Sunshine Health, Wellbeing and Education Precinct

Integrated Transport Assessment

Client // Victorian Planning Authority

Office // VIC

Reference // V134260

Date // 22/01/18

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1. Introduction

1.1 Introduction

The Sunshine Health, Wellbeing and Education Precinct (SHWEP) forms part of the Sunshine National Employment and Innovation Cluster (NEIC) and seeks to facilitate urban renewal and encourage its redevelopment into a mixed-use precinct that focuses on health and education use. The Victorian Planning Authority (VPA) has been working with Brimbank City Council (BCC) on the preparation of a structure plan for SHWEP. This has included engagement with key stakeholders including VicRoads, Public Transport Victoria (PTV) and Transport for Victoria (TfV).

As part of this project, GTA Consultants has been engaged by the VPA to undertake an Integrated Transport Assessment (ITA) to determine the access and mobility needs of the traffic and transport generated from the anticipated level of development. Rather than developing a new base model, the ITA is proposed to build on the previous work done to date, in particular strategic modelling undertaken by GTA using the Victorian Integrated Transport Model (VITM).

1.2 Purpose of this Report

By analysing the strategic transport modelling outputs, the ITA seeks to understand the network performance at different stages of the precinct's development. The modelling will be used to inform broader planning considerations including:

o   the performance of Furlong Road and its ability to cater for the intensification of land use predicted for the precinct
o   the impact on the arterial roads in and around SHWEP, with the introduction of the proposed link road
o   the impact of additional traffic generated by jobs growth in SHWEP, and its effect on the transport network.

It is important to note that the scope of the strategic transport modelling focused on the design year of 2046 which is the longest time horizon considered in the VITM. The 2046 timeframe was considered suitable to assess the ultimate development scenario of the precinct, which is forecast to occur by 2051 as stated in the SGS Economics and Planning report (July 2017). The future employment and dwelling projections for the precinct used in this ITA have been taken from the fore mentioned report.

1.3 References

In preparing this report, reference has been made to the following documents:

o   Draft plans prepared by Victoria Planning Authority
o   Victorian Integrated Transport Model (VITM)
o   SGS Economics and Planning's (SGSEP) Sunshine Health Wellbeing and Education Precinct Final Report, July 2017

Additionally, the following technical data, as well as other documents as nominated have been referenced:

o   Traffic Modelling Analysis – St Albans Road Extension, Sunshine: VITM Model Calibration and Validation, GTA Consultants, 26 May 2014
o   Traffic Modelling Analysis: St Albans Road Extension, Sunshine – Model Calibration and Validation Report, GTA Consultants, 2 June 2014

2.   Site Context

2.1   Study Area

The SHWEP is located in the municipality of Brimbank, within the suburb of St Albans. The precinct is bound by the M80 Western Ring Road to the south-east, St Albans Road to the south-west and Stony Creek to the north. The approximately 61 hectare site is bisected by Furlong Road, running east-west, linking the site and the suburbs of St Albans and Cairnlea to wider metropolitan Melbourne via direct access to the M80.

The proposed study area covers the relevant roads within the precinct, as well as a wider area of approximately 1.5 km around the SHWEP. The study area is shown in Figure 2.1.

Figure 2.1:   Project location and study area

Legend
- SHWEP Site
- Study Area

The precinct is currently home to approximately 3,200 employees and has undergone significant transformation in recent years including a redevelopment of the public hospital, the introduction of a private hospital and from a transport perspective, the completion of the Furlong Road level crossing removal and the rebuild of a new below ground train station (Ginifer).

2.2   Road Network

The site has a diverse range of potential access points and access modes, including car, bus, train and bicycle. The existing road network servicing this site affords connections to surrounding suburbs in all four directions. The site's immediate proximity to the Furlong Road / Western Ring Road interchange provides the area with access to the whole of metropolitan Melbourne and regional Victoria via the state's freeway network.

The recent grade separation of the Sunbury train line at Furlong Rd / Ginifer Station has likely decreased congestion in and around the site, improving travel times for buses and vehicles. However, in the medium term, further intensification of land use is likely to increase traffic on the precincts road network.

Both Furlong Road and St Albans Road are classified as primary state arterials (VicRoads controlled) and through traffic along these roads is relatively high. Particularly the section of Furlong Road linking St Albans Road to the freeway interchange, as it provides one of the key links between the suburb of St Albans and activity centres across Melbourne.

The precinct is supported by a local road network that provides access to residential properties and local services as well as secondary access to hospital facilities, mainly from Majorca Street, which is a Council Controlled Road.

The following intersections within the precinct are currently signalised:

○   Furlong Road / St Albans Road
○   Furlong Road / Public Hospital Access
○   Furlong Road / Western Ring Road

3.   Precinct Context

3.1   Draft Future Urban Structure Plan

A preliminary draft of the Future Urban Structure Plan of the precinct is reproduced in Figure 3.1. It seeks to provide a mixture of health, mixed use, residential, industrial and commercial land uses.

Figure 3.1:   Draft Future Urban Structure
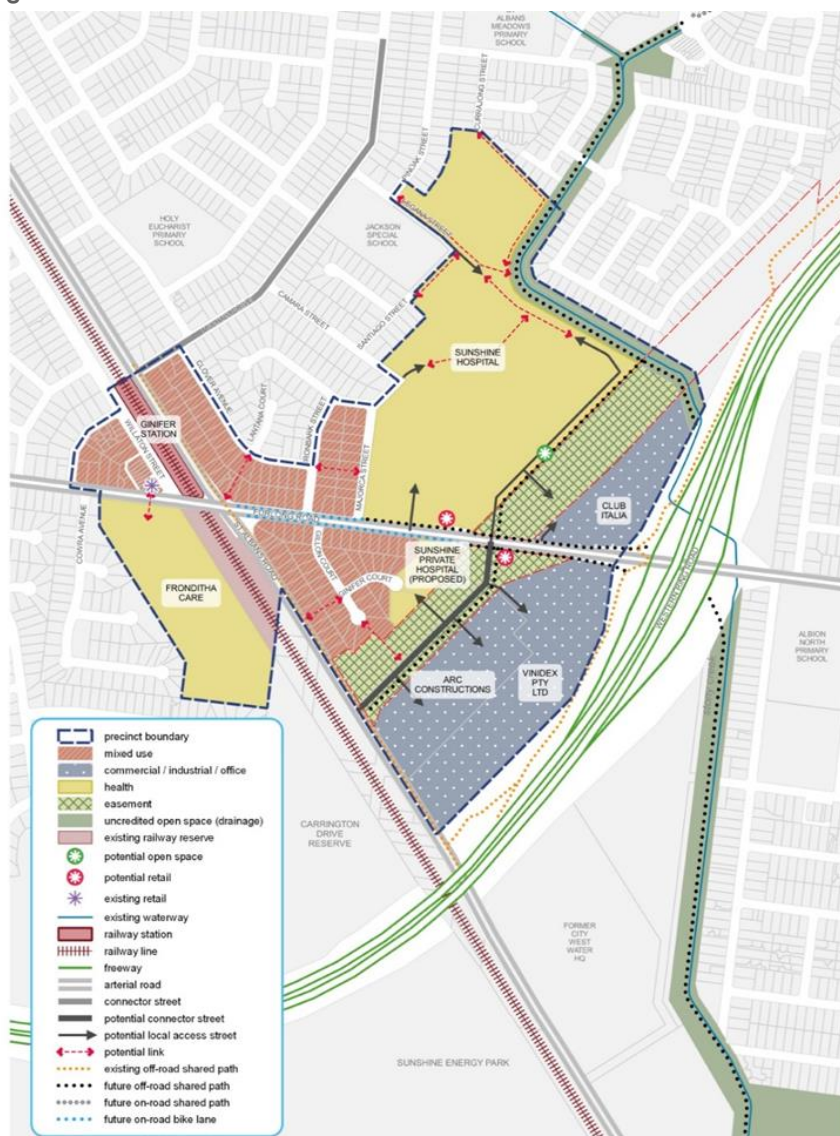
Source: VPA

As part of the redevelopment, a new link road is proposed between St Albans Road and Furlong Road, connecting onto St Albans Rd South of Furlong, halfway between the M80 and Furlong Rd. The New Link Road seeks to reduce the reliance on the Furlong Road / St Albans Road intersection as well as providing a more direct connection to the Hospital from the south. The new link road will also provide increased access to the land between the utility easement and the freeway and facilitate redevelopment within the precinct.

3.2   Future Land Uses

SGSEP's Sunshine Health Wellbeing and Education Precinct Final Report anticipates that by 2051, the SHWEP could support 6,283 jobs under a 'business as usual' scenario and up to 7,239 jobs under the 'middle growth' scenario.

The indicative structure plan for the SHWEP, shown in Figure 3.1, anticipates the 2051 middle growth scenario. The detailed floorspace scenarios for 2051 are summarised in Table 3.1 below.

Table 3.1:   2051 Floorspace Scenarios (Metres Square)

Scenario Year	2051		
Type of Land Use	Business As Usual	Middle	Higher
Commercial-industrial	23,778	18,156	26,798
Health	178,457	197,207	228,840
Mixed Use - Commercial / Retail	16,423	31,988	53,820
Mixed Use - Dwellings	96,000	196,000	231,000

Source: SGS Economics and Planning, July 2017

3.3   Access

As part of the development of the SHWEP, a series of changes are proposed to the road network, including the following:

- The formalisation of Furlong Road as a two-lane carriageway between the Public Hospital access and the Furlong Road / St Albans Road Intersection
- A New Link Road connecting Furlong Road to St Albans Road south
- Signalisation of the Furlong Road / Majorca Street intersection
- Relocation of the existing signalised Public Hospital access point on Furlong Road to form a new four leg signalised intersection with Furlong Road and the New Link Road
- A signalised T-Intersection with St Albans Road and the New Link Road
- The closure of other intersections on Furlong Road between St Albans Road and the Western Ring Road, except Gillon Court Some local left in, left out may remain, subject to further work.

The aim of the road network proposals are to improve the efficiency of the corridor for both through traffic and traffic accessing the precinct.

3.4   Public Transport

The location of the bus lines that are planned to travel through the study area in 2046, and are included in the modelling, are shown in Figure 3.2. The frequency of services are summarised in Table 3.2. Note that these networks are subject to further development by PTV/TfV.

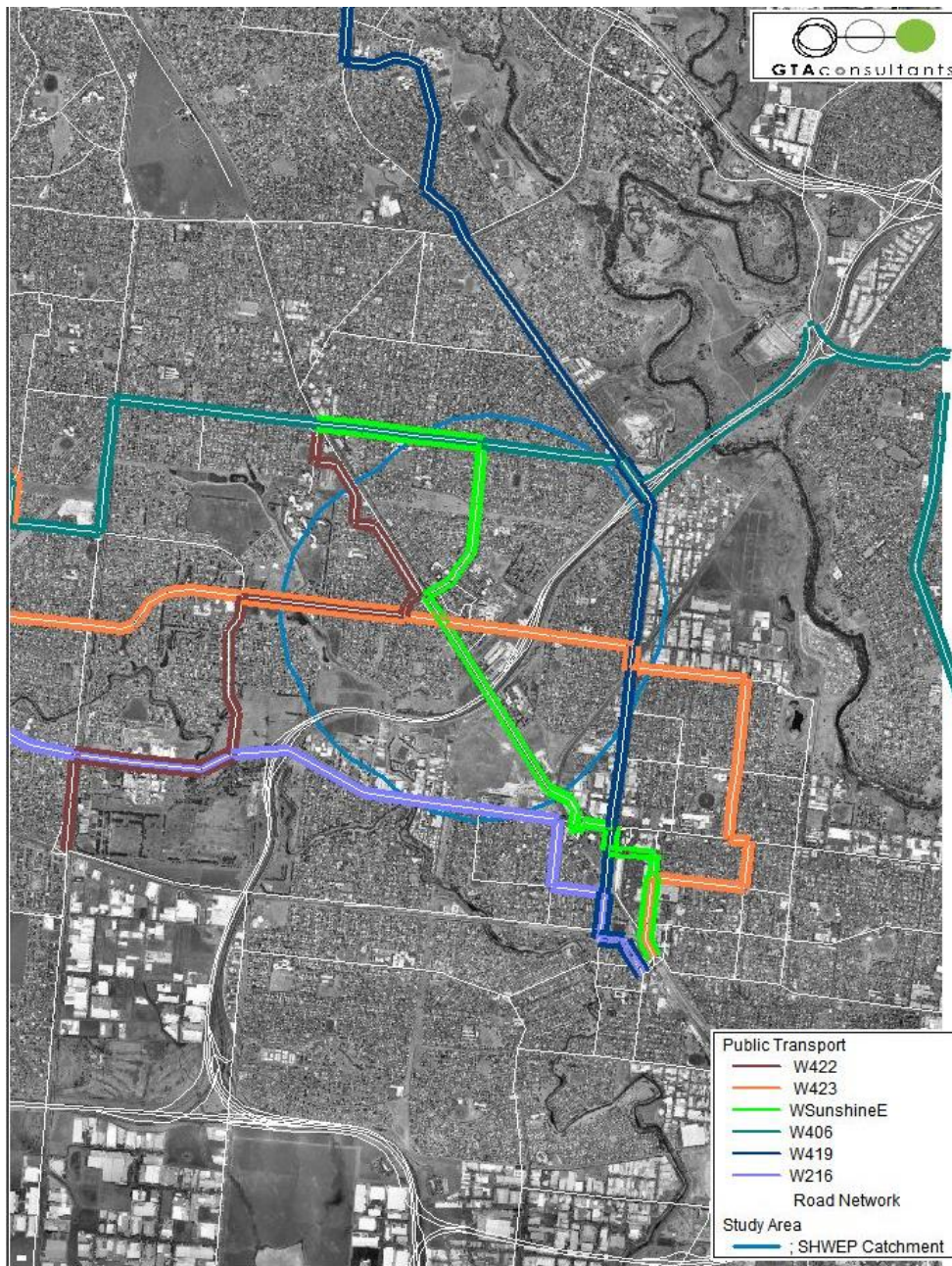**Figure 3.2:   VITM2016V2 Proposed Bus Network 2046**

Table 3.2:   Bus Headway – VITM2016v2 2046

Bus Route ID	Bus Route Name	Headway (min)			
		AM (07:00-09:00)	IP (09:00-15:00)	PM (15:00-18:00)	OP (18:00-24:00)
W422	St Albans - Deer Park	20	40	20	40
W216	Sunshine - Caroline Springs	20	20	20	20
W419	Sunshine - Watergardens	10	10	10	20
W406	Highpoint SC - Caroline Springs	10	20	10	20
WSunshineE	St Albans - Sunshine via Albion	20	20	20	40
W423	Brimbank SC - Sunshine	20	20	20	40

The bus headways show that generally bus services will run every 10 to 20 minutes during peak periods. The headway for trains within the model at 2046 is shown in Table 3.3.

Table 3.3:   Rail Line's Headway at Ginifer Station – VITM2016v2 2046

Rail Line	Headway (min)			
	AM (07:00-09:00)	IP (09:00-15:00)	PM (15:00-18:00)	OP (18:00-24:00)
Sydenham – Pakenham	20		60	
Pakenham – Sydenham	60		20	
Sunbury – Pakenham	10	20	10	20
Pakenham – Sunbury	10	20	10	20
Sydenham – Clyde	20		20	
Clyde – Sydenham	20		20	

In 2046, there will be three metropolitan train service patterns proposed which will travel through Ginifer Station, representing the equivalent of one train every five minutes during peak periods.

Overall, SHWEP is considered to have fair coverage and convenient access to the public transport network.

3.4.1   Review of Updated Public Transport Lines

A revised 2046 bus network provided by PTV was provided on the 5th of October 2017. It was reviewed to determine its appropriateness for inclusion as part of this modelling. The updated bus network showed little differences between the bus routes that travel through the SHWEP catchment and Ginifer Railway Station.

The networks showed a similar coverage, and access to SHWEP as the networks currently within the existing model. Both networks included multiple routes to Sunshine railway station and connections to St Albans and Deer Park railway stations.

In terms of frequency of routes, it is noted that the new networks included one more bus route, and, one less high frequency route. The revised network provides a similar level of service to the study area; however, it does provide an improved east-west frequency on parts of Furlong Road.

Based on the minor differences between the two networks, it is considered that the model will not provide a significant shift in the demands on the road network, including the New Link Road. Further, the sites close proximity to the railway station and the freeway access does result in the bus network being less critical than other parts of Melbourne in how people access the site from a modelling perspective. This is not to suggest that public transport improvements wouldn't be welcomed (as this would align well with state and local government policy). However, from a strategic modelling perspective, on the scenarios tested, it would not show much benefit.

4. Transport Modelling

4.1 Model Establishment

VITM is a tool developed by the Department of Economic Development, Jobs, Transport and Resources (DEDJTR) to assist in the planning of road and public transport infrastructure in Victoria. It is a multimodal strategic model that uses future population, employment and land use projections to forecast travel behaviour and the impacts of changes to the road and public transport networks.

A number of model versions were considered for this assessment in order to support an informed decision on the suitability of the model version for the purposes of the SHWEP project. After a detailed review of the recent versions of the model, including the modelling used as part of the St Albans Road extension in Sunshine, VITM version 2016_160317_V1_2 (herein referred to as the VITM2016V2, also known as the VITM Reference Case) was considered to best represent the network in the year 2046. This was due to its finer zoning system which contains more up-to-date road and public transport network data in the study area.

GTA refined the VITM 2016V2 model for SHWEP for the purposes of testing three scenarios (base case, project case and scenario case) in 2046. The refinements to VITM included the following changes:

o Disaggregation of the zone system within the study area,
o Updates to the future modelled land use yields to reflect the level of growth predicted by SGSEP report, and
o Updates to the road network within the study area.
o Refinement of the zone centroid connection locations for the precinct.

4.2 Scenarios

The purpose of the project was to provide a strategic model of the SHWEP which could be used to understand the transport needs of the VPA and other stakeholders for the related projects. A total of three scenarios in 2046 have been tested and are summarised in Table 4.1 as they relate to the road network and land use inputs.

Table 4.1:   Summary of Road Network and Land Use Inclusions for each Scenario

Design Year 2046	Model Inputs	Scenario		
		Base Case	Project Case	Scenario Case
Road Network	With Connector between Furlong Rd and St Albans Rd in Network		✓	✓
	Without Connector between Furlong Rd and St Albans Rd in Network	✓		
Land Use Assumption for SHWEP	SGSEP Assumption: Business as usual	✓	✓	
	SGSEP Assumption: Middle			✓
	SGSEP Assumption: High	-	-	-

Specific details of each of the road network and land use assumptions for the Base Case, Project Case and Scenario Case are provided in the following sections.

4.3 Base Case

4.3.1 Base Case Network Refinements

GTA refined a copy of VITM2016V2 and has used it in this ITA. The extent of the GTA network refinements are shown in Figure 4.1 to Figure 4.4.
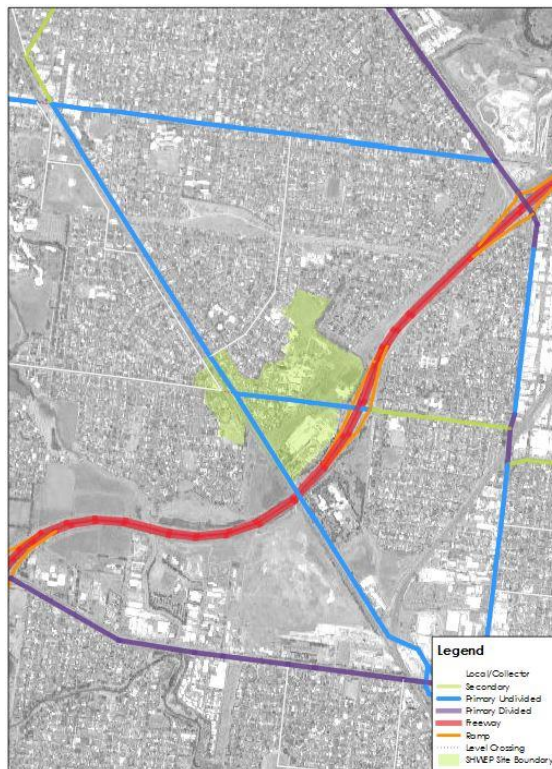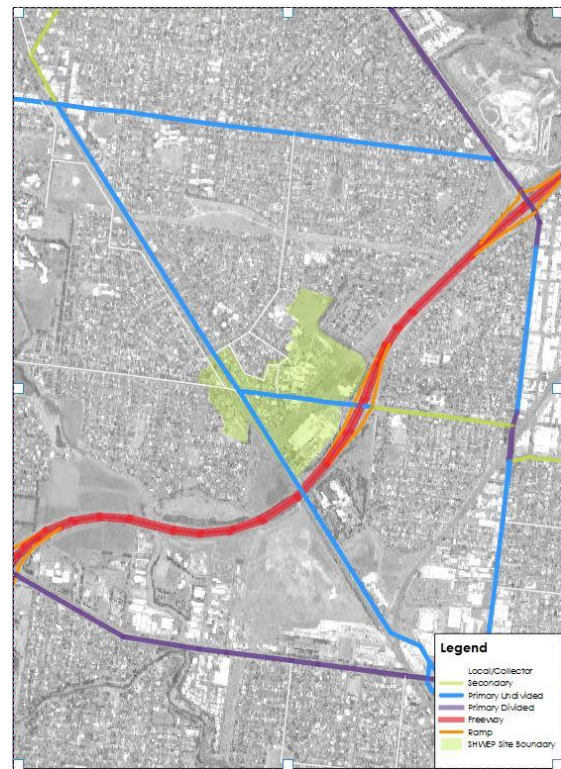
Figure 4.1: VITM2016V2 - Link Class

Figure 4.2: Base Case - Link Class

A few local collectors were added in model in order to reflect the precincts existing access. These are representative of the local road network around the precinct, and are not designed to be taken isolation as other modelling packages are better placed to assess a local road network performance.

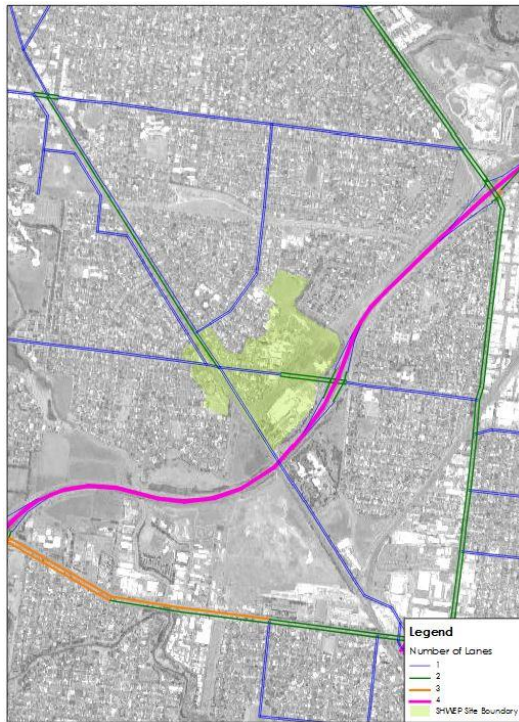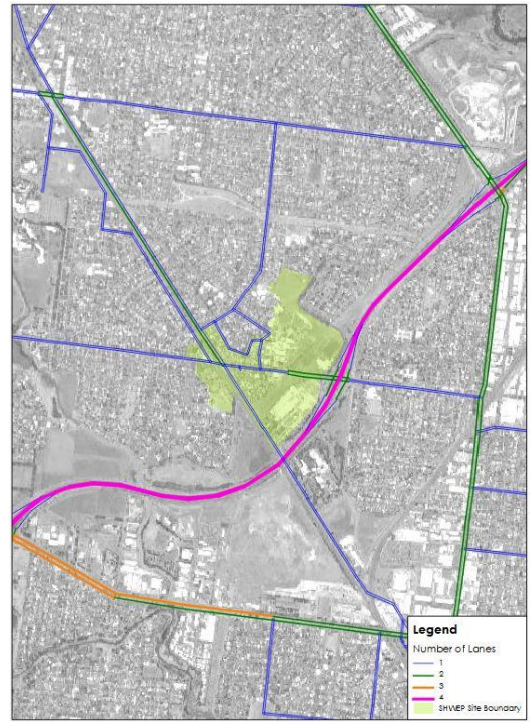**Figure 4.3: VITM2016V2 - Number of Lanes**   **Figure 4.4:   Base Case - Number of Lanes**

The GTA refinements were made to enhance how the VITM2016V2 reflected the likely access arrangements for the SHWEP. It is highlighted that the GTA refinements did not result in any noteworthy changes to the 2046 VITM network beyond the bounds of the study area.

Plots of the road network characteristics (i.e. link class, lanes etc.) for both base case and project case are located in Appendix A and Appendix B.

4.3.2   Base Case Land Use Refinements

In addition to the road network refinements, the zone configuration of the precinct was disaggregated for the purpose of more representative land zoning. The zone system was based around the proposed draft urban structure plan's land uses and road network characteristics.

The zone refinements are shown graphically in Figure 4.5 and Figure 4.6.

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Figure 4.5: VITM2016V2 Zone Structure
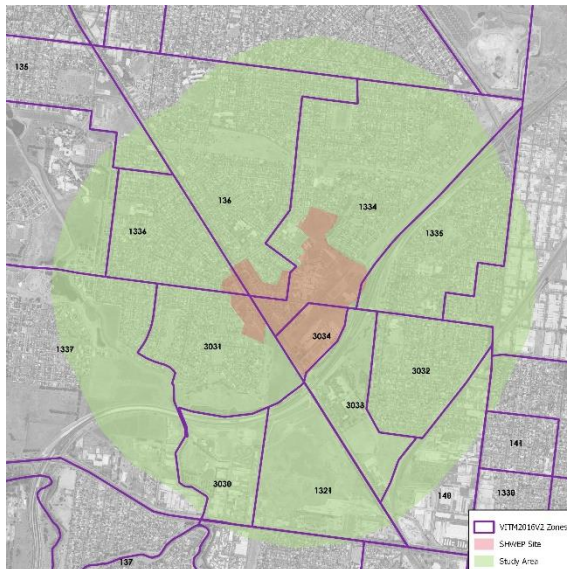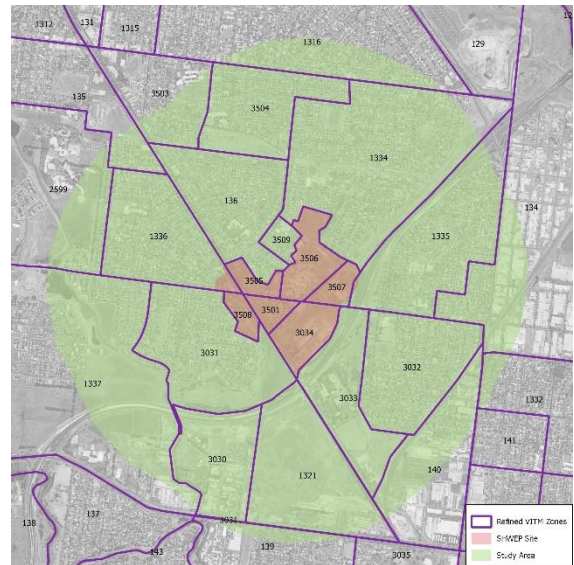

Figure 4.6: Refined SHWEP Zone Structure

The land uses within the VITM Reference Case (VITM2016V2) are provided in Table 4.2.

The refined model replaced the land use inputs within the precinct area, with the SHWEP's SGSEP assumptions summarised in Table 4.3. The enrolment assumptions within the reference cases have not been adjusted as part of these updates.

Table 4.2:   VITM2016V2 Land Use for 2046

VITM Zone	Household (no. of dwellings)	Employment (no. of jobs)
1334	2,342	5,643
136	2,425	2,530
3031	976	373
3034	88	221
1336	909	338
Total	**6741**	**9105**

Table 4.3:   2051 SGSEP land use assumption figures for the precinct area applied to VITM model (2046)

Refined Zone	Business as Usual		Middle		High	
	Household (no. of dwellings)	Employment (no. of jobs)	Household (no. of dwellings)	Employment (no. of jobs)	Household (no. of dwellings)	Employment (no. of jobs)
3501	192	888	448	1,022	528	1,194
3506	-	4,425	-	4,875	-	5,625
3507	-	332	-	383	-	495
3509	92	-	92	-	92	-
3503	322	364	322	364	322	364
3504	929	1,050	929	1,050	929	1,050
3505	192	5	448	72	528	105
3508	48	295	112	325	132	375
1336	957	341	1021	376	1041	566
1334	2,058	-	2,058	-	2,058	-
136	983	1,111	983	1,111	983	1,111
3031	928	1	928	1	928	1
3034	-	335	-	524	-	1,081
Total	**6701**	**9147**	**7341**	**10103**	**7541**	**11967**

Table note: Zone 3501, 3506, 3507, 3505, 3508, 1336 and 3034 relate to the SHWEP Precinct only, whilst the remaining zones relate to existing areas that are not expected to change in between scenarios.

The results show that for the 1.5km study area around SHWEP, the Business As Usual (BAU) result inputs (Table 4.3) are very similar to the VITM Reference Case inputs (Table 4.2) whilst the High Growth scenario equates to approximately 800 extra households and 2,600 extra jobs.

4.4   Project Case

4.4.1   Project Case Network Refinements

Project case's road network was established from base case's one and included a link connecting Furlong Road to St Albans Road, as well as a few site access links that are illustrated in Figure 4.7 and Figure 4.8.

Figure 4.7:   2046 Base Case – Link Class
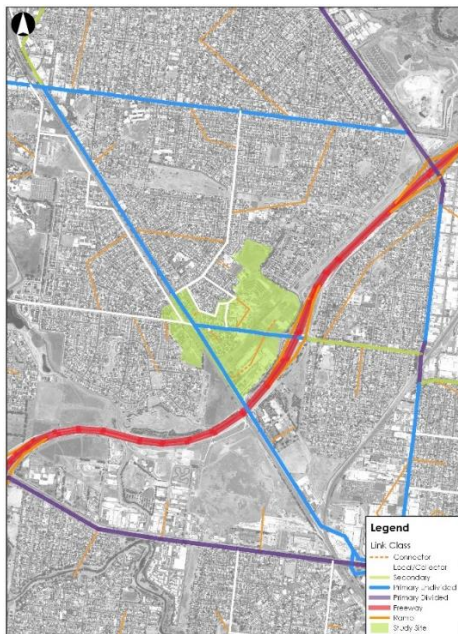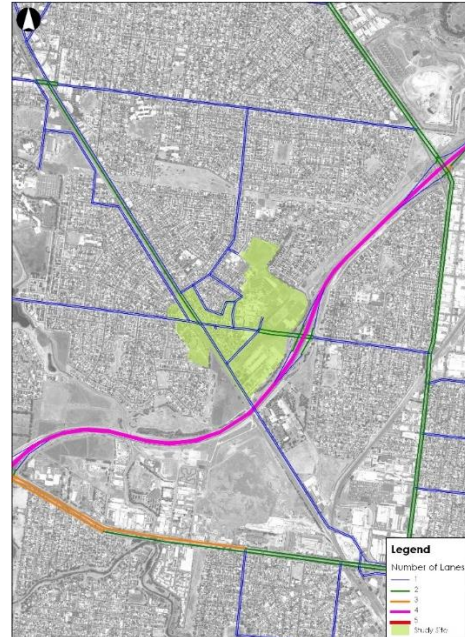

Figure 4.8:   2046 Project Case – Link Class

The number of lanes are shown graphically in Figure 4.9 and Figure 4.10.

Figure 4.9:   2046 Base Case – No. of Lanes   **Figure 4.10: 2046 Project Case – No. of Lanes**

With new access and links built into the network, the relevant zone connectors were adjusted accordingly.

4.4.2   Project Case Land Use Refinements

The Project Case's land use is the same as the base case's land use input as tabulated in Table 4.3.

4.5   Scenario Case

4.5.1   Scenario Case Network Refinements

The Scenario Case was developed to test the broader transport impacts of the "Middle" land use assumption for SHWEP, which included higher land use inputs, compared to the project case. Therefore, the Scenario Case adopted the same road network as the Project Case which is shown in Figure 4.8 to Figure 4.10.

4.5.2   Scenario Case Land Use Refinement

As shown in Table 4.3, the Scenario Case uses the 'middle' land use which includes 640 more households and 956 more jobs within SHWEP and the surrounding area, when compared to the Base Case and Project Case scenarios.

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5. Results

5.1 Introduction

Based on the outcomes of the VITM modelling, this section demonstrates the traffic volumes & level of service of the network for each scenario by time period. The plot of results show the general outlook of the study area, while key locations' results were extracted and summarized into a table for comparison purposes. Figure 5.1 shows the key locations identified for undertaking select link analysis, indicating degree of traffic impact.

Figure 5.1: Identified Key Locations for SHWEP
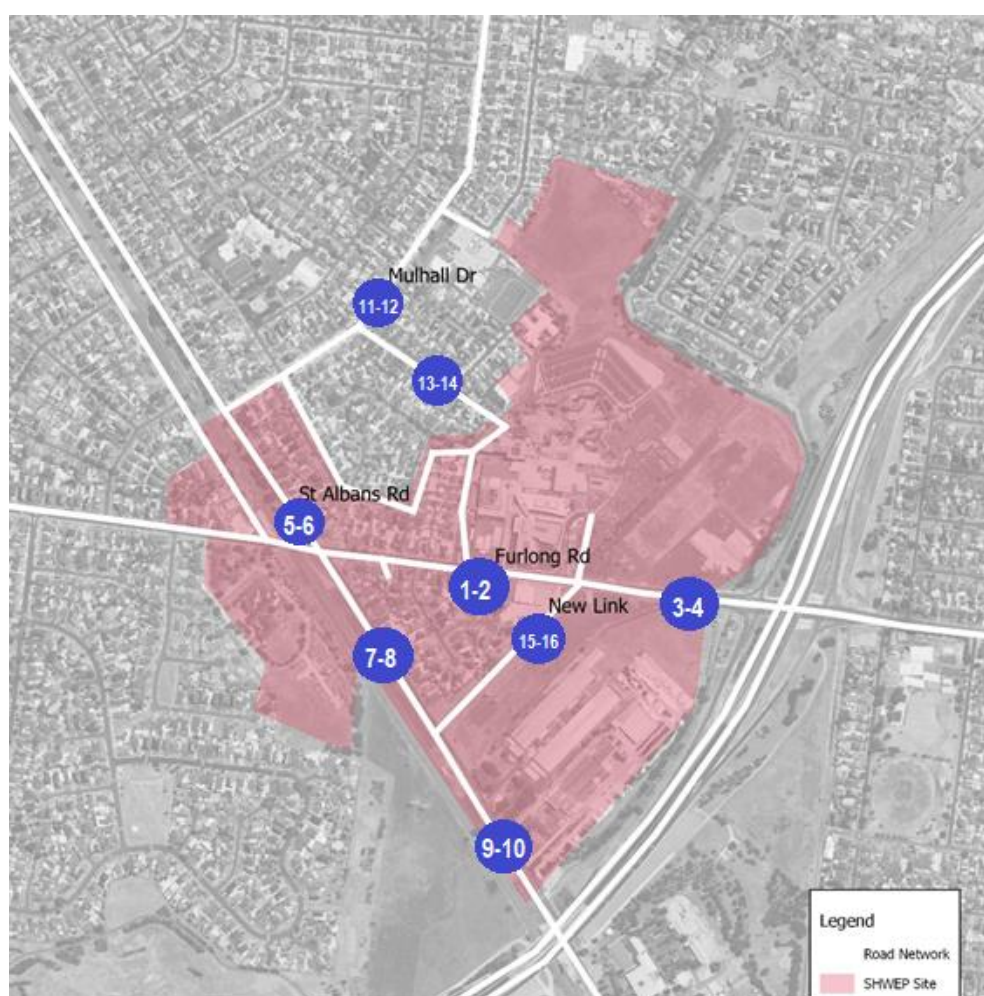
This section will also demonstrate the Volume to Capacity Ratio (VCR), a degree of road saturation, as a result of each modelling test. The VCR is a good indicator as it assesses the operation of the network at the specific link locations. The VCR is also able to be correlated with the Level of Service Definitions as defined in the Austroads document, outlined in Table 5.1

Table 5.1:   Volume to Capacity Ratio Category

VC Ratio	LOS	Definition
0.00 - 0.35	A	Conditions of free flow, speed is controlled by driver's desires, speed limits or physical Roadway conditions
0.35 - 0.5	B	Conditions of stable flow, operating speeds begin to be restricted, little or no restrictions on manoeuvrability from other vehicles
0.50 - 0.75	C	Conditions of stable flow, speeds and manoeuvrability more closely restricted, occasional backups behind left-turning vehicles at intersections
0.75 - 0.90	D	Conditions approach unstable flow, tolerable speeds can be maintained but temporary restrictions may cause extensive delays, little freedom to manoeuvre
0.90 - 1.00	E	Conditions approach capacity, unstable flow with stoppages of momentary duration, manoeuvrability severely limited
> 1.00	F	Forced flow conditions, stoppages for long periods, low operating speeds

This section will also present the results of Select Link Analysis undertaken for identified key locations in order to provide information of traffic movement at certain links.

Finally, public transport percentage figures for Ginifer Railway Station are shown to help understand the impact of the SHWEP development on public transport usage.

5.2   Base Case vs Project Case

Base case and project case have a different road networks, but the same land use inputs. The side by side comparison of two scenarios could indicate the potential impact of proposed link to the network in terms of traffic volume and level of service.
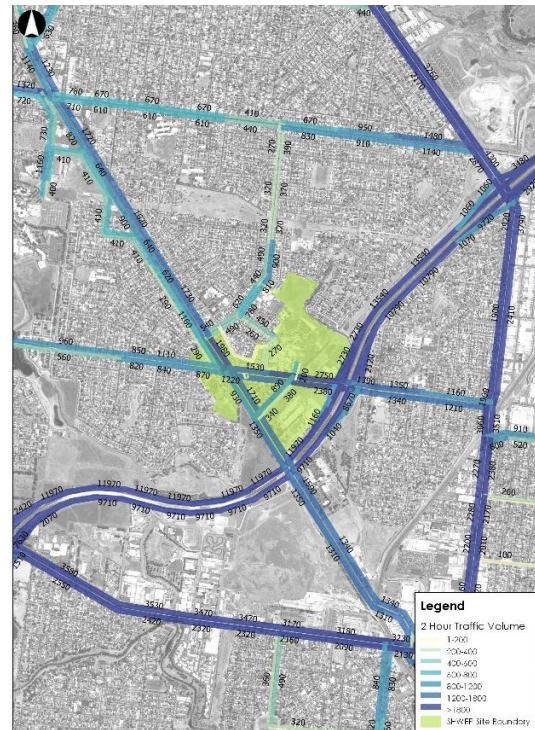
5.2.1   Traffic Volumes

The AM (7am-9am) and PM (4pm-6pm) peak two hour volume plots are provided in Figure 5.2 to Figure 5.5, whilst the Daily volumes are shown in Figure 5.6 and Figure 5.7.

AM Traffic Volume 2046

Figure 5.2: **Base Case AM 2hr Traffic Volume**

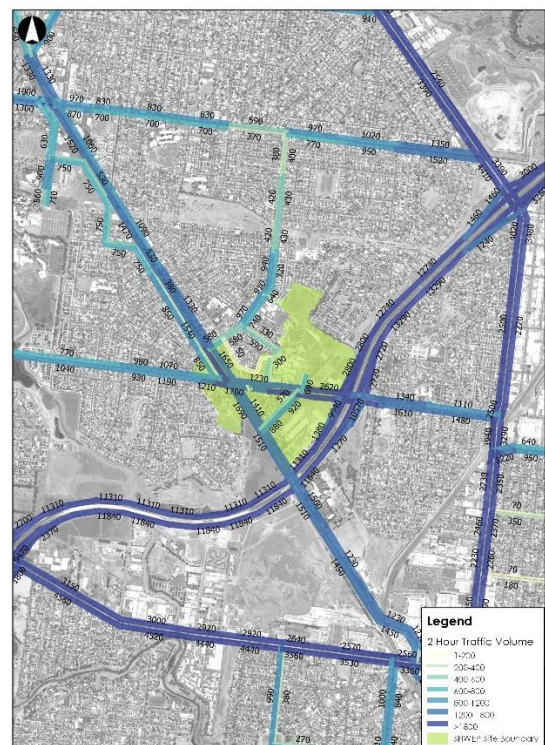**Figure 5.3:** **Project Case AM 2hr Traffic Volume**

PM Traffic Volume 2046

Figure 5.4: **Base Case PM 2hr Traffic Volume**

Figure 5.5: **Project Case PM 2hr Traffic Volume**

Daily Traffic Volume 2046
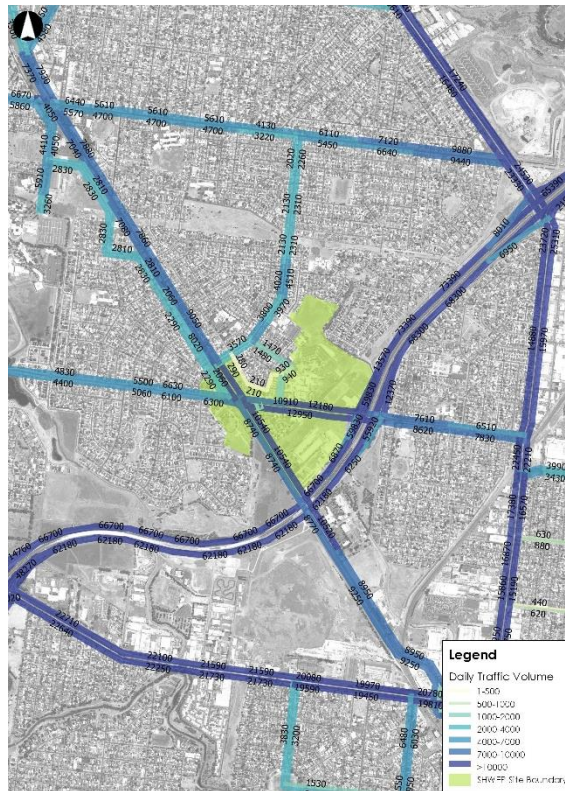
Figure 5.6:   Base Case Daily Traffic Volume   **Figure 5.7:   Project Case Daily Traffic Volume**

2046 Base Case and Project Case's two-way traffic volume by time period on key roads identified in Figure 5.1 are summarised in Table 5.2

Table 5.2:   Summary of Ultimate Traffic Volumes on Key Roads (Base Case vs Project Case) - 2046

Time Period	AM		PM		Daily		Daily Volume Changes
Key Location	Base Case	Project Case	Base Case	Project Case	Base Case	Project Case	
Furlong Road	3240	3280	3640	3600	20250	21620	+7%
St Albans Road	3440	3410	3290	3490	22050	22310	+1%
Mulhall Drive	1400	1400	1740	1710	8700	8760	+1%
New Link Road		1190		1490		6810	

With the same land use inputs, the modelling results does not show any significant improvement brought by proposed new link to Furlong Road.   In addition, the New Link Road is expected to carry the order of 7,000 vehicles per day, indicating that a single lane in each direction should be sufficient (subject to intersection flaring). Whilst the daily change on Furlong Road is larger than the other roads listed, the AM and PM Peak changes on Furlong Road is less than 50 vehicles.

Figure 5.8 is a difference plot that compares the Base Case and Project Case, whereby a green line shows a reduction in daily volume on a particular link and a red line shows an increase in volume of a particular link modelled in the base case. The introduction of the New Link Road is in red as it is not modelled in the base case.

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Figure 5.8:   Base Case/Project Case Daily Traffic Volume Difference 2046

Legend

Daily Traffic Volume Difference

— Daily volume change less than 200
— Decreased Volume (200 - 500)
— Decreased Volume (500 - 1,500)
— Decreased Volume (> 1,500)
— Increased Volume (200 - 500)
— Increased Volume (500 - 1500)
— Increased Volume (> 1,500)
  SHWEP Site Boundary
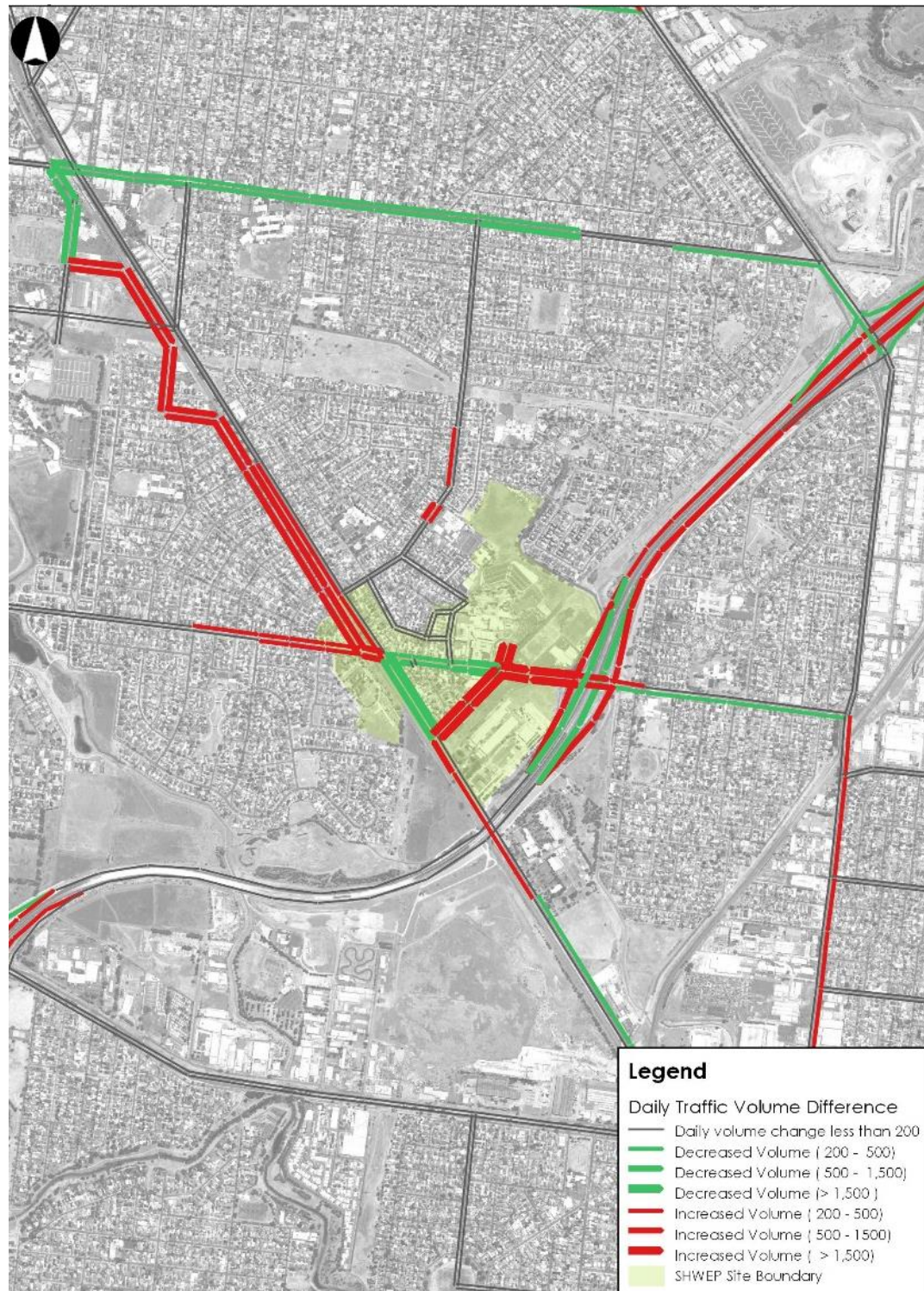
The introduction of the New Link Road will provide an alternative for some motorists wishing to travel to the Western Ring Road. This reduces the traffic through the intersection of Furlong Road and St Albans Road, carrying less traffic.

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5.2.2　Volume to Capacity Ratio (VCR)

The VCR outputs surrounding the SHWEP have been extracted from the model and shown graphically in Figure 5.9 to Figure 5.12. For the key locations shown in Figure 5.1 the VCR's are summarised in Table 5.3 below.

AM Peak 2046

Figure 5.9:　Base Case AM VC Ratio

Figure 5.10: Project Case AM VC Ratio

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PM Peak 2046

Figure 5.11: Base Case PM VC Ratio

Figure 5.12: Project Case PM VC Ratio
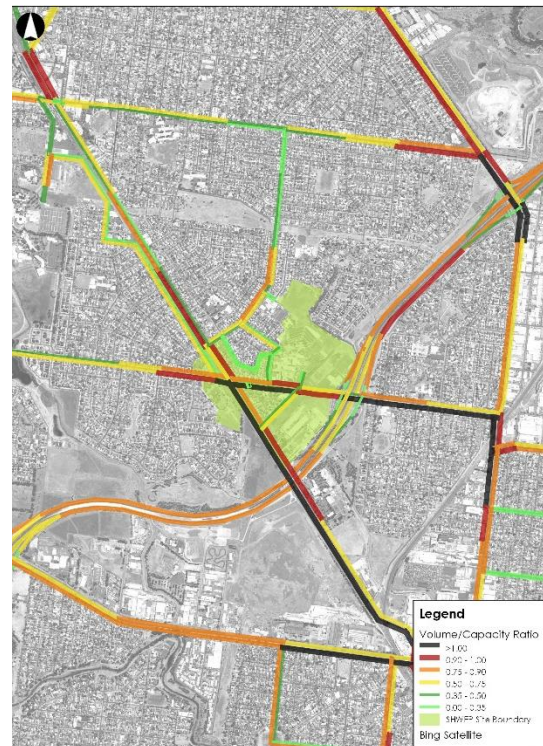
Summary of VCR

Key locations' level of service is summarised in Table 5.3.

Table 5.3:   Summary of Level of Service at Key Locations (Base Case vs Project Case) - 2046

Key Location			AM		PM	
Site	Road Name	Direction	Base Case	Project Case	Base Case	Project Case
1	Furlong Rd (in front of Hospital)	East Bound	F	F	F	E
2		West Bound	E	F	F	F
3	Furlong Rd (bt M80 & Hospital)	East Bound	C	D	C	C
4		West Bound	C	D	C	E
5	St Albans Rd (bt Furlong Rd & Mulhall Dr)	North Bound	E	F	C	C
6		South Bound	C	C	E	E
7	St Albans Rd (bt Furlong Rd & new link)	North Bound	C	C	F	F
8		South Bound	F	F	E	D
9	St Albans Rd (bt new link & M80)	North Bound	C	D	F	F
10		South Bound	F	F	E	E
11	Mulhall Dr	North Bound	B	B	E	D
12		South Bound	C	C	C	C
13	Camara Street	East Bound	B	B	A	A
14		West Bound	A	A	C	C
15	New Link	North Bound	n/a	C	n/a	B
16		South Bound	n/a	B	n/a	C

As part of a growing Melbourne, an intensification of land use within the existing suburbs is occurring. Most arterial roads and freeways will experience congestion in the peak periods. With limited ability to expand road capacity, most trips are likely to encounter delays in the peaks and these will be greater than what is currently experienced.

In that context the model results show that the network within the study area will experience high levels of congestion at full development (as shown by the red and brown colours in the figures and tables), especially at Furlong Road and St Albans Road. The new project link will provide minor relief, and some of the traffic will use other routes to travel around the area that will result in a modest reduction in the overall congestion within the study area. However, given that this is an activity centre, there will always be a substantial number of people wanting to travel to the precinct, and providing a range of travel choices will be important.

While the local roads coded into the model are meant to be representative of the road network in the precinct, they are not heavily utilised or altered in their use by the addition of the new link road.

5.2.3   Select Link Analysis

In order to gain a better understanding on the likely usage of the key links in the network (Figure 5.1), select link analysis have been carried out for each scenario. The select link analysis provides the origin and destinations for vehicles using each crossing. The results of the Select Link Analysis are shown in Figure 5.13 to Figure 5.18.

Figure 5.13: SLA Base Case AM Furlong Road

Figure 5.14: SLA Project Case AM Furlong Road
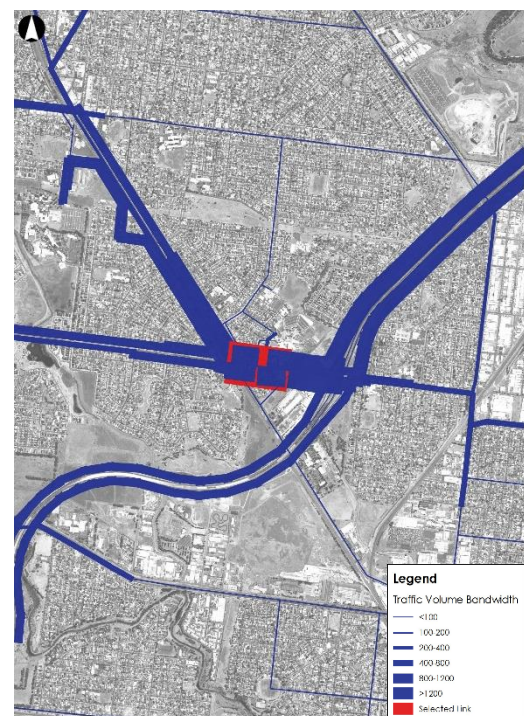
The Base Case results show that traffic through Furlong Road in front of Sunshine Public Hospital is predominantly through traffic seeking access to and from the Western Ring Road.

Figure 5.15: SLA Base Case AM St Albans Road
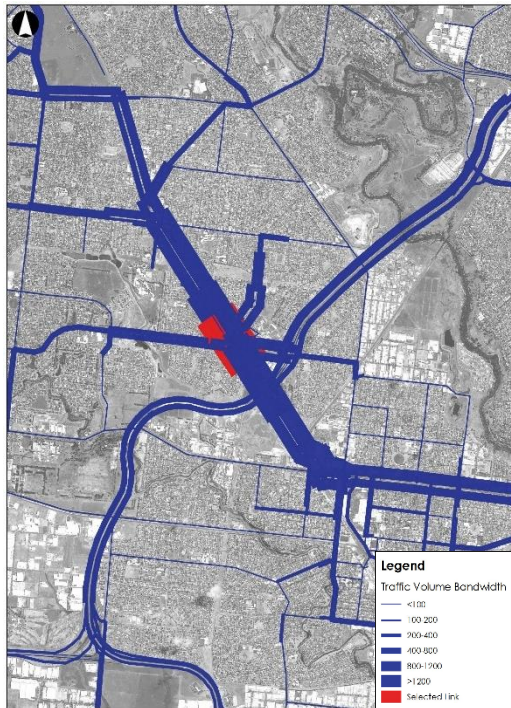
Figure 5.16: SLA Project Case AM St Albans Road
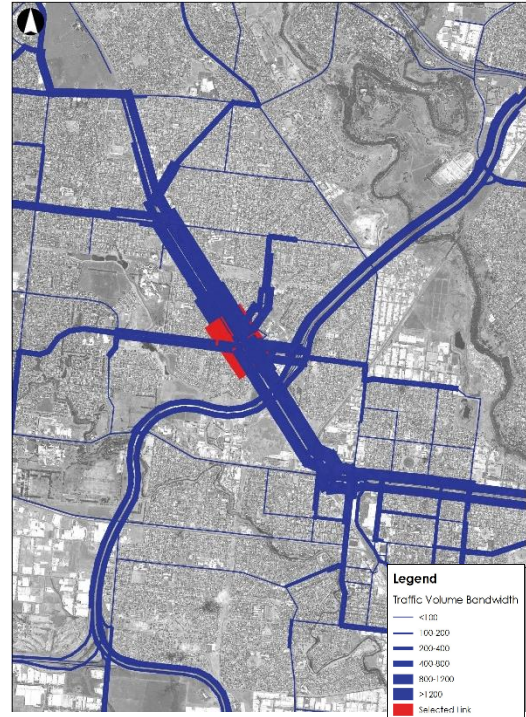
Figure 5.17: SLA Base Case AM Mulhall Dr
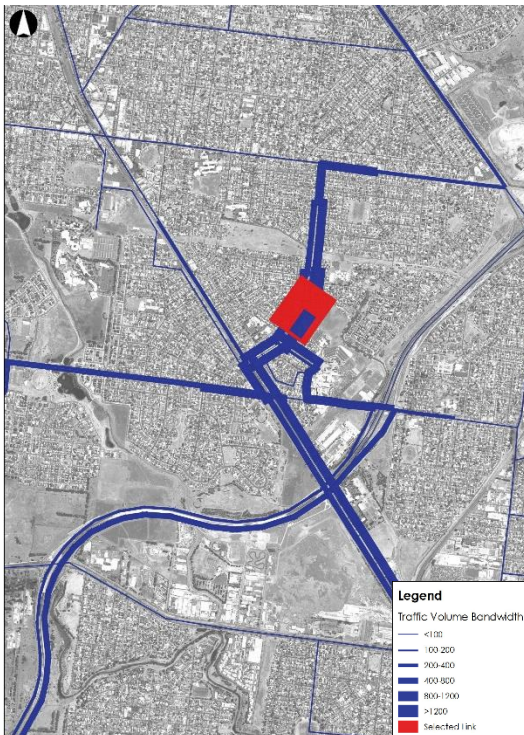
Figure 5.18: SLA Project Case AM Mulhall Dr
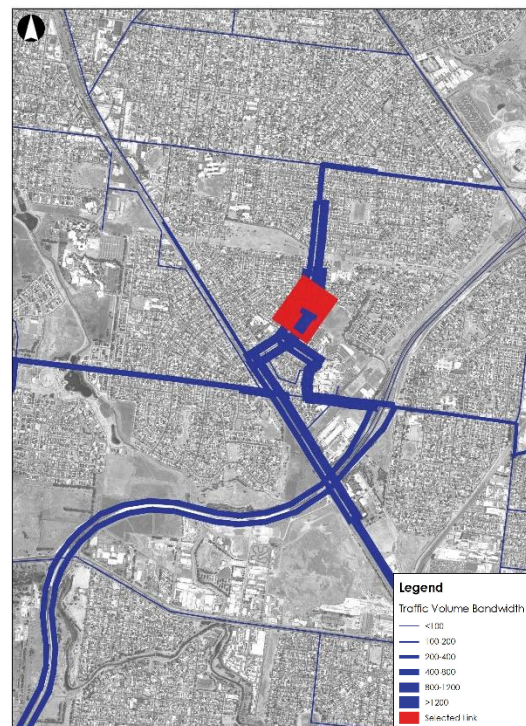
5.2.4 Public Transport

The number of passengers boarding and alighting at Ginifer Railway Station is summarized in Table 5.4 and Table 5.5

Table 5.4: Ginifer station Base Case Daily Patronage

Train Line	Daily Boarding	Daily Alighting
Sydenham – Pakenham	690	40
Pakenham – Sydenham	30	640
Sunbury – Pakenham	4460	430
Pakenham – Sunbury	480	3880
Sydenham – Clyde	850	70
Clyde – Sydenham	60	750
Total	6570	5810

Table 5.5: Ginifer station Project Case Daily Patronage

Train Line	Daily Boarding	Daily Alighting
Sydenham – Pakenham	700	40
Pakenham – Sydenham	30	670
Sunbury – Pakenham	4470	460
Pakenham – Sunbury	480	3930
Sydenham – Clyde	850	80
Clyde – Sydenham	60	780
Total	6590	5960

The results show that there is no significant mode shift from public transport to car between the Base Case and Project Case.

5.3 Project Case Vs Scenario Case

The Project Case and Scenario Case have same transport network. However, the land use for the Scenario Case has adopted the SGSEP 'Middle Case' land use assumption, as detailed in Table 4.3.

5.3.1 Traffic Volumes

The AM (7am-9am) and PM (4pm-6pm) peak two hour volume plots are provided in Figure 5.19 and Figure 5.20, whilst the Daily volumes are shown in Figure 5.23 and Figure 5.24.

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AM Traffic Volume 2046

Figure 5.19: Project Case AM 2hr Traffic Volume

Figure 5.20: Scenario 1 AM 2hr Traffic Volume
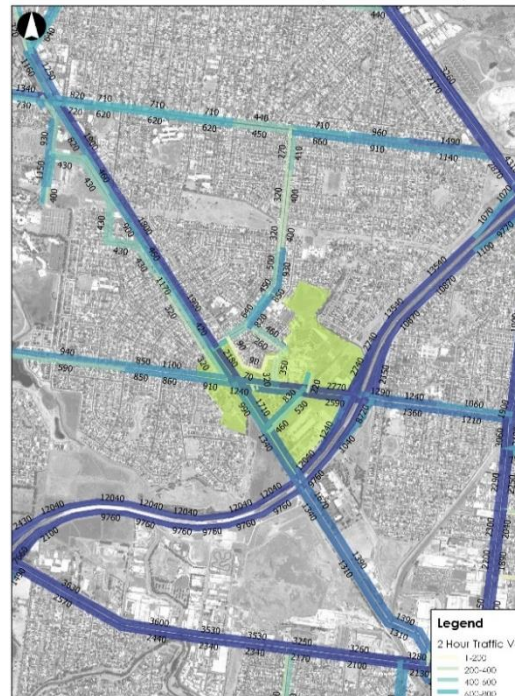
PM Traffic Volume 2046

Figure 5.21: Project Case PM 2hr Traffic Volume

Figure 5.22: Scenario 1 PM 2hr Traffic Volume
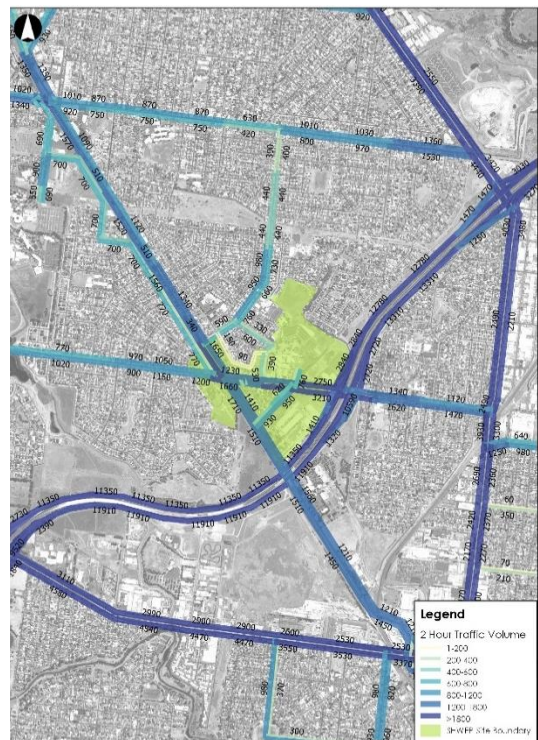
Daily Traffic Volume 2046

Figure 5.23: Project Case Daily Traffic Volume   **Figure 5.24: Scenario Case Daily Traffic Volume**
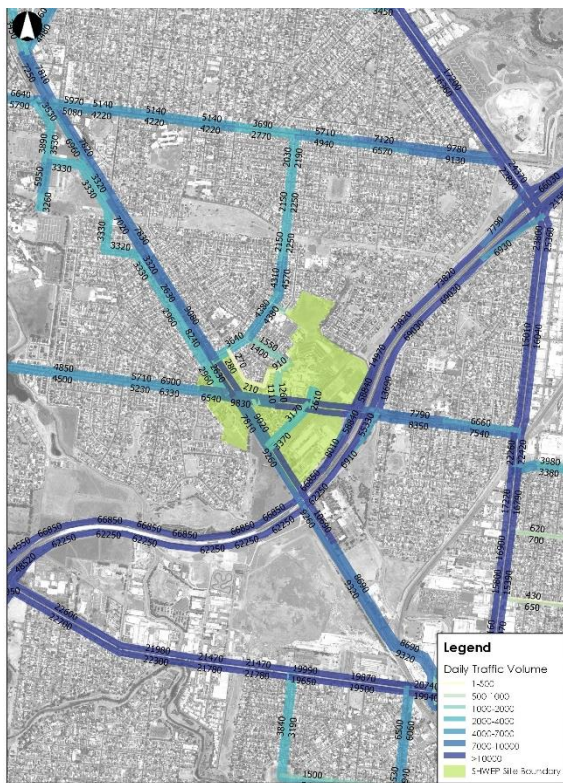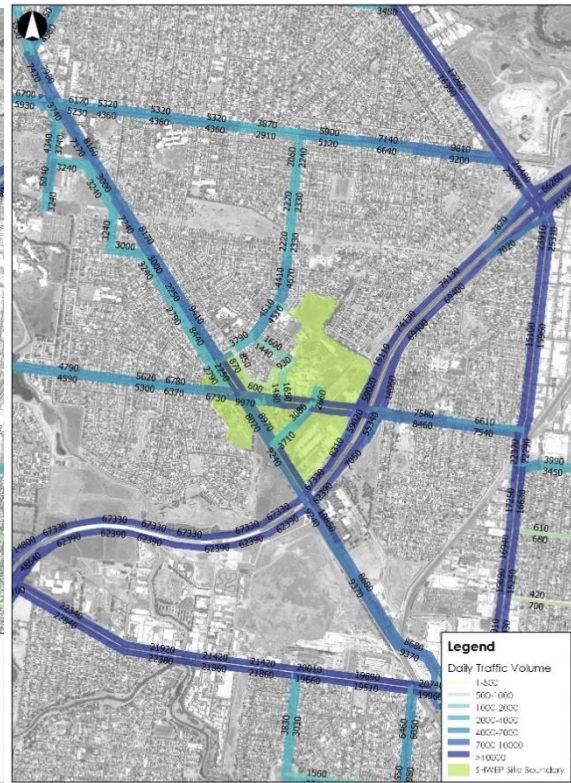
Summary of Traffic Volume

The Scenario Case and Project Case's two-way traffic volume by time period on key roads identified in Figure 5.1 are summarised in Table 5.6.

Table 5.6:   Summary of Ultimate Traffic Volumes on Key Roads (Scenario Case vs Project Case)

Time Period	AM		PM		Daily		Daily Volume Changes
Key Location	Project	Scenario	Project	Scenario	Project	Scenario	
Furlong Road	3280	3380	3600	3640	21620	22360	+3%
St Albans Road	3410	3600	3490	3520	22310	22810	+2%
Mulhall Drive	1400	1460	1710	1780	8760	9020	+3%
New Link Road	1190	1360	1490	1570	6810	7100	+4%

With the higher land use inputs exhibited in the 'Middle Case' forecast, the modelling results show general increases in traffic of around 3%; a relatively low level of growth. From a daily perspective, the increases are not sufficient enough to warrant changes to the number of lanes at any of the four key locations.

Figure 5.25 is a difference plot that compares the Project Case and Scenario Case, whereby a green line shows a reduction in daily volume on a particular link and a red line shows an increase in volume in a particular link with the additional land uses in the 'Middle Case' land use scenario. It is noted that the decrease on the road parallel to the railway line is southbound on Willaton St.

Figure 5.25: Project Case/Scenario 1 Daily Traffic Volume Difference

Legend

Daily Traffic Volume Difference

— Daily volume change less than 200
— Decreased Volume (200 - 500)
— Decreased Volume (500 - 1,500)
— Decreased Volume (> 1,500)
— Increased Volume (200 - 500)
— Increased Volume (500 - 1500)
— Increased Volume (> 1,500)
  SHWEP Site Boundary
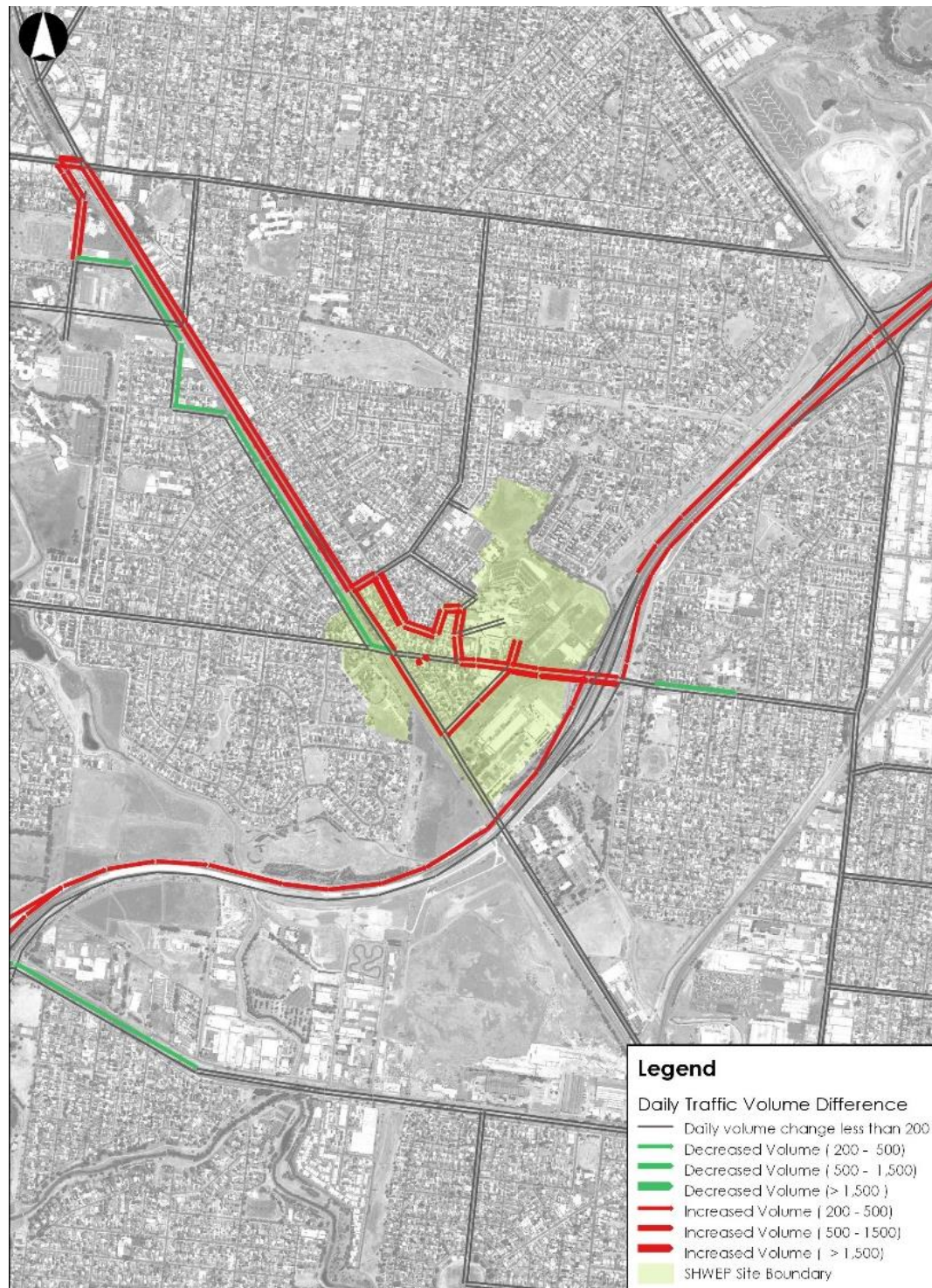
The additional land use in the Scenario Case provided show that the land uses will generate additional volumes in and around Furlong Road and St Albans Road. Some marginal increases in traffic is observed on the Western Ring Road. However, these are not considered to be substantial from a daily perspective.

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5.3.2 Volume to Capacity Ratio (VCR)

The VCR outputs surrounding the SHWEP have been extracted from the model and shown graphically in Figure 5.26 to Figure 5.29. For the key locations shown in Figure 5.1 the VCR's are summarised in Table 5.7.

AM Peak 2046

Figure 5.26: Scenario 1 AM VC

Figure 5.27: Project Case AM VC

PM Peak 2046

Figure 5.28: Scenario 1 PM VC

Figure 5.29: Project Case PM VC

Summary of VCR

Key locations' level of service is summarized in Table 5.7 below

Table 5.7:   Summary of Level of Service at Key Locations (Scenario 1 vs Project Case)

Key Location			AM		PM	
Site	Road Name	Direction	Project Case	Scenario 1	Project Case	Scenario 1
1	Furlong Rd (in front of Hospital)	East Bound	F	F	E	E
2		West Bound	F	E	F	F
3	Furlong Rd (bt M80 & Hospital)	East Bound	D	D	C	D
4		West Bound	D	D	E	E
5	St Albans Rd (bt Furlong Rd & Mulhall Dr)	North Bound	F	F	C	C
6		South Bound	C	C	E	E
7	St Albans Rd (bt Furlong Rd & new link)	North Bound	C	C	F	F
8		South Bound	F	F	D	D
9	St Albans Rd (bt new link & M80)	North Bound	D	D	F	F
10		South Bound	F	F	E	E
11	Mulhall Dr	North Bound	B	B	D	E
12		South Bound	C	C	C	D
13	Camara Street	East Bound	B	B	A	A
14		West Bound	A	A	C	C
15	New Link	North Bound	C	C	B	B
16		South Bound	B	C	C	C

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As noted earlier, a growing Melbourne will cause many roads to be congested by 2046, with slower speeds experienced for road users. In that context, the further development of the precinct with additional residents and jobs does not result in a significant shift in congestion in the study area[1]. While the local roads coded into the model are meant to be representative of the road network in the precinct, they are not heavily utilised[2] or altered in their use by the addition of new residents and jobs.

5.3.3   Select Link Analysis

In order to gain a better understanding on the likely usage of the key links in the network (Figure 5.1), select link analyses have been carried out for each scenario. The select link analysis provides the origin and destinations for vehicles using each point. The results of the Select Link Analysis is shown in Figure 5.30 to Figure 5.37.

Figure 5.30: SLA Project Case AM Furlong Road

Figure 5.31: SLA Scenario 1 AM Furlong Road

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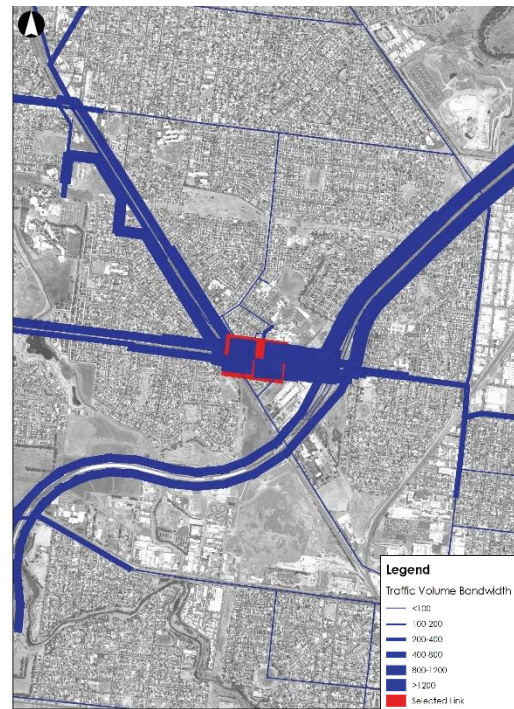
[1] With congestion defined as level of service E & F; the red and brown colours in the figures and tables
[2] As indicated by the yellow and green in the table and figures

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The traffic through Furlong Road in front of Sunshine hospital is mainly from the north of the site, through the M80 in both project case and scenario case.

Figure 5.32: SLA Project Case AM St Albans Road
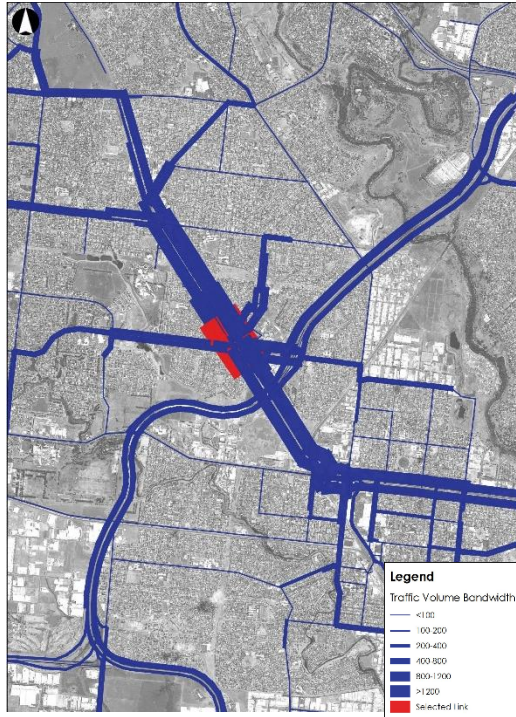
Figure 5.33: SLA Scenario 1 AM St Albans Road
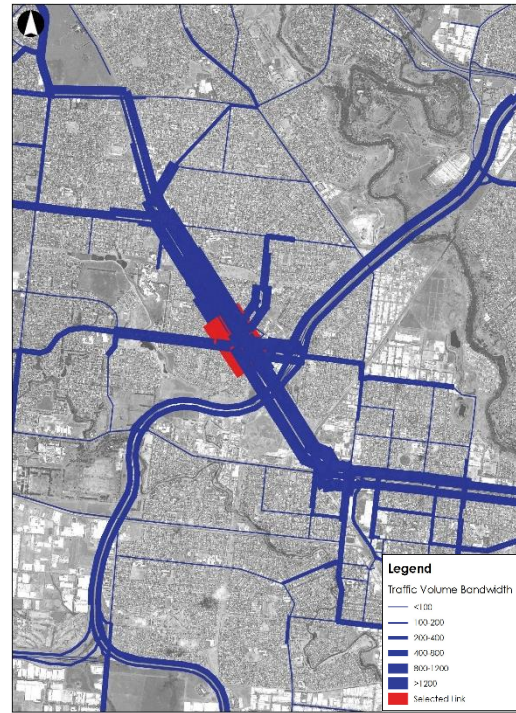
Figure 5.34: SLA Project Case AM Mulhall Dr
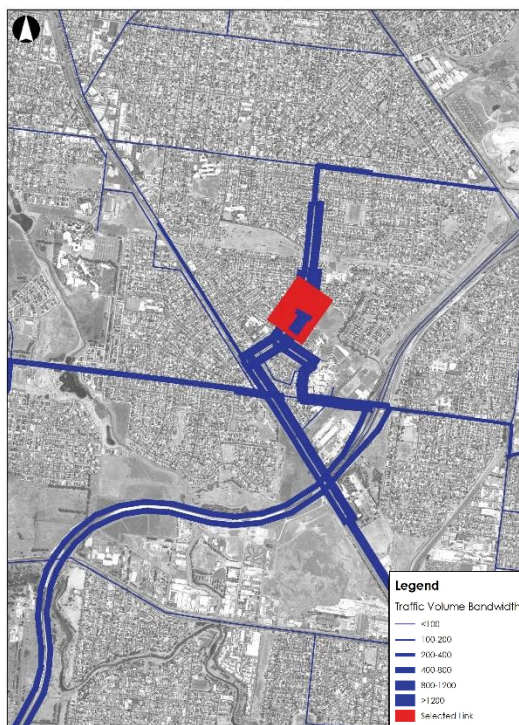
Figure 5.35: SLA Scenario 1 AM Mulhall Dr
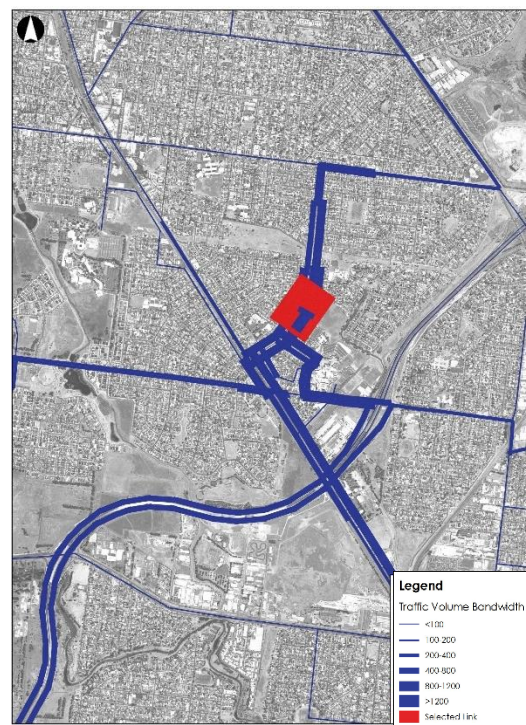
Figure 5.36: SLA Project Case AM Mulhall Dr
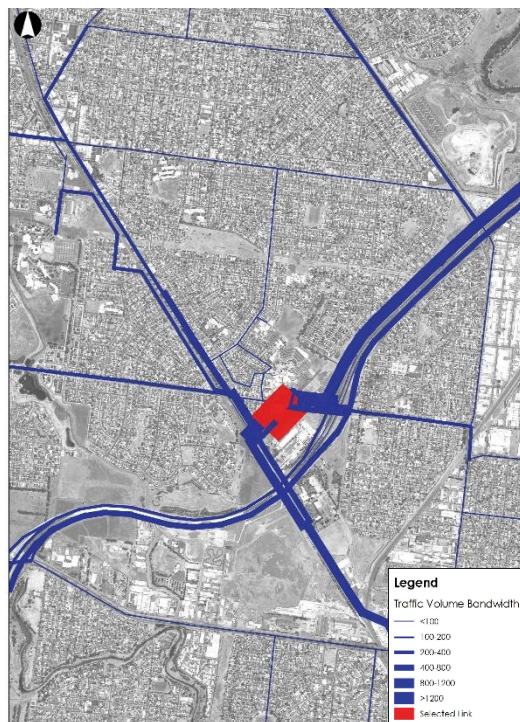
Figure 5.37: SLA Scenario 1 AM Mulhall Dr
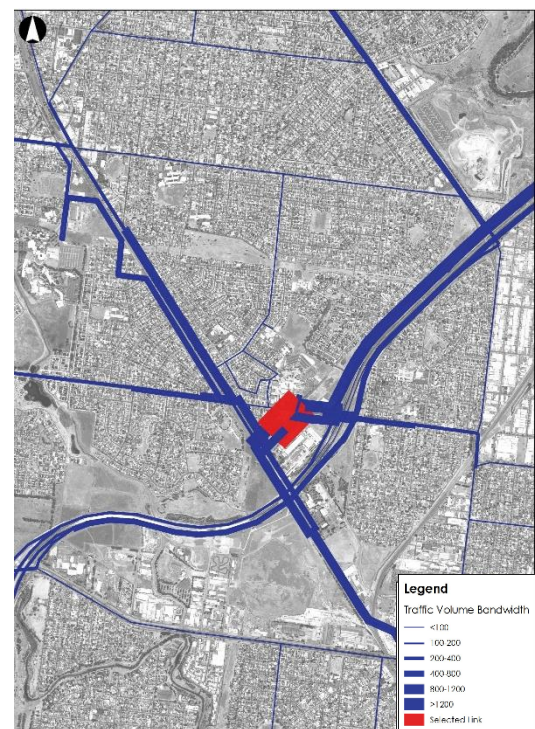
5.3.4   Public Transport

The number of passengers boarding and alighting at Ginifer Railway Station for the Project Case and Scenario Case is summarized in Table 5.8 and Table 5.9.

Table 5.8:   Ginifer Station Project Case Daily patronage

Train Services	Daily Boarding	Daily Alighting
Sydenham – Pakenham	700	40
Pakenham – Sydenham	30	670
Sunbury – Pakenham	4,470	460
Pakenham – Sunbury	480	3,930
Sydenham – Clyde	850	80
Clyde – Sydenham	60	780
Total	**6,590**	**5,960**

Table 5.9:   Ginifer Station Scenario Case Daily patronage

Train Services	Daily Boarding	Daily Alighting
Sydenham – Pakenham	730	40
Pakenham – Sydenham	40	720
Sunbury – Pakenham	4,790	500
Pakenham – Sunbury	520	4,210
Sydenham – Clyde	900	90
Clyde – Sydenham	70	830
Total	**7,050**	**6,390**

The Scenario Case, with roughly 1,000 more jobs and 600 more households is estimated to result in an increase in public transport use in the area within the magnitude of 400 additional boarding and alighting passengers expected over a typical weekday at Ginifer Railway Station.

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5.4 Model Plots

In addition to the information presented in this section, a range of outputs have been extracted from the model. The intention of these is to assist in the understanding of travel demand for developments in future year. These are located within Appendix A to Appendix C for the Base Case, Project Case and Scenario Case, and include the following plots:

i   Road Network: link class and number of lanes
ii   Two Hour traffic volume for AM and PM peak by direction
iii   Daily volume by direction
iv   Volume difference between scenarios
v   Traffic volume to capacity ratio for the AM and PM peak
vi   Select Link Analysis Plots for four identified key locations, for the AM and daily periods

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6. Discussion

To bring together the commentary across the items presented in this report, this section discusses some of the outcomes from the analysis as they relate to the Development Yield, the New Link Road, and Public Transport Initiatives.

Relativity of Model Outputs

The results presented in this report are based on the VITM and are reliant on a number of assumptions underpinning these outputs. These include projections on the demographic make up (development yield) in the wider Melbourne metropolitan area as well as the local study area.

The performance on the network as shown in the VITM model is similar to outputs expected in employment and retail centres across suburban Melbourne as demand for travel increases. Indeed, many of the existing centres are anticipating an uplift of activity with little or no increases to on road capacity.

From a strategic perspective, the outputs from the VITM have identified the locations within the study area with levels of congestion that would warrant further detail and investigation. More specifically, the congestion expected on Furlong Road is able to be investigated and addressed in more detail at a later stage in the delivery of the project.

Development Yield

GTA modelled two different land use scenarios in 2046, based on work by SGS Economics and Planning. These represented a 'business as usual' and 'middle' development yield, with the later having higher population and employment within the precinct. This higher land use generates more person trips to and from the precinct, which adds to the congestion on the transport network. However, as the precinct is focused on employment in the health sector, the transport task for this trip purpose will be spread over the day, unlike other sectors, such as manufacturing. The profile of the trips allows the network to respond to increased intensity should higher yields be required.

Impact of the New Link Road

The road network proposed in and around the SHWEP in 2046 will operate at or above its theoretical capacity, in particular on Furlong Road and St Albans Road, for both peak (AM & PM) periods. It is noted that in 2046 large parts of the arterial road network will also operate around its theoretical capacity.
In terms of the flexibility of the network, it currently is quite rigid with the site located on one arterial road with poor access to other arterial roads. The Furlong / St Albans Road intersection is congested and the ability to increase traffic through this intersection is limited. The introduction of the New Link Road between St Albans Road and Furlong Road, as depicted in the Project Case will provide a more direct access to the Health Precinct. In some cases new road infrastructure can significantly increase usage of connecting roads (for examples roads leading to new freeway on/off ramps). While there is an increase in traffic on nearby roads connecting to the New Link Road, this is not significant, and the model results show:

- Daily two-way volumes on the New Link Road in the order of 6,500 vehicles per day, meaning that one lane in each direction will be sufficient,

- Increases in volumes between the new Link Road and the Western Ring Road, as some additional traffic is attracted to using the New Link Road to connect to the Freeway,
- Less traffic congestion in parts of the network with improved levels of service for sections of Furlong Road between St Albans Road and the Hospital Entrance,
- The connection from the New Link Road to the hospital reduces the amount of traffic travelling through the Furlong Road / St Albans Road Intersection, resulting in less congestion.

Overall the introduction of the New Link Road provides a benefit to the precinct and its form of one lane in each direction is suitable. Further detailed design and analysis is recommended to confirm the final form and the make up of the interfaces with the existing road network and adjacent land uses.

Public Transport initiatives

The Sunshine Health, Wellbeing and Education Precinct (SHWEP) forms part of the Sunshine National Employment and Innovation Cluster (NEIC) and seeks to facilitate urban renewal and encourage its redevelopment into a mixed-use precinct that focuses on health and education uses.

To realise the level of development projected, a connect walking, cycling and public transport network would be required. The scope of this study was not to investigate the performance of the public transport; however, the following commentary is provided around initiatives that could be further investigated as part of more detailed planning:

- The location of the Precinct is close to the recently reconstructed Ginifer railway station. Direct and reliable walk and bus connections to this station and the wider areas will support the Cluster sustainable transport's objectives and also reduce road congestion.
- Consideration should be given to higher bus frequencies, and where possible dedicated lanes to improve the speed and reliability of services. When intersections are redesigned, bus jump lanes should be considered (noting this is a detailed design matter).
- Public transport mode share of motorised trips to and from the precinct in 2046 are in the order of 12%, with the remaining 88% of trips completed by car. This suggests that further planning work is requires, including analysis in the future of where the workers and visitors to the precinct are coming from.

Overall, the mode share for a precinct of this nature is consistent to model forecasts for similar employment precincts in Melbourne. Whilst the model does forecast levels of congestion for the immediate network, any increases in public transport mode share as outlined in this section will result in a benefit to the performance of the on-road network. Any such interventions should be worked through in consultation with the VPA, Council and Transport for Victoria.

7. Summary

The VPA requested GTA Consultants to prepare an Integrated Transport Assessment, using the outputs from a strategic transport model to broadly determine the access and mobility needs of the traffic and transport generated from the anticipated level of development, and to ensure that the transport interventions proposed for the area will be acceptable.

Based on this strategic transport modelling using the Victorian Integrated Transport Model (VITM) it is concluded that:

- Melbourne's population will grow by 2046 and that will increase congestion above the levels experienced today,
- The 'Middle' Development case has a greater intensity of development; however it does not significantly alter the level of congestion in the study area in the 2046,
- The road network proposed in and around the SHWEP in 2046 will operate at or above its theoretical capacity, in particular on Furlong Road and St Albans Road, for both the peak (AM & PM) periods. This did not materially change between the base case and the other scenarios, suggesting further analysis of the operational performance of the network would be required as the development proceeds,
- The introduction of the New Link Road between St Albans Road and Furlong Road, as depicted in the Project Case will provide a more direct access to the Health Precinct and flexibility for the network, and
- Scenario 1 includes higher employment and residential land uses which provides increases in traffic demand and congestion on Furlong Road which resulted in increases in traffic on the local road network in the magnitude of 200 to 500 vehicles per day. Notwithstanding this increase will not impact significantly on the peak hour performance when compared to the Project Case Option.

In summary, the introduction of the New Link Road to support intensification of the site is supported, noting that further design and development will be required to determine its layout and function. Further improvements to public transport are also supported that aim to assist in reducing the reliance on car travel for people travelling to the site.

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Appendix A

Base Case Results

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SHWEP Link Class 2046 Base Case
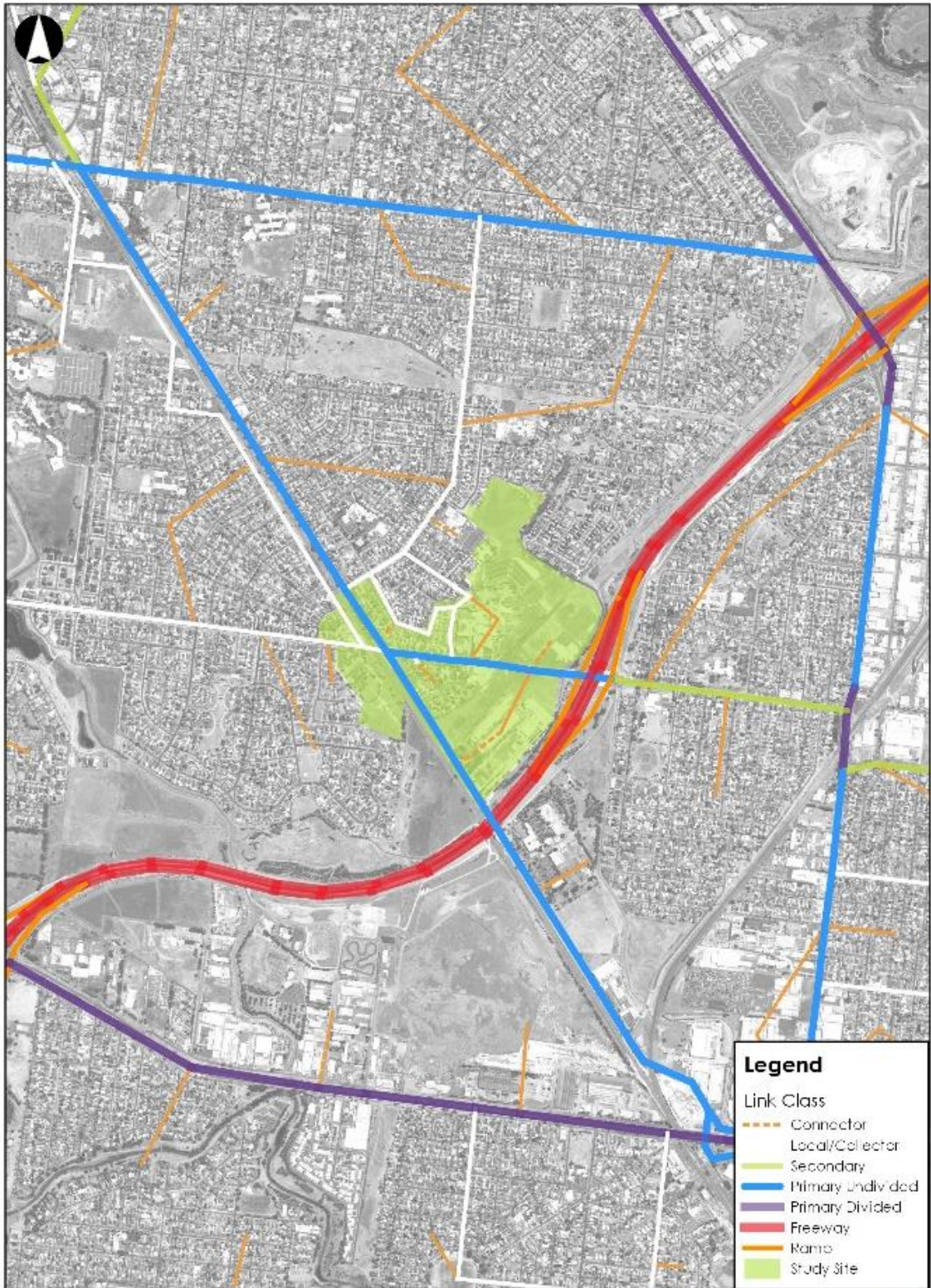
Legend

Link Class
- - - - Connector
—— Local/Collector
—— Secondary
—— Primary Undivided
—— Primary Divided
—— Freeway
—— Ramp
Study Site

SHWEP Number of Lanes 2046 Base Case
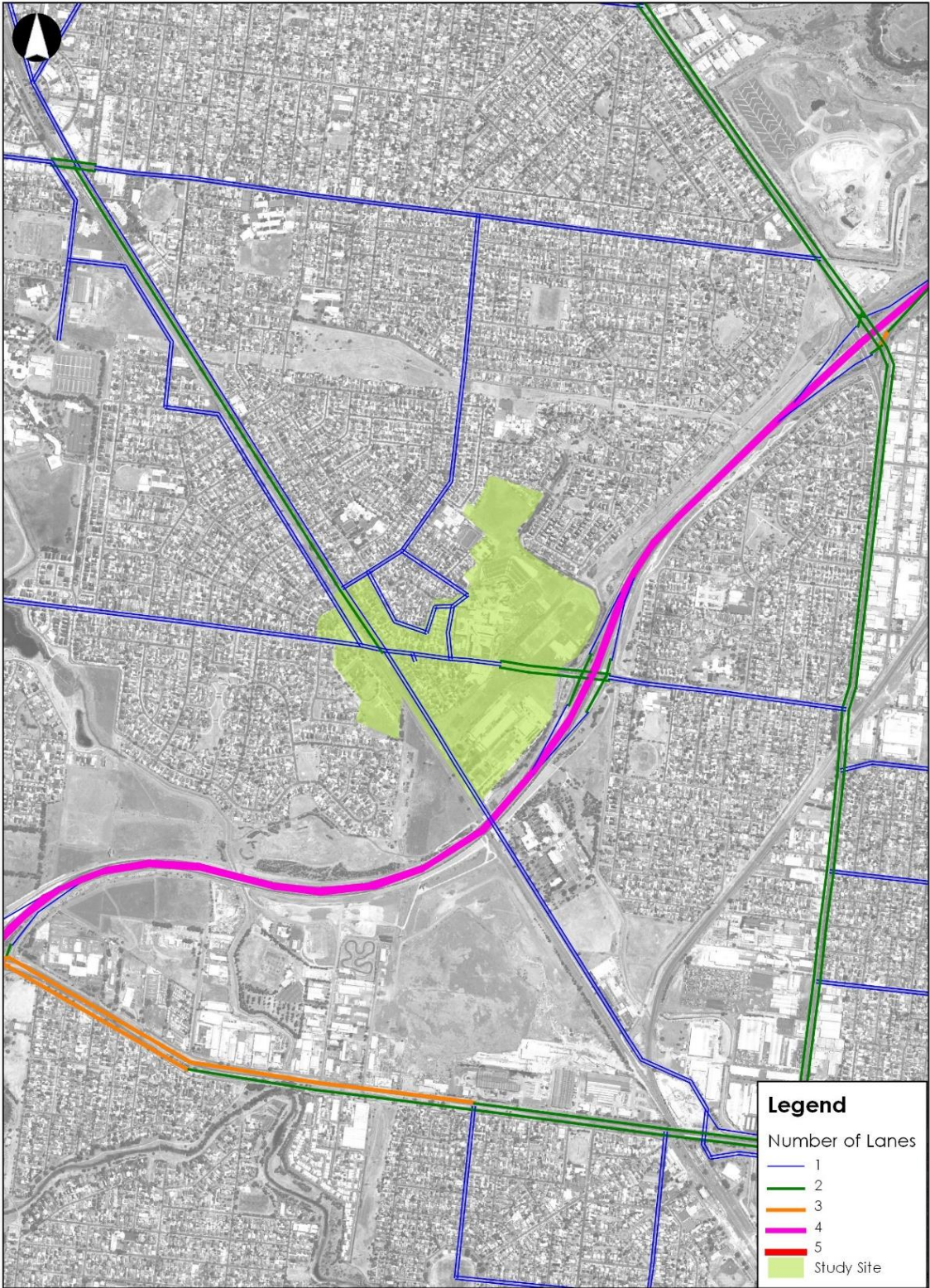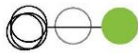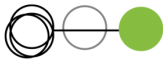
Legend

Number of Lanes
— 1
— 2
— 3
— 4
— 5
Study Site

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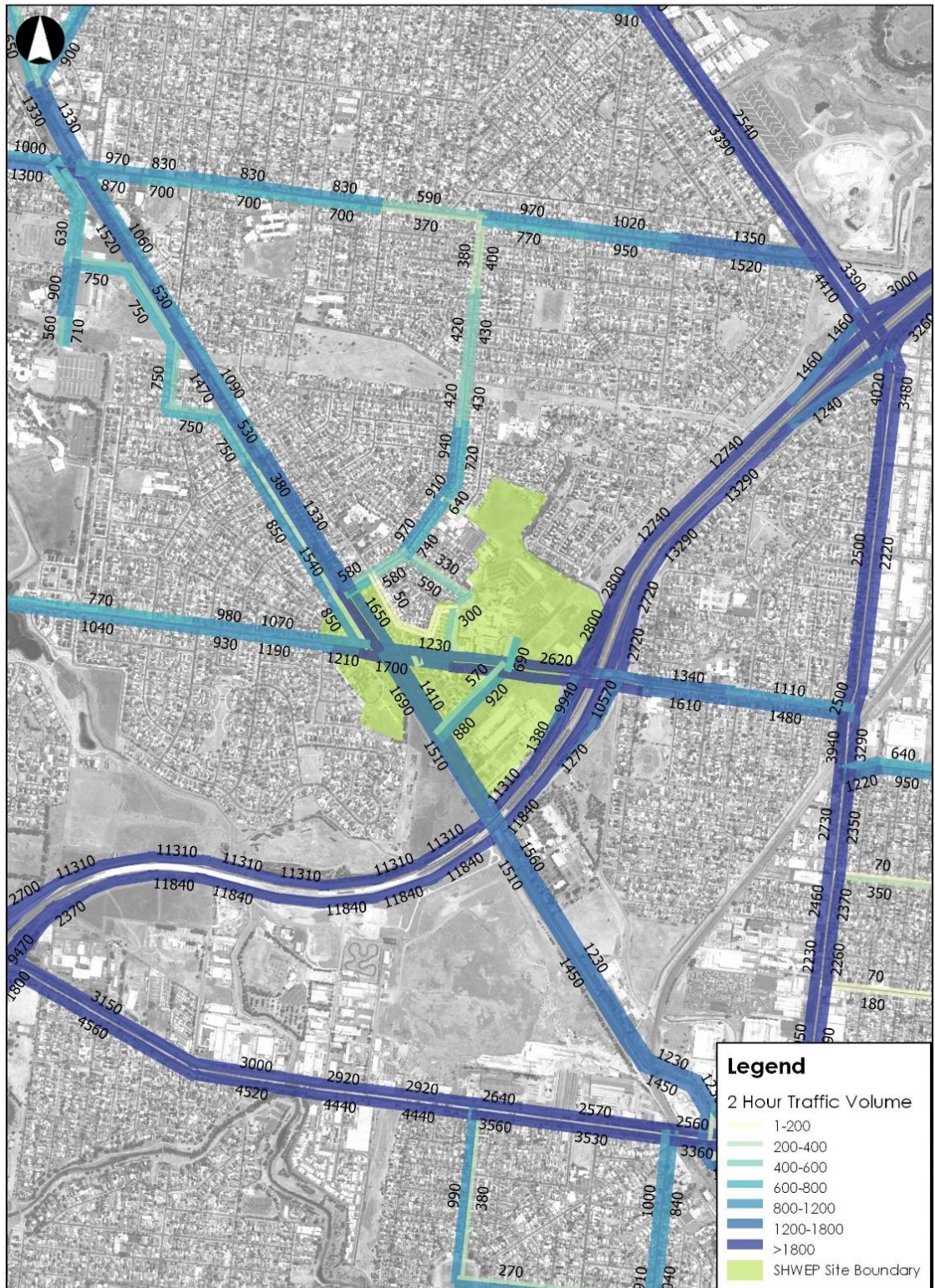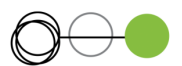V134260 // 22/01/18
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Sunshine Health, Wellbeing and Education Precinct

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SHWEP AM 2 Hour Traffic Volume 2046 Base Case

Legend

2 Hour Traffic Volume

1-200
200-400
400-600
600-800
800-1200
1200-1800
>1800
SHWEP Site Boundary
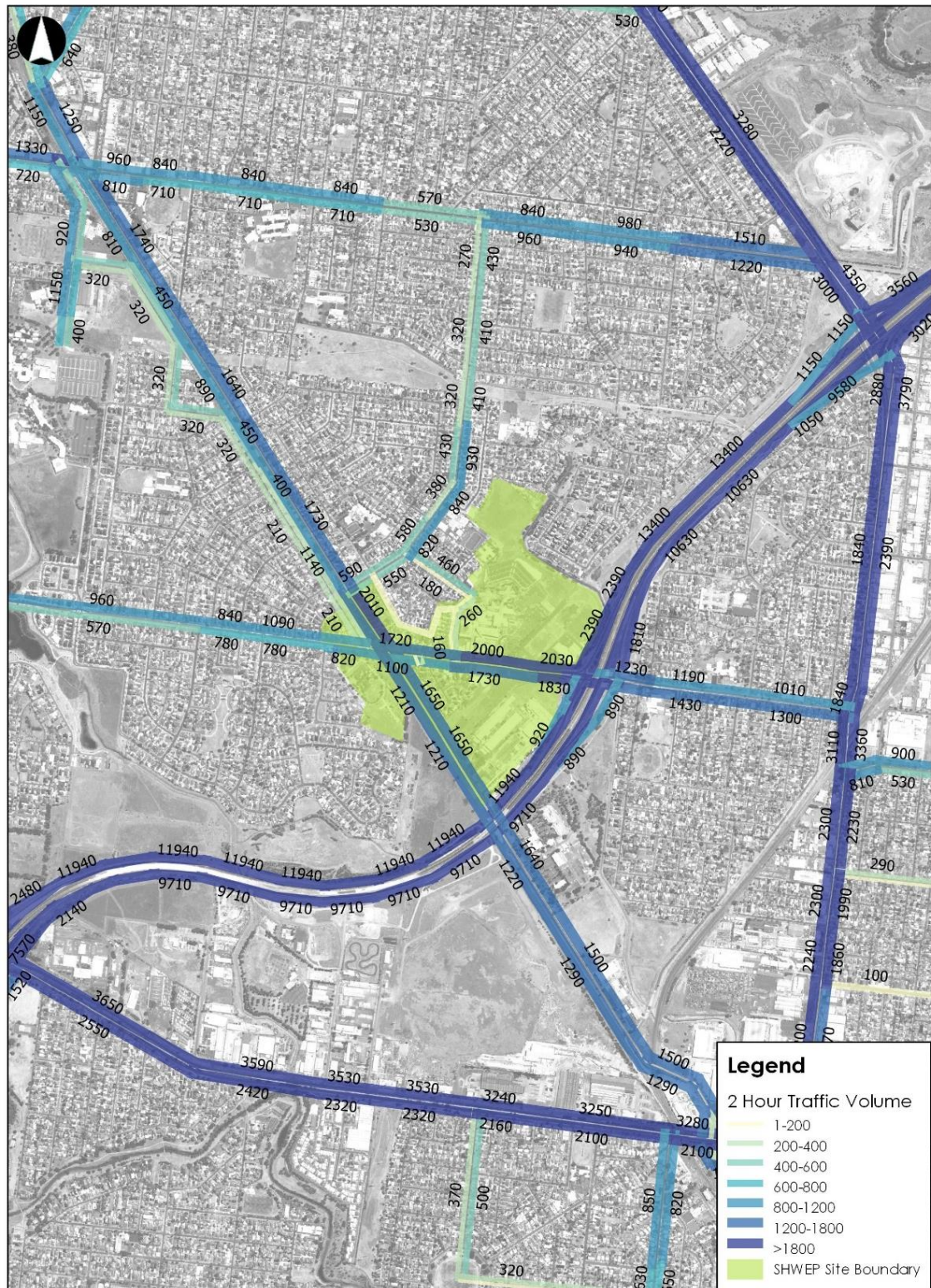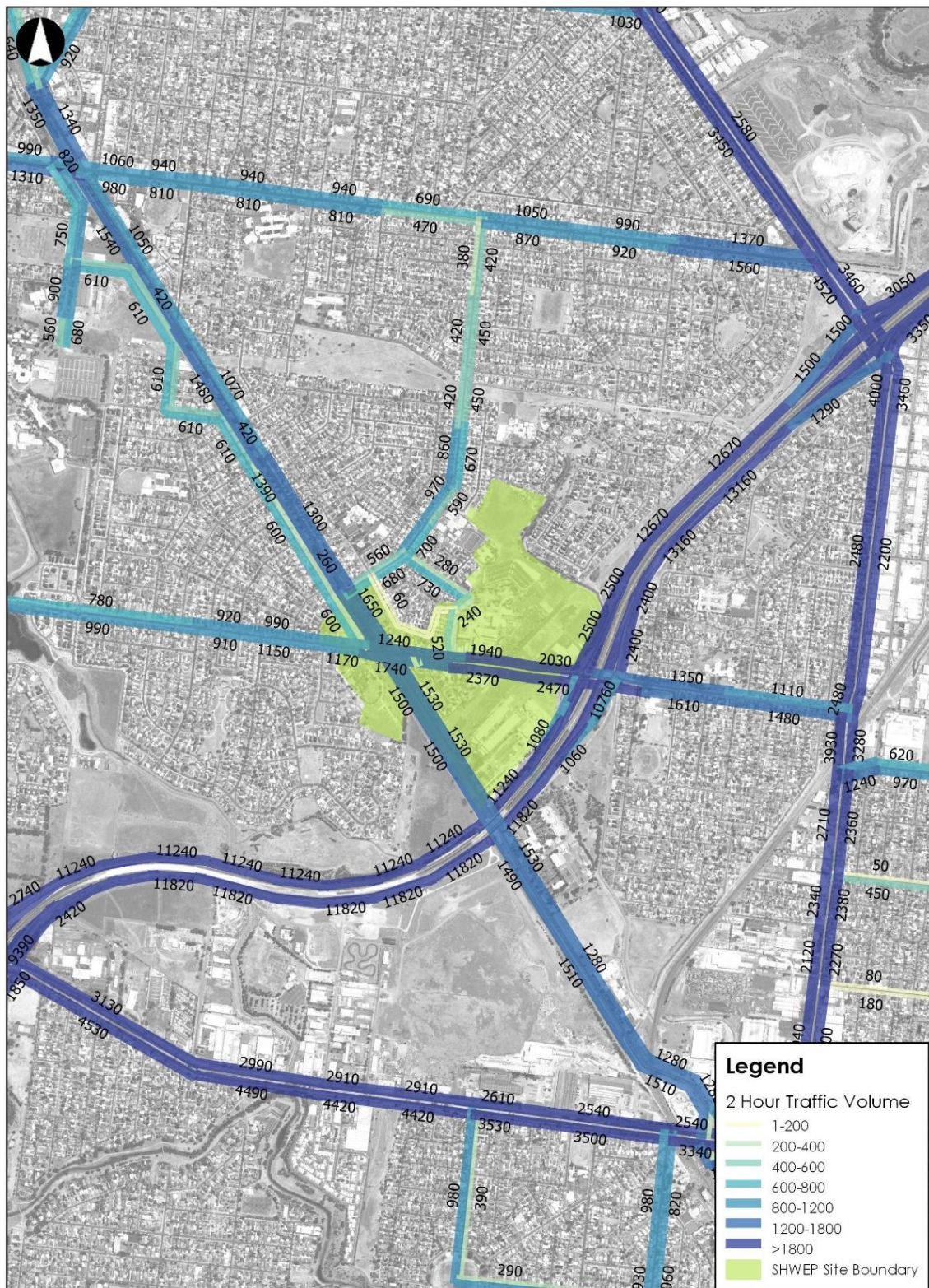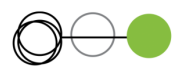
18/10/2017
Issue: A
V134260 - VITM2016 V2
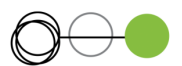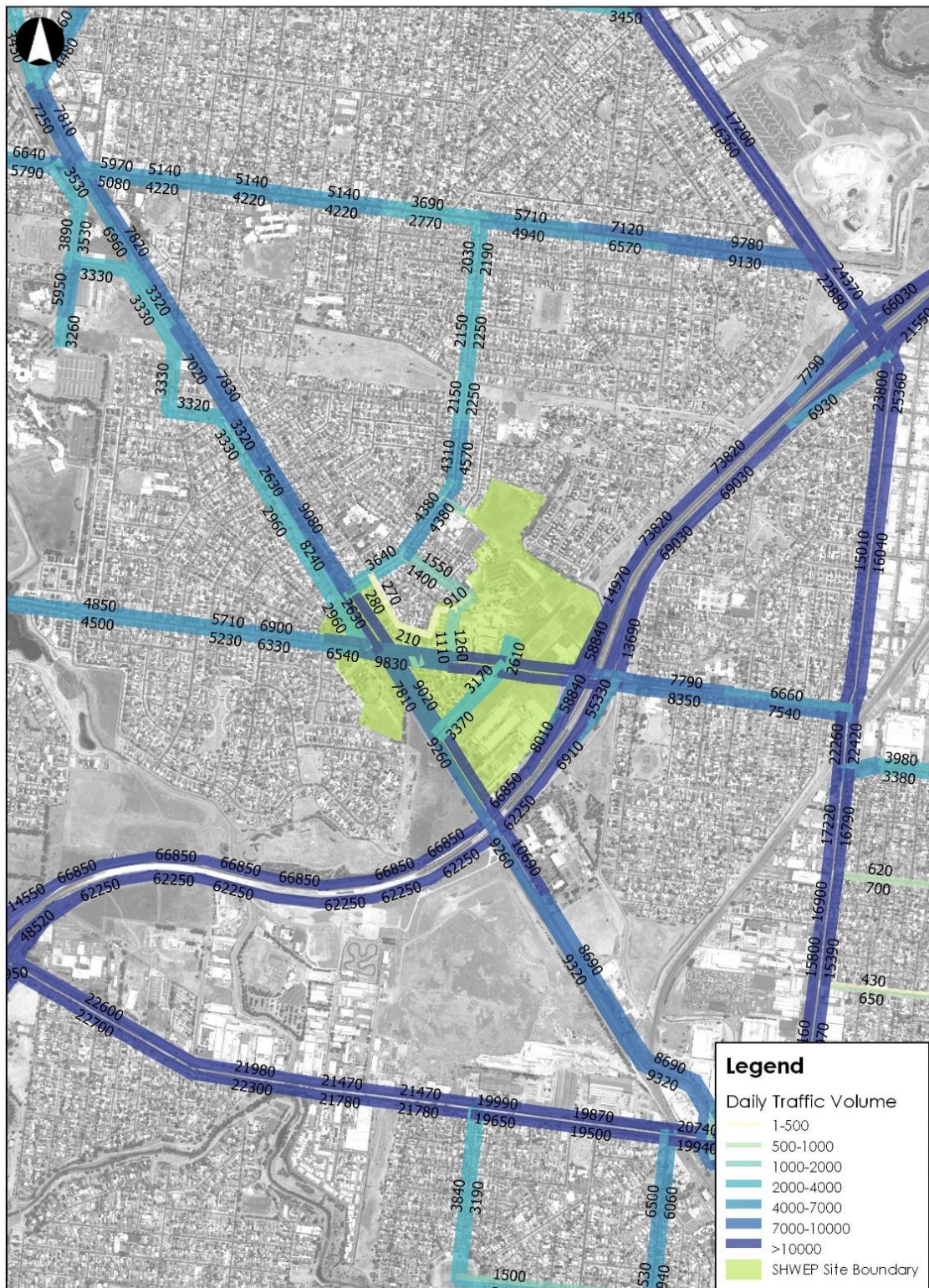
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SHWEP PM 2 Hour Traffic Volume 2046 Base Case

Legend

2 Hour Traffic Volume

- 1-200
- 200-400
- 400-600
- 600-800
- 800-1200
- 1200-1800
- >1800
- SHWEP Site Boundary

SHWEP Daily Traffic Volume 2046 Base Case

Legend

Daily Traffic Volume

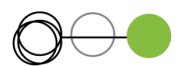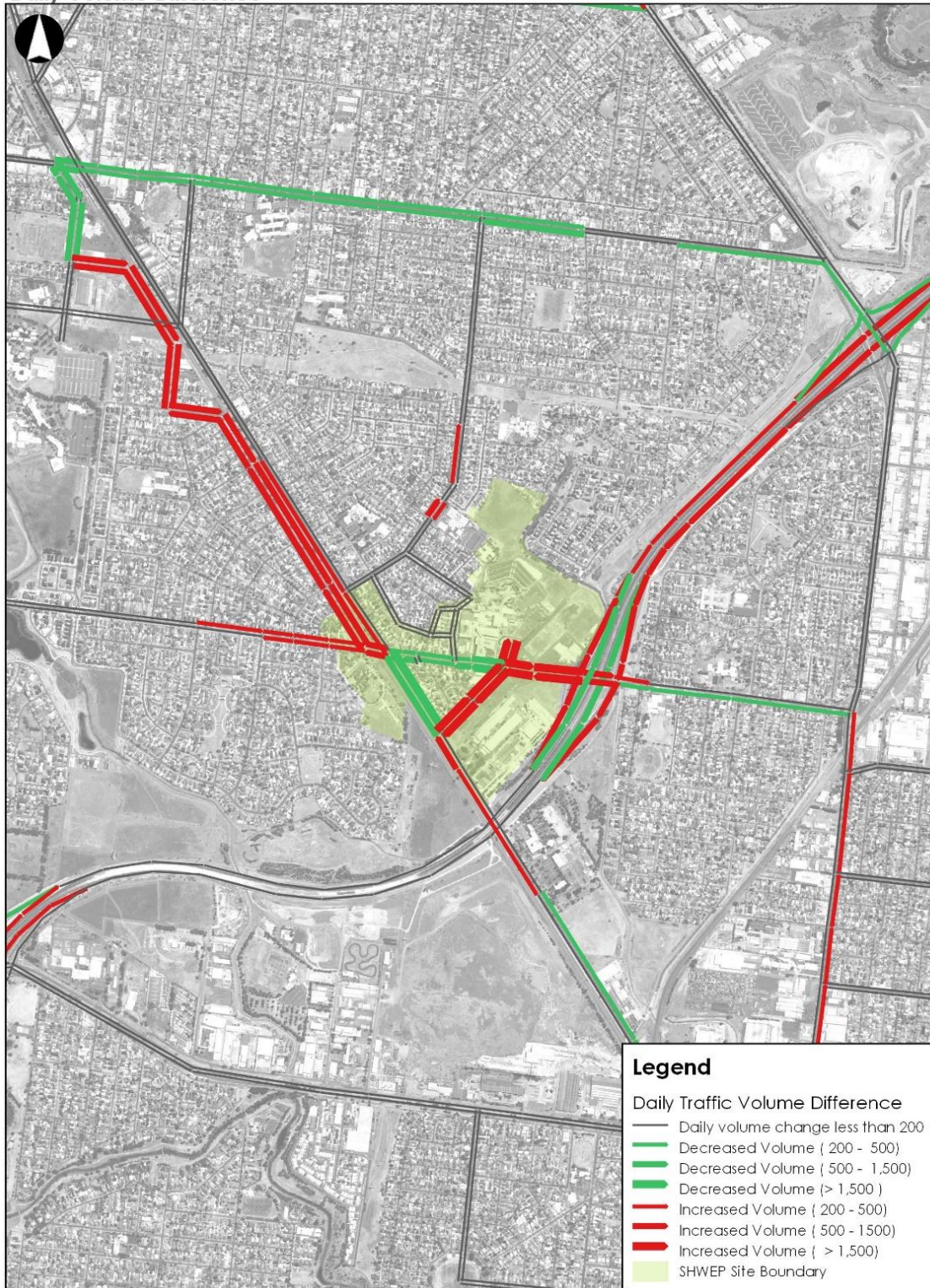|	
	1-500
	500-1000
	1000-2000
	2000-4000
	4000-7000
	7000-10000
	>10000
	SHWEP Site Boundary

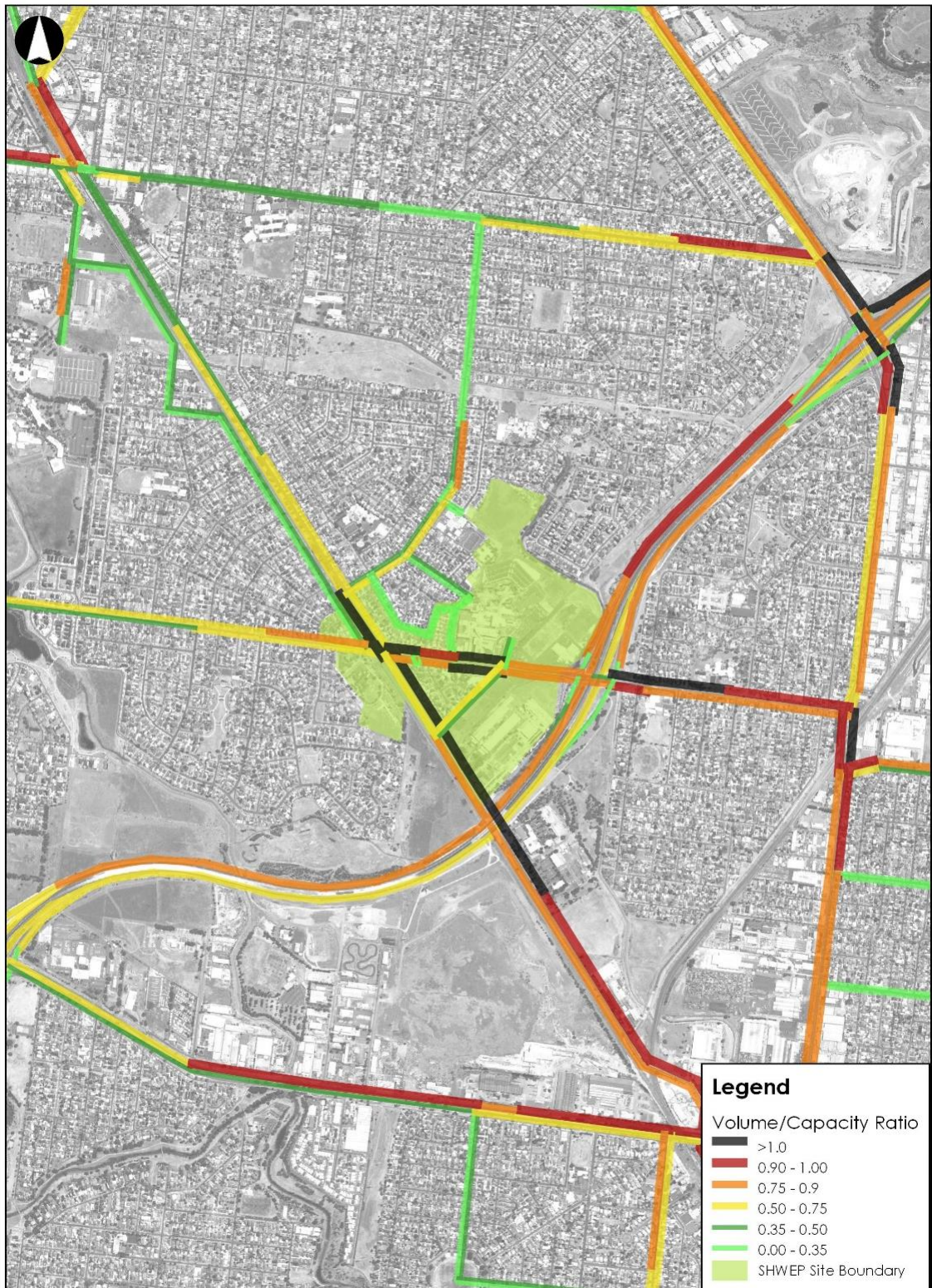18/10/2017
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Sunshine Health, Wellbeing and Education Precinct

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SHWEP AM Volume / Capacity Ratio 2046 Base Case

Legend

Volume/Capacity Ratio

- ▬ >1.0
- ▬ 0.90 - 1.00
- ▬ 0.75 - 0.9
- ▬ 0.50 - 0.75
- ▬ 0.35 - 0.50
- ▬ 0.00 - 0.35
- ▬ SHWEP Site Boundary

SHWEP PM Volume / Capacity Ratio 2046 Base Case

Legend

Volume/Capacity Ratio
- ■ >1.00
- ■ 0.90 - 1.00
- ■ 0.75 - 0.90
- ■ 0.50 - 0.75
- ■ 0.35 - 0.50
- ■ 0.00 - 0.35
- ■ SHWEP Site Boundary

Bing Satellite

20/10/2017
Issue: A
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V134260 // 22/01/18
Integrated Transport Assessment // Issue: -A
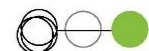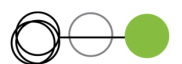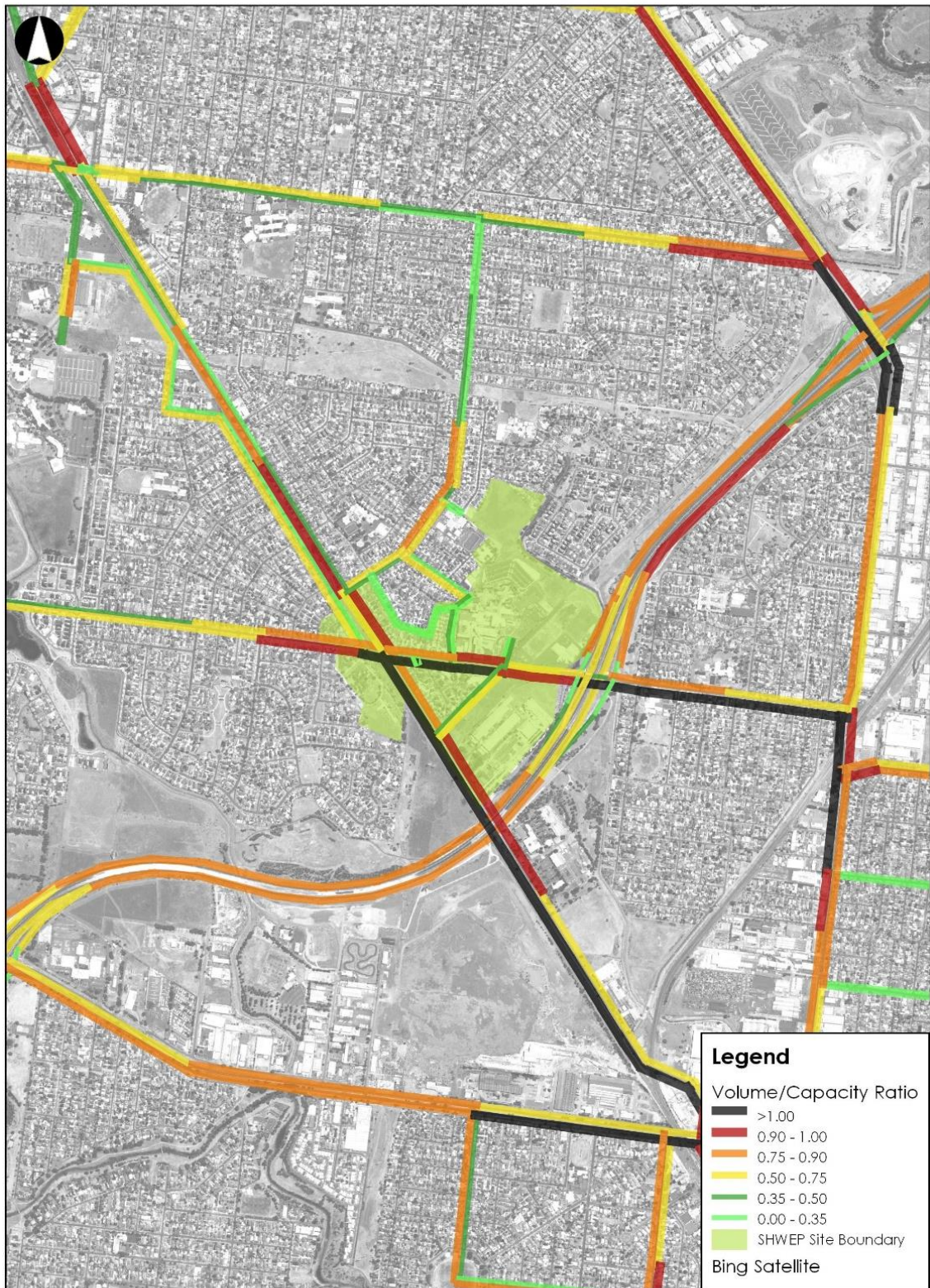Sunshine Health, Wellbeing and Education Precinct   **GTA**consultants

SHWEP Select Link Analysis of Furlong Road 2046 AM Base Case

Legend

Traffic Volume Bandwidth

——	<100
——	100-200
——	200-400
——	400-800
——	800-1200
——	>1200
■	Selected Link

SHWEP Select Link Analysis of Furlong Road 2046 Daily Base Case

Legend

Traffic Volume Bandwidth

——	<100
——	100-200
——	200-400
▬	400-800
▬	800-1200
▬	>1200
▬	Selected Link

SHWEP Select Link Analysis of St Albans Rd 2046 AM Base Case

Legend

Traffic Volume Bandwidth

——	<100
——	100-200
——	200-400
——	400-800
——	800-1200
——	>1200
◼	Selected Link

SHWEP Select Link Analysis of St Albans Rd 2046 Daily Base Case

Legend

Traffic Volume Bandwidth

——	<100
——	100-200
——	200-400
——	400-800
——	800-1200
——	>1200
——	Selected Link
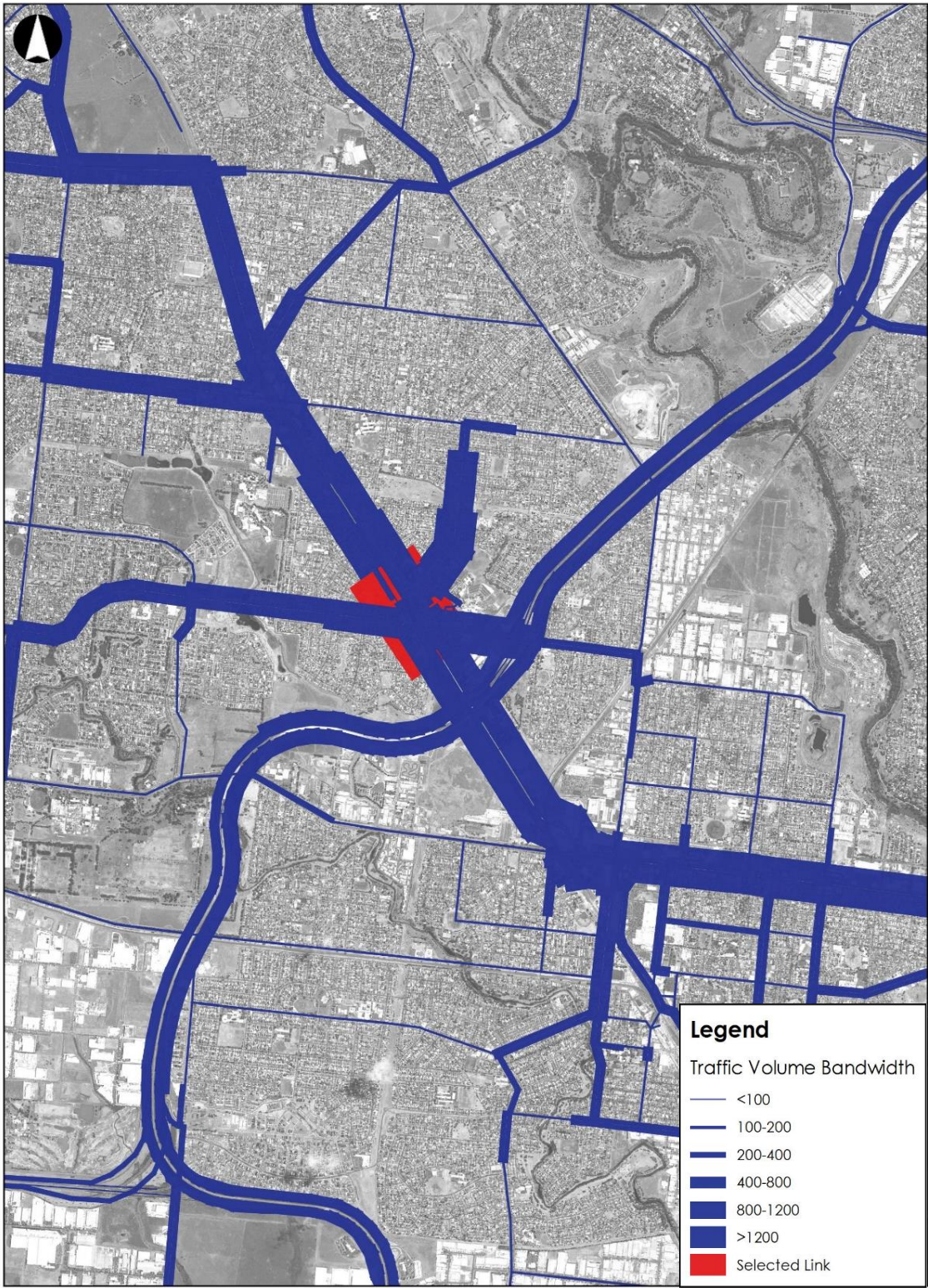
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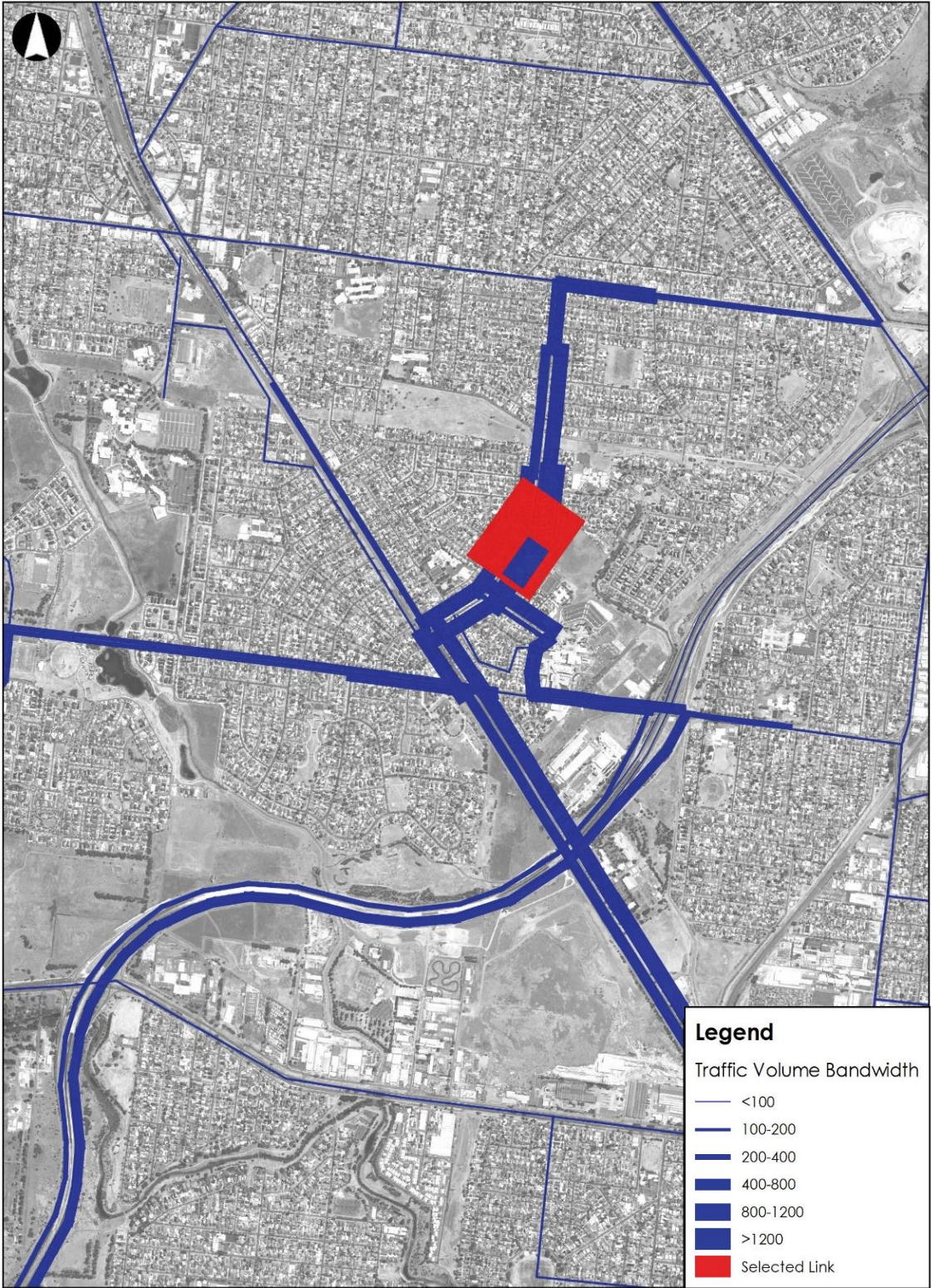
Legend

Traffic Volume Bandwidth

——	<100
——	100-200
——	200-400
——	400-800
——	800-1200
——	>1200
■	Selected Link
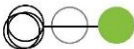
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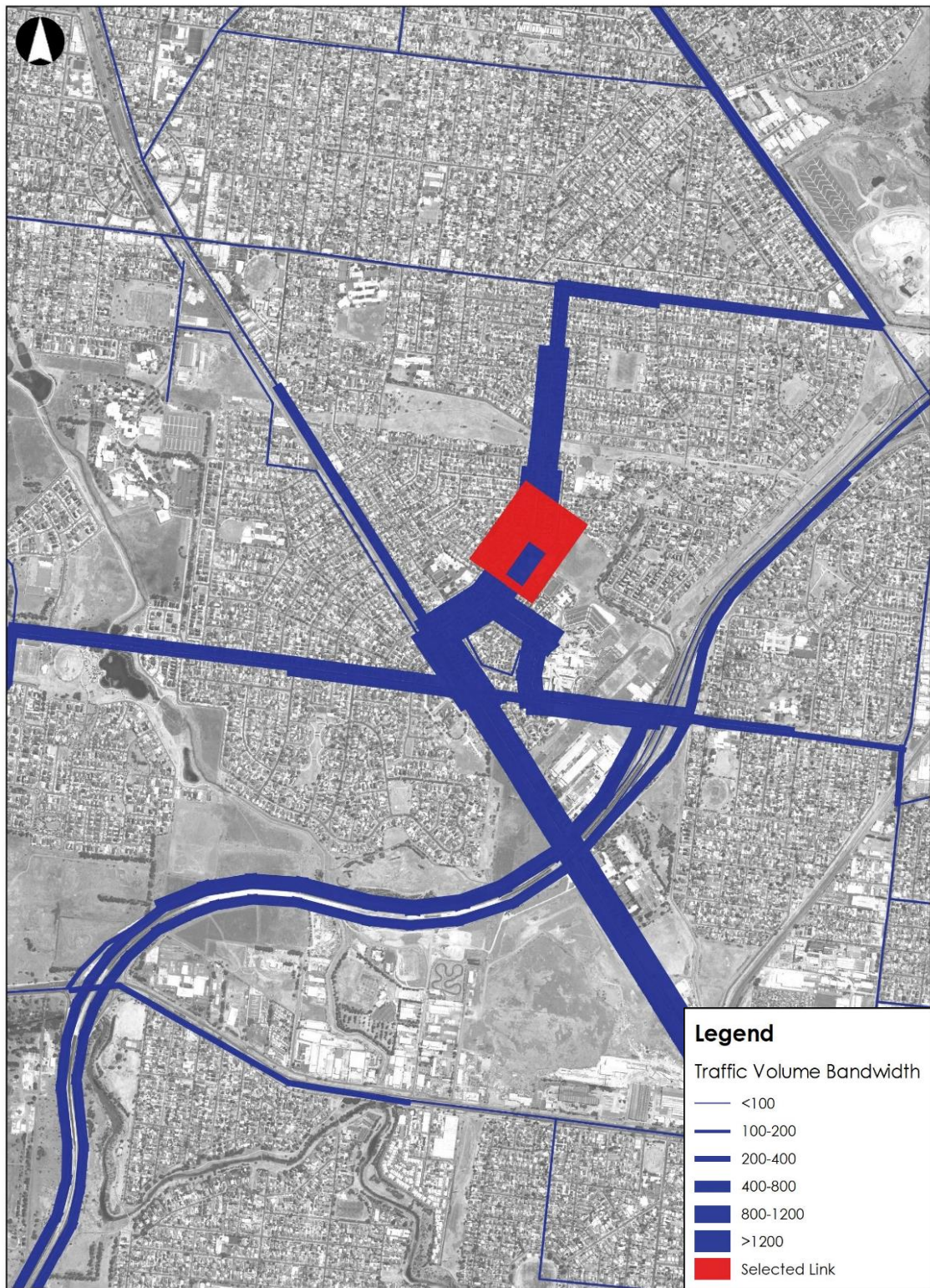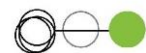
Legend

Traffic Volume Bandwidth

——	<100
——	100-200
——	200-400
▬	400-800
▬	800-1200
▬	>1200
▬	Selected Link

Appendix B

Project Case Results

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VITM2016V2 2046 Project Case: Link Class

Legend

Link Class

- Connector
- Local/Collector
- Secondary
- Primary Undivided
- Primary Divided
- Freeway
- Ramp
- Level Crossing
- CBD
- Rural Unsealed
- SHWEP Site Boundary
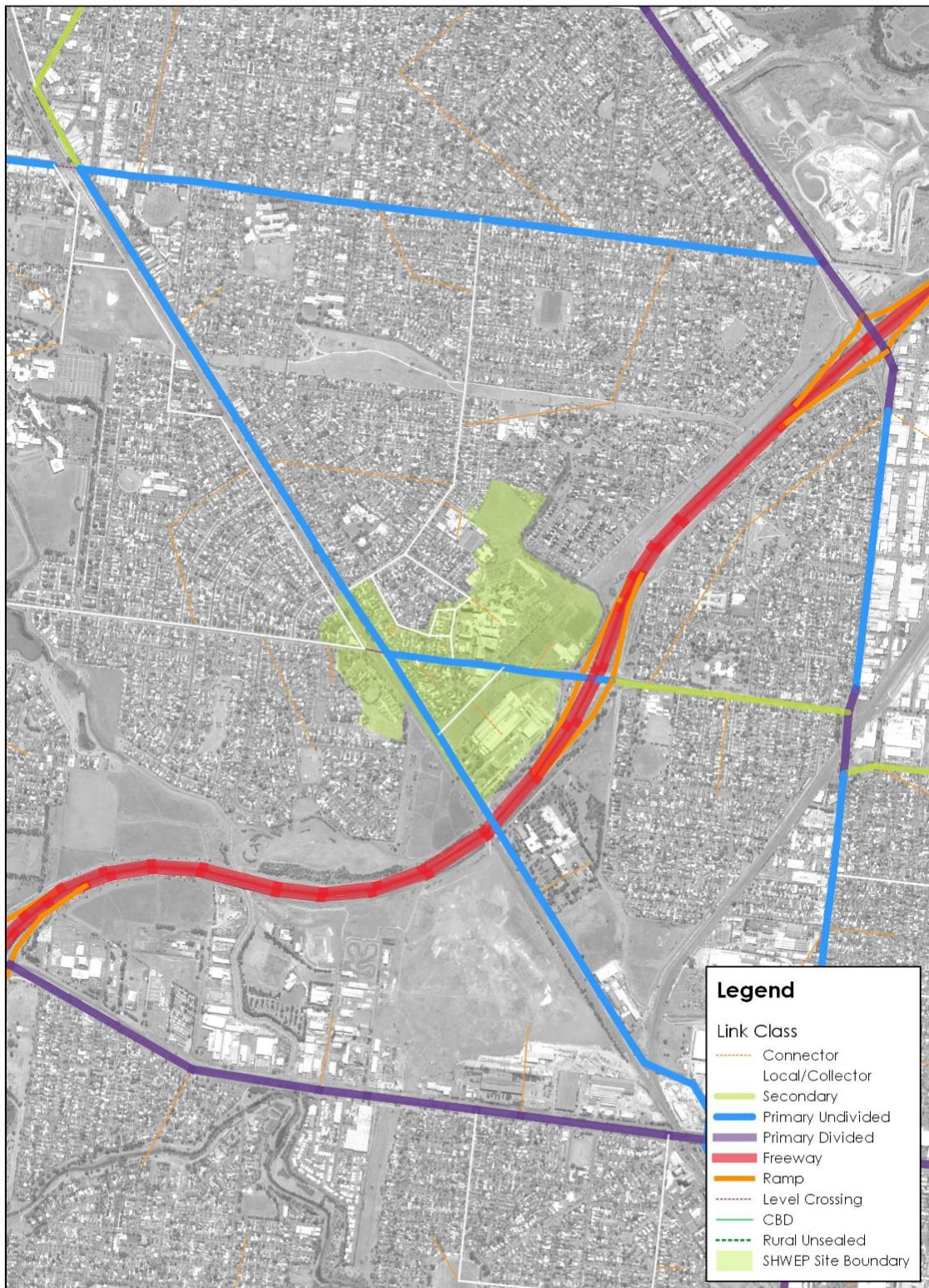
SHWEP Number of Lanes 2046 Project Case

Legend

Number of Lanes
— 1
— 2
— 3
— 4
— 5
Study Site

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SHWEP AM 2 Hour Traffic Volume 2046 Project Case

Legend

2 Hour Traffic Volume

- 1-200
- 200-400
- 400-600
- 600-800
- 800-1200
- 1200-1800
- >1800
- SHWEP Site Boundary

SHWEP PM 2 Hour Traffic Volume 2046 Project Case

Legend

2 Hour Traffic Volume

- 1-200
- 200-400
- 400-600
- 600-800
- 800-1200
- 1200-1800
- >1800
- SHWEP Site Boundary
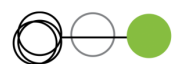
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SHWEP Daily Traffic Volume 2046 Project Case

Legend

Daily Traffic Volume

- 1-500
- 500-1000
- 1000-2000
- 2000-4000
- 4000-7000
- 7000-10000
- >10000
- SHWEP Site Boundary

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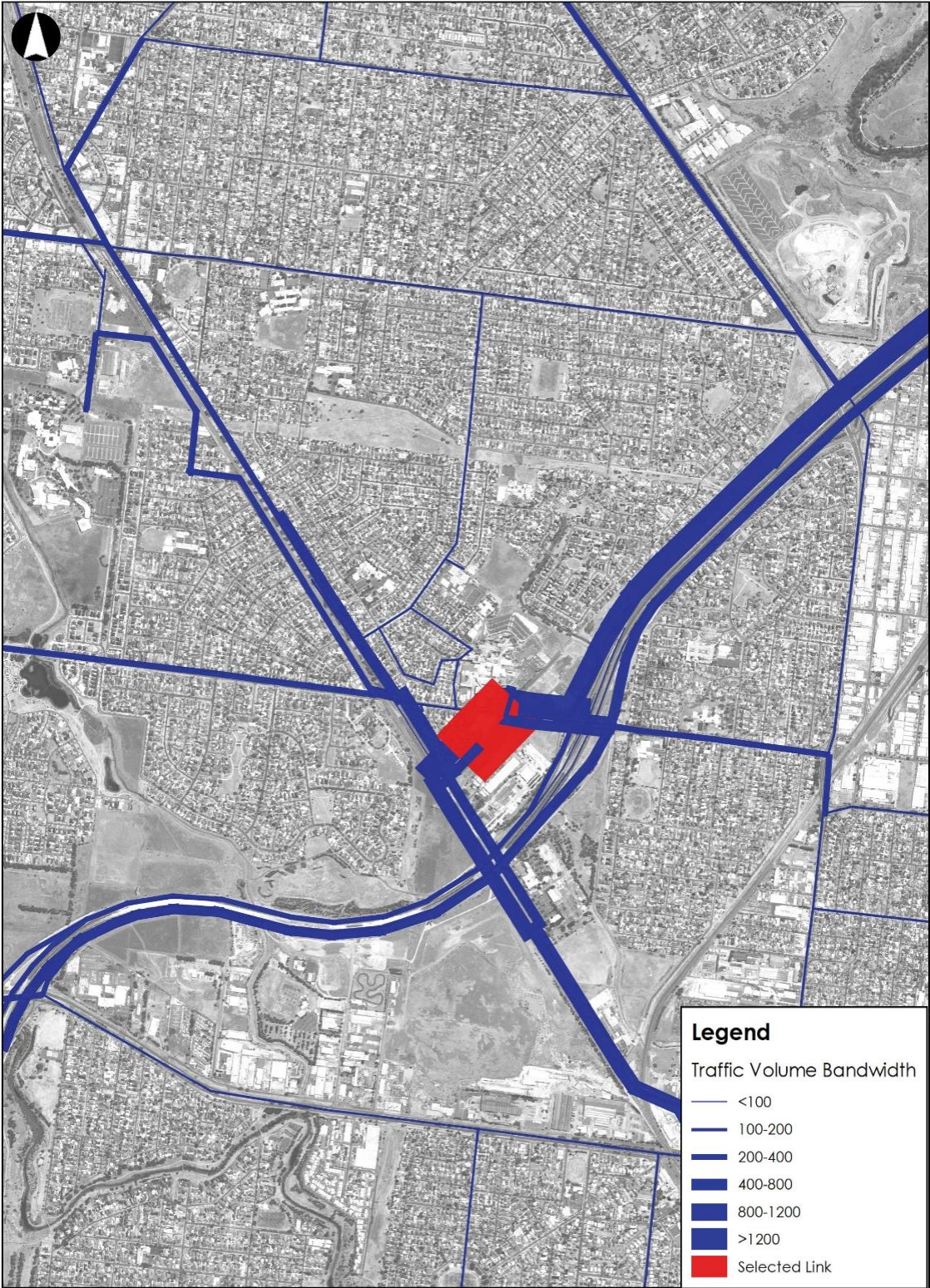
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VITM2016V2 2046 Analysis: Base Case - Project Case
Daily Volume Difference

Legend

Daily Traffic Volume Difference

Daily volume change less than 200
Decreased Volume (200 - 500)
Decreased Volume (500 - 1,500)
Decreased Volume (> 1,500)
Increased Volume (200 - 500)
Increased Volume (500 - 1500)
Increased Volume (> 1,500)
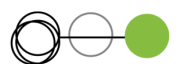SHWEP Site Boundary

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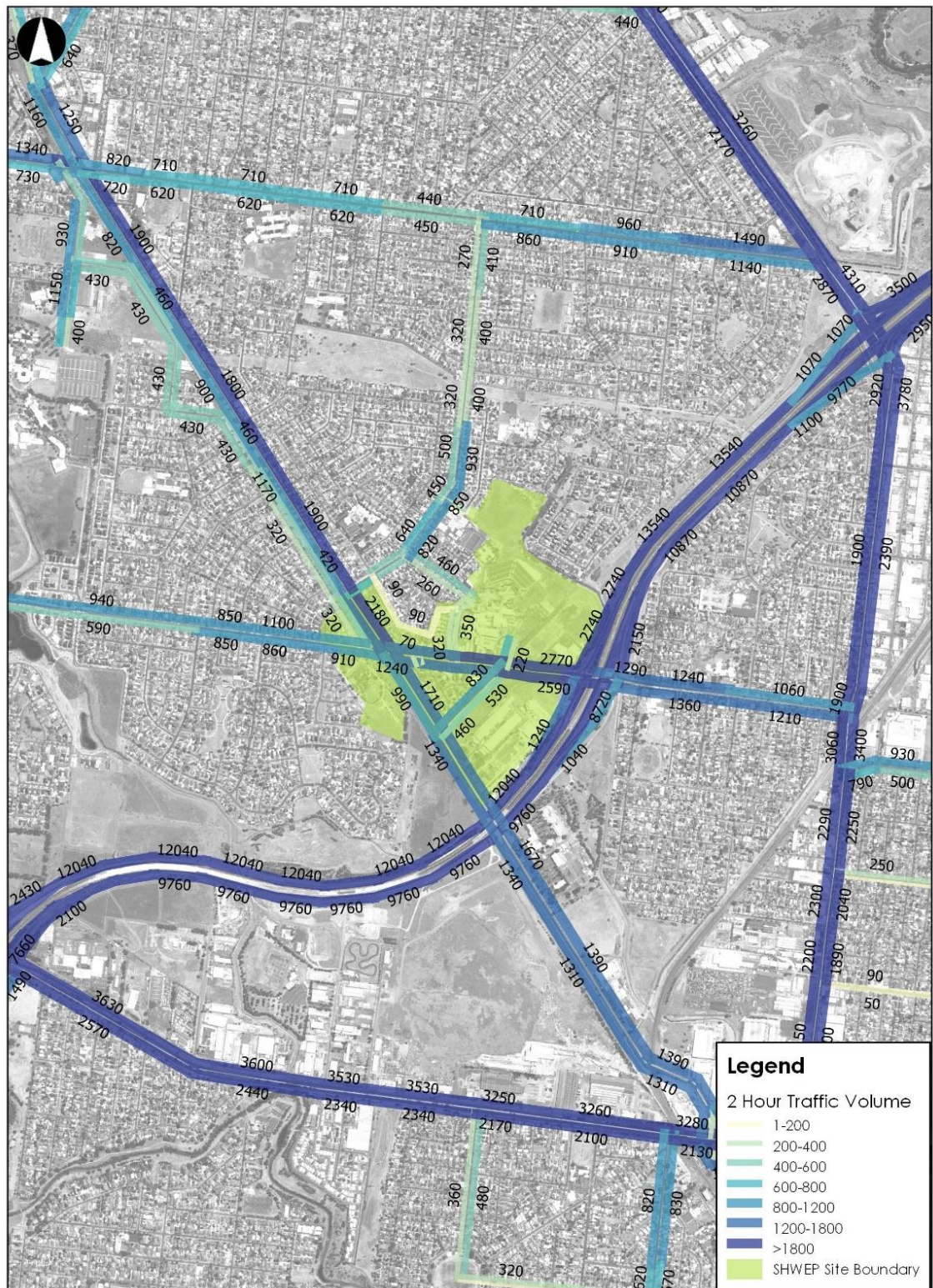
SHWEP AM Volume / Capacity Ratio 2046 Project Case

Legend

Volume/Capacity Ratio

▬	>1.0
▬	0.90 - 1.00
▬	0.75 - 0.9
▬	0.50 - 0.75
▬	0.35 - 0.50
▬	0.00 - 0.35
▬	SHWEP Site Boundary

Legend

Volume/Capacity Ratio

- ■ >1.00
- ■ 0.90 - 1.00
- ■ 0.75 - 0.90
- ■ 0.50 - 0.75
- ■ 0.35 - 0.50
- ■ 0.00 - 0.35
- ■ SHWEP Site Boundary

Bing Satellite

SHWEP Select Link Analysis of Furlong Road 2046 AM Project Case
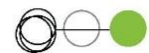
Legend

Traffic Volume Bandwidth

——	<100
——	100-200
——	200-400
——	400-800
——	800-1200
——	>1200
■	Selected Link

SHWEP Select Link Analysis of Furlong Road 2046 Daily Project Case

Legend

Traffic Volume Bandwidth

——	<100
——	100-200
——	200-400
——	400-800
——	800-1200
——	>1200
——	Selected Link
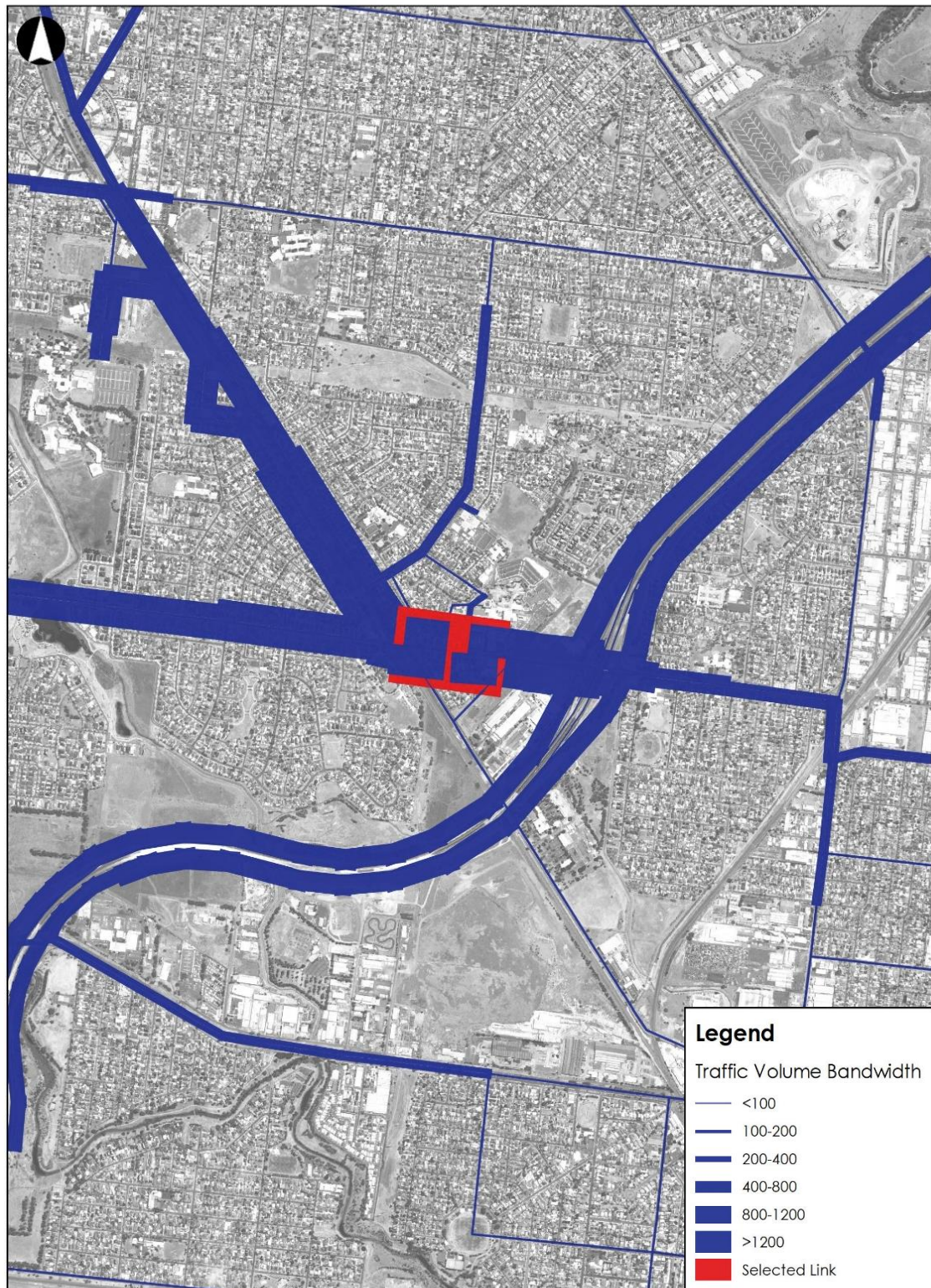
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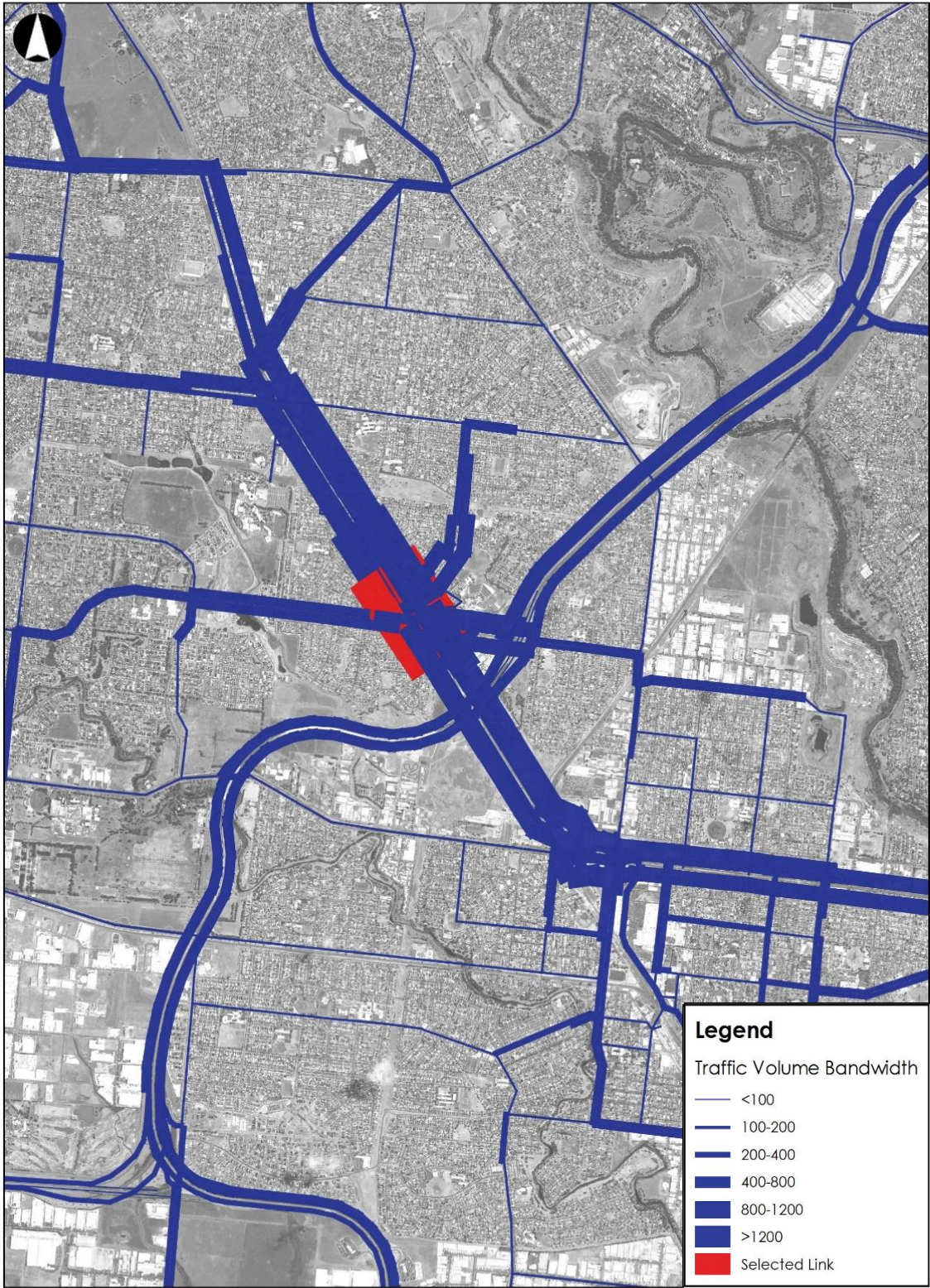
Legend

Traffic Volume Bandwidth

—— <100

—— 100-200

—— 200-400

—— 400-800

—— 800-1200

—— >1200

—— Selected Link
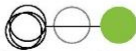
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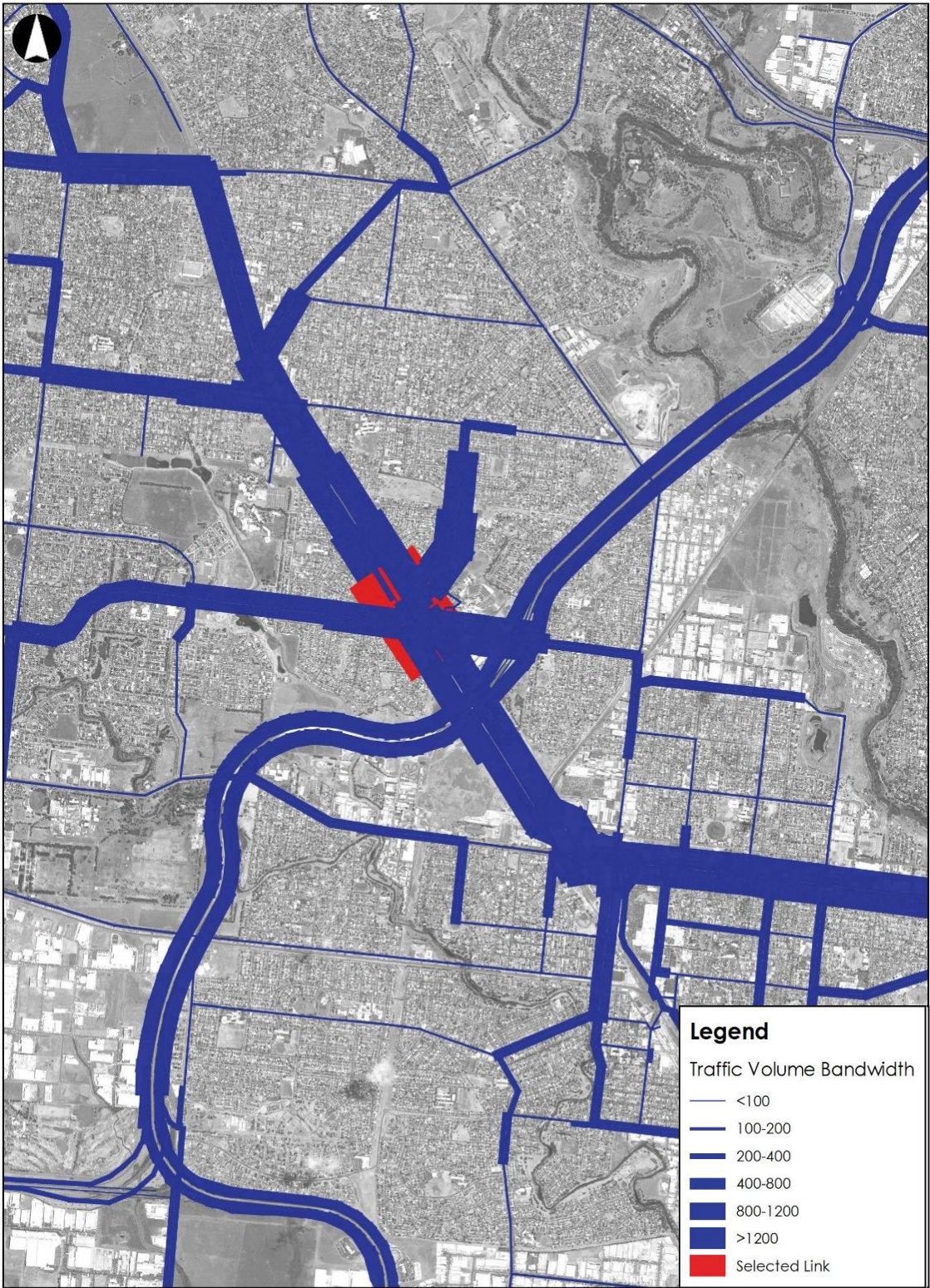
Legend

Traffic Volume Bandwidth

———	<100
———	100-200
▬▬▬	200-400
▬▬▬	400-800
▬▬▬	800-1200
▬▬▬	>1200
🟥	Selected Link
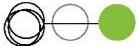
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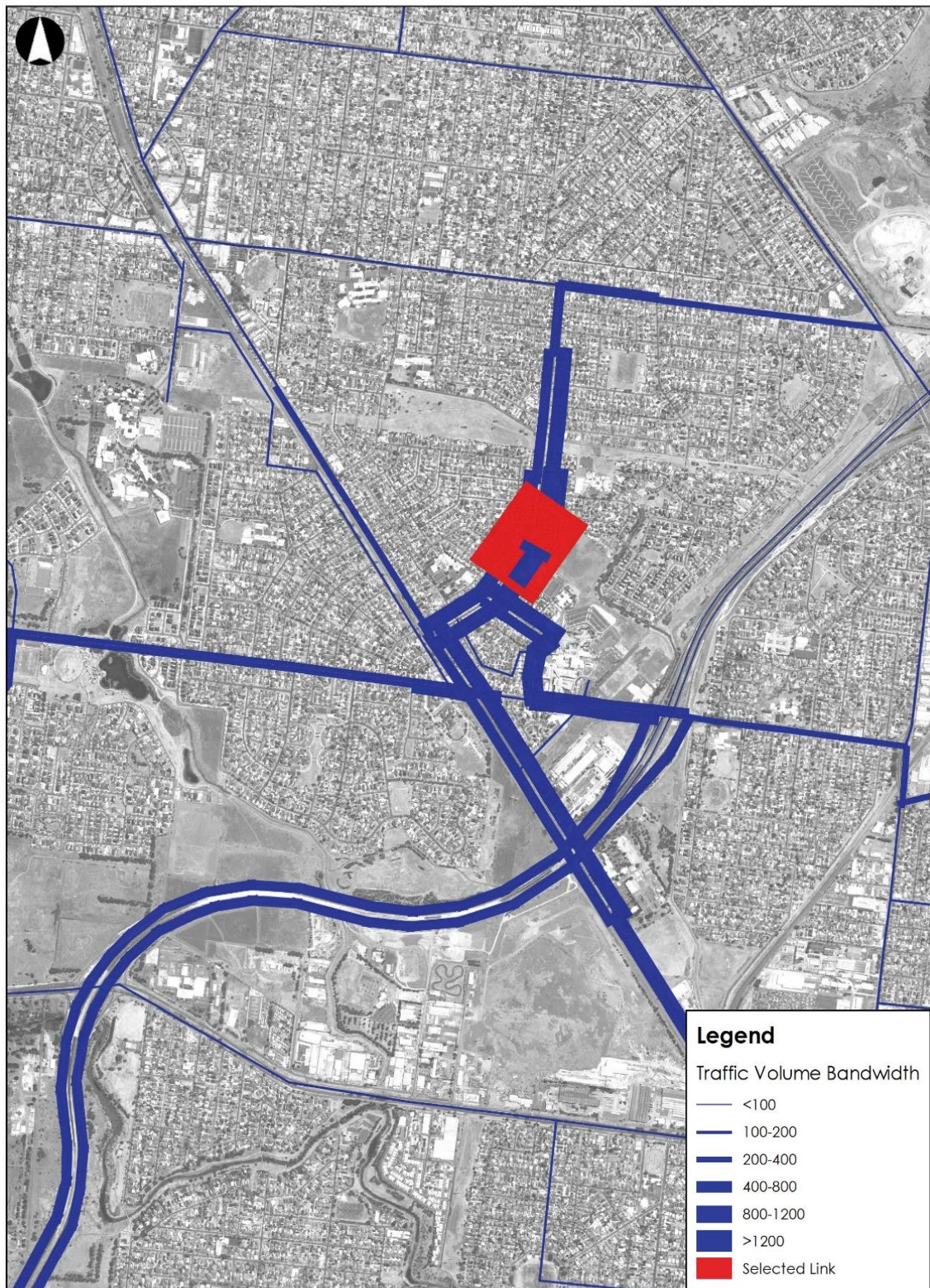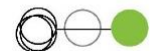
Legend

Traffic Volume Bandwidth

——	<100
——	100-200
——	200-400
——	400-800
——	800-1200
——	>1200
■	Selected Link

SHWEP Select Link Analysis of Mulhall Dr. 2046 Daily Project Case
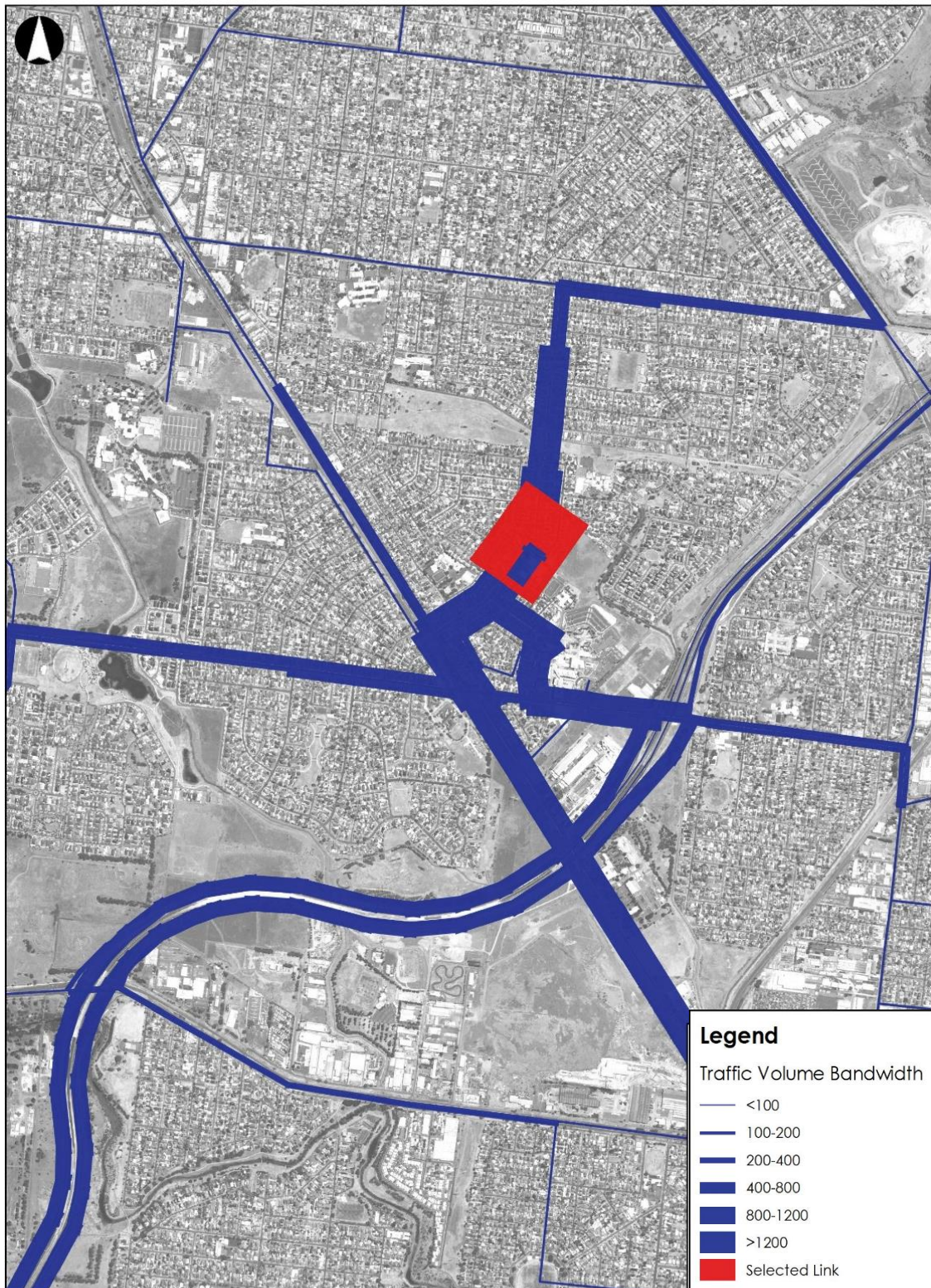
Legend

Traffic Volume Bandwidth

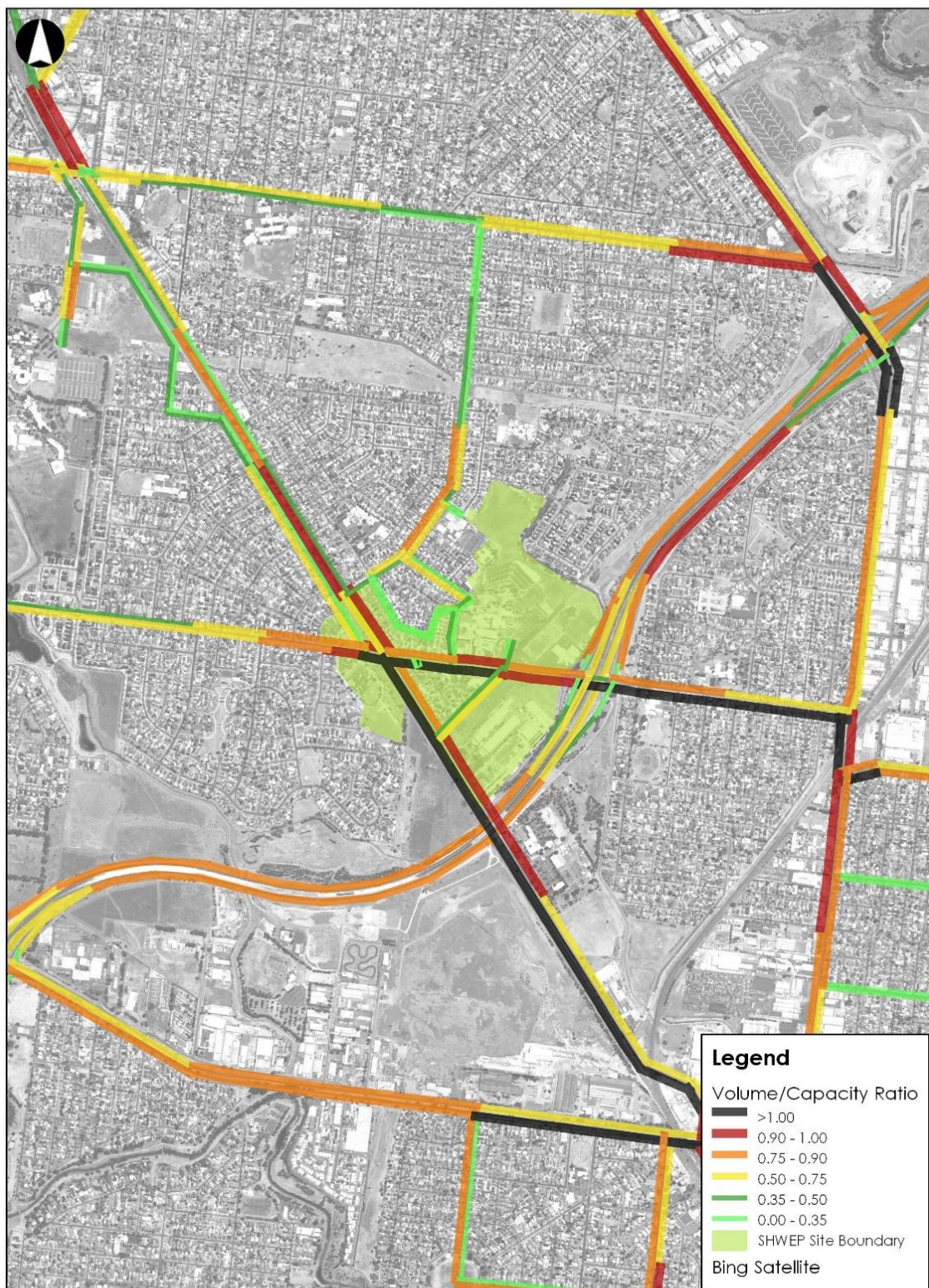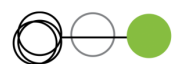|	
——	<100
——	100-200
——	200-400
▬	400-800
▬	800-1200
▬	>1200
▬	Selected Link

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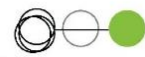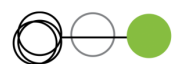Sunshine Health, Wellbeing and Education Precinct

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SHWEP Select Link Analysis of Proposed New Link 2046 AM Project Case

Legend

Traffic Volume Bandwidth

——	<100
——	100-200
——	200-400
——	400-800
——	800-1200
——	>1200
▬	Selected Link

SHWEP Select Link Analysis of Proposed New Link 2046 Daily Project Case
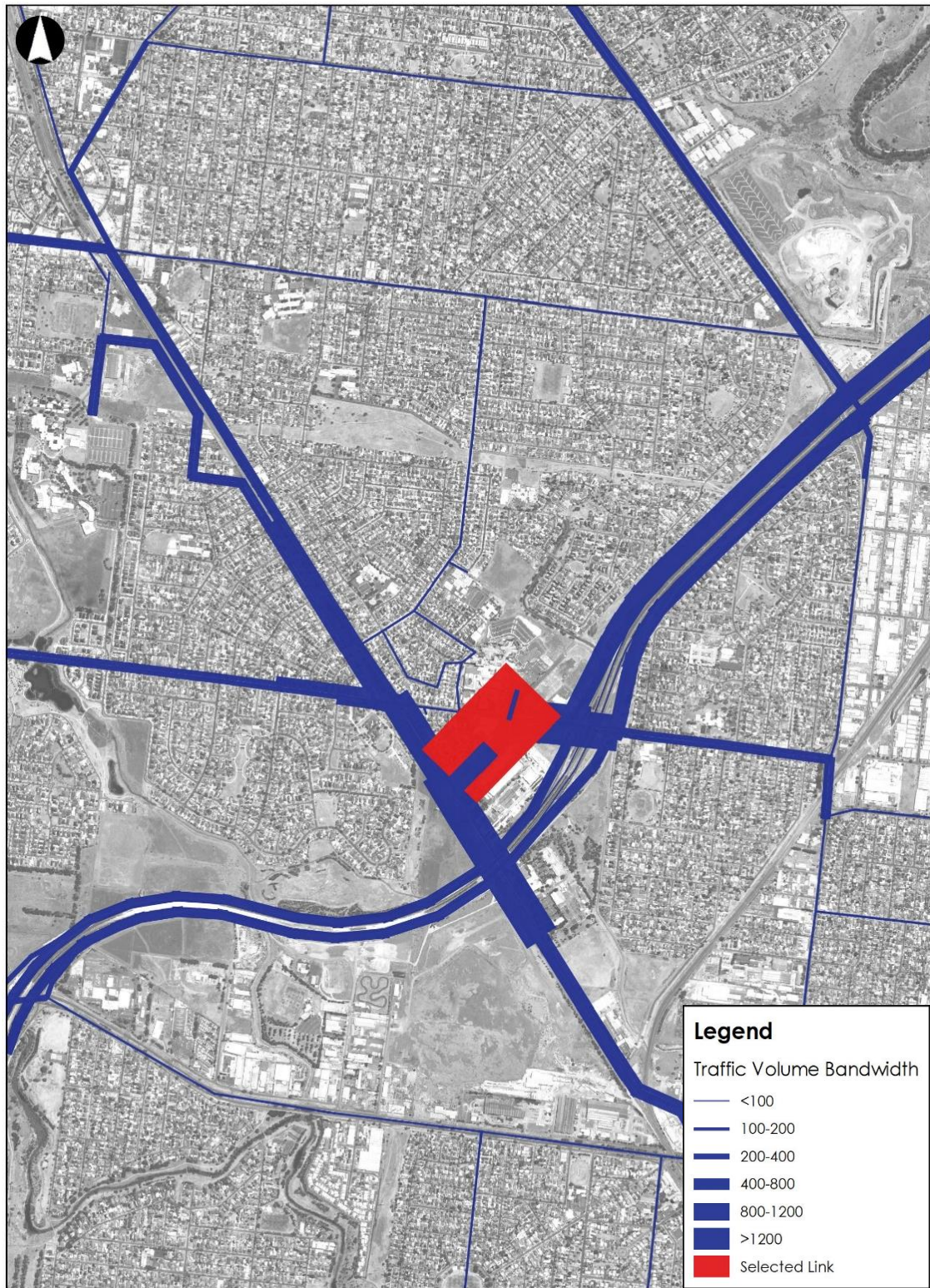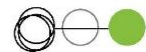
Legend

Traffic Volume Bandwidth

——	<100
——	100-200
——	200-400
——	400-800
——	800-1200
——	>1200
▆	Selected Link

Appendix C

Scenario 1 Results

SHWEP AM 2 Hour Traffic Volume 2046 Scenario 1 (Middle Land Use Case)

Legend

2 Hour Traffic Volume

- 1-200
- 200-400
- 400-600
- 600-800
- 800-1200
- 1200-1800
- >1800
- SHWEP Site Boundary

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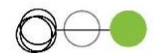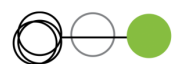
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SHWEP PM 2 Hour Traffic Volume 2046 Scenario 1 (Middle Land Use Case)

Legend

2 Hour Traffic Volume

- 1-200
- 200-400
- 400-600
- 600-800
- 800-1200
- 1200-1800
- >1800
- SHWEP Site Boundary

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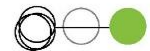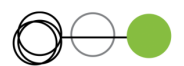Sunshine Health, Wellbeing and Education Precinct

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SHWEP Daily Traffic Volume 2046 Scenario 1 (Middle Land Use Case)

Legend

Daily Traffic Volume

- 1-500
- 500-1000
- 1000-2000
- 2000-4000
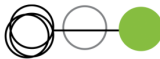- 4000-7000
- 7000-10000
- >10000
- SHWEP Site Boundary
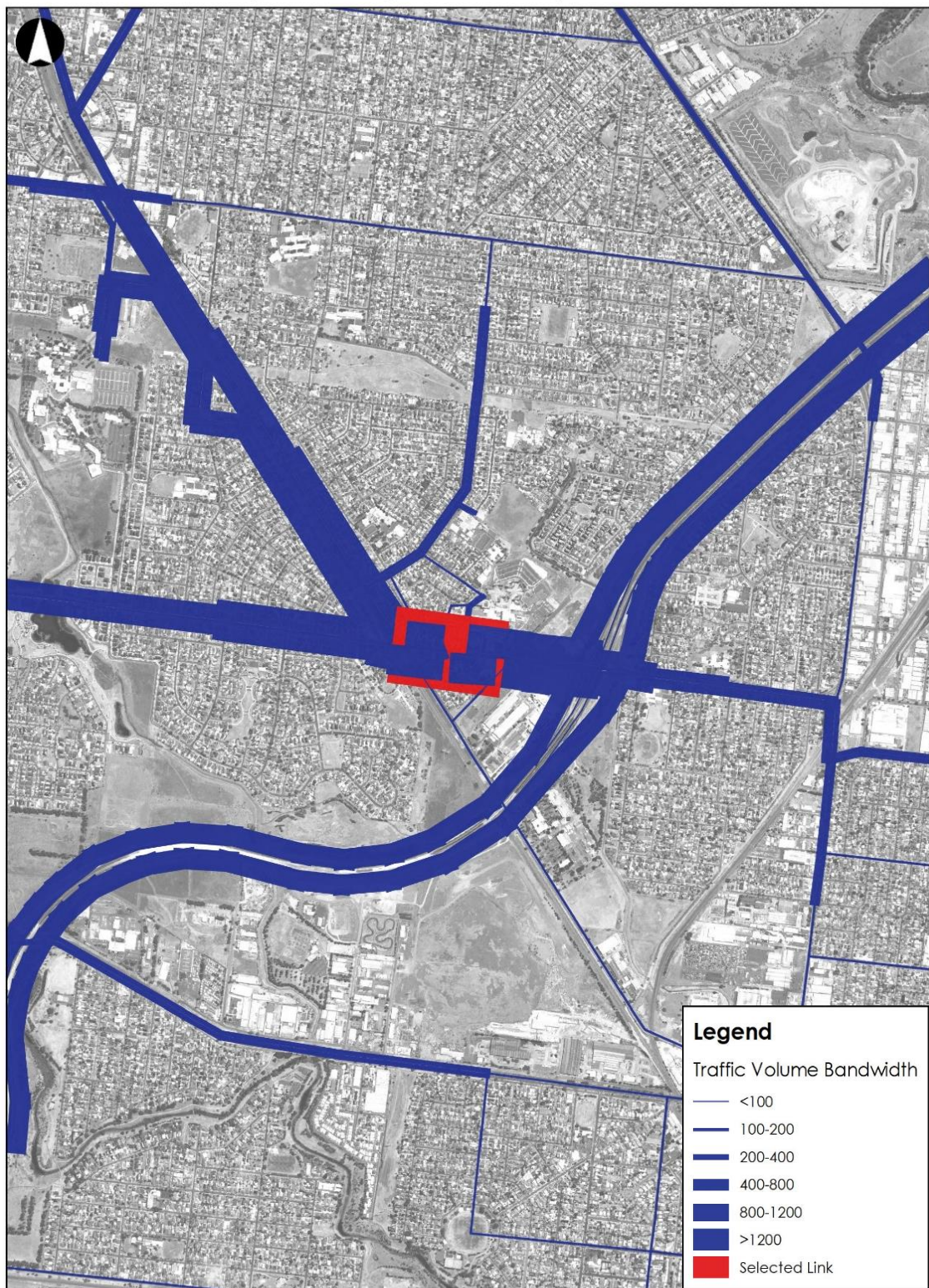
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Integrated Transport Assessment // Issue: -A
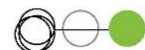
Sunshine Health, Wellbeing and Education Precinct

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Legend

Daily Traffic Volume Difference

— Daily volume change less than 200
— Decreased Volume (200 - 500)
— Decreased Volume (500 - 1,500)
— Decreased Volume (> 1,500)
— Increased Volume (200 - 500)
— Increased Volume (500 - 1500)
— Increased Volume (> 1,500)
  SHWEP Site Boundary

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SHWEP AM Volume / Capacity Ratio 2046 Scenario 1 (Middle Land Use Case)

Legend

Volume/Capacity Ratio

- ▬ >1.0
- ▬ 0.90 - 1.00
- ▬ 0.75 - 0.9
- ▬ 0.50 - 0.75
- ▬ 0.35 - 0.50
- ▬ 0.00 - 0.35
- ▬ SHWEP Site Boundary

SHWEP PM Volume / Capacity Ratio 2046 Scenario 1 (Middle Land Use Case)

Legend

Volume/Capacity Ratio
- >1.00
- 0.90 - 1.00
- 0.75 - 0.90
- 0.50 - 0.75
- 0.35 - 0.50
- 0.00 - 0.35
- SHWEP Site Boundary

Bing Satellite

SHWEP Select Link Analysis of Furlong Road 2046 AM Scenario 1

Legend

Traffic Volume Bandwidth
- 1-10
- 10-100
- 100-200
- 200-400
- 400-600
- 600-800
- 800-1000
- >1000
- Selected Link

SHWEP Select Link Analysis of Furlong Road 2046 Daily Scenario 1

Legend

Traffic Volume Bandwidth

—— <100

—— 100-200

—— 200-400

—— 400-800

—— 800-1200

—— >1200

■ Selected Link

SHWEP Select Link Analysis of St Albans Rd 2046 AM Scenario 1

Legend

Traffic Volume Bandwidth

——	<100
——	100-200
——	200-400
▬	400-800
▬	800-1200
▬	>1200
🟥	Selected Link

SHWEP Select Link Analysis of Furlong Road 2046 Daily Scenario 1

Legend

Traffic Volume Bandwidth

———	<100
———	100-200
———	200-400
———	400-800
———	800-1200
———	>1200
———	Selected Link

SHWEP Select Link Analysis of St Albans Rd 2046 AM Scenario 1

Legend

Traffic Volume Bandwidth

	<100
	100-200
	200-400
	400-800
	800-1200
	>1200
	Selected Link

SHWEP Select Link Analysis of Mulhall Dr. 2046 AM Scenario 1
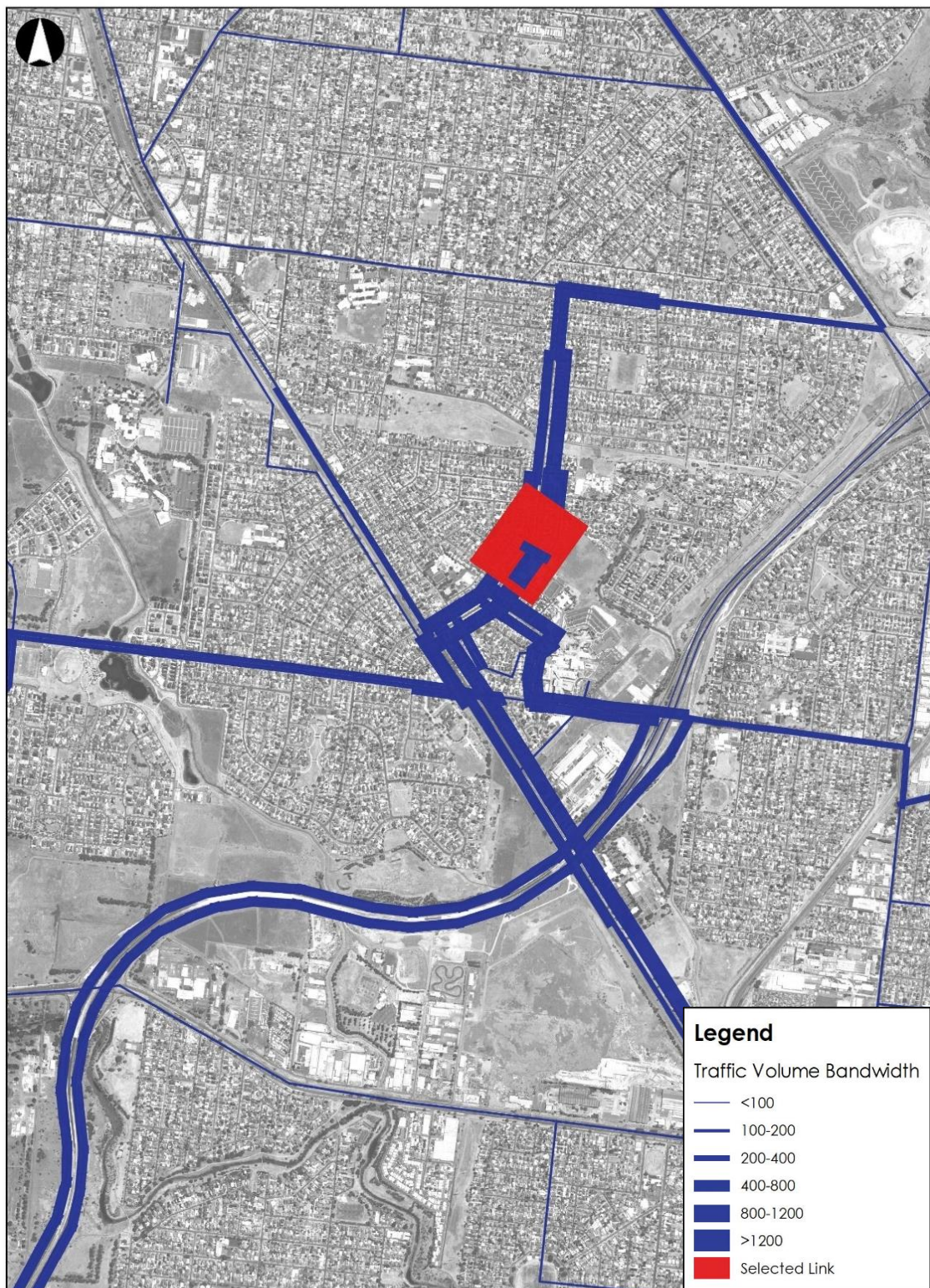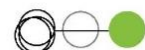
Legend

Traffic Volume Bandwidth

	<100
	100-200
	200-400
	400-800
	800-1200
	>1200
	Selected Link
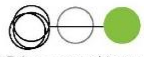
SHWEP Select Link Analysis of Mulhall Dr. 2046 Daily Scenario 1
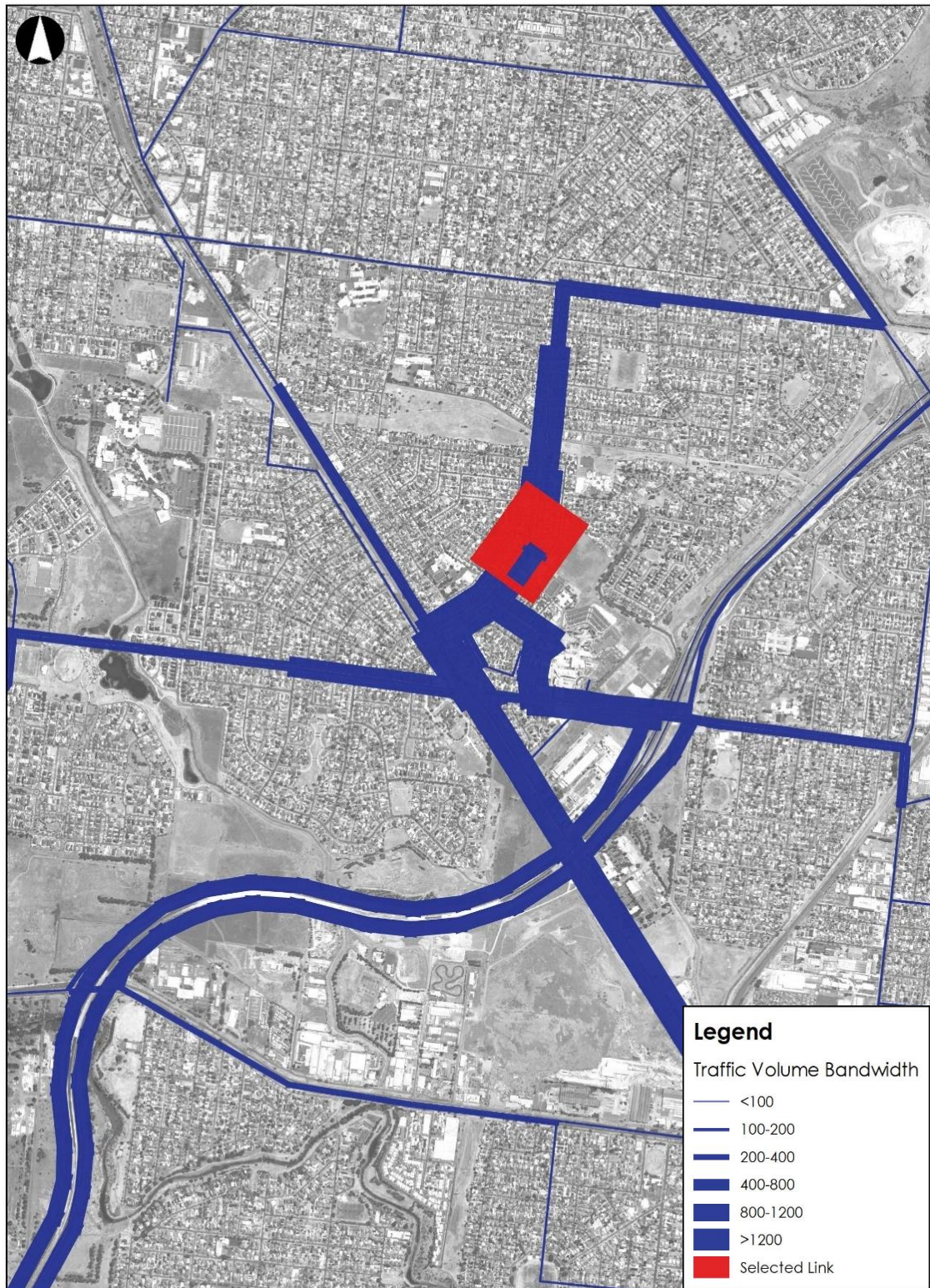
Legend

Traffic Volume Bandwidth

— <100
— 100-200
— 200-400
— 400-800
— 800-1200
— >1200
■ Selected Link

SHWEP Select Link Analysis of Proposed New Link 2046 AM Scenario 1

Legend

Traffic Volume Bandwidth

———	<100
———	100-200
———	200-400
———	400-800
———	800-1200
———	>1200
■	Selected Link

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SHWEP Select Link Analysis of Proposed New Link 2046 Daily Scenario 1

Legend

Traffic Volume Bandwidth

— <100
— 100-200
— 200-400
— 400-800
— 800-1200
— >1200
■ Selected Link

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