Minta Farm PSP

City of Casey

Peer Review and Traffic Impact Assessment

Revision | 5

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Contents

Executive Summary

Background and regional context

The South East Growth Corridor is one of the fastest growing regions within Australia, and will eventually accommodate a population of 230,000 or more people and has the capacity to provide for at least 86,000 jobs. The Minta Farm Precinct Structure Plan is at the heart of the growth corridor. It comprises approximately 285 hectares and is expected to cater 2,850 residential dwellings and 11,260 jobs, along with supporting community facilities, open space and activity centres. The Minta Farm PSP area has long been identified by Council and the Victorian Government as a key location for business and employment opportunities.

The Victorian Planning Authority has prepared the draft Minta Farm Precinct Structure Plan (PSP) to guide new urban development within the Minta Farm precinct area. The Precinct Structure Plan is currently under review, with the Planning Panel scheduled for April 2018.

Peer review

This report has undertaken a critical review of documents related to the Minta Farm PSP to confirm the suitability of previous traffic modelling and determine if all traffic and transport issues associated with the Minta Farm PSP are fully addressed.

The peer review found a number of concerns with regards to the previous traffic modelling and consideration of wider transport issues, which raises questions around the suitability of the analysis underpinning the planning of Minta Farm. A summary of the traffic and transport findings that were identified as unacceptable or requiring clarification are summarised below by category.

Category: Data sources

- There are concerns regarding the quality of data used from SCATS and ABS
- The previous modelling was based largely on a superseded draft Future Urban Structure Plan by VPA, which included slightly different road alignments and level of proposed development to that in the exhibited PSP. Modelling should be undertaken with the updated PSP structure plan to ensure the layout configurations within and surrounding the Minta Farm PSP are still appropriate.

Category: Trip generation

- There are a number of concerns with regard to trip generation assumptions. In a number of instances, information pertaining to forecast volumes and reference to other sources were not included in the reports, bringing in to question the trip generation rates utilised
- A 25% reduction is commonly applied to external residential dwelling trips to account for the proportion of trips that would be internal to the development area. However, as interim development will contain residential land-use only (no internal destinations). Assuming a 25% reduction for the interim development scenarios underestimates the traffic generation of the development, which ultimately impacts the analysis and conclusions drawn regarding impacts on the road network

Category: Modelling/ traffic distribution

- The reduction of vehicle trips in the sensitivity testing to account for VISTA data mode split findings, is considered unreasonable given the lack of development of a public transport network

Category: Cross sections/ road layout

- No modelling for storage requirements of turning lanes has been undertaken
- With regards to cycling infrastructure provision, dedicated cycle links should be incorporated to ensure cyclists are not forced to share the road with vehicles, both moving and parked, and to complement the proposed off-road network
- There are concerns with the inclusion of on-road cycle lanes along Grices Road (and whether they would connect to a wider cycle network) and the intersection layout of O'Shea Road/ North-South Arterial. The interim layout of O'Shea Road, Grices Road and the North-South Arterial should also be designed with its ultimate layout in mind. Council to ensure when interim designs are provided that they tie into the ultimate design.

Category: Public transport

- The primary concern surrounding public transport in the Minta Farm PSP area centres on the location of bus stops and the lack of provision for bus priority lanes, primarily along the North-South Arterial. With no locations confirmed for bus stops within the development, stops could be placed in less-than-optimum locations and fail to maximise its catchment
- Additionally, with no indication of bus priority allocated for, especially on the North-South Arterial, a key link in the transport network between the Pakenham rail line and the PSP could be compromised
- If public transport infrastructure requirements are not captured in the PSP, Council is unable to require that additional land be set aside for bus stops, bus priority lanes etc when development commences. Furthermore, if the ICP does not reflect the true land take, this could have financial implications for Council

Category: Walking and cycling

- While a significant amount of off-road bike paths has been allowed for within the Minta Farm PSP area, there are a couple of key missing links within the activity centres in Minta Farm and a lack of integration with the existing network in adjacent developments. If such links are not identified and captured within the PSP, this could result in a lost opportunity to improve the provision of cycling infrastructure in the new development

Category: Smart Cities / 20 Minute Neighbourhoods

- In order to meet Smart Cities and 20 Minute Neighbourhood objectives as set out in the City of Casey's Integrated Transport Strategy, there is a need to emphasise public and active transport modes, through the provision of high-quality walking and cycling routes and public transport facilities. However, there is no evidence to suggest they have been fully considered
- If not fully considered from the outset, this could have significant implications in terms of accessibility, liveability and sustainability of the development

Transport impact assessment

Further transport modelling was undertaken by Jacobs to understand the implications of development at Minta Farm on the broader network and to determine whether the 1,000 dwelling lot cap is an appropriate cap for the North–South Arterial to be constructed. As part of this assessment, multiple road infrastructure and lot development scenarios were analysed to capture current and forecast conditions, both with and without the Minta Farm Development. The assessment also tested scenarios related to the recent announcement[1] regarding Monash Stage 2 which could see State Government commencing construction works on the Beaconsfield Interchange and connection to and duplication of O'Shea Road, as early as 2019.

[1] https://www.premier.vic.gov.au/wp-content/uploads/2018/03/180318-Work-To-Start-On-Monash-Stage-Two-This-Year.pdf

Trip generation

The Minta Farm Precinct is expected to generate approximately 72,000 daily vehicle trips once fully developed. A summary of the total number of estimated trips per land use is provided below:

Land use	Daily trips	Peak hour trips
Residential	19,258	1,819 (AM Peak), 1,819 (PM Peak)
Retail	19,405	581 (AM Peak) 1,778 (PM Peak)
Other (office/ innovation/ industry)	33,840	4,578 (AM Peak) 4,280 (PM Peak)
Total	**72,503**	**6,978 (AM Peak)** **7,877 (PM Peak)**

This includes a 25% reduction to external residential dwelling trips to account for the proportion of trips that would be made internal to the development area. At interim development this reduction does not apply as there will be no destinations within the PSP area (such as a school, town centre, employment area).

Trip distribution

VISTA data was used to develop the trip distribution for the Minta Farm development. VISTA data takes into account non-work related trips and represents an average weekday.

Background traffic growth rate

Background traffic in the area surrounding Minta Farm is assumed to grow at 6% per annum from 2018 (when surveys were conducted) to 2021 when lot scenarios have been modelled. For the full development scenarios (i.e. full build out of the Minta Farm precinct), 2046 was designated as the future design year, and a growth factor of 72% (approximately 2% per annum) was applied to the 2018 volumes.

Intersection modelling

Intersection modelling was undertaken in SIDRA Intersection version 7, for five existing intersections around the site and the planned North-South Arterial/ O'Shea Road intersection. Four development scenarios were modelled, 500, 750 and 1000 lots (at 2021) and the ultimate build out (2046). The following scenarios were modelled in order to establish appropriate development triggers for the delivery of transport infrastructure projects identified in the proposed PSP:

- No improvements to the current road network
- Truncation of Soldiers Road with interim delivery of the North-South Arterial (2 lane carriageway)
- Truncation of Soldiers Road with delivery of North-South Arterial (4 lane carriageway)
- Delivery of O'Shea Road (4 lane carriageway, Clyde Road to Princes Freeway) and Beaconsfield Interchange without delivery of the North-South Arterial
- Truncation of Soldiers Road with interim delivery of the North-South Arterial (2 lane carriageway) and delivery of O'Shea Road (4 lane carriageway, Clyde Road to Princes Freeway) and Beaconsfield Interchange
- Truncation of Soldiers Road with delivery of North-South Arterial (4 lane carriageway) and delivery of O'Shea Road (4 lane carriageway, Clyde Road to Princes Freeway) and Beaconsfield Interchange

A number of sensitivity tests were also undertaken on the duplication of Grices Road to further assist in the identification of critical infrastructure improvements to support the 1,000 lot development scenario.

Key Findings

Key findings from the analysis are summarised below:

Without Minta Farm development		
Horizon	**Key findings**	**Critical transport infrastructure**
2018 with no improvements to current road network 2021 (6% p.a. growth) with no improvements to current road network	• **Clyde Road/ O'Shea Road** and **Clyde Road/ Grices Road** are already operating above capacity, except Clyde Road/ Grices Road in PM peak for 2018 • All other intersections operate satisfactorily	• Clyde Road/ O'Shea Road intersection requires an intersection capacity upgrade • Clyde Road/ Grices Road intersection requires an intersection capacity upgrade
2021 (6% p.a. growth) with delivery of O'Shea Road (4 lane carriageway) and Beaconsfield Interchange	• **Clyde Road/ O'Shea Road** and **Clyde Road/ Grices Road** are already operating above capacity • The O'Shea Road/ Beaconsfield Interchange connection diverts traffic from Clyde Road, however, as this becomes a desirable link to the Princes Freeway it will induce traffic demand to O'Shea Road, Grices Road and Soldiers Road. The induced demand at the **Grices Road/ Soldiers Road** intersection causes it to fail	• Grices Road requires duplication between Clyde Road and Viewgrand Drive • Grices Road/ Soldiers Road intersection requires an upgrade

With Minta Farm development		
Horizon	**Key findings**	**Critical transport infrastructure**
2021 with 500, 750 & 1,000 lot scenarios with all road network scenarios.	• **Chase Boulevard/ Soldiers Road** generally operates satisfactorily, regardless of the lot scenarios and surrounding road infrastructure upgrades	• Not dependent on other infrastructure, however, it does benefit from the North-South Arterial being built
	• **O'Shea Road/ Soldiers Road** fails for the following scenarios; a) No improvement to current road network b) Truncation of Soldiers Road with interim delivery of North-South Arterial (2 lane carriageway) c) Truncation of Soldiers Road with delivery of North-South Arterial (4 lane carriageway) • O'Shea Road /Soldiers Road operates satisfactorily for all scenarios where the O'Shea Road extension/ Beaconsfield Interchange is built	• O'Shea Road requires duplication between Clyde Road and Beaconsfield Interchange • O'Shea Road/ Soldiers Road intersection requires an upgrade • Beaconsfield Interchange requires an upgrade

With Minta Farm development		
Horizon	**Key findings**	**Critical transport infrastructure**
	• **Grices Road/ Soldiers Road** fails in AM peak, prior to 500 lots being developed at Minta Farm However, it also fails without Minta Farm when Beaconsfield Interchange is built. This is due to traffic redistribution	• Grices Road/ Soldiers Road intersection requires an upgrade if; a) The Beaconsfield Interchange is built b) Before Minta Farm reaches 500 lots and Beaconsfield interchange is not built • North-South Arterial needs a connection to Soldiers Road before either Beaconsfield Interchange is operational or Minta Farm reaches 500 lots. This is due to the truncation of Soldiers Road as part of the intersection upgrade
	• **Clyde Road/ O'Shea Road** performance deteriorates with the development of Minta Farm, remaining above capacity • North-South Arterial alleviates some congestion on Clyde Road, without O'Shea Road extension and Beaconsfield Interchange. This is due to traffic being diverted from Clyde Road to the North-South Arterial, particularly via Grices Road. This traffic distribution results in the Grices Road/ Soldiers Road intersection operating beyond capacity • When O'Shea Road extension and Beaconsfield Interchange is built, its intersection with Clyde Road performs more unsatisfactorily (above capacity). This is due to likelihood that the Greaves Road/ O'Shea Road connection to the Beaconsfield Interchange becoming a key link to the Princes Freeway.	• Improvements to the Clyde Road/ O'Shea Road intersection are dependent on wider road network improvements, such as upgrades to Thompsons Road, Glasscocks Road, Greaves/ Pound Road and other key arterial roads
	• **Clyde Road/ Grices Road** is not significantly impacted from the Minta Farm development The intersection is more impacted by the Beaconsfield Interchange upgrade • Clyde Road/ Grices Road operates marginally better with the interim North-South Arterial, without the O'Shea Road extension and Beaconsfield Interchange upgrade • When O'Shea Road extension and Beaconsfield Interchange is built, this	• Clyde Road/ Grices Road operates satisfactorily when Grices Road is duplicated and a double right-turn provided

With Minta Farm development		
Horizon	**Key findings**	**Critical transport infrastructure**
	intersection fails due to traffic redistribution and not due to the Minta Farm development	
2046 with full development with all road network scenarios	• Generally, all intersections, aside from Chase Boulevard/ Soldiers Road, fail with significant deterioration of operating performance This is taking into consideration; a) Casey's 2046 population forecast b) Minimal road network upgrades within the study area • Previous modelling indicates that when the road network is fully developed, most roads within the vicinity of Minta Farm and the South Eastern Growth Corridor still operate close to capacity	• Road infrastructure alone will not resolve the estimated traffic congestion within Minta Farm area and the wider South Eastern Growth Corridor • Key employment centres within the region, such as Minta Farm, need to focus on encouraging modal shift to public transport and active transport to reduce the reliance on private vehicles • Investigate dedicated public transport corridors and plan to encourage active transport as a mode of choice

Appropriateness of Requirement R96

Following the traffic impact assessment, a review on the appropriateness of Requirement R96 in the Exhibited *Minta Farm Precinct Structure Plan* (VPA, October 2017) was undertaken, highlighting the critical transport infrastructure required and the potential lot caps as follows:

Road upgrade	Critical transport infrastructure	Lot cap
O'Shea Road/ Beaconsfield Interchange	Duplicate O'Shea Road between Clyde Road and Beaconsfield Interchange, and upgrade to full diamond interchange	By 500 lots, the Beaconsfield Interchange and O'Shea Road duplication needs to be complete
Grices Road/ Soldiers Road	Signalise intersection and truncate Soldiers Road	By 500 lots or if Beaconsfield Interchange is upgraded
Grices Road	Duplicate Grices Road between Clyde Road and Soldiers Road	By 500 lots or if Beaconsfield Interchange is upgraded
North-South Arterial	Construct interim 2-lane carriageway	By 1001 lots, if Beaconsfield Interchange is not upgraded

Essentially, the finding from this analysis is that the O'Shea Road duplication through to the Beaconsfield Interchange and improvements along Grices Road are as important as the North-South Arterial in alleviating traffic congestion in the surrounding Minta Farm area. The 1000 lot cap in place prior to the construction of the North-South Arterial hinges upon the construction of the O'Shea Road extension and the construction of the Beaconsfield Interchange.

1. Introduction

Jacobs Group (Australia) Pty Ltd has been engaged by the City of Casey ("the Council") to investigate the potential traffic and transport impacts on the road network surrounding the Minta Farm Precinct Structure Plan (PSP) under various lot development scenarios for the Minta Farm PSP area.

1.1 Purpose

The objective of this study was to undertake a critical review of documents related to the Minta Farm PSP, undertake new transport modelling to better understand the implications of development at Minta Farm on the broader network and to determine whether the 1,000 dwelling lot cap is an appropriate cap for the North–South Arterial to be constructed.

The scope of the study is to:

- Undertake a peer review of previous documents related to the Minta Farm PSP to confirm if critical traffic and transport risks have been identified in previous assessments
- Review the suitability of previous traffic modelling, including assumptions, intersections layouts, traffic generation, assignment and distribution
- Review the existing conditions of the key intersections within the study area
- Undertake scenario testing to determine an appropriate level for the dwelling lot cap
- Undertake scenario testing to determine the critical transport infrastructure required to assist in the development and staging of the PSP

The outcomes of the study will enable the Council to make an informed decision regarding the timing of the construction of critical transport infrastructure within the study area.

1.2 Report structure

This report includes the following main sections:

- **Section 1: Introduction** – outlines the purpose and scope of the report
- **Section 2: Strategic context** – provides background information on the documents relevant to the Minta Farm PSP and its study area
- **Section 3: Peer review** – highlights the major concerns related to topics such as public transport, walking and cycling, modelling and road layouts/ cross sections, after reviewing the relevant documents
- **Section 4: Traffic impact assessment** – provides a summary of the existing and forecast transport conditions within the study area. Outlines trip generation estimates and distribution for different network and development scenarios, and analyses the results to determine whether the 1,000 dwelling lot cap is appropriate and what transport infrastructure is critical
- **Section 5: Appropriateness of Requirement R96** – summarises the findings of the study and outlines an appropriate lot cap for the different scenarios

2. Strategic context

2.1 South East Growth Corridor

The South East Growth Corridor is one of the fastest growing regions within Australia, and will eventually accommodate a population of 230,000 or more people and has the capacity to provide for at least 86,000 jobs[2]. The Minta Farm PSP is at the heart of the growth corridor. The 290 hectares of land is expected to cater approximately 2,850 residential dwellings and 11,260 jobs, along with supporting community facilities, open space and activity centres.

As shown in Figure 1, Minta Farm is generally bounded by the Princes Freeway to the northeast, Cardinia Creek to the east, Grices Road to the south and Soldiers Road to the west. It is strategically located adjacent to the future Beaconsfield Interchange with the Monash Freeway.

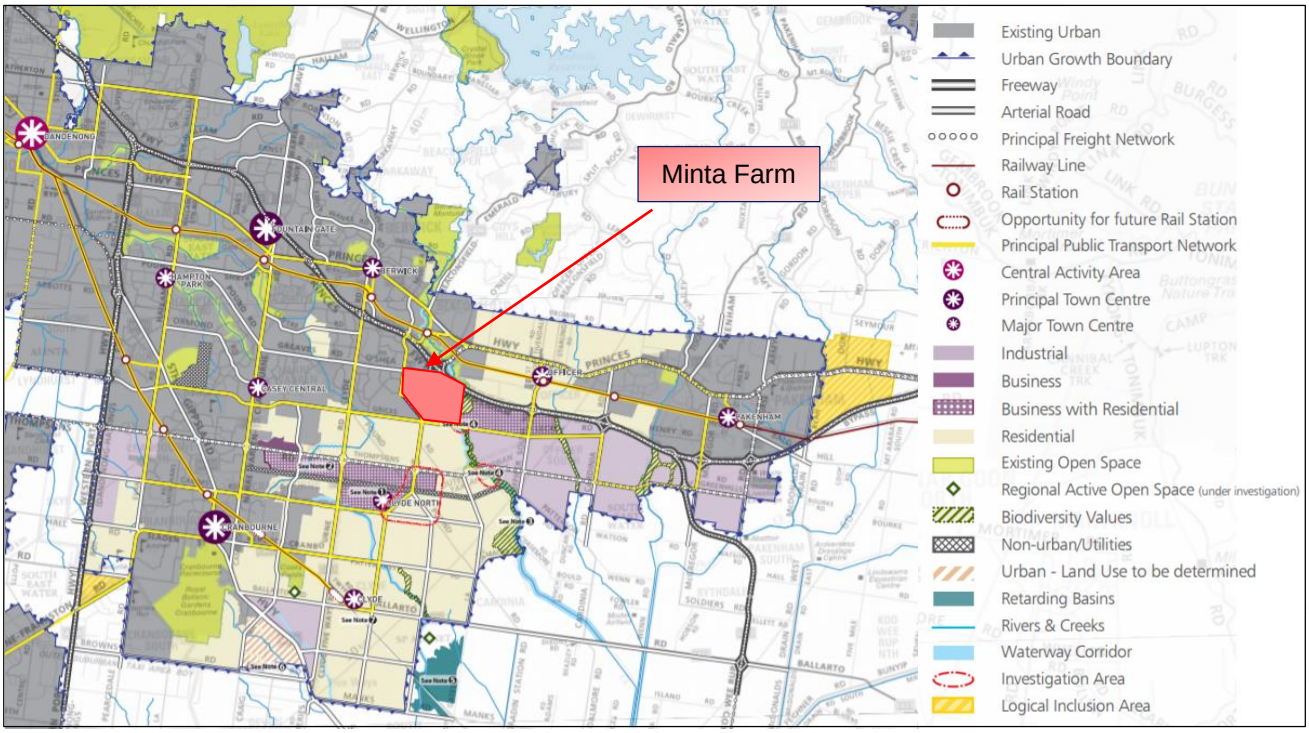


Figure 1: South East Growth Corridor Plan (Minta Farm Precinct Structure Plan, VPA October 2017)

Minta Farm PSP is a greenfield development site, however existing and proposed surrounding land use add complexities to this classification from a transport planning perspective.

The site adjoins an established residential development to the west, and residential developments in the growth area to the south (including the Clyde North PSP, Thompsons Road PSP and Clyde Creek PSP areas) which are advancing rapidly. Within close proximity to the Minta Farm PSP, there are also a number of schools, as well as the Berwick township and the Berwick Health and Education Precinct, all of which place specific and significant demands on the surrounding transport network. Congestion and capacity concerns are already identified as key existing issues.

[2] https://vpa.vic.gov.au/wp-content/Assets/Files/GCP%20-%20Chapter%205%20North%20Corridor%20Plan.pdf

2.2 Precinct Structure Plan status

The Victorian Planning Authority (VPA) has prepared the draft Minta Farm PSP to guide new urban development within the Minta Farm precinct area. The PSP is currently under review, with a Planning Panel scheduled for April 2018.

As shown in Figure 2, many of the surrounding PSPs have been approved by the VPA and are in the process of being delivered.

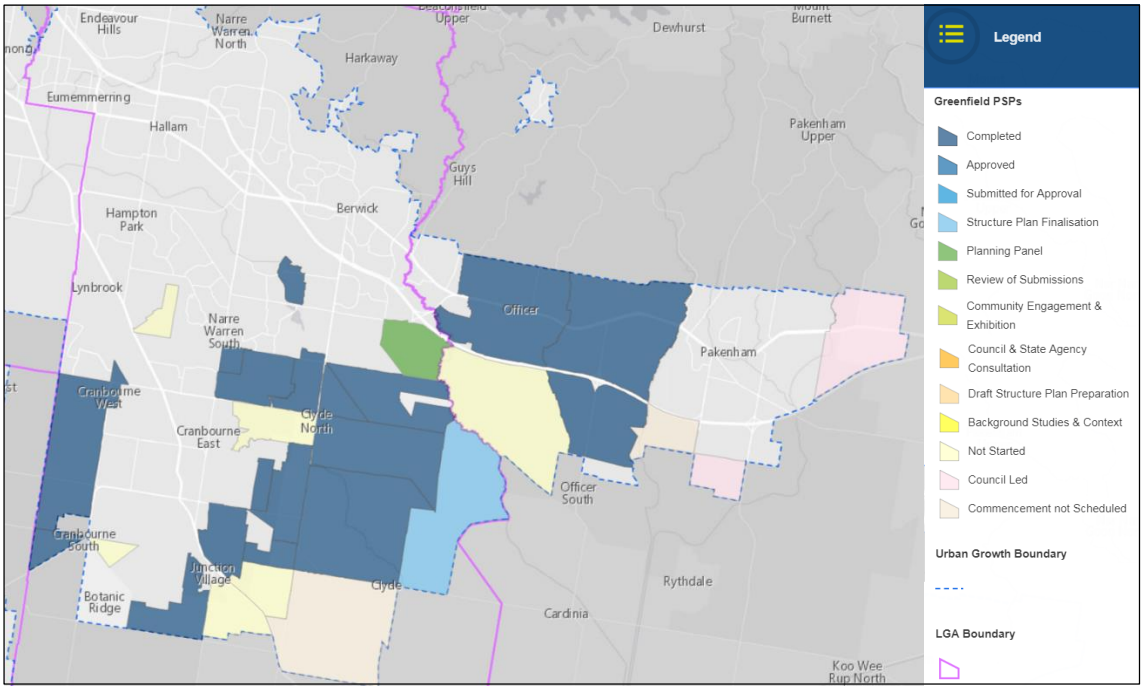


Figure 2: VPA South East Corridor PSP status map (https://vpa.vic.gov.au/greenfield/interactive-status-map/)

2.3 City of Casey Integrated Transport Strategy 'Streets Ahead'

The City of Casey adopted their Integrated Transport Strategy titled 'Streets Ahead' in November 2017, which provides guidance and direction on investment and improvements to all modes of transport.

Streets Ahead introduces the overarching vision of *'making the City of Casey a connected City for everybody to work, live and thrive in'*. It identifies four strategic objectives required to realise the vision, which are as follows:

- Establish 20-minute neighbourhoods
- Support and enhance sustainable modes of transport
- Create an efficient and reliable network
- Adopt a 'smart city' approach to transport planning

A summary of these objectives and their expected outcomes is provided in Table 1.

Table 1: Summary of Integrated Transport Strategy 'Streets Ahead'

Number	Objective	Description	Expected outcomes
01	Establish 20-minute Neighbourhoods	The '20-minute neighbourhood' concept centres on residents having access to all amenities and basic services within 20-minutes by walking, cycling or public transport	• Majority of Casey residents can access their day to day needs within 20 minutes by walking, cycling or public transport • Walking and cycling are convenient transport modes for short trips • Footpaths and bicycle facilities effectively link from residential areas to shops and services • Public transport is an accessible mode for residents • Maximise local employment opportunities
02	Promote and enhance sustainable modes of transport	Sustainable transport includes walking, cycling and public transport. Sustainable modes of transport help meet the needs of the current population with the least harmful effect on future generations	• Increase in school trips made by active transport • The community feels safe and confident using active transport modes for short trips. • Increased investment in sustainable transport infrastructure • Community acceptance of sustainable transport modes as being legitimate transport choices
03	Efficient and reliable network	An efficient and reliable transport network moves people and goods safely, in a timely manner and is accessible for all	• Proactive and effective planning of our transport network to respond to the growth pressures in Casey • Transport infrastructure and services are delivered in a timely manner responding to network and community needs • Cranbourne rail line duplication and extension are delivered in the next five years • Fast, frequent, reliable and connected bus network across Casey • Existing transport infrastructure and resources are used efficiently and effectively
04	Adopt a 'smart city' approach to transport planning	The concept of a 'smart city' involves how both information and communication technologies can improve the functioning of the urban environment	• Smart data analytics inform transport decisions • Intelligent transport solutions are applied across the transport network • Transport options driven by smart technology are encouraged • Casey residents have easy access to information of available transport choices. • Real time information is available

2.4 Study area

The Minta Farm PSP area is located approximately 45 kilometres south-east of Melbourne's Central Business District in the City of Casey. It comprises approximately 285 hectares of land, generally bounded by the Princes Freeway to the north-east, Cardinia Creek to the east, Grices Road to the south and Soldiers Road to the west.

The precinct is expected to accommodate approximately 2,850 dwellings (8,000 people) and 11,260 ongoing jobs, along with supporting community facilities, open space and activity centres. The Minta Farm PSP area has long been identified by Council and the Victorian Government as a key location for business and employment opportunities. The employment precinct (comprising a net developable area of 69 hectares) will support a mix of commercial, office, technology businesses and light industry, providing opportunities for a diverse range of employment close to home.

A planning permit application is also being considered concurrently with the amendment under Section 96A of the *Planning and Environment Act 1987*. The permit application proposes a multi-staged subdivision for residential development, comprising 231 lots (refer area in red below). The VPA is the responsible authority for the consideration of the permit application and Council is a referral authority.

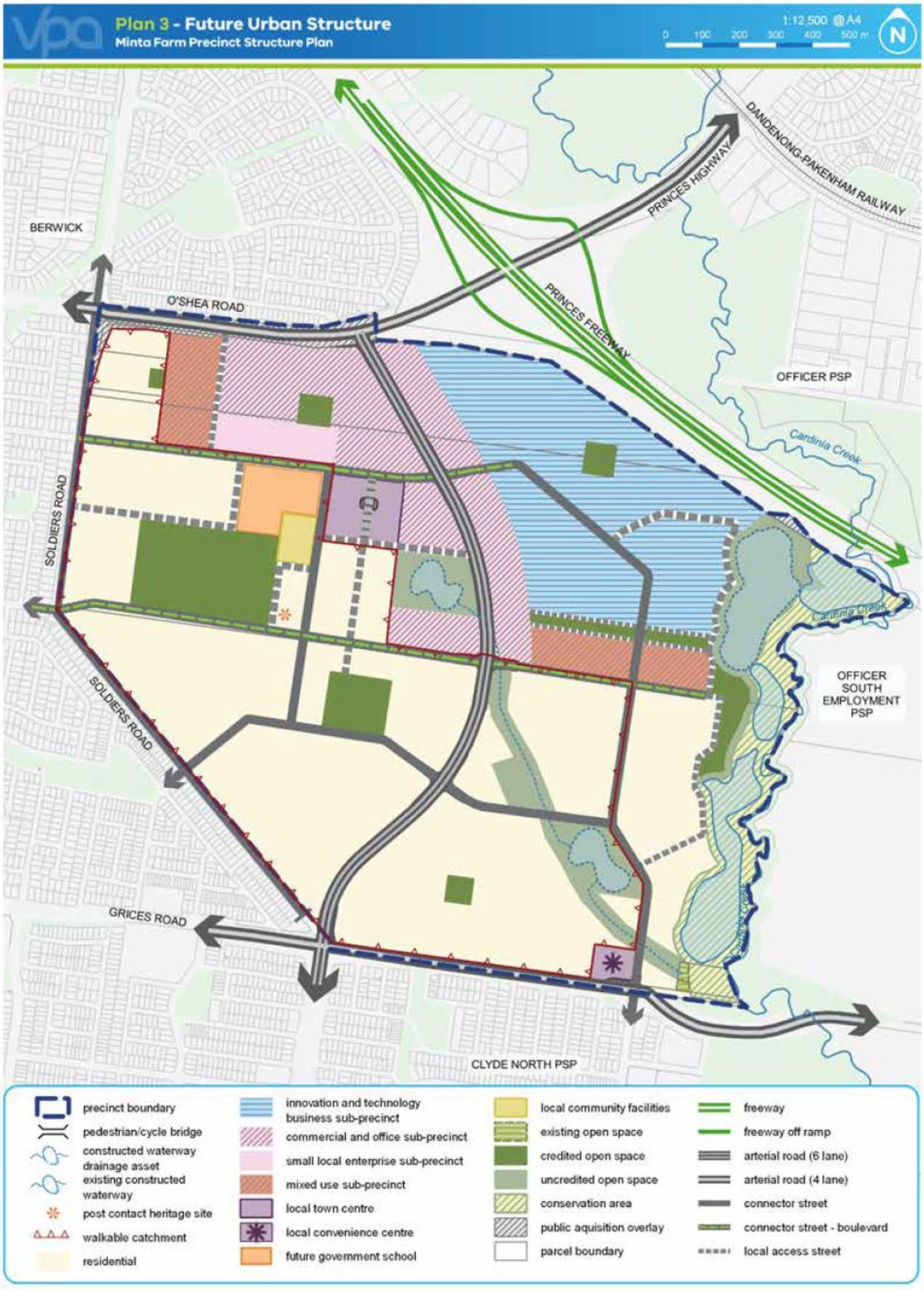


Figure 3: Minta Farm Future Urban Structure (Minta Farm Precinct Structure Plan, VPA October 2017)

2.5 Reference documents

The VPA have undertaken technical investigations in housing and employment, transport, Aboriginal heritage, environment and biodiversity, social infrastructure and open space, and utilities to inform the preparation of the draft PSP. Table 2 summarises the traffic and transport assessments undertaken by, or on behalf of, VPA which were provided by Council for peer review as part of this study (Section 3).

A planning permit application is also being considered alongside the PSP for a multi-staged residential subdivision development. The application seeks approval for the first stage of residential development within the Minta Farm site, totalling 231 lots. The traffic impact assessment prepared on behalf of the developers, Stockland, has also been reviewed as part of this study.

Table 2: Summary of reference documents

Title	Description	Author	Date completed
Strategic Transport Modelling Assessment (Ultimate Scenario) – McPherson, Croskell and Minta Farm Precincts	Strategic transport modelling of the ultimate (2046) development scenario undertaken as part of the preparation of the draft Urban Structure. The outputs of the strategic modelling formed an input into further modelling to determine the road and intersection configurations that will be included in the PSP and subsequent Development Contributions Plans (DCPs), or similar	Cardno (prepared for VPA, formerly MPA)	August 2015
Traffic Engineering Assessment, Additional Traffic Modelling at Minta Farm PSP 11	Additional Traffic Modelling in relation to the Minta Farm PSP. Three (3) development scenarios were assessed (i.e. 1,000, 1,250 and 1,500 lots). The modelling aimed to determine the level of development possible prior to the construction of the key north-south arterial road through the subject site	Traffix Group (prepared for VPA)	September 2017
Exhibited Minta Farm Precinct Structure Plan	PSP prepared by the VPA for the Minta Farm site. A long-term plan for urban development, describing how the land is expected to be developed, and how and where services are planned to support development	VPA	October 2017
Minta Farm Precinct Structure Plan – Concept Road Design Report	Concept designs for both interim and ultimate arrangements for five key intersections and four road segments in relation to the Minta Farm PSP	Traffic Works Pty Ltd (prepared for VPA)	October 2017
Minta Farm Berwick – S96A – Traffic Impact Assessment	Transport Impact Assessment of the proposed residential subdivision development (231 lots) at Soldiers Road, Berwick, to inform the Section 96A application	Onemilegrid (prepared for Stockland Development)	October 2017

3. Peer review

3.1 Scope of peer review

The purpose of this peer review is to confirm the suitability of previous traffic modelling and determine if all traffic and transport issues associated with the Minta Farm PSP have been fully addressed. This includes an assessment of the methodology used (including assumptions, intersection layouts, traffic generation, assignment and distribution), the data selection and alignment to State Government and the City of Casey's network objectives, strategies and goals.

The review findings have informed the scenario testing at Section 4 of this Report, with a view to assuring all stakeholders on the final analytical approach, methodology, inputs, parameters and the findings of the analysis.

The peer review focuses on the following documents:

- Exhibited Minta Farm Precinct Structure Plan (VPA, October 2017)
- Traffic Engineering Assessment, Additional Traffic Modelling at Minta Farm PSP 11 (Traffix Group on behalf of VPA, September 2017)
- Minta Farm Precinct Structure Plan – Concept Road Design Report (Traffic Works Pty Ltd on behalf of VPA, October 2017)
- Minta Farm Berwick – S96A – Transport Impact Assessment (Onemilegrid on behalf of Stockland Development, October 2017)
- Strategic Transport Modelling Assessment (Ultimate Scenario) – McPherson, Croskell and Minta Farm Precincts (Cardno on behalf of VPA, August 2015)

3.2 Detailed peer review findings

Table 3 to Table 7 highlight Jacobs findings of the peer review component. Each finding has been categorised as either acceptable, coloured green in the 'acceptability of finding' column, or unacceptable, which is coloured red. Unacceptable is defined as requiring further clarification before the finding can be accepted, assumptions or omissions that are non-standard and have a material impact on the findings of a report or the development of a transport network that meets the aims of the development. Where a finding has been categorised as unacceptable, a recommendation has been provided to resolve the issue.

Table 3: Exhibited Minta Farm Precinct Structure Plan (VPA, October 2017) – Peer Review Findings

Section	Key findings	Acceptability of finding
Land use scenarios		
2.2 Objectives	*"O5 – Deliver a minimum of 2,853 new homes (20.1 dwellings per net developable hectare overall precinct average)"*	
2.2 Objectives	"*O7 – Ensure medium and high density development is prioritised within walkable catchments around key destinations and public transport"*	
2.2 Objectives	*"O23 – Ensure that development staging is co-ordinated with the timely delivery of key local and state infrastructure."*	
Public transport		
3.5.1 Public Transport	Requirements for households to have direct and convenient walking access to public transport services. Roads and roundabouts to accommodate ultra-low-floor buses. Bus stop and facilities must be designed as an integral part of town centres and activity generating	

Section	Key findings	Acceptability of finding
	land uses such as schools, community facilities, sports fields, employment areas and the employment precinct.	
3.5.3 Town centre transport, access and connectivity	"*Public transport hubs, stops and routes must be located to facilitate access to key destinations and generate activity in town centres.*"	
3.4 Plan 9	Significant amount of bus capable roads have been allowed for in Minta Farm PSP area. However, Plan 9 does not confirm the location of the bus stops. This could provide ambiguity between developers, Council and State Government on the precise location of each bus stop. Plan 9 does not show whether any of the roads will contain bus priority. Given the North-South Arterial will be a key link to the Pakenham rail line and the PSP will be a major employment hub, some level of bus priority should be provided. ***Jacobs recommendation:* Confirm location of bus stops and allow for some level of bus priority.**	
Walking & cycling		
3.2.1 Local Town Centre	Contains requirements for the local town centre to prioritise pedestrians and provide for continuous path of travel for pedestrians and cyclists. Traffic calming measures have been made a requirement.	
3.4 Plan 9	Significant amount of off-road bike paths have been allowed for in Minta Farm PSP area. Plan 9 does not show the integration with the bicycle/ shared paths to the adjacent developments. For example, Soldiers Road, south of Chase Boulevard has a shared path along the western side of the road which is not shown. Furthermore, Plan 9 shows the two-way bicycle path continuing into the developments west of Soldiers Road, whereas there are existing shared paths in these locations. Furthermore, the four lane arterial (Grices Road and O'Shea Road) cross sections have on road bike lanes, however, the existing Grices Road and O'Shea Road have off-road shared paths. ***Jacobs recommendation:* Reconfigure cross sections to ensure all cycling is off-road and integrated with adjacent developments.** Refer to Traffic Engineering Manual Volume 3 – Additional Network Standards & Guidelines Design Guidance for strategically important cycling corridors Figure 4 Page 9, on road is not recommended for these roads.	
3.5.2 Walking and Cycling	The requirements for providing priority in the design of streets to cyclists and pedestrians cater for the safety of these users and assist in the aim of increasing active transport.	
3.5.3 Town centre transport, access and connectivity	"*Pedestrian priority must be provided across all side roads along main streets and all car park entrances.*"	
Cross sections/ road layout		

Section	Key findings	Acceptability of finding
3.5.3 Town centre transport, access and connectivity	*"Main Street must be designed for a low-speed 40 km/hr environment, such that vehicles and cyclists share the carriageway and pedestrians can safely cross the road."* *"Safe and easy access for pedestrians and cyclists must be provided to the town centre through the layout and design of the surrounding street and path network."* The PSP is designed to ensure cyclists are off-road within the main boundaries, however, within the activity centres, cyclists are forced to share with vehicles within the vicinity of cars parking. ***Jacobs recommendation:* Include potential dedicated bicycle links as shown in red below.** 	
20 Minute Neighbourhoods		
2.2 Objectives	*"O17, O18, O19, O20"* transport and movement objectives strongly align with the 20-minute neighbourhood's concept.	
3.5.1 Public Transport	The public transport requirements stated in section 3.5.1 align with the principles of 20-minute neighbourhoods.	

Table 4: Traffic Engineering Assessment, Additional Traffic Modelling at Minta Farm PSP 11 (Traffix Group, September 2017) – Peer Review Findings

Section	Key Findings	Acceptability of finding
Data sources		
3.4.2 Turning movement counts	*"Traffix Group conducted turning movement counts on Wednesday, 29th March, 2017"* The school term finished on 31st March 2017. There could be a potential difference between normal traffic volumes and the traffic volumes collected on 29th March 2017 due to the potential for some families commencing holidays early. Jacobs conducted a review of the SCATS volumes at the Clyde Road/ O'Shea Road and Clyde Road/ Grices Road intersections from the 22nd March 2017 and 29th March 2017. The finding from this review was that the volumes were comparable, with the O'Shea Road intersection being slightly higher on the 29th but not out of the realm of daily fluctuations in traffic volumes.	

Section	Key Findings	Acceptability of finding
3.4.2 Turning movement counts	Figure 3 and 4 show the existing turning movement volumes in the peak hour. The Clyde Road/ O'Shea Road intersection data is stated as being collected from SCATS data, however there are no left turn SCATS detectors on any approach and there is no discussion about how these volumes were developed. ***Jacobs recommendation:* Clarification required to determine if the volumes for the left turn slip lanes where undertaken through manual traffic counts.**	
Trip generation		
4.1 Traffic Generation	*"Daily Traffic Generation – 10 trips/ household* This assumption of 10 trips per household appears reasonable as NSW RTA guidelines for residential dwellings trip generation has its trip generation at approximately 9 trips/ household.	
4.1 Traffic Generation	The map in Figure 5 shows the initial residential area as being only residential (when also looking at the PSP). There appears to be no destinations within the specified area that would warrant a 25% reduction in internal trips (i.e. schools, employment, etc.). Section 3.1.1 of the RTA Guide to Traffic Generating Developments, regarding residential dwelling trip generating states: *"Note that not all trips are external trips. As a guide, about 25% of trips are internal to the subdivision, involving local shopping, schools and local social visits. When reviewing the impact of the traffic generated on sub-regional and regional roads, some adjustment is necessary, depending on the location of shops, schools and recreation facilities."* ***Jacobs recommendation: 25% reduction in trips is unreasonable given there are no internal 'destinations' in the development (i.e. schools, employment) during the interim scenarios.***	
Modelling/ traffic distribution		
2. Modelling scenarios	Three development scenarios were to be tested by Traffix Group: • 1,000 dwellings (scenario 1) • 1,250 dwellings (scenario 2) • 1,500 dwellings (scenario 3)	
4.2.1 Global Traffic Distribution	*"The global distribution of traffic volumes throughout the road network has been based on the 2011 ABS Census data for 'Journey to Work'."* Other data sources could also have been used to check the reasonability of these distributions (i.e. VISTA, VITM). Journey to work data only includes data about journeys to work (i.e. no other types of trips like shopping, school drop-offs). 2016 ABS Census data may not have been available at the time of this analysis. ***Jacobs recommendation:* Other data sources could have been used to check the reasonability of the trip distributions as Journey to Work data doesn't include non-work trips. VISTA data could have been used or referred to.**	

Section	Key Findings	Acceptability of finding
4.2.2 Localised Route Selection	Basing the routes taken from the development on the shortest path is a reasonable assumption. The three access points to the development is also a reasonable assumption.	
4.4 Peak Hour Traffic Volumes	The in/out traffic split of 20/80 in the AM peak and 60/40 in the PM peak appear reasonable.	
4.5 Sensitivity Testing (Option 1 – Trip Generation A)	This option applies a discount on the 7.5 trips per household to account for VISTA data stating that 81% of trips occurring in outer Melbourne are taken by private vehicle. This lowers the trip generation to 6.5 trips per household. This could be seriously underestimating the trips created by the development for 1,000 dwellings. ***Jacobs recommendation:*** **Reduction due to mode split is unreasonable as there would most likely be limited public transport and there are limited destinations within walking distance in the area for the first 1,000 lots.**	
4.5 Sensitivity Testing (Option 2 and 3)	Reasonable to undertake a sensitivity test to take account for access locations, but the 7.5 trips per household appears low as stated in comment about section 4.1. ***Jacobs recommendation:*** **25% reduction in trips is unreasonable given there are no internal 'destinations' in the development (i.e. schools, employment).**	
5.1 Daily Traffic Volumes	Traffix Group's post development daily traffic volume assessment considers forecast traffic volumes against guidance on appropriate traffic volumes (by road hierarchy classification) as set out in City of Casey's Road Management Plan. Whilst this is a sound approach, Grices Road and O'Shea Road have been assessed as arterial roads. As there is no firm commitment of if and when these roads are likely to be upgraded, an assessment under their current classification should have also been included. Although the Victorian Government has recently announced the O'Shea Road/ Beaconsfield Interchange upgrade, this is yet to be confirmed within the 2018/19 State Budget. Furthermore, there is an error in Table 6. Target volumes for local roads are stated as ">3,000", when this should be <3,000. ***Jacobs recommendation:*** **Table 6 should be updated to ensure the correct target volume for each road type. Table 6 should also include the existing road conditions for Grices Road and O'Shea Road.**	
5.1.1 Soldiers Road (South of O'Shea Road)	The Traffix Group Reports states: *"Across all proposed scenarios the volume ranges between 8,084-9,701 vehicles per day, which is approximately 1,100-1,700 vehicles per day above the 7,000 vehicles per day threshold… the sensitivity testing has shown that the traffic volumes remain within approximately 15% of this threshold. Our experience indicates that roads such as Soldiers Road are capable of carrying traffic volumes in excess of this threshold (7,000 vehicles per day) and that there are examples of collector roads that carry up to 10,000 vehicles per day. On this basis we consider it acceptable, in the short- to medium-term, for Soldiers Road to accommodate traffic volumes associated with the initial development of 1,000 dwellings on the Minta Farm site."*	

Section	Key Findings	Acceptability of finding
	No examples of collector roads carrying up to 10,000 vehicles were provided. These volumes may be underestimated as per comment about section 4.1. If this is the case, this would impact the analysis and push volumes above 10,000 vpd. No discussion was provided about if there was a preference to keep the road at current classification and volumes for current classification. Potential implications of a road carrying traffic volumes above its classification could include amenity and safety concerns. Clarification should be given for what period of time was considered as short-to-medium term. ***Jacobs recommendation:*** **Clarification should be given to confirm that Soldiers Road will only remain over the theoretical capacity until the North-South Arterial is constructed.**	
5.2.1 Capacity Modelling Methodology	The intersections along O'Shea Road were based on the proposed duplicated layout for O'Shea Road. There is no specification of when this duplication will occur in the report. At least some modelling should have been undertaken without any of the future upgrades to the O'Shea Road and Grices Road included. This would have better informed the level of suitable development prior to the O'Shea Road duplication and extension, the Grices Road duplication and the North-South Arterial construction. ***Jacobs recommendation:*** **A scenario should have been modelled where the O'Shea Road duplication had not been constructed, as there is still uncertainty on the time and funding of construction of this duplication**.	
5.2.3 Intersection capacity results	*"It is noted that intersection capacity analysis has not been undertaken for scenario 2 or scenario 3 as it was established in Section 5.1 that the daily traffic volume on Soldiers Road would exceed its formal target volume under scenario 1"* Understandable conclusion to come to, however in section 5.1.1 it said it was acceptable in the short to medium term to exceed this threshold. *"The above analysis indicates that the intersections along O'Shea Road (post duplication layout) will operate with adequate capacity when accounting for the predicted volumes from the initial development on the Minta Farm site."* A scenario should have been modelled where the O'Shea Road duplication had not been constructed, as there is still uncertainty on the time and funding of construction of this duplication. Intersection capacity results table shows the results for scenario 1, but earlier in the report it states that sensitivity testing was undertaken. It is unclear how the results in this table relates to the sensitivity testing. **Jacobs recommendation: A scenario should have been modelled where the O'Shea Road duplication had not been constructed, as there is still uncertainty on the time and funding of construction of this duplication**.	

Section	Key Findings	Acceptability of finding
Cross sections/ road layout		
3.1 Road Network	Chase Boulevard is listed as collector road, whereas in Council Road Register it is listed as local road. (this is discussed later in comment about section 5.1.2.	
3.1 Road Network	Wurundjeri Boulevard, Meadowlands Way and Kirrabilli Parade are listed as collector roads, whereas in Council Road Register they are listed as local roads.	
3.1 Road Network	Skyline Way is listed as a collector road, however it is a mixture of local and trunk collector road types and the only section being shown as a potential route for the development vehicles (in section 4.2.2) is a local road.	
3.2 O'Shea Road Duplication 3.3 O'Shea Road Extension	Report states that there will be a duplication of O'Shea Road (with preliminary alignment plans sighted by Traffix Group) and a further extension of O'Shea Road to connect to Beaconsfield Interchange. There is no given date for when these upgrades would be constructed or that the O'Shea Road extension had not been fully funded. ***Jacobs recommendation:* Modelling to determine the development cap should have had a scenario based on the existing network layout.**	
5.1.2 Chase Boulevard	*"Council's road register identifies Chase Boulevard as a local road. However, the cross-section is more in line with a collector road (separate lanes in each direction with indented parking on both sides) and has the same cross-section as Bridgewater Boulevard to the west (which is identified as a collector road in Council's road register.* *It appears that Chase Boulevard has been misclassified under Council's Road Register and we are of the view that is could accommodate collector road volumes. On this basis, the projected 2,990-3,826 vpd can be accommodated by Chase Boulevard."* Council has confirmed that Chase Boulevard is correctly classified as a local road (i.e. 1,000 to 3,000 vehicles per day) and therefore should not carry traffic in excess of this classification. ***Jacobs recommendation: given the location of Chase Boulevard connecting Bridgewater Boulevard and the Minta Farm collector, it is reasonable to assume the Chase Boulevard will also act as a collector, especially considering that it will provide an ultimate connection to three schools and a shopping centre.***	
Smart Cities/ 20 Minute Neighbourhoods		
Smart Cities/ 20 Minute Neighbourhoods	This study focused on the assessment of vehicular traffic volumes and intersection performance in the Minta Farm PSP site and surrounding area, to determine the level of development possible prior to the construction of the key north-south arterial road. It does not consider active or public transport connections, nor does it consider the principles of Smart Cities and 20 minute Neighbourhoods. However, as a vehicular transport assessment this is not considered unacceptable.	

Table 5: Minta Farm Precinct Structure Plan – Concept Road Design Report (Traffic Works Pty Ltd, October 2017) – Peer Review Findings

Section	Key Findings	Acceptability of finding
Data sources		
2. Background	Note: At time of the writing of this report, VPA were in the process of preparing the PSP.	
Modelling/ traffic distribution		
Modelling / traffic distribution	No intersection modelling is provided for the reasoning behind the layouts of each of the intersections (i.e. three left turn lanes off O'Shea Road into the North-South Arterial) and their ability to handle future volumes. ***Jacobs recommendation:* Further details should be provided to confirm the layout configuration is appropriate for the development. Given that the strategic modelling occurred for the previous urban structure plan, it is possible the proposed layout configuration needs to be updated.**	
Walking & cycling		
3.1.3 Connector Streets	The three connector street cross-sections (boulevard, industrial and residential) provide for a two-way off-road bicycle path on one side of the road and separate pedestrian paths on both sides of the road.	
Cross sections/ road layout		
2. Background	*"O'Shea Road is currently classified as a local road, configured with one lane in each direction."* O'Shea Road is currently classified as a secondary arterial in the City of Casey's Public Road Register. *"Future planning for O'Shea Road indicates that it will become a six-lane arterial road."*	
3.1.1 Primary Arterial Road (6 lanes)	Cross section caters for two-way off-road bicycle paths and separate pedestrian paths on both sides of the road. Report says the North-South Arterial and O'Shea Road would function as primary arterials.	
3.1.2 Secondary Arterial Road (4 Lanes)	Cross-section has provision for on-road cycle lanes and shared paths on both sides of the road. Report says Grices Road would function as a secondary arterial. ***Jacobs recommendation: Confirm if on-road cycle lanes continue along Grices Road. If not, then remove on-road cycle lanes, as shared paths should be sufficient.***	
3.2 Lane Geometry	Two sources were used to determine turning lane lengths (VicRoads *Guide for Planning Road Networks in Growth Areas,* and *Austroads Guide to Road Design – Part 4A: Unsignalised and Signalised Intersections* (AGRD4A). The longer lane lengths were used in design. ***Jacobs recommendation: Modelling of the intersections should have been undertaken to estimate the storage requirements of turning lanes.***	
3.3.2 O'Shea Road and North-South Arterial intersection –	*"O'Shea Road has been designed by VicRoads. The design of the intersection with the North-South Arterial included a left turn slip lane from east to south which provided three traffic lanes."*	

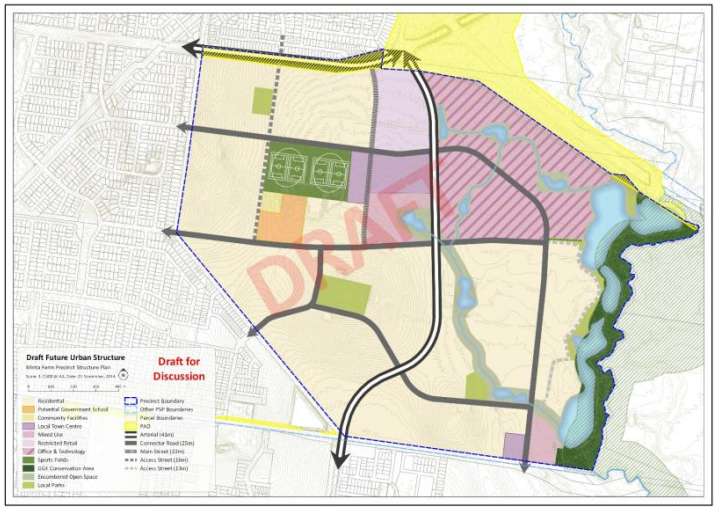
Section	Key Findings	Acceptability of finding
VicRoads concept design	***Jacobs recommendation: Request VicRoads to provide modelling outputs to determine if intersection configuration is appropriate.***	
3.5 Interim and Ultimate Layout Interaction	*"The North-South Arterial, O'Shea Road and Grices Road comprise divided carriageways in the ultimate condition. The interim layout of these roads (mid-block) is to be designed to ensure that the interim two-way traffic lanes will fit within a single carriageway in the ultimate condition. The interim layout at intersections should be designed so that the intersection is located in its ultimate position."* ***Jacobs recommendation:* Council to ensure when interim designs are provided that they tie into the ultimate design.**	
Smart Cities / 20 Minute Neighbourhoods		
Smart Cities/ 20 Minute Neighbourhoods	Design considers active transport along the North-South Arterial. No evidence of public transport connections provided in the design drawings. No bus priority shown on arterial roads. ***Jacobs recommendation:* Public transport facilities, such as bus stops and bus priority should be shown on the ultimate layouts.**	

Table 6: Minta Farm Berwick – S96A – Transport Impact Assessment (Onemilegrid on behalf of Stockland Development, 2017) – Peer Review Findings

Section	Key Findings	Acceptability of finding
Data sources		
1.Introduction	The Precinct Structure Plan was not completed at time of writing of this report. Section 3.2 says that a draft version had been prepared at the time.	
Data Collection	There was little information about existing traffic in the local area, only a statement that the section of Soldiers Road fronting the development currently carries 2,000 vehicles per day. No description if this is a typical working day. Recent traffic counts collected as part of this study indicate daily volumes of 3,045 at a comparable location on Soldiers Road, suggesting the volume used in the report likely to be an underestimate. ***Jacobs recommendation: Confirm traffic volumes.***	
Trip generation		
5.1.3 Clause 56.06-4, Neighbourhood street network objective	*"The forecast daily traffic volumes for the internal subdivision roads will be well within the recommended volume limits specified in Table C1 of Clause 56.06"* No forecast volumes provided in report. ***Jacobs recommendation: Confirm traffic volumes.***	
6.3 Traffic Generation	9 vehicle trips per day per residential lot is a reasonable assumption. This rate is given in the RTA *Guide to Traffic Generating Developments*, and a rate of 9.11 is given in the South Australia Department of Planning and Transport Infrastructure *Trip Generation Rates for Assessment of Development Proposals* which looks at multiple sources of data for trip rates.	

Section	Key Findings	Acceptability of finding
Modelling/ traffic distribution		
6.2 Traffic Capacity	*"Review on-site indicates that the section of Soldiers Road along the frontage of the site is currently carrying 2,000 vehicles per day."* Tube counts from 2014-2016 undertaken and reported in Figure 2 of the Traffix *Traffic Engineering Assessment, Additional Traffic Modelling at Minta Farm PSP 11* state this volume was 2,706 vehicles.	
6.4 Traffic distribution	*"Of that traffic, it will be assumed that 70% is distributed to the northwest and 30% to the southeast based on likely destinations and attractions."* More detail to inform their assumptions could have been used. ***Jacobs recommendation: Evidence, such as VISTA or Journey to Work data should be provided to back up this claim.***	
6.5 Traffic impact	No SIDRA assessments were reported on or referenced to, to back up the claim that "*the level of additional traffic is expected to be easily assimilated be the existing and proposed network".* ***Jacobs recommendation:* At a minimum, a SIDRA assessment of the new four legged intersection of Hazelnut Boulevard and Soldiers Road should have been provided.**	
Public transport		
5.1.2 Clause 56.06-3, Public transport network objectives	*Public Transport Guidelines for Land Use and Development* (Department of Transport) says 95% of residential land uses in established and urban growth areas to be designed to allow access to public transport services within 400m safe walking distance.	
Walking & cycling		
4.4 Pedestrian and Bicycle Network	Good provision for pedestrians and cyclists.	
Smart Cities/ 20 Minute Neighbourhoods		
Summary of Key Criteria - Alignment to State Government and the City of Casey's network, objectives, strategies and goals	This report systematically works through Casey Planning Scheme Requirements, generally addressing each of them well. Public transport connections rely on later developments. Active transport has clearly been considered in the planning of this part of the development.	

Table 7: Strategic Transport Modelling Assessment (Ultimate Scenario) – McPherson, Croskell and Minta Farm Precincts (Cardno, 2015) – Peer Review Findings

Section	Key Findings	Acceptability of Finding
Data sources		
Figure 2-4	Minta Farm PSP is assumed to include: - A connection to the Beaconsfield Interchange via an internal north-south arterial road - The extension of O'Shea Road east and duplication of this road This is based on a superseded draft Urban Structure by VPA. Figure 2-4 Minta Farm PSP – Draft Urban Structure  Notably, the location of the employment and the northern section of the North–South Arterial has shifted between the Draft Urban Structure plan and the PSP. ***Jacobs recommendation: Prior to the detailed design of the O'Shea Road extension and the Beaconsfield Interchange, transport* modelling should be undertaken with the updated PSP structure plan to ensure the layout configurations within and surrounding the Minta Farm PSP are still appropriate.**	
4	Good account of the previous modelling undertaken by AECOM and what was changed for this work.	
Trip generation		
4.5	The Cardno modelling slightly changed the land uses anticipated compared to the AECOM model. Total jobs decreased but within this report, more retail jobs were included.	
Modelling/ traffic distribution		
1.2	The South East Growth Corridor VITM model was used. This is appropriate and specific to the study area.	
4.3.2	The interim modelling (for horizon year 2026) includes a number of infrastructure works not included in the AECOM modelling, most notably: - O'Shea Road extension and duplication - Duplication of North-South Arterial, south of Minta Farm	

Section	Key Findings	Acceptability of Finding
	Jacobs recommendation: **Any update to the modelling of Minta Farm PSP or the surrounding PSPs should only consider government confirmed upgrades as a base case and potential upgrades should be flagged as required to ensure the delivery of these developments.**	
4.3.3	The ultimate modelling which is what is primarily reported upon in this document includes an extensive package of road duplication across the entire of the City of Casey. This model year represents 2046. Cardno made no changes to the standard VITM reference case though so this is deemed appropriate and is consistent with the AECOM modelling.	
4.4	The model zone system was disaggregated to better replicate the PSP. There were originally five zones for Minta Farm, whereas Cardno disaggregated this to nineteen. This adds robustness to the modelling.	
Smart Cities / 20 Minute Neighbourhoods		
Smart Cities/ 20 Minute Neighbourhoods	No consideration of active transport and little public transport consideration although this is appropriate for the type of modelling carried out.	

3.3 Summary of peer review findings

The sub-sections below provide a summary of the unacceptable traffic and transport findings identified through the peer review, by category. These include concerns with elements of the previous traffic modelling (particularly with a number of trip generation and distribution assumptions, and scenarios modelled) and traffic and transport issues (including public and active transport provision and integration), which raises questions around the suitability of the analysis that is underpinning the planning for the Minta Farm PSP area.

Further details of the concerns and the specific report they refer to are detailed in Table 3 to Table 7 in the previous section.

Category: Data sources

There are concerns regarding the quality of data used from SCATS and ABS. In the Traffix Group report, it states that SCATS data was sourced for the O'Shea Road/ Clyde Road intersection. The SCATS data in the report shows left turns movements when it is known to not have left turn detectors.

Additionally, the Minta Farm PSP modelling by Cardno was based largely on a superseded draft Future Urban Structure Plan by VPA, which included slightly different road alignments and level of proposed development (approximately 10,000 jobs and 3,000 dwellings) to that in the exhibited PSP. As a result, the Traffix Group report underestimates the level of trip making expected for Minta Farm.

Category: Trip generation

There are a number of concerns with regard to trip generation assumptions in the analysis reviewed. In a number of instances, information pertaining to forecast volumes and reference to other sources were not included in the reports, bringing in to question the trip generation rates utilised.

In the Traffix Group report, there was also an assumption that impacts internal trip rates. According to Section 3.1.1 of the *RTA Guide to Traffic Generating Developments,* a 25% reduction should be applied to external residential dwelling trips to account for the proportion of those that would be internal to the development area. However, as interim development will contain residential land-use only (no internal 'destinations'), it is unreasonable to include this assumption in the Traffix Group analysis.

Assuming a 25% reduction in this case, underestimates the potential traffic generation of the development, which ultimately impacts the analysis and conclusions drawn regarding impacts on the road network.

Category: Modelling/ traffic distribution

Little detail is provided in the Traffix Group report in terms of their approach to global traffic distribution. Analysis appears to rely solely on the 2011 ABS Census data for 'Journey to Work' which would fail to capture other trip purposes. Additional sources could have been used to check the reliability of the ABS data.

The reduction of vehicle trips in the sensitivity testing to account for VISTA data mode split findings, is also considered unreasonable, particularly in the initial 1,000 lot scenarios due to limited public transport links.

The modelling conducted by Traffix Group also makes assumptions regarding the timing of road upgrades, when there is no certainty yet. This includes the duplication of O'Shea Road, the upgrade to the Beaconsfield Interchange, duplication of Grices Road as well the full delivery of the North-South Arterial.

Finally, it was noted that Traffix Group did not undertake intersection capacity analysis for development scenarios of 1,250 or 1,500 lots, as it was established that the daily traffic volume on Soldiers Road would exceed its formal target volume under scenario 1 (1,000 lots). Notwithstanding that this contradicts Traffix Group's earlier statement that it was acceptable in the short to medium term to exceed this threshold, modelling will be required if the 1,000 lot cap is not accepted.

Overall, there are a number of flaws in the assumptions drawn (both in terms of road network and trip distribution) and gaps in the assessment undertaken, which raises questions around the suitability of the modelling.

Category: Cross sections/ road layout

Assumptions have been made about the duplication of O'Shea Road, however, as there is still uncertainty around the timing and funding of this duplication, scenarios should also have also been assessed under the existing network layout.

Additionally, no modelling for storage requirements of turning lanes has been undertaken. Instead the turning lane lengths have been taken as the maximum length from two sources. These assumptions have a significant impact on the capacity of the transport network and will impact the modelling results.

With regards to cycling infrastructure provision, while the main activity centre has been designed as a low-speed environment to allow for safer passage for pedestrians and cyclists, dedicated cycle links should be incorporated to ensure cyclists are not forced to share the road with vehicles, both moving and parked, and to complement the proposed off-road network.

There are also some concerns with the inclusion of on-road cycle lanes along Grices Road and the intersection layout of O'Shea Road/ North-South Arterial. The interim layout of O'Shea Road, Grices Road and the North-South Arterial should also be designed with its ultimate location in mind.

Category: Public transport

The primary concern surrounding public transport in the Minta Farm PSP area centres on the location of bus stops and the lack of provision for bus priority lanes, primarily along the North-South Arterial. With no locations confirmed for bus stops within the development, stops could be placed in less-than-optimum locations and fail to maximise bus patronage. Additionally, with no indication of bus priority allocated for, especially on the North-South Arterial, a key link in the transport network between the Pakenham rail line and the PSP could be compromised. Without the provision of high-quality public transport services, the viability of buses (and therefore mode choice) could be compromised, entrenching car dependent travel patterns.

If public transport infrastructure requirements are not captured in the PSP, Council is unable to require that additional land be set aside for bus stops, bus priority lanes etc. when development commences. Furthermore, if the ICP does not reflect the true land take, this could have financial implications for Council.

Category: Walking and cycling

While a significant amount of off-road bike paths has been allowed for within the Minta Farm PSP area, there are a couple of key missing links within the activity centres in Minta Farm and a lack of integration with the existing network in adjacent developments. If such links are not identified and captured within the PSP, this could result in a lost opportunity to improve the provision of cycling infrastructure in the new development.

High-quality, integrated networks would help to create a safer environment for pedestrians and cyclists and provide a viable alternative mode of transport for both recreational and commuter cyclists.

Category: Smart Cities20 Minute Neighbourhoods

In order to meet *Smart Cities and 20 Minute Neighbourhood* objectives as set out in the City of Casey's Integrated Transport Strategy, there is a need to emphasise public and active transport modes. However, there is no evidence to suggest they have been fully considered.

If not fully considered from the outset, this could have significant implications in terms of accessibility, liveability and sustainability of the development.

3.4 Conclusion

The peer review focused on the traffic and transport assessments undertaken by, or on behalf of, VPA and Stockland, as part of the draft PSP and permit application, respectively. As outlined above, there are a number of concerns with regards to the previous traffic modelling and consideration of wider transport issues, which raises questions around the suitability of the analysis underpinning the planning of Minta Farm.

In order to overcome these concerns, a number of recommendations have been made. These are detailed in Table 3 to Table 7, with a summary of the recommendations including:

- Use of recent data for trip generation and distribution purposes and verification against a range of sources
- Justified assumptions with regards to trip rates and consideration of a range of trip purposes
- Any update to the modelling of Minta Farm PSP or the surrounding PSPs should only consider government confirmed upgrades as a base case and potential upgrades should be flagged as required to ensure the delivery of these developments
- The location of bus stops should be confirmed and some level of bus priority included
- Dedicated cycle infrastructure should be provided and integrated with adjacent developments.
- Cross sections should be reconfigured to ensure all cycling is off-road and integrated with adjacent developments
- Council to ensure when interim designs are provided that they tie into the ultimate design

Where appropriate, these findings and recommendations have been used to inform the scenario testing at Section 4 of this Report, to ensure suitable assumptions have been utilised and gaps addressed.

4. Traffic impact assessment

4.1 Scope of traffic impact assessment

The purpose of the traffic impact assessment is to assess the current and future transport and traffic conditions surrounding the Minta Farm PSP area. This includes an assessment of existing conditions, trip generation estimates and distribution for different scenarios, and an analysis of the performance of key intersections to determine whether the 1,000 dwelling lot cap is appropriate and what transport infrastructure is critical to assist in the development and staging of the PSP.

4.2 Existing conditions

Turning movement surveys were undertaken on Thursday 15th February 2018 to understand the existing conditions at five intersections to the west of the proposed Minta Farm precinct. The five intersections that were surveyed were:

- Clyde Road/ O'Shea Road (1)
- O'Shea Road/ Soldiers Road (2)
- Chase Boulevard/ Soldiers Road (3)
- Clyde Road/ Grices Road (4)
- Grices Road/ Soldiers Road (5)

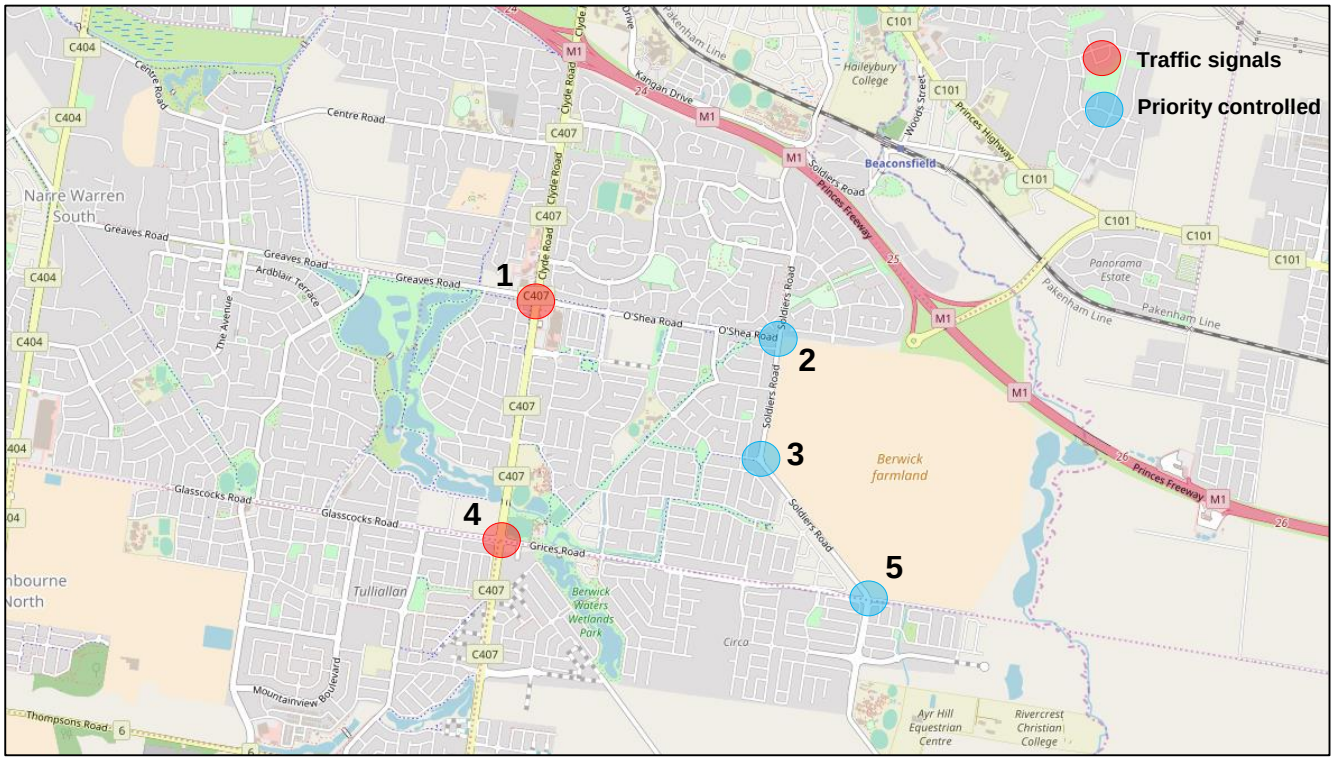


Figure 4: Location of traffic surveys (Open Street Map, February 2018)

Based on the traffic survey data, the peak hour observed across these five intersections was 08:00-09:00 in the AM peak, and 16:00-17:00 in the PM peak. The turning volumes corresponding to these peak hours are provided in Figure 5 and Figure 6.

Intersection traffic volumes for the two signalised intersections were also obtained from VicRoads Open Data Portal for the same days as the manual traffic surveys using SCATS. The SCATS data was predominately used

to validate the accuracy of the manual turning movement data, to ensure that it is fit for purpose. For a majority of intersection movements, variance between the two data sets ranged between 5-10%. This comparison of the SCATS data versus the manual traffic surveys in shown in Appendix A. For the purposes of this assessment, the manual traffic survey data have been used.

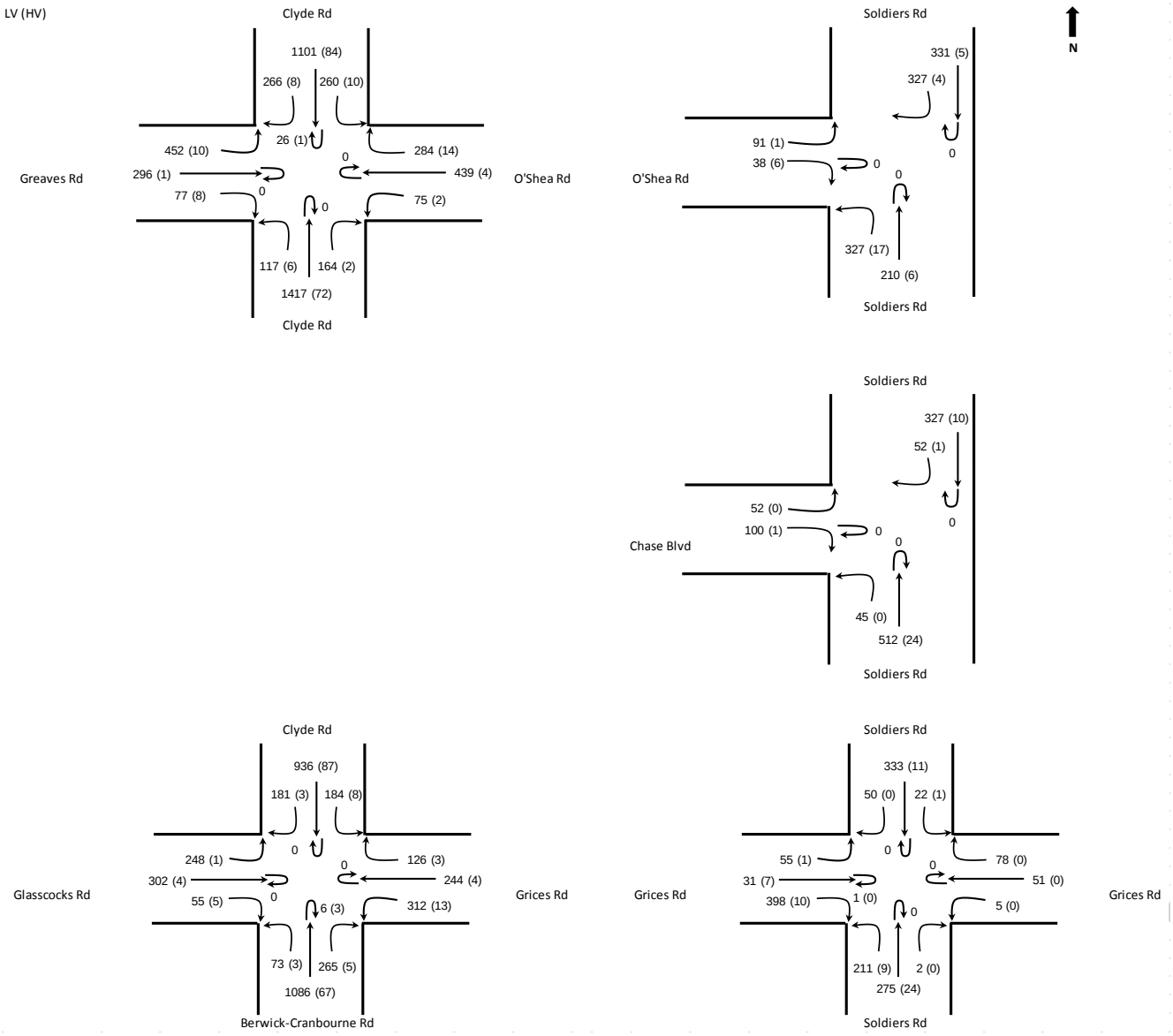


Figure 5: AM peak existing turning movements (08:00-09:00, Thursday 15th February 2018)

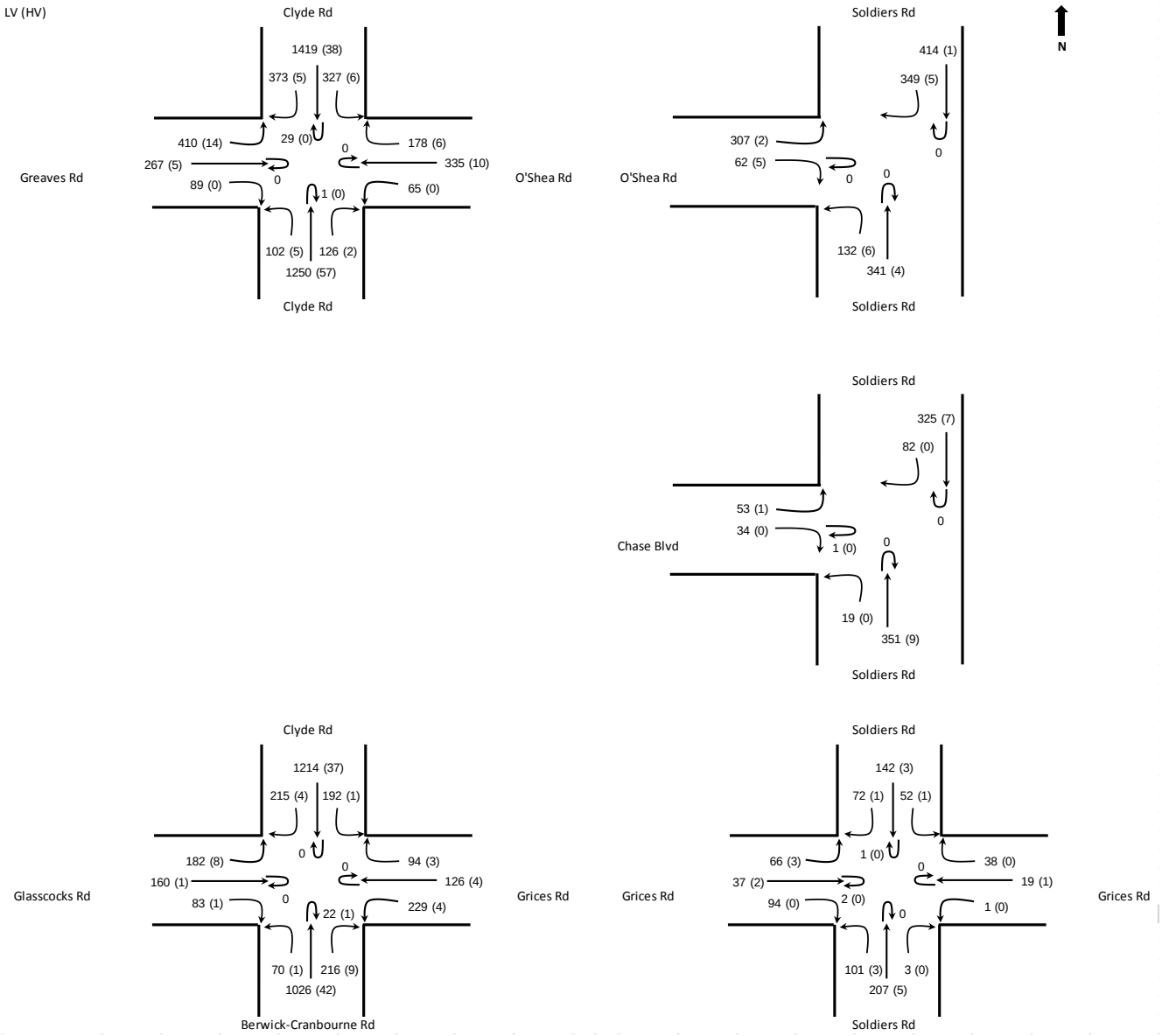


Figure 6: PM peak existing turning movements (16:00-17:00, Thursday 15th February 2018)

4.3 Trip generation

4.3.1 Model scenarios

As part of this assessment, multiple road infrastructure and lot development scenarios have been analysed. These capture current and forecast conditions, both with and without the Minta Farm Development. They also include scenarios related to the recent announcement regarding Monash Stage 2[1], which could see State Government commencing works on Beaconsfield Interchange and links to a duplicated O'Shea Road, as early as 2019. A summary of these scenarios is provided in Table 8.

Table 8: Scenarios modelled

Scenario	Development	Horizon
Without Minta Farm development		
Current condition	0 lots	2018
	0 lots	2021
Delivery of O'Shea Road (4 lane carriageway) and Beaconsfield Interchange	0 lots	2021
With Minta Farm development		
No improvements to current road network	500 lots	2021
	750 lots	2021
	1,000 lots	2021
	Full development	2046
Truncation of Soldiers Road with interim delivery of the North-South Arterial (2 lane carriageway) ***(assumes no changes to O'Shea Road and Beaconsfield Interchange)***	500 lots	2021
	750 lots	2021
	1,000 lots	2021
	Full development	2046
Truncation of Soldiers Road with delivery of North-South Arterial (4 lane carriageway) ***(assumes no changes to O'Shea Road and Beaconsfield Interchange)***	500 lots	2021
	750 lots	2021
	1,000 lots	2021
	Full development	2046
Delivery of O'Shea Road (4 lane carriageway) and Beaconsfield Interchange without delivery of the North-South Arterial	500 lots	2021
	750 lots	2021
	1,000 lots	2021
	Full development	2046
Truncation of Soldiers Road with interim delivery of the North-South Arterial (2 lane carriageway) and delivery of O'Shea Road (4 lane carriageway) and Beaconsfield Interchange	500 lots	2021
	750 lots	2021
	1,000 lots	2021
	Full development	2046
Truncation of Soldiers Road with delivery of North-South Arterial (4 lane carriageway) and delivery of O'Shea Road (4 lane carriageway) and Beaconsfield Interchange	500 lots	2021
	750 lots	2021
	1000 lots	2021
	full development	2046

The 500, 750 and 1,000 lot scenarios were assessed as purely residential development. The full development scenario includes the full build out of the Minta Farm PSP, compromising of approximately 2,850 dwellings (8,000 people) and 11,260 ongoing jobs. The staging of this progressive development is illustrated in Figure 7.

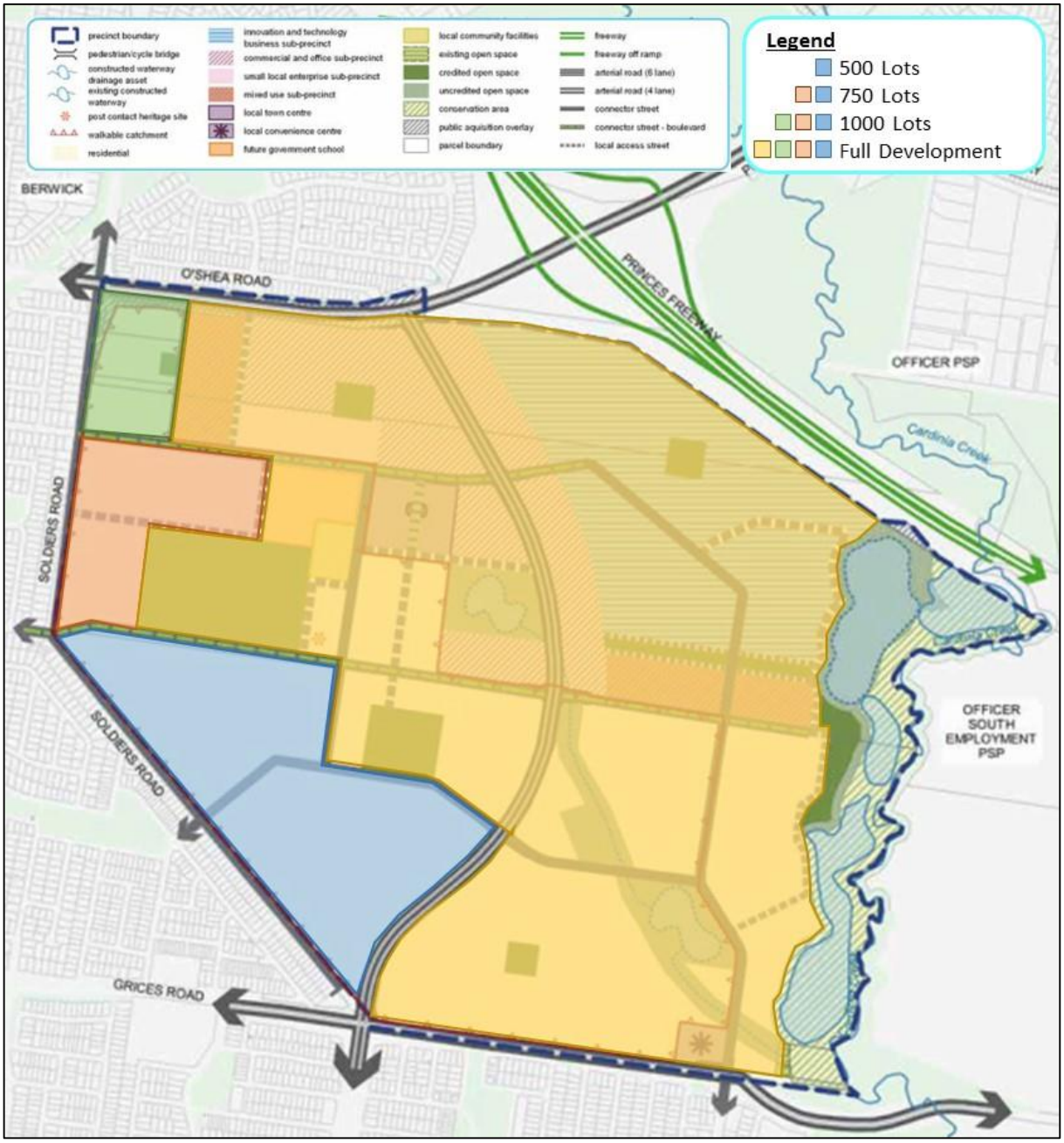


Figure 7: Proposed staging of 500, 750, 1000 and full development scenarios

4.3.2 Residential trip generation

Residential trip generation was estimated from the NSW RTA *Guide to Traffic Generating Developments* (2002) and DPTI *Trip Generation Rates for Assessment of Development Proposals* (2014). The trip generation rates used are given in Table 9.

Table 9: Residential trip generation rate

Land Use	Vehicle trips per dwelling	
	Daily	Weekday peak hour
Residential	9	0.85

Information regarding the density of the residential dwellings proposed within the Minta Farm area is included in Table 3 of the PSP (VPA, October 2017). This includes a range of residential dwelling yields across the site i.e. higher density adjacent the local town centre to lower density dwellings outside walkable catchment in transitional housing areas as outlined in Table 10.

Table 10: Estimated residential dwelling yield (Minta Farm Precinct Structure Plan, VPA, October 2017)

Residential Type	NDA (ha)	Dwelling/ NDHa	Dwellings
Residential adjacent the local town centre	5.25	30	158
Residential adjacent the district park	9.46	25	236
Residential within walkable catchment	96.77	20	1,935
Residential outside walkable catchment	10.93	16	175
Residential in Transitional Housing area	4.37	11	48
Mixed use	10.40	20	208
Town centre and local convenience centre	4.63	20	93
		Total	**2,853**

The number and density of dwellings in the Minta Farm area were found and apportioned among eight zones within the development area. The resulting density is illustrated in Figure 8. The trip generation rates shown above, were applied under the residential only lot scenarios, while the full development scenario saw the application of a 25% reduction factor, as is discussed further in Section 4.3.4.

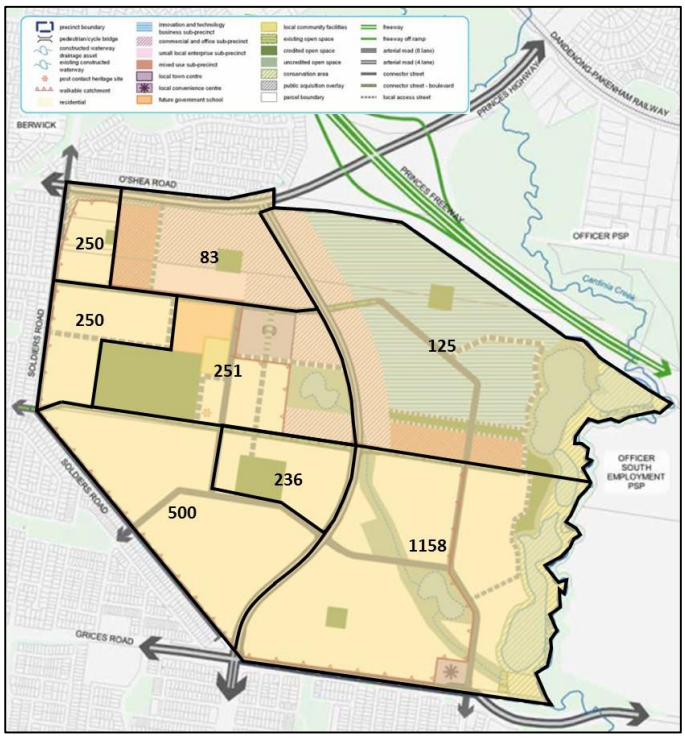


Figure 8: Allocation of residential dwellings within the Minta Farm precinct

4.3.3 Employment trip generation

For the employment area of the Minta Farm precinct, little is currently known about the exact types of businesses that will be situated within. However, in the *Minta Farm Precinct Structure Plan* (October 2017) there are anticipated employment creation estimates. Refer to Table 11 for a summary of the anticipated employment creation. Additionally, outside of work-related trip generation it is assumed that the local government primary school will contribute only local trips which are internal to the Minta Farm precinct.

Table 11: Anticipated employment creation (Minta Farm Precinct Structure Plan, VPA, October 2017)

Land use	Unit of measure	Jobs per unit	Projected units in PSP	Jobs
Council kindergarten	Jobs per centre	10	1	10
Community centre	Jobs per centre	10	1	10
Government primary school	Jobs per school	40	1	40
Private child care facility	Jobs per 100 places	15	1	15
Local town centre	Jobs per hectare	87	3.62	314
Local convenience centre	Jobs per hectare	87	1.00	87
Innovation and technology	Jobs per hectare	56	39.26	2,199
Office and commercial	Jobs per hectare	280	26.15	7,322
Small local enterprise	Jobs per hectare	158	3.40	536
Mixed use	Jobs per hectare	56	10.40	582
Home-based business	Jobs per dwelling	0.05	2,853	143
Total				**11,258**

The anticipated number of jobs for the Minta Farm precinct were then split into retail and other job categories, to allow the estimation of trips per employee per land use type. Note that, while home-based jobs were counted as part of employment numbers within the precinct, their associated trips were assumed to be captured as residential trips.

Table 12: Jobs breakdown by type

Land use	Job type	Number of jobs	Total number of jobs
Retail	Local town centre (as shown in Table 4 in the *Minta Farm PSP* report states 83% of the estimated floor space is retail)	262	1,162
	Local convenience centre (as shown in Table 4 in the *Minta Farm PSP* report states 83% of the estimated floor space is retail)	73	
	Small local enterprise	536	
	50% of mixed use	291	
Other	Council kindergarten	10	9,953
	Community centre	10	
	Government primary school	40	
	Private child care facility	15	
	Local town centre (as shown in Table 4 in the *Minta Farm PSP* report states 17% of the floor space is commercial)	52	
	Local convenience centre (as shown in Table 4 in the *Minta* Farm *PSP* report states 17% of the floor space is commercial)	14	
	Innovation and technology	2,199	
	Office and commercial	7,322	
	50% mixed use	291	
Home-based business		143	143
Total		**11,258**	**11,258**

4.3.3.1 Retail trip generation

Retail trip generation was based on trip generation rates, shown in Table 13, used in the Cardno report '*Strategic Transport Modelling Assessment (Ultimate Scenario) – McPherson, Croskell and Minta Farm Precincts*' (2015), which are also consistent with the NSW RTA trip rates.

Table 13: Retail trip generation rates

Land use	Trip generation rates		
	AM peak (1 hour)	PM peak (1 hour)	Daily
Retail	0.5 trips/ job	1.53 trips/ job	16.7 trips/ job

4.3.3.2 Non-retail trip generation

Other non-retail job trips were estimated by using land use type trip generation from the *ITE Trip Generation Handbook (9th Edition).* To make an assumption on the trip generation rate, a range of land use types in the office/ commercial/ innovation/ industrial area were tabled.

Table 14: ITE trip generation rates (9th Edition) (USA)

Land use	Trips per employee		
	Weekday	AM peak	PM peak
Business Park	4.04	0.45	0.39
R&D Centre	2.77	0.43	0.41
Office Park	3.50	0.43	0.39
Single Tenant Office Building	3.70	0.53	0.51
General Light Industrial	3.02	0.44	0.42
Industrial Park	3.34	0.47	0.46
Average	**3.40**	**0.46**	**0.43**

For the purpose of this assessment, the average trip generation rates for non-retail land uses was used.

4.3.4 Total trips

A summary of the total number of estimated trips per land use is provided in Table 15 (interim development) and Table 16 (full development).

Table 15: Total estimated trips (interim development)

Lot development	Daily trips	Peak hour trips
500 lots	4,500	425 (AM Peak), 425 (PM Peak)
750 lots	6,750	638 (AM Peak) 638 (PM Peak)
1000 lots	9,000	850 (AM Peak) 850 (PM Peak)

Table 16: Total estimated trips per land use (full development)

Land use	Daily trips	Peak hour trips
Residential	19,258	1,819 (AM Peak), 1,819 (PM Peak)
Retail	19,405	581 (AM Peak) 1,778 (PM Peak)
Other (office/ innovation/ industry)	33,840	4,578 (AM Peak) 4,280 (PM Peak)
Total	**72,503**	**6,978 (AM Peak)** **7,877 (PM Peak)**

A 25% reduction has been applied to external residential dwelling trips to account for the proportion of those that would be internal to the development area, in the full development lot scenario only. At full development, there will be destinations within the PSP area (such as a school, town centre, employment area). These internal 'destinations' are unlikely to be delivered in the <1,000 lot scenarios. As such, no reduction factors were applied in these residential lot scenarios.

The 25% internal trip reduction factor is consistent with *RTA Guide to Traffic Generating Developments (2002).*

4.4 Trip distribution

VISTA data was used to develop the trip distribution for the Minta Farm development. VISTA data takes into account non-work related trips and represents an average weekday. This compares to the ABS 'journey to work' data which is limited to one trip type on a specific day (Tuesday August 9th, 2016). This means there will be a slight difference between the ABS 'journey to work' distribution and the VISTA distribution.

The ABS 'Journey to Work' data remains a good data set, however in this case, pooling all available VISTA data across the survey years of 2007 to 2014 provides a better representation of trip distribution.

VISTA trip origin and destination data was grouped at the LGA level to ensure consistency between VISTA survey years. All trips that occurred within the Casey LGA have been ignored for the purposes of determining vehicle trip direction. All trip purposes were included in the count, not just work related.

Once proportions of each trip were determined to and from each LGA, the most appropriate route through the development area was mapped for each LGA destination.

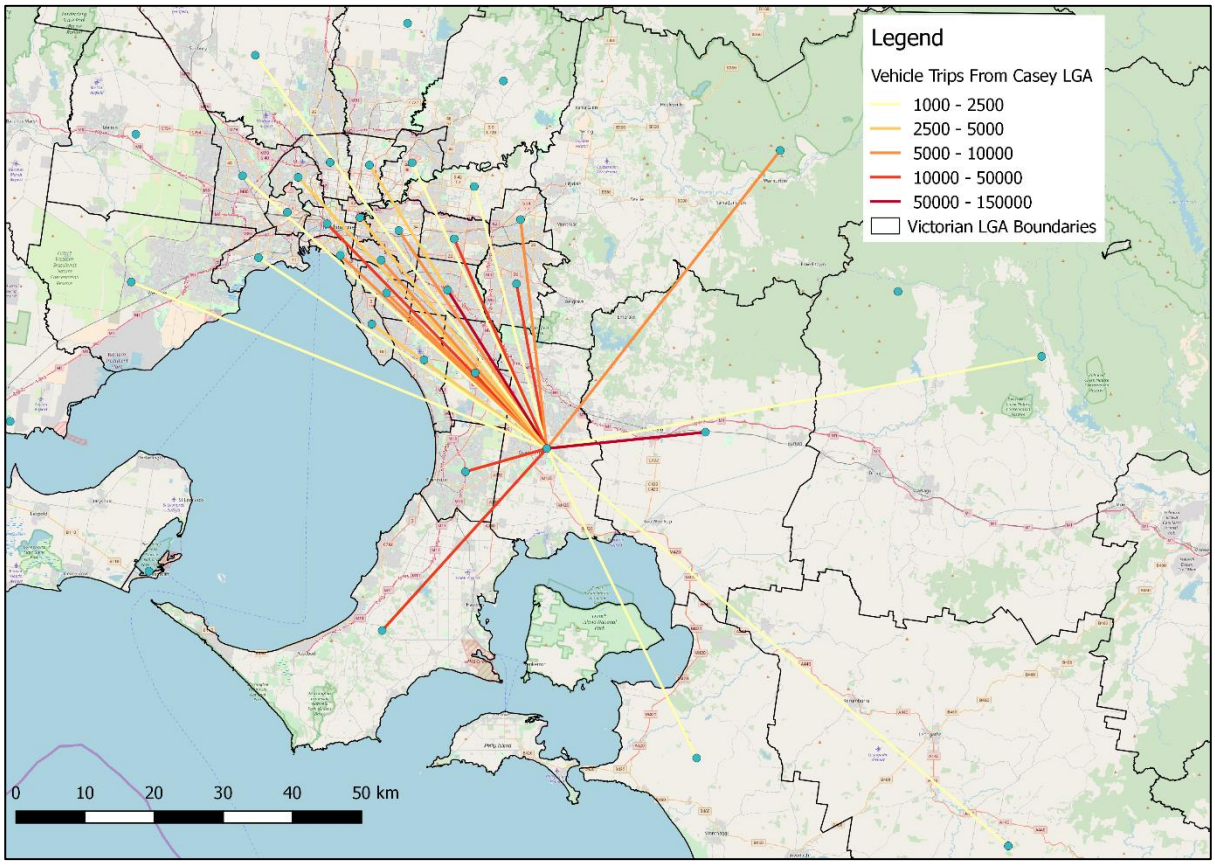


Figure 9: Map of trip distribution to/ from Casey (VISTA data, 2007, 2009, 2012-2014)

This distribution was checked against two alternative sources of data. The first of these, Profile ID, uses census information at the LGA level to determine journey to work patterns. The second, Traffix Group's assessment of

2011 ABS 'Journey to Work' (contained within the *Traffic Engineering Assessment, Additional Traffic Modelling at Minta Farm PSP 11* report) as a comparison to test the assumptions and validity of the VISTA data. A comparison of these proportions is provided in Table 17.

Table 17: Comparison of estimated trip distributions

Direction	Waypoint for direction	VISTA	2016 Profile ID / ABS 'Journey to Work'	Traffix 2011 ABS 'Journey to Work'
South-west	Southern end of Clyde Road	14%	14%	14%
North-west	West on Greaves Road North west on Monash Freeway North/North west on Soldiers Road	71%	72%	73%
North-east	Beaconsfield interchange	15%	14%	12%

The VISTA data sets used to derive this distribution were the 2007, 2009 and 2012-2014 data sets. When comparing the ABS 'Journey to Work' proportions from 2011 to 2016, there was minimal change in the proportions detailed in Table 16. Profile ID data also uses 2016 ABS 'Journey to Work' data, however assumptions about proportions may differ between the Traffix Group assessment and Jacobs assessment.

The Profile ID assessment shows that the major movement is to the north-west, with the south-west and north-east movements being relatively minor in comparison. A similar conclusion can be drawn from analysing the VISTA data.

It is acknowledged that over time the Cardinia Shire's growth area will develop, which may increase the number of trips to the east, particularly with the Cardinia Road Employment Precinct forecast to generate up to 18,500 jobs at full development. Therefore we are more comfortable in adopting the VISTA proportions which are broadly consistent with those adopted by Traffix Group.

4.4.1.1 Trip distribution maps

Figure 10 shows the general trip distribution adopted for the following road infrastructure scenarios:

- No improvements to current road network
- Truncation of Soldiers Road with interim delivery of the North-South Arterial (2 lane carriageway)
- Truncation of Soldiers Road with delivery of North-South Arterial (4 lane carriageway)

Figure 11 shows the trip distribution adopted for the following road infrastructure scenarios:

- Delivery of O'Shea Road (4 lane carriageway) and Beaconsfield Interchange without delivery of the North-South Arterial
- Truncation of Soldiers Road with interim delivery of the North-South Arterial (2 lane carriageway and delivery of O'Shea Road (4 lane carriageway) and Beaconsfield Interchange
- Truncation of Soldiers Road with delivery of North-South Arterial (4 lane carriageway) and delivery of O'Shea Road (4 lane carriageway) and Beaconsfield Interchange

The main difference between the two maps is the inclusion of the Beaconsfield Interchange, which will significantly alter the localised trip distribution patterns for vehicles travelling to/ from the Monash Freeway. Note

that in each of the full development scenarios, half of the vehicle trips going southbound on Clyde Road have been redistributed southbound on Soldiers Road.

Refer to Appendix C for more detailed trip distribution maps.

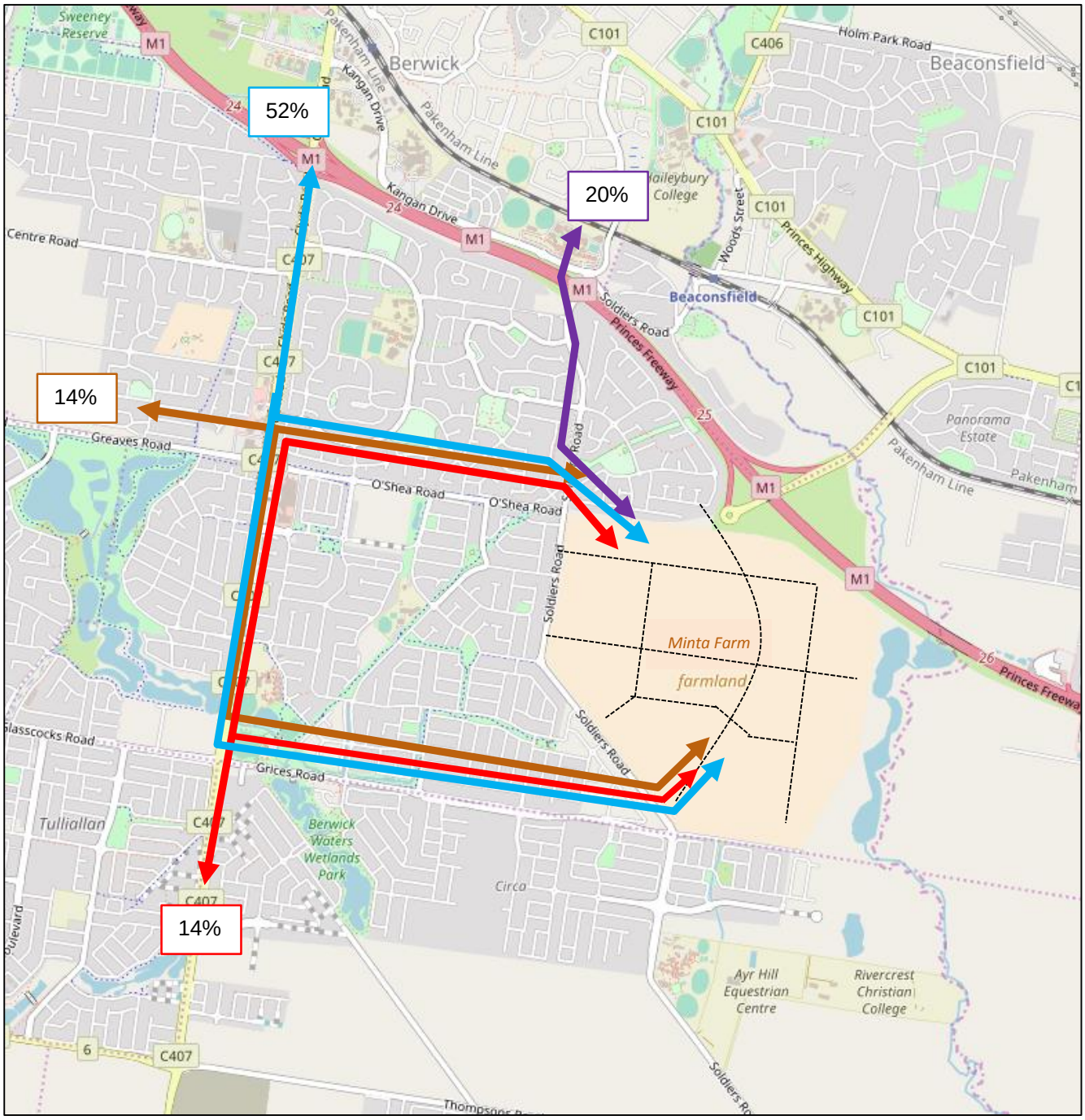


Figure 10: Trip distribution for scenarios without O'Shea Road (4 lane carriageway) and Beaconsfield Interchange

Note: At full development, 7% of trips are assumed to use Soldiers Road southbound, and 7% using Clyde Road southbound

Figure 11: Trip distribution for scenarios with O'Shea Road (4 lane carriageway) and Beaconsfield Interchange

4.4.1.2 Background traffic rerouting

As there are different road infrastructure scenarios in this assessment, it is expected that some background traffic would alter their travel paths as shorter paths become available. The proportions outlined from VISTA have been rerouted to utilise the proposed transport infrastructure, relevant to each scenario. For example, when the North-South Arterial is constructed, some traffic that would typically use Clyde Road has been redistributed to use the North-South Arterial.

4.4.2 Directional splits

Directional splits for the different land use types were sourced from *ITE Trip Generation Handbook (9th Edition)*. A summary of the directional splits used in this analysis are in Table 18. The residential splits are within ±5% of those adopted by Traffix Group.

Table 18: Land use trip directional splits (ITE Trip Generation Handbook (9th Edition))

Land use	AM in	AM out	PM in	PM out
Residential	25%	75%	63%	37%
Retail	62%	38%	49.5%	50.5%
Other	87%	13%	17%	83%

4.5 Background traffic growth

Observed 2018 counts (see Figure 5 and Figure 6) were grown uniformly by 6% per annum to represent background traffic for a future year of 2021. The factor was derived by analysing the City of Casey's future population projections in the surrounding areas of Berwick South, Clyde, Clyde North, Cranbourne, Cranbourne North and Narre Warren South. The use of these higher-growth areas is expected to mirror the accelerated traffic growth, at least in the short term around the Minta Farm development area.

For the full development scenarios (i.e. full build out of the Minta Farm precinct), 2046 was designated as the future design year, and a growth factor of 72% (approximately 2% per annum) was applied to the 2018 volumes. This figure was derived using future population projections for the entire City of Casey from 2018 to 2041, and then scaling linearly up to 2046. Details on the derivation of this factor are shown in Appendix D.

4.6 Intersection modelling

The intersections described in Section 4.2 as well as a future O'Shea Road/ North-South Arterial intersection were modelled using SIDRA Intersection version 7. SIDRA Intersection was recommended as the appropriate software package for the analysis due to the level of detail required. SIDRA Intersection is a micro-analytical modelling software package which allows the performance of intersections to be assessed and statistics relating to performance to be obtained. Key outputs that were obtained from SIDRA and utilised in this assessment include the following:

- Degree of Saturation (DoS)
- Level of Service (LOS)
- Average delay

Degree of Saturation is a volume to capacity ratio, which looks at how many vehicles are observed passing through the intersection, compared to its theoretical maximum throughput in the same period. Within SIDRA, the degree of saturation is calculated per approach lane, it then allocates the largest degree of saturation in any lane to the intersection overall.

The degree of saturation ranges from close to zero for very low traffic flows, up to one for saturated flow or capacity. If a degree of saturation is greater than one, there isn't sufficient capacity for vehicles to pass through the intersection and significant delays and queuing would occur. Maximum practical degree of saturation for different intersection types as recommended by *VicRoads (Supplement to Austroads Guide to Traffic Management Part 3: Traffic Studies and Analysis)* are as follows:

- At a signalised intersection: 0.90 (desirable) and 0.95 (maximum target)
- At an unsignalised intersection, including roundabouts: 0.8 (desirable) 0.85 (maximum target)

It is undesirable to have a DoS value above the maximum target.

Level of Service is a measure of the performance of an intersection. A level of service has been determined for each movement by adopting the SIDRA Intersection default method for vehicles. Level of Service is defined as a qualitative measure for ranking operating conditions. There are a range of performance measures that can be used to define Level of Service however, delay is typically used as the primary performance measure for intersections (as outlined in *Austroads Guide to Traffic Management Part 3: Traffic Studies and Analysis, Table 3.1).*

Within SIDRA, the intersection Level of Service values are based on average delay for all movements. The Level of Service criteria and thresholds used are given in Table 19. There are six levels of service, designated A to F, with level of service A representing the best operating condition and level of service F the worst. As outlined in the *VicRoads Supplement to Austroads Guide to Traffic Management Part 6: Intersections, Interchanges and Crossings*, suggested guidelines for target Levels of Services for arterial and collector/ local roads are LOS C and LOS D respectively.

Table 19: Intersection level of service parameters

Level of service	Control delay per vehicle in seconds (d)			Target LOS
	Signals	Roundabout	Sign controlled	
A	d ≤ 10	d ≤ 10	d ≤ 10	Desirable
B	10 < d ≤ 20	10 < d ≤ 20	10 < d ≤ 15	Desirable
C	20< d ≤ 35	20< d ≤ 30	15< d ≤ 25	Desirable
D	35 < d ≤ 55	30 < d ≤ 50	25 < d ≤ 35	Maximum target
E	55 < d ≤ 80	50 < d ≤ 70	35 < d ≤ 50	Undesirable
F	80 < d	70 < d	50 < d	Undesirable

Average delay is a measure of the additional (excess) time experienced by all vehicles at an intersection relative to free-flow travel times. In SIDRA, this is the average delay experienced to vehicles arriving during a given analysis period including the delay experienced after the end of flow period, which is possible under heavy (especially oversaturated) traffic conditions. This is presented as an average for each movement and the intersection as a whole, in seconds per vehicle.

4.6.1 Modelling Assumptions

Other assumptions made in carrying out this assessment include:

- Rat-running through local roads has not been assumed when distributing trips
- Vehicle trips, depending on the scenario modelled, were assumed to access Minta Farm from one of six access roads in the development:
  - Viewgrand Drive/ Soldiers Road
  - Chase Boulevard/ Soldiers Road
  - Hazelnut Boulevard/ Soldiers Road
  - Grices Road/ New local connector
  - O'Shea Road/ North-South Arterial
  - Grices Road/ North-South Arterial
- Short term growth factor of 6% per annum was applied to redistributed 2018 observed traffic volumes for the lot 500, 750 and 1,000 dwelling lot scenarios
- Long term growth factor of 72% was applied to redistributed 2018 observed traffic volumes for the full development scenarios
- Trips generated in this assessment have been assumed to be 95% light vehicles and 5% heavy vehicles. This was based on observed proportions from other similar developments in south-east Melbourne
- Intersection layouts were developed for each of the scenarios as set out in Table 20. These were informed through lane assumptions received from Council and are shown in the SIDRA layouts in Appendix E.
- Signalised intersections have been optimised using SIDRA's 'Optimum Cycle Time' function, whereby the program calculates a cycle time that optimises intersection performance (minimum delay by default). To ensure consistency across the coordinated traffic signals in SCATS and within each scenario modelled, optimised cycle times for signalised intersections where compared (e.g. Clyde Road/ Grices Road, Clyde Road/ O'Shea Road and Grices Rd/ North-South Arterial). Where there were differences, manual cycle time adjustments were made to achieve consistent cycle times, and a balance across intersection performance.
- When intersection layouts are upgraded, it was assumed that signal phasing would also be modified. For example, at Clyde Road/ Grices Road, right-turns currently filter during the through phase. When duplicated, it was assumed that right turns would be fully controlled.

Table 20: SIDRA Intersection layout assumptions

Scenario		Horizon	O'Shea Road/ Soldiers Road	Chase Boulevard/ Soldiers Road	Grices Road/ North-South Arterial/ Soldiers Road	Clyde Road/ O'Shea Road	Clyde Road/ Grices Road	North-South Arterial/ O'Shea Road
Without Minta Farm development								
Current condition	**0 lots**	2018	Current layout	Current layout	Current layout	Current layout	Current layout	NA
	0 lots	2021	Current layout	Current layout	Current layout	Current layout	Current layout	NA
Delivery of O'Shea Road (4 lane carriageway) and Beaconsfield Interchange	**0 lots**	2021	Signalised 4-arm intersection. Two thru lanes on O'Shea Road and Soldiers Road approach	Current layout	Current layout	Two thru lanes on O'Shea Road and Greaves Road approach	Current layout	NA
With Minta Farm development								
No improvements to current road network	**500 lots**	2021	Current layout	4-arm roundabout - Chase Boulevard connection	Current layout	Current layout	Current layout	NA
	750 lots	2021						
	1000 lots	2021						
	full development	2046						
Truncation of Soldiers Road with interim delivery of the north-south arterial (2 lane carriageway)	**500 lots**	2021	Current layout	4-arm roundabout - Chase Boulevard connection	Signalised 4-arm intersection with new north-south connector. Assume Soldier Road truncated. One thru lane on all approaches	Current layout	Current layout	NA
	750 lots	2021						
	1000 lots	2021						
	full development	2046					Two thru lanes and two RTs on Grices Road. Two thru lanes on Glasscocks Road approach	
Truncation of Soldiers Road with delivery of north-south arterial (4 lane carriageway)	**500 lots**	2021	Current layout	4-arm roundabout - Chase Boulevard connection	Signalised 4-arm intersection. Two thru lanes on the North-South Arterial. 1 thru lane on Grices Rd.	Current layout	Current layout	NA
	750 lots	2021						
	1000 lots	2021						
	full development	2046					Two thru lanes and two RTs on Grices Road. Two thru lanes on Glasscocks Road approach	

Scenario		Horizon	O'Shea Road/ Soldiers Road	Chase Boulevard/ Soldiers Road	Grices Road/ North-South Arterial/ Soldiers Road	Clyde Road/ O'Shea Road	Clyde Road/ Grices Road	North-South Arterial/ O'Shea Road
Delivery of O'Shea Road (4 lane carriageway) and Beaconsfield Interchange without delivery of the north-south arterial	**500 lots**	2021	Signalised 4-arm intersection. Two thru lanes on O'Shea Road and Soldiers Road approach	4-arm roundabout - Chase Boulevard connection	Assume Soldiers Rd remains open Assume current intersection layout (roundabout)	Two thru lanes on O'Shea Road and Greaves Road approach	Current layout	NA
	750 lots	2021						
	1000 lots	2021						
	full development	2046			Signalised 4-arm intersection with new north-south connector. Assume Soldier Road truncated. One thru lane on all approaches		Two thru lanes and two RTs on Grices Road. Two thru lanes on Glasscocks Road approach	
Truncation of Soldiers Road with interim delivery of the north-south arterial (2 lane carriageway) and delivery of O'Shea Road (4 lane carriageway) and Beaconsfield Interchange	**500 lots**	2021	Signalised 4-arm intersection. Two thru lanes on O'Shea Road and Soldiers Road approach	4-arm roundabout - Chase Boulevard connection	Signalised 4-arm intersection with new north-south connector. Assume Soldier Road truncated One thru lane on all approaches	Two thru lanes on O'Shea Road and Greaves Road approach	Current layout	Signalised 3-arm intersection Two thru lanes each way on O'Shea Road
	750 lots	2021						
	1000 lots	2021						
	full development	2046					Two thru lanes and two RTs on Grices Road. Two thru lanes on Glasscocks Road approach	
Truncation of Soldiers Road with delivery of north-south arterial (4 lane carriageway) and delivery of O'Shea Road (4 lane carriageway) and Beaconsfield Interchange	**500 lots**	2021	Signalised 4-arm intersection. Two thru lanes on O'Shea Road and Soldiers Road approach	4-arm roundabout - Chase Blvd connection	Signalised 4-arm intersection Two thru lanes on the North-South Arterial	Two thru lanes on O'Shea Road and Greaves Road approach	Current layout	Signalised 3-arm intersection Two thru lanes each way on O'Shea Road
	750 lots	2021						
	1000 lots	2021						
	full development	2046					Two thru lanes and two RTs on Grices Road Two thru lanes on Glasscocks Road approach	

4.7 Results

4.7.1 Baseline results (without Minta Farm development)

4.7.1.1 Intersection modelling

To establish the baseline current and forecast conditions without the development of Minta Farm, SIDRA models have been run for the five existing intersections under the following scenarios, results are contained in Table 21 to Table 23:

- Current conditions (2018)
- No improvements to the current road network (2021)
- State Government delivery of O'Shea Road duplication and Beaconsfield Interchange (2021)

As outlined in Section 4.6, the following outputs are presented for each scenario:

- Degree of Saturation (DoS) for the worst movement at each intersection, the worst movement is noted when DoS reaches an undesirable level
- Level of Service (LOS) for the intersection based on average delay for all vehicle movements
- Average delay for all vehicles (in seconds per vehicle)

The intersection geometries, movement summaries and phasing diagrams from SIDRA are located in Appendix E.

It can be seen in Table 21 to Table 23, that:

- With the exception of Clyde Road/ Grices Road in the PM peak, Clyde Road/ O'Shea Road and Clyde Road/ Grices Road are already operating above capacity. All other intersections currently operate satisfactorily
- Without road network improvements, intersection performance is forecast to deteriorate across all five intersections due to increasing volumes of traffic. Changes in terms of target performance include: O'Shea Road/ Soldiers Road in the PM peak, which is forecast to operate close to the maximum target DOS by 2021, and Clyde Road/ Grices Road in the PM peak which is forecast to operate over capacity
- The delivery of O'Shea Road duplication and Beaconsfield Interchange does not solve the identified intersection performance issues. The performance of Grices Road/ Soldiers Road, O'Shea Rd/ Clyde Road in the AM and Grices Road/ Clyde Road is forecast to worsen as this becomes a desirable link and induces additional traffic demand. SIDRA modelling shows:
    - Grices Road/ Soldiers Road: In the AM particularly, increased traffic volumes on Soldiers Road and Grices Road of over 200 vehicles cause the DOS to exceed one
    - O'Shea Rd/ Clyde Road AM: Redistribution of traffic through to Beaconsfield Interchange more than doubles the right turn movement from Clyde Road (northbound) in the AM
    - Grices Road/ Clyde Road: Redistribution of traffic via Beaconsfield Interchange increases through and left turn movements on Grices Road in both of the peak periods (by over 200 vehicles). In the SIDRA cycle time optimisation, the program tries to accommodate this by reducing green time for the Clyde Road phase

Table 21: O'Shea Road/ Soldiers Road and O'Shea Road/ baseline modelling results

Scenario		Horizon	O'Shea Road/ Soldiers Road							
			AM				PM			
			DoS	Worst Movement	Average Delay (sec)	LOS	DoS	Worst Movement	Average Delay (sec)	LOS
Current condition	**0 lots**	2018	0.57		6.5	LOS A	0.60		7.1	LOS A
No improvements to current road network	**0 lots**	2021	0.76		9.3	LOS A	0.94		14.9	LOS B
Delivery of O'Shea Road (4 lane carriageway) and Beaconsfield Interchange	**0 lots**	2021	0.55		35.4	LOS D	0.67		35.1	LOS E

Table 22: Chase Boulevard/ Soldiers Road and Grices Road/ Soldiers Road baseline modelling results

Scenario		Horizon	Chase Boulevard/ Soldiers Road								Grices Road/ Soldiers Road							
			AM				PM				AM				PM			
			DoS	Worst Movement	Average Delay (sec)	LOS	DoS	Worst Movement	Average Delay (sec)	LOS	DoS	Worst Movement	Average Delay (sec)	LOS	DoS	Worst Movement	Average Delay (sec)	LOS
Current condition	**0 lots**	2018	0.44		7.1	LOS A	0.31		6.5	LOS A	0.57		10.2	LOS B	0.27		6.8	LOS A
No improvements to current road network	**0 lots**	2021	0.53		7.5	LOS A	0.38		6.6	LOS A	0.75		14.0	LOS B	0.33		7.1	LOS A
Delivery of O'Shea Road (4 lane carriageway) and Beaconsfield Interchange	**0 lots**	2021	0.52		7.4	LOS A	0.36		6.6	LOS A	1.07	GR - EB	41.2	LOS D	0.50		8.3	LOS A

Notes:
GR: Grices Road
EB: Eastbound

Table 23: O'Shea Road/ Clyde Road and Grices Road/ Clyde Road baseline modelling results

Scenario		Horizon	O'Shea Rd/ Clyde Road								Grices Road/ Clyde Road							
			AM				PM				AM				PM			
			DoS	Worst Movement	Average Delay (sec)	LOS	DoS	Worst Movement	Average Delay (sec)	LOS	DoS	Worst Movement	Average Delay (sec)	LOS	DoS	Worst Movement	Average Delay (sec)	LOS
Current condition	**0 lots**	2018	1.02	GRR – EB T	66.3	LOS E	1.42	GGR – EB RT	84.4	LOS F	1.07	B-CR – NB T	67.4	LOS F	0.89		34.5	LOS C
No improvements to current road network	**0 lots**	2021	1.29	CR – NB RT	131.3	LOS F	1.62	GGR – EB RT	121.4	LOS F	1.09	B-CR – NB T	65.0	LOS F	1.02	CR- SB RT	50.0	LOS F
Delivery of O'Shea Road (4 lane carriageway) and Beaconsfield Interchange	**0 lots**	2021	1.54	CR – NB RT	170.9	LOS F	1.28	OSR – WB RT	107.1	LOS F	1.20	B-CR – NB T	85.7	LOS F	1.27	CR- SB RT	91.4	LOS F

Notes:
O'SR: O'Shea Road / CR: Clyde Road / GRR: Greaves Road
WB: Westbound / EB: Eastbound / SB: Southbound
T: Through Lane / RT: Right Turn Lane

4.7.2 Development results (with Minta Farm)

4.7.2.1 Intersection modelling

To establish the forecast conditions with the development of Minta Farm PSP, SIDRA models were prepared for the five existing intersections and the new North-South Arterial/ O'Shea Road intersection under the following scenarios, results are provided in Table 24 to Table 26:

- No improvements to the current road network
- Truncation of Soldiers Road with interim delivery of the North-South Arterial (2 lane carriageway)
- Truncation of Soldiers Road with delivery of North-South Arterial (4 lane carriageway)
- Delivery of O'Shea Road (4 lane carriageway) and Beaconsfield Interchange without delivery of the North-South Arterial
- Truncation of Soldiers Road with interim delivery of the North-South Arterial (2 lane carriageway) and delivery of O'Shea Road (4 lane carriageway) and Beaconsfield Interchange
- Truncation of Soldiers Road with delivery of North-South Arterial (4 lane carriageway) and delivery of O'Shea Road (4 lane carriageway) and Beaconsfield Interchange

As outlined in Section 4.6, the following outputs are again presented for each scenario:

- Degree of Saturation (DoS) for the worst movement at each intersection, the worst movement is noted when DoS reaches an undesirable level
- Level of Service (LOS) for the intersection based on average delay for all vehicle movements
- Average delay for all vehicles (in seconds per vehicle)

The intersection geometries, movement summaries and phasing diagrams from SIDRA are located in Appendix E. Key observations from Table 24 to Table 26 include:

- O'Shea Road /Soldiers Road operates satisfactorily for all scenarios up to 1,000 lots where the O'Shea Road extension/ Beaconsfield Interchange is in place
- North-South Arterial/ O'Shea Road operates satisfactorily for all scenarios up to 1,000 lots. At full development, however, it is forecast to exceed capacity. Performance measures also appear worse under the 4-lanes on North-South Arterial scenario, however, this is due to SIDRA cycle time optimisation in line with other signalised intersections
- Chase Boulevard/ Soldiers Road generally operates satisfactorily, regardless of the lot scenarios and surrounding road infrastructure upgrades
- Grices Road/ Soldiers Road/ North-South Arterial is forecast to exceed capacity in the AM peak, prior to 500 lots being developed at Minta Farm. It generally operates satisfactorily in the PM, regardless of the lot scenarios and surrounding road infrastructure upgrades. While still within a desirable DOS, performance measures do appear to deteriorate under the 4-lanes on North-South Arterial scenario, however, this is due to signal phasing assumptions (i.e. fully controlled right turns) and SIDRA cycle time optimisation

Clyde Road/ O'Shea Rd and Clyde Road/ Grices Road remain over capacity under all scenarios. Intersection performance under the different scenarios is impacted by traffic redistribution, but also SIDRA cycle time optimisation which has resulted in somewhat 'non-sequential' performance results. Nevertheless, the intersections are still forecast to operate well over capacity

Table 24: O'Shea Boulevard/ Soldiers Road and North-South Arterial/ O'Shea Road SIDRA modelling results

Scenario		Horizon	O'Shea Rd/ Soldiers Road								North-South Arterial/ O'Shea Road							
			AM				PM				AM				PM			
			DoS	Worst Movement	Average Delay (sec)	Level of Service	DoS	Worst Movement	Average Delay (sec)	Level of Service	DoS	Worst Movement	Average Delay (sec)	Level of Service	DoS	Worst Movement	Average Delay (sec)	Level of Service
No improvements to current road network	**500 lots**	2021	0.97	SR - SB	19.8	LOS C	1.93	OSR - EB	120.3	LOS F								
	750 lots	2021	1.27	SR - SB	72.6	LOS F	>2	OSR - EB	300.3	LOS F								
	1000 lots	2021	1.87	SR - SB	203.5	LOS F	>2	OSR - EB	598.4	LOS F								
	full development	2046	>2	SR - SB	>1,000	LOS F	>2	OSR - EB	>1,000	LOS F								
Truncation of Soldiers Road with interim delivery of the north-south arterial (2 lane carriageway)	**500 lots**	2021	0.77		9.6	LOS A	1.14	OSR - EB	31.5	LOS D								
	750 lots	2021	0.81		10.8	LOS B	1.39	OSR - EB	58.4	LOS F								
	1000 lots	2021	0.87	SR - SB	13.2	LOS B	1.74	OSR - EB	101.1	LOS F								
	full development	2046	>2	SR - SB	>1,000	LOS F	>2	OSR - EB	>1000	LOS F								
Truncation of Soldiers Road with delivery of north-south arterial (4 lane carriageway)	**500 lots**	2021	0.77		9.6	LOS A	1.14	OSR - EB	31.5	LOS D								
	750 lots	2021	0.81		10.8	LOS B	1.39	OSR - EB	58.4	LOS F								
	1000 lots	2021	0.87	SR - SB	13.2	LOS B	1.74	OSR - EB	101.1	LOS F								
	full development	2046	>2	SR - SB	>1,000	LOS F	>2	OSR - EB	>1,000	LOS F								
Delivery of O'Shea Road (4 lane carriageway) and Beaconsfield Interchange without delivery of the north-south arterial	**500 lots**	2021	0.55		35.0	LOS D	0.68		33.5	LOS C								
	750 lots	2021	0.60		35.4	LOS D	0.69		31.4	LOS C								
	1000 lots	2021	0.73		37.0	LOS D	0.69		33.4	LOS C								
	full development	2046	1.41	SR – SB T	117.3	LOS F	1.41	SR – SB T	142.3	LOS F								
Truncation of Soldiers Road with interim delivery of the north-south arterial (2 lane carriageway) and delivery of O'Shea Road (4 lane carriageway) and Beaconsfield Interchange	**500 lots**	2021	0.57		30.4	LOS C	0.69		33.6	LOS C	0.30		20.3	LOS C	0.24		19.9	LOS B
	750 lots	2021	0.57		30.1	LOS C	0.69		34.4	LOS C	0.34		20.4	LOS C	0.26		20.4	LOS C
	1000 lots	2021	0.56		32.0	LOS C	0.68		35.3	LOS D	0.37		22.0	LOS C	0.28		20.9	LOS C
	full development	2046	1.41	OSR – EB RT	117.3	LOS F	1.41	SR – SB RT	142.3	LOS F	>2	OSR-WB LT	936.7	LOS F	1.60	N-S ART RT	443.0	LOS F
Truncation of Soldiers Road with delivery of north-south arterial (4 lane carriageway) and delivery of O'Shea Road (4 lane carriageway) and Beaconsfield Interchange	**500 lots**	2021	0.60		34.4	LOS C	0.73		35.7	LOS D	0.30		20.3	LOS C	0.24		20.4	LOS C
	750 lots	2021	0.67		34.9	LOS C	0.75		35.3	LOS D	0.34		21.5	LOS C	0.26		19.9	LOS B
	1000 lots	2021	0.70		40.1	LOS D	0.77		37.2	LOS D	0.37		23.2	LOS C	0.28		20.0	LOS B
	full development	2046	1.36	OSR – EB T	117.0	LOS F	1.31	OSR – EB RT	112.5	LOS F	>2	OSR-WB LT	993.2	LOS F	1.73	N-S ART RT	486.1	LOS F

Notes:

SR: Soldiers Road / OSR: O'Shea Road / NS ART: North-South Arterial

SB: Southbound / EB: Eastbound / WB: Westbound

T: Through / RT: Right Turn Lane

Table 25: Chase Boulevard/ Soldiers Road and Grices Road/ North-South Arterial SIDRA modelling results

Scenario		Horizon	Chase Boulevard/ Soldiers Road								Grices Road/ Soldiers Road/ North-South Arterial							
			AM				PM				AM				PM			
			DoS	Worst Movement	Average Delay (sec)	Level of Service	DoS	Worst Movement	Average Delay (sec)	Level of Service	DoS	Worst Movement	Average Delay (sec)	Level of Service	DoS	Worst Movement	Average Delay (sec)	Level of Service
No improvements to current road network	**500 lots**	2021	0.72		10.2	LOS B	0.49		7.5	LOS A	0.95		23.8	LOS C	0.39		7.6	LOS A
	750 lots	2021	0.80		12.5	LOS B	0.55		7.8	LOS A	0.97	SR - SB	25.2	LOS C	0.40		7.6	LOS A
	1000 lots	2021	0.80		12.5	LOS B	0.55		7.8	LOS A	0.97	SR - SB	25.2	LOS C	0.40		7.6	LOS A
	full development	2046	1.15	SR - NB	54.7	LOS E	0.73		9.5	LOS A	1.45	SR - SB	137.7	LOS F	0.59		9.4	LOS A
Truncation of Soldiers Road with interim delivery of the north-south arterial (2 lane carriageway)	**500 lots**	2021	0.56		8.0	LOS A	0.41		7.0	LOS A	0.97	SR – NB T	51.5	LOS D	0.70		27.7	LOS C
	750 lots	2021	0.57		8.1	LOS A	0.42		7.0	LOS A	0.97	GR – EB RT	51.1	LOS E	0.71		27.7	LOS C
	1000 lots	2021	0.57		8.1	LOS A	0.42		7.0	LOS A	0.97	GR – EB RT	51.1	LOS E	0.71		27.7	LOS C
	full development	2046	1.03	CB – WB	36.4	LOS D	0.92	SR - NB	18.6	LOS B	1.66	SR – NB T	196.2	LOS F	1.29	N-S ART RT	108.1	LOS F
Truncation of Soldiers Road with delivery of north-south arterial (4 lane carriageway)	**500 lots**	2021	0.56		8.0	LOS A	0.41		7.0	LOS A	0.92		48.9	LOS D	0.70		28.9	LOS C
	750 lots	2021	0.57		8.1	LOS A	0.42		7.0	LOS A	0.94	N-S ART RT	49.8	LOS D	0.71		28.8	LOS C
	1000 lots	2021	0.57		8.1	LOS A	0.42		7.0	LOS A	0.94	N-S ART RT	49.8	LOS D	0.71		28.8	LOS C
	full development	2046	1.03	CB – WB	36.4	LOS D	0.95	SR - NB	20.7	LOS C	1.32	N-S ART RT	138.6	LOS F	1.00	N-S ART RT	59.8	LOS E
Delivery of O'Shea Road (4 lane carriageway) and Beaconsfield Interchange without delivery of the north-south arterial	**500 lots**	2021	0.77		11.1	LOS B	0.55		7.5	LOS A	1.10	GR - EB	52.2	LOS E	0.53		8.5	LOS A
	750 lots	2021	0.86	SR - NB	14.3	LOS B	0.60		7.8	LOS A	1.10	GR - EB	54.3	LOS E	0.54		8.5	LOS A
	1000 lots	2021	0.86	SR - NB	14.3	LOS B	0.60		7.8	LOS A	1.10	GR - EB	54.3	LOS E	0.54		8.5	LOS A
	full development	2046	1.00	CB – WB	35.6	LOS D	0.98	SR - NB	22.7	LOS C	1.68	GR – EB RT	244.0	LOS F	1.96	N-S ART T	254.4	LOS F
Truncation of Soldiers Road with interim delivery of the north-south arterial (2 lane carriageway) and delivery of O'Shea Road (4 lane carriageway) and Beaconsfield Interchange	**500 lots**	2021	0.69		9.2	LOS A	0.50		7.2	LOS A	1.02	GR – EB RT	51.7	LOS D	0.54		24.0	LOS C
	750 lots	2021	0.75		10.7	LOS B	0.53		7.4	LOS A	1.02	GR – EB RT	53.4	LOS D	0.54		23.9	LOS C
	1000 lots	2021	0.75		10.7	LOS B	0.53		7.4	LOS A	1.02	GR – EB RT	53.4	LOS E	0.54		23.9	LOS C
	full development	2046	1.00	SR - SB	35.6	LOS D	0.98	SR - NB	22.7	LOS C	1.69	GR – EB RT	223.6	LOS F	1.16	N-S ART RT	72.5	LOS F
Truncation of Soldiers Road with delivery of north-south arterial (4 lane carriageway) and delivery of O'Shea Road (4 lane carriageway) and Beaconsfield Interchange	**500 lots**	2021	0.69		9.2	LOS A	0.50		7.2	LOS A	0.92		49.9	LOS D	0.70		29.1	LOS C
	750 lots	2021	0.75		10.7	LOS B	0.53		7.4	LOS A	0.93		50.7	LOS D	0.71		29.1	LOS C
	1000 lots	2021	0.75		10.7	LOS B	0.53		7.4	LOS A	0.95		50.5	LOS D	0.71		29.1	LOS C
	full development	2046	1.04	CB – WB	45.4	LOS D	1.03	SR - NB	28.5	LOS C	1.32	SR – NB T	145.800	LOS F	0.99	N-S ART RT	58.4	LOS E

Notes:

CB: Chase Boulevard / SR: Soldiers Road / GR: Grices Road / NS ART: North-South Arterial

NB: Northbound / SB: Southbound / EB: Eastbound / WB: Westbound

T: Through / RT: Right Turn Lane

Table 26: O'Shea Road/ Clyde Road and Grices Road/ Clyde Road SIDRA modelling results

Scenario		Horizon	Clyde Road/ O'Shea Rd								Clyde Road/ Grices Road							
			AM				PM				AM				PM			
			DoS	Worst Movement	Average Delay (sec)	Level of Service	DoS	Worst Movement	Average Delay (sec)	Level of Service	DoS	Worst Movement	Average Delay (sec)	Level of Service	DoS	Worst Movement	Average Delay (sec)	Level of Service
No improvements to current road network	**500 lots**	2021	1.77	OSR – WB T	248.2	LOS F	1.61	OSR – WB RT	224.7	LOS F	1.18	B-CR – NB T	85.8	LOS F	1.07	CR – SB RT	53.1	LOS F
	750 lots	2021	1.92	CR – SB RT	296.8	LOS F	1.65	OSR – WB RT	246.0	LOS F	1.18	CR – SB RT	86.0	LOS F	1.09	CR – SB RT	54.8	LOS F
	1000 lots	2021	>2	OSR – WB RT	332.7	LOS F	1.73	OSR – WB T	268.3	LOS F	1.18	B-CR – NB T	101.5	LOS F	1.09	CR – SB T	56.4	LOS F
	full development	2046	>2	OSR – WB RT	575.9	LOS F	>2	OSR – WB T	441.0	LOS F	1.80	B-CR – NB RT	173.9	LOS F	1.46	GLR – EB T	177.2	LOS F
Truncation of Soldiers Road with interim delivery of the north-south arterial (2 lane carriageway)	**500 lots**	2021	1.60	GRR – EB RT	113.7	LOS F	1.44	OSR – WB RT	174.9	LOS F	1.42	CR – SB RT	114.5	LOS F	0.98	GR – WB T	44.3	LOS E
	750 lots	2021	1.53	GRR – EB RT	106.9	LOS F	1.34	OSR – WB RT	158.5	LOS F	1.35	CR – SB RT	115.2	LOS F	1.33	CR – SB RT	117.7	LOS F
	1000 lots	2021	1.68	OSR – WB RT	116.7	LOS F	1.37	OSR – WB T	164.0	LOS F	1.16	B-CR – NB T	90.7	LOS F	1.15	B-CR – NB T	87.6	LOS F
	full development	2046	>2	GRR – EB RT	416.3	LOS F	>2	GRR – EB RT	395.4	LOS F	1.43	GR – WB LT	157.0	LOS F	1.81	GR – WB LT	181.0	LOS F
Truncation of Soldiers Road with delivery of north-south arterial (4 lane carriageway)	**500 lots**	2021	1.47	OSR – WB T	170.9	LOS F	1.34	GRR – EB RT	157.4	LOS F	1.26	GR – WB T	114.9	LOS F	1.11	GR – WB T	88.9	LOS F
	750 lots	2021	1.53	GRR – EB RT	106.9	LOS F	1.34	OSR – WB RT	158.5	LOS F	1.27	GR – WB T	107.4	LOS F	1.12	GR – WB T	90.4	LOS F
	1000 lots	2021	1.68	GRR – EB RT	116.7	LOS F	1.37	OSR – WB T	164.0	LOS F	1.27	GR – WB T	119.9	LOS F	1.11	GR – WB RT	93.1	LOS F
	full development	2046	>2	GRR – EB RT	416.3	LOS F	>2	GRR – EB RT	507.6	LOS F	1.43	GR – WB LT	157.0	LOS F	1.78	GR – WB LT	186.2	LOS F
Delivery of O'Shea Road (4 lane carriageway) and Beaconsfield Interchange without delivery of the north-south arterial	**500 lots**	2021	1.67	OSR – WB RT	129.4	LOS F	1.89	CR – SB RT	90.4	LOS F	1.23	B-CR – NB T	87.8	LOS F	1.47	GR – WB RT	53.0	LOS F
	750 lots	2021	>2	OSR – WB RT	181.0	LOS F	1.66	CR – SB RT	80.9	LOS F	1.62	B-CR – NB T	163.1	LOS F	1.54	GLR – EB RT	38.3	LOS E
	1000 lots	2021	>2	CR – SB RT	182.2	LOS F	1.65	CR – SB RT	79.2	LOS E	1.63	B-CR – NB T	167.4	LOS F	1.61	GLR – EB RT	62.6	LOS F
	full development	2046	>2	GRR – EB RT	308.3	LOS F	>2	GRR – EB RT	293.1	LOS F	1.56	GR – WB LT	162.5	LOS F	1.67	GR – WB LT	174.8	LOS F
Truncation of Soldiers Road with interim delivery of the north-south arterial (2 lane carriageway) and delivery of O'Shea Road (4 lane carriageway) and Beaconsfield Interchange	**500 lots**	2021	>2	OSR – WB RT	128.4	LOS F	1.89	CR – SB RT	88.7	LOS F	1.31	B-CR – NB T	103.0	LOS F	1.47	GLR – EB RT	52.5	LOS F
	750 lots	2021	>2	OSR – WB RT	128.8	LOS F	1.66	CR – SB RT	78.9	LOS E	1.12	GR – WB T	65.6	LOS F	1.20	GLR – EB RT	40.7	LOS F
	1000 lots	2021	>2	CR – SB RT	102.6	LOS F	1.65	CR – SB RT	76.8	LOS E	1.42	CR – SB RT	122.8	LOS F	0.99	GR – WB T	36.7	LOS E
	full development	2046	>2	GRR – EB RT	308.3	LOS F	>2	GRR – EB RT	293.1	LOS F	1.56	GR – WB LT	162.5	LOS F	1.67	GR – WB LT	174.8	LOS F
Truncation of Soldiers Road with delivery of north-south arterial (4 lane carriageway) and delivery of O'Shea Road (4 lane carriageway) and Beaconsfield Interchange	**500 lots**	2021	1.90	OSR – WB RT	95.3	LOS F	1.74	OSR – WB RT	82.2	LOS F	1.32	GR – WB RT	112.4	LOS F	1.15	GR – WB RT	66.7	LOS F
	750 lots	2021	>2	CR – SB RT	101.4	LOS F	1.89	CR – SB RT	90.4	LOS F	1.34	GR – WB T	111.0	LOS F	1.15	CR – SB T	67.7	LOS F
	1000 lots	2021	1.47	CR – SB RT	76.1	LOS E	>2	OSR – WB RT	94.0	LOS F	1.32	GR – WB T	128.2	LOS F	1.16	CR – SB T	84.8	LOS F
	full development	2046	>2	GRR – EB RT	312.3	LOS F	>2	OSR – WB RT	286.0	LOS F	1.43	GR – WB LT	160.6	LOS F	1.49	CR – SB T	182.5	LOS F

Notes:
OSR: O'Shea Road / CR: Clyde Road / GRR: Greaves Road / B-CR: Berwick-Cranbourne Road / SR: Soldiers Road / GR: Grices Road / GLR: Glasscocks Road
NB: Northbound / SB: Southbound / EB: Eastbound / WB: Westbound
T: Through / RT: Right Turn Lane / LT: Left Turn Lane

4.7.2.2 Sensitivity testing

Sensitivity tests were also undertaken on the Grices Road intersections with Clyde Road and the North-South Arterial, to assess the impact of the duplication of Grices Road on intersection performance (layouts as shown in Figure 12). The purpose of the testing was to further assist in the identification of critical infrastructure improvements to support the 1,000 lot development scenario.

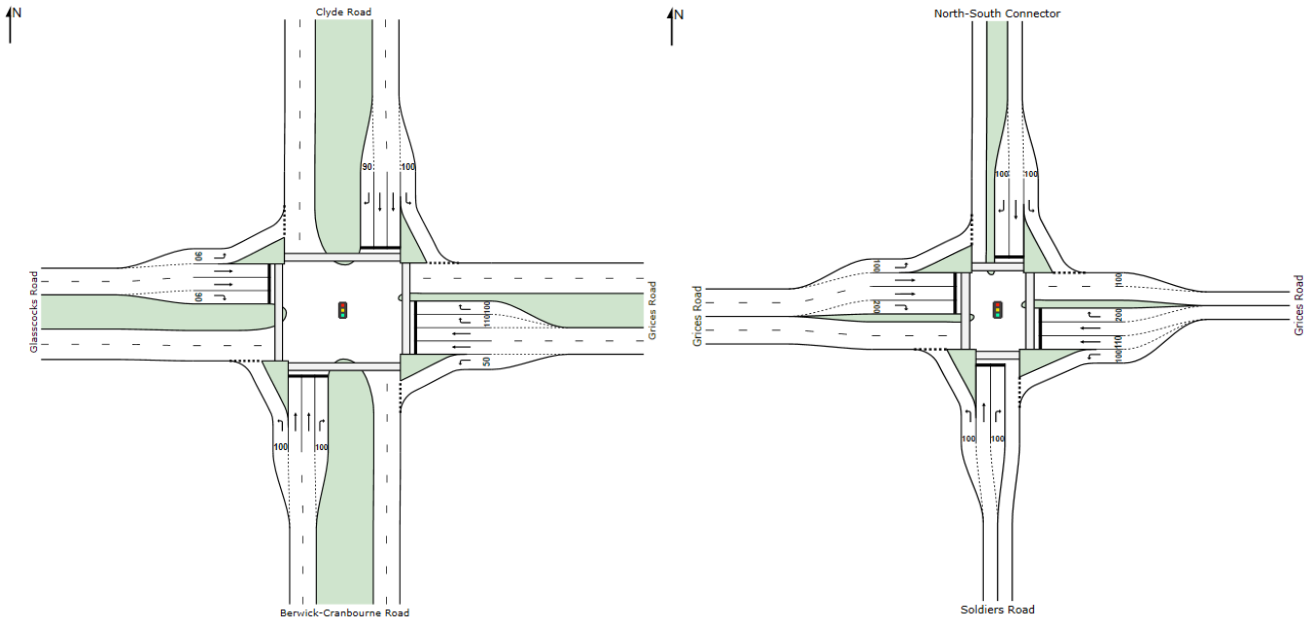


Figure 12: Intersection layouts for Clyde Road / Grices Road and Grices Road / North-South Arterial – Sensitivity tests

The sensitivity tests were undertaken for the following road infrastructure scenarios:

- No improvements to the current road network (1,000 lots)
- Truncation of Soldiers Road with interim delivery of the north-south arterial (2 lane carriageway) without O'Shea Road (4 lane carriageway) and Beaconsfield Interchange (1,000 lots)
- Truncation of Soldiers Road with interim delivery of the north-south arterial (2 lane carriageway) and delivery of O'Shea Road (4 lane carriageway) and Beaconsfield Interchange (1,000 lots)

Results of the sensitivity tests are presented in Table 27. Results for the equivalent scenarios without the Grices Road duplication have also been presented for comparative purposes.

The intersection geometries, movement summaries and phasing diagrams from SIDRA are located in Appendix F.

Table 27: Sensitivity test modelling results

Scenario			Horizon	Grices Road/ Clyde Road								Grices Road/ North-South Arterial							
				AM				PM				AM				PM			
				DoS	Worst Movement	Av. Delay (sec)	LOS	DoS	Worst Movement	Av. Delay (sec)	LOS	DoS	Worst Movement	Av. Delay (sec)	LOS	DoS	Worst Movement	Av. Delay (sec)	LOS
Without Grices Rd Duplication	No improvements to current road network	**1,000 lots**	2021	1.18	B-CR – NB T	101.5	LOS F	1.09	CR – SB T	56.4	LOS F	0.97	SR SB	25.2	LOS C	0.40		7.6	LOS A
	Truncation of Soldiers Road with interim delivery of the north-south arterial (2 lane carriageway)	**1,000 lots**	2021	1.16	B-CR – NB T	90.7	LOS F	1.15	B-CR – NB T	87.6	LOS F	0.97	GR-EB RT	51.1	LOS E	0.71		27.7	LOS C
	Truncation of Soldiers Road with interim delivery of the north-south arterial (2 lane carriageway) and delivery of O'Shea Road (4 lane carriageway) and Beaconsfield Interchange	**1,000 lots**	2021	1.42	CR – SB RT	122.8	LOS F	0.99	GR – WB T	36.7	LOS E	1.02	GR – EB RT	53.4	LOS E	0.54		23.9	LOS C
With Grices Rd Duplication	No improvements to current road network	**1,000 lots**	2021	0.96	GLR – EB T	49.9	LOS E	0.89		37.3	LOS C								
	Truncation of Soldiers Road with interim delivery of the north-south arterial (2 lane carriageway)	**1,000 lots**	2021	0.90		34.2	LOS D	0.890		42.0	LOS C	0.97	GR-EB RT	52.4	LOS D	0.59		31.1	LOS C
	Truncation of Soldiers Road with interim delivery of the north-south arterial (2 lane carriageway) and delivery of O'Shea Road (4 lane carriageway) and Beaconsfield Interchange	**1,000 lots**	2021	0.90		34.7	LOS C	0.89		32.8	LOS C	0.98	GR-EB RT	53.9	LOS D	0.59		30.0	LOS C

Notes:
CR: Clyde Road / B-CR: Berwick-Cranbourne Road / SR: Soldiers Road / GR: Grices Road / GLR: Glasscocks Road
NB: Northbound / SB: Southbound / EB: Eastbound / WB: Westbound
T: Through / RT: Right Turn Lane / LT: Left Turn Lane

The results indicate that the duplication of Grices Road (to provide a four lane carriageway) notably improves the operation of the intersection with Clyde Road under the 1,000 lot development scenarios.

Duplicating Grices Road and providing a double right turn lane on to Clyde Road reduces the degree of saturation to below 1.0 in the morning peak, and in combination with wider network changes, to within the target degree of saturation. In the evening peak, duplication of Grices Road improves intersection performance to within a desirable degree of saturation and level of service.

At the Grices Road intersection with the interim North-South Arterial, the duplication of Grices Road (to provide a four lane carriageway) has a negligible difference on intersection performance. The critical movement at the intersection, particularly in the AM peak, remains the right turn from Grices Road to the south, which is not addressed through provision of an additional through lane.

The results suggest that the delivery of the Grices Road duplication, including a double right-turn on the east approach is critical to ensure satisfactory operation of the Clyde Road/ Grices Road intersection under the 1,000 lot development of Minta Farm. However, it is not critical to extend this duplication to the interim North-South Arterial / Grices Road intersection. Two through lanes on Grices Road does at the intersection with the interim North-South Arterial does not appear to assist intersection performance. Further investigation at this intersection with regard to intersection layout or signal timing/ phasing will be required to support the critical west to south movement.

4.7.2.3 Mid-block analysis

An analysis of midblock volumes was carried out on the current network configuration as well on all other network options under the 1000-lot residential scenario only. Where possible, midblock volume counts were sourced from *Additional Traffic Modelling at Minta Farm PSP 11* (Traffic Group, 2017), as well as traffic surveys undertaken for this report. Figure 13 shows the midblock volumes under the current network configuration using 2018 traffic volumes.

Figure 13: Midblock daily volume summary under current network conditions (2018)

Table 28 shows a comparison of the midblock volumes under the aforementioned modelled scenarios for the horizon year 2021, in relation to the roads classification in the City of Casey Public Road Register.

Table 28: Midblock daily volume summary – 1000 lot scenario

Road	Location	Road classification	Base (2021)	Without O'Shea Road Extension and Beaconsfield Interchange		With O'Shea Road Extension and Beaconsfield Interchange	
				No N-S Connection	N-S Arterial	No N-S Connection	N-S Arterial
O'Shea Rd	Between Clyde Road & Soldiers Road	Existing: Collector Road (3,000-7,000) Future: Secondary Arterial (12,000-40,000)	9,420	14,325	11,020	10,840	10,945

Road	Location	Road classification	Base (2021)	Without O'Shea Road Extension and Beaconsfield Interchange		With O'Shea Road Extension and Beaconsfield Interchange	
				No N-S Connection	N-S Arterial	No N-S Connection	N-S Arterial
Clyde Rd	Between O'Shea Road & Grices Road	Primary Arterial (>40,000)	47,045	49,000	42,935	43,835	42,050
Grices Rd	Between Clyde Road & Soldiers Road	Existing: Collector Road (3,000-7,000) Future: Secondary Arterial (12,000-40,000)	10,595	15,500	12,195	12,015	12,120
Soldiers Rd	Between Chase Boulevard & Hazelnut Blvd	Collector Road (3,000-7,000)	3,630	4,570	3,930	5,730	4,970
Soldiers Rd	Between Viewgrand Drive and Chase Blvd	Collector Road (3,000-7,000)	6,505	9,845	7,275	11,005	9,855

Table 28 highlights the following key points;

- O'Shea Road has midblock volumes above the category of collector road, which it currently operates as. However, with the recent Government announcement of the upgrade to O'Shea Road, this will result in an upgrade to a secondary arterial, which should provide sufficient capacity
- Clyde Road is within the expected capacity of a primary arterial and highlights the requirement for Clyde Road to be 6 lanes between Meadowlands Way and Grices Road
- Grices Road has estimated midblock volumes above the desired volume for the existing roads classification across all road layout scenarios. Ultimately, Grices Road will be classified as a secondary arterial and should see the duplication of the road between Clyde Road and Viewgrand Drive
- Soldiers Road, between Chase Boulevard and Hazelnut Boulevard, has estimated mid-block volumes within the collector road category, regardless of the scenarios
- Soldiers Road, between Viewgrand Drive and Chase Boulevard, has estimated midblock volumes above the desired volume for the roads in most of the 1000-lot scenarios, with the worst performing scenario being the O'Shea Road extension without the interim north-south arterial. This demonstrates the need for the North-South Arterial to be constructed by the 1001st lot within Minta Farm

4.7.3 Key results

The key results from the analysis are summarised in Table 29.

Table 29: Key findings from SIDRA analysis

Scenario		Horizon	O'Shea Road/ Soldiers Road		Chase Boulevard/ Soldiers Road		Grices Road/ Soldiers Road		Clyde Road/ O'Shea Rd/		Clyde Road / Grices Road/		North-South Arterial/ O'Shea Road	
			AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
			DoS	DoS	DoS	DoS	DoS	DoS	DoS	DoS	DoS	DoS	DoS	DoS
Baseline Results (without Minta Farm)														
Current condition	**0 lots**	2018	0.57	0.57	0.44	0.31	0.57	0.27	1.02	1.42	1.07	0.89	NA	NA
No improvements to current road network	**0 lots**	2021	0.76	0.76	0.53	0.38	0.75	0.33	1.29	1.62	1.09	1.02	NA	NA
Delivery of O'Shea Road (4 lane carriageway) and Beaconsfield Interchange	**0 lots**	2021	0.55	0.55	0.52	0.36	1.07	0.50	1.54	1.28	1.20	1.27	NA	NA
Development Results (with Minta Farm)														
No improvements to current road network	**500 lots**	2021	0.97	1.93	0.72	0.49	0.95	0.39	1.77	1.61	1.18	1.07	NA	NA
	750 lots	2021	1.27	>2	0.80	0.55	0.97	0.40	1.92	1.65	1.18	1.09	NA	NA
	1000 lots	2021	1.87	>2	0.80	0.55	0.97	0.40	>2	1.73	1.18	1.09	NA	NA
	full development	2046	>2	>2	1.15	0.73	1.45	0.59	>2	>2	1.80	1.46	NA	NA
Truncation of Soldiers Road with interim delivery of the north-south arterial (2 lane carriageway)	**500 lots**	2021	0.77	1.14	0.56	0.41	0.97	0.70	1.60	1.44	1.42	0.98	NA	NA
	750 lots	2021	0.81	1.39	0.57	0.42	0.97	0.71	1.53	1.34	1.35	1.33	NA	NA
	1000 lots	2021	0.87	1.74	0.57	0.42	0.97	0.71	1.68	1.37	1.16	1.15	NA	NA
	full development	2046	>2	>2	1.03	0.92	1.66	1.29	>2	>2	1.43	1.81	NA	NA
Truncation of Soldiers Road with delivery of north-south arterial (4 lane carriageway)	**500 lots**	2021	0.77	1.14	0.56	0.41	0.92	0.70	1.47	1.34	1.26	1.11	NA	NA
	750 lots	2021	0.81	1.39	0.57	0.42	0.94	0.71	1.53	1.34	1.27	1.12	NA	NA
	1000 lots	2021	0.87	1.74	0.57	0.42	0.94	0.71	1.68	1.37	1.27	1.11	NA	NA
	full development	2046	>2	>2	1.03	0.95	1.32	1.00	>2	>2	1.43	1.78	NA	NA

Delivery of O'Shea Road (4 lane carriageway) and Beaconsfield Interchange without delivery of the north-south arterial	**500 lots**	2021	0.55	0.68	0.77	0.55	1.10	0.53	1.67	1.89	1.23	1.47	NA	NA
	750 lots	2021	0.60	0.69	0.86	0.60	1.10	0.54	>2	1.66	1.62	1.54	NA	NA
	1000 lots	2021	0.73	0.69	0.86	0.60	1.10	0.54	>2	1.65	1.63	1.61	NA	NA
	full development	2046	1.41	1.41	1.00	0.98	1.68	1.96	>2	>2	1.56	1.67	NA	NA
Truncation of Soldiers Road with interim delivery of the north-south arterial (2 lane carriageway) and delivery of O'Shea Road (4 lane carriageway) and Beaconsfield Interchange	**500 lots**	2021	0.57	0.69	0.69	0.50	1.02	0.54	>2	1.89	1.31	1.47	0.30	0.24
	750 lots	2021	0.57	0.69	0.75	0.53	1.02	0.54	>2	1.66	1.12	1.20	0.34	0.26
	1000 lots	2021	0.56	0.68	0.75	0.53	1.02	0.54	>2	1.65	1.42	0.99	0.37	0.28
	full development	2046	1.41	1.41	1.00	0.98	1.69	1.16	>2	>2	1.56	1.67	>2	1.60
Truncation of Soldiers Road with delivery of north-south arterial (4 lane carriageway) and delivery of O'Shea Road (4 lane carriageway) and Beaconsfield Interchange	**500 lots**	2021	0.60	0.73	0.69	0.50	0.92	0.70	1.90	1.74	1.32	1.15	0.30	0.24
	750 lots	2021	0.67	0.75	0.75	0.53	0.93	0.71	>2	1.89	1.34	1.15	0.34	0.26
	1000 lots	2021	0.70	0.77	0.75	0.53	0.95	0.71	1.47	>2	1.32	1.16	0.37	0.28
	full development	2046	1.36	1.31	1.04	1.03	1.32	0.99	>2	1.61	1.43	1.49	>2	1.73

Key findings from the analysis are summarised in Table 30 and Table 31.

Table 30: Baseline findings - without Minta Farm development

Without Minta Farm development		
Horizon	**Key findings**	**Critical transport infrastructure**
2018 with no improvements to current road network 2021 (6% p.a. growth) with no improvements to current road network	• **Clyde Road/ O'Shea Road** and **Clyde Road/ Grices Road** are already operating above capacity, except Clyde Road/ Grices Road in PM peak for 2018 • All other intersections operate satisfactorily	• Clyde Road/ O'Shea Road intersection requires an intersection capacity upgrade • Clyde Road/ Grices Road intersection requires an intersection capacity upgrade
2021 (6% p.a. growth) with delivery of O'Shea Road (4 lane carriageway) and Beaconsfield Interchange	• **Clyde Road/ O'Shea Road** and **Clyde Road/ Grices Road** are already operating above capacity • The O'Shea Road/ Beaconsfield Interchange connection diverts traffic from Clyde Road, however, as this becomes a desirable link to the Princes Freeway it will induce traffic demand to O'Shea Road, Grices Road and Soldiers Road. The induced demand at the **Grices Road/ Soldiers Road** intersection causes it to fail	• Grices Road requires duplication between Clyde Road and Viewgrand Drive • Grices Road/ Soldiers Road intersection requires an upgrade

Table 31: Development findings - with Minta Farm development

With Minta Farm development		
Horizon	**Key findings**	**Critical transport infrastructure**
2021 with 500, 750 & 1,000 lot scenarios with all road network scenarios.	• **Chase Boulevard/ Soldiers Road** generally operates satisfactorily, regardless of the lot scenarios and surrounding road infrastructure upgrades	• Not dependent on other infrastructure, however, it does benefit from the North-South Arterial being built
	• **O'Shea Road/ Soldiers Road** fails for the following scenarios; d) No improvement to current road network e) Truncation of Soldiers Road with interim delivery of North-South Arterial (2 lane carriageway) f) Truncation of Soldiers Road with delivery of North-South Arterial (4 lane carriageway) • O'Shea Road /Soldiers Road operates satisfactorily for all scenarios where the O'Shea Road extension/ Beaconsfield Interchange is built	• O'Shea Road requires duplication between Clyde Road and Beaconsfield Interchange • O'Shea Road/ Soldiers Road intersection requires an upgrade • Beaconsfield Interchange requires an upgrade

With Minta Farm development		
Horizon	**Key findings**	**Critical transport infrastructure**
	• **Grices Road/ Soldiers Road** fails in AM peak, prior to 500 lots being developed at Minta Farm However, it also fails without Minta Farm when Beaconsfield Interchange is built. This is due to traffic redistribution	• Grices Road/ Soldiers Road intersection requires an upgrade if; c) The Beaconsfield Interchange is built d) Before Minta Farm reaches 500 lots and Beaconsfield interchange is not built • North-South Arterial needs a connection to Soldiers Road before either Beaconsfield Interchange is operational or Minta Farm reaches 500 lots. This is due to the truncation of Soldiers Road as part of the intersection upgrade
	• **Clyde Road/ O'Shea Road** performance deteriorates with the development of Minta Farm, remaining above capacity • North-South Arterial alleviates some congestion on Clyde Road, without O'Shea Road extension and Beaconsfield Interchange. This is due to traffic being diverted from Clyde Road to the North-South Arterial, particularly via Grices Road. This traffic distribution results in the Grices Road/ Soldiers Road intersection operating beyond capacity • When O'Shea Road extension and Beaconsfield Interchange is built, its intersection with Clyde Road performs more unsatisfactorily (above capacity). This is due to likelihood that the Greaves Road/ O'Shea Road connection to the Beaconsfield Interchange becoming a key link to the Princes Freeway.	• Improvements to the Clyde Road/ O'Shea Road intersection are dependent on wider road network improvements, such as upgrades to Thompsons Road, Glasscocks Road, Greaves/ Pound Road and other key arterial roads
	• **Clyde Road/ Grices Road** is not significantly impacted from the Minta Farm development The intersection is more impacted by the Beaconsfield Interchange upgrade • Clyde Road/ Grices Road operates marginally better with the interim North-South Arterial, without the O'Shea Road extension and Beaconsfield Interchange upgrade • When O'Shea Road extension and Beaconsfield Interchange is built, this	• Clyde Road/ Grices Road operates satisfactorily when Grices Road is duplicated and a double right-turn provided

With Minta Farm development		
Horizon	**Key findings**	**Critical transport infrastructure**
	intersection fails due to traffic redistribution and not due to the Minta Farm development	
2046 with full development with all road network scenarios	• Generally, all intersections, aside from Chase Boulevard/ Soldiers Road, fail with significant deterioration of operating performance This is taking into consideration; c) Casey's 2046 population forecast d) Minimal road network upgrades within the study area • Previous modelling indicates that when the road network is fully developed, most roads within the vicinity of Minta Farm and the South Eastern Growth Corridor still operate close to capacity	• Road infrastructure alone will not resolve the estimated traffic congestion within Minta Farm area and the wider South Eastern Growth Corridor • Key employment centres within the region, such as Minta Farm, need to focus on encouraging modal shift to public transport and active transport to reduce the reliance on private vehicles • Investigate dedicated public transport corridors and plan to encourage active transport as a mode of choice

5. Appropriateness of Requirement R96

Following the traffic impact assessment, a review on the appropriateness of Requirement R96 in the Exhibited *Minta Farm Precinct Structure Plan* (VPA, October 2017) was undertaken. From the results discussed throughout the report, Table 32 highlights the critical transport infrastructure required and the potential lot caps.

Table 32: Lot cap summary per scenario

Road upgrade	Critical transport infrastructure	Lot cap
O'Shea Road/ Beaconsfield Interchange	Duplicate O'Shea Road between Clyde Road and Beaconsfield Interchange, and upgrade to full diamond interchange	By 500 lots, the Beaconsfield Interchange and O'Shea Road duplication needs to be complete
Grices Road/ Soldiers Road	Signalise intersection and truncate Soldiers Road	By 500 lots or if Beaconsfield Interchange is upgraded
Grices Road	Duplicate Grices Road between Clyde Road and Soldiers Road	By 500 lots or if Beaconsfield Interchange is upgraded
North-South Arterial	Construct interim 2-lane carriageway	By 1,001 lots, if Beaconsfield Interchange is not upgraded

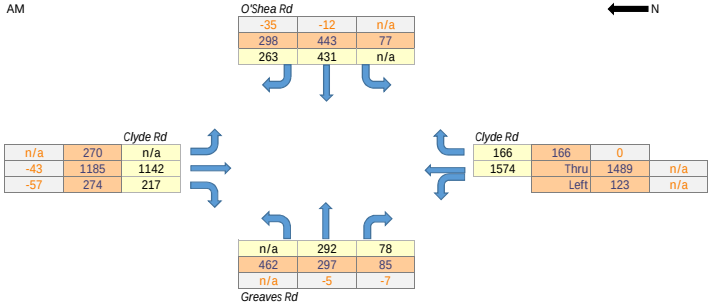
Essentially, the finding from this analysis is that the O'Shea Road duplication through to the Beaconsfield Interchange and improvements along Grices Road are as important as the North-South Arterial in alleviating traffic congestion in the surrounding Minta Farm area.

The lot cap in place prior to the construction of the North-South Arterial generally hinges upon the construction of the O'Shea Road extension and the construction of the Beaconsfield Interchange.

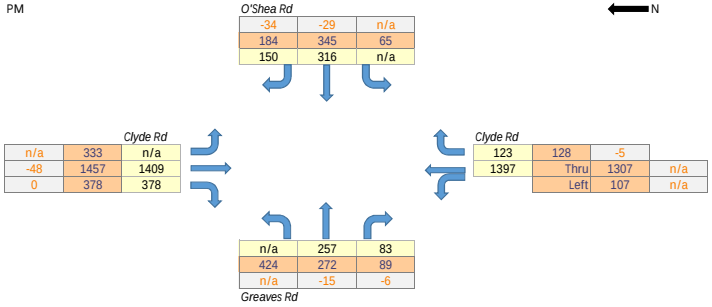
Appendix A. SCATS vs Turning Count Survey Comparison

O'Shea Rd / Clyde Rd

15-Feb
AM



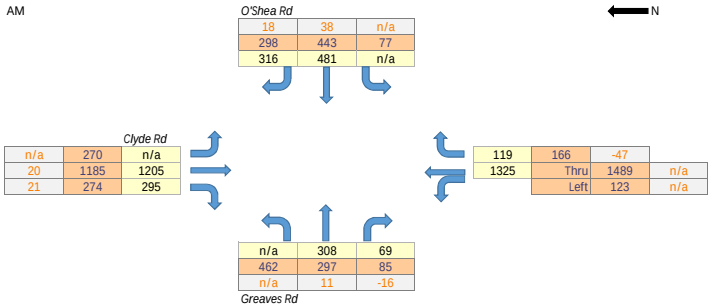
15-Feb
PM



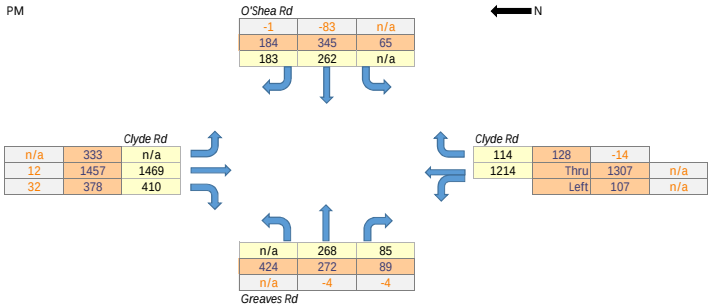
Legend

	SCATS data
	Traffic Survey data
	Vehicle volume difference (SCATS minus Survey)
n/a	No SCATS data available for turn movement

22-Feb
AM



22-Feb
PM

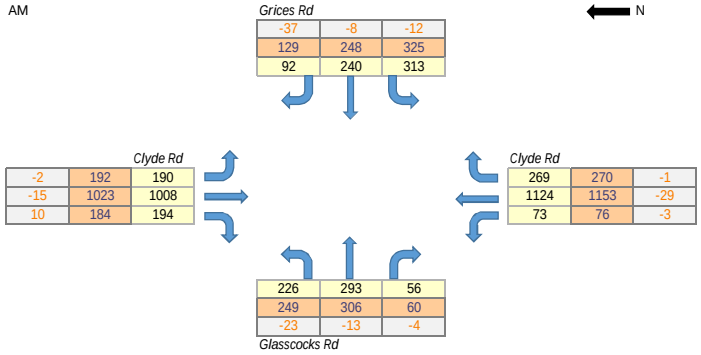


Legend

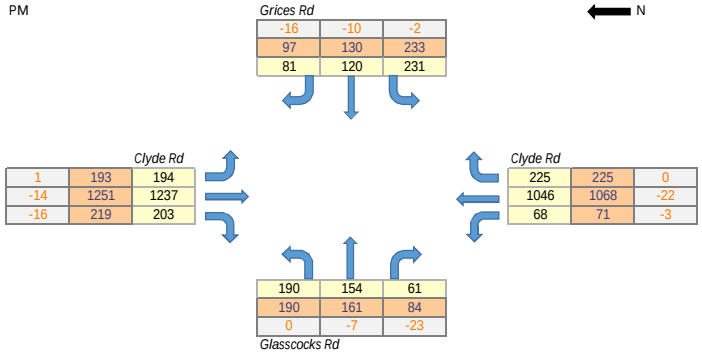
	SCATS data
	Traffic Survey data
	Vehicle volume difference (SCATS minus Survey)
n/a	No SCATS data available for turn movement

Grices Rd / Clyde Rd

15-Feb
AM



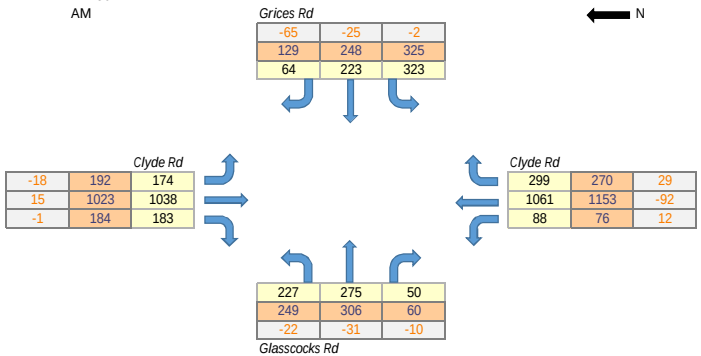
15-Feb
PM



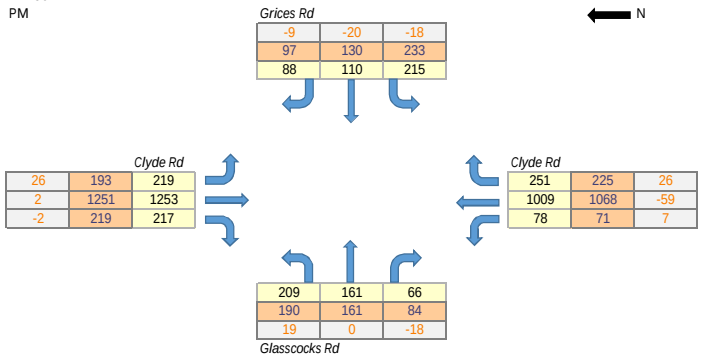
Legend

	SCATS data
	Traffic Survey data
	Vehicle volume difference (SCATS minus Survey)
n/a	No SCATS data available for turn movement

22-Feb
AM



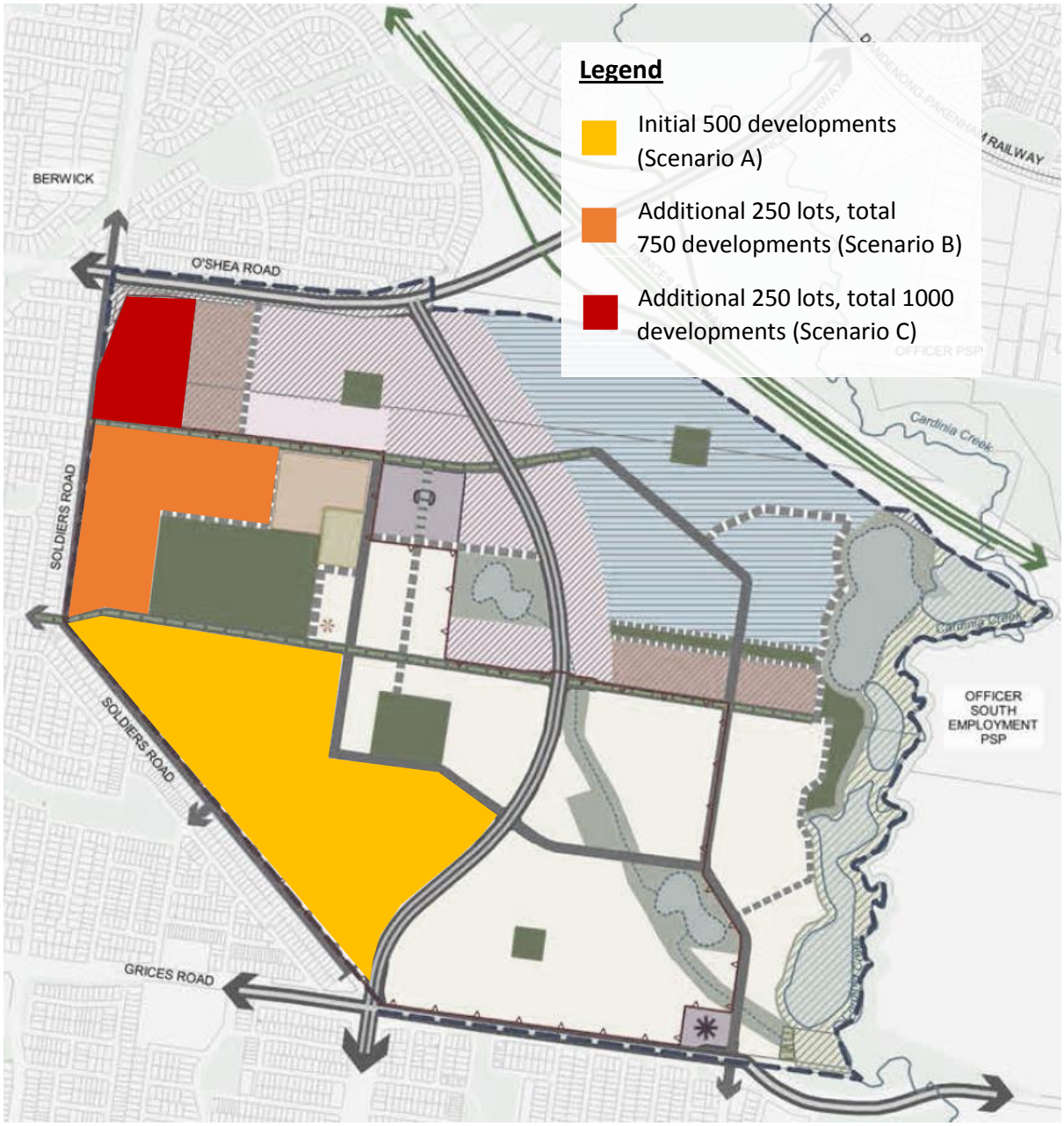
22-Feb
PM



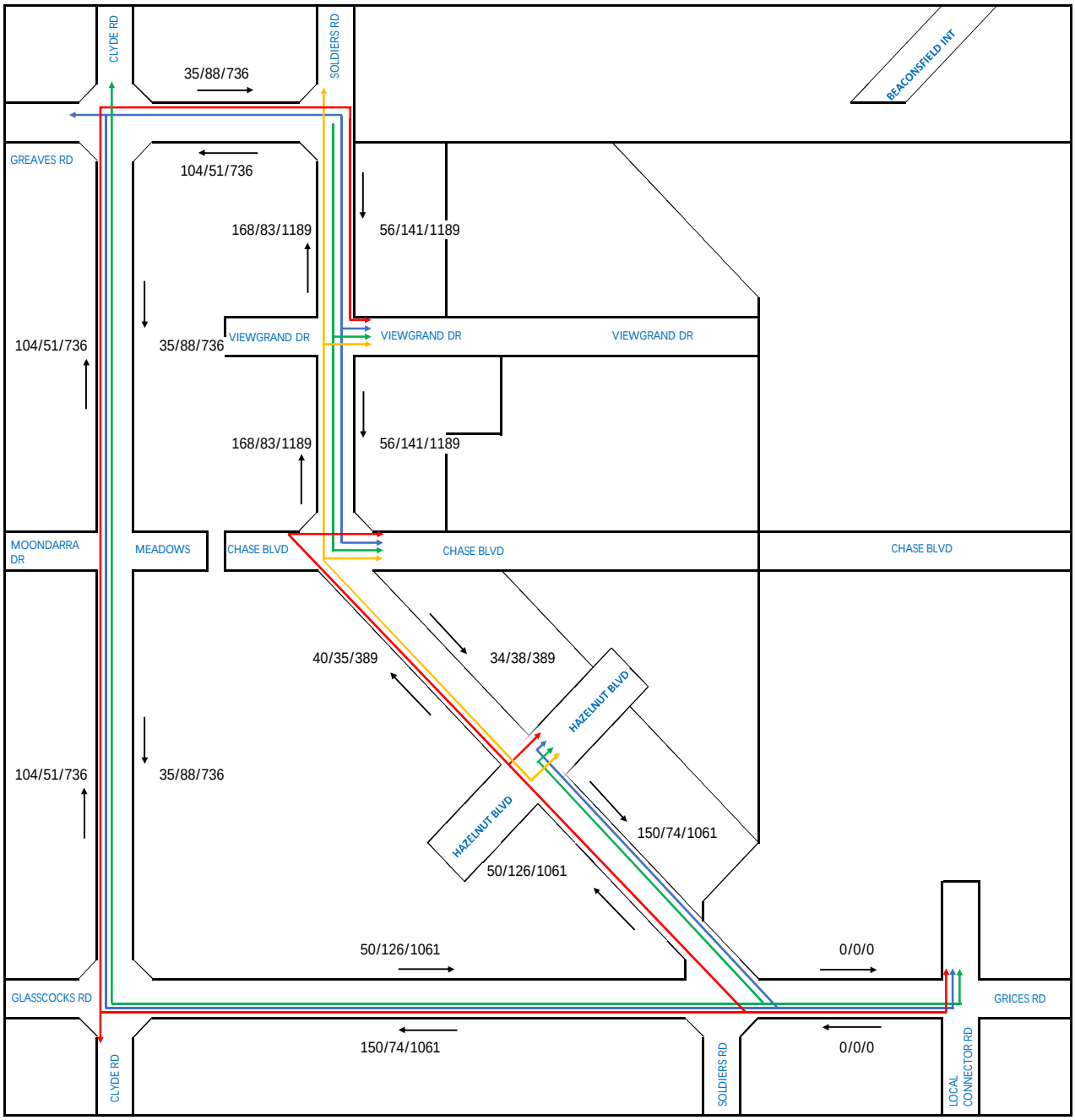
Legend

	SCATS data
	Traffic Survey data
	Vehicle volume difference (SCATS minus Survey)
n/a	No SCATS data available for turn movement

Appendix B. Staging of lots


Legend
Initial 500 developments (Scenario A)
Additional 250 lots, total 750 developments (Scenario B)
Additional 250 lots, total 1000 developments (Scenario C)
BERWICK
O'SHEA ROAD
SOLDIERS ROAD
SOLDIERS ROAD
GRICES ROAD
Cardinia Creek
OFFICER SOUTH EMPLOYMENT PSP

Appendix C. Trip distribution maps

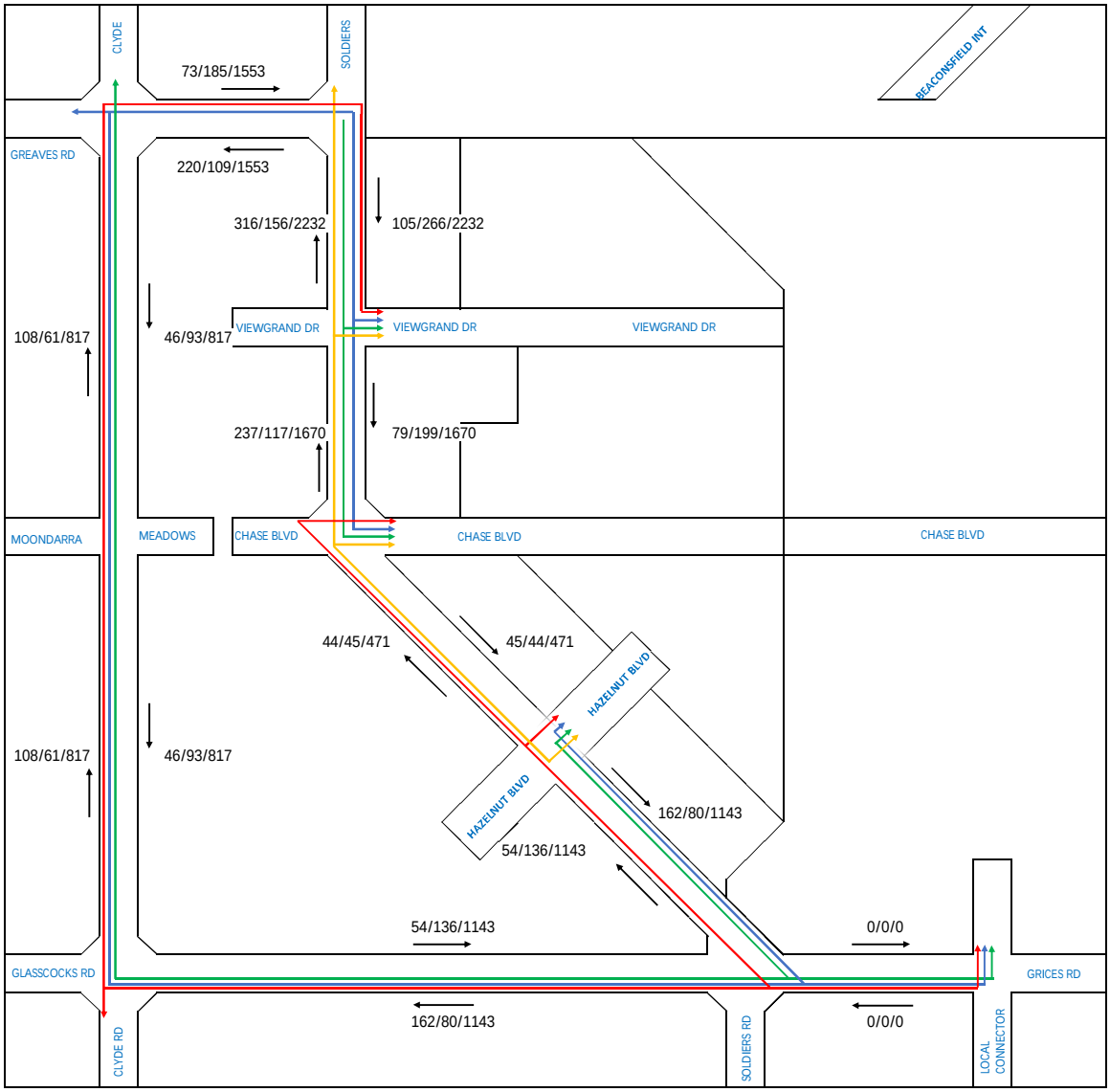


Option 1A - Additional Development Traffic

Legend

AM Peak/PM Peak/Daily (veh/hr)/(veh/hr)/(veh/day)

- Trips to/from Clyde Rd (south)
- Trips to/from Greaves Rd
- Trips to/from Monash Fwy (west)
- Trips to/from Monash Fwy (east) & Soldiers Rd

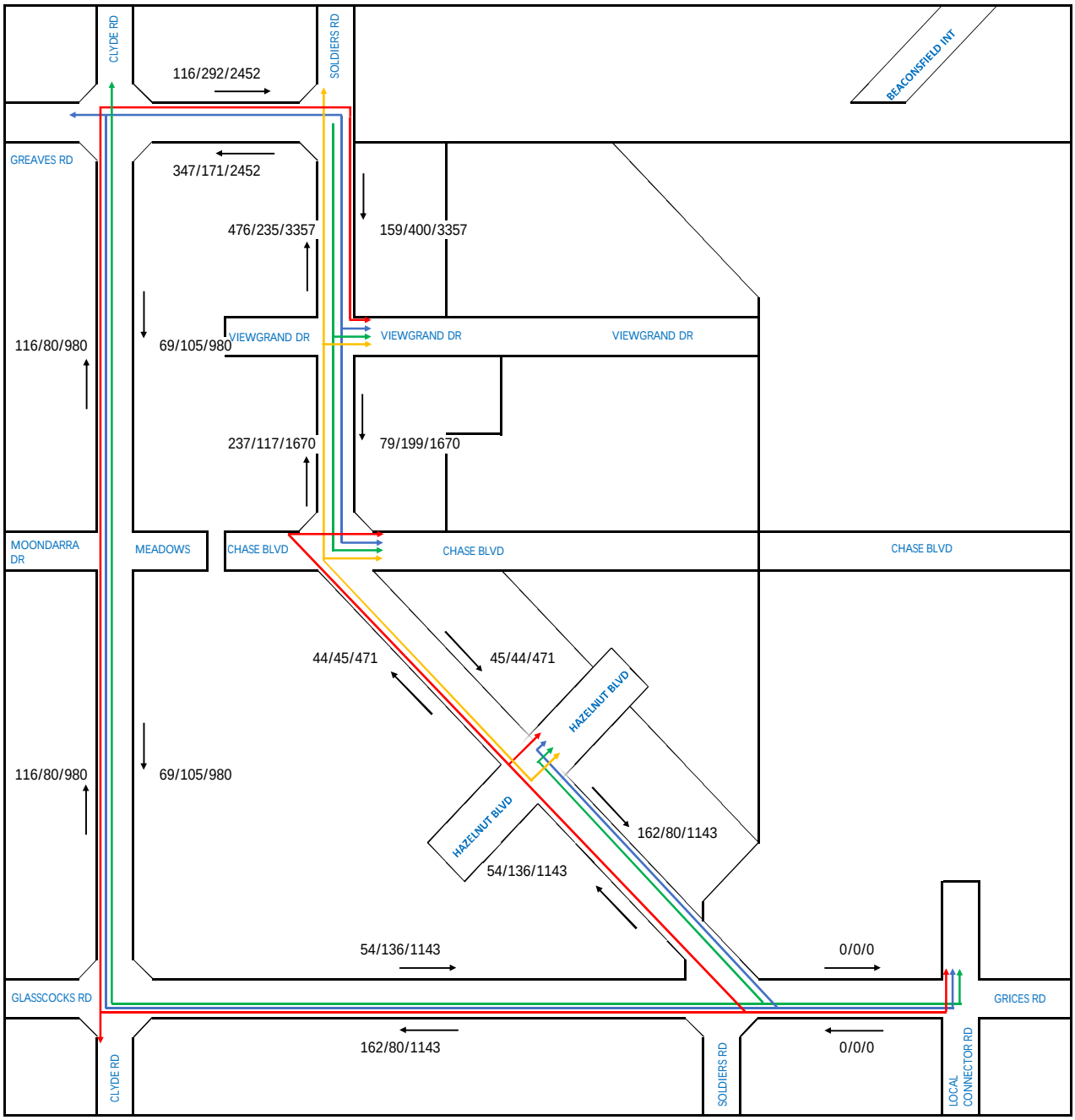


Option 1B - Additional Development Traffic

Legend

AM Peak/PM Peak/Daily (veh/hr)/(veh/hr)/(veh/day)

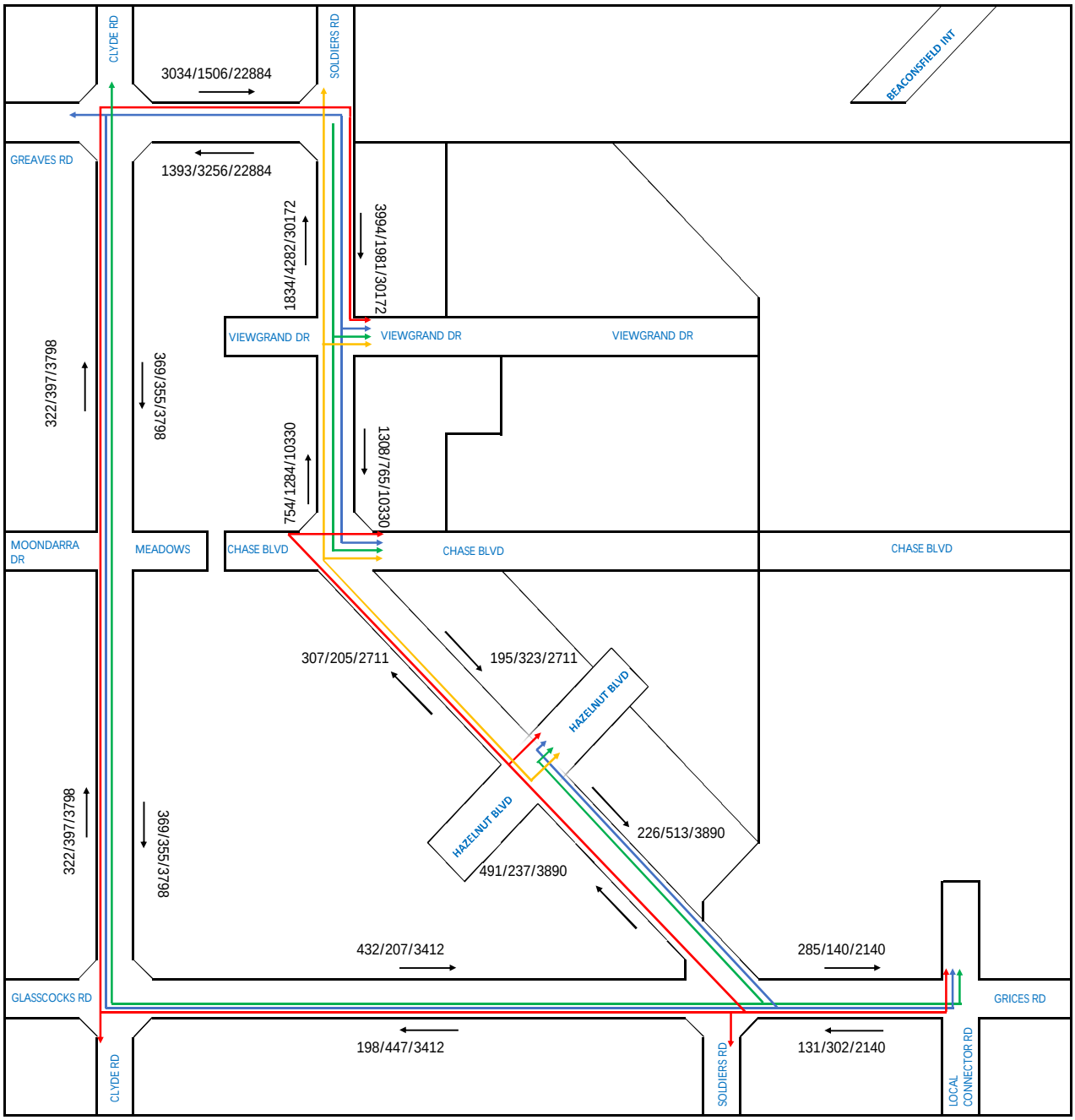
- Trips to/from Clyde Rd (south)
- Trips to/from Greaves Rd
- Trips to/from Monash Fwy (west)
- Trips to/from Monash Fwy (east) & Soldiers Rd



Option 1C - Additional Development Traffic

Legend

AM Peak/PM Peak/Daily (veh/hr)/(veh/hr)/(veh/day)	
	Trips to/from Clyde Rd (south)
	Trips to/from Greaves Rd
	Trips to/from Monash Fwy (west)
	Trips to/from Monash Fwy (east) & Soldiers Rd

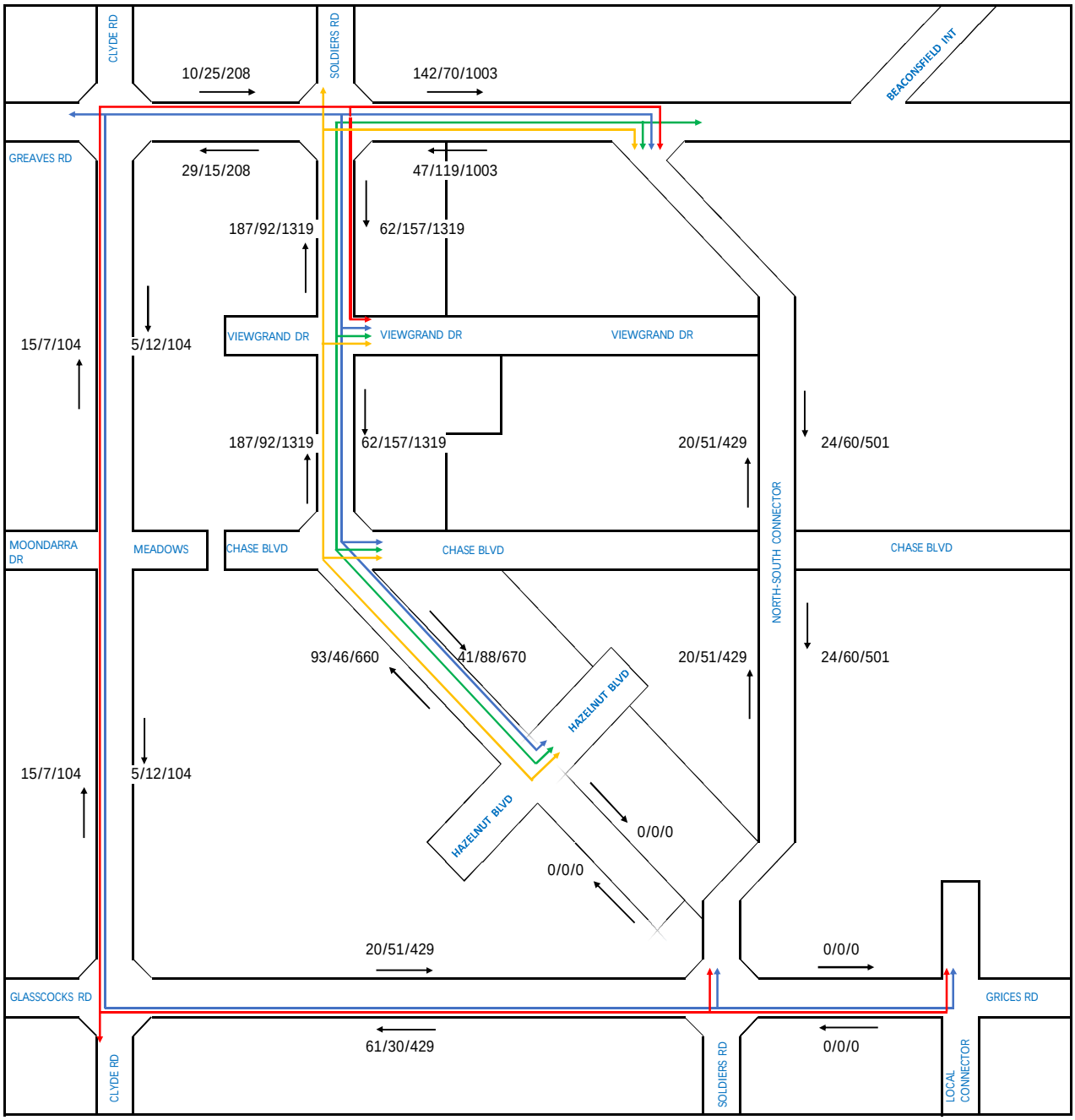


Option 1D - Additional Development Traffic

Legend

AM Peak/PM Peak/Daily (veh/hr)/(veh/hr)/(veh/day)

- Trips to/from Clyde Rd (south) and Soldiers Road (south)
- Trips to/from Greaves Rd
- Trips to/from Monash Fwy (west)
- Trips to/from Monash Fwy (east) & Soldiers Rd

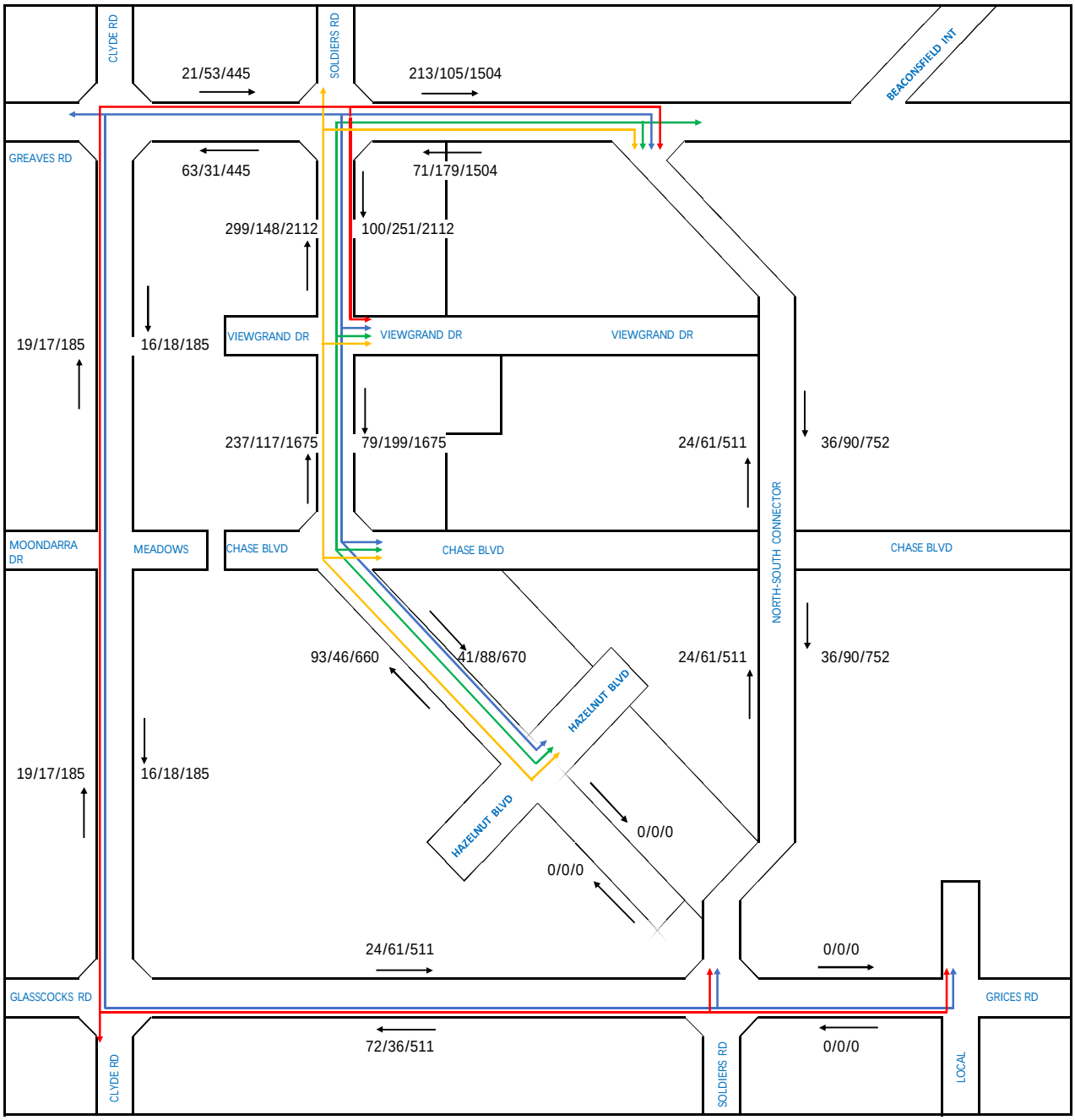


Option 2A - Additional Development Traffic

Legend

AM Peak/PM Peak/Daily (veh/hr)/(veh/hr)/(veh/day)

- Trips to/from Clyde Rd (south)
- Trips to/from Greaves Rd
- Trips to/from Monash Fwy (east) & Monash Fwy (west)
- Trips to/from Soldiers Rd

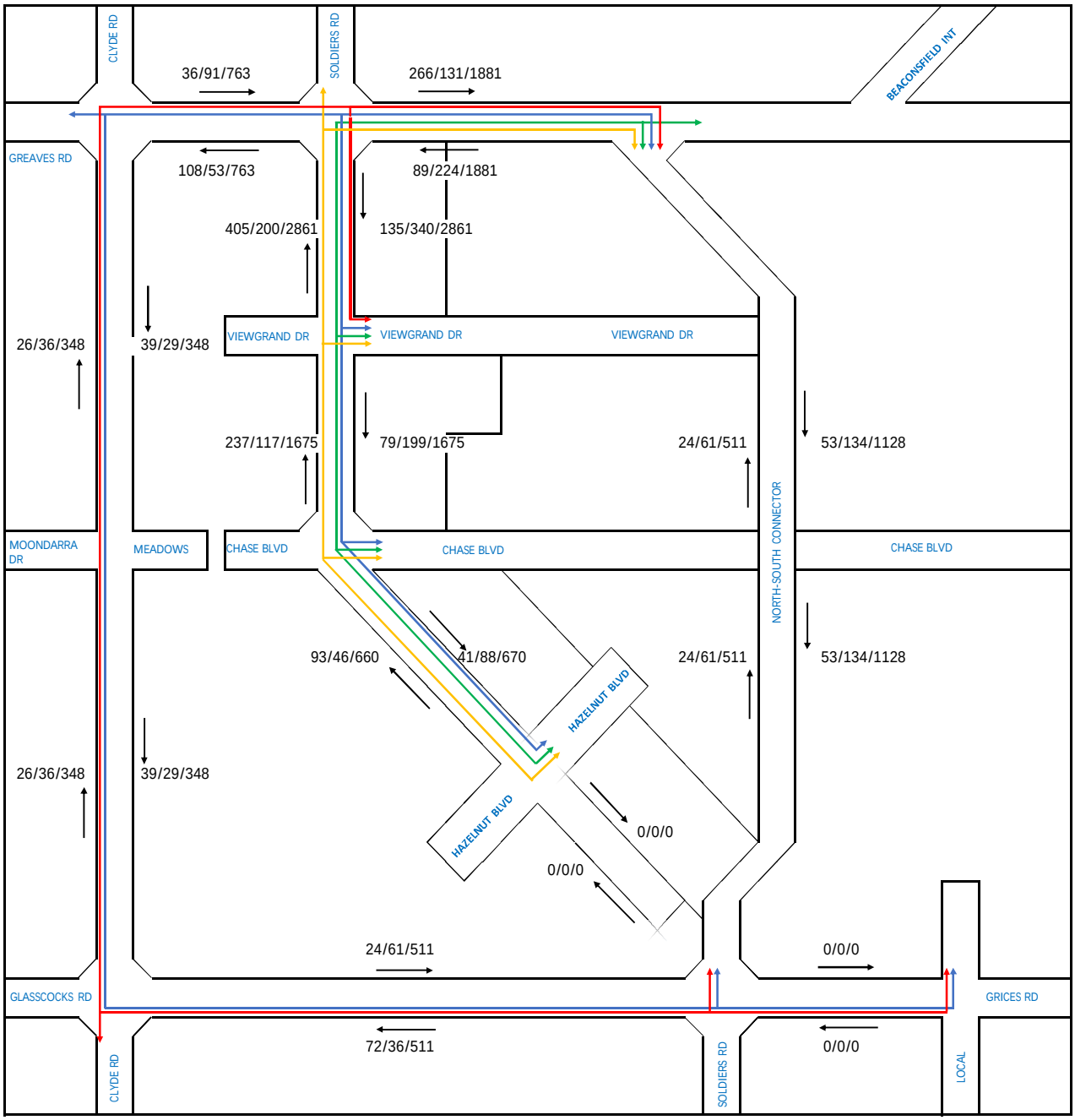


Option 2B - Additional Development Traffic

Legend

AM Peak/PM Peak/Daily (veh/hr)/(veh/hr)/(veh/day)

- Trips to/from Clyde Rd (south)
- Trips to/from Greaves Rd
- Trips to/from Monash Fwy (east) & Monash Fwy (west)
- Trips to/from Soldiers Rd

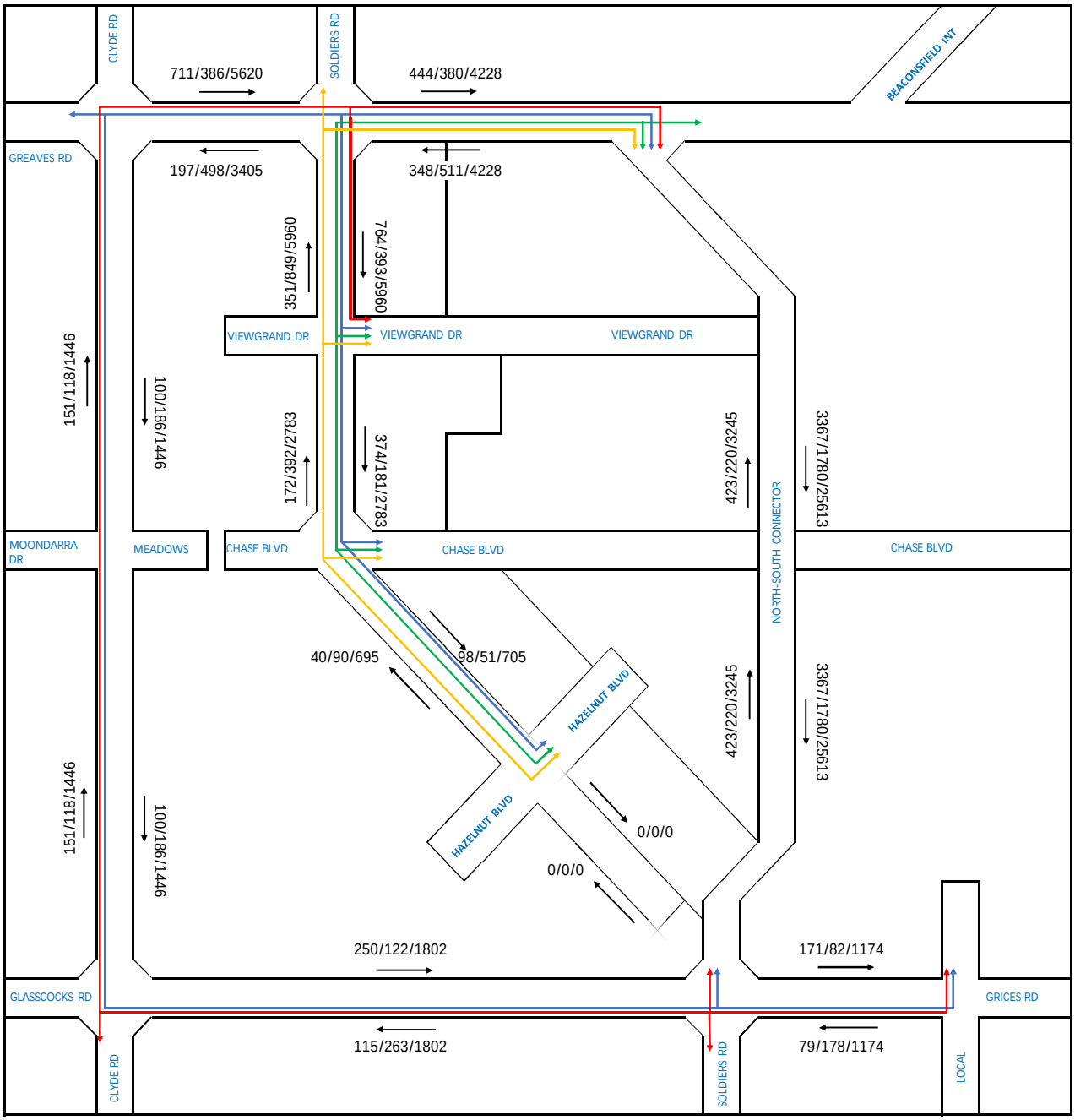


Option 2C - Additional Development Traffic

Legend

AM Peak/PM Peak/Daily (veh/hr)/(veh/hr)/(veh/day)

- Trips to/from Clyde Rd (south)
- Trips to/from Greaves Rd
- Trips to/from Monash Fwy (east) & Monash Fwy (west)
- Trips to/from Soldiers Rd

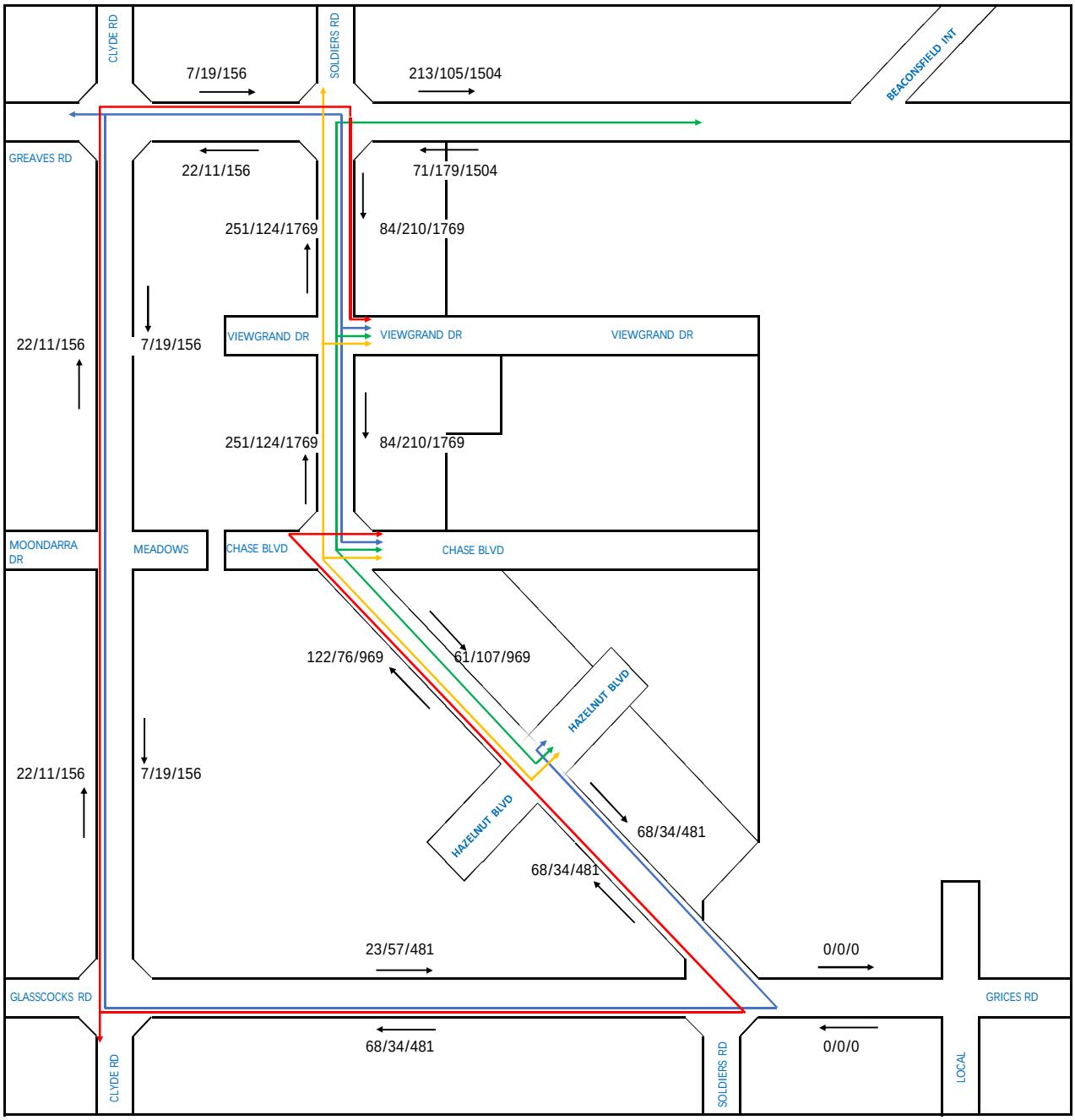


Option 2D - Additional Development Traffic

Legend

AM Peak/PM Peak/Daily (veh/hr)/(veh/hr)/(veh/day)

- Trips to/from Clyde Rd (south) and Soldiers Road (south)
- Trips to/from Greaves Rd
- Trips to/from Monash Fwy (east) & Monash Fwy (west)
- Trips to/from Soldiers Rd

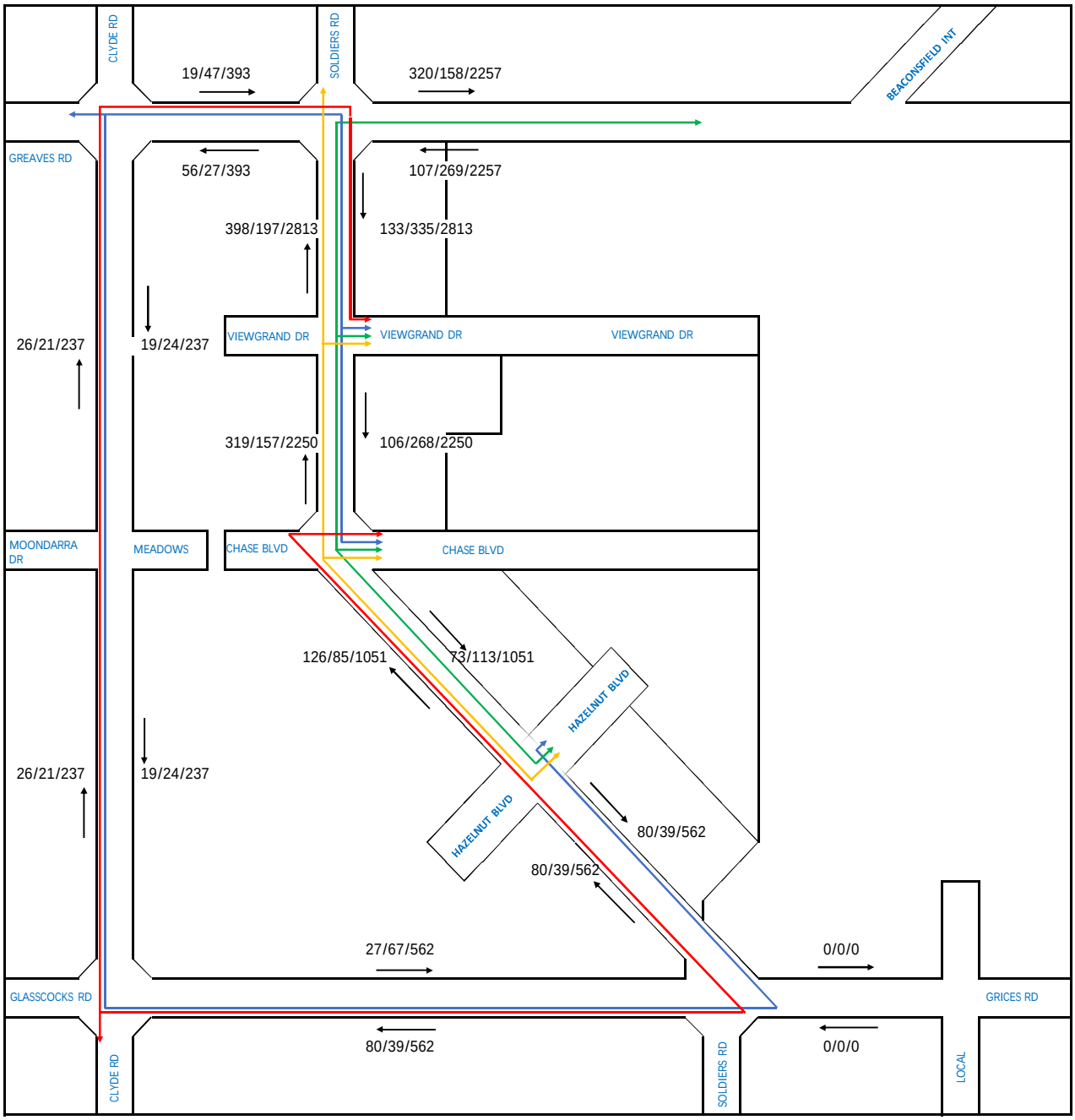


Option 2.2A - Additional Development Traffic

Legend

AM Peak/PM Peak/Daily (veh/hr)/(veh/hr)/(veh/day)

- Trips to/from Clyde Rd (south)
- Trips to/from Greaves Rd
- Trips to/from Monash Fwy (east) & Monash Fwy (west)
- Trips to/from Soldiers Rd

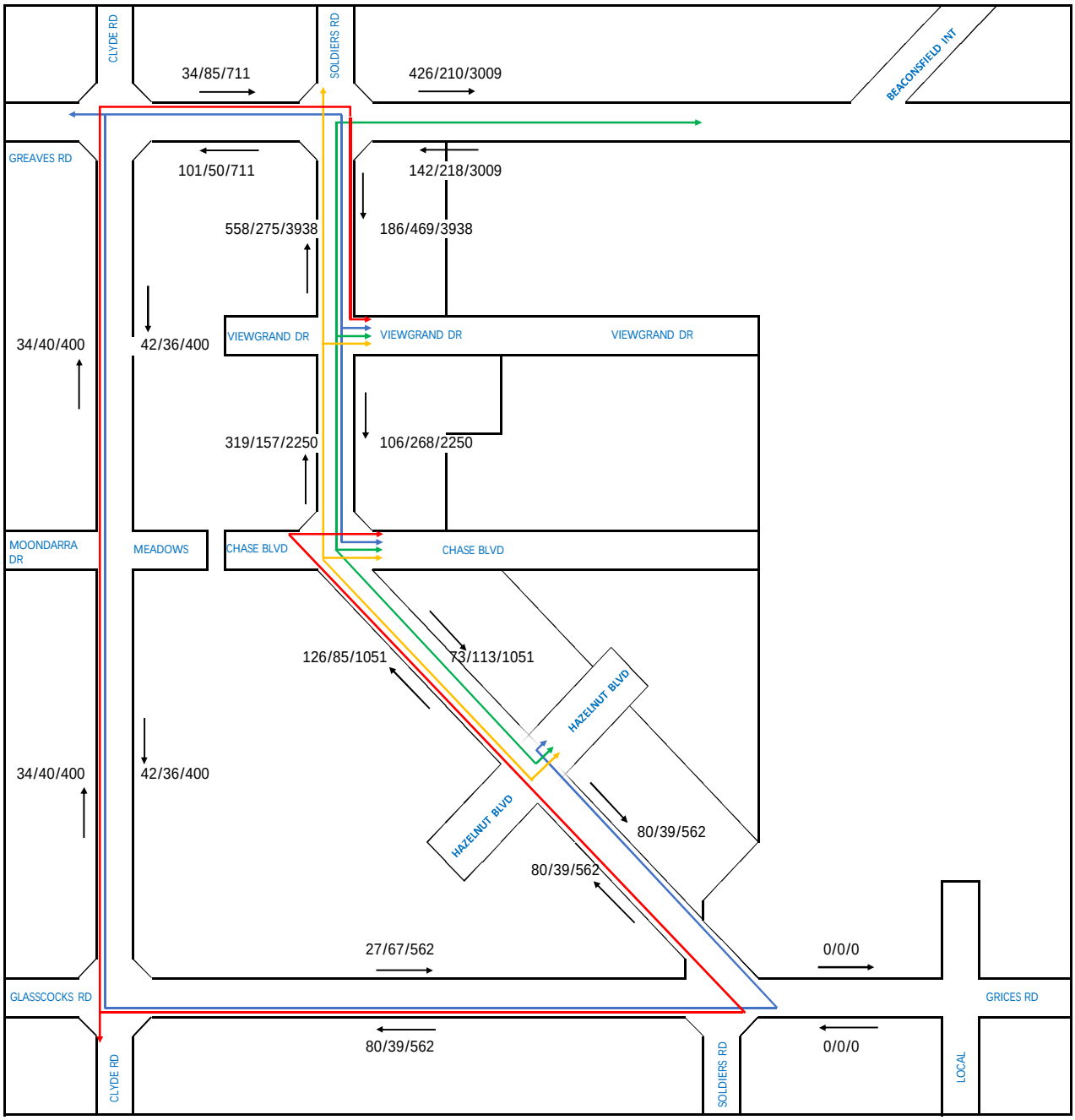


Option 2.2B - Additional Development Traffic

Legend

AM Peak/PM Peak/Daily (veh/hr)/(veh/hr)/(veh/day)

- Trips to/from Clyde Rd (south)
- Trips to/from Greaves Rd
- Trips to/from Monash Fwy (east) & Monash Fwy (west)
- Trips to/from Soldiers Rd

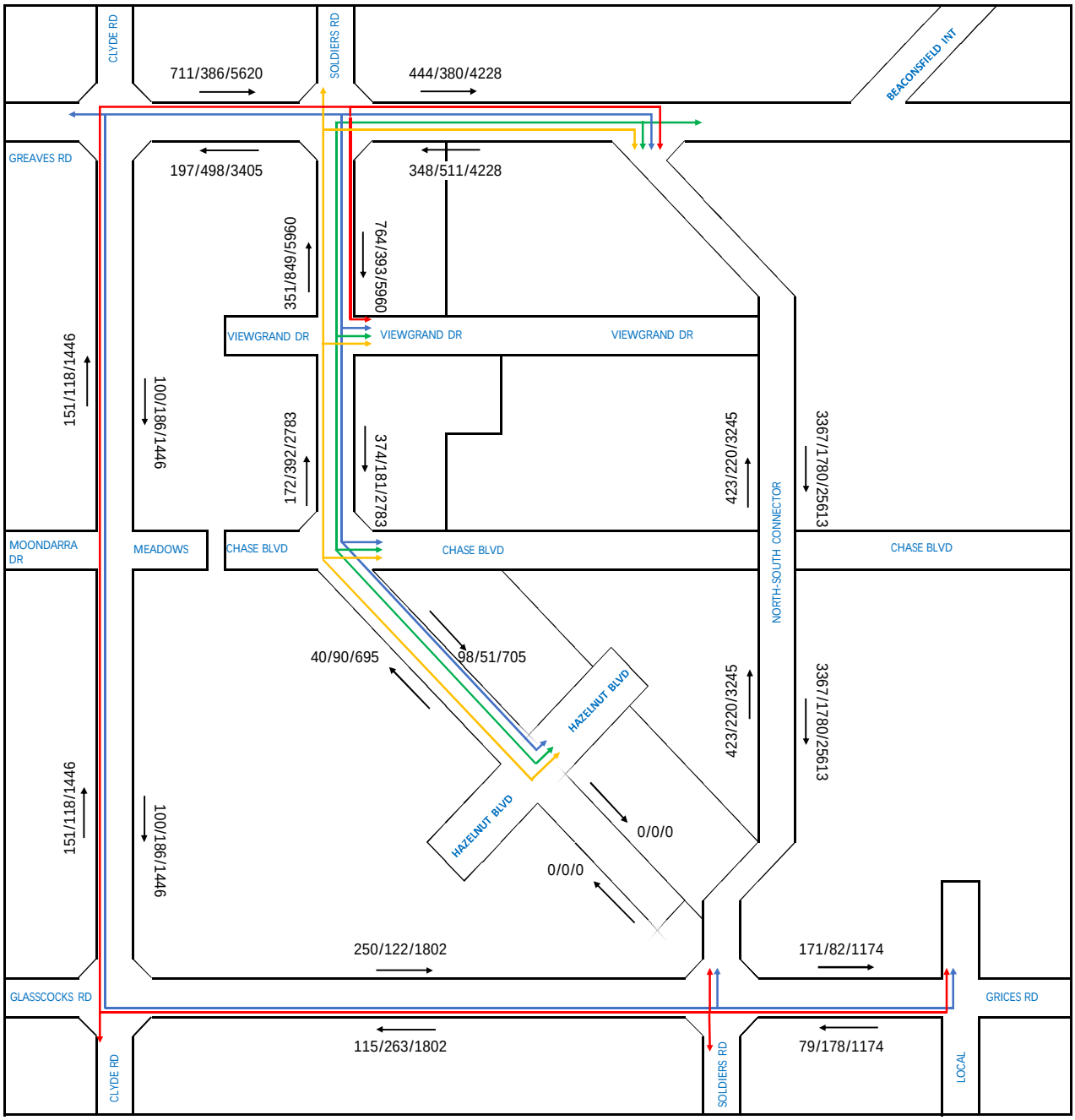


Option 2.2C - Additional Development Traffic

Legend

AM Peak/PM Peak/Daily (veh/hr)/(veh/hr)/(veh/day)

- Trips to/from Clyde Rd (south)
- Trips to/from Greaves Rd
- Trips to/from Monash Fwy (east) & Monash Fwy (west)
- Trips to/from Soldiers Rd

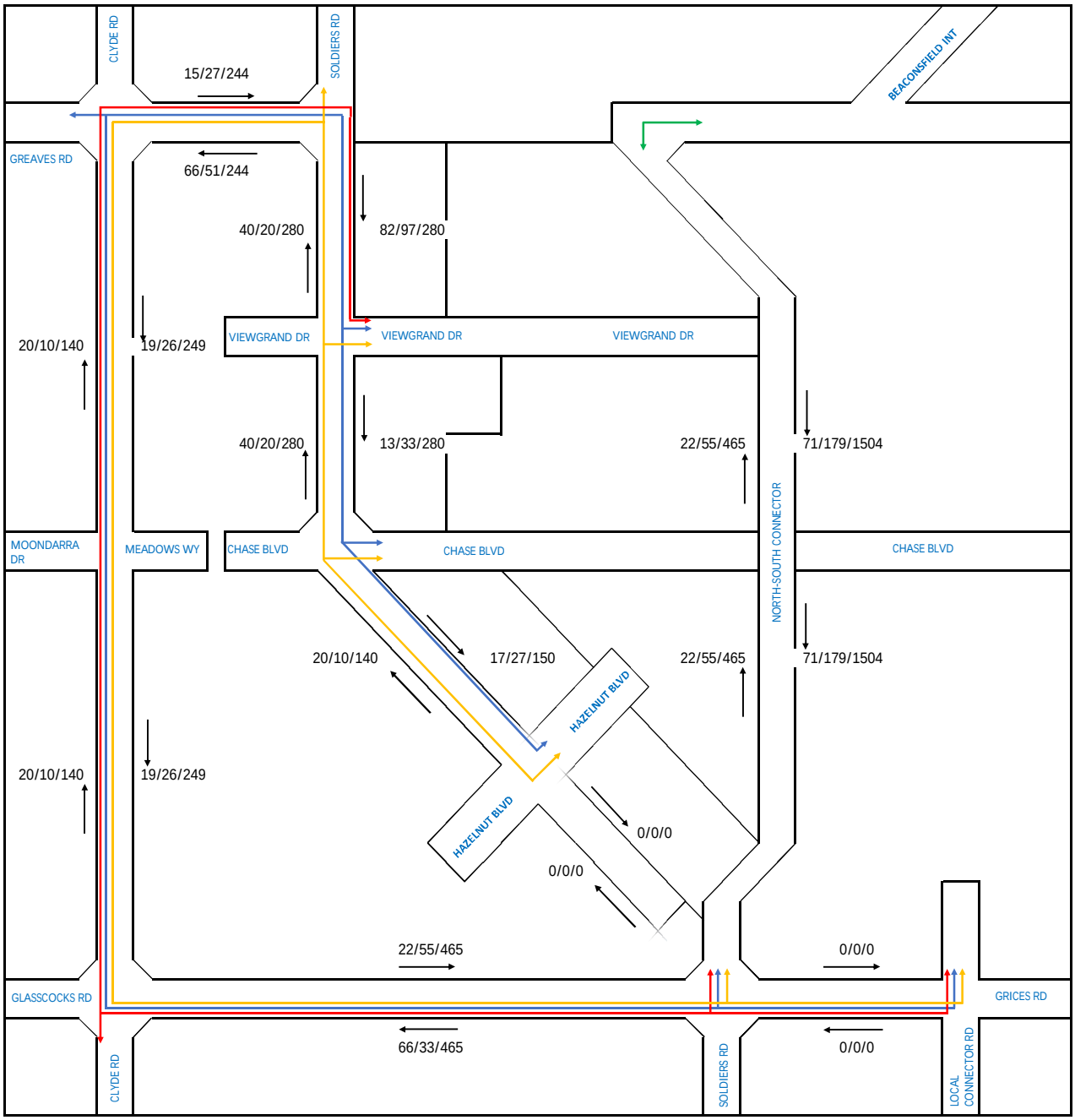


Option 2.2D - Additional Development Traffic

Legend

AM Peak/PM Peak/Daily (veh/hr)/(veh/hr)/(veh/day)

- Trips to/from Clyde Rd (south) and Soldiers Road (south)
- Trips to/from Greaves Rd
- Trips to/from Monash Fwy (east) & Monash Fwy (west)
- Trips to/from Soldiers Rd

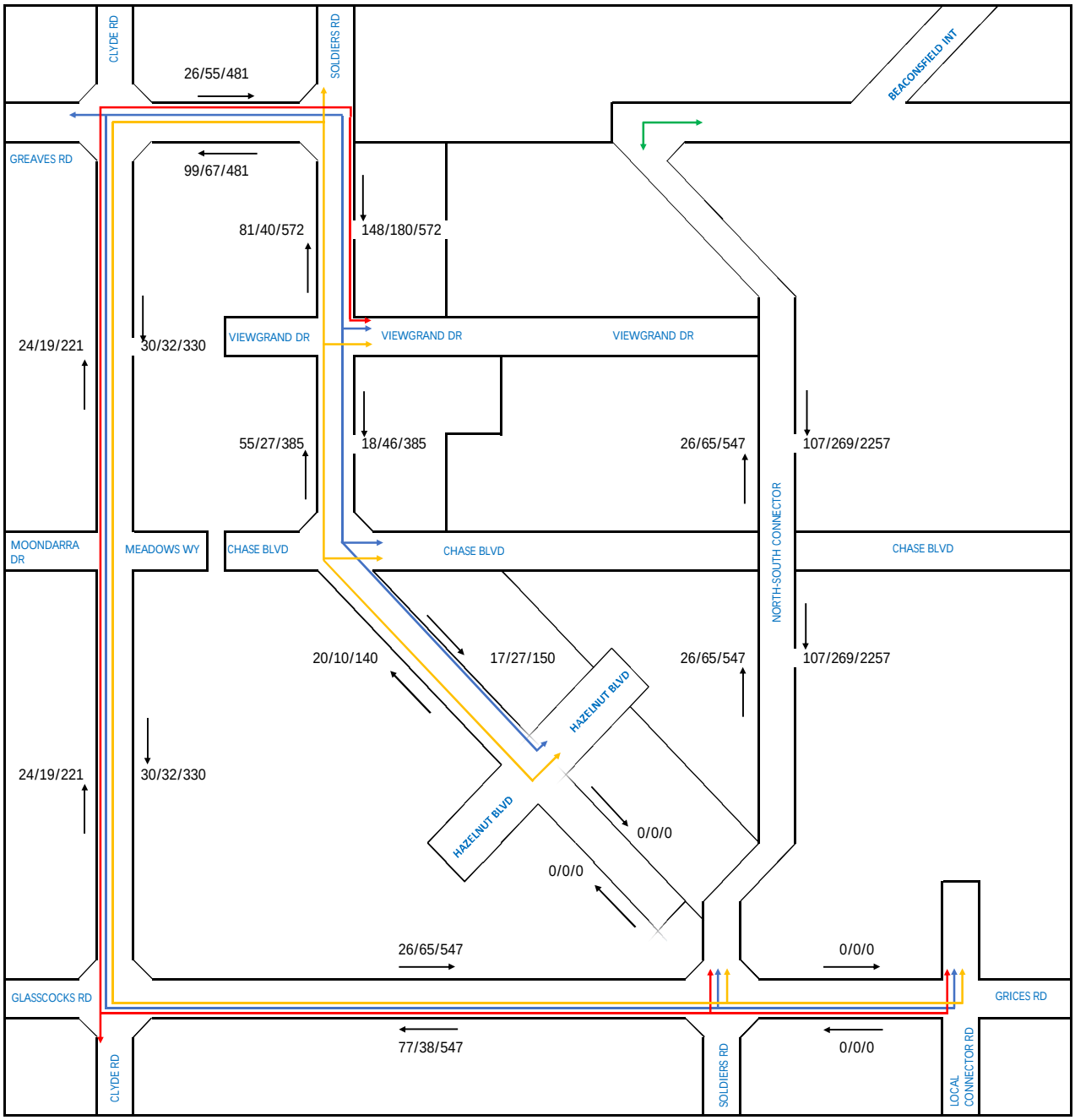


Option 3A - Additional Development Traffic

Legend

AM Peak/PM Peak/Daily (veh/hr)/(veh/hr)/(veh/day)

- Trips to/from Clyde Rd (south)
- Trips to/from Greaves Rd
- Trips to/from Monash Fwy (east) & Monash Fwy (west)
- Trips to/from Soldiers Rd

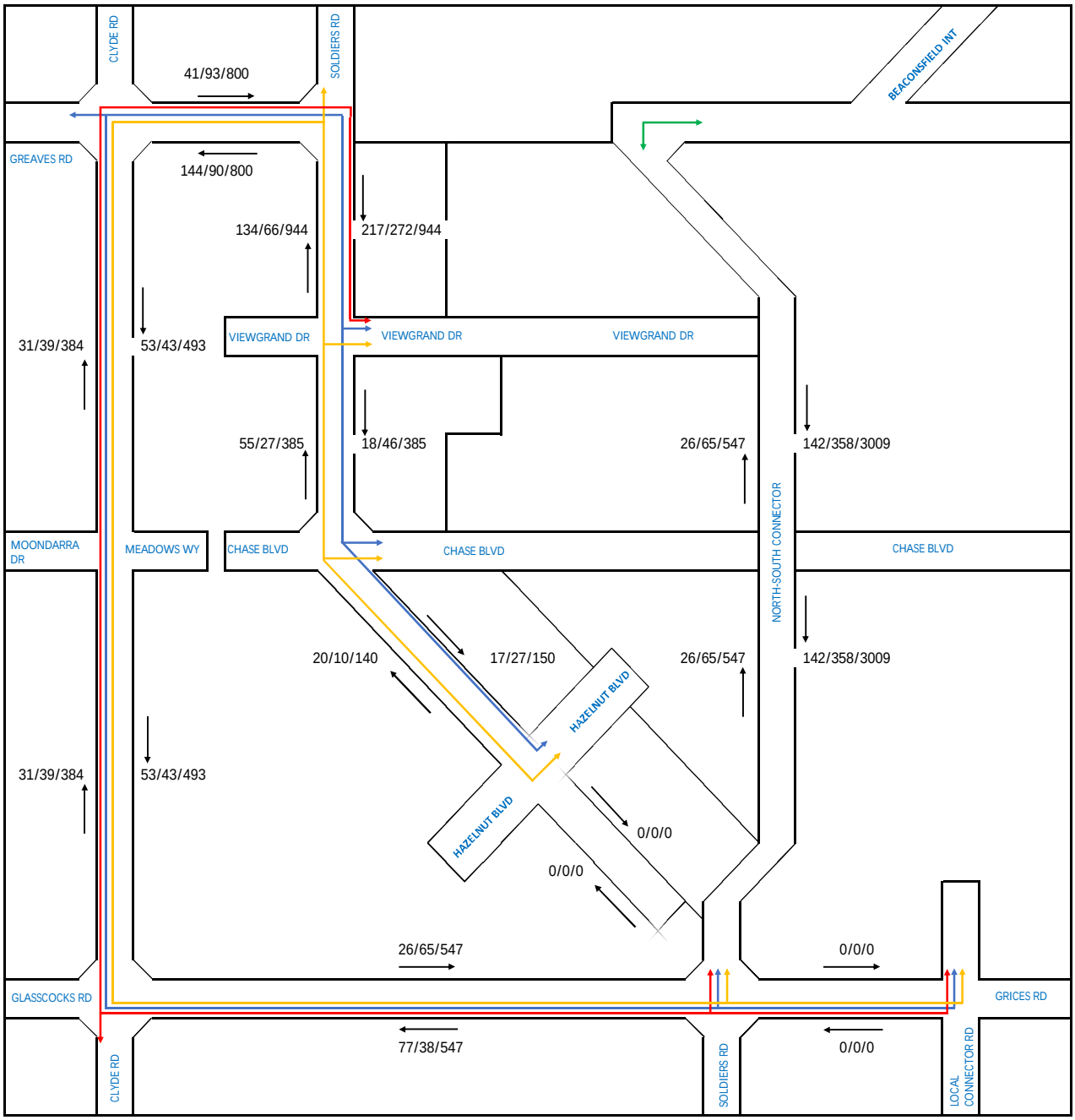


Option 3B - Additional Development Traffic

Legend

AM Peak/PM Peak/Daily (veh/hr)/(veh/hr)/(veh/day)

- Trips to/from Clyde Rd (south)
- Trips to/from Greaves Rd
- Trips to/from Monash Fwy (east) & Monash Fwy (west)
- Trips to/from Soldiers Rd

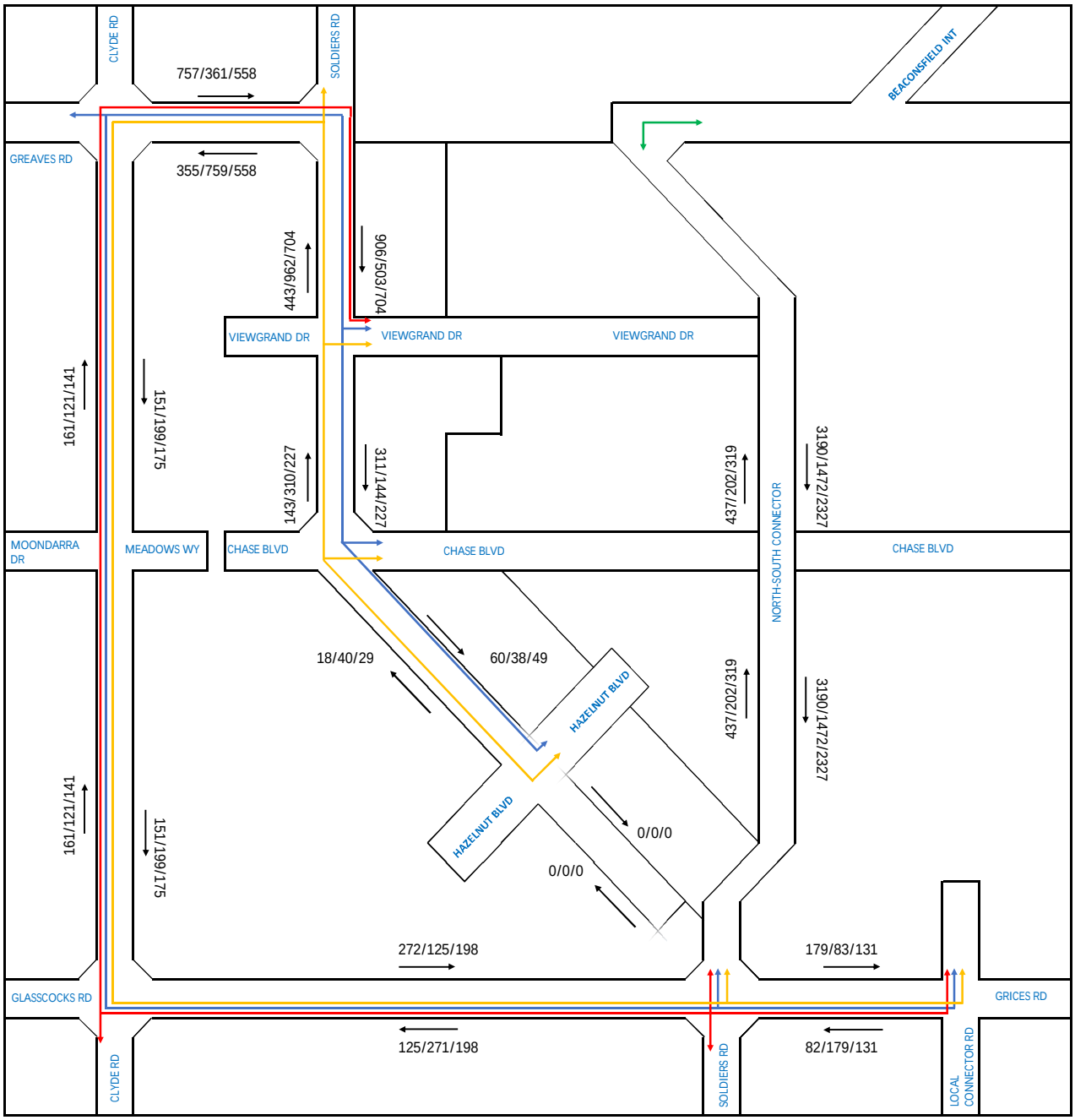


Option 3C - Additional Development Traffic

Legend

AM Peak/PM Peak/Daily (veh/hr)/(veh/hr)/(veh/day)

- Trips to/from Clyde Rd (south)
- Trips to/from Greaves Rd
- Trips to/from Monash Fwy (east) & Monash Fwy (west)
- Trips to/from Soldiers Rd

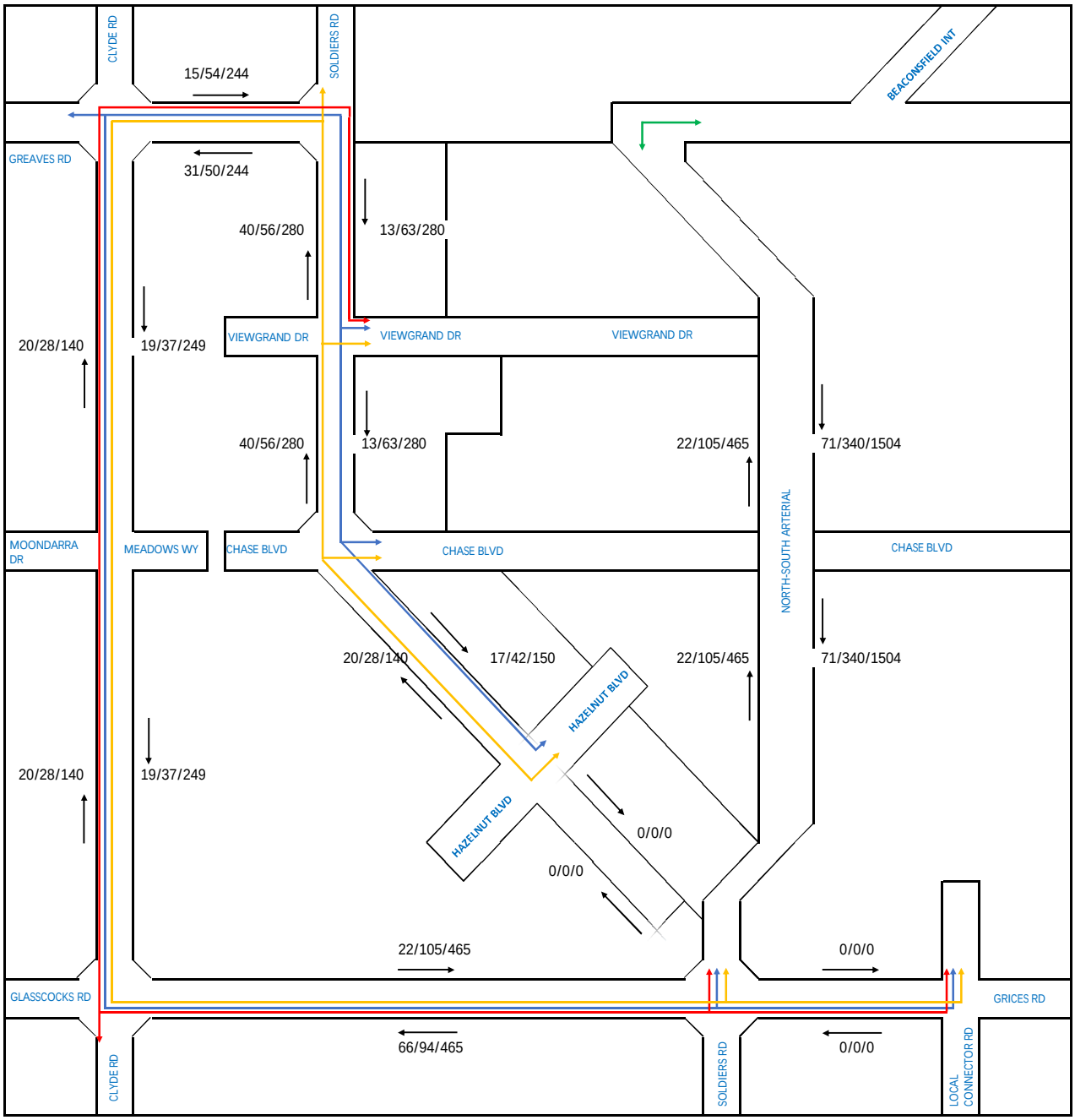


Option 3D - Additional Development Traffic

Legend

AM Peak/PM Peak/Daily (veh/hr)/(veh/hr)/(veh/day)

- Trips to/from Clyde Rd (south) and Soldiers Road (south)
- Trips to/from Greaves Rd
- Trips to/from Monash Fwy (east) & Monash Fwy (west)
- Trips to/from Soldiers Rd

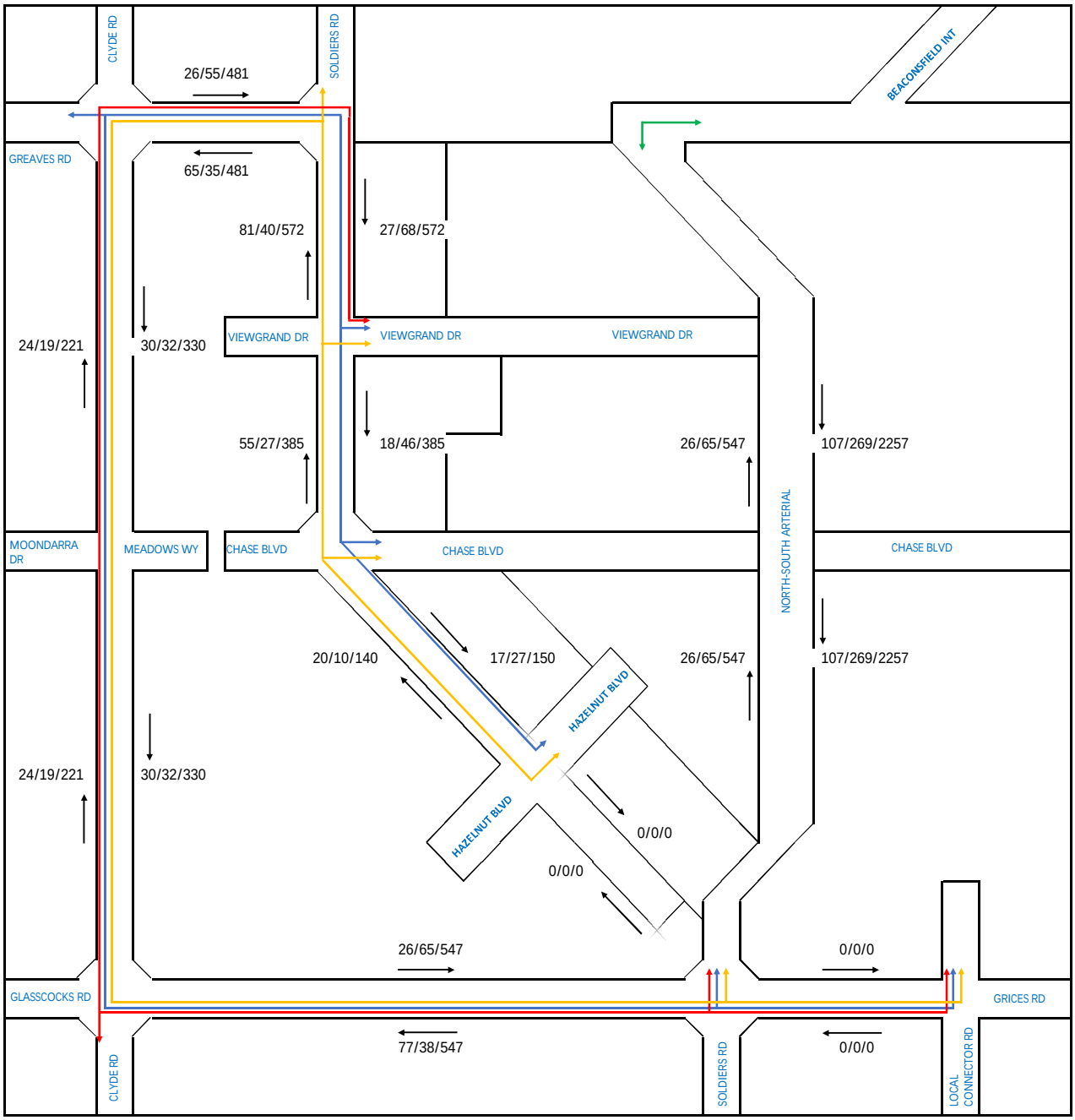


Option 4A - Additional Development Traffic

Legend

AM Peak/PM Peak/Daily (veh/hr)/(veh/hr)/(veh/day)

- Trips to/from Clyde Rd (south)
- Trips to/from Greaves Rd
- Trips to/from Monash Fwy (east) & Monash Fwy (west)
- Trips to/from Soldiers Rd

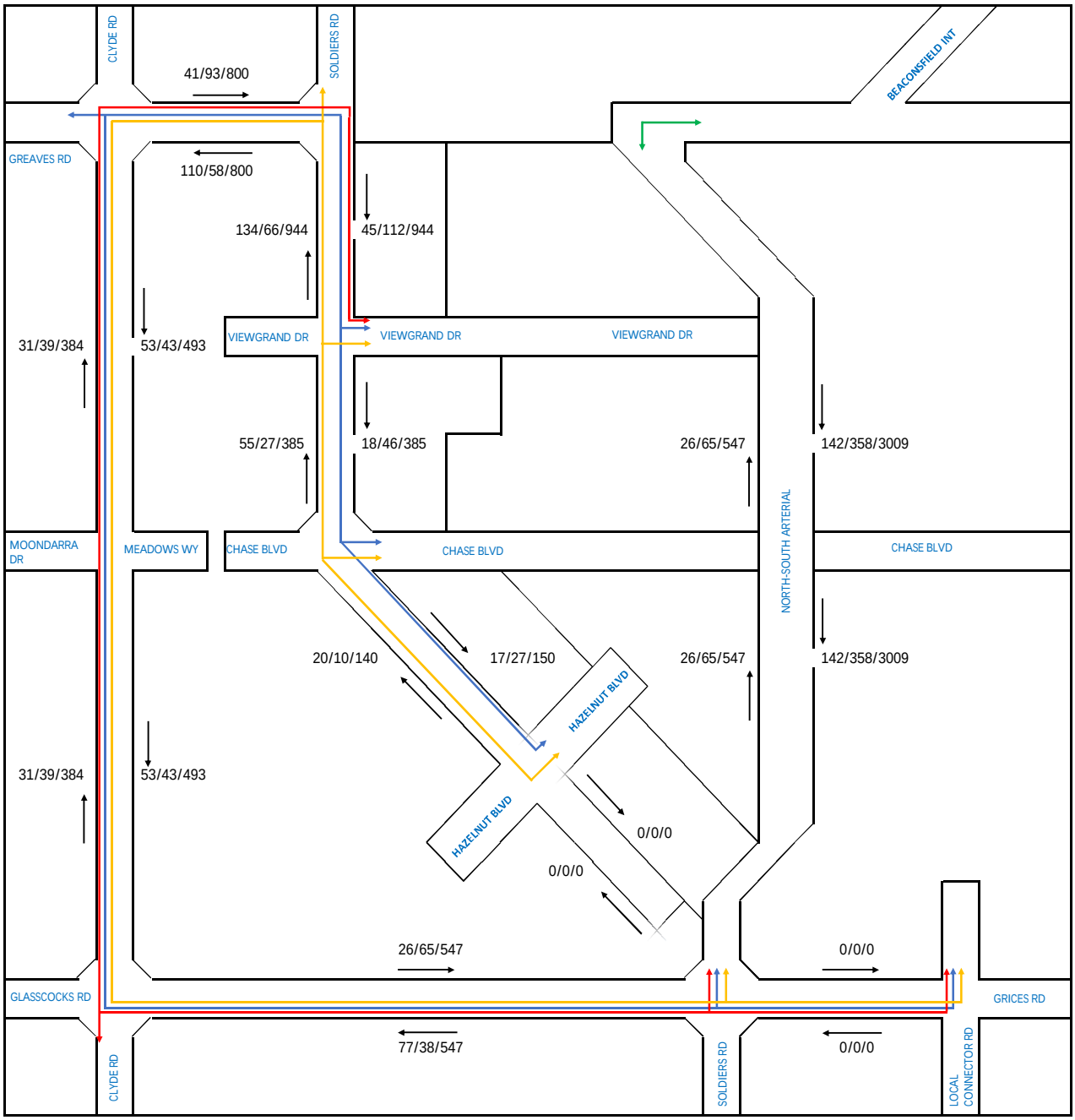


Option 4B - Additional Development Traffic

Legend

AM Peak/PM Peak/Daily (veh/hr)/(veh/hr)/(veh/day)

- Trips to/from Clyde Rd (south)
- Trips to/from Greaves Rd
- Trips to/from Monash Fwy (east) & Monash Fwy (west)
- Trips to/from Soldiers Rd

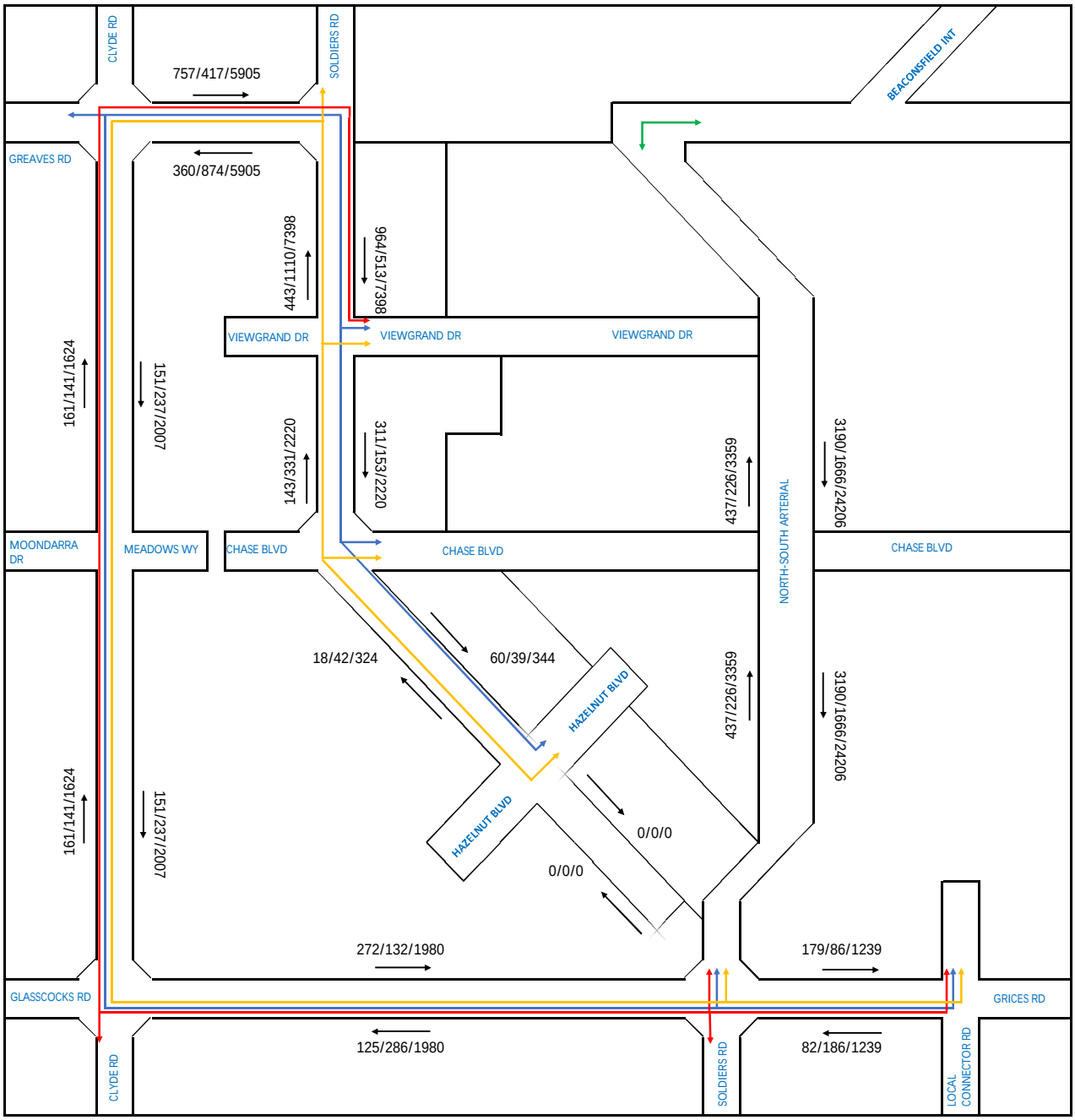


Option 4C - Additional Development Traffic

Legend

AM Peak/PM Peak/Daily (veh/hr)/(veh/hr)/(veh/day)

- Trips to/from Clyde Rd (south)
- Trips to/from Greaves Rd
- Trips to/from Monash Fwy (east) & Monash Fwy (west)
- Trips to/from Soldiers Rd

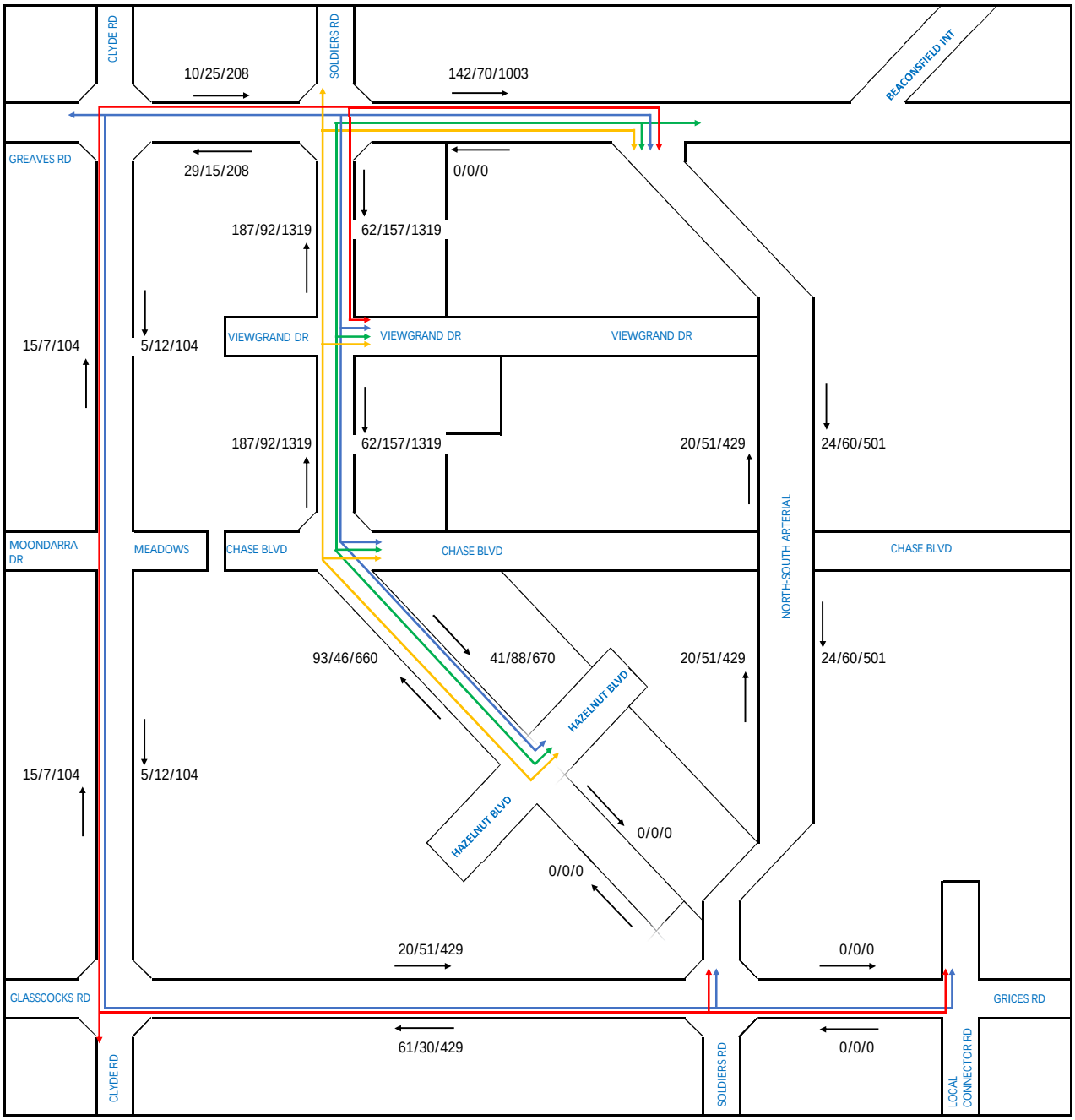


Option 4D - Additional Development Traffic

Legend

AM Peak/PM Peak/Daily (veh/hr)/(veh/hr)/(veh/day)

- Trips to/from Clyde Rd (south)
- Trips to/from Greaves Rd
- Trips to/from Monash Fwy (east) & Monash Fwy (west)
- Trips to/from Soldiers Rd

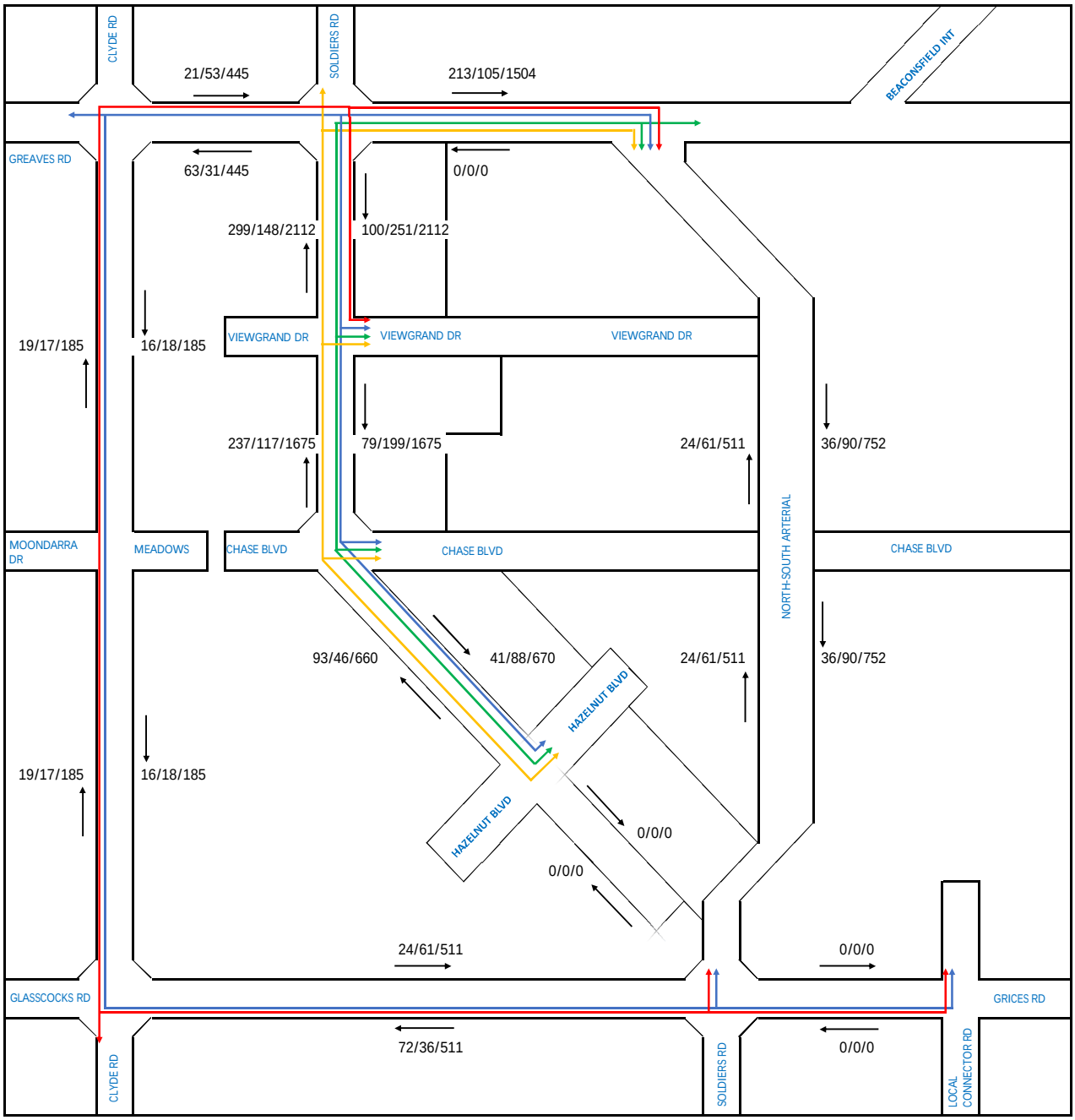


Option 5A - Additional Development Traffic

Legend

AM Peak/PM Peak/Daily (veh/hr)/(veh/hr)/(veh/day)

- Trips to/from Clyde Rd (south)
- Trips to/from Greaves Rd
- Trips to/from Monash Fwy (east) & Monash Fwy (west)
- Trips to/from Soldiers Rd

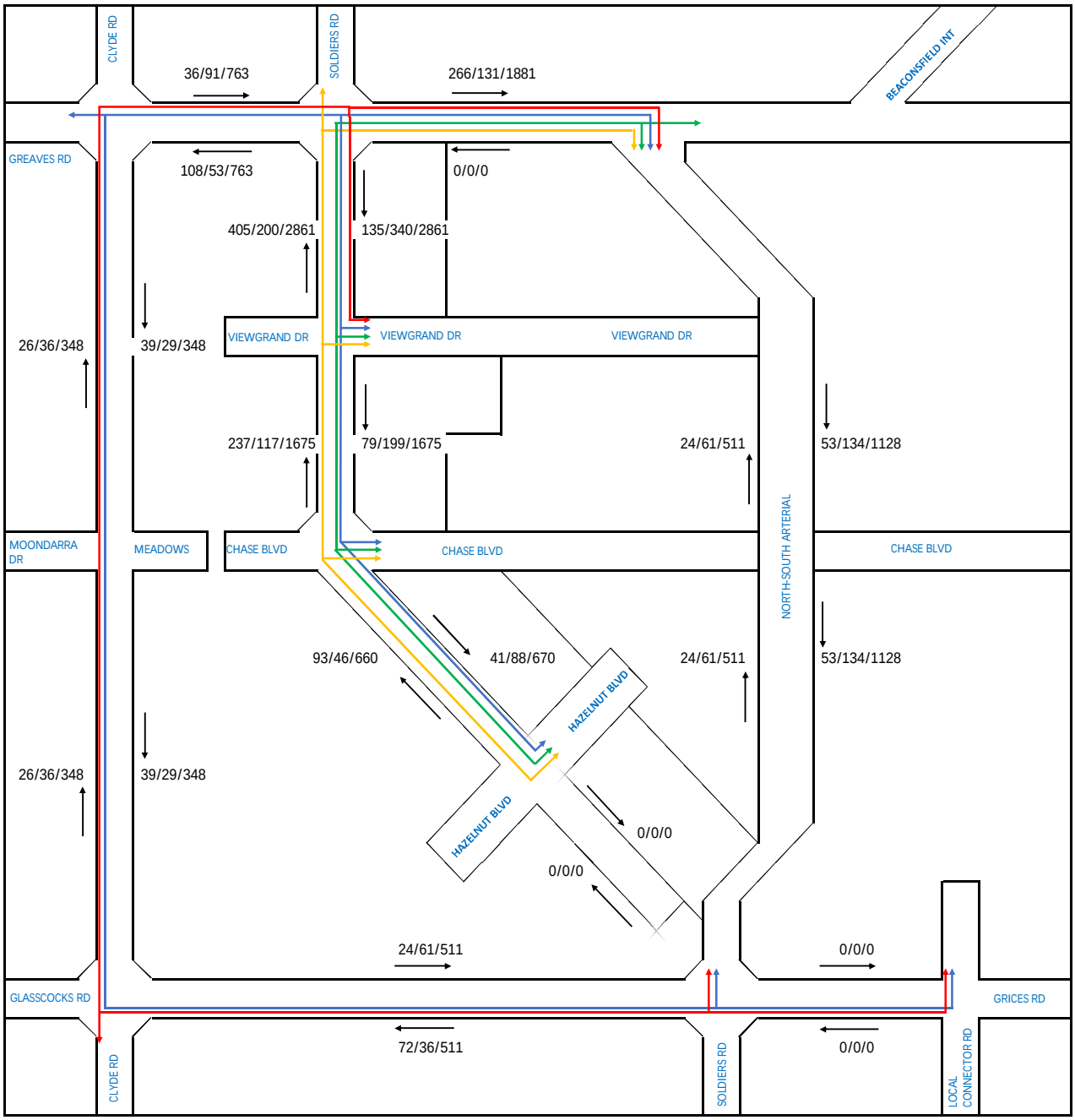


Option 5B - Additional Development Traffic

Legend

AM Peak/PM Peak/Daily (veh/hr)/(veh/hr)/(veh/day)

- Trips to/from Clyde Rd (south)
- Trips to/from Greaves Rd
- Trips to/from Monash Fwy (east) & Monash Fwy (west)
- Trips to/from Soldiers Rd

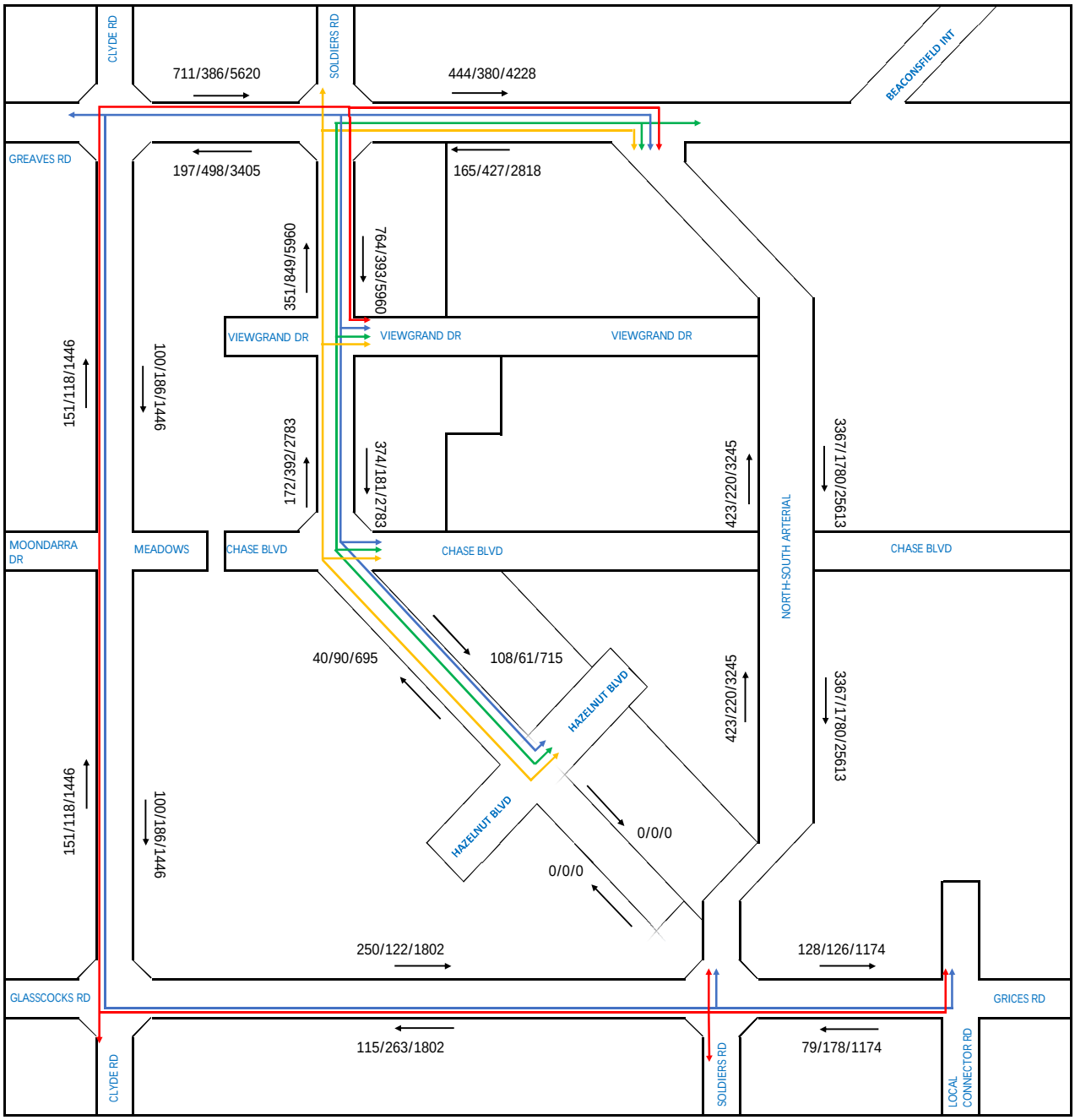


Option 5C - Additional Development Traffic

Legend

AM Peak/PM Peak/Daily (veh/hr)/(veh/hr)/(veh/day)

- Trips to/from Clyde Rd (south)
- Trips to/from Greaves Rd
- Trips to/from Monash Fwy (east) & Monash Fwy (west)
- Trips to/from Soldiers Rd



Option 5D - Additional Development Traffic

Legend

AM Peak/PM Peak/Daily (veh/hr)/(veh/hr)/(veh/day)

- Trips to/from Clyde Rd (south) and Soldiers Road (south)
- Trips to/from Greaves Rd
- Trips to/from Monash Fwy (east) & Monash Fwy (west)
- Trips to/from Soldiers Rd

Appendix D. Growth Factor Calculation

Short-term and Long-term Growth Factor Calculation

Source: https://forecast.id.com.au/casey/about-forecast-areas?WebID=350

	Historical Population				
Area	2012	2013	2014	2015	2016
Berwick South	23647	24103	24589	25204	25936
Clyde - Clyde North	1448	1872	2452	3256	4227
Cranbourne	19508	19917	20245	20565	20859
Cranbourne East	9890	11679	14630	18986	23554
Cranbourne North	15934	16920	18071	19469	20916
Narre Warren South	30305	30782	31127	31463	31890
Total	100732	105273	111114	118943	127383

% Change		4.51%	5.55%	7.05%	7.10%
	Average:	6.05%			**Short-term growth factor*

	Projected Population		
Population	2016	2021	2041
City of Casey	313,521	357,649	514,800
% Change from 2016		2.67%	2.00%

Interim Projections	
2018	*2046*
330,478	*568,477*

% Change (2018 - 2046): 72.0% **Long-term growth factor*

Appendix E. SIDRA modelling outputs

Appendix F. Sensitivity Test Results