12 September 2022

BAESA Williamtown (Schedule 1 Works)

DesignInc transport impact assessment;

For: **DesignInc**

Site Address: **BAESA Special Activation Precinct, Williamtown NSW**

document control;

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1. Introduction

1.1. Project Summary

ptc. has been engaged by DesignInc, on behalf of BAE Systems Australia (the Applicant), to prepare a Transport Impact Assessment (TIA) to accompany a Development Application (DA) to Port Stephens Council (Council) in relation to the adaptive reuse of the existing aircraft hangars within the BAE Systems Australia (BAESA) Williamtown site. The BAESA site is located within the Williamtown Special Activation Precinct (SAP) adjacent to Newcastle Airport.

Specifically, this TIA relates to the adaptive reuse of the South Hangar which forms part of the Schedule 1 Works. Any works relating to other areas of the BAESA Williamtown Site are subject to a separate DA and will be assessed separately. Further details of the development proposal are outlined in Section 1.4.

The location of the BAESA Williamtown site is outlined in Figure 1.

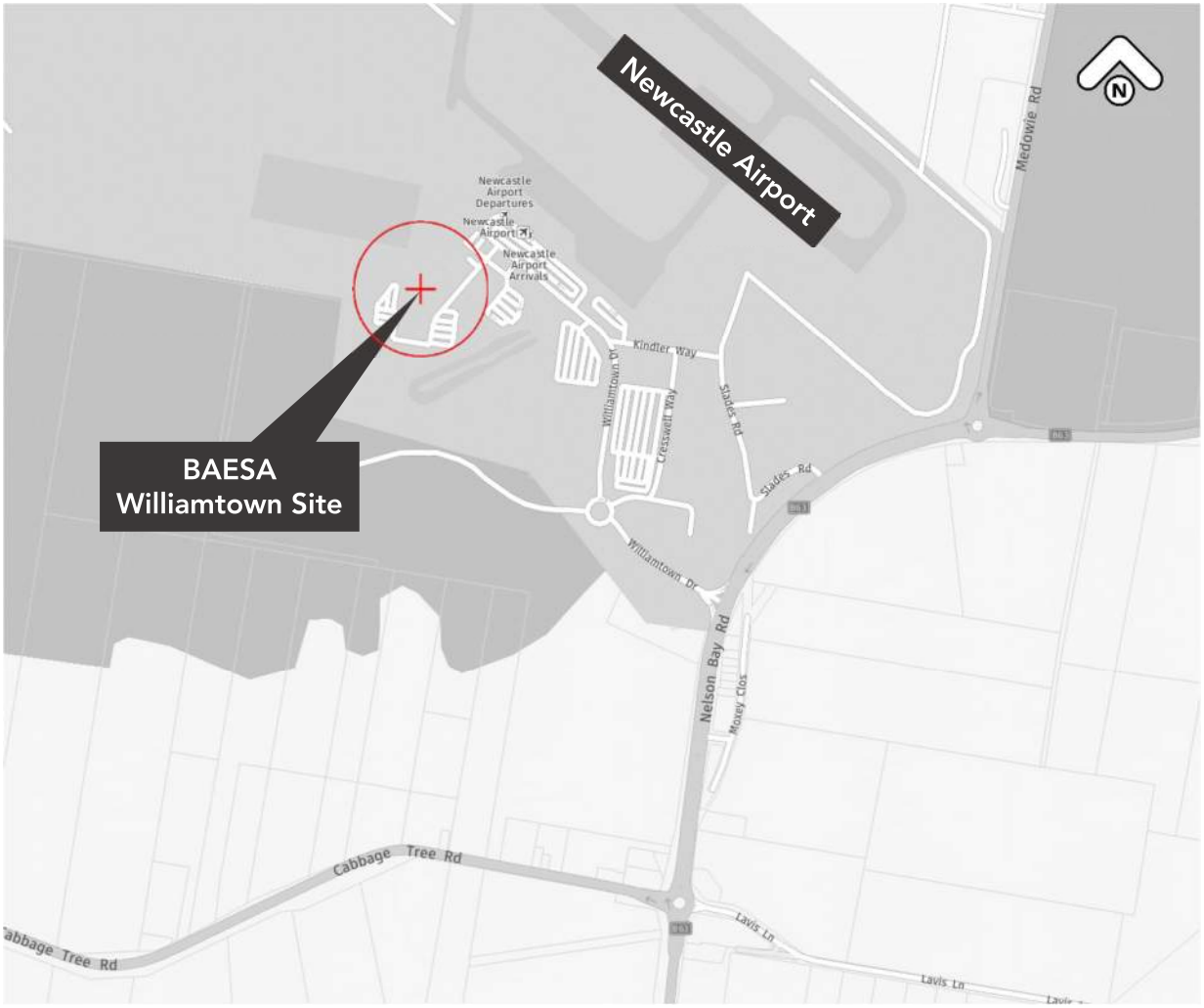


Figure 1 - Site Location (Source: Nearmap, 2022)

1.2. Site Context

The BAESA Williamtown site lies within an SP2 Defence/Air Transport Facility zone to the south-west of Newcastle Airport. The general vicinity of the site comprises a B7 Business Park zone and some RU2 Rural Landscape zones to the south. The surrounding land uses are illustrated in Figure 2.

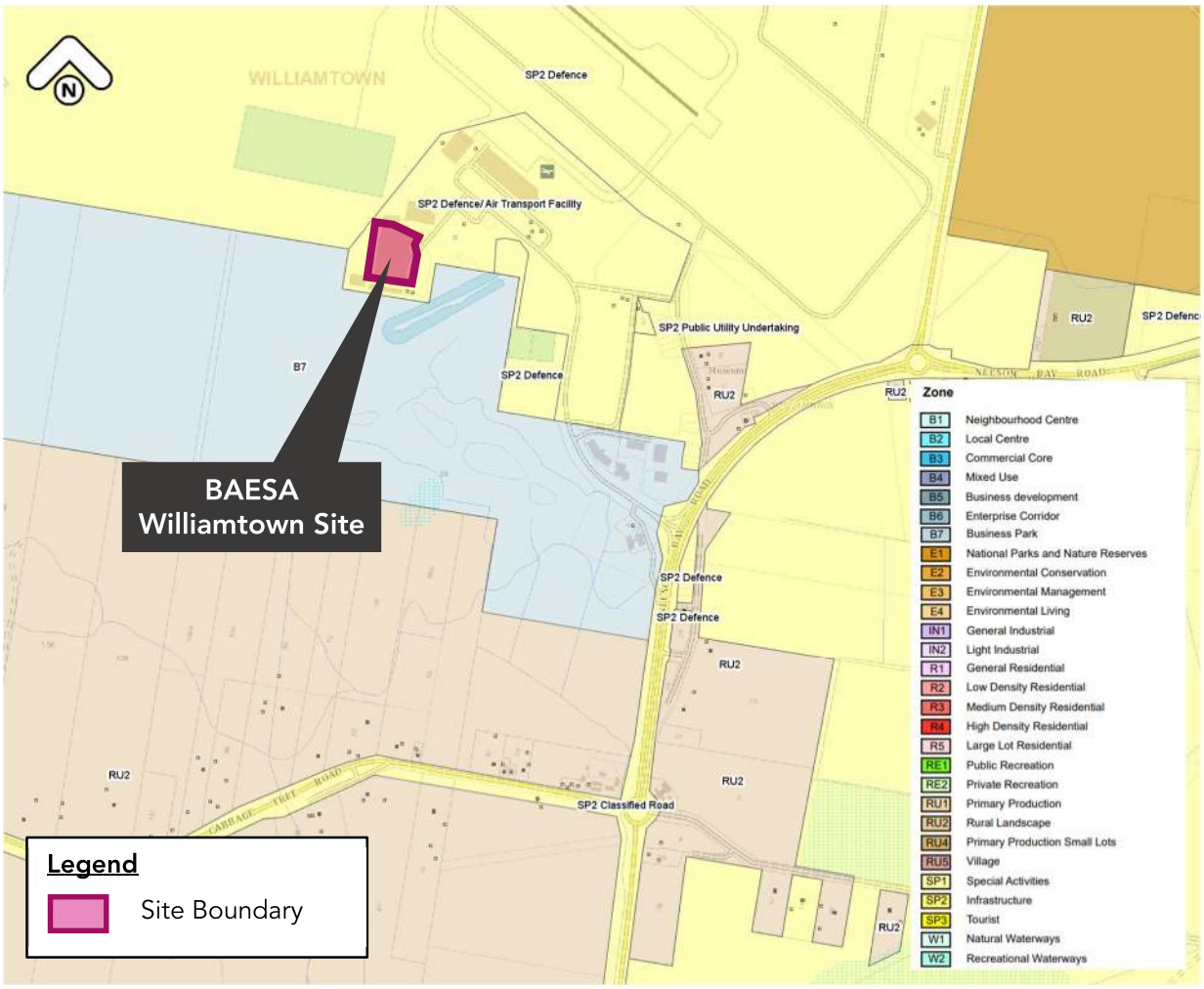


Figure 2 - Local Land Use Map (Source: NSW ePlanning Spatial Viewer, 2022)

1.3. Development Site

The proposed development relates to the BAESA Williamtown site at 55C Slades Road, Williamtown NSW which is illustrated in Figure 3.

The site is located to the south-west of Newcastle Airport and accessed via Williamtown Drive.

The South Hangar within the BAESA Williamtown Site is illustrated in Figure 3.

Figure 3 - Aerial View of Subject Site & Surrounds (Source: Nearmap, 2022)

1.4. Development Proposal

The Schedule 1 - South Hangar adaptive reuse works involves the following:

- Provision of four new aircraft general maintenance bays to be located in the existing hangar;
- Hangar floor fit-out;
- Construction of supporting facilities; and
- Site services amplification.

The adaptive reuse areas of the South Hangar are illustrated in blue and proposed building extensions to the South Hangar are illustrated in pink (refer to Figure 4). It is understood that the existing car parks located to the east and west of the South Hangar will remain unchanged as part of these works.

Based on a desktop review of Nearmap aerial imagery, the existing car parks located to the east and west of the South Hangar accommodate an approximate total of 265 car spaces (inclusive of four accessible parking spaces) dedicated to BAESA staff use. It is noted that these car parks serve the existing North and South Hangars.

These car parks are accessed via the existing internal road connecting to Williamtown Drive. The various components of the Schedule 1 Works are illustrated in Figure 4.

Figure 4 – Proposed South Hangar Site Plan (Source: DesignInc, 2022)

A summary of the existing and proposed GFAs associated with the Schedule 1 Works is outlined in Table 1.

Table 1 - Summary of Existing and Proposed GFA for Schedule 1 Works (Source: DesignInc, 2022)

Component	Existing GFA (m^2)	Proposed GFA (m^2)	Change in GFA (m^2)
South Hangar	4,700m^2	4,700m^2	No change
Annex Support Building	3,720m^2	3,720m^2	No change
South Hangar Admin	731m^2	731m^2	No change
GSE Storage	670m^2	670m^2	No change
Ancillary Buildings / Storage (south of the Existing Eastern Car Park)	352m^2	180m^2	-172m^2
Extension to South Hangar – Covered SE Storage / LV Room	-	32m^2	+32m^2
TOTAL (SCHEDULE 1 WORKS ONLY)	**10,173m^2**	**10,033m^2**	**-140m^2**

As shown in Table 1, the Schedule 1 Works results in an overall net reduction of 140m^2 GFA when compared to the existing use.

1.4.1. North Hangar / Warehouse (Outside Schedule 1 Works Scope)

The following table outlines the existing GFA of the North Hangar and warehouse (located to the south-west of the South Hangar). It is noted that these buildings are outside the scope of the Schedule 1 Works but have been included for completeness. These GFAs will be referenced when calculating the existing parking provisions in Section 3.

Table 2 – North Hangar and Warehouse GFA Summary (Source: DesignInc, 2022)

Component	Existing GFA (m^2)
North Hangar	1,635m^2
North Hangar Admin	1,700m^2
Warehouse (south-west of South Hangar)	870m^2
TOTAL	**4,205m^2**

In light of the above information, the total existing GFA across the North and South Hangars as well as admin, storage and support buildings is 14,378m^2. This figure comprises the following breakdown of the land use types stipulated within the DCP:

Table 3 - Existing GFA Breakdown based on Land Use Type

Land Use	**GFA (m^2)**
Heavy industrial storage, establishments, heavy industry and general industry	8,227m^2
Office Premises	6,151m^2
TOTAL	**14,378m^2**

The detailed architectural plans are included in Appendix 1.

1.5. Purpose of this Report

This report presents the following considerations in relation to the Transport Impact Assessment of the proposal:

Section 2	A description of the transport environment;
Section 3	Assessment of the proposed parking provision in the context of the relevant planning control requirements;
Section 4	Determination of the traffic activity associated with the development proposal, and the adequacy of the surrounding road network;
Section 5	Description of the access and car parking arrangements; and
Section 6	Summary.

2. Transport Environment

2.1. Road Hierarchy

The BAESA Williamtown Site is located within the Port Stephens Local Government Area (LGA) and is serviced by a mix of state, regional and local roads as presented in Figure 5.

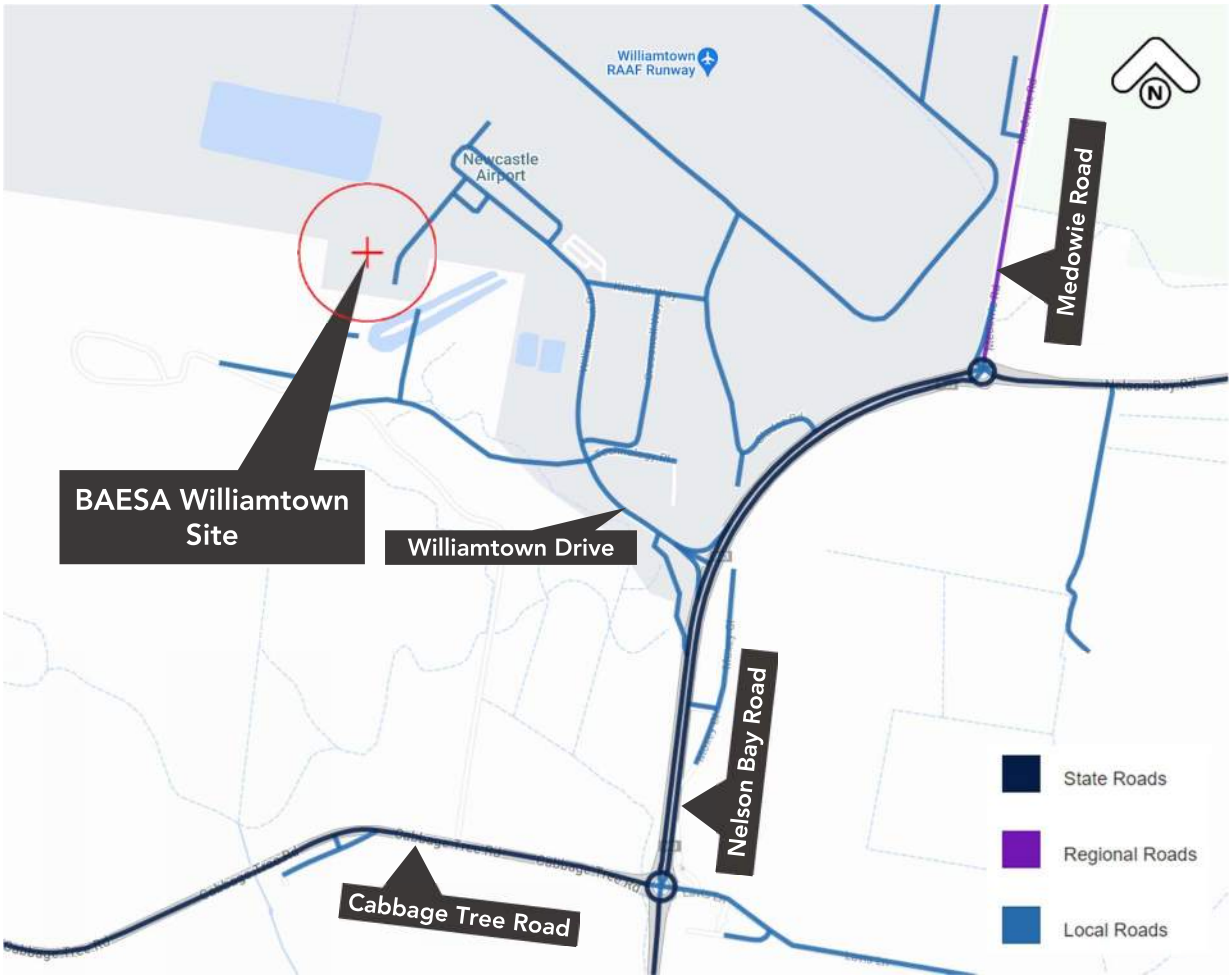


Figure 5 - Road Network Classification Map (Source: TfNSW, 2022)

The NSW administrative road hierarchy comprises the following road classifications, which align with the generic road hierarchy:

- **State Roads:** Freeways and Primary Arterials (TfNSW managed);
- **Regional Roads:** Secondary or sub-arterials (Council managed, partly funded by the State);
- **Local Roads:** Collector and local access roads (Council managed).

Nelson Bay Road (B63)	
Road Classification	State Road
Alignment	North – South
Number of Lanes	Varies, typically two lanes in each direction
Carriageway Type	Divided
Carriageway Width	Varies
Speed Limit	80km/hr
School Zone	No
Parking Controls	Parking not permitted
Forms Site Frontage	No

Figure 6 – Nelson Bay Road (Northbound)

Williamtown Drive	
Road Classification	Local Road
Alignment	East - West
Number of Lanes	One lane in each direction
Carriageway Type	Undivided
Carriageway Width	Varies, approx. 7m within vicinity of BAESA site entry
Speed Limit	Varies, 20km/h within vicinity of BAESA site entry
School Zone	No
Parking Controls	No Stopping
Forms Site Frontage	Yes

Figure 7 – Williamtown Drive (Westbound)

2.2. Key Intersections

The key intersections in the vicinity of the development site and their characteristics are listed below:

1. Nelson Bay Road / Williamtown Drive 3-arm signalised intersection

The key intersection is illustrated in Figure 8.

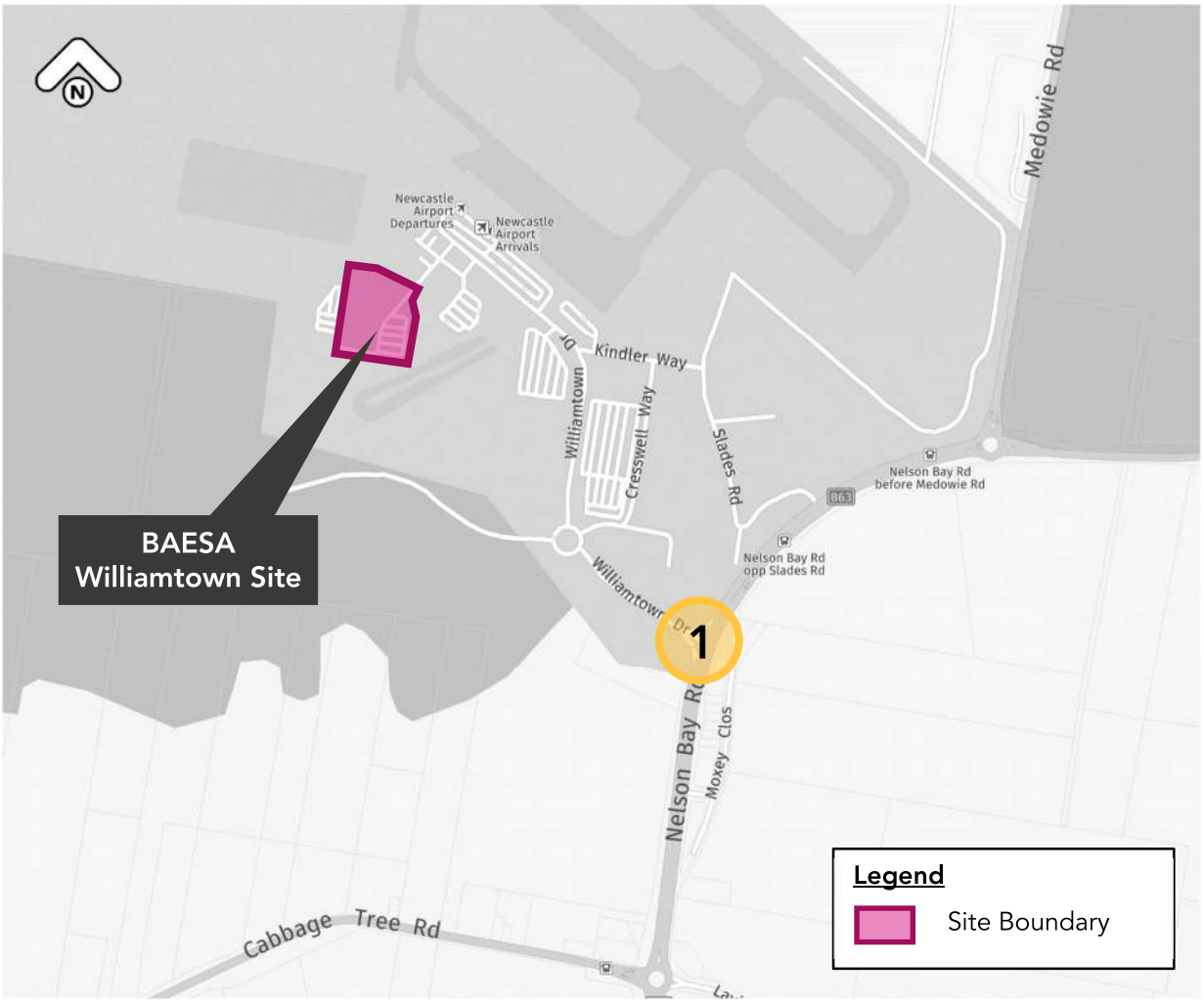


Figure 8 – Key Intersection Location (Source: HERE WeGo, 2022)

2.3. Public & Active Transport

The locality has been assessed in relation to the available public transport options that may serve the various users of the development. This assessment considered the *NSW Planning Guidelines for Walking and Cycling (2004)*, which suggests that a distance of 400-800m is a walkable catchment and 1,500m is a suitable cycling catchment when the development is within proximity to public transport.

The 800m walking catchment for public transport is illustrated in Figure 9.

Figure 9 - 800m Walking Catchment (Source: Nearmap, 2022)

As shown in Figure 9, access to the site via public transport is limited to the existing connections to Newcastle Airport given its proximity. A summary of the available public transport facilities is outlined in the followign subsections.

2.3.1. Bus

The closest bus stop is the Newcastle Airport, Williamtown Drive stop which is located within 230m walking distance of the site. The Newcastle Airport, Williamtown Drive bus stop is illustrated in Figure 10.

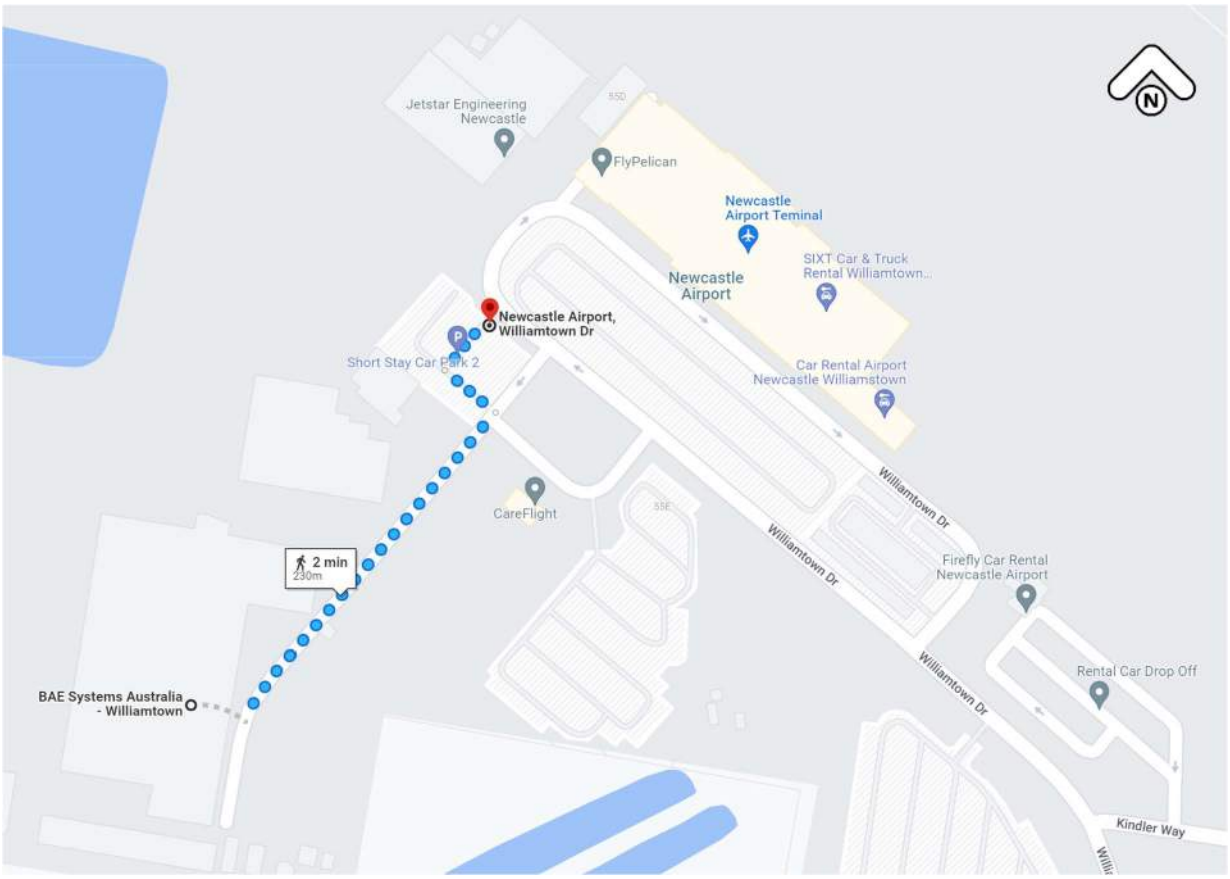


Figure 10 – Newcastle Airport, Williamtown Drive Bus Stop (Source: Google Maps, 2022)

Table 4 - Bus Service Summary

Bus Route	Coverage	Approximate Frequency
130	Fingal Bay to Newcastle via Gan Gan Road	Every 20-30 minutes during AM peak Every 60 minutes during PM peak Every 60 minutes off-peak
131	Fingal Bay to Newcastle (Express Service)	Only one AM service and one PM service throughout the day
136	Stockton to Raymond Terrace via Medowie	Every 60 minutes
138	Newcastle Interchange to Lemon Tree Passage via Airport	Only two AM services and two PM services throughout the day
145	Newcastle Airport to Green Hills Shopping Centre via Raymond Terrace	Every 60 minutes

As outlined in Table 4, the bus services are limited in terms of frequency and only operate with a few services throughout the day.

2.3.2. Cycling

There are currently limited cycling connections within the vicinity of the site, predominantly comprising hard difficulty cycle lanes on Nelson Bay Road and Cabbage Tree Road. It is noted that these are both State Roads which carry high volumes of traffic and not conducive to cycling.

The existing cycling paths are illustrated in Figure 11.

Figure 11 – Cycling Network (Source: TfNSW Cycleway Finder, 2022)

3. Parking Provision

The car parking provision requirements has been assessed with reference to the following planning document:

- *Port Stephens Council Development Control Plan 2022 (DCP)*

Reference has been made to *Figure BU: On-site Parking Requirements* within the DCP which stipulates the minimum car parking rates for various development types. The minimum car and bicycle parking rates applicable for *"heavy industrial storage, establishments, heavy industry and general industry"* and *"office premises and business premises"* is as follows:

Heavy industrial storage, establishments, heavy industry and general industry:

- ***Car Parking:*** *1 car space per 100m² floor area or 4 space per work bay*
- ***Accessible Car Parking:*** *1 car space per 30 car spaces*
- ***Bicycle Parking:*** *1 bike space per 20 employees*

Office Premises and Business Premises:

- ***Car Parking:*** *1 car space per 40m² floor area*
- ***Accessible Car Parking:*** *1 car space per 30 car spaces*
- ***Bicycle Parking:*** *1 bike space per 200m² floor area*

3.1. Car Parking

A comparison of the existing and proposed car parking provisions associated with the current GFAs and the proposed change in yield (as outlined in Table 1) is presented in the following subsections.

3.1.1. Existing Car Parking

A review of the existing car parking provision requirements based on the current GFA within the BAESA site has been undertaken as a benchmark.

Applying the minimum DCP parking rates to the existing GFA[1] (includes both the existing North and South Hangars for the purposes of calculating the adequacy of the existing parking provisions) results in the following car parking requirements outlined in Table 5.

[1] Existing GFA as previously outlined in Table 3

Table 5 - Existing Car Parking Provision Summary

Land Use Type	Existing GFA (m^2)	Min DCP Car Parking Rate	Minimum Car Parking Requirement	Existing Car Parking Provision
Heavy industrial storage, establishments, heavy industry and general industry	8,227m^2	• 1 car space per 100m^2 floor area; or • 4 space per work bay	83 (82.3)	265
Office Premises	10,602m^2	• 1 car space per 40m^2 floor area	154 (153.8)	
		TOTAL	**237**	**265**

As outlined in Section 1.4, the existing car parks accommodate approximately 265 car spaces which exceeds the minimum DCP requirement.

3.1.2. Proposed Car Parking

The minimum and proposed car parking associated with the change in yield associated with the Schedule 1 Works is summarised in Table 6. The existing GFA associated with the North Hangar has been retained under "proposed GFA" to provide a robust assessment.

Table 6 - Proposed Car Parking Provision Summary

Land Use Type	Proposed GFA (m^2)	Min DCP Car Parking Rate	Minimum Car Parking Requirement	Proposed Car Parking Provision
Heavy industrial storage, establishments, heavy industry and general industry	8,087m^2	• 1 car space per 100m^2 floor area; or • 4 space per work bay	81 (80.9)	265
Office Premises	6,151m^2	• 1 car space per 40m^2 floor area	154 (153.8)	
		TOTAL	**235**	**265**

As outlined in Table 6, the proposed yield results in a minimum car parking requirement of 235 car spaces, which is less than the existing situation due to the net reduction in yield. There is no proposed change in the existing car parking provision as part of the Schedule 1 Works. However, it has been demonstrated that there is sufficient on-site parking to accommodate the change in yield as part of the works.

3.2. Accessible Parking

3.2.1. Existing Accessible Parking

Applying the minimum DCP accessible parking rates to the existing GFA[2] results in the following accessible parking requirements outlined in Table 7.

Table 7 - Existing Accessible Parking Provision Summary

Land Use Type	Existing Car Parking Spaces	Min DCP Accessible Car Parking Rate	Minimum Accessible Car Parking Requirement	Existing Accessible Car Parking Provision
Heavy industrial storage, establishments, heavy industry and general industry	265	• *1 car space per 30 car spaces*	9 (8.8)	4
Office Premises				
		TOTAL	**9**	**4**

As shown in Table 7, there is an existing shortfall of five accessible parking spaces within the site. As part of the development proposal, it is anticipated that any existing shortfalls will be met to improve accessibility for staff.

3.2.2. Proposed Accessible Parking

The minimum and proposed accessible car parking associated with the change in yield associated with the Schedule 1 Works is summarised in Table 6.

Table 8 - Proposed Accessible Parking Provision Summary

Land Use Type	Proposed Car Parking Spaces	Min DCP Accessible Car Parking Rate	Minimum Accessible Car Parking Requirement	Proposed Accessible Car Parking Provision
Heavy industrial storage, establishments, heavy industry and general industry	265	• *1 car space per 30 car spaces*	9 (8.8)	9
Office Premises				
		TOTAL	**9**	**9**

[2] Existing hangar, support building and support building GFA has been combined to provide a robust assessment.

As outlined in Table 8, the site requires a total of nine accessible parking spaces associated with the existing 265 car spaces. The Schedule 1 Works proposes to provide nine accessible bays which meets the minimum accessible parking requirement. There are eight accessible bays located within the eastern car park and one accessible bay within the western car park as shown in Figure 12.

Figure 12 - Location Plan of Accessible Parking Bays

This represents an improvement to the existing situation by meeting the existing shortfall of accessible parking and should be considered on merit.

4. Traffic Impact Assessment

The traffic generation of the proposed development has been established with reference to the *RMS Guide to Traffic Generating Developments (2002)* (RMS Guide) and *RMS Technical Direction 2013/04a* (TDT) (which provides as an update to the RMS Guide and presents the traffic generation rates for a number of land uses based on updated surveys).

4.1. Existing Traffic Volume

An intersection traffic count was undertaken at the Nelson Bay Road/Williamtown Drive intersection on Thursday, 18th August 2022 (outside of school holiday period), between 6am – 9am and 4pm – 7pm. These periods were selected in order to coincide with the AM and PM commuter peaks.

The surveyed AM and PM peak periods are as follows:

- **AM Peak:** 7:15am – 8:15am
- **PM Peak:** 4pm – 5pm

The AM and PM peak hour traffic volumes are illustrated in the following diagrams:

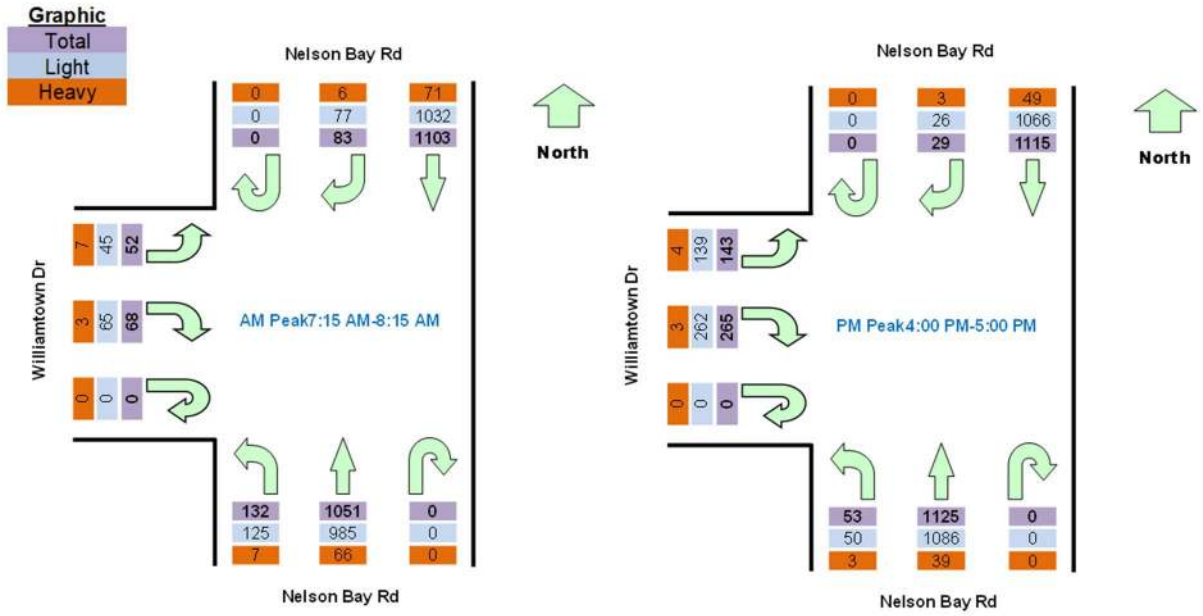


Figure 13 - AM and PM Peak Hour Traffic Survey Volumes (Source: Trans Traffic Survey, 2022)

The detailed traffic survey data collected by Trans Traffic Survey is included in Appendix 2.

4.2. Development Traffic Generation

It is noted that the proposed extensions to the existing storage facilities are ancillary to the existing land uses within the site. Furthermore, there is no proposed change to the overall existing onsite car parking provision. In this regard, it is not anticipated that the Schedule 1 Works will attract additional trips to the site over and above what is currently generated in existing daily operation.

As such, the traffic modelling presented in the following sections will only assess the existing performance of the Nelson Bay Road / Williamtown Drive intersection, noting that the traffic survey undertaken as part of this assessment already captures the existing traffic associated with the site.

4.3. Modelling Scenarios

The following scenarios have been analysed in this report:

- **Scenario 1A – 2022 Existing AM Peak** – The existing road network with the existing AM peak traffic volumes as observed in the traffic survey.
- **Scenario 1B – 2022 Existing PM Peak** – The existing road network with the existing PM peak traffic volumes as observed in the traffic survey.

4.4. SIDRA Analysis

A volume analysis has been performed using the SIDRA Intersection 9 software, a micro-analytical tool for individual intersection and whole-network modelling. The models are based on the collected traffic survey data. SIDRA provides a number of performance indicators outlined below:

- **Degree of Saturation** – The total usage of the intersection expressed as a factor of 1 with 1 representing 100% use/saturation. (e.g. 0.8=80% saturation)
- **Average Delay** – The average delay encountered by all vehicles passing through the intersection. It is often important to review the average delay of each approach as a side road could have a long delay time, while the large free flowing major traffic will provide an overall low average delay.
- **95% Queue Lengths (Q95)** – is defined to be the queue length in metres that has only a 5-percent probability of being exceeded during the analysis time period. It transforms the average delay into measurable distance units.
- **Level of Service (LoS)** – This is a categorization of average delay, intended for simple reference. It is a good indicator of overall performance for individual intersections. TfNSW adopts the following bands:

Table 9 - Intersection Performance - Levels of Service

Level of Service	Average Delay (secs/vehicle)	Traffic Signals, Roundabout	Give Way & Stop Signs
A	<14	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 would cause excessive delays. Roundabouts require other control mode	At capacity, requires other control mode
F	>70	Extra capacity required	Extreme delay, major treatment required

A summary of the existing intersection performance criteria is provided in Nelson Bay Road / Williamtown Drive

Table 10 and a detailed breakdown of the SIDRA movement summaries is provided in Appendix 1.

4.4.1. Nelson Bay Road / Williamtown Drive

Table 10 - Intersection Performance Summary

Intersection	Time	Scenario	LoS	Average Delay (s)[3]	DoS (v/c)	Q95 (m)
Nelson Bay Road / Williamtown Drive	Weekday AM Peak	Scenario 1A	A	11.2	0.492	133.3
	Weekday PM Peak	Scenario 1B	B	15.5	0.673	130.4

The intersection performs with LoS A in the existing AM peak with an average delay of approximately 11 seconds. In the existing PM peak period, the intersection performs at LoS B with an average delay of approximately 16 seconds. The intersection performs at a high level of service during both commuter peak periods.

[3] For signalised intersections, the average performance indicators have been reported. For priority and roundabout intersections, the average delay of the worst movement is used to determine the LoS.

5. Access and Car Park Arrangement

The proposed Schedule 1 Works does not involve any changes to the existing vehicular access arrangements within the site. In this regard, no assessment of the existing access and car parking facilities is applicable.

Access into the site is via the existing connection to Williamtown Drive and this will be maintained. The existing vehicle and pedestrian access routes which are illustrated in Figure 14, Figure 15 and Figure 16.

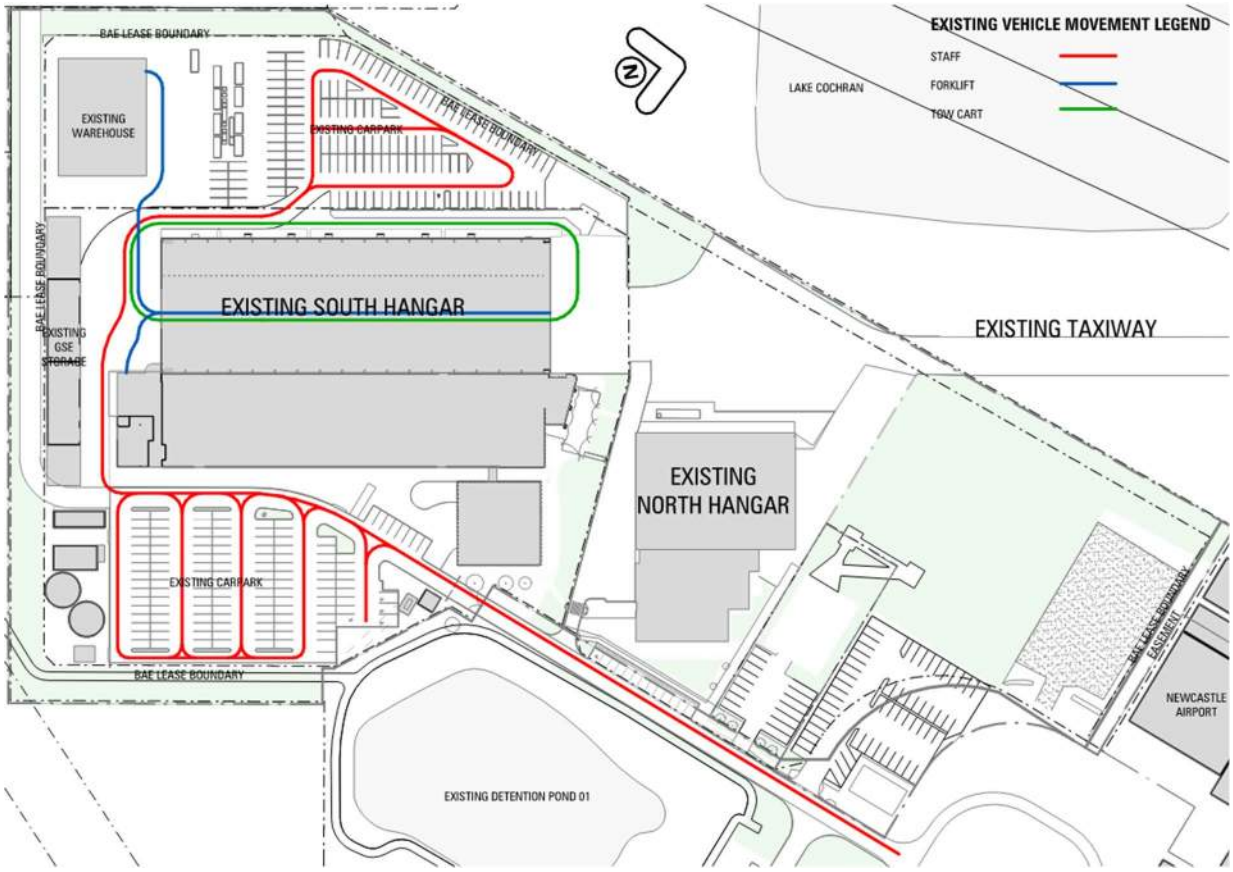


Figure 14 – Existing Vehicle Movement Diagram for Staff, Forklift and Tow Carts (Source: DesignInc, 2022)

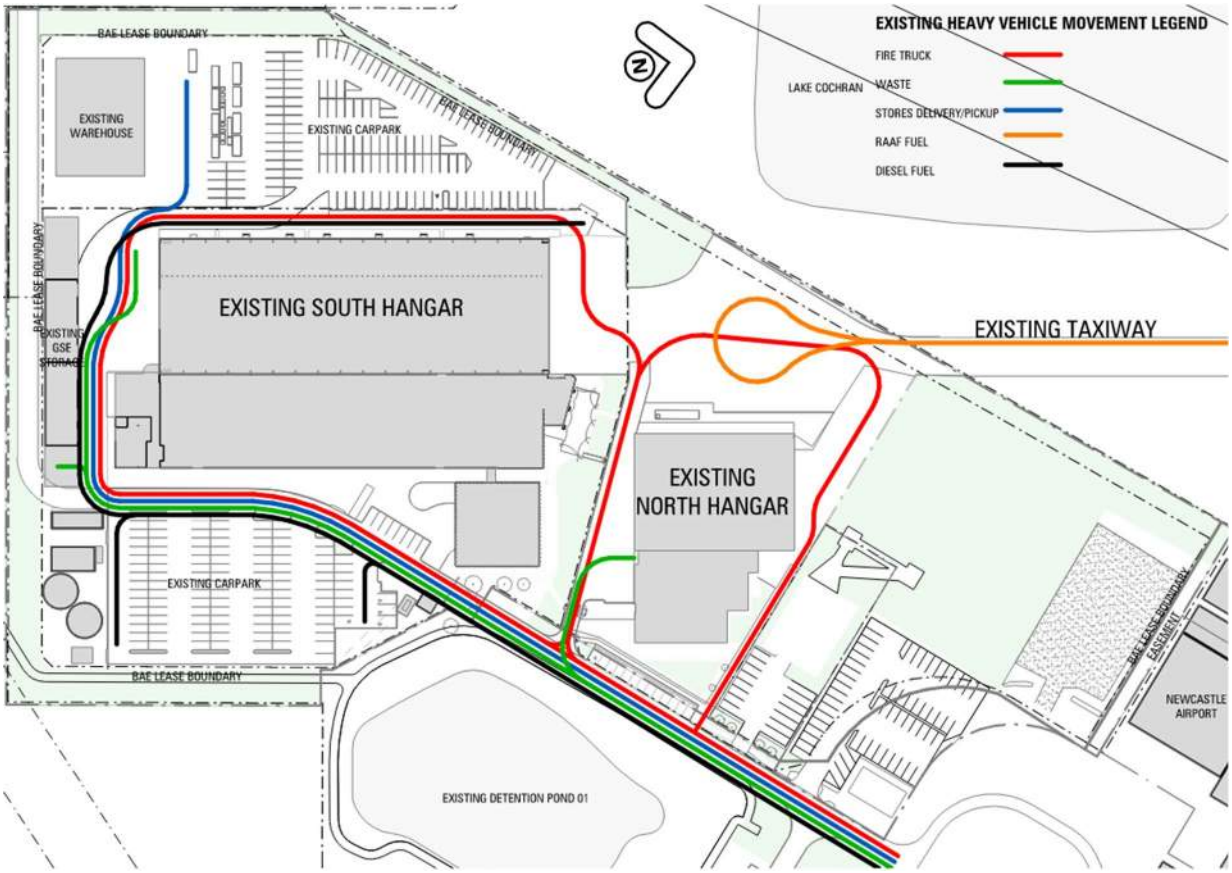


Figure 15 - Existing Heavy Vehicle Movement Diagram for Waste, Deliveries and Fire Truck (Source: DesignInc, 2022)

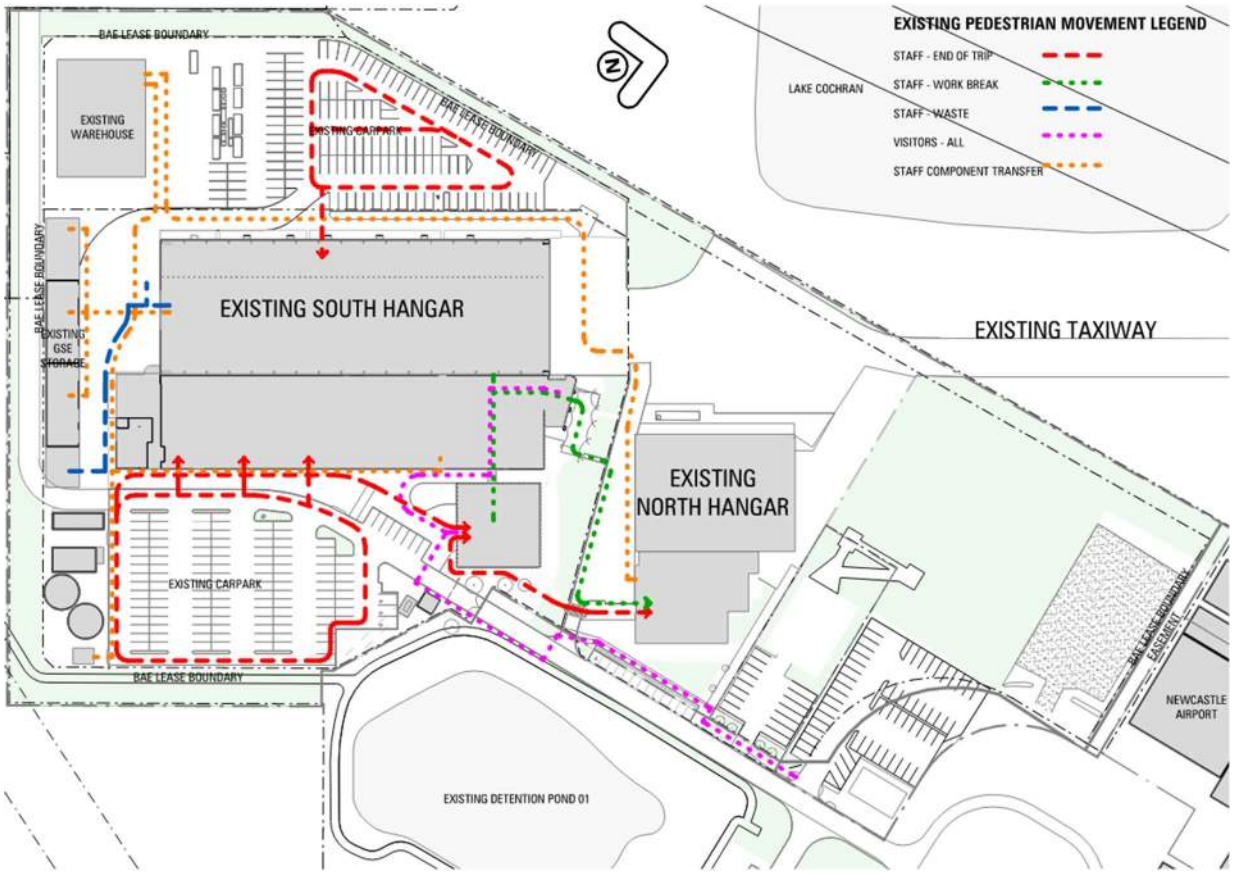


Figure 16 – Existing Pedestrian Movement Diagram (Source: DesignInc, 2022)

5.1. Car Park Layout and Circulation

Where changes to existing car parking allocations are proposed, the parking design requirements outlined in the following subsections shall apply.

5.1.1. Typical Requirements

Table 1.1 of *AS2890.1 (2004)* presents a number of car park classifications applicable to different land-uses. As the car parks are designated for staff use, the car park is classified as a Class 1A facility. The parking space dimensions and associated aisle width requirements for a Class 1A facility are as follows:

- Space: 2.4m x 5.4m
- Aisle widths: 5.8m (plus an additional 300mm to any vertical obstructions greater than 150mm in height including, but not limited to, walls, bollards etc.)

5.1.2. Accessible Parking

Accessible parking spaces are to satisfy minimum dimensions of 2.4m x 5.4m, with an adjacent shared bay of equal dimensions. Shared bays and accessible spaces shall be installed in accordance with AS2890.6:2009, including the installation of bollards and relevant pavement markings.

5.1.3. Waste Collection

It is understood that waste collection is currently being undertaken by private waste contractor and there are no proposed changes to the existing waste collection arrangements.

6. Summary

ptc. has been engaged by DesignInc, on behalf of BAE Systems Australia (the Applicant), to prepare a TIA to accompany a DA to Port Stephens Council in relation to the Schedule 1 Works within the BAESA Williamtown site.

In the context of parking, the site currently accommodates approximately 265 car parking spaces (inclusive of four existing accessible parking spaces). A review of the existing car parking provisions indicates that the standard staff car parking exceeds the minimum DCP requirement. However, there is an existing shortfall of five accessible car parking spaces. The proposed development will involve the reallocation of existing staff spaces to meet the shortfall in accessible parking to achieve an overall total of nine accessible bays.

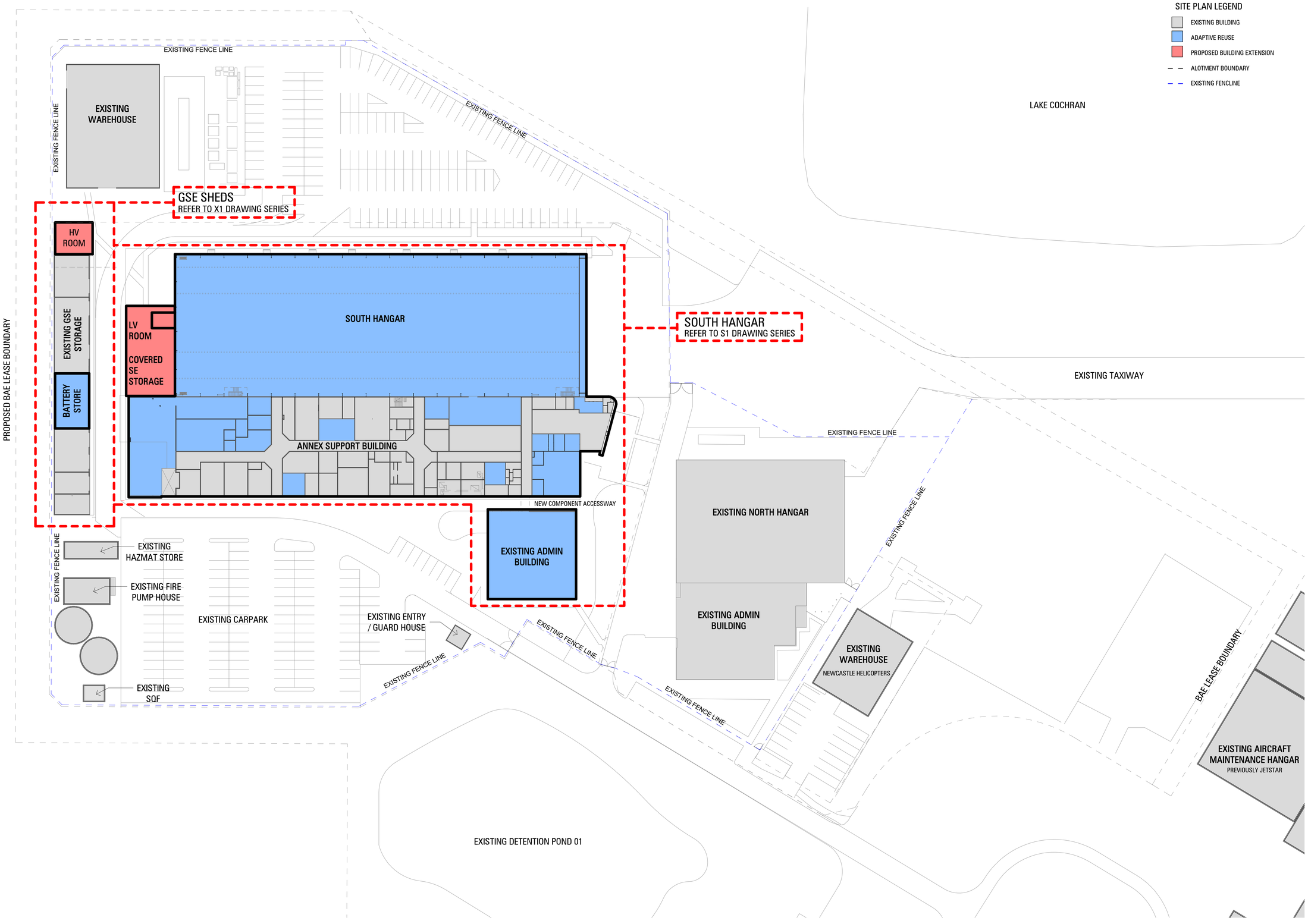
In terms of vehicular access and waste collection arrangements, there are no changes proposed as part of the Schedule 1 Works.

A review of the potential traffic activity associated with the development site has found that the minor building extensions to existing storage facilities within the site are not expected to generate additional trips when compared to the current operation of the site.

For the purposes of this assessment, **ptc.** has assessed that the proposed development is unlikely to have a significant impact on the surrounding road network over and above the existing situation.

ptc.

Appendix 1. Architectural Drawings (DesignInc)



SITE PLAN LEGEND

- EXISTING BUILDING
- ADAPTIVE REUSE
- PROPOSED BUILDING EXTENSION
- ALOTMENT BOUNDARY
- EXISTING FENCLINE

PROPOSED SITE PLAN
SCALE 1 : 500

0 12.5 25 metres
1:500

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A	06.08.2021	DRAFT ISSUE FOR COSTING	
B	27.08.2021	PDR ISSUE	
C	17.09.2021	PDR ISSUE	

PROJECT MANAGER: APP

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CLIENT: BAE SYSTEMS

PROJECT: F-35 REQUIREMENTS DEFINITION CONTRACT

ELEMENT: SITEWIDE ARCHITECTURAL

SHEET TITLE: SOUTH HANGAR - PROPOSED SITE PLAN

DRAWING STATUS	REVIEWED BY	SIGNATURE	DATE
PRELIMINARY			
FOR INFORMATION ONLY			
FOR D.A. APPROVAL			
CONSTRUCTION CERTIFICATE			
FOR TENDER			
FOR CONSTRUCTION			
AS BUILT DOCUMENT			

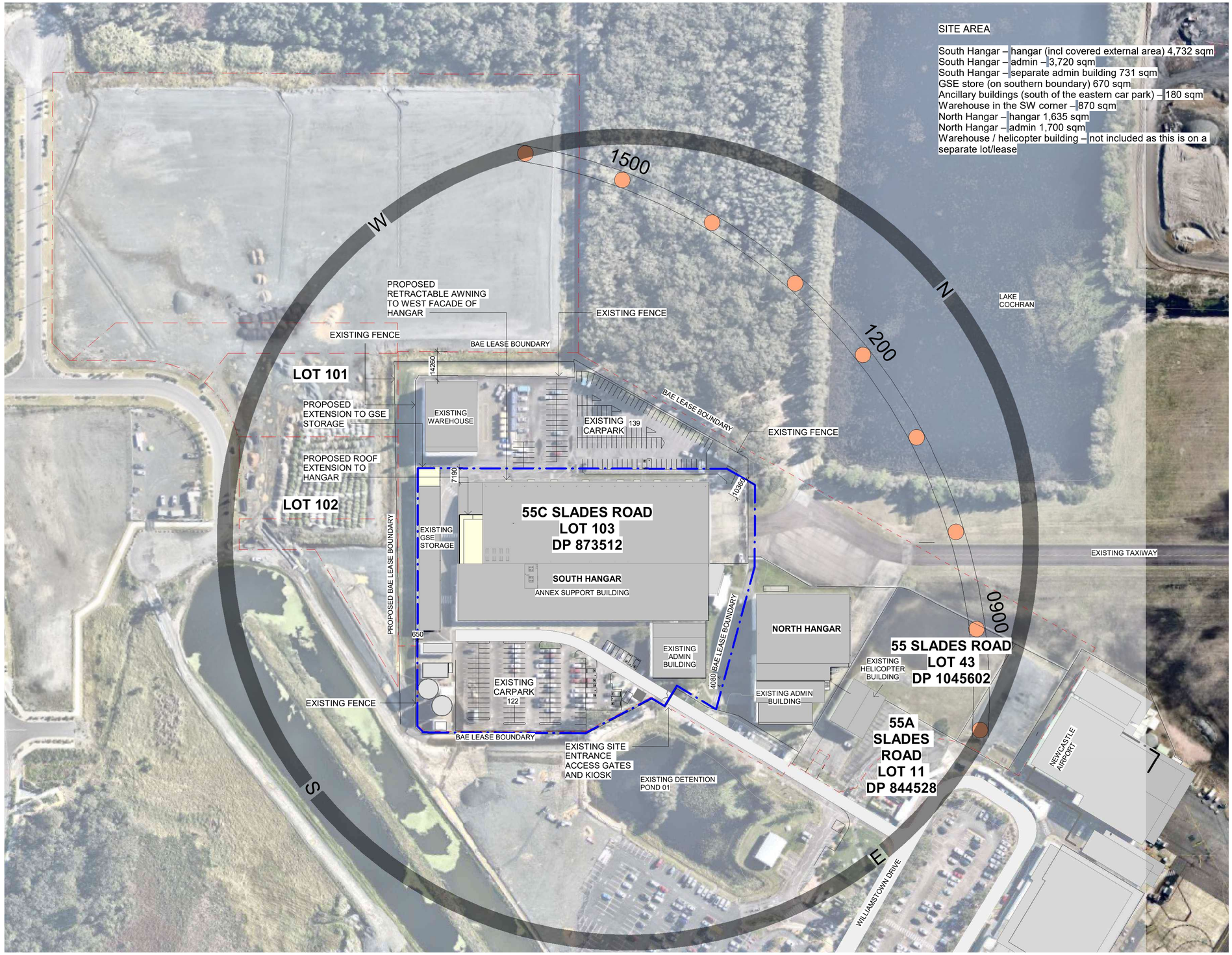
DRAWN	DM / RH
SCALE @ A1	As indicated
DATE	17.09.2021

DRAWING NO.: A20-0059-00-AR-DRG-1001
REV.: C

ISSUE: PRELIMINARY
ISSUED DATE: 17.09.2021

SYMBOL LEGEND:

- LOT BOUNDARY
- LEASE BOUNDARY



1 SITE PLAN & SITE ANALYSIS & LANDSCAPE

0 1 2 3 4 5 m
SCALE BAR - 1:100

PLOTTED : 7/09/2022 12:56:01 PM

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BAE SYSTEMS

PROJECT

FACILITIES EXPANSION PROGRAM

WILLIAMTOWN NSW 2313

DETAILS

DRAWN MD
CHECKED CK
APPROVED CDB

SCALE
As indicated @ A1

TITLE

SITE PLAN & SITE ANALYSIS & LANDSCAPE PLAN

STATUS

DA ISSUE

WORK-IN-PROGRESS

DRAWING NUMBER
P22-034-DA001

REVISION
A

NOT FOR CONSTRUCTION

Appendix 2. Survey Data (TTS)

TRANS TRAFFIC SURVEY

TURNING MOVEMENT SURVEY

Intersection of Williamtown Dr and Nelson Bay Rd, Williat

GPS -32.811529, 151.844336

Date:	Thu 18/08/22
Weather:	Fine
Suburban:	Williamtown
Customer:	PTC

North:	Nelson Bay Rd
East:	N/A
South:	Nelson Bay Rd
West:	Williamtown Dr

Survey	AM:	6:00 AM-9:00 AM
Period	PM:	4:00 PM-7:00 PM
Traffic	AM:	7:15 AM-8:15 AM
Peak	PM:	4:00 PM-5:00 PM

All Vehicles

Time		orth Approach Nelson Bay			outh Approach Nelson Bay			est Approach Williamtown			Hourly Total	
Period Start	Period End	U	R	SB	U	NB	L	U	R	L	Hour	Peak
6:00	6:15	0	5	220	0	91	23	0	10	4	1824	
6:15	6:30	0	19	244	0	183	18	0	5	10	1972	
6:30	6:45	0	14	221	0	220	21	0	7	4	2137	
6:45	7:00	0	13	224	0	221	37	0	3	7	2323	
7:00	7:15	0	10	229	0	216	31	0	8	7	2414	
7:15	7:30	0	18	263	0	318	30	0	7	8	2489	Peak
7:30	7:45	0	22	316	0	281	32	0	12	10	2384	
7:45	8:00	0	25	264	0	214	37	0	36	20	2237	
8:00	8:15	0	18	260	0	238	33	0	13	14	2093	
8:15	8:30	0	19	244	0	195	59	0	11	11		
8:30	8:45	0	14	258	0	182	49	0	10	13		
8:45	9:00	0	16	191	0	185	32	0	6	22		
16:00	16:15	0	10	306	0	294	17	0	82	41	2730	Peak
16:15	16:30	0	9	269	0	285	16	0	54	35	2514	
16:30	16:45	0	5	299	0	286	14	0	60	29	2350	
16:45	17:00	0	5	241	0	260	6	0	69	38	2118	
17:00	17:15	0	3	221	0	236	6	0	44	24	1913	
17:15	17:30	0	6	198	0	235	4	0	41	20	1682	
17:30	17:45	0	5	137	0	278	13	0	15	13	1485	
17:45	18:00	0	6	125	0	224	16	0	21	22	1265	
18:00	18:15	0	4	96	0	154	21	0	18	10	1094	
18:15	18:30	0	5	105	0	155	24	0	13	5		
18:30	18:45	0	3	80	0	127	15	0	12	4		
18:45	19:00	0	8	54	0	120	30	0	22	9		

Peak Time		orth Approach Nelson Bay			outh Approach Nelson Bay			est Approach Williamtown			Peak
Period Start	Period End	U	R	SB	U	NB	L	U	R	L	total
7:15	8:15	0	83	1103	0	1051	132	0	68	52	2489
16:00	17:00	0	29	1115	0	1125	53	0	265	143	2730

Pedestrians Crossing

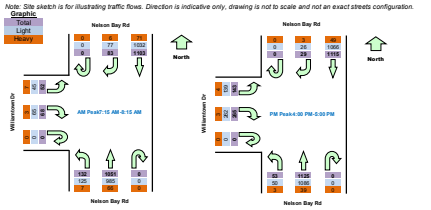
Time		North Approach Nelson Bay Rd		South Approach Nelson Bay Rd		West Approach Williamtown Dr		Hourly Total
Period Start	Period End	Westbound	Eastbound	Westbound	Eastbound	Southbound	Northbound	
6:00	6:15	0	0	0	0	0	0	0
6:15	6:30	0	0	0	0	0	0	0
6:30	6:45	0	0	0	0	0	0	0
6:45	7:00	0	0	0	0	0	0	0
7:00	7:15	0	0	0	0	0	0	0
7:15	7:30	0	0	0	0	0	0	0
7:30	7:45	0	0	0	0	0	0	0
7:45	8:00	0	0	0	0	0	0	0
8:00	8:15	0	0	0	0	0	0	0
8:15	8:30	0	0	0	0	0	0	
8:30	8:45	0	0	0	0	0	0	
8:45	9:00	0	0	0	0	0	0	
16:00	16:15	0	0	0	0	0	0	0
16:15	16:30	0	0	0	0	0	0	0
16:30	16:45	0	0	0	0	0	0	0
16:45	17:00	0	0	0	0	0	0	0
17:00	17:15	0	0	0	0	0	0	0
17:15	17:30	0	0	0	0	0	0	0
17:30	17:45	0	0	0	0	0	0	0
17:45	18:00	0	0	0	0	0	0	0
18:00	18:15	0	0	0	0	0	0	0
18:15	18:30	0	0	0	0	0	0	
18:30	18:45	0	0	0	0	0	0	
18:45	19:00	0	0	0	0	0	0	

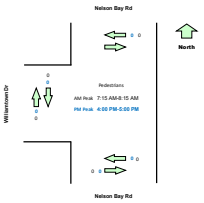
Peak Time		North Approach Nelson Bay Rd		South Approach Nelson Bay Rd		West Approach Williamtown Dr		Peak total
Period Start	Period End	Westbound	Eastbound	Westbound	Eastbound	Southbound	Northbound	
7:15	8:15	0	0	0	0	0	0	0
16:00	17:00	0	0	0	0	0	0	0

Note: Site sketch is for illustrating traffic flows. Direction is indicative only, drawing is not to scale and not an exact streets configuration.

Graphic

Total
Light
Heavy





Light Vehicles

Time		orth Approach Nelson Bay			outh Approach Nelson Bay			est Approach Williamtown		
Period Start	Period End	U	R	SB	U	NB	L	U	R	L
6:00	6:15	0	4	206	0	84	22	0	9	4
6:15	6:30	0	19	226	0	162	18	0	5	9
6:30	6:45	0	13	215	0	203	18	0	5	4
6:45	7:00	0	12	214	0	200	32	0	3	6
7:00	7:15	0	9	216	0	197	30	0	7	6
7:15	7:30	0	17	255	0	309	28	0	6	8
7:30	7:45	0	21	292	0	262	30	0	10	9
7:45	8:00	0	23	243	0	194	35	0	36	17
8:00	8:15	0	16	242	0	220	32	0	13	11
8:15	8:30	0	19	231	0	179	58	0	9	10
8:30	8:45	0	14	248	0	157	43	0	10	12
8:45	9:00	0	14	179	0	168	32	0	5	17
16:00	16:15	0	10	292	0	285	16	0	82	41
16:15	16:30	0	8	256	0	265	16	0	54	34
16:30	16:45	0	5	283	0	282	13	0	59	28
16:45	17:00	0	3	235	0	254	5	0	67	36
17:00	17:15	0	3	216	0	232	6	0	42	23
17:15	17:30	0	4	191	0	227	4	0	39	20
17:30	17:45	0	5	130	0	274	13	0	15	13
17:45	18:00	0	5	124	0	219	15	0	21	21
18:00	18:15	0	3	90	0	152	20	0	17	8
18:15	18:30	0	4	100	0	155	24	0	13	5
18:30	18:45	0	3	76	0	121	14	0	11	4
18:45	19:00	0	7	54	0	116	30	0	21	9

Peak Time		orth Approach Nelson Bay			outh Approach Nelson Bay			est Approach Williamtown			Peak
Period Start	Period End	U	R	SB	U	NB	L	U	R	L	total
7:15	8:15	0	77	1032	0	985	125	0	65	45	2329
16:00	17:00	0	26	1066	0	1086	50	0	262	139	2629

Heavy Vehicles

Time		orth Approach Nelson Bay			outh Approach Nelson Bay			est Approach Williamtown		
Period Start	Period End	U	R	SB	U	NB	L	U	R	L
6:00	6:15	0	0	14	0	7	0	0	0	0
6:15	6:30	0	0	18	0	21	0	0	0	0
6:30	6:45	0	0	6	0	16	3	0	1	0
6:45	7:00	0	0	10	0	20	4	0	0	1
7:00	7:15	0	0	12	0	19	1	0	0	0
7:15	7:30	0	0	8	0	8	2	0	0	0
7:30	7:45	0	0	16	0	19	1	0	0	1
7:45	8:00	0	1	12	0	20	1	0	0	2
8:00	8:15	0	0	16	0	17	1	0	0	1
8:15	8:30	0	0	12	0	16	1	0	0	1
8:30	8:45	0	0	10	0	25	5	0	0	1
8:45	9:00	0	0	12	0	14	0	0	1	4
16:00	16:15	0	0	13	0	9	0	0	0	0
16:15	16:30	0	0	13	0	18	0	0	0	0
16:30	16:45	0	0	15	0	3	0	0	0	0
16:45	17:00	0	0	6	0	5	0	0	1	1
17:00	17:15	0	0	5	0	4	0	0	2	0
17:15	17:30	0	0	6	0	7	0	0	0	0
17:30	17:45	0	0	7	0	4	0	0	0	0
17:45	18:00	0	0	1	0	5	0	0	0	0
18:00	18:15	0	0	6	0	2	0	0	0	0
18:15	18:30	0	0	4	0	0	0	0	0	0
18:30	18:45	0	0	4	0	6	0	0	0	0
18:45	19:00	0	0	0	0	4	0	0	0	0

Peak Time		orth Approach Nelson Bay			outh Approach Nelson Bay			est Approach Williamtown			Peak
Period Start	Period End	U	R	SB	U	NB	L	U	R	L	total
7:15	8:15	0	6	71	0	66	7	0	3	7	160
16:00	17:00	0	3	49	0	39	3	0	3	4	101

Bus

Time		orth Approach Nelson Bay			outh Approach Nelson Bay			est Approach Williamtown		
Period Start	Period End	U	R	SB	U	NB	L	U	R	L
6:00	6:15	0	1	0	0	0	1	0	1	0
6:15	6:30	0	0	0	0	0	0	0	0	1
6:30	6:45	0	1	0	0	1	0	0	1	0
6:45	7:00	0	1	0	0	1	1	0	0	0
7:00	7:15	0	1	1	0	0	0	0	1	1
7:15	7:30	0	1	0	0	1	0	0	1	0
7:30	7:45	0	1	8	0	0	1	0	2	0
7:45	8:00	0	1	9	0	0	1	0	0	1
8:00	8:15	0	2	2	0	1	0	0	0	2
8:15	8:30	0	0	1	0	0	0	0	2	0
8:30	8:45	0	0	0	0	0	1	0	0	0
8:45	9:00	0	2	0	0	3	0	0	0	1
16:00	16:15	0	0	1	0	0	1	0	0	0
16:15	16:30	0	1	0	0	2	0	0	0	1
16:30	16:45	0	0	1	0	1	1	0	1	1
16:45	17:00	0	2	0	0	1	1	0	1	1
17:00	17:15	0	0	0	0	0	0	0	0	1
17:15	17:30	0	2	1	0	1	0	0	2	0
17:30	17:45	0	0	0	0	0	0	0	0	0
17:45	18:00	0	1	0	0	0	1	0	0	1
18:00	18:15	0	1	0	0	0	1	0	1	2
18:15	18:30	0	1	1	0	0	0	0	0	0
18:30	18:45	0	0	0	0	0	1	0	1	0
18:45	19:00	0	1	0	0	0	0	0	1	0

Peak Time		orth Approach Nelson Bay			outh Approach Nelson Bay			est Approach Williamtown			Peak
Period Start	Period End	U	R	SB	U	NB	L	U	R	L	total
7:15	8:15	0	5	19	0	2	2	0	3	3	34
16:00	17:00	0	3	2	0	4	3	0	2	3	17

Appendix 3. SIDRA Analysis

MOVEMENT SUMMARY

Site: TCS4174 [1a. Nelson Bay Road / Williamtown Drive - Existing AM Peak (Site Folder: Existing Scenario)]

Existing AM Peak
Peak hour: 7:15am - 8:15am
Survey date: 18/08/2022
Site Category: Existing
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 120 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Nelson Bay Road (S)														
1	L2	132	7	139	5.3	0.078	7.8	LOS A	0.0	0.0	0.00	0.60	0.00	63.9
2	T1	1051	66	1106	6.3	* 0.492	14.4	LOS A	18.1	133.3	0.61	0.55	0.61	63.9
Approach		1183	73	1245	6.2	0.492	13.7	LOS A	18.1	133.3	0.54	0.56	0.54	63.9
North: Nelson Bay Road (N)														
8	T1	1103	71	1161	6.4	0.414	5.7	LOS A	12.0	88.9	0.39	0.36	0.39	72.7
9	R2	83	6	87	7.2	* 0.236	15.6	LOS B	1.5	10.8	0.56	0.73	0.56	51.5
Approach		1186	77	1248	6.5	0.414	6.4	LOS A	12.0	88.9	0.40	0.38	0.40	71.1
West: Williamtown Drive (W)														
10	L2	52	7	55	13.5	0.032	5.7	LOS A	0.0	0.0	0.00	0.46	0.00	47.6
12	R2	68	3	72	4.4	* 0.298	56.3	LOS D	3.9	28.1	0.94	0.76	0.94	29.7
Approach		120	10	126	8.3	0.298	34.4	LOS C	3.9	28.1	0.53	0.63	0.53	35.7
All Vehicles		2489	160	2620	6.4	0.492	11.2	LOS A	18.1	133.3	0.48	0.48	0.48	65.2

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

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Nelson Bay Road (S)												
P1	Full	50	53	54.3	LOS E	0.2	0.2	0.95	0.95	221.3	217.2	0.98
North: Nelson Bay Road (N)												
P3	Full	50	53	54.3	LOS E	0.2	0.2	0.95	0.95	226.4	223.8	0.99
West: Williamtown Drive (W)												
P4	Full	50	53	54.3	LOS E	0.2	0.2	0.95	0.95	218.0	212.9	0.98
All Pedestrians		150	158	54.3	LOS E	0.2	0.2	0.95	0.95	221.9	218.0	0.98

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: TCS4174 [1b. Nelson Bay Road / Williamtown Drive - Existing PM Peak (Site Folder: Existing Scenario)]

Existing PM Peak
Peak hour: 4:00pm - 5:00pm
Survey date: 18/08/2022
Site Category: Existing
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 80 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Nelson Bay Road (S)														
1	L2	53	3	56	5.7	0.031	7.7	LOS A	0.0	0.0	0.00	0.60	0.00	63.8
2	T1	1125	39	1184	3.5	*0.671	18.1	LOS B	18.1	130.4	0.84	0.75	0.84	60.7
Approach		1178	42	1240	3.6	0.671	17.6	LOS B	18.1	130.4	0.80	0.74	0.80	60.8
North: Nelson Bay Road (N)														
8	T1	1115	49	1174	4.4	0.505	9.3	LOS A	12.8	92.8	0.60	0.54	0.60	68.8
9	R2	29	3	31	10.3	*0.111	19.1	LOS B	0.5	3.9	0.75	0.71	0.75	48.9
Approach		1144	52	1204	4.5	0.505	9.6	LOS A	12.8	92.8	0.61	0.55	0.61	68.2
West: Williamtown Drive (W)														
10	L2	143	4	151	2.8	0.083	5.8	LOS A	0.0	0.0	0.00	0.47	0.00	47.7
12	R2	265	3	279	1.1	*0.673	36.5	LOS C	10.4	73.5	0.97	0.85	1.01	36.7
Approach		408	7	429	1.7	0.673	25.8	LOS B	10.4	73.5	0.63	0.71	0.65	40.0
All Vehicles		2730	101	2874	3.7	0.673	15.5	LOS B	18.1	130.4	0.69	0.65	0.70	60.1

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

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Nelson Bay Road (S)												
P1	Full	50	53	34.3	LOS D	0.1	0.1	0.93	0.93	201.4	217.2	1.08
North: Nelson Bay Road (N)												
P3	Full	50	53	34.3	LOS D	0.1	0.1	0.93	0.93	206.5	223.8	1.08
West: Williamtown Drive (W)												
P4	Full	50	53	34.3	LOS D	0.1	0.1	0.93	0.93	198.1	212.9	1.07
All Pedestrians		150	158	34.3	LOS D	0.1	0.1	0.93	0.93	202.0	218.0	1.08

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.