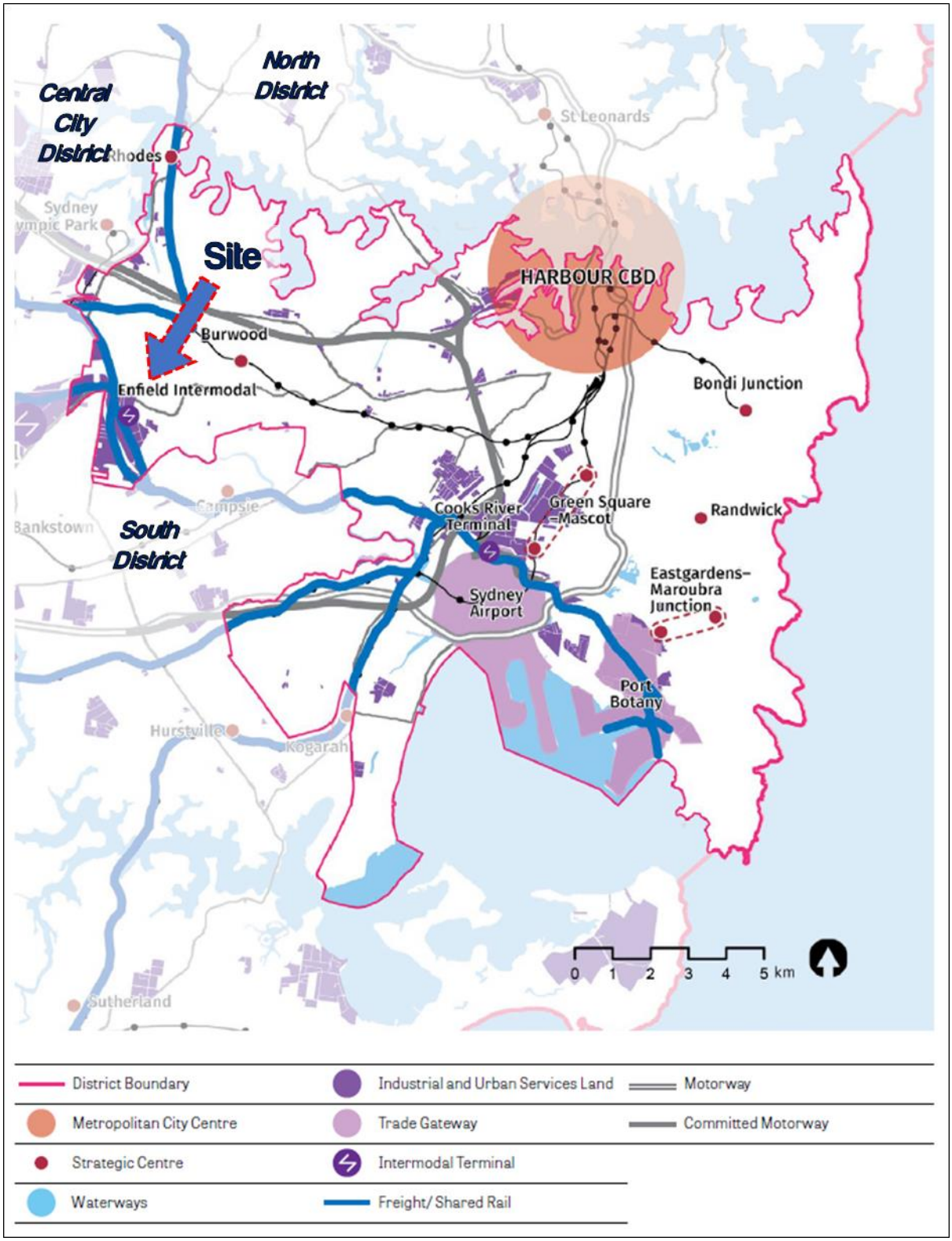

Figure 9: GSC - Eastern City District Plan - Industrial Land and Freight Assets

4.2 Project Approvals

The approved development scheme encompassed the intermodal facility, intermodal warehouses (linked to the intermodal facility) and light industrial areas, as shown in **Figure 10**.

Figure 10: Approved Site Plan

Corresponding building areas under the existing approval are summarised below.

Table 5: NSW Ports Approved Development Schemes

Land Use	Warehouse	Approved Max GFA (m^2)
Light Industrial / Commercial	W	14,995
	X	4,191
	Y	7,790
	Z	14,013
Sub Total		***40,989***
Warehouse	A	20,500
	B	20,500
	C	4,000
	D	3,000
	E	4,500
	F	13,500
	G[1]	7,000
Sub Total		***73,000***
TOTAL		**113,989**

A summary of the historic approvals and applications relating to the development are provided in **Table 6**.

Table 6: Enfield ILC Project Approvals Summary

Application	Proposal	Status	Traffic Implications
05_0147	Demolition, relocation or removal of former railway buildings and structures. Earthworks and drainage including levelling of the site. Construction and operation of an intermodal logistics centre, including intermodal terminal, railway lines, rail siding and associated works, warehousing, empty container storage areas, a community and ecological area, commercial and light industrial area fronting Cosgrove Road and on-site works including internal roads, administrative buildings, diesel and LPG storage, container washdown area and vehicle maintenance shed.	Approved as of 05/09/2007	Numerous local road upgrades, regional road upgrades and traffic monitoring measures as outlined in by the conditions of consent, included in **Appendix B**.
MOD 1	Amendment to the number of dust monitoring sites required and the methodology associated with dust monitoring on the site.	Approved as of 07/10/2008	No significant traffic implications.
MOD 2	Modification to Condition 2.43 of the project approval regarding the timing requirements for the submission of a Site Audit Statement.	Approved as of 30/03/2009	No significant traffic implications.

Application	Proposal	Status	Traffic Implications
MOD 3	Application not progressed.	n/a	n/a
MOD 4	Project adjustments (noise wall arrangements, location and size of detention basins, internal road layout) as a result of detail design as well as minor changes to the wording of construction related conditions.	Approved as of 27/05/2010	No significant traffic implications.
MOD 5	On-site relocation and reuse of excavated material deemed unsuitable for use as engineering fill at the ILC operational areas to the southern part of the site. The fill is proposed to be placed on and around the existing stockpile located at the southern port of the site and commonly referred to as Mt Enfield.	Approved as of 10/11/2011	No significant traffic implications.
MOD 6	Integration of the former Toll Lease area in the ILC project site, some site layout adjustments, site subdivision and a request to provide flexibility in the use of the project meteorological station.	Approved as of 11/12/2012	No significant traffic implications.
MOD 7	Subdivision of a portion of Lot 11 DP1007302 to provide two additional lots comprising: Lot 23: Leasehold Tenant Lot & Intermodal Storage Area G; and Lot 24: Leasehold Tenant Lot & Intermodal Services Area.	Withdrawn	n/a
MOD 8	Subdivision of the Enfield ILC site into 23 allotments to facilitate the construction and operation of the approved Project.	Approved as of 27/11/2013	No significant traffic implications.
MOD 9	Modification of Major Project MP05_0147 to facilitate development of the Site to accommodate the Aglink Global use.	SEARs issued 19/05/2014. No further action taken.	Potential traffic implications – any assessment must demonstrate that no additional traffic is generated as a result of the modification.
MOD 10	Modification of the Project Approval in order to enable truck and container related uses at the Enfield Intermodal Logistics Centre which do not interface with rail operations and rail to rail operations which do not interface with trucks.	On hold	Potential traffic implications. Approval would likely be dependent on NSW Ports demonstrating that truck-to-truck activities would decrease as rail to truck activities increase. Ultimately, this would ensure that the facility would operate as originally approved.
MOD 11	Construction and operation of a new warehouse (Warehouse G) including a workshop, wash bay and office.	Approved as of 08/02/2017	No significant traffic implications.

Application	Proposal	Status	Traffic Implications
MOD 12	Extension of the existing rail sidings, including the expansion of the administration building for the intermodal terminal.	Approved as of 07/03/2017	No significant traffic implications.
MOD 13	This application seeks to remove approximately 2.16 hectares of land (Part Lot 19 DP 1183316) where the Tarpaulin Factory is situated from the original Part 3A approved Enfield ILC . Removing the subject site from the Part 3A approval ensures there is no inconsistency with any development consent granted for a garden centre. The removal is proposed to be undertaken in two stages to facilitate the remediation of the land. The Modification will facilitate the future development for a garden centre and hardware and building supplies assessed under Part 4 of the Act.	Under Assessment	No significant traffic implications.

The relevant conditions, status and commentary relating to traffic and transport applicable to the approval of the Enfield ILC is provided in **Appendix B**.

4.3 Previous Traffic and Transport Studies

4.3.1 Approved Operational Traffic

The SKM TIA was prepared to assess the traffic impacts of the initial project application for the intermodal terminal. Since publishing of the original SMK TIA, a number of modifications have been made to the project application. These applications (otherwise referred to as modifications) have generally argued against the need for updated traffic assessments on the basis that the modifications result in a traffic generation comparable to that of the ILC previously assessed by the SKM TIA. An exception being MOD 10 which did include further traffic studies, however that application has not proceeded and therefore does not form part of the approved baseline from which to compare this Modification.

As part of the original SKM study, regional traffic modelling was undertaken which assessed two scenarios:

- "Do Nothing" scenario including growth at Port Botany and Sydney Airport with no growth of the Enfield ILC, and

- Development of Enfield ILC with some of the movements previously undertaken to/from Port Botany directly by road now replaced by train between Port Botany and Enfield. This would include separate truck trips between Enfield and the ultimate origin/destination within the target market area.

The report provided daily and peak hour generation estimates of truck movements using a "first principles" analysis from data of other rail freight terminals, surveys and data supplied by Sydney Ports at the time. One of the key assumptions in this analysis was that the annual throughput of the intermodal facility would be 300,000 Twenty-foot Equivalent Units (TEUs) of containers. The breakdown of this activity is as follows:

- 150,000 TEUs per annum sent by rail from Port Botany to Enfield.
    - 50,000 TEUs would be unpacked at the Logistics Centre Warehouse and the contents dispatched by road on light trucks;
    - 100,000 TEUs would be dispatched full directly to importers; and
    - 145,000 empty TEUs would be returned to the Empty Container Depot at Enfield from the Logistics Centre Warehouse and from importers/exporters. Around 5,000 TEUs would leak from the system (i.e. containers to other ports / locations).
- 150,000 TEUs per annum would be returned to Port Botany by rail.
    - 10,000 TEUs would come from the Logistics Centre Warehouse where they would be packed with goods brought to Enfield by light trucks;
    - 60,000 full TEUs would be trucked direct from exporters. Most of the containers filled by the exporters would have come from the Empty Container Depot; and
    - 80,000 empty TEUs would be returned to Port Botany from the Empty Container Depot.

Container movements to/from Logistics Centre Warehouse refers to the operations of the various warehouse developments within the Site. Corresponding truck movements associated with the movement of containers associated by the various components of the approved Project Application is provided in **Figure 11** below.

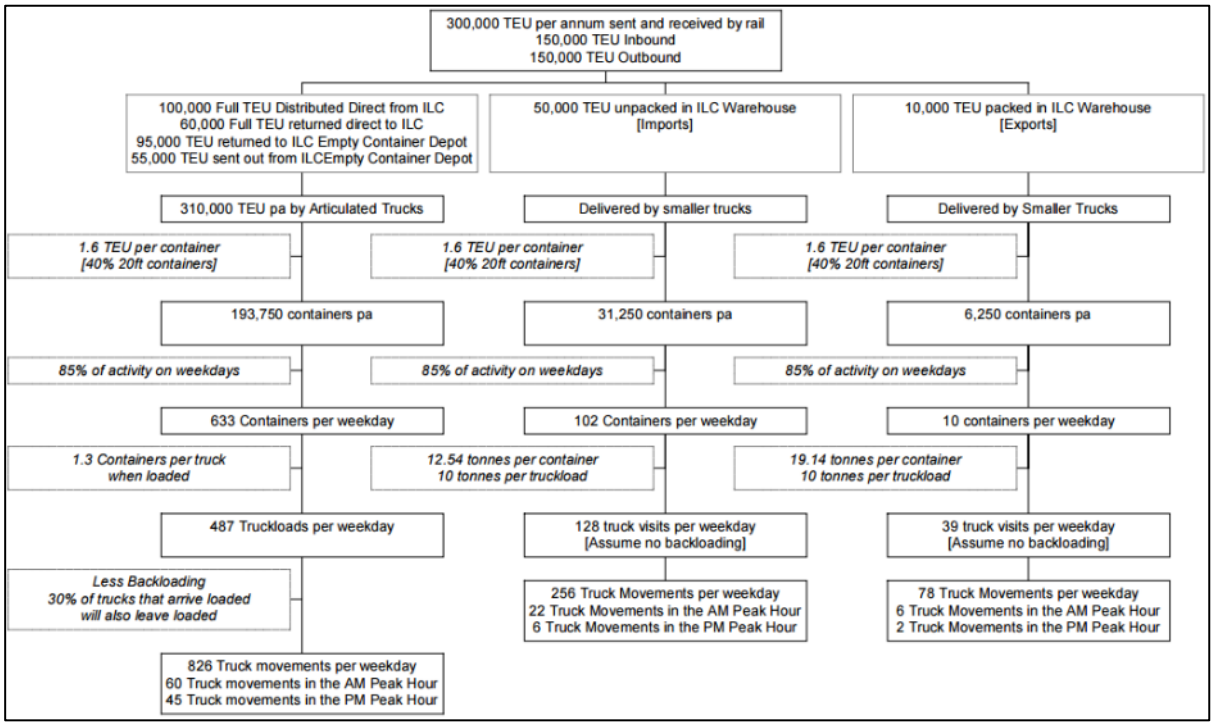

Figure 11: Forecast TEU Projection & Resultant Truck Movements

The generation for the Intermodal and Precinct A are based on operational projections included within the SKM TIA, supporting the original application. Forecast future traffic volumes to be generated by the ILC are outlined in Section 4 of that report in Tables 4-4 and 4-5 providing the AM and PM peak hour trip distributions.

Following the above, the estimated peak hour (7:00-8:00AM and 5:00-6:00PM) traffic generation for the approved intermodal scheme is as follows:

- 1,916 daily movements
  - 1,160 truck movements,
  - 756 staff movements
- 221 morning (AM) peak hour trips
  - 88 trucks
  - 133 staff
- 184 evening (PM) peak hour trips
  - 53 trucks
  - 131 staff movements

The above figures relate to the intermodal (terminal and warehouse) traffic only. Projected traffic volumes associated with the wider precinct, including Light Industrial and Toll area (Area G), is summarised below in **Table 7**.

Table 7: Approved Peak Hourly Traffic Generation

Use	Area	AM			PM		
	n/a	**Staff**	**Trucks**	**Total**	**Staff**	**Trucks**	**Total**
Intermodal	n/a	21	60	**81**	94	45	**139**
Area G (Lot 23)	7,000	9	2	**11**	10	1	**11**
Warehouses	66,000	112	28	**140**	88	8	**96**
Light Industrial	40,989	164	5	**169**	159	10	**169**
Total	113,989	306	95	**401**	300	64	**364**

Similarly, total precinct-wide daily traffic volumes are in the order of 3,702 vehicles per day, including 1,382 trucks and 2,320 staff movements.

Reference should also be made to the adopted traffic distribution during weekday AM and PM peak periods for the overall precinct included in **Appendix C**. These figures expand the values included in table 4-4 and 4-5 of the SKM TIA to include traffic associated with the light industrial areas also forming part of the approval but not reported by the SKM TIA as intermodal traffic.

It is evident that a high proportion of heavy vehicle movements use the Norfolk Road intersection with Roberts Road to access the wider road network.

4.3.2 Existing Site Generation

According to the *Traffic Monitoring Program Report and Traffic Audit of Enfield Intermodal Logistics Centre for NSW Ports* (August 2017) the throughput if the ILC is currently 50,000 TEU per annum. This is equivalent to 16.7% (1 / 6) of the approved ILC throughput and is generally supported by the traffic counts included as part of that audit study.

5 Parking Requirements

5.1 Car Parking

Applicable parking rates outlined by the Strathfield Consolidated Development Control Plan (SCDCP) and the RMS *Guide to Traffic Generating Developments* are outlined in **Table 8** below.

Table 8: Parking Rates

Land Use	RMS	Council
Warehouses	1 space per 300m^2 GFA	Greater of: Office < 20%: 1 space per 55m^2 GFA Office > 20%: 1 space per 55m^2 GFA (excl office) + 1 space per 40m^2 GFA (office)
Industry / Factories	1.3 spaces per 100m^2 GFA	OR 1 space per 2 employees

All precincts with, the exception of Precinct B which relates to light industrial developments, are considered warehouses for the purposes of the above parking rates.

Section 3.8.2 of the DCP states that the warehouse rate "*shall only apply to existing buildings proposed to be used as a warehouse or bulk store and where no building work is proposed*" and that instead "*the development shall comply with the requirements of Part 8.1*" which details car parking rates for a generic "Industry" land-use. This DCP rates includes both floor area and staff based parking rates. The number of staff of each precinct is unknown and, accordingly, the floor area based calculation has generally been applied. The exception is for the intermodal services area for which staff numbers are derived from the original Project Application operational requirements.

As outlined in the SKM TIA in Section 3.3.7, the staff profile during weekdays are as follows:

- A total of 291 staff at any one time, including:
  - 195 warehouse staff; and
  - 96 IMT staff

In Section 4.2.*2 Office Traffic Generation* the report assumes a car occupancy of 1 per person based on a worst-case scenario. As the RMS Guide does not specify a car parking rate based on the number of staff the aforementioned assumptions were used to calculate a requirement for 96 spaces associated with the intermodal.

The corresponding parking requirements are provided in **Table 9**.

Table 9: Car Parking Requirements (RMS Guide & DCP)

Precinct	Building Area (m^2)	Car Parking		
		RMS Requirement	Council Requirement	Proposed
Intermodal / Services	n/a	83[1]	48	-
A1	41,570	139	756	178
A2	21,030	71	382	105
B	7.384	96	146	91
C	10,487	35	191	83
D	11,460	39	208	95
E	7,604	26	138	68
F	9,620	33	175	63
G	-	-	-	-
H	17,475	55	300	127
I	-	-	-	-
TOTAL	125,630	576	2,344	816

Note: 1) No specific rate within the RMS Guide. Accordingly, parking demand calculated from 'first-principles' having regard for the number of staff (96) and current mode share to 'vehicle driver' of 86%

Application of the RMS and Council's rates to the proposed development yield results in a requirement for between 576 – 2,344 car parking spaces, respectively.

A total of 816 car parking spaces are proposed which forms a suitable compromise between these two requirements. It is noted that the Council requirement would result in a parking provision far in excess of the expected staff profile. Accordingly, a parking provision (as proposed) toward the lower end of this range is supportable to encourage, as far as is practicable for a site not well served by public transport, non-car travel modes.

6 Operational Traffic Assessment

6.1 Traffic Generation

6.1.1 Proposed Generation

Consistent with previous traffic studies undertaken for similar developments of the same scale, the traffic generated by the proposed warehouse Precincts excluding the Intermodal, Precinct A and Precinct B has been forecast based upon the average observed trip generation rates at the three warehouse estate sites surveyed to inform the RMS TDT 2013/04a These surveyed sites are generally larger format warehouses at Erskine Park Industrial Estate, Wonderland Business Park and the Riverwood Business Park. The derived traffic generation rates for the warehouse (plus ancillary office) component are as follows:

- AM Peak Hour: 0.158 vehicle trips / 100m^2 GFA
- PM Peak Hour: 0.155 vehicle trips / 100m^2 GFA

Traffic volumes for the intermodal terminal have been maintained from that of the previous SKM TIA.

Forecast traffic associated with Precinct A (which will operate with rail-truck freight, similar to that envisaged for the intermodal warehouses under the approved Project Application) has been calculated on a “pro-rata” basis having consideration for the overall “Approved” Warehouse traffic generation. Similarly, distribution of this traffic between units A1 and A2 has also been determined proportionally based on area from the component traffic generation calculated above.

Traffic generated by Precinct B has been assessed having regard for the RMS *Guide to Traffic Generating Developments* (2002) rates for an industrial ‘Business Park’ having regard for the smaller tenancy sizes proposed within that Precinct. Accordingly, the following equation for business parks was used to derive the generation which was adopted for the AM and PM peak period:

- Peak hour vehicle trips (PVT) = 1.2 vehicles per hour per 100m^2 of gross leasable office / showroom area + 1.0 Vehicle per hour per 100m^2 of gross leasable factory/ warehouse area

The following table outlines the proportion of trucks to cars in the AM and PM peak which has been determined separately for each of the component uses. Intermodal and Precinct A are based on the previously modelled projections included in the original Project Approval. For “Other Warehouses” the proportion is based on the large format warehouses surveyed including Erskine Park Industrial Estate, Wonderland Business Park and Riverwood Business Park. The proportion of trucks for Precinct B is based on Business Park surveyed sites with an average unit size of less than 650m^2 which includes Helensburgh Business Park, Central Business Park (Albion Park Rail) and Shearwater Business Park.

Table 10: Proportion of Trucks

Use	Period	% Trucks
Intermodal (including Precinct A)[1]	AM	19.94 %
	PM	8.30 %
	Daily	42.07 %
Precinct B[2]	AM	3.98 %
	PM	1.66 %
	Daily	5.58 %
Other Warehouses[3]	AM	22.23 %
	PM	13.44 %
	Daily	21.44 %

Note(s): 1) Intermodal figure derived from pro-rata "Approved" proportion

2) Precinct B derived from TDT 2013/04a for Business Park surveyed sites with an average unit size of < 650m^2

3) General warehouse derived from TDT 2013/04a for Erskine Park, Eastern Creek and Riverwood sites

The following table provides a summary of the proposed traffic generation associated with each of the uses.

Table 11: Proposed Generation

Use	Area	AM			PM		
		Staff	Trucks	Total	Staff	Trucks	Total
Intermodal	n/a	21	60	81	43	45	88
Precinct A1	41,570	70	18	88	55	5	60
Precinct A2	21,030	36	9	45	28	3	31
Precinct B	7,384	74	3	77	76	1	77
Other Warehouses	55,646	68	20	88	75	11	86
Total	**125,630**	**269**	**110**	**379**	**277**	**65**	**342**

Note: "Other Warehouses" includes 18 veh/hr associated with the Toll Lease Area within Precinct D

The distribution and impacts of these vehicle trips are assessed further below.

6.2 Traffic Distribution

The adopted traffic distribution is consistent with the original Project Application traffic study and derived based from Table 4-4 and Table 4-5 of the SKM 2005 report which presented 2016 distribution, based on Netanal regional modelling, for AM and PM peak hour flows. This adopts the relative proportion (%) of trip distributions reported, however baseline values have been updated to reflect 2017 surveys. Where updated survey information was not available, background growth factors from comparing 2005 and 2016 volumes from the SKM TIA report were applied.

Inbound and outbound distribution of trips for cars associated with the intermodal was determined based on the operational profile of the staff shift arrival/departure profile detailed in the SKM report.

Distributions for non-intermodal uses are based on the average splits from the surveys for the business park sites underpinning the RMS Guide Update. For truck movements, the AM and PM peak distributions are assumed to be evenly split. The inbound and outbound distribution of vehicles associated with the AM and PM peak are outlined in Table 12.

Table 12: Inbound and Outbound Distribution of Trips

Vehicle	Period	Inbound	Outbound
Trucks	AM	50%	50%
	PM	50%	50%
Cars (Intermodal and Precinct A)	AM	100%	0%
	PM	0%	100%
Cars (Other Warehouses)	AM	80%	20%
	PM	25%	75%

Having regard for these directional splits, the resulting impact on the operation of the critical intersections in the locality is discussed below.

Reference should also be made to the modelled traffic volumes on the surrounding network which are presented in the following.

Period (b) AM Peak
Scenario (a) Cars

Centenary Dr
Hume Hwy
Liverpool Rd
Intermodal
Other Warehouses
Cosgrove Rd
Norfolk Rd
Wentworth St
Mainline Rd
Roberts Rd
Warehouse A2
Precinct B
Warehouse A1
Punchbowl Rd

Period (b) AM Peak
Scenario (b) Trucks

Centenary Dr
Hume Hwy
Liverpool Rd
Intermodal
Other Warehouses
Cosgrove Rd
Norfolk Rd
Wentworth St
Mainline Rd
Roberts Rd
Warehouse A2
Precinct B
Warehouse A1
Punchbowl Rd

Period (c) PM Peak
Scenario (a) Cars

Centenary Dr
Hume Hwy
Liverpool Rd
Intermodal
Other Warehouses
Cosgrove Rd
Norfolk Rd
Wentworth St
Mainline Rd
Roberts Rd
Warehouse A2
Precinct B
Warehouse A1
Punchbowl Rd

Period (c) PM Peak
Scenario (b) Trucks

Centenary Dr
Hume Hwy
Liverpool Rd
Intermodal
Other Warehouses
Cosgrove Rd
Norfolk Rd
Wentworth St
Mainline Rd
Roberts Rd
Warehouse A2
Precinct B
Warehouse A1
Punchbowl Rd

A summary of projected traffic volumes on key road segments is presented in **Table 13** for the road segments outlined in **Figure 12**. It is noted that car parking for Warehouse A1 is proposed within Precinct B and, accordingly, Warehouse A1 and A2 (Link 7 below) traffic volumes are limited to truck movements only.

Table 13: Projected Road Link Volumes Comparison Summary

Link	Direction	Existing		Approved		Proposed	
		AM	PM	AM	PM	AM	PM
1	Northbound	2,656	2,870	2,707	2,878	2,702 (-5)	2,882 (4)
	Southbound	1,903	2,153	1,918	2,182	1,924 (6)	2,182 (0)
2	Northbound	2,640	2,101	2,668	2,133	2,680 (12)	2,138 (5)
	Southbound	1,943	2,393	1,993	2,408	2,000 (7)	2,418 (10)
3	Eastbound	4,129	2,976	4,146	2,984	4,146 (0)	2,983 (-1)
	Westbound	2,784	3,761	2,795	3,774	2,797 (2)	3,774 (0)
4	Eastbound	3,199	2,884	3,214	3,050	3,210 (-4)	3,034 (-16)
	Westbound	2,064	2,960	2,169	2,989	2,156 (-13)	2,984 (-5)
5	Northbound	426	554	449	737	440 (-9)	716 (-21)
	Southbound	383	650	518	689	497 (-21)	675 (-14)
6	Eastbound	405	173	506	196	508 (2)	210 (14)
	Westbound	153	231	196	292	214 (18)	297 (5)
7	Northbound	0	0	0	0	9 (9)	3 (3)
	Southbound	0	0	0	0	9 (9)	3 (3)
8	Northbound	539	422	625	435	607 (-18)	428 (-7)
	Southbound	299	465	318	514	307 (-11)	502 (-12)

A more detailed breakdown separately identifying trucks and car movements for each of the above links is provided in **Appendix C**.

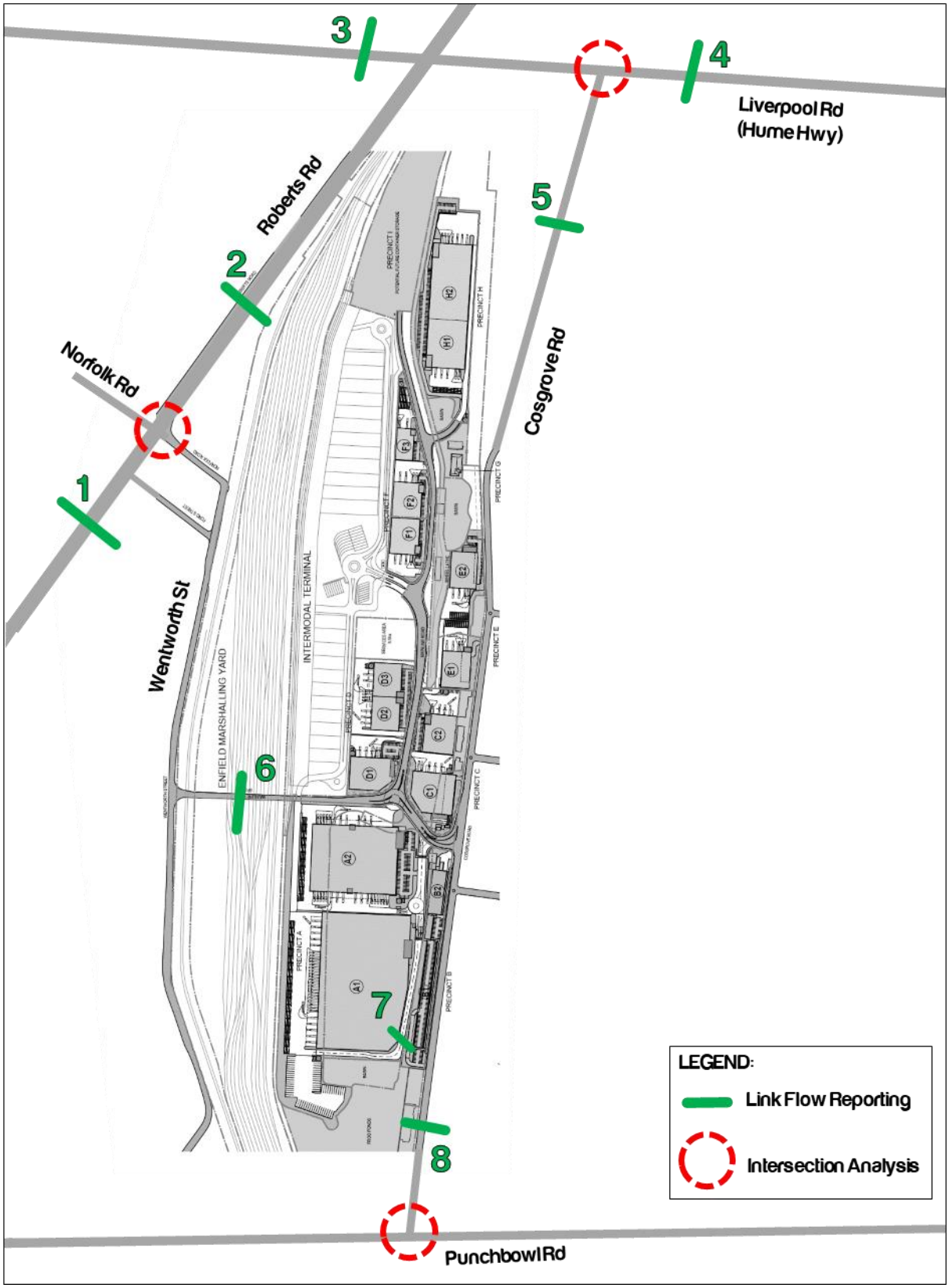

Figure 12: Link Volume Locations

6.3 Traffic Impacts

A comparison of the approved and proposed traffic generation is shown below in **Table 14**.

Table 14: Comparison of Future Traffic Generation (Approved vs Proposed)

Component	Approved				Proposed			
	AM		PM		AM		PM	
	Vehicles	Trucks	Vehicles	Trucks	Vehicles	Trucks	Vehicles	Trucks
Intermodal	21	60	43	45	21	60	43	45
Warehouses	121	30	98	9	174	47	158	19
Light Industrial	164	5	159	10	74	3	76	1
Sub-total	306	95	300	64	269	110	277	65
TOTAL	401		364		379		342	

As a consequence of the proposed modification, there is a forecast reduction in the overall traffic generation from that adopted for the approved Project. Specifically, a decrease in 22 vehicles per hour in both the AM and PM peak periods are to be expected.

The performance of key intersections under the following scenarios has been undertaken.

- Existing — Based on surveyed volumes and calibrated to reflect observed queue lengths and signal phasing arrangement. This includes approximately 16.7% of the 'approved' traffic generation associated with the Project.
- Existing + Approved — This includes the balance of 'approved' traffic volumes.
- Existing + Proposed — Network performance accounting for the reduced volumes and changes in the proportion of heavy vehicles generated by the Project.

The resultant impacts on intersection performance is summarised in **Table 15**.

Table 15: Network Performance – Existing Intersection Geometry

Intersection	Scenario	Period	Intersection Delay	Level of Service
Liverpool Rd / Cosgrove Rd	Existing	AM	24.4	B
		PM	37.0	C
	Existing + Approved	AM	29.4	C
		PM	71.9	F
	Existing + Proposed	AM	28.7	C
		PM	68.8	E
Roberts Rd / Norfolk Rd	Existing	AM	77.0	F
		PM	74.3	F
	Existing + Approved	AM	96.1	F
		PM	76.3	F
	Existing + Proposed	AM	96.4	F
		PM	76.5	F
Punchbowl Rd / Cosgrove Rd	Existing	AM	25.5	B
		PM	27.9	B
	Existing + Approved	AM	28.7	C
		PM	29.5	C
	Existing + Proposed	AM	28.2	B
		PM	29.1	C

The SIDRA analysis indicates that the 'net' traffic volumes arising from the proposed scheme would generally decrease average vehicle delays, with Level of Service remaining unchanged when compared to the approved scheme. An exception is Roberts Rd / Norfolk Rd intersection which has a negligible increase in delay of 0.3 and 0.2 seconds during the AM and PM peak, respectively. This increase is expected to be a result of marginally increased number of heavy vehicles generated by the Project under MOD 14. However, that increase in heavy vehicles is largely offset by reduced light vehicle movement numbers.

It is noteworthy that the current Approval required the extension of the right turn storage bay on the southern approach to the intersection of the Roberts Road / Norfolk Road intersection and this work was completed in conjunction with the intersection upgrade works in late 2013.

7 Rail Operations

No change to rail operations are proposed as part of this Modification.

The Project includes two rail sidings of 930 metres and will operate 24/7 to meet the operating needs of Port Botany and the IMT / ILC

As outlined in the *Intermodal Logistics Centre at Enfield Environmental Assessment* (SKM, October 2005), the target mode share for freight handled by rail from Port Botany is 40%. This envisaged an increase in rail usage from 21% at the time of publication (2005).

8 Construction Traffic Assessment

As part of the original Construction and Environmental Management Plans (CEMP) prepared on behalf the NSW Ports Authority, a set of Construction Traffic Management Protocols (CTMP) for each stage of construction works were included. These CTMP's were attached in the appendices of each CEMP for each of the 3 stages of construction. The CEMP's, and associated CTMP's can be found on the NSW Ports website.

The SKM TIA outlined a total of some 18,354 trucks being required during construction works. Limited details regarding the future construction activities are known at this stage. Nevertheless, no change to the previous construction traffic impacts or management systems is envisaged or proposed as part of MOD 14.

Many of the construction works associated with the Project likely to impact on the surrounding road network have already been undertaken in accordance with the current Approval. These works include much of the site establishment, benching and infrastructure works such as construction of Mainline Road and Turnout Drive.

It is understood that 52,425m^3 of fill material may be required for works associated with the future warehouses. At 18m^3 per truck (in accordance with the previous construction traffic estimates), this equates to a total of approximately 2,910 trucks (5,820 movements). These construction truck volumes associated with the import of material are substantially less than the operational traffic projections. A breakdown of fill material required for each precinct is outlined in the table below:

Table 16: Proposed Fill Material Phasing

Precinct	Estimated Start Date	Duration (Weeks)	Quantity (m^3)	Movements per Day
C, D & F	May 2018 and August 2019	4 - 8	8,695	40
H	June 2018	4	2,660	12
E	February 2019	4	9,300	44
A & B	March 2020	6 – 8	31,770	74-98

It is also noted that this import of material is just part of the remaining earthworks and is not necessarily a new impact as a result of this Modification. Accordingly, the remaining movements are but some of the originally projected volumes.

Detailed Construction Traffic Management Plans will be prepared respective works as and when they occur in the future. In this regard, these CTMPs would have regard for current conditions at the time that works are to occur.

9 Conclusions

The key findings of this Traffic Impact Assessment are:

- The proposal relates to modifications (MOD 14) to the approved warehouse/industrial development at the Enfield Intermodal Logistics Centre (ILC) at Cosgrove Road, Strathfield South. Specifically, MOD 14 seeks an increase in the overall warehouse building floor area, removal of restrictions on the use of the warehouse buildings to permit truck-to-truck movements with the exception of precinct A.
- Located in Strathfield South approximately 18km from Port Botany, the site is directly linked to the Port through the Metropolitan Freight Network and has had numerous historical applications and approvals associated with it.
- A total of 816 parking spaces are proposed which forms a compromise between the nominal RMS Guide rates (576 spaces) and the significantly higher parking required by the Strathfield DCP (2,344 spaces). Accordingly, the proposed parking forms a suitable compromise between these two rates.
- The project will generate the following traffic volumes:
  - AM peak 379 veh/hr (-22 from the approved Project) incl. 110 trucks
  - PM peak 342 veh/hr (-22 from the approved Project) incl. 65 trucks
  - Daily 3,424 veh/day (-278 from the approved Project) incl. 1,413 trucks
- Staff trips by non-car travel modes are expected to be minimal, having consideration for the limited public transport options (rail and bus) services operating in close proximity to the site. Whilst improvements to these services would be desirable, it is not considered that the increased employment generated by the development will necessitate changes to existing services in isolation.
- As outlined above, the Project will propose to generate some 22 vehicles less per hour during the AM and PM peak periods compared to the approved traffic generation.
- SIDRA analysis indicates that the proposed changes to network traffic volumes (less than the approved Project) will generally reduce average delays at surrounding intersections, except for the Roberts Rd / Norfolk Rd intersection which increase marginally by less than 0.3 seconds. Notwithstanding, that negligible increase would be mitigated by extension of the right turn bay in Roberts Road on the southern approach to Norfolk Road, which is required under the original Project approval.
- Level of Service at all key intersections will remain unchanged as a result of this Modification.

In summary, the proposed Modifications are supportable on traffic planning grounds and will not result in any adverse impacts on the surrounding road network or the availability of on-street parking.

Appendix A

Response to SEARs

SEARs Requirement	Report Section	Comments
TRAFFIC AND TRANSPORT		
An assessment of construction and operational traffic (vehicle, pedestrian, bus services, train operation and cyclists) impacts, including but not necessarily limited to:		
a) A considered approach to route identification and scheduling of transport movements	6.2	Adopted distribution is consistent with original application for staff and trucks in all precincts.
b) The number, frequency and size of construction related vehicles (passenger, commercial and heavy vehicles, including spoil management movements and track machines	8	No change from current approval.
c) The nature of existing traffic (types and number of movements) on construction access routes (including consideration of peak traffic times and sensitive road users and parking arrangements) and assessment of traffic impacts on these routes including identifying traffic management measures to mitigate any issues	2	Overall traffic volumes under MOD 14 will reduce from that previously approved. Accordingly, the impact of the development on the surrounding road network is generally consistent with that already approved.
d) Construction worker parking	8	No change from approved concept plan. All parking is to be provided on site with no contractor parking to occur in surrounding streets.
e) Provisions proposed to ensure safe access and egress to/from the classified road network	6	Access to classified road network is provided via signalised intersections to: ▪ Roberts Road, ▪ Liverpool Road; and ▪ Punchbowl Road These accesses are provided by way of signalised intersection, thus providing safe and controlled access to/from the site.
f) The nature of any train paths (types and number of movements) and potential impact to these train paths due to additional track possession requirements	7	No change from the approved concept plan

<table>
<tr><th>SEARs Requirement</th><th>Report Section</th><th>Comments</th></tr>
<tr><td>g) The need to close, divert otherwise reconfigure elements of the road and cycle network associated with construction of the project</td><td>8</td><td>Most construction works are to be contained wholly within the site. Accordingly, no significant impacts are expected to occur on public roads or cycle routes.

Localised works may be required to facilitate construction of access driveways. Subject to detailed construction traffic management plan.</td></tr>
<tr><td colspan="3">Operational Transport Impacts</td></tr>
<tr><td colspan="3">An assessment (and modelling) of the operational transport impacts of the project for both road and rail in accordance with the Rods and Maritime Services (formerly RTA) Guide to Traffic Generating Developments, including:</td></tr>
<tr><td>a) Existing and forecast travel demand and traffic volumes for the project (road and rail)</td><td>6</td><td><table><tr><th></th><th>Approved</th><th>Proposed</th></tr><tr><td>AM</td><td>401</td><td>370</td></tr><tr><td>PM</td><td>364</td><td>334</td></tr><tr><td>Daily</td><td>3,702</td><td>3,390</td></tr></table></td></tr>
<tr><td>b) Assessment of rail transport movements, including the number and frequency of train movements and potential conflicts with current rail traffic</td><td>7</td><td>No change to the approved freight rail movements.</td></tr>
<tr><td>c) Consideration of cumulative traffic impacts and the effect of likely and target modal splits (including maximization of rail haulage)</td><td>6.3
&
2.4.1</td><td>No change to the cumulative impact of the approved concept plan.

The Modification is intended to help encourage businesses into the Enfield Intermodal to help realise the Project which forms part of the regional freight plan to maximise the use of rail haulage from Port Botany and therefore reduce potential barriers to economic growth out of the Port (associated with road congestion in and around the Port itself).

No change anticipated in modal split from approved concept plan</td></tr>
</table>

SEARs Requirement	Report Section	Comments
d) Performance of key interchanges and intersections by undertaking a level of service analysis at key locations	6.3	See table below
e) Wider transport interactions (including assessment of impacts on local roads, cycling, public and freight transport and the broader NSW rail network	6.3	MOD14 will reduce overall traffic demands and improve the regional network performance. Rail freight movements will be preserved however the decrease in heavy vehicle movements around Port Botany, one of the key objectives of the project will be maintained.
f) Details of design of additional rail sidings (if implemented) and related infrastructure, including any accreditation requirements	7	No change in the design of or additional rail sidings from the approved concept plan.
g) Risk impacts and proposed routes for any dangerous goods transport must be identified in the EIS, unless identified and consistent with the current approval	7	The Modification will not result in any change to the likelihood of Dangerous Goods being transport to/from the site. Any transport of Dangerous Goods must adhere to the relevant standards and guidelines.

Intersection	Scenario	Period	Level of Service
Liverpool Rd / Cosgrove Rd	Existing	AM	B
		PM	C
	Existing + Approved	AM	C
		PM	F
	Existing + Proposed	AM	C
		PM	E
Roberts Rd / Norfolk Rd	Existing	AM	F
		PM	F
	Existing + Approved	AM	F
		PM	F
	Existing + Proposed	AM	F
		PM	F
Punchbowl Rd / Cosgrove Rd	Existing	AM	B
		PM	B
	Existing + Approved	AM	C
		PM	C
	Existing + Proposed	AM	B
		PM	C

SEARs Requirement	Report Section	Comments
h) Identification of traffic and transport measures to mitigate any impacts, including clear details of any road and rail infrastructure upgrades, particularly at the entrance to the site and at any road/rail interfaces	6.3	Overall, MOD 14 will decrease traffic volumes on the surrounding road when compared to the approved scheme. Accordingly, no additional road or rail upgrades are deemed to be required as a result of this Modification to the Project. The improvements, required under the current Approval have been completed. This includes extension of the right turn storage bay in Roberts Road on the southern approach to Norfolk Road
Justification for use of road movements to the site	7	Current utilisation of rail-to-freight opportunities are minimal, with the Intermodal currently operating at approximately 16.7% of its approved capacity of 300,000 TEU per annum. The truck-to-truck freight activities proposed are intended to encourage businesses into the precinct to activate the development. It should be noted that the higher turnover associated with rail-to-truck movements results in more truck movements than occurs with standard warehousing activities. This reflects the nature of operations with typically longer on-site dwell times for goods in standard warehouses (truck-to-truck) when compared to transitional nature of the intermodal distribution facility.
Details of progression from road-to-rail movements	7	The project will facilitate both road and rail movements. As further road congestion occurs at Port Botany, the use of intermodal facilities such as Enfield will increase.
Consideration of existing approved, and current proposals for modification to operations under the Enfield Logistics Centre project approval MP05_0147	4	Consideration for all relevant previous modifications have been undertaken. The majority of previous applications did not have significant implications for operational traffic movements associated with the project. Those applications that did have potential implications (i.e. MOD 10) have been placed on hold.

Appendix B

Summary of Relevant Conditions of Approval

Table 17: Relevant Condition of Consent (Existing Approvals)

Ref	Condition of Consent	Comment	Status	Compliance
	Traffic and Transport Impacts			
2.1	The Proponent shall provide a shuttle bus service between Strathfield train station and the site during peak construction works, and shall encourage construction employees to utilise public transport rather than private transport to the site.	The requirement of the condition indicates that shuttle bus services should be provided during "peak construction works". Shuttle bus services were provided during the base infrastructure and major civil construction works which were completed in 2013. The scale of the future warehouse construction is of a lesser scale and does not warrant a shuttle bus service	Closed	Compliant
2.2	The Proponent shall provide a manual and/ or technological solution to control the frequency of articulated and B-double vehicles utilising the Cosgrove Road entrance to the site during morning and afternoon peak periods.	Addressed in NSW Ports approved Overarching Operational Traffic Management Plan. It is noted that the design of the Cosgrove Road / Turnout Drive intersection does not permit right turn egress movements from Turnout Drive, thus limiting ILC traffic using Cosgrove Road to the south.	Closed	Compliant
	On-Site Traffic Management and Parking			
2.3	The Proponent shall design, construct and maintain all internal road works, including the associated 300 parking facilities and loading bays (for the operational areas associated with the ILC) and the 212 parking facilities and loading bays (for the light industrial/commercial area), to meet or exceed the following requirements: a) Compliance with the provisions of relevant Australian Standards, RTA standards and guidelines; b) Installation of clear signage to demarcate all vehicle movements within the site;	The full quantum of 512 total parking facilities and loading bays have yet to be delivered. However, provision of parking spaces is expected to occur as the future development of individual lots is realised. Note – it is anticipated that this Condition will be modified as part of this MOD 14.	Ongoing	Compliant

Ref	Condition of Consent	Comment	Status	Compliance
	c) Provision of directional pavement arrows on all internal roads, and line-marking and signage to indicate designated truck routes and bays; d) Internal roadways wide enough to accommodate through traffic and turning two-way traffic; e) Design of site ingress and egress points to ensure that vehicles enter and leave the site in a forward direction; f) Installation and maintenance of any landscaping on the site so as not to affect driver sight distances for vehicles entering and exiting the site; and g) Clear demarcation of all visitor, disabled, ambulance and service vehicle parking areas.			
	Local Area Traffic Management			
2.4	Prior to the commencement of operation of the project, the Proponent shall develop and implement, in consultation with the RTA, Strathfield Municipal Council and Bankstown City Council, the following measures to prevent the movement of heavy vehicles through residential areas of Greenacre to the west of the project, generally between Roberts Road, Boronia Road and the Hume Highway:			
	a) Physical measures to discourage through-traffic across Roberts Road at the intersection of Norfolk Road, with the aim of preventing heavy vehicles leaving the project from directly accessing residential areas, and reducing the desirability of rat-running through those residential areas;	This measure has been addressed through the provision of left and right turn only signals from the side approaches at the intersection of Roberts Road / Norfolk Road. Load limit restrictions are also in place along Norfolk Road (west).	Complete	Compliant
	b) Closure of the median strip on the Hume Highway at Como Road, to prevent heavy vehicles turning right into residential areas on the way to the project;	See Condition 2.5	Not required	n/a
	c) Traffic calming measures on Rawson Road to reduce the desirability of heavy vehicles travelling along this route between the Hume Highway and the project;	Speed humps and cushions are present along Rawson Road between the Hume Highway and Roberts Road.	Complete	Compliant

Ref	Condition of Consent	Comment	Status	Compliance
	d) Stop signs on Noble Avenue at the intersections of Chiswick Road and Northcote Road to reduce the desirability of vehicles rat-running in a north-south direction through residential areas; and	Roundabout installed at intersection of Noble Avenue / Chiswick Road. Stop signs at the intersection of Noble Avenue / Northcote Road have been provided at the Northcote Road approaches only.	Complete	Compliant
	e) Imposition of load limits on Karuah Street and Valencia Street to prevent heavy vehicles lawfully using this route as a by-pass around Boronia Road.	Load limit restriction signs are in place at the intersections into these streets. NSW Ports provided a Traffic Management Plan requesting the load limits on Karuah and Valencia Streets to Council as requested at a meeting on 16 May 2013 for consideration at the local Traffic Management Committee.	Complete	Compliant
2.5	Prior to the commencement of operation of the project, the Proponent shall consult with the State Transit Authority, and relevant bus operators, with the aim of relocating bus routes currently following Roberts Road. Should relocation of these bus routes be agreed between the parties, the Proponent shall install physical measures to prevent through-traffic across Roberts Road at the intersection of Norfolk Road. Any such road works shall be undertaken in consultation with, and to meet the requirements of, the RTA. Notwithstanding condition 2.4b) of this approval, should physical measures be implemented on Roberts Road at the intersection of Norfolk Road, the Proponent shall review the need for closure of the median strip on Hume Highway at Como road in consultation with RTA, and if agree by the RTA, no longer be required to implement those works.	Intersection works complete with signal arrangements preventing through movements across Roberts Road at Norfolk Road. Site observations indicate that some vehicles disobey the signal arrangements and still travel through the intersection unlawfully.	Complete	Compliant
2.6	The Proponent shall investigate, in consultation with Strathfield Municipal Council, opportunities to install 4-hour parking restrictions along the full length of Wentworth avenue to discourage the parking of trailers on the approach to the site. Should such measures be found to be feasible and agreed by Council, the Proponent shall arrange to have parking restrictions in place prior to the commencement of the operation of the project.	Minutes of the Road Transport Coordination Group (31/10/16) indicate that the group would review the opportunity to include Wentworth Avenue parking restrictions post commencement of IMT operations. Since commencement in early May 2016, the group stated that “there has been no issues raised with trailer parking and it is understood that the standard restrictions apply to trailer parking (i.e. 1-hour limit)”.	Complete	Compliant

Ref	Condition of Consent	Comment	Status	Compliance
	Regional Traffic Management			
2.7	Prior to the commence of the operation of the project, the Proponent shall upgrade the intersection of Roberts Road and Norfolk Road, as agreed with the RTA and in accordance with the relevant RTA standards. The upgrade works shall comprise:			
	a) Upgrade of the intersection to accommodate 19-metre semi-trailer and 25-metre B-double swept paths in accordance with the relevant RTA guidelines and AUSTROADS standards;		Complete	Compliant
	b) Extension of the Roberts Road northbound right-turn bay to 150 metres;	Intersection design of 100m was agreed and approved by RTA, with works completed in late 2013.	Complete	Compliant
	c) Provision of a southbound slip lane into Norfolk Road;		Complete	Compliant
	d) Provision of diamond phasing operation on Norfolk Road to ensure right-turn movements can be carried out in a controlled and safe environment;	A fully controlled right turn movement is provided. However, Norfolk Road movements occur as part of a "split phase" (not diamond) on account of the dual right turn lanes from Norfolk Road (east) into Roberts Road northbound.	Complete	Compliant
	e) Reconfiguration of Norfolk Road east to provide a right-turn bay, with the right-turn bays in Norfolk Road facing each other;		Complete	Compliant
	f) Provision of three lanes for exiting traffic (including the right-turn bay) from Norfolk Road east by widening the intersection to the north; and		Complete	Compliant
	g) Median island works on Roberts Road to achieve the necessary turning path on entry and exit to and from Norfolk Road.		Complete	Compliant
2.8	Prior to the commencement of the operation of the project, the Proponent shall validate that the intersection of Norfolk Road and Wentworth Street, and the intersection of Cosgrove Road and the Hume Highway can accommodate 19-metre semi-trailer and 25-metre B-	GHD road safety audit carried out in October 2013 did not identify any deficiency with RTA or other guidelines with regard to swept paths. Intersection works completed by Christie Civil in September 2013	Complete	Compliant

Ref	Condition of Consent	Comment	Status	Compliance
	double swept paths in accordance with the relevant RTA guidelines and AUSTROADS standards. Where necessary, the Proponent shall arrange for the upgrade of these intersections to accommodate 19-metre semi-trailer and 25-metre B-double swept paths, in consultation with and to the satisfaction of the RTA. All upgrade works shall be completed prior to the commencement of operation of the project, unless otherwise agreed by the RTA.			
2.9	Prior to the commencement of operation of the project, the Proponent shall validate that the pavement of Wentworth Street and Norfolk Road, between Roberts Road and the access point for the site is of a standard suitable for 19-metre semi-trailer and 25-metre B-double vehicles. Where necessary, the Proponent shall arrange for the upgrade of the pavement of these roads to a standard suitable for 19-metre semi-trailer and 25-metre B-double vehicles in consultation with and to the satisfaction of the RTA. All upgrade works shall be completed prior to the commence of operations of the project, unless otherwise agreed by the RTA.	Validated in Fugro PMS Report No R2010097-1 (21 May 2010)	Complete	Compliant
2.10	The Proponent shall investigate, and where feasible implement, measures at the intersection of Norfolk Road and Roberts Road to give priority (increase "green time") to vehicles turning right from Norfolk Road into Roberts Road, in preference to vehicles turning left at that intersection. In considering options for such priority movements, the Proponent shall consult with the RTA, Strathfield Municipal Council and Bankstown City Council.	Works Authorisation Deed approved by RTA in June 2010 included signal group phase chart indicating the agreed priorities for vehicle movements at the intersection. Works completed by Christie Civil in September 2013. Signal timings are a matter for RMS and therefore not within the control of the Proponent.	Complete	Compliant
	Coordination and Management of Transport Issues			
2.12	The Proponent shall establish and maintain for the life of the project, unless otherwise agreed by the Director-General, a **Road Transport Coordination Group** to oversee and coordinate the management of traffic and road issues associated with and affected by the project. The Group shall include representatives of the Proponent, the Department, the RTA, Strathfield Municipal Council and Bankstown City Council, and shall operate in accordance with the terms of reference agreed by those	Approximately 2-3 meetings held every year.	Ongoing	Compliant

Ref	Condition of Consent	Comment	Status	Compliance
	parties at the first meeting(s) of the Group. The Proponent shall bear the full cost of administering the Group.			
	Traffic Monitoring and Auditing			
3.6	The Proponent shall develop and implement a **Traffic and Capacity Monitoring Program** to monitor the throughput and traffic generation of the project. The Program shall include, but not necessarily be limited to: a) Provisions for monitoring the throughput of the project; b) Provisions for representative monitoring the traffic generation of the project, with reference to traffic generation as a function of project throughput, type of road transport employed, hours of traffic movements and intended road traffic destinations; c) Provisions for periodic monitoring of traffic movements generated by the project in the surrounding road network, with a particular focus on the residential areas of Greenacre to the west of the project, generally between Roberts Road, Boronia Road and the Hume Highway, and the principal road transport routes to and from the site; and d) A framework for recording and reporting the outcomes of the Program and a system for considering data generated through the Program.	An Independent Environmental Compliance Audit, undertaken in December 2016 recommended that: *NSW Ports still needed to implement most components of their TCMP, including traffic counters at specified suburban street locations; plus surveys of trucking types, routes utilised and arrival times.* Traffic audit reports were undertaken for NSW Ports by Transport & Urban Planning Pty Ltd on the following dates: ▪ April 2016 ▪ August 2017	Ongoing	Compliant
3.7	Within 90 days of the project reaching annual throughput of 50,000 TEU, 150,000 TEU and 250,000 TEU, or as may be directed or agreed by the Director-General, and during a period in which the project is operating under normal operation conditions, a **Traffic Audit** of the project shall be undertaken by an independent qualified person(s) approved by the Director-General. The Audit shall include, but not necessarily be limited to: a) Assessment of the traffic performance of the project against the predictions made in the documented referred to under condition 1.1 of this approval; b) Consideration of the results of the Traffic and Capacity Monitoring Program required under condition 3.6 of this approval;	Traffic audit reports were undertaken for NSW Ports by Transport & Urban Planning Pty Ltd on the following dates: ▪ April 2016 ▪ August 2017 Based on Meeting Minutes of the Intermodal Logistics Centre Community Liaison Committee (05/12/16), it is understood that the throughput of the Enfield ILC is currently low and that traffic generation has yet to reach its forecasted peak to trigger a need for latter stage Traffic Audits.	Ongoing	Open

Ref	Condition of Consent	Comment	Status	Compliance
	c) Consideration of the effectiveness of the traffic management measures implemented by the Proponent and the measures required under this approval; d) Consideration of the traffic-related issues raised by the RTA, Bankstown City Council and Strathfield Municipal Council; e) Consideration of the traffic-related complaints recorded in accordance with condition 5.3 of this approval; f) Findings and recommendations with respect to the traffic performance of the project and any additional measures that may be required to manage traffic associated with the project.			
3.8	Within 28 days of conducting the traffic auditing referred to under condition 3.7 of this approval, the Proponent shall provide the Director-General with a copy of the audit report. If the audit report identifies any non-compliance with the traffic predictions, principal heavy vehicle routes or local area traffic management measures outlined in the documents referred to under condition 1.1, or specified under this approval, the Proponent shall detail what additional measures would be implemented to ensure compliance, clearly indicating who would implement these measures, when these measures would be implemented, and how the effectiveness of these measures would be measured and reported to the Director-General.	Subject to outcome of above Traffic Audit. Note, the 2017 audit noted that truck volumes are less than predicted in the original EA documentation. Light vehicle (car) trips were higher than predicted, however the hourly volume is very low and would have a negligible impact on surrounding roads.	Ongoing	Compliant
3.9	Following consideration of the outcomes of the traffic audits referred to under conditions 3.7 and 3.8 of this approval, the Director-General may require the Proponent to implement additional traffic mitigation, monitoring or management measures to address traffic associated with the project. The Director-General may require any or all of the measures proposed by the Proponent in the traffic audit report, or other measured considered appropriate by the Director-General (including additional local area traffic management measures or on-site traffic management controls) to be implemented. The Proponent shall implement the measured required by the Director-General within such period as the Director-General may specify.	See above. At this stage, traffic audits have not specified any remedial action to be required.	Ongoing	Future

Appendix C

Traffic Distribution

Link	Direction	Existing				TOTAL Approved				Proposed			
		AM		PM		AM		PM		AM		PM	
		Cars	Trucks	Cars	Trucks	Cars	Trucks	Cars	Trucks	Cars	Trucks	Cars	Trucks
1	Northbound	2,437	219	2,684	186	2,476	231	2,684	194	2469 (-7)	233 (2)	2687 (3)	195 (1)
	Southbound	1,677	226	2,014	139	1,678	240	2,034	148	1681 (3)	243 (3)	2033 (-1)	149 (1)
2	Northbound	2,421	219	1,978	123	2,421	247	1,994	139	2424 (3)	256 (9)	1993 (-1)	145 (6)
	Southbound	1,694	249	2,257	136	1,715	278	2,257	151	1712 (-3)	288 (10)	2259 (2)	159 (8)
3	Eastbound	3,700	429	2,870	106	3,706	440	2,871	113	3705 (-1)	441 (1)	2870 (-1)	113 (0)
	Westbound	2,519	265	3,574	187	2,520	275	3,578	196	2521 (1)	276 (1)	3578 (0)	196 (0)
4	Eastbound	2,780	419	2,771	113	2,794	420	2,936	114	2790 (-4)	420 (0)	2920 (-16)	114 (0)
	Westbound	1,881	183	2,797	163	1,986	183	2,825	164	1973 (-13)	183 (0)	2820 (-5)	164 (0)
5	Northbound	357	69	525	29	377	72	704	33	370 (-7)	70 (-2)	687 (-17)	29 (-4)
	Southbound	336	47	613	37	466	52	646	43	449 (-17)	48 (-4)	638 (-8)	37 (-6)
6	Eastbound	323	82	166	7	383	123	166	30	373 (-10)	135 (12)	171 (5)	39 (9)
	Westbound	124	29	195	36	125	71	231	61	131 (6)	83 (12)	229 (-2)	68 (7)
7	Northbound	0	0	0	0	0	0	0	0	0 (0)	9 (9)	0 (0)	3 (3)
	Southbound	0	0	0	0	0	0	0	0	0 (0)	9 (9)	0 (0)	3 (3)
8	Northbound	488	51	362	60	570	55	372	63	556 (-14)	51 (-4)	368 (-4)	60 (-3)
	Southbound	254	45	434	31	269	49	478	36	262 (-7)	45 (-4)	471 (-7)	31 (-5)

Appendix D1

Existing

LANE SUMMARY

Site: TCS1088 [Liverpool Rd / Cosgrove Rd AM Existing]

Liverpool Rd / Cosgrove Rd
Signals - Fixed Time Isolated Cycle Time = 140 seconds (User-Given Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

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: Cosgrove Rd (910m)													
Lane 1	418	17.6	560 [1]	0.747	100	40.4	LOS C	22.3	179.9	Short (P)	60	0.0	NA
Lane 2	149	8.5	213	0.703	100	72.3	LOS F	10.3	77.0	Full	910	0.0	0.0
Approach	567	15.2		0.747		48.8	LOS D	22.3	179.9				
East: Liverpool Rd (1000m)													
Lane 1	550	4.8	676 [1]	0.814	100	30.7	LOS C	27.8	202.9	Short	80	0.0	NA
Lane 2	553	4.9	679 [1]	0.814	100	29.4	LOS C	27.9	203.3	Full	1000	0.0	0.0
Lane 3	769	4.9	945	0.814	100	31.3	LOS C	43.7	318.5	Full	1000	0.0	0.0
Approach	1873	4.9		0.814		30.6	LOS C	43.7	318.5				
West: Liverpool Rd (420m)													
Lane 1	964	5.2	1495	0.645	100	6.5	LOS A	27.2	198.9	Full	500	0.0	0.0
Lane 2	955	5.2	1481 [1]	0.645	100	6.4	LOS A	26.7	195.0	Full	500	0.0	0.0
Lane 3	344	18.0	475	0.725	100	50.3	LOS D	17.1	137.9	Short	115	0.0	NA
Approach	2263	7.2		0.725		13.1	LOS A	27.2	198.9				
Intersection	4703	7.2		0.814		24.4	LOS B	43.7	318.5				

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.
Intersection and Approach LOS values are based on average delay for all 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.

[1] Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

LANE SUMMARY

Site: TCS1088 [Liverpool Rd / Cosgrove Rd PM Existing]

Liverpool Rd / Cosgrove Rd
Signals - Fixed Time Isolated Cycle Time = 140 seconds (User-Given Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

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: Cosgrove Rd (910m)													
Lane 1	544	6.6	581 [1]	0.937	100	74.1	LOS F	43.1	318.7	Short (P)	60	0.0	NA
Lane 2	120	0.0	226	0.532	100	69.2	LOS E	7.9	55.2	Full	910	0.0	0.0
Approach	664	5.4		0.937		73.2	LOS F	43.1	318.7				
East: Liverpool Rd (1000m)													
Lane 1	621	5.6	672 [1]	0.924	100	49.4	LOS D	39.8	291.9	Short	80	0.0	NA
Lane 2	633	3.6	685 [1]	0.924	100	48.0	LOS D	40.3	291.0	Full	1000	0.0	0.0
Lane 3	955	3.6	1035	0.924	100	45.4	LOS D	69.5	501.3	Full	1000	0.0	0.0
Approach	2209	4.1		0.924		47.3	LOS D	69.5	501.3				
West: Liverpool Rd (420m)													
Lane 1	845	1.8	1528	0.553	100	5.6	LOS A	20.7	147.2	Full	500	0.0	0.0
Lane 2	845	1.8	1528	0.553	100	5.6	LOS A	20.7	147.3	Full	500	0.0	0.0
Lane 3	302	13.2	408	0.740	100	57.7	LOS E	15.8	123.3	Short	115	0.0	NA
Approach	1992	3.5		0.740		13.5	LOS A	20.7	147.3				
Intersection	4865	4.1		0.937		37.0	LOS C	69.5	501.3				

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.
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.

[1] Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

LANE SUMMARY

Site: TCS2555 [Roberts Rd / Norfolk Rd AM Existing]

Signals - Fixed Time Isolated Cycle Time = 145 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows Total	HV	Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue Veh	Dist	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
South: Roberts Rd (550m)													
Lane 1	855	7.1	833	1.026	100	109.7	LOS F	91.6	679.9	Full	550	0.0	24.3
Lane 2	855	7.5	833	1.026	100	109.3	LOS F	91.6	682.4	Full	550	0.0	24.6
Lane 3	789	7.5	769 [1]	1.026	100	111.4	LOS F	85.3	635.7	Full	550	0.0	18.1
Lane 4	97	34.8	103	0.944	100	103.5	LOS F	8.3	75.8	Short	105	0.0	NA
Approach	2597	8.4		1.026		109.9	LOS F	91.6	682.4				
East: Norfolk Rd (725m)													
Lane 1	19	66.7	330	0.057	100	48.1	LOS D	1.0	11.0	Short (P)	35	0.0	NA
Lane 2	40	61.7	197	0.202	100	63.6	LOS E	2.5	26.9	Full	725	0.0	0.0
Lane 3	38	68.1	190	0.202	100	64.4	LOS E	2.4	26.9	Short	30	0.0	NA
Approach	97	65.2		0.202		60.9	LOS E	2.5	26.9				
North: Roberts Rd (1000m)													
Lane 1	651	17.0	781	0.833	100	41.3	LOS C	41.2	330.8	Full	1000	0.0	0.0
Lane 2	678	11.6	813	0.833	100	39.7	LOS C	43.1	331.4	Full	1000	0.0	0.0
Lane 3	619	11.6	743 [1]	0.833	100	38.9	LOS C	38.0	292.8	Full	1000	0.0	0.0
Lane 4	103	4.1	124	0.829	100	86.9	LOS F	7.9	57.5	Short	100	0.0	NA
Approach	2051	12.9		0.833		42.3	LOS C	43.1	331.4				
West: Norfolk Rd (245m)													
Lane 1	275	0.8	388 [1]	0.709	100	36.4	LOS C	12.4	87.5	Short (P)	30	0.0	NA
Lane 2	101	5.2	296	0.341	100	62.7	LOS E	6.4	46.7	Full	245	0.0	0.0
Approach	376	2.0		0.709		43.5	LOS D	12.4	87.5				
Intersection	5120	10.8		1.026		77.0	LOS F	91.6	682.4				

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.
Intersection and Approach LOS values are based on average delay for all 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.

[1] Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Organisation: ASON GROUP PTY LTD | Processed: Thursday, 9 November 2017 11:34:08 AM
Project: C:\Users\Catherine Tran\Ason Group\Ason Group Team Site - 0440\Projects\SIDRA\0440m01 Enfield Existing.sip7

LANE SUMMARY

Site: TCS2555 [Roberts Rd / Norfolk Rd PM Existing]

Signals - Fixed Time Isolated Cycle Time = 145 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows Total	HV	Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue Veh	Dist	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
South: Roberts Rd (550m)													
Lane 1	672	5.2	803	0.837	100	42.5	LOS D	43.5	317.7	Full	550	0.0	0.0
Lane 2	674	5.5	805	0.837	100	41.9	LOS C	43.5	319.3	Full	550	0.0	0.0
Lane 3	634	5.5	757 [1]	0.837	100	41.4	LOS C	40.1	293.9	Full	550	0.0	0.0
Lane 4	55	50.0	142	0.386	100	75.3	LOS F	3.8	37.7	Short	105	0.0	NA
Approach	2035	6.6		0.837		42.8	LOS D	43.5	319.3				
East: Norfolk Rd (725m)													
Lane 1	28	18.5	487	0.058	100	43.4	LOS D	1.4	11.5	Short (P)	35	0.0	NA
Lane 2	107	9.3	269	0.396	100	63.4	LOS E	6.9	52.2	Full	725	0.0	0.0
Lane 3	101	15.3	254	0.396	100	65.4	LOS E	6.5	51.8	Short	30	0.0	NA
Approach	236	12.9		0.396		61.9	LOS E	6.9	52.2				
North: Roberts Rd (1000m)													
Lane 1	788	10.2	776	1.014	100	98.8	LOS F	77.6	590.7	Full	1000	0.0	0.0
Lane 2	824	4.1	812	1.014	100	102.8	LOS F	85.2	617.2	Full	1000	0.0	0.0
Lane 3	723	4.1	713 [1]	1.014	100	106.2	LOS F	75.9	550.0	Full	1000	0.0	0.0
Lane 4	188	1.1	191	0.989	100	115.4	LOS F	17.5	123.9	Short	100	0.0	NA
Approach	2523	5.8		1.014		103.5	LOS F	85.2	617.2				
West: Norfolk Rd (245m)													
Lane 1	138	1.5	445	0.310	100	32.7	LOS C	5.6	39.8	Short (P)	30	0.0	NA
Lane 2	82	1.3	279	0.294	100	63.9	LOS E	5.2	36.9	Full	245	0.0	0.0
Approach	220	1.4		0.310		44.3	LOS D	5.6	39.8				
Intersection	5014	6.3		1.014		74.3	LOS F	85.2	617.2				

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.
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.

[1] Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

LANE SUMMARY

Site: 101 [Punchbowl Rd / Cosgrove Rd AM Existing]

Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Cycle Time)

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. %
East: Punchbowl Rd (620m)													
Lane 1	471	4.8	1450	0.325	100	4.6	LOS A	8.4	60.9	Full	620	0.0	0.0
Lane 2	471	4.8	1450	0.325	100	4.6	LOS A	8.4	60.9	Full	620	0.0	0.0
Lane 3	249	9.3	305	0.818	100	63.4	LOS E	15.4	116.5	Short	95	0.0	NA
Approach	1192	5.7		0.818		16.9	LOS B	15.4	116.5				
North: Cosgrove Rd (730m)													
Lane 1	159	13.3	226	0.704	100	62.5	LOS E	9.4	73.4	Short (P)	40	0.0	NA
Lane 2	156	16.9	221	0.704	100	62.6	LOS E	9.2	73.8	Full	730	0.0	0.0
Approach	315	15.1		0.704		62.5	LOS E	9.4	73.8				
West: Punchbowl Rd (460m)													
Lane 1	319	9.6	1284	0.248	100	8.7	LOS A	4.4	33.6	Short	90	0.0	NA
Lane 2	734	4.3	863 [1]	0.851	100	27.6	LOS B	35.4	256.7	Full	460	0.0	0.0
Lane 3	875	4.3	1028	0.851	100	28.2	LOS B	45.7	331.2	Full	460	0.0	0.0
Approach	1928	5.1		0.851		24.8	LOS B	45.7	331.2				
Intersection	3435	6.3		0.851		25.5	LOS B	45.7	331.2				

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.
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.

[1] Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

LANE SUMMARY

Site: 101 [Punchbowl Rd / Cosgrove Rd PM Existing]

Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Cycle Time)

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. %
East: Punchbowl Rd (620m)													
Lane 1	678	2.7	1246	0.544	100	12.0	LOS A	21.1	151.1	Full	620	0.0	0.0
Lane 2	678	2.7	1246	0.544	100	12.0	LOS A	21.1	151.1	Full	620	0.0	0.0
Lane 3	284	10.4	389	0.730	100	54.1	LOS D	16.0	122.0	Short	95	0.0	NA
Approach	1640	4.0		0.730		19.3	LOS B	21.1	151.1				
North: Cosgrove Rd (730m)													
Lane 1	241	9.1	341 [1]	0.707	100	49.4	LOS D	12.7	95.7	Short (P)	40	0.0	NA
Lane 2	250	4.3	354 [1]	0.707	100	49.2	LOS D	13.1	95.2	Full	730	0.0	0.0
Approach	492	6.6		0.707		49.3	LOS D	13.1	95.7				
West: Punchbowl Rd (460m)													
Lane 1	160	21.1	1124	0.142	100	8.9	LOS A	2.1	17.5	Short	90	0.0	NA
Lane 2	503	2.3	686 [1]	0.733	100	34.0	LOS C	24.8	177.2	Full	460	0.0	0.0
Lane 3	528	2.3	720	0.733	100	34.6	LOS C	26.5	189.3	Full	460	0.0	0.0
Approach	1191	4.9		0.733		30.9	LOS C	26.5	189.3				
Intersection	3322	4.7		0.733		27.9	LOS B	26.5	189.3				

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.
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.

[1] Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Appendix D2

Approved

LANE SUMMARY

Site: TCS1088 [Liverpool Rd / Cosgrove Rd AM Approved]

Liverpool Rd / Cosgrove Rd
Signals - Fixed Time Isolated Cycle Time = 140 seconds (User-Given Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

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: Cosgrove Rd (910m)													
Lane 1	425	17.6	548 [1]	0.776	100	42.2	LOS C	23.5	189.2	Short (P)	60	0.0	NA
Lane 2	173	7.3	214	0.805	100	76.4	LOS F	12.4	92.3	Full	910	0.0	0.0
Approach	598	14.6		0.805		52.1	LOS D	23.5	189.2				
East: Liverpool Rd (1000m)													
Lane 1	570	4.0	649 [1]	0.878	100	41.6	LOS C	33.4	241.6	Short	80	0.0	NA
Lane 2	572	4.9	651 [1]	0.878	100	39.3	LOS C	33.3	243.0	Full	1000	0.0	0.0
Lane 3	830	4.9	945	0.878	100	39.1	LOS C	54.0	394.1	Full	1000	0.0	0.0
Approach	1972	4.6		0.878		39.8	LOS C	54.0	394.1				
West: Liverpool Rd (420m)													
Lane 1	960	5.3	1495	0.642	100	6.4	LOS A	27.0	197.3	Full	500	0.0	0.0
Lane 2	960	5.3	1495	0.642	100	6.4	LOS A	27.0	197.3	Full	500	0.0	0.0
Lane 3	369	17.1	473	0.781	100	56.1	LOS D	20.4	163.4	Short	115	0.0	NA
Approach	2289	7.2		0.781		14.4	LOS A	27.0	197.3				
Intersection	4859	7.1		0.878		29.4	LOS C	54.0	394.1				

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.
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.

[1] Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

LANE SUMMARY

Site: TCS1088 [Liverpool Rd / Cosgrove Rd PM Approved]

Liverpool Rd / Cosgrove Rd
Signals - Fixed Time Isolated Cycle Time = 140 seconds (User-Given Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

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: Cosgrove Rd (910m)													
Lane 1	559	6.4	552 [1]	1.013	100	115.9	LOS F	58.2	430.0	Short (P)	60	0.0	NA
Lane 2	271	0.0	264 [1]	1.025	100	132.2	LOS F	27.9	195.2	Full	910	0.0	0.0
Approach	829	4.3		1.025		121.2	LOS F	58.2	430.0				
East: Liverpool Rd (1000m)													
Lane 1	626	5.4	620 [1]	1.010	100	105.6	LOS F	66.2	484.7	Short	80	0.0	NA
Lane 2	638	3.6	632 [1]	1.010	100	103.8	LOS F	67.3	485.6	Full	1000	0.0	0.0
Lane 3	989	3.6	980	1.010	100	91.5	LOS F	98.5	710.8	Full	1000	0.0	0.0
Approach	2253	4.1		1.010		98.9	LOS F	98.5	710.8				
West: Liverpool Rd (420m)													
Lane 1	880	1.9	1390	0.633	100	10.5	LOS A	30.1	213.8	Full	500	0.0	0.0
Lane 2	811	1.9	1281 [1]	0.633	100	9.8	LOS A	26.0	184.8	Full	500	0.0	0.0
Lane 3	307	13.0	333	0.922	100	79.8	LOS F	21.0	163.7	Short	115	0.0	NA
Approach	1998	3.6		0.922		20.9	LOS B	30.1	213.8				
Intersection	5080	3.9		1.025		71.9	LOS F	98.5	710.8				

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.
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.

[1] Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

LANE SUMMARY

Site: TCS2555 [Roberts Rd / Norfolk Rd AM Approved]

Signals - Fixed Time Isolated Cycle Time = 145 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows Total	HV	Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue Veh	Dist	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
South: Roberts Rd (550m)													
Lane 1	863	7.1	808	1.069	100	140.5	LOS F	102.8	763.4	Full	550	0.0	34.9
Lane 2	863	7.5	808	1.069	100	140.1	LOS F	102.8	766.2	Full	550	0.0	35.2
Lane 3	774	7.5	724 [1]	1.069	100	142.6	LOS F	93.0	693.2	Full	550	0.0	26.0
Lane 4	141	32.1	136	1.041	100	146.7	LOS F	15.0	134.3	Short	105	0.0	NA
Approach	2641	8.7		1.069		141.3	LOS F	102.8	766.2				
East: Norfolk Rd (725m)													
Lane 1	39	64.9	359	0.108	100	46.5	LOS D	2.0	22.2	Short (P)	35	0.0	NA
Lane 2	56	68.6	190	0.292	100	65.0	LOS E	3.6	39.8	Full	725	0.0	0.0
Lane 3	54	73.7	185	0.292	100	65.6	LOS E	3.5	39.8	Short	30	0.0	NA
Approach	148	69.5		0.292		60.4	LOS E	3.6	39.8				
North: Roberts Rd (1000m)													
Lane 1	656	20.8	739	0.887	100	51.6	LOS D	47.3	390.1	Full	1000	0.0	0.0
Lane 2	699	11.6	788	0.887	100	49.5	LOS D	50.4	387.5	Full	1000	0.0	0.0
Lane 3	642	11.6	723 [1]	0.887	100	49.0	LOS D	44.9	345.3	Full	1000	0.0	0.0
Lane 4	103	4.1	162	0.638	100	78.2	LOS F	7.4	53.3	Short	100	0.0	NA
Approach	2100	14.1		0.887		51.4	LOS D	50.4	390.1				
West: Norfolk Rd (245m)													
Lane 1	275	0.8	406 [1]	0.677	100	35.3	LOS C	12.2	85.8	Short (P)	30	0.0	NA
Lane 2	101	5.2	284	0.356	100	63.8	LOS E	6.4	47.2	Full	245	0.0	0.0
Approach	376	2.0		0.677		43.0	LOS D	12.2	85.8				
Intersection	5265	12.1		1.069		96.1	LOS F	102.8	766.2				

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.
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.

[1] Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Organisation: ASON GROUP PTY LTD | Processed: Thursday, 16 November 2017 12:27:39 PM
Project: C:\Users\Catherine Tran\Ason Group\Ason Group Team Site - 0440\Projects\SIDRA\0440m02 Enfield Approved.sip7

LANE SUMMARY

Site: TCS2555 [Roberts Rd / Norfolk Rd PM Approved]

Signals - Fixed Time Isolated Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows Total	HV	Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue Veh	Dist	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
South: Roberts Rd (550m)													
Lane 1	676	5.2	814	0.830	100	42.0	LOS C	44.1	322.5	Full	550	0.0	0.0
Lane 2	677	5.5	816	0.830	100	41.4	LOS C	44.2	324.0	Full	550	0.0	0.0
Lane 3	627	5.5	756 [1]	0.830	100	40.7	LOS C	39.8	292.2	Full	550	0.0	0.0
Lane 4	65	53.2	135	0.485	100	79.0	LOS F	4.7	48.1	Short	105	0.0	NA
Approach	2045	6.9		0.830		42.6	LOS D	44.2	324.0				
East: Norfolk Rd (725m)													
Lane 1	52	24.5	464	0.111	100	46.0	LOS D	2.7	23.1	Short (P)	35	0.0	NA
Lane 2	124	14.7	217 [1]	0.569	100	66.5	LOS E	8.4	66.1	Full	725	0.0	0.0
Lane 3	116	22.3	205 [1]	0.569	100	68.3	LOS E	7.9	66.1	Short	30	0.0	NA
Approach	292	19.5		0.569		63.6	LOS E	8.4	66.1				
North: Roberts Rd (1000m)													
Lane 1	787	12.6	773	1.017	100	101.2	LOS F	79.5	616.8	Full	1000	0.0	0.0
Lane 2	837	4.1	823	1.017	100	105.5	LOS F	89.3	646.6	Full	1000	0.0	0.0
Lane 3	733	4.1	720 [1]	1.017	100	109.1	LOS F	79.3	574.7	Full	1000	0.0	0.0
Lane 4	188	1.1	184	1.023	100	135.3	LOS F	19.5	137.7	Short	100	0.0	NA
Approach	2545	6.5		1.023		107.4	LOS F	89.3	646.6				
West: Norfolk Rd (245m)													
Lane 1	138	1.5	442	0.312	100	33.8	LOS C	5.8	41.3	Short (P)	30	0.0	NA
Lane 2	82	1.3	282	0.291	100	65.6	LOS E	5.4	38.0	Full	245	0.0	0.0
Approach	220	1.4		0.312		45.7	LOS D	5.8	41.3				
Intersection	5102	7.2		1.023		76.3	LOS F	89.3	646.6				

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.
Intersection and Approach LOS values are based on average delay for all 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.

[1] Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

LANE SUMMARY

Site: 101 [Punchbowl Rd / Cosgrove Rd AM Approved]

Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Cycle Time)

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. %
East: Punchbowl Rd (620m)													
Lane 1	471	4.8	1450	0.325	100	4.6	LOS A	8.4	60.9	Full	620	0.0	0.0
Lane 2	471	4.8	1450	0.325	100	4.6	LOS A	8.4	60.9	Full	620	0.0	0.0
Lane 3	285	8.1	322	0.886	100	69.7	LOS E	19.0	142.0	Short	95	0.0	NA
Approach	1227	5.6		0.886		19.7	LOS B	19.0	142.0				
North: Cosgrove Rd (730m)													
Lane 1	169	12.6	216 [1]	0.781	100	65.0	LOS E	10.3	80.1	Short (P)	40	0.0	NA
Lane 2	165	15.9	211 [1]	0.781	100	65.2	LOS E	10.1	80.2	Full	730	0.0	0.0
Approach	334	14.2		0.781		65.1	LOS E	10.3	80.2				
West: Punchbowl Rd (460m)													
Lane 1	359	8.5	1263	0.284	100	9.6	LOS A	5.8	43.7	Short	90	0.0	NA
Lane 2	724	4.3	828 [1]	0.874	100	32.1	LOS C	37.3	270.6	Full	460	0.0	0.0
Lane 3	885	4.3	1012	0.874	100	32.4	LOS C	49.6	359.6	Full	460	0.0	0.0
Approach	1968	5.0		0.874		28.1	LOS B	49.6	359.6				
Intersection	3529	6.1		0.886		28.7	LOS C	49.6	359.6				

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.
Intersection and Approach LOS values are based on average delay for all 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.

[1] Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

LANE SUMMARY

Site: 101 [Punchbowl Rd / Cosgrove Rd PM Approved]

Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Cycle Time)

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. %
East: Punchbowl Rd (620m)													
Lane 1	678	2.7	1214	0.559	100	13.2	LOS A	22.1	158.4	Full	620	0.0	0.0
Lane 2	678	2.7	1214	0.559	100	13.2	LOS A	22.1	158.4	Full	620	0.0	0.0
Lane 3	291	10.1	390	0.746	100	54.7	LOS D	16.5	125.8	Short	95	0.0	NA
Approach	1646	4.0		0.746		20.5	LOS B	22.1	158.4				
North: Cosgrove Rd (730m)													
Lane 1	261	8.3	351 [1]	0.745	100	49.3	LOS D	13.9	104.0	Short (P)	40	0.0	NA
Lane 2	270	4.0	362 [1]	0.745	100	49.1	LOS D	14.3	103.4	Full	730	0.0	0.0
Approach	532	6.1		0.745		49.1	LOS D	14.3	104.0				
West: Punchbowl Rd (460m)													
Lane 1	166	20.3	1120	0.149	100	8.9	LOS A	2.2	18.2	Short	90	0.0	NA
Lane 2	501	2.3	651 [1]	0.770	100	36.9	LOS C	25.9	184.8	Full	460	0.0	0.0
Lane 3	530	2.3	688	0.770	100	37.4	LOS C	27.8	198.5	Full	460	0.0	0.0
Approach	1197	4.8		0.770		33.2	LOS C	27.8	198.5				
Intersection	3375	4.6		0.770		29.5	LOS C	27.8	198.5				

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.
Intersection and Approach LOS values are based on average delay for all 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.

[1] Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Appendix D3

Proposed

LANE SUMMARY

Site: TCS1088 [Liverpool Rd / Cosgrove Rd AM Proposed]

Liverpool Rd / Cosgrove Rd
Signals - Fixed Time Isolated Cycle Time = 140 seconds (User-Given Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

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: Cosgrove Rd (910m)													
Lane 1	421	17.8	554 [1]	0.760	100	41.2	LOS C	22.8	184.2	Short (P)	60	0.0	NA
Lane 2	160	7.9	214	0.749	100	73.8	LOS F	11.2	83.6	Full	910	0.0	0.0
Approach	581	15.0		0.760		50.2	LOS D	22.8	184.2				
East: Liverpool Rd (1000m)													
Lane 1	569	4.0	651 [1]	0.874	100	40.7	LOS C	32.9	238.6	Short	80	0.0	NA
Lane 2	570	4.9	653 [1]	0.874	100	38.5	LOS C	32.9	239.9	Full	1000	0.0	0.0
Lane 3	826	4.9	945	0.874	100	38.4	LOS C	53.2	388.3	Full	1000	0.0	0.0
Approach	1965	4.7		0.874		39.1	LOS C	53.2	388.3				
West: Liverpool Rd (420m)													
Lane 1	960	5.3	1495	0.642	100	6.4	LOS A	27.0	197.3	Full	500	0.0	0.0
Lane 2	960	5.3	1495	0.642	100	6.4	LOS A	27.0	197.3	Full	500	0.0	0.0
Lane 3	367	17.2	473	0.777	100	55.6	LOS D	20.1	161.3	Short	115	0.0	NA
Approach	2287	7.2		0.777		14.3	LOS A	27.0	197.3				
Intersection	4834	7.1		0.874		28.7	LOS C	53.2	388.3				

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.
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.

[1] Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

LANE SUMMARY

Site: TCS1088 [Liverpool Rd / Cosgrove Rd PM Proposed]

Liverpool Rd / Cosgrove Rd
Signals - Fixed Time Isolated Cycle Time = 140 seconds (User-Given Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

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: Cosgrove Rd (910m)													
Lane 1	558	6.4	553 [1]	1.009	100	113.6	LOS F	57.6	425.1	Short (P)	60	0.0	NA
Lane 2	267	0.0	264 [1]	1.014	100	126.2	LOS F	26.8	187.9	Full	910	0.0	0.0
Approach	825	4.3		1.014		117.7	LOS F	57.6	425.1				
East: Liverpool Rd (1000m)													
Lane 1	620	5.5	620 [1]	1.001	100	100.4	LOS F	64.2	470.9	Short	80	0.0	NA
Lane 2	632	3.6	632 [1]	1.001	100	98.8	LOS F	65.3	471.3	Full	1000	0.0	0.0
Lane 3	981	3.6	980	1.001	100	86.3	LOS F	95.3	687.9	Full	1000	0.0	0.0
Approach	2234	4.1		1.001		93.7	LOS F	95.3	687.9				
West: Liverpool Rd (420m)													
Lane 1	880	1.9	1390	0.633	100	10.5	LOS A	30.1	213.7	Full	500	0.0	0.0
Lane 2	811	1.9	1281 [1]	0.633	100	9.8	LOS A	26.0	184.9	Full	500	0.0	0.0
Lane 3	305	13.1	333	0.916	100	78.4	LOS F	20.6	160.5	Short	115	0.0	NA
Approach	1996	3.6		0.916		20.6	LOS B	30.1	213.7				
Intersection	5055	4.0		1.014		68.8	LOS E	95.3	687.9				

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.
Intersection and Approach LOS values are based on average delay for all 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.

[1] Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

LANE SUMMARY

Site: TCS2555 [Roberts Rd / Norfolk Rd AM Proposed]

Signals - Fixed Time Isolated Cycle Time = 145 seconds (Optimum Cycle Time - Minimum Delay)

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: Roberts Rd (550m)													
Lane 1	863	7.1	808	1.069	100	140.4	LOS F	102.8	763.2	Full	550	0.0	34.9
Lane 2	863	7.5	808	1.069	100	140.0	LOS F	102.8	766.0	Full	550	0.0	35.2
Lane 3	774	7.5	724 [1]	1.069	100	142.5	LOS F	93.0	693.2	Full	550	0.0	26.0
Lane 4	140	33.1	135	1.039	100	145.7	LOS F	14.9	133.6	Short	105	0.0	NA
Approach	2640	8.7		1.069		141.2	LOS F	102.8	766.0				
East: Norfolk Rd (725m)													
Lane 1	38	75.0	342	0.111	100	46.7	LOS D	2.0	22.8	Short (P)	35	0.0	NA
Lane 2	58	71.5	187	0.308	100	65.3	LOS E	3.7	42.1	Full	725	0.0	0.0
Lane 3	56	76.7	182	0.308	100	65.9	LOS E	3.6	42.2	Short	30	0.0	NA
Approach	152	74.3		0.308		60.8	LOS E	3.7	42.2				
North: Roberts Rd (1000m)													
Lane 1	655	21.8	734	0.892	100	52.7	LOS D	47.8	397.3	Full	1000	0.0	0.0
Lane 2	703	11.6	788	0.892	100	50.5	LOS D	51.2	393.9	Full	1000	0.0	0.0
Lane 3	645	11.6	724 [1]	0.892	100	50.0	LOS D	45.6	351.2	Full	1000	0.0	0.0
Lane 4	103	4.1	162	0.638	100	78.2	LOS F	7.4	53.3	Short	100	0.0	NA
Approach	2106	14.4		0.892		52.4	LOS D	51.2	397.3				
West: Norfolk Rd (245m)													
Lane 1	275	0.8	406 [1]	0.677	100	35.3	LOS C	12.2	85.8	Short (P)	30	0.0	NA
Lane 2	101	5.2	284	0.356	100	63.8	LOS E	6.4	47.2	Full	245	0.0	0.0
Approach	376	2.0		0.677		43.0	LOS D	12.2	85.8				
Intersection	5274	12.4		1.069		96.4	LOS F	102.8	766.0				

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.
Intersection and Approach LOS values are based on average delay for all 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.

[1] Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

LANE SUMMARY

Site: TCS2555 [Roberts Rd / Norfolk Rd PM Proposed]

Signals - Fixed Time Isolated Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)

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: Roberts Rd (550m)													
Lane 1	675	5.2	814	0.830	100	42.0	LOS C	44.1	322.3	Full	550	0.0	0.0
Lane 2	677	5.5	816	0.830	100	41.4	LOS C	44.2	323.8	Full	550	0.0	0.0
Lane 3	628	5.5	756 [1]	0.830	100	40.7	LOS C	39.9	292.3	Full	550	0.0	0.0
Lane 4	64	54.1	134	0.479	100	79.0	LOS F	4.6	47.6	Short	105	0.0	NA
Approach	2044	7.0		0.830		42.6	LOS D	44.2	323.8				
East: Norfolk Rd (725m)													
Lane 1	55	26.9	457	0.120	100	46.2	LOS D	2.9	25.0	Short (P)	35	0.0	NA
Lane 2	125	15.0	215 [1]	0.580	100	66.6	LOS E	8.5	66.9	Full	725	0.0	0.0
Lane 3	117	22.6	203 [1]	0.580	100	68.3	LOS E	8.0	66.9	Short	30	0.0	NA
Approach	297	20.2		0.580		63.5	LOS E	8.5	66.9				
North: Roberts Rd (1000m)													
Lane 1	787	12.8	773	1.018	100	101.7	LOS F	79.7	618.6	Full	1000	0.0	0.0
Lane 2	838	4.1	823	1.018	100	106.0	LOS F	89.5	648.3	Full	1000	0.0	0.0
Lane 3	733	4.1	720 [1]	1.018	100	109.5	LOS F	79.5	576.2	Full	1000	0.0	0.0
Lane 4	188	1.1	184	1.023	100	135.3	LOS F	19.5	137.7	Short	100	0.0	NA
Approach	2546	6.5		1.023		107.8	LOS F	89.5	648.3				
West: Norfolk Rd (245m)													
Lane 1	138	1.5	442	0.312	100	33.8	LOS C	5.8	41.3	Short (P)	30	0.0	NA
Lane 2	82	1.3	282	0.291	100	65.6	LOS E	5.4	38.0	Full	245	0.0	0.0
Approach	220	1.4		0.312		45.7	LOS D	5.8	41.3				
Intersection	5107	7.3		1.023		76.5	LOS F	89.5	648.3				

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.
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.

[1] Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

LANE SUMMARY

Site: 101 [Punchbowl Rd / Cosgrove Rd AM Proposed]

Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Cycle Time)

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. %
East: Punchbowl Rd (620m)													
Lane 1	471	4.8	1450	0.325	100	4.6	LOS A	8.4	60.9	Full	620	0.0	0.0
Lane 2	471	4.8	1450	0.325	100	4.6	LOS A	8.4	60.9	Full	620	0.0	0.0
Lane 3	282	8.2	322	0.877	100	68.4	LOS E	18.5	138.7	Short	95	0.0	NA
Approach	1224	5.6		0.877		19.3	LOS B	18.5	138.7				
North: Cosgrove Rd (730m)													
Lane 1	163	12.9	222 [1]	0.734	100	63.3	LOS E	9.8	75.9	Short (P)	40	0.0	NA
Lane 2	160	16.5	218 [1]	0.734	100	63.5	LOS E	9.6	76.6	Full	730	0.0	0.0
Approach	323	14.7		0.734		63.4	LOS E	9.8	76.6				
West: Punchbowl Rd (460m)													
Lane 1	356	8.6	1264	0.281	100	9.4	LOS A	5.6	41.9	Short	90	0.0	NA
Lane 2	725	4.3	830 [1]	0.874	100	32.0	LOS C	37.3	270.5	Full	460	0.0	0.0
Lane 3	884	4.3	1012	0.874	100	32.3	LOS C	49.4	358.7	Full	460	0.0	0.0
Approach	1965	5.0		0.874		28.0	LOS B	49.4	358.7				
Intersection	3513	6.1		0.877		28.2	LOS B	49.4	358.7				

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.
Intersection and Approach LOS values are based on average delay for all 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.

[1] Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

LANE SUMMARY

Site: 101 [Punchbowl Rd / Cosgrove Rd PM Proposed]

Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Cycle Time)

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. %
East: Punchbowl Rd (620m)													
Lane 1	678	2.7	1230	0.551	100	12.6	LOS A	21.6	154.7	Full	620	0.0	0.0
Lane 2	678	2.7	1230	0.551	100	12.6	LOS A	21.6	154.7	Full	620	0.0	0.0
Lane 3	288	10.2	389	0.741	100	54.5	LOS D	16.4	124.6	Short	95	0.0	NA
Approach	1644	4.0		0.741		19.9	LOS B	21.6	154.7				
North: Cosgrove Rd (730m)													
Lane 1	260	8.3	339 [1]	0.769	100	51.4	LOS D	14.2	106.5	Short (P)	40	0.0	NA
Lane 2	269	4.1	350 [1]	0.769	100	51.1	LOS D	14.6	105.9	Full	730	0.0	0.0
Approach	529	6.2		0.769		51.2	LOS D	14.6	106.5				
West: Punchbowl Rd (460m)													
Lane 1	162	20.8	1120	0.145	100	8.9	LOS A	2.2	17.8	Short	90	0.0	NA
Lane 2	502	2.3	670 [1]	0.750	100	35.1	LOS C	25.2	180.1	Full	460	0.0	0.0
Lane 3	528	2.3	704	0.750	100	35.6	LOS C	26.9	192.3	Full	460	0.0	0.0
Approach	1193	4.9		0.750		31.8	LOS C	26.9	192.3				
Intersection	3366	4.7		0.769		29.1	LOS C	26.9	192.3				

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.
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.

[1] Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Appendix D4

Proposed with Improvements

LANE SUMMARY

Site: TCS2555 [Roberts Rd / Norfolk Rd AM Proposed Improv]

Signals - Fixed Time Isolated Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)

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: Roberts Rd (550m)													
Lane 1	854	7.1	806	1.060	100	135.5	LOS F	101.6	754.5	Full	550	0.0	33.8
Lane 2	854	7.5	806	1.060	100	135.1	LOS F	101.6	757.3	Full	550	0.0	34.2
Lane 3	792	7.5	748 [1]	1.060	100	136.9	LOS F	95.0	707.8	Full	550	0.0	27.9
Lane 4	140	33.1	140	0.998	100	126.7	LOS F	13.9	124.7	Short	150	0.0	NA
Approach	2640	8.7		1.060		135.3	LOS F	101.6	757.3				
East: Norfolk Rd (725m)													
Lane 1	38	75.0	347	0.109	100	47.6	LOS D	2.0	23.4	Short (P)	35	0.0	NA
Lane 2	58	71.5	189	0.304	100	67.0	LOS E	3.8	43.4	Full	725	0.0	0.0
Lane 3	56	76.7	184	0.304	100	67.6	LOS E	3.7	43.4	Short	30	0.0	NA
Approach	152	74.3		0.304		62.4	LOS E	3.8	43.4				
North: Roberts Rd (1000m)													
Lane 1	655	21.8	732	0.895	100	55.6	LOS D	49.5	411.6	Full	1000	0.0	0.0
Lane 2	703	11.6	786	0.895	100	52.3	LOS D	53.0	408.0	Full	1000	0.0	0.0
Lane 3	645	11.6	720 [1]	0.895	100	51.9	LOS D	47.2	362.9	Full	1000	0.0	0.0
Lane 4	103	4.1	168	0.612	100	79.5	LOS F	7.5	54.5	Short	100	0.0	NA
Approach	2106	14.4		0.895		54.5	LOS D	53.0	411.6				
West: Norfolk Rd (245m)													
Lane 1	275	0.8	410 [1]	0.670	100	35.9	LOS C	12.5	87.9	Short (P)	30	0.0	NA
Lane 2	101	5.2	287	0.353	100	65.5	LOS E	6.6	48.6	Full	245	0.0	0.0
Approach	376	2.0		0.670		43.9	LOS D	12.5	87.9				
Intersection	5274	12.4		1.060		94.4	LOS F	101.6	757.3				

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.
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.

[1] Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

LANE SUMMARY

Site: TCS2555 [Roberts Rd / Norfolk Rd PM Proposed Improv]

Signals - Fixed Time Isolated Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows Total	HV	Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue Veh	Dist	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
South: Roberts Rd (550m)													
Lane 1	670	5.2	814	0.823	100	41.3	LOS C	43.2	316.0	Full	550	0.0	0.0
Lane 2	672	5.5	816	0.823	100	40.7	LOS C	43.3	317.6	Full	550	0.0	0.0
Lane 3	638	5.5	775 [1]	0.823	100	40.2	LOS C	40.4	296.3	Full	550	0.0	0.0
Lane 4	64	54.1	134	0.479	100	79.0	LOS F	4.6	47.6	Short	150	0.0	NA
Approach	2044	7.0		0.823		42.0	LOS C	43.3	317.6				
East: Norfolk Rd (725m)													
Lane 1	55	26.9	457	0.120	100	46.2	LOS D	2.9	25.0	Short (P)	35	0.0	NA
Lane 2	125	15.0	215 [1]	0.580	100	66.6	LOS E	8.5	66.9	Full	725	0.0	0.0
Lane 3	117	22.6	203 [1]	0.580	100	68.3	LOS E	8.0	66.9	Short	30	0.0	NA
Approach	297	20.2		0.580		63.5	LOS E	8.5	66.9				
North: Roberts Rd (1000m)													
Lane 1	787	12.8	773	1.018	100	101.7	LOS F	79.7	618.6	Full	1000	0.0	0.0
Lane 2	838	4.1	823	1.018	100	106.0	LOS F	89.5	648.3	Full	1000	0.0	0.0
Lane 3	733	4.1	720 [1]	1.018	100	109.5	LOS F	79.5	576.2	Full	1000	0.0	0.0
Lane 4	188	1.1	184	1.023	100	135.3	LOS F	19.5	137.7	Short	100	0.0	NA
Approach	2546	6.5		1.023		107.8	LOS F	89.5	648.3				
West: Norfolk Rd (245m)													
Lane 1	138	1.5	442	0.312	100	33.8	LOS C	5.8	41.3	Short (P)	30	0.0	NA
Lane 2	82	1.3	282	0.291	100	65.6	LOS E	5.4	38.0	Full	245	0.0	0.0
Approach	220	1.4		0.312		45.7	LOS D	5.8	41.3				
Intersection	5107	7.3		1.023		76.2	LOS F	89.5	648.3				

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.
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.

[1] Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.