Shepparton North-East Growth Corridor Development

Traffic Impact Assessment Report

Client:

Greater Shepparton City Council

Project 113040

Final Report: 22/08/2014

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1 EXECUTIVE SUMMARY

Trafficworks Pty Ltd has been engaged by Greater Shepparton City Council to prepare a comprehensive Traffic Impact Assessment Report for the Shepparton North-East Growth Corridor. In undertaking this assessment, Trafficworks has relied extensively on the previous draft report prepared by Maunsell Australia Pty Ltd in November 2008 for Nordic Pty Ltd, the draft report by AECOM dated December 2009 that formed Appendix F of the Structure Plan, and the peer review of the AECOM report undertaken in March 2011 by TraffixGroup.

This assessment has aimed to update findings in the above documents in the light of more recent developments and to present a consolidated status report on traffic impacts for the North-East Growth Corridor. In preparing this report, ongoing design advice has been provided to Greater Shepparton City Council throughout the past two years that has informed various aspects of the Precinct Structure Plan (PSP), particularly with respect to the internal street network and external road connections resulting from investigations into these aspects. This report incorporates the outcomes of this collaborative approach, with the key findings being summarised in Section 6.

1.1 References

Technical references used in the preparation of this report include the following:

- *Shepparton North East Growth Corridor Development, Traffic Impact Assessment,* draft report by Nordic Pty Ltd, dated 21 November 2008;
- *Shepparton North East Growth Corridor, Appendix F, Traffic Impact Assessment*, draft by AECOM Australia Pty Ltd dated 17 December 2009;
- *Shepparton North East Growth Corridor, Structure Plan, Traffic Engineering Assessment,* by TraffixGroup Pty Ltd dated 7 March 2011;
- Austroads *Guide to Road Design, Part 4A – Unsignalised and Signalised Intersections*, to establish criteria for provision for turning vehicles at intersections;
- VicRoads *Crashstats* database for safety history of the road network in the vicinity of the development;
- VicRoads draft *Access Management Policies* (AMPs), dated May 2006 Version 1.02;
- Shepparton City's *Infrastructure Design Manual*, Version 4.2, dated November 2013;
- The *Greater Shepparton Planning Scheme*, for land zoning details;
- *Public Transport Guidelines for Land Use Development* by Department of Transport, 2008.

2 INTRODUCTION

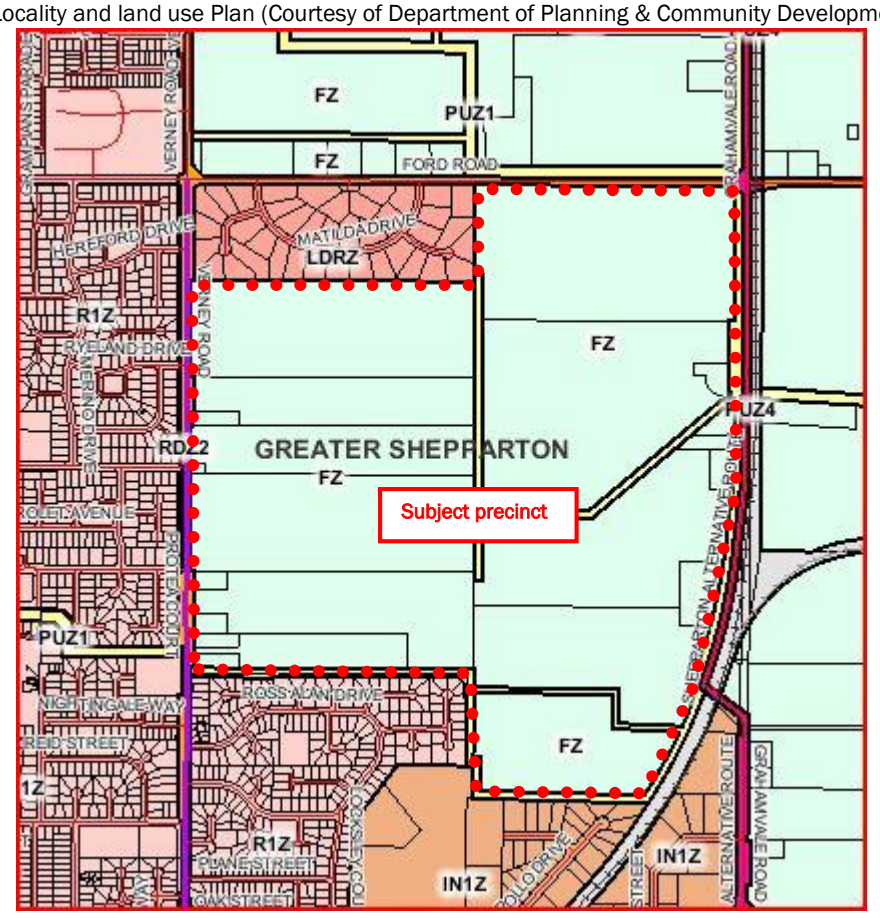
The precinct identified in Figure 1 below, is located in the north-east corner of the existing developed area of Shepparton City. It primarily comprises farming land that is awaiting rezoning for future residential development. Trafficworks Pty Ltd was initially engaged to review previous pertinent traffic reports and provide a consolidated position statement on traffic-related issues that incorporates recent developments impacting on traffic management for the precinct.

The key objectives of the initial study were to:

- Reassess external road connections from the precinct with regard to their location and treatment options. In particular, to review:
    - Access conditions along the Grahamvale Road frontage against the VicRoads draft Arterial Road *Access Management Policies* (AMPs); and
    - The form of access to Verney Road for consistency with the ultimate layout proposals for this road;
- Review the internal street network by way of input into the Precinct Structure Plan.

Since preparation of the initial draft report, Trafficworks has worked with Greater Shepparton City Council to consolidate development proposals for the precinct that are now summarised in this report.

Figure 1 – Locality and land use Plan (Courtesy of Department of Planning & Community Development website)



3 EXISTING CONDITIONS

3.1 Land Use

The precinct comprises around 170ha of land at the northeast fringe of Shepparton (see Figure 1). All the land is included in the Farming 1 Zone (F1Z) in the Greater Shepparton Planning Scheme, although it currently contains two schools and some residential development. Land to the west and southwest is included in the Residential 1 Zone (RZ1) whilst land in the Matilda Drive Estate to the northwest is included in the Low Density Residential Zone (LDRZ). Land to the northeast and to the east (across Grahamvale Road) is included in the Farming 1 Zone (F1Z) and land to the southeast is included in the Industrial 1 Zone (IN1Z).

Several channels that cross the precinct are included in the Public Use Zone – Service & Utility (PUZ1). Grahamvale Road, along the eastern boundary of the land, is an arterial road and is included in the Road Zone Category 1 (RDZ1).

3.2 Road Network

Grahamvale Road: forms part of the Shepparton Alternative Route (SAR), a State Arterial Road (C391) managed by VicRoads. The SAR provides an important bypass route to the east of the city centre, particularly for long distance commercial traffic between Melbourne and Brisbane along the Goulburn Valley/Newell Highway corridor. It also offers more appropriate access for this commercial traffic to Shepparton's industrial areas along the eastern fringe of the city. Along the precinct frontage, Grahamvale Road comprises a two-lane two-way sealed carriageway with sealed shoulders, located centrally in a 20m road reservation, bounded to the east by the Shepparton to Tocumwal railway line and to the west by irrigation channels. It generally operates under an 80km/h speed limit.

VicRoads has developed ultimate layout proposals for the SAR that include a duplicated cross section (achieved by occupying the redundant channel reserves along this portion of the route), a large rural roundabout at the Ford Road intersection and provision for a grade separation over the railway line at the existing rail level crossing near the southern limit of the precinct.

Verney Road: forms the western boundary to the land and is included in the Road Zone Category 2 (RDZ2). This is a trunk collector road in Shepparton City's local road network managed by Council. It has a two-lane two-way cross section, augmented with turn lanes at major intersections. It is currently subject to a 60km/h speed limit along the precinct frontage, with a time-based 40 km/h school zone along the boundary of the Christian School operating within the precinct. An off-road shared path has been constructed in the western part of the reservation from south of Pine Road to Ryeland Drive.

Council has developed ultimate layout proposals for this road along the frontage of the precinct that include widening for a two-lane (one lane in each direction) divided cross section to accommodate sheltered right turn lanes at all significant intersections while also providing sections of central right turning lane for minor side streets and private access points. The proposed cross section is also to incorporate on-road bicycle lanes. The layout proposals make provision for the proposed access points to the internal street network for the precinct. The

section of road north from Pine Road is currently under construction, while concept plans for the length to the south are included as Figures A7 & A8 in Attachment A to this report.

Ford Road: forms part of the northern boundary to the land and is included in the Road Zone Category 2 (RDZ2). This is also a collector road in Shepparton City's local road network managed by Council that currently has a two-lane two-way cross section within a 20m reservation. Ford Road operates under a 60km/h speed limit. There are currently no proposals to upgrade this road.

3.3 Traffic Environment

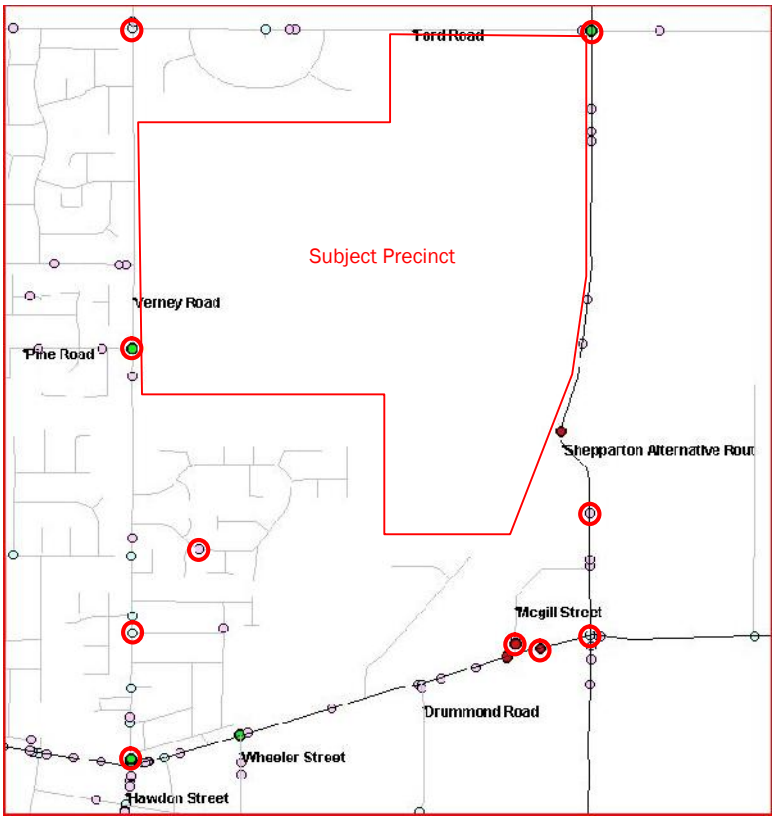
A full assessment of traffic volumes on the significant routes surrounding the precinct is provided in Section 4.2 of this report.

A comparison of the above extrapolated traffic volumes was attempted with traffic forecasts prepared by AECOM for VicRoads as part of a study to assess the traffic impacts of Shepparton Bypass. As the subject precinct is at the fringe of the AECOM study area and their modelling was at a strategic level, little correlation was found.

3.4 Crash History

The VicRoads *Crashstats* database has recorded 12 casualty crashes along roads surrounding the precinct during the most recent 5 years of data (July 2008 to June 2013). The locations of these crashes are plotted in Figure 2 below and details have been summarised over the page (refer to full listing in Figure B2 of Attachment B for further information).

Figure 2: Crashes on the road network surrounding the precinct



- 2 crashes at the intersection of Dookie-Shepparton Road with Shepparton Alternative Route: one was a fall from a bicycle (DCA 190) and one a loss of control crash (DCA 173). One occurred at night, one during the day, and both under dry clear conditions. Both resulted in other injuries.

- 2 crashes at the intersection of Grahamvale Road (Shepparton Alternative Route) with Ford Road: involving one cross traffic crash (DCA 110) and one a loss of control crash (DCA 170). Both occurred during the day, under dry clear conditions. Both resulted in other injuries.

  An additional fatal collision has since occurred at this intersection on 12/3/2014. It was a cross traffic crash (DCA 110) involving a westbound car and northbound truck, during the day in dry and clear conditions.

- 5 other intersection crashes; one each at Ford Road/Verney Road (cross traffic DA 110), Pine Road/Verney Road (right near DCA 113), Oak Street/Verney Road (right near DCA 113), Dookie-Shepparton/Drummond (right rear DCA 132) and Dookie-Shepparton Road/Hawdon Street/Verney Road/Balaclava Road (loss of control DCA 174). Three occurred at night or twilight, two during the day, and all under dry clear conditions. Two involved bicycles (Verney Rd at Oak St and Pine Rd) and one a motorcycle (Dookie-Shepparton Rd at Hawdon St). Two resulted in serious injuries, three in other injuries.

- 3 single vehicle mid-block crashes: on King Richard Drive bicycle into parked car (DCA160), Grahamvale Road off road (DCA 181) and McGill Street off road (DCA 173). One occurred at night, two during the day, all under dry clear conditions. Two resulted in serious injuries, one in other injuries.

A plot of all reported injury crashes since 1987 is provided in Figure 2, with those that have occurred in the last 5 years (as noted above) circled.

The roundabout at the intersection of Dookie-Shepparton Road with Hawdon Street and Verney Road shows a consistent and continuing crash history. It was also identified in the TraffixGroup report as a site showing a high crash frequency and it is recommended that VicRoads investigate this location for potential remedial treatments independent of the development proposals for the growth precinct.

Consistent patterns that emerge from scrutiny of all of the above crash data are a high night time occurrence (5/12 or 42%) and relatively high involvement of bicycles (5 No, 3 along Verney Road).

It can be concluded that, apart from the roundabout at the intersection of Dookie-Shepparton Road and Verney Road and the intersection of Grahamvale Road with Ford Road, the road network in the vicinity of the precinct currently does not have a traffic safety problem that requires urgent remedial action.

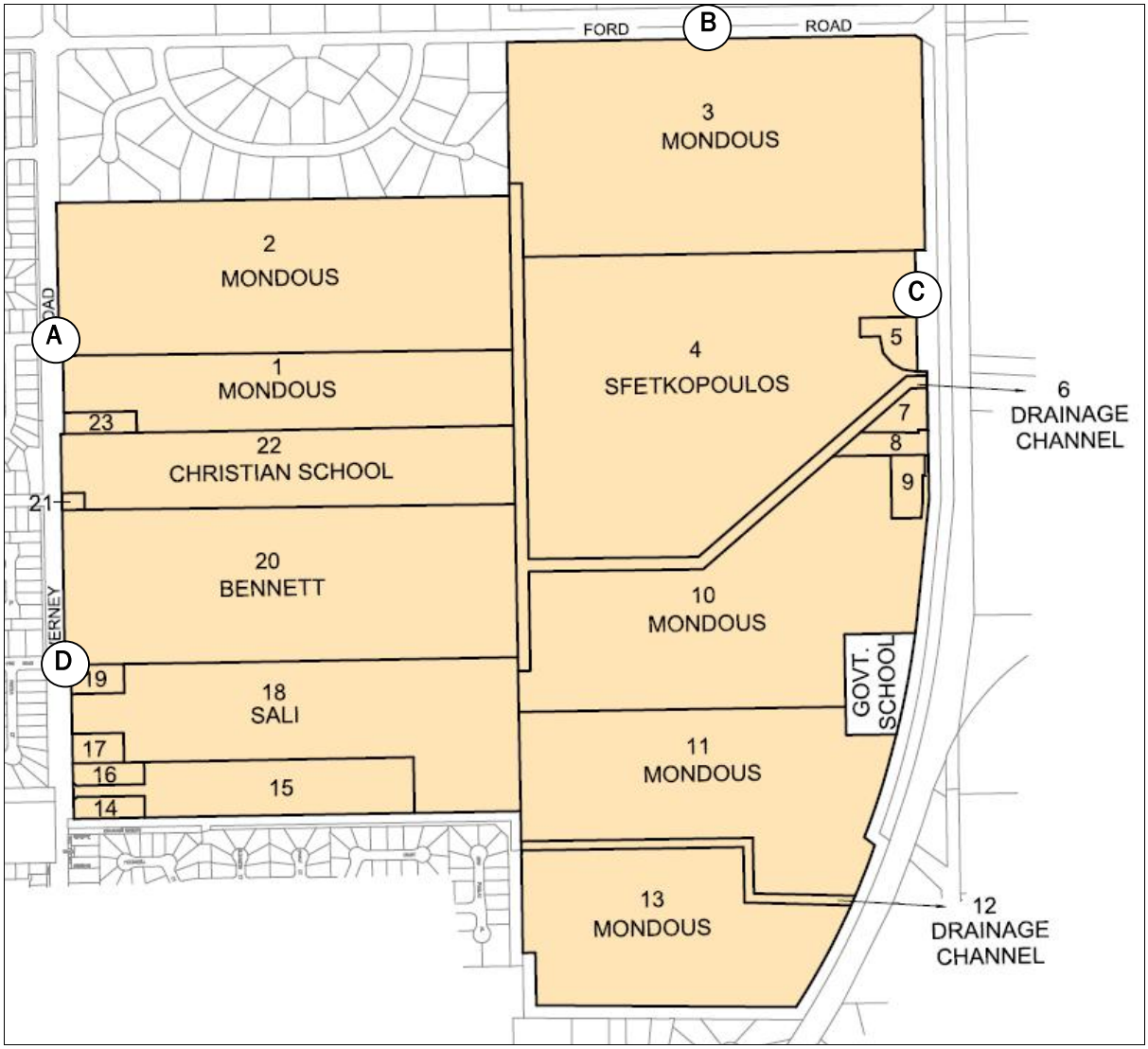
4 PROPOSED DEVELOPMENT

Of the various structure options considered, the development process for the precinct has settled on the layout prepared by Reeds Consulting entitled "Proposed Future Precinct Structure Plan" (Version H) and reproduced in Figure A1 of Attachment A. This plan dated 1/8/2013 forms the basis for the preparation of a detailed internal road network and has been used to undertake the traffic assessments that follow.

4.1 Overview

The land is currently in five primary ownerships, with a number of additional smaller allotments in different ownership abutting the Verney Road and Grahamvale Road frontages (as demonstrated in Figure 3 below).

Figure 3: Ownership Plan (Source: Reeds Consulting "Ownership Plan Version C"). Plan includes access point notation.



The precinct is expected to generate a total lot yield in the order of 1,635 residential lots (based on 75% at 14 lots/ha and 25% at 22 lots/ha applied to net developable areas) as well as a small neighbourhood centre and additional provision for expansion of the two schools currently located

in the precinct. Development is anticipated to occur in a clockwise manner, commencing with the Mondous land in the northwest quadrant and finishing with the Bennett and Sali properties in the southwest quadrant. The development stages that have been adopted are generally aligned with ownership boundaries and coincide with the progressive opening of the external access points discussed below. That is:

- Stage 1: involves development of areas 1 and 2 (including the community hub) with all access obtained via Access A to Verney Road;
- Stage 2: involves the additional development of area 3 and opening of Access B to Ford Road;
- Stage 3: involves the additional development of areas 4, 10, 11 & 13, and the opening of Access C to Grahamvale Road (including eventual reorientation of access to Grahamvale Primary School);
- Stage 4: involves development of the remaining areas 18 & 20, and opening of Access D to Verney Road.

External access to the precinct will be restricted to four controlled intersections as follows (see also Figure 2):

- Access A: to Verney Road opposite Ryeland Drive forming a cross intersection to be under signals control from commencement. A functional layout for this intersection is provided in Figure A3 of Attachment A;
- Access B: to Ford Road with a T-junction under STATCON control west of Grahamvale Road. A functional layout is shown in Figure A4 of Attachment A;
- Access C: to Grahamvale Road as a signalised T-junction north of the current drainage channel crossing. A functional layout is shown in Figure A5 of Attachment A;
- Access D: to Verney Road diagonally opposite Pine Road under signals control from commencement. A functional layout is shown in Figure A6 of Attachment A.

Access point "C" to Grahamvale Road has been the subject of considerable discussion between Council and VicRoads to achieve compliance with the VicRoads draft *Access Management Policies* (refer more detailed discussion in Section 5.4 of this report). This new access point to the precinct from Grahamvale Road will require the longer term closure of direct access to Grahamvale Primary School and reorientation of this school access internally within the precinct.

The investigations in the AECOM and TraffixGroup reports extended to cover the impact of traffic from the precinct on the Goulburn Valley Highway at the highway intersections with Pine Road and Hawkins Street. This assessment has adopted the position that the intersection of Pine Road with the highway is currently signalised and has the capacity to cater for the anticipated modest increase in traffic from the north-east precinct. The intersection of Hawkins Street with the highway is to be signalised as part of the Fairley's redevelopment (including part funding by the McDonald's development on the southwest corner) and will similarly have capacity to cater for the anticipated future additional traffic from the north-east precinct. Neither intersection is evaluated further in this report.

4.2 External Traffic

Traffic counts conducted on surrounding streets by Shepparton City are summarised in Table 1. These volumes have been factored up, with growth rates of 2% per annum (pa) for Verney Road and Grahamvale Road, while a lower factor of 1.5%pa was adopted for Ford Road, to approximate traffic conditions at 2021 (representing approximately 7 years of development and aligning with the time-frame of VicRoads traffic modelling undertaken for Shepparton Bypass. The resultant volumes were used to assess intersection configurations at the precinct access points (refer Section 5.2).

In addition, Greater Shepparton City Council undertook a turning movement count at the intersection of Verney Road with Pine Road (results of this count are summarised in Figure B1 of Attachment B).

Table 1: Summary of traffic count data obtained from Greater Shepparton City Council.

Street	Location	Count Date	Volumes			
			Total (vpd)	AM Peak (vph)	PM Peak (vph)	CVs
Pine Road	Pontiac Ave to Protea Crt	11/5/2010	2,300	269	293	4.3%
Pine Road	Harrier St to Camaro Nook	12/2/2009	1,901	243	227	3.2%
Balaclava Road	Dunrobin St to Bourchier St	19/10/2004	7,129	631	667	11.8%
Ford Road	Merino Dr to Verney Rd	29/4/2010	2,746	357	288	10.0%
Grahamvale Rd	McGill St to Dookie Rd	27/5/2003	4,141	455	431	21.7%
Grahamvale Rd	McGill St to rail crossing	27/5/2003	3,827	412	428	20.8%
Hawkins Street	Southdown St to Merino Dr	14/2/2007	2,716	198	315	4.9%
New Dookie Rd	Glenn St to Wheeler St	26/10/2006	8,959	787	827	9.4%
Verney Road	Maple St to Clarke Crt	19/10/2004	9,250	781	845	5.2%
Verney Road	North of Ford Rd	17/2/2005	2,826	317	382	6.0%
Verney Road	Hereford Dr to Ryeland Dr	22/7/2008	3,959	421	453	6.9%
Verney Road	Hawkins St to Pine Rd	8/1/2009	5,325	373	479	6.3%

4.3 Internal Trip Generation & Assignment

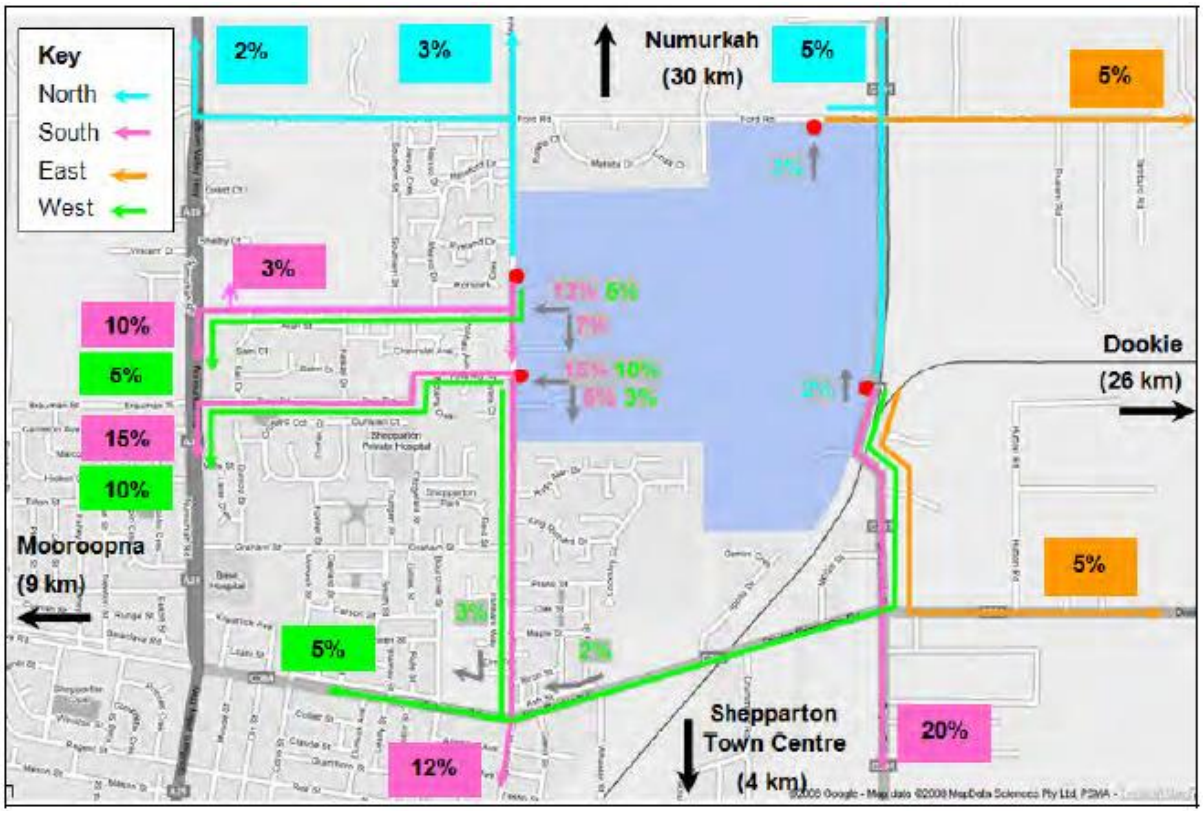
For consistency with the previous Traffic Impact Assessment report by AECOM (December 2009) and the peer review by TraffixGroup (March 2011) the following parameters have been adopted for establishing traffic generation from within the precinct:

- Lot yield = 11 dwellings/hectare applied to gross areas.
- Generation rate = 8 trips/dwelling/day, with 10% occurring in the AM and PM peaks.
- Traffic generation by the neighbourhood centre has assumed that 90% will be generated within the precinct and 10% externally.

- Separate assessments have been conducted on the basis of a 90% exiting/10% entering and an 80% exiting/20% entering directional split in the AM peak. Both have adopted a 70% entering/30% exiting directional split in the PM peak.

- A suggested assignment of traffic onto the external network was provided in Figure 5.1 of the AECOM report. However, the TraffixGroup review suggested a modified distribution in Figure 8 of its report. The TraffixGroup distribution has been adopted for this assessment and is reproduced in Figure 4.

Figure 4: Adopted traffic distribution (Source: Figure 8 from TraffixGroup peer review report dated 7/3/2011)



5 ASSESSMENTS

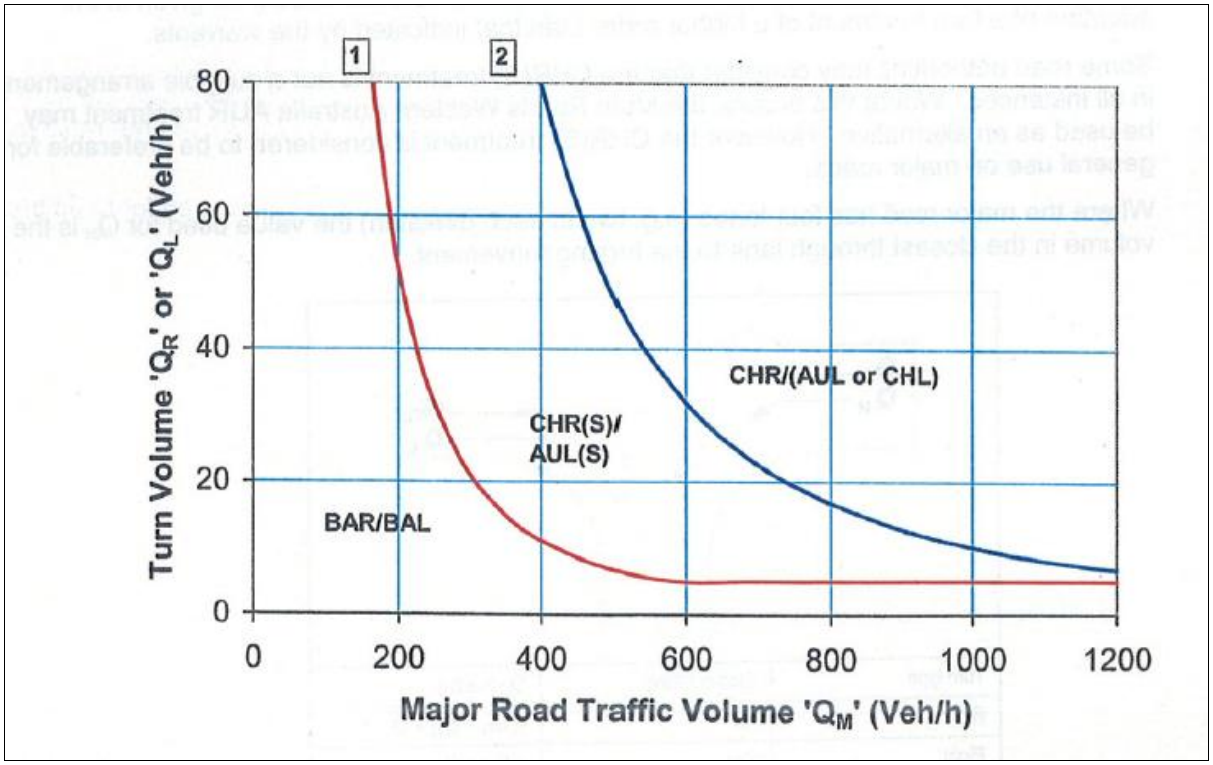
The traffic generation estimates and directional assignments outlined in Section 4 have been inserted in spreadsheets that provide the cumulative effects of this traffic on the internal collector roads. With these resultant traffic volume data the following assessments have been made for each stage of the development:

- The entering and exiting traffic at each access point has been compared with the projected through traffic on the external road and appropriate intersection treatment options selected with reference to Figure 4.9(b) of the Austroads *Guide to Road Design, Part 4A – Unsignalised and Signalised Intersections* (reproduced in Figure 5 below).
- The turn movements have been reviewed with SIDRA to confirm the most appropriate intersection layout and to determine optimum means of ultimate control.
- The internal traffic volumes have been assessed against the parameters in Table 2 of Council's IDM and appropriate internal street types nominated (reproduced in Figure C1 of Attachment C).

These assessments have been extended to also review operation at the intersection of Verney Road with Hawkins Street and provide comment on the intersection of Dookie-Shepparton Road with Verney Road/Hawdon Street/Balaclava Road.

The two spreadsheets that assess the impacts of an AM split of 90% out/10% in and an alternative AM split of 80% out/20% in are reproduced in Figures E1 and E2 in Attachment E.

Figure 5: Warrants for turn treatments for design speed <100 km/h (Source: Figure 4.9(b) in Austroads *Guide to Road Design, 4A*).



5.1 Turn Lane Selection

From the anticipated turn movements the additional turn lane arrangements recommended at the assessed intersections are as outlined in Table 2. The suggested turn lanes at the intersections along Verney Road are consistent with those described in Council's Verney Road Master Plan. The full intersection layouts are further explored in Section 5.2.

Table 2: Indicative turn lane treatments at external access points.

Intersection	Approach	Treatment
Verney Road at Access A/Ryeland Drive	South	Type CHR channelized right turn
	North	Type AUL(S) short auxiliary left turn
Verney Road at Hawkins Street	North	Type CHR channelized right turn
Ford Road at Access B	East	Type AUL(S) short auxiliary left turn
Grahamvale Road at Access C	North	Type CHR channelized right turn
	South	Type AUL(S) short auxiliary left turn
Verney Road at Access D/Pine Road	South	Type CHR channelized right turn

5.2 Intersection Layout and Control

5.2.1 SIDRA Assessment

Analysis was conducted for the turn movements and through volumes at the above intersections with the results summarised in Table 3 (full SIDRA Movement Summaries are provided in Attachment D).

From this analysis it can be seen that:

- The Verney Road intersections at Access A/Ryeland Drive and with Hawkins Street are expected to function satisfactorily under Give Way control. However, Access A/Ryeland Drive intersection is to be provided with signal control in the first instance to provide improved safety for pedestrian and cyclist access to the precinct (refer discussion in Section 5.5).

- The Ford Road intersection at Access B is expected to function satisfactorily under Give Way control.

- As a result of the anticipated heavy demand for west to/from south movements, the Grahamvale Road intersection at Access C is expected to experience total saturation under Give Way conditions; marginal operation as a roundabout (requiring two-lane circulating roadway) but satisfactory operation with signals control. Signalisation is the recommended treatment for this intersection in the first instance.

- The SIDRA evaluation indicates that a Give Way option at Access D/Verney Road/Pine Road is not feasible, whilst signals can offer satisfactory operation in the critical PM peak, with the layout as indicated in the Verney Road Master Plan.

Table 3: Results of SIDRA assessments for external intersections.

Location	Control	Leg	Degree of Saturation	Average Delays (sec)	95% Queue (m)
Access A at Verney Rd	Give Way	S	0.40	6.9	16.7
		E	0.67	17.2	38.6
		N	0.13	9.8	0
Hawkins St at Verney Rd	Give Way	S	0.11	4.0	0
		N	0.37	6.6	14.9
		W	0.67	18.8	24.1
Access B at Ford Rd	Give Way	S	0.19	13.2	5.5
		E	0.10	2.2	0
		W	0.08	1.3	4.1
Access C at Grahamvale Rd	Give Way	S	0.16	4.2	0
		N	0.13	0.9	0.7
		W	1.24	259	382
	Roundabout	S	0.79	10.0	93.2
		N	0.29	11.1	9.4
		W	0.16	9.7	5.3
	Signals	S	0.47	14.8	35.1
		N	0.35	11.0	26.4
		W	0.32	19.8	21.0
Access D at Verney/Pine Rds	Signals	S	0.65	19.5	62.8
		E	0.47	12.9	49.0
		N	0.53	16.1	18.4
		W	0.05	16.8	2.0
	GW option	E	1.51	499	659

5.3 Internal Roads

5.3 1 Traffic Volumes and Street Types

From the internal traffic generation estimates developed in the spreadsheets in Attachment E, peak traffic generation along the internal roads can be deduced, as set out in Table 4 below:

Table 4: Peak internal traffic volumes and resultant road types at precinct boundaries

Location	Traffic	Road Type	Comment
At Access A	6,640vpd	Trunk Collector	Peak traffic volume at completion of Stage 3. (reduces to 4,050vpd at completion of Stage 4)
At Access B	1,040vpd	Collector Level 1	Peak achieved at completion of Stage 4.
At Access C	5,790vpd	Trunk Collector	Requires Trunk Collector at end of Stage 3.
At Access D	4,590vpd	Trunk Collector	Required upon opening.

The pertinent street characteristics are set out in Table 2 of Council's IDM (reproduced in Attachment C1) for each street type. An assessment of the extent of these traffic conditions into the precinct would indicate that:

- The Trunk Collector (Collector Street Level 2) cross section should be maintained east from Access A to midway through areas 1/2 (section B-B), with the remaining length to the proposed roundabout in area 4 reverting to Collector Street Level 1 (section A-A);
- The Trunk Collector cross section should be maintained west from Access C to the proposed roundabout at the junction with the north-south collector midway through area 4 (section B-B);
- The Trunk Collector cross section should be maintained east from Access D to the eastern boundary of areas 18/20 (section B-B), with the remaining length to the north-south collector in area 10 reverting to Collector Street Level 1 (section C-C);
- Collector Street Level 1 status should extend south from Access B to the proposed roundabout at the connection of this link with the east-west collector (section D-D, but including bicycle facilities);
- Collector Street Level 1 status for the primary internal north-south collector servicing areas 4, 10 & 11 (section A-A). The cross section should be reviewed in the vicinity of the school to include a requirement to cater for buses;

All other internal streets can be constructed as access streets or access places, as appropriate to the extent of development they service. These road profiles are depicted in the typical cross sections provided in Figure A2 in Attachment A and cross referenced to the sections above.

5.3.2 Network Layout Options

Underlying principles to guide the layout design should include the following:

- The collector road network should service the ultimate internal access for Grahamvale Primary School, with parent delivery/collection areas separated from the bus interchange location.
- A bus route through the precinct should be able to position bus stops at locations where 95% of residences are located within 400m walking distance of a bus stop. If this bus route deviates from the collector street network, the cross sections and intersections of the minor streets travelled should be able to cater for bus movements and make provision for bus stops.
- The street layout should avoid cross road intersections. Where these are unavoidable, safety considerations would indicate it desirable to treat these locations with roundabouts.
- Although shown as a through route on the PSP, it is considered advisable not to provide a direct east-west connection through the precinct that may encourage "rat running" between the Verney Road and Grahamvale Road arterial routes through this essentially residential area. Consideration should be given to an amendment to the east-west collector route alignment to introduce a stagger in this route.

- Staging of the internal development may require that consideration be given to the provision of a frontage road along the western side of Grahamvale Road to connect Access C to the school car park.

5.4 Access C

Location

Grahamvale Road is a State Arterial Road managed by VicRoads. As such, its development should be consistent with VicRoads Access Management Policies as outlined in the VicRoads draft Policy Statement dated May 2006 (Version 1.02). Schedule 2 of this document sets out the conditions covering Access Management Policy 2 (AMP 2) for major urban limited-access roads, applicable to Grahamvale Road. The performance standards for this category of road aim to minimise interference to traffic flow, reduce collisions associated with access movements and provide for orderly development of, and vehicular access to, abutting land by allowing limited and well-planned minor local connections between widely spaced controlled intersections.

The standards and principal characteristics for AMP 2 roads include:

- Typical operating speed of 80 km/h, unimpeded by turn or cross traffic except at predetermined controlled locations;
- Divided or planned divided cross section;
- High level of control over intersection spacing, vehicle turns and cross movements;
- Agreed intersection locations may be specified in an access management plan or local structure plan;
- Intersections may be cross or T intersections, controlled by roundabouts or signals and generally at a minimum spacing of 800m, varied to suit future signal progression and traffic flow requirements;
- Intermediate T intersections are at least 200m apart and separated from principal intersections, conforming to the layouts in Figures C2 & C3 in Attachment C;
- No unrestricted individual site access to the through carriageway. All access to be via:
    - Alternative abutting roads, or
    - A parallel frontage street or one-way service road, or
    - Approved access points complying with the AMP 2 requirements.

Applied to the Grahamvale Road frontage of the precinct, the implications on ultimate access to the development include:

- A major intersection treatment at the Ford Road intersection (likely to be a roundabout);
- One additional controlled major access location (Access “C” - to be signalised) approximately midway between Ford Road and the future rail overpass;

- Full control over access to individual lots, requiring:
    - Ultimate closure and reorientation of access to the current properties at Nos 125, 131, 133 and 135 to the internal street network or provision of a contiguous service road;
    - Ultimate closure and relocation of access to Grahamvale Primary School and its parking area from within the precinct;
    - Provision of internal access to all new lots along this boundary of the precinct.

It is not possible to comply with the AMP 2 criterion of 800m spacing between major intersections in the approximate 1,120m between Ford Road and the location of a future rail overpass. A compromise site at about the midpoint has been proposed and agreed in-principle by VicRoads, subject to progressive relocation/control of current direct access along this length.

Configuration

As noted is Section 5.2.1 the anticipated strong tidal flows at this intersection require its signalisation by the completion of Stage 3. Further SIDRA assessments have indicated that operational requirements at the signalised intersection call for two eastbound approach lanes and two southbound departure lanes. The design of any crossing structure over the channel immediately west of Grahamvale Road will need to be able to accommodate three traffic lanes (two eastbound and one westbound). A functional layout for this signalised intersection in accordance with these criteira is provided in Figure A5 of Attachment A.

A private access to an orchard property to the east of the railway line connects with Grahamvale Road, via an occupational crossing of the rail line, to a point approximately 25m south of the proposed location of Access C. This private access will be located in close proximity to the signals and has the potential to impact on the efficiency and safety of the intersection operation. As such, it is desirable that this connection is relocated. An interim location further south should aim to achieve maximum separation from the signalised intersection at Access C whilst providing adequate clearance to the guard fencing at the approach to the nearby channel crossing.

5.5 Remote Impacts

Numurkah Road

As noted earlier in this report, the intersections of Goulburn Valley Highway (Numurkah Road) with Pine Road is currently signalised, and with Hawkins Street to be signalised as part of adjacent development proposals. Both intersections are expected to operate satisfactorily under ultimate traffic conditions.

Verney Road

Verney Road currently carries between 10,000vpd at the south end and 4,000vpd south of Ford Road (refer Table 1). These volumes can be expected to increase through natural growth to 13,000vpd and 5,100vpd respectively by the design year of 2021 (adopting a 2%pa growth rate).

Under such traffic conditions the IDM indicates a need for upgrading this route to Trunk Collector standard (divided carriageway) between Dookie-Shepparton Road and Hawkins Street; with

Collector Street Level 1 standard required to the north of Hawkins Street. The ultimate development proposals prepared by Council for Verney Road go part way towards addressing this need but only indicate provision of one traffic lane in each direction. Full development of a Trunk Collector cross section (with two traffic lanes in each direction) is expected to require widening along the east side of the road reservation. It is recommended that developments along the Verney Road frontage of the precinct incorporate provision for widening of the road reservation to accommodate future full duplication.

Total ultimate traffic generation from the precinct is in the order of 15,500vpd. From Figure 4 it is estimated that 17% (12% + 5%) or 2,600vpd of generated traffic will travel along the section of Verney Road south of Hawkins Street. It is considered that the DCP for the precinct should incorporate a contribution to the cost of future road upgrading works along Verney Road south of Hawkins Street.

Ford Road

Ford Road currently carries around 2,750vpd between Verney Road and Grahamvale Road (refer Table 1). These volumes can be expected to increase through natural growth to 3,200vpd by the design year of 2021 (adopting a 1.5% annual growth rate). Such traffic volumes would require Collector Street Level 1 conditions with an 11.0m carriageway in a 24m reserve width.

From Figure 3 it is estimated that 8% (3% + 5%) or 1,250vpd of generated traffic will travel along the length of Ford Road from Access B to Grahamvale Road. This represents in the order of 39% of total traffic on this short section of road in the design year.

As indicated for Verney Road above, it is suggested that the development of the precinct along the Ford Road frontage make provision for future road widening from a 20m to a 24m road reservation for the full length of this frontage and that a contribution could be considered at permit stage for any upgrading to be undertaken of the section of Ford Road between Access B and Grahamvale Road to satisfy Collector Street Level 1 conditions.

Dookie-Shepparton Road at Hawdon Street, Balaclava Road, Verney Road

The roundabout at the intersection of Dookie-Shepparton Road, Verney Road, Hawdon Street and Balaclava Road has an ongoing crash history (see Section 3.5) that is expected to require ameliorative treatment for improved operation under the anticipated increased future traffic demands.

The TraffixGroup report undertook a SIDRA assessment of the operation of this intersection under estimated traffic conditions at 2020 that indicated marginal performance at this stage (degree of saturation of 0.88 in AM peak with 144m queue lengths in the Verney Road approach). The source of base traffic data on which this assessment was performed is not known. It is recommended that peak hour turning movement counts be undertaken at this location in order to verify the TraffixGroup conclusions regarding the operation of this intersection into the future in its current configuration.

In addition it is recommended that a detailed analysis of the crashes at this intersection be undertaken to identify any operational deficiencies that require remedial action. It is noted that a large concrete high voltage power pole at the back of kerb in the northeast quadrant constitutes

a hazard and a control on potential improvements that could represent a significant cost item if needed to be relocated.

Grahamvale Road at Ford Road

Both the AECOM and TraffixGroup reports indicated that this intersection has adequate capacity to absorb the additional traffic from the precinct and maintain operation at low degrees of saturation, and minimal increases in queue lengths and delays. It is noted that ultimate development of Shepparton Alternative Route envisages the installation of a roundabout at this location, with black spot funding likely to see the installation proceed in the short term. No additional works are required at this location as a result of the precinct development.

Treatment of Access A

As indicated in Tables 2 and 3 of this report, the layout of Access A is expected to function satisfactorily as a cross intersection with Ryeland Drive controlled by Give Way signs and including a channelized right turn (Type CHR) lane and auxiliary left turn (Type AUL) lane.

In recent years Council has installed a flagged children's crossing in Verney Road at the Christian School between Hawkins Street and proposed Access A. This crossing was provided on advice that 27 students would use the crossing, thereby satisfying the minimum VicRoads pedestrian (20 children) and traffic (50vph) criteria for such a facility.

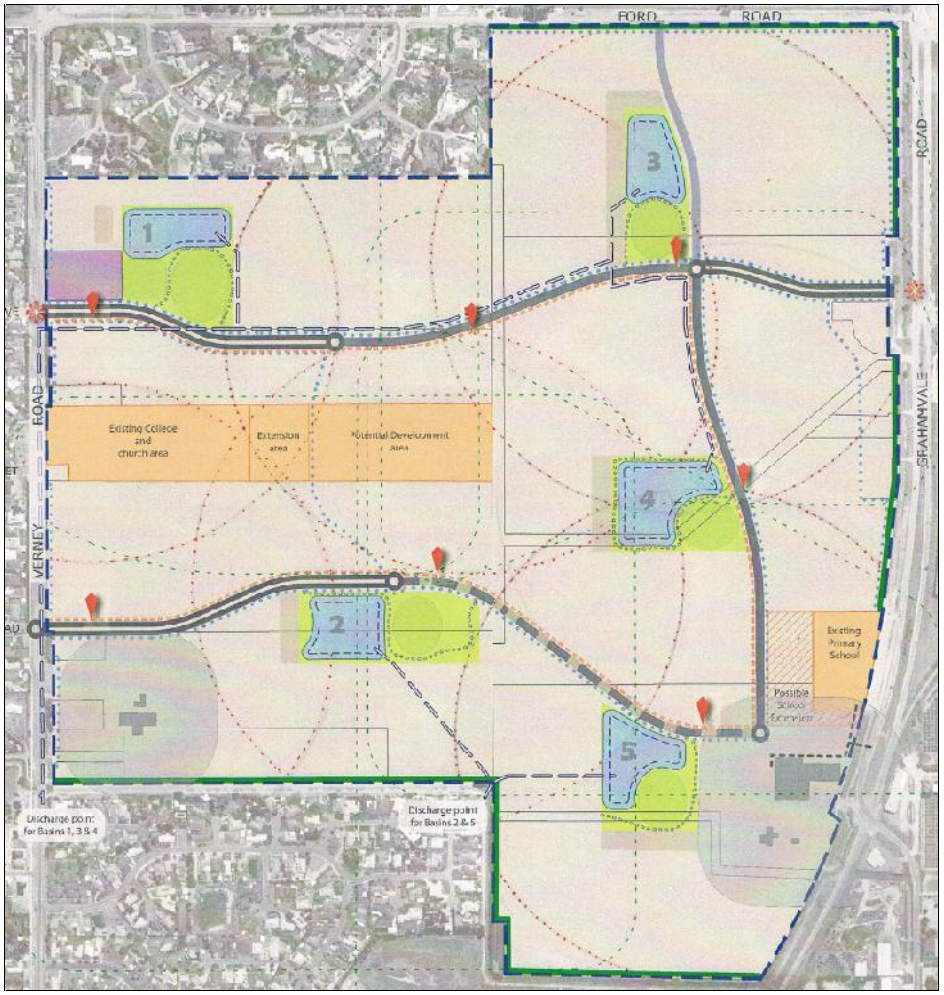
Enrolments at the Christian School are growing. The neighbourhood activity centre planned immediately northeast of Access A is also likely to attract significant pedestrian traffic from the residential areas west of Verney Road in due course. In addition, the projected growth of Grahamvale Primary School (to a student population of around 600) has the potential to attract students from west of the precinct, who would need to cross Verney Road en-route to and from this school.

As a safety response to these anticipated increases in pedestrian movements across Verney Road, its intersection with Access A/Ryeland Drive should be signalised at the commencement of the development as an item included in the DCP. This should be accompanied by the removal of the existing flagged school crossing and installation of pedestrian fencing, with students at the Christian School instructed to use the signals for their crossing movements to/from the west.

5.6 Public Transport

Public Transport Victoria (PTV) guidelines have established a target for urban growth areas to be designed so that 95% of residential land is located within 400m walking distance of public transport services. The Precinct Structure Plan in Figure A1 of Attachment A, shows notional bus stop locations along a future bus route through the precinct. These stops will capture 95% of residential lots with considerable overlap, as demonstrated in Figure 6. There is scope to adjust stop locations during detailed layout design to reduce the number of stops within the precinct and to make allowance for any bus stops in Verney Road, whilst still maintaining the desired coverage.

Figure 6: 400m radius catchment areas from notional bus stop locations within the precinct.



5.7 Bicycle Facilities

There are no cycling facilities in Ford Road or Grahamvale Road. However, there are sections of shared path along the west side of Verney Road from Elm Terrace to Ford Road and from south of Pine Road to Ryeland Drive. It is expected that the Verney Road paths will be extended to form a continuous cycling route from Ford Road to Hawdon Street where existing paths to the south provide access to Shepparton High School.

It is considered important that the internal street network though the precinct complements this external path by providing a comprehensive coverage of bicycle facilities that links to Verney Road as well as servicing access requirements to the two primary schools within the precinct. This should include bicycle facilities along the collector street south from Access B.

5.8 Further PSP Development

Table 1 of the TraffixGroup report provides a detailed review of the Transport and Movement section of the draft PSP at Section 4.6. The comments on the planning and design guidelines in the draft PSP provided in Table 1 are supported and should applied during the detailed design of the internal street network.

6 CONCLUSIONS AND RECOMMENDATIONS

This report has reviewed previous pertinent traffic reports and provided a consolidated position statement on traffic-related issues for the Shepparton North East Growth Corridor. The following conclusions are drawn from the review:

- Section 4.6 of the draft PSP needs to be reviewed to take on board the comments provided in Table 1 of the TraffixGroup report.
- The long-term crash history of the intersection of Dookie-Shepparton Road with Verney Road, Hawdon Street and Balaclava Road needs detailed investigation by VicRoads to identify safety improvements. Associated with this investigation, a Turning Movement Count should be undertaken at this site to review its future operation and identify any improvements to cater for the additional traffic generated by the precinct.
- External road access points for the precinct should be configured as follows:
    - Access A at the northern end of Verney Road frontage: should be aligned with Ryeland Drive opposite and controlled by traffic signals in the first instance.
    - Access B to Ford Road: provide with Type AUL(S) treatment on east approach only.
    - Access C to Grahamvale Road at approximate midpoint between Ford Road and the ultimate rail grade separation: signalised T intersection in first instance.
    - Access D at the southern end of Verney Road frontage diagonally opposite Pine Road: installation of traffic signals in first instance.
    - Verney Road at Hawkins Street: provide Type CHR treatment on north approach.
- The above recommended treatments are consistent with the Verney Road Master Plan.
- The underlying principles to guide the internal layout design should include the following:
    - The collector road network should service the ultimate internal access for Grahamvale Primary School, with parent delivery/collection areas separated from the bus interchange location.
    - A bus route through the precinct should be able to position bus stops at locations where 95% of residences are located within 400m walking distance of a bus stop. If this bus route deviates from the collector street network, the cross sections and intersections of the minor streets travelled should be able to cater for bus movements and make provision for bus stops.
    - The street layout should avoid cross road intersections. Where these are unavoidable, safety considerations would indicate it desirable to treat these locations with roundabouts.
    - It is considered advisable not to provide a direct east-west connection through the precinct to avoid “rat running” between the Verney Road and Grahamvale Road. Consideration should be given to a review of the alignment of this route.

- Staging of the internal development may require that consideration be given to the provision of a frontage road along the western side of Grahamvale Road to connect Access C to the current school car park.
- Full control over access to Grahamvale Road, requiring:
  - Ultimate closure and reorientation of access to the current properties at Nos 125, 131, 133 and 135 to the internal street network or provision of a contiguous service road;
  - Ultimate closure and relocation of access to Grahamvale Primary School and its parking area from within the precinct;
  - Provision of internal access to all new lots in the precinct.

- Street types consistent with the IDM based on traffic estimates within the precinct should be:
  - Trunk Collector (Collector Street Level 2) cross section from Access A to midway through area 1/2, with Collector Street Level 1 for the remaining distance;
  - Collector Street Level 1 for the link to Access B, including provision of bicycle facilities;
  - Trunk Collector cross section from Access C to the roundabout in area 4;
  - Trunk Collector cross section from Access D to the eastern boundary of areas 18/20, with Collector Street Level 1 for the remaining distance;
  - Collector Street Level 1 for the north-south collector street servicing areas 4, 10 & 11 reviewed in the vicinity of the school to ensure it caters for bus movements.
- Predicted future traffic levels in the surrounding street network would indicate a need for:
  - Provision for future road widening along the Verney Road and Ford Road frontages of the precinct;
  - Allowance by way of permit conditions for a proportional contribution to the upgrading of these roads to the required standard under ultimate traffic conditions.

ATTACHMENT A – CONCEPT DEVELOPMENT PLANS

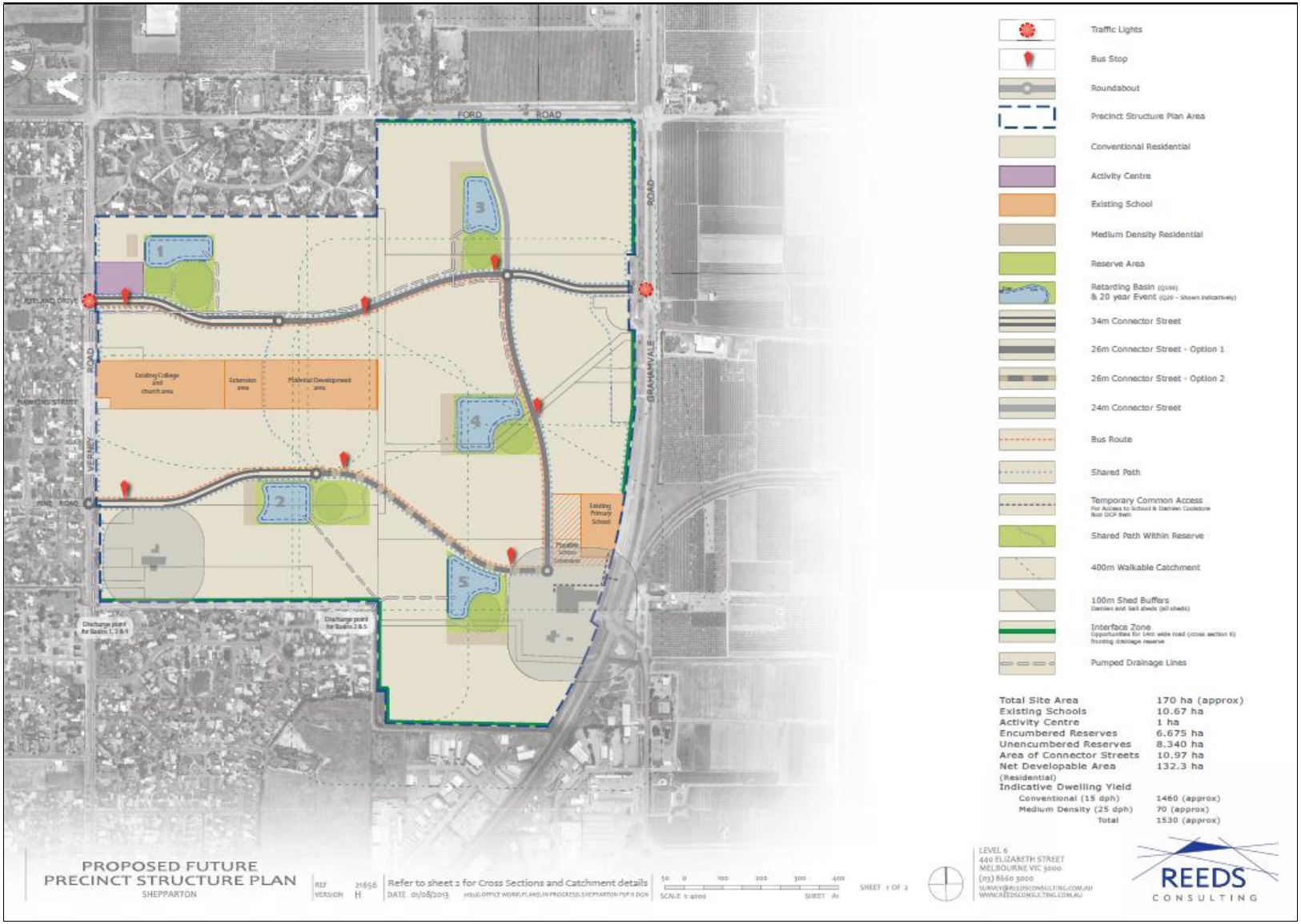


Figure A1: Proposed Future Precinct Structure Plan (by Reeds Consulting – version H)

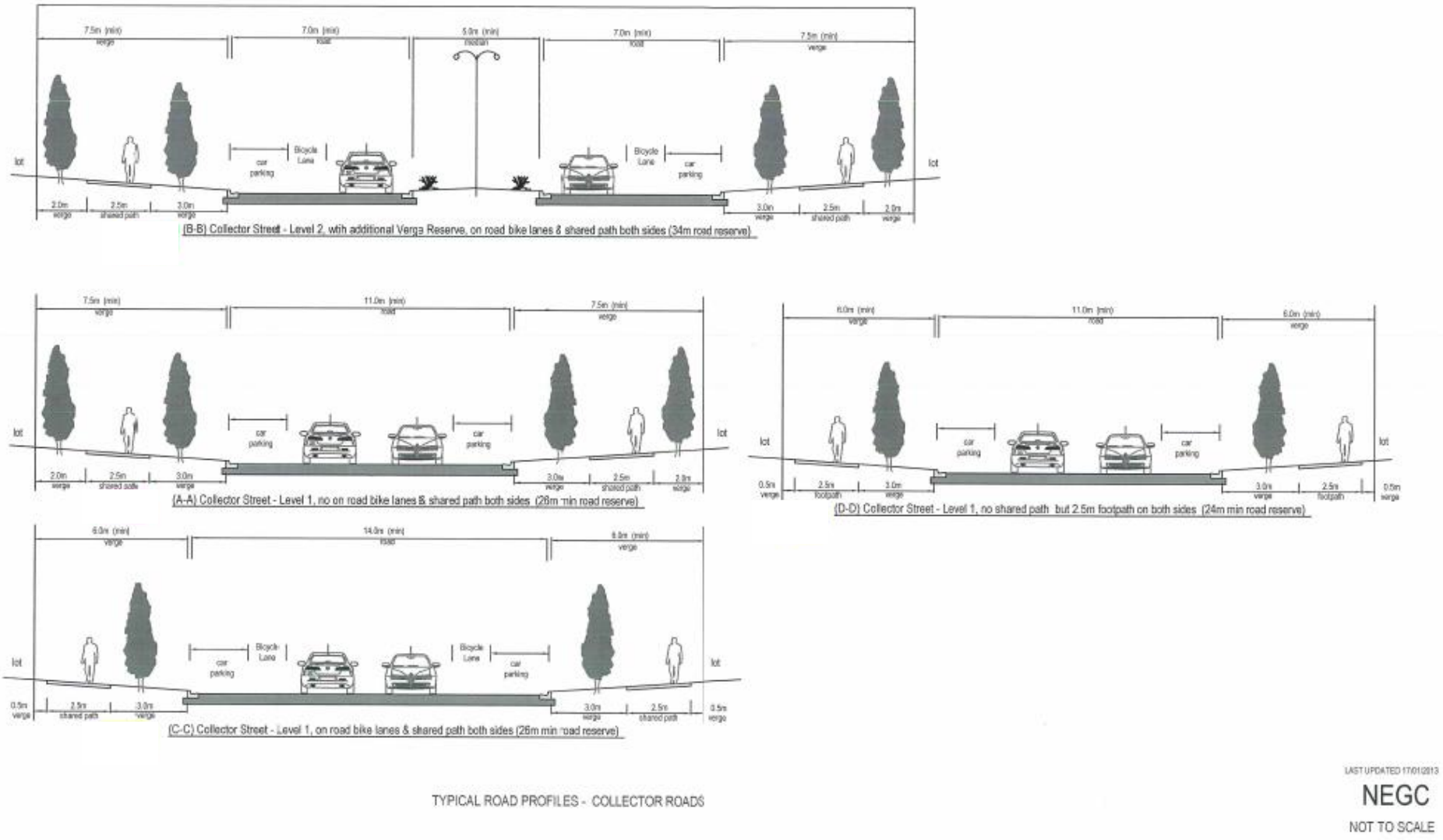


Figure A2: Typical Road Profiles – Collector Roads

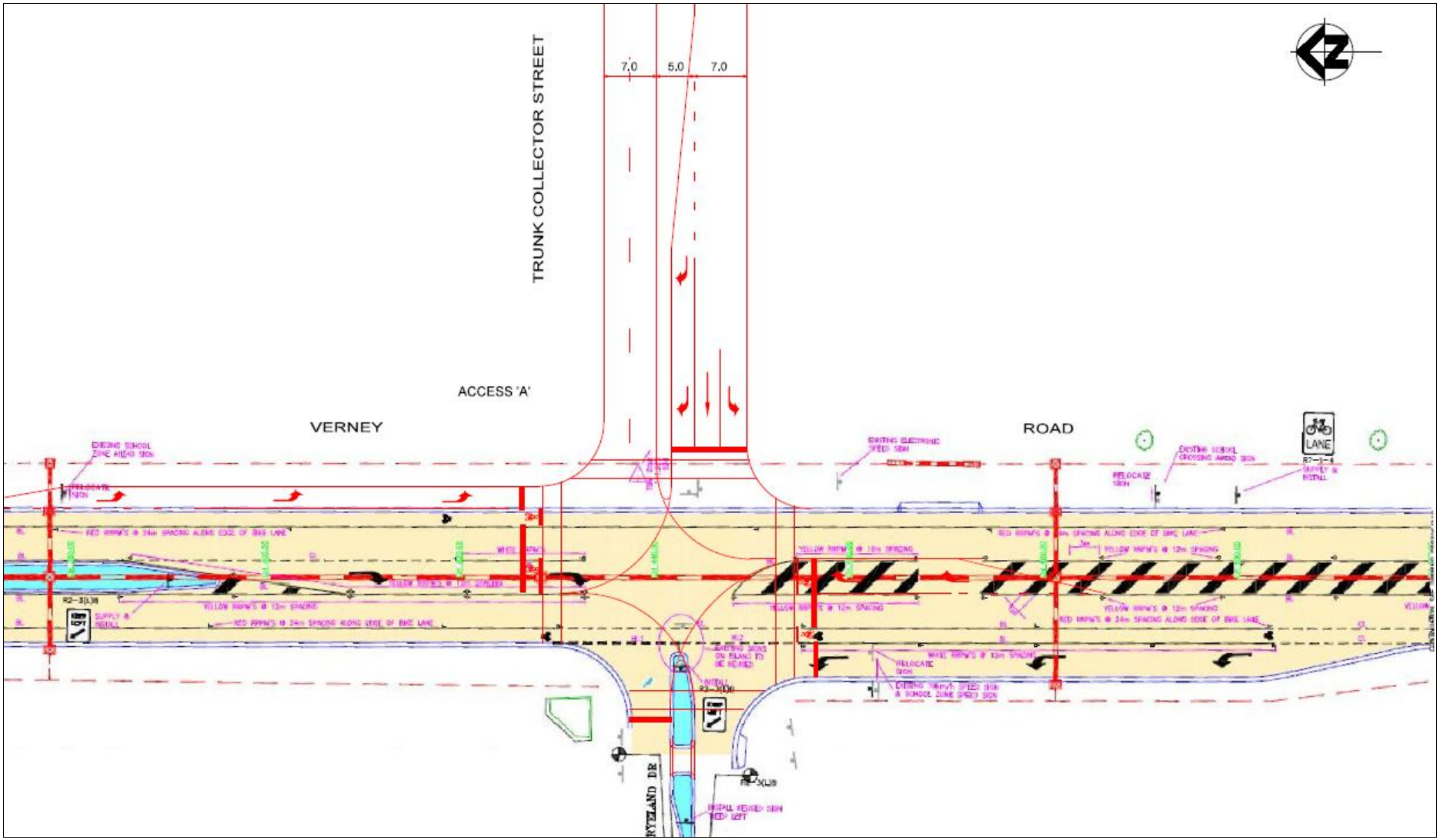


Figure A3: Functional layout for the intersection of Verney Road at Access A

Figure A4: Functional layout for the intersection of Ford Road at Access B

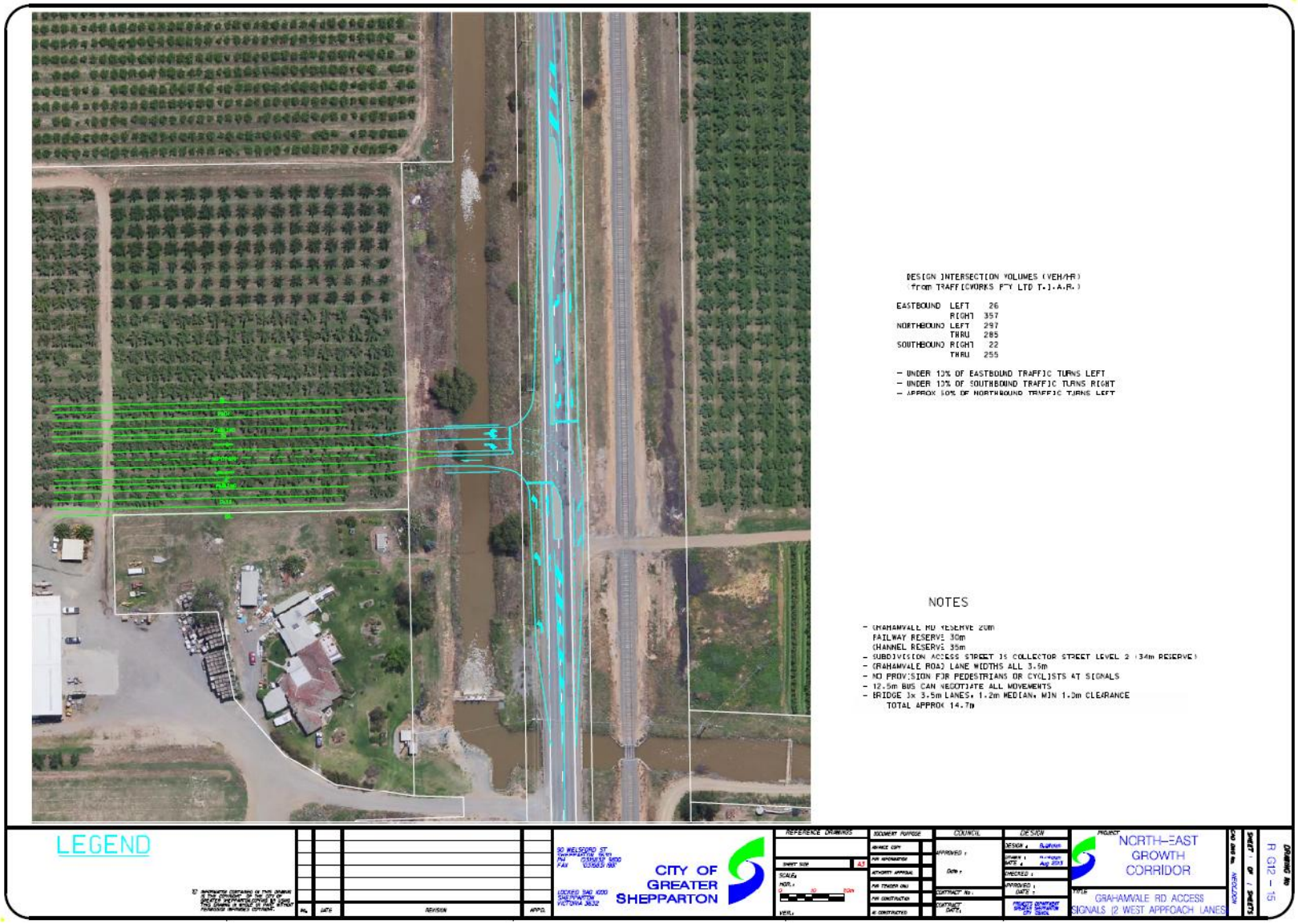


Figure A5: Functional layout for the intersection of Grahamvale Road at Access C

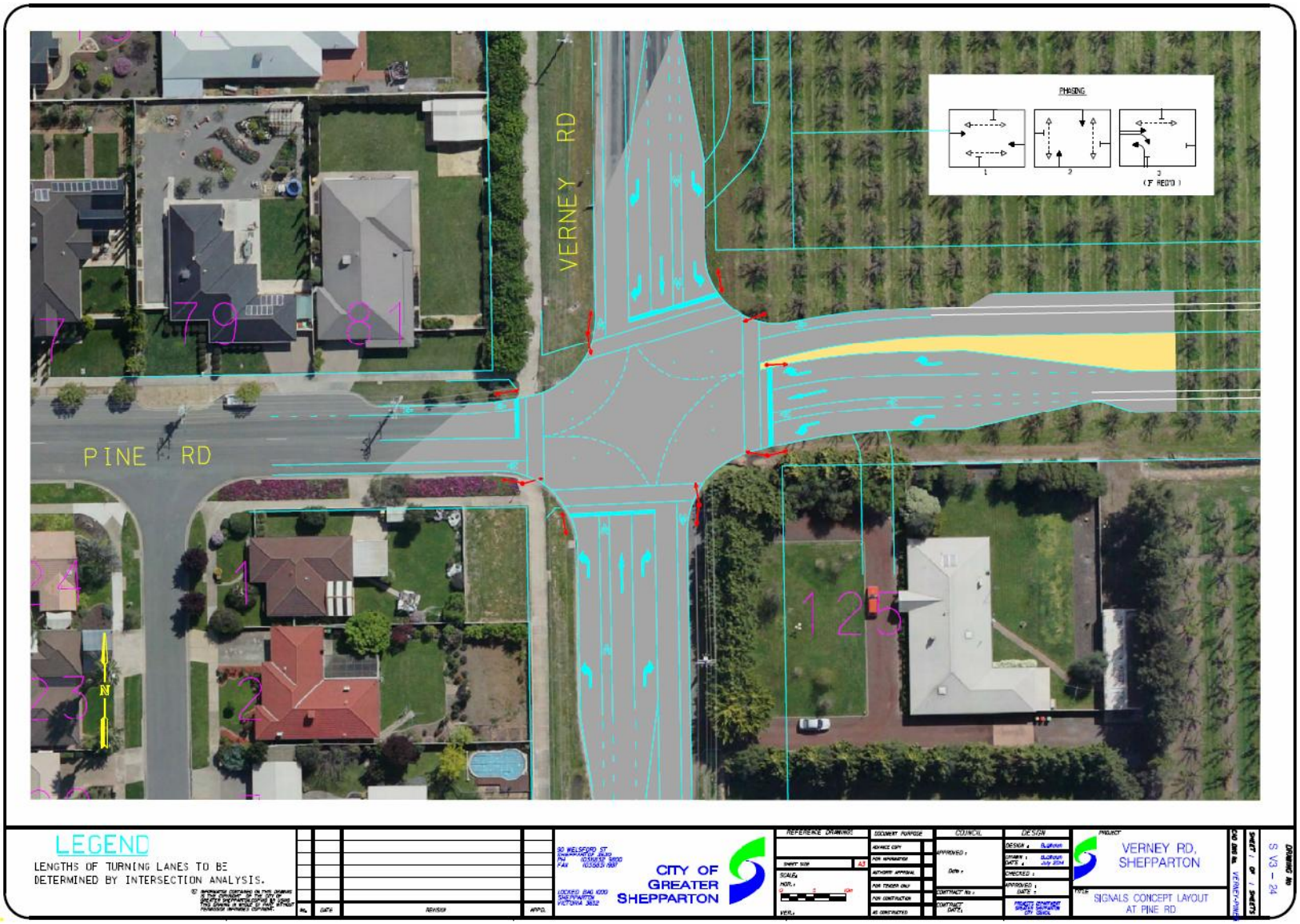


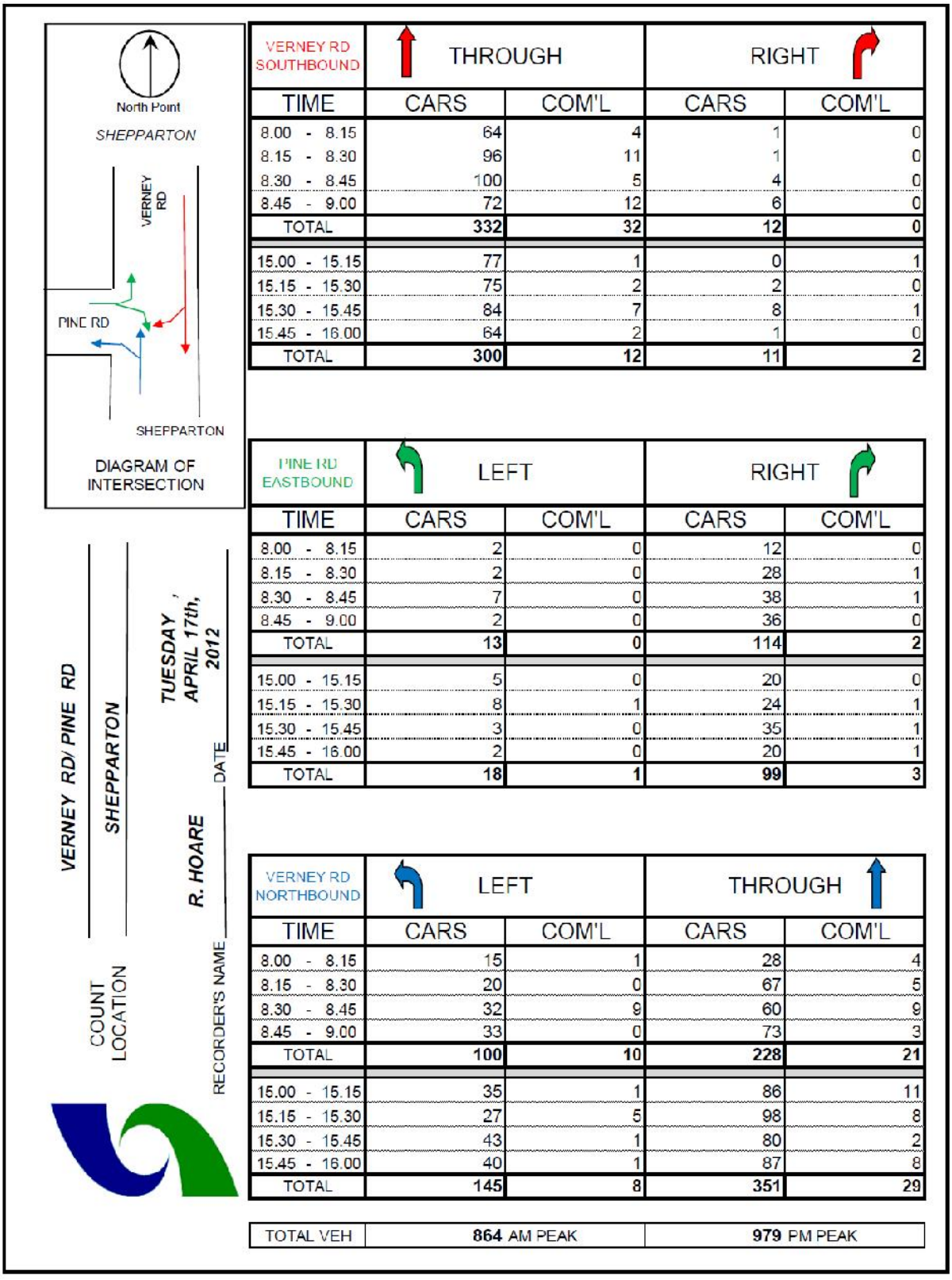
Figure A6: Functional layout for the intersection of Verney Road at Access D

Figure A7: Functional layout for Verney Road upgrades between Balaclava Road and Graham Street (continued in Figure A8).

Figure A8: Functional layout for Verney Road upgrades between Graham Street and Pine Road.

ATTACHMENT B – TRAFFIC COUNTS & CRASH DATA

Figure B1: Turning Movement Count on Verney Road at Pine Road – 17/4/2012



VERNEY RD SOUTHBOUND	THROUGH		RIGHT	
TIME	CARS	COM'L	CARS	COM'L
8.00 - 8.15	64	4	1	0
8.15 - 8.30	96	11	1	0
8.30 - 8.45	100	5	4	0
8.45 - 9.00	72	12	6	0
TOTAL	**332**	**32**	**12**	**0**
15.00 - 15.15	77	1	0	1
15.15 - 15.30	75	2	2	0
15.30 - 15.45	84	7	8	1
15.45 - 16.00	64	2	1	0
TOTAL	**300**	**12**	**11**	**2**

PINE RD EASTBOUND	LEFT		RIGHT	
TIME	CARS	COM'L	CARS	COM'L
8.00 - 8.15	2	0	12	0
8.15 - 8.30	2	0	28	1
8.30 - 8.45	7	0	38	1
8.45 - 9.00	2	0	36	0
TOTAL	**13**	**0**	**114**	**2**
15.00 - 15.15	5	0	20	0
15.15 - 15.30	8	1	24	1
15.30 - 15.45	3	0	35	1
15.45 - 16.00	2	0	20	1
TOTAL	**18**	**1**	**99**	**3**

VERNEY RD NORTHBOUND	LEFT		THROUGH	
TIME	CARS	COM'L	CARS	COM'L
8.00 - 8.15	15	1	28	4
8.15 - 8.30	20	0	67	5
8.30 - 8.45	32	9	60	9
8.45 - 9.00	33	0	73	3
TOTAL	**100**	**10**	**228**	**21**
15.00 - 15.15	35	1	86	11
15.15 - 15.30	27	5	98	8
15.30 - 15.45	43	1	80	2
15.45 - 16.00	40	1	87	8
TOTAL	**145**	**8**	**351**	**29**

TOTAL VEH	**864** AM PEAK	**979** PM PEAK

Road Crash Statistics: Victoria Accident Details

Location is LGA(s): SHEPPARTON; Query: Casualty accidents; Sites: On Ford Rd between Verney Rd and , On Dookie-Shepparton Road (2.176 km) between New Dookie Road / Apollo Drive and Drummond Road, On Dookie-Shepparton Road (2.366 km) between Drummond Road and Mcgill Street, Intersection of Pine Road and Verney Road, Intersection of Dookie-Shepparton Road and Drummond Road, Intersection of Dookie-Shepparton Road and Hawdon Street, Intersection of Graham Street and Verney Road, Intersection of Oak Street and Verney Road, Intersection of Dookie-Shepparton Road and Shepparton Alternative Rout, Intersection of Clarke Court and Verney Road, Intersection of Ford Road and Verney Road, Intersection of Dookie-Shepparton Road and Wheeler Street, Intersection of Crestwood Grove and Verney Road, Intersection of Ann Wood Nook and Ford Road, Intersection of Shepparton Alternative Rout and Ford Road, Intersection of Birch Street and Verney Road, Intersection of Dookie-Shepparton Road and Glenn Street, On Hawkins Street (1.212 km) between Pontiac Avenue and Verney Road, On Grahamvale Road (13.685 km) between Ford Road and Mcgill Street, On Grahamvale Road (13.044 km) between Ford Road and Mcgill Street, On Grahamvale Road (13.184 km) between Ford Road and Mcgill Street, On Verney Road (0.143 km) between Elm Terrace and Birch Street, On Grahamvale Road (13.785 km) between Ford Road and Mcgill Street, On Ford Road (1.724 km) between Ann Wood Nook and Matilda Drive, On Dookie-Shepparton Road (1.394 km) between Glenn Street and Ash Street, On Dookie-Shepparton Road (1.294 km) between Balaclava Road / Verney RoadHawdon Street and Glenn Street, On New Dookie Road (1.618 km) between Dookie-Shepparton Road / Wheeler Street and Dookie-Shepparton Road / Apollo Drive, On Grahamvale Road (12.47 km) between Ford Road and Mcgill Street, On Grahamvale Road (13.715 km) between Ford Road and Mcgill Street, On New Dookie Road (1.895 km) between Dookie-Shepparton Road / Wheeler Street and Dookie-Shepparton Road / Apollo Drive, On ...

ACCIDENT COUNT: 1

Accident No	T20110016048	**Light**	Day	**DCA/Accident**	110 Cross traffic(Intersections only)		**Location**	Ford Road&
Date/Time	1/5/2011 Sun 09:00	**Road**	Dry	**Sub DCA**	Not Required		**(Road Names)**	Verney Road
Severity	Other Injury	**Atmosphere**	Clear	**Sub DCA Code**	NRQ			
Traffic Control	Roundabout	**Total Vehicles**	Total Veh=2		**PERSON INJURY DETAILS**			
Map Refs	VCD ED7 673 R2	**Killed**	0	**Vehicle,DIR.(+DCA arrow)**	**Road User**	**Age**	**Sex**	**Injury Level**
Road Number	141208	**Serious Injury**	0	Unknown, W(2)	Bicyclist	40	M	Injured, needed treatment
KM from Start	1.215 Km , Shepparton	**Other Injury**	1	Unknown, N(1)	Driver	53	F	Not Injured
Speed Zone	80 km/hr	**Not Injury**	1					
Urbanisation	Rural							

ACCIDENT COUNT: 2

Accident No	T20090016381	**Light**	Dark, street lights on	**DCA/Accident**	113 Right near (Intersections only)		**Location**	Pine Road&
Date/Time	1/5/2009 Fri 19:45	**Road**	Dry	**Sub DCA**	Not Required		**(Road Names)**	Verney Road
Severity	Serious Injury	**Atmosphere**	Clear	**Sub DCA Code**	NRQ			
Traffic Control	Giveway sign	**Total Vehicles**	Total Veh=2		**PERSON INJURY DETAILS**			
Map Refs	VCD ED7 673 R4	**Killed**	0	**Vehicle,DIR.(+DCA arrow)**	**Road User**	**Age**	**Sex**	**Injury Level**
Road Number	192941	**Serious Injury**	1	Unknown, E(1)	Driver	41	M	Not Injured
KM from Start	1.309 Km , Shepparton	**Other Injury**	0	Unknown, N(2)	Bicyclist	24	M	Sent to hospital
Speed Zone	60 km/hr	**Not Injury**	1					
Urbanisation	Sml. Prov. City							

ACCIDENT COUNT: 3

Accident No	T20120002105	**Light**	Dusk/dawn	**DCA/Accident**	113 Right near (Intersections only)		**Location**	Oak Street&
Date/Time	28/1/2012 Sat 05:30	**Road**	Dry	**Sub DCA**			**(Road Names)**	Verney Road
Severity	Other Injury	**Atmosphere**	Not known	**Sub DCA Code**				
Traffic Control	Giveway sign	**Total Vehicles**	Total Veh=2		**PERSON INJURY DETAILS**			
Map Refs	VCD ED7 673 R5	**Killed**	0	**Vehicle,DIR.(+DCA arrow)**	**Road User**	**Age**	**Sex**	**Injury Level**
Road Number	186374	**Serious Injury**	0	Unknown, W(1)	Not known		U	Not Injured
KM from Start	0.000 Km , Shepparton	**Other Injury**	1	Unknown, S(2)	Bicyclist	33	M	Injured, needed treatment
Speed Zone	50 km/hr	**Not Injury**	1					
Urbanisation	Sml. Prov. City							

Figure B2: Pages 1 to 4 of Crash Data for NEGC Precinct (July 2008 to June 2013)

Road Crash Statistics: Victoria Accident Details

Location is LGA(s): SHEPPARTON; Query: Casualty accidents; Sites: On Ford Rd between Verney Rd and , On Dookie-Shepparton Road (2.176 km) between New Dookie Road / Apollo Drive and Drummond Road, On Dookie-Shepparton Road (2.366 km) between Drummond Road and Mcgill Street, Intersection of Pine Road and Verney Road, Intersection of Dookie-Shepparton Road and Drummond Road, Intersection of Dookie-Shepparton Road and Hawdon Street, Intersection of Graham Street and Verney Road, Intersection of Oak Street and Verney Road, Intersection of Dookie-Shepparton Road and Shepparton Alternative Rout, Intersection of Clarke Court and Verney Road, Intersection of Ford Road and Verney Road, Intersection of Dookie-Shepparton Road and Wheeler Street, Intersection of Crestwood Grove and Verney Road, Intersection of Ann Wood Nook and Ford Road, Intersection of Shepparton Alternative Rout and Ford Road, Intersection of Birch Street and Verney Road, Intersection of Dookie-Shepparton Road and Glenn Street, On Hawkins Street (1.212 km) between Pontiac Avenue and Verney Road, On Grahamvale Road (13.685 km) between Ford Road and Mcgill Street, On Grahamvale Road (13.044 km) between Ford Road and Mcgill Street, On Grahamvale Road (13.184 km) between Ford Road and Mcgill Street, On Verney Road (0.143 km) between Elm Terrace and Birch Street, On Grahamvale Road (13.785 km) between Ford Road and Mcgill Street, On Ford Road (1.724 km) between Ann Wood Nook and Matilda Drive, On Dookie-Shepparton Road (1.394 km) between Glenn Street and Ash Street, On Dookie-Shepparton Road (1.294 km) between Balaclava Road / Verney RoadHawdon Street and Glenn Street, On New Dookie Road (1.618 km) between Dookie-Shepparton Road / Wheeler Street and Dookie-Shepparton Road / Apollo Drive, On Grahamvale Road (12.47 km) between Ford Road and Mcgill Street, On Grahamvale Road (13.715 km) between Ford Road and Mcgill Street, On New Dookie Road (1.895 km) between Dookie-Shepparton Road / Wheeler Street and Dookie-Shepparton Road / Apollo Drive, On ...

ACCIDENT COUNT: 4

Accident No	T20070046864	**Light**	Dark, street lights on	**DCA/Accident**	174 Out of control on carriageway (on straight)	**Location (Road Names)**	Dookie-Shepparton Road& Hawdon Street
Date/Time	22/12/2007 Sat 03:00	**Road**	Dry				
Severity	Serious Injury	**Atmosphere**	Clear	**Sub DCA**	Not Required		
Traffic Control	Roundabout	**Total Vehicles**	Total Veh=1	**Sub DCA Code**	NRQ		
Map Refs	VCD ED7 673 R6	**Killed**	0				
Road Number	252555	**Serious Injury**	1				
KM from Start	1.233 Km , Shepparton	**Other Injury**	0				
Speed Zone	60 km/hr	**Not Injury**	0				
Urbanisation	Sml. Prov. City						

PERSON INJURY DETAILS

Vehicle,DIR.(→DCA arrow)	Road User	Age	Sex	Injury Level
Unknown, NK(1)	Motor cyclist	33	M	Sent to hospital

ACCIDENT COUNT: 5

Accident No	T20080011671	**Light**	Day	**DCA/Accident**	110 Cross traffic(intersections only)	**Location (Road Names)**	Dookie-Shepparton Road& Hawdon Street
Date/Time	9/3/2008 Sun 12:00	**Road**	Dry	**Sub DCA**	Not Required		
Severity	Other Injury	**Atmosphere**	Not known	**Sub DCA Code**	NRQ		
Traffic Control	Roundabout	**Total Vehicles**	Total Veh=2				
Map Refs	VCD ED7 673 R6	**Killed**	0				
Road Number	252555	**Serious Injury**	0				
KM from Start	1.233 Km , Shepparton	**Other Injury**	2				
Speed Zone	60 km/hr	**Not Injury**	1				
Urbanisation	Sml. Prov. City						

PERSON INJURY DETAILS

Vehicle,DIR.(→DCA arrow)	Road User	Age	Sex	Injury Level
Unknown, S(2)	Driver	37	M	Injured, needed treatment
	Passenger	4	F	Injured, needed treatment
HV-RIGID>4.5T, W(1)	Driver	45	M	Not Injured

ACCIDENT COUNT: 6

Accident No	T20100022426	**Light**	Dark, street lights on	**DCA/Accident**	174 Out of control on carriageway (on straight)	**Location (Road Names)**	Dookie-Shepparton Road& Hawdon Street
Date/Time	7/6/2010 Mon 20:20	**Road**	Dry				
Severity	Serious Injury	**Atmosphere**	Clear	**Sub DCA**	No vehicle mounted/struck		
Traffic Control	Giveway sign	**Total Vehicles**	Total Veh=1	**Sub DCA Code**	V01		
Map Refs	VCD ED7 673 R6	**Killed**	0				
Road Number	252555	**Serious Injury**	1				
KM from Start	1.233 Km , Shepparton	**Other Injury**	0				
Speed Zone	50 km/hr	**Not Injury**	0				
Urbanisation	Sml. Prov. City						

PERSON INJURY DETAILS

Vehicle,DIR.(→DCA arrow)	Road User	Age	Sex	Injury Level
Unknown, S(1)	Motor cyclist	28	M	Sent to hospital

Road Crash Statistics: Victoria Accident Details

Location is LGA(s): SHEPPARTON; Query: Casualty accidents; Sites: On Ford Rd between Verney Rd and , On Dookie-Shepparton Road (2.176 km) between New Dookie Road / Apollo Drive and Drummond Road, On Dookie-Shepparton Road (2.366 km) between Drummond Road and Mcgill Street, Intersection of Pine Road and Verney Road, Intersection of Dookie-Shepparton Road and Drummond Road, Intersection of Dookie-Shepparton Road and Hawdon Street, Intersection of Graham Street and Verney Road, Intersection of Oak Street and Verney Road, Intersection of Dookie-Shepparton Road and Shepparton Alternative Rout, Intersection of Clarke Court and Verney Road, Intersection of Ford Road and Verney Road, Intersection of Dookie-Shepparton Road and Wheeler Street, Intersection of Crestwood Grove and Verney Road, Intersection of Ann Wood Nook and Ford Road, Intersection of Shepparton Alternative Rout and Ford Road, Intersection of Birch Street and Verney Road, Intersection of Dookie-Shepparton Road and Glenn Street, On Hawkins Street (1.212 km) between Pontiac Avenue and Verney Road, On Grahamvale Road (13.685 km) between Ford Road and Mcgill Street, On Grahamvale Road (13.044 km) between Ford Road and Mcgill Street, On Grahamvale Road (13.184 km) between Ford Road and Mcgill Street, On Verney Road (0.143 km) between Elm Terrace and Birch Street, On Grahamvale Road (13.785 km) between Ford Road and Mcgill Street, On Ford Road (1.724 km) between Ann Wood Nook and Matilda Drive, On Dookie-Shepparton Road (1.394 km) between Glenn Street and Ash Street, On Dookie-Shepparton Road (1.294 km) between Balaclava Road / Verney RoadHawdon Street and Glenn Street, On New Dookie Road (1.618 km) between Dookie-Shepparton Road / Wheeler Street and Dookie-Shepparton Road / Apollo Drive, On Grahamvale Road (12.47 km) between Ford Road and Mcgill Street, On Grahamvale Road (13.715 km) between Ford Road and Mcgill Street, On New Dookie Road (1.895 km) between Dookie-Shepparton Road / Wheeler Street and Dookie-Shepparton Road / Apollo Drive, On ...

ACCIDENT COUNT: 7

Accident No	T20110039725	**Light**	Day	**DCA/Accident**	132 Right rear	**Location**	Dookie-Shepparton Road&
Date/Time	17/10/2011 Mon 17:10	**Road**	Unknown	**Sub DCA**	Intersection	**(Road Names)**	Drummond Road
Severity	Other Injury	**Atmosphere**	Not known		Vehicle entering intersection		
Traffic Control	No control	**Total Vehicles**	Total Veh=2	**Sub DCA Code**	N01,A01		
Map Refs	VCD ED7 673 T6	**Killed**	0		**PERSON INJURY DETAILS**		
Road Number	5409	**Serious Injury**	0	**Vehicle,DIR.(→DCA arrow)**	**Road User**	**Age**	**Sex**	**Injury Level**
KM from Start	2.189 Km , Shepparton	**Other Injury**	1	Unknown, E(2)	Driver	23	M	Injured, needed treatment
Speed Zone	60 km/hr	**Not Injury**	1	Unknown, E(1)	Driver	23	F	Not Injured
Urbanisation	Rural							

ACCIDENT COUNT: 8

Accident No	T20080006506	**Light**	Day	**DCA/Accident**	140 U turn	**Location**	On Dookie-Shepparton Road
Date/Time	22/2/2008 Fri 12:35	**Road**	Dry	**Sub DCA**	Hit by veh from same dir as initial dir of U tur	**(Road Names)**	btw Drummond Road
Severity	Serious Injury	**Atmosphere**	Clear	**Sub DCA Code**	P01		& Mcgill Street
Traffic Control	No control	**Total Vehicles**	Total Veh=2				(27 m W of Mcgill)
Map Refs	VCD ED7 673 T6 (T5)	**Killed**	0		**PERSON INJURY DETAILS**		
Road Number	5409	**Serious Injury**	1	**Vehicle,DIR.(→DCA arrow)**	**Road User**	**Age**	**Sex**	**Injury Level**
KM from Start	2.471 Km , Shepparton	**Other Injury**	2	Unknown, E(1)	Passenger	0	F	Sent to hospital
Speed Zone	80 km/hr	**Not Injury**	1		Driver	23	F	Injured, needed treatment
Urbanisation	Rural				Passenger	23	M	Injured, needed treatment
				PM SING TRLR, E(2)	Driver	47	M	Not Injured

ACCIDENT COUNT: 9

Accident No	T20100018653	**Light**	Day	**DCA/Accident**	170 Off carriageway to left	**Location**	Shepparton Alternative Rout&
Date/Time	14/5/2010 Fri 12:30	**Road**	Dry	**Sub DCA**	No vehicle mounted/struck	**(Road Names)**	Ford Road
Severity	Other Injury	**Atmosphere**	Clear	**Sub DCA Code**	V01		
Traffic Control	Giveway sign	**Total Vehicles**	Total Veh=2		**PERSON INJURY DETAILS**		
Map Refs	VCD ED7 673 U2	**Killed**	0	**Vehicle,DIR.(→DCA arrow)**	**Road User**	**Age**	**Sex**	**Injury Level**
Road Number	5982	**Serious Injury**	0	HV-RIGID>4.5T, E(8)	Driver	60	M	Not Injured
KM from Start	14.033 Km , Shepparton	**Other Injury**	2	Unknown, S(1)	Driver	45	M	Injured, needed treatment
Speed Zone	100 km/hr	**Not Injury**	1		Passenger	40	M	Injured, needed treatment
Urbanisation	Rural							

Road Crash Statistics: Victoria Accident Details

Location is LGA(s): SHEPPARTON; Query: Casualty accidents; Sites: On Ford Rd between Verney Rd and , On Dookie-Shepparton Road (2.176 km) between New Dookie Road / Apollo Drive and Drummond Road, On Dookie-Shepparton Road (2.366 km) between Drummond Road and Mcgill Street, Intersection of Pine Road and Verney Road, Intersection of Dookie-Shepparton Road and Drummond Road, Intersection of Dookie-Shepparton Road and Hawdon Street, Intersection of Graham Street and Verney Road, Intersection of Oak Street and Verney Road, Intersection of Dookie-Shepparton Road and Shepparton Alternative Rout, Intersection of Clarke Court and Verney Road, Intersection of Ford Road and Verney Road, Intersection of Dookie-Shepparton Road and Wheeler Street, Intersection of Crestwood Grove and Verney Road, Intersection of Ann Wood Nook and Ford Road, Intersection of Shepparton Alternative Rout and Ford Road, Intersection of Birch Street and Verney Road, Intersection of Dookie-Shepparton Road and Glenn Street, On Hawkins Street (1.212 km) between Pontiac Avenue and Verney Road, On Grahamvale Road (13.685 km) between Ford Road and Mcgill Street, On Grahamvale Road (13.044 km) between Ford Road and Mcgill Street, On Grahamvale Road (13.184 km) between Ford Road and Mcgill Street, On Verney Road (0.143 km) between Elm Terrace and Birch Street, On Grahamvale Road (13.785 km) between Ford Road and Mcgill Street, On Ford Road (1.724 km) between Ann Wood Nook and Matilda Drive, On Dookie-Shepparton Road (1.394 km) between Glenn Street and Ash Street, On Dookie-Shepparton Road (1.294 km) between Balaclava Road / Verney RoadHawdon Street and Glenn Street, On New Dookie Road (1.618 km) between Dookie-Shepparton Road / Wheeler Street and Dookie-Shepparton Road / Apollo Drive, On Grahamvale Road (12.47 km) between Ford Road and Mcgill Street, On Grahamvale Road (13.715 km) between Ford Road and Mcgill Street, On New Dookie Road (1.895 km) between Dookie-Shepparton Road / Wheeler Street and Dookie-Shepparton Road / Apollo Drive, On ...

ACCIDENT COUNT: 10

Accident No	T20080016021	**Light**	Dark, no street lights	**DCA/Accident**	171 Left off carriageway into object/parked vehicle	**Location (Road Names)**	On Dookie-Shepparton Road btw Mcgill Street & Grahamvale Road (84 m E of Mcgill)
Date/Time	3/5/2008 Sat 05:46	**Road**	Dry				
Severity	Serious Injury	**Atmosphere**	Fog	**Sub DCA**	Hit other objects (Telephone/Culvert/RX) Fix		
Traffic Control	No control	**Total Vehicles**	Total Veh=1	**Sub DCA Code**	Q10		
Map Refs	VCD ED7 673 U5	**Killed**	0		**PERSON INJURY DETAILS**		
Road Number	5409	**Serious Injury**	1	**Vehicle,DIR.(+DCA arrow)**	**Road User**	**Age**	**Sex**	**Injury Level**
KM from Start	2.582 Km , Shepparton	**Other Injury**	1	Unknown, W(1)	Passenger	24	M	Sent to hospital
Speed Zone	100 km/hr	**Not Injury**	0		Driver		U	Injured, needed treatment
Urbanisation	Rural							

ACCIDENT COUNT: 11

Accident No	T20110026144	**Light**	Dark, street lights on	**DCA/Accident**	173 Right off carriageway into object/parked vehicle	**Location (Road Names)**	Dookie-Shepparton Road& Shepparton Alternative Rout
Date/Time	21/5/2011 Sat 23:40	**Road**	Dry				
Severity	Other Injury	**Atmosphere**	Clear	**Sub DCA**	Hit Poles (telephone/ electricity)		
Traffic Control	No control	**Total Vehicles**	Total Veh=1		Traffic Island mounted/struck		
Map Refs	VCD ED7 673 U5	**Killed**	0	**Sub DCA Code**	Q01,V03		
Road Number	5409	**Serious Injury**	0		**PERSON INJURY DETAILS**		
KM from Start	2.745 Km , Shepparton	**Other Injury**	2	**Vehicle,DIR.(+DCA arrow)**	**Road User**	**Age**	**Sex**	**Injury Level**
Speed Zone	80 km/hr	**Not Injury**	1	Unknown, S(1)	Driver	17	M	Injured, needed treatment
Urbanisation	Rural				Passenger	18	M	Injured, needed treatment
					Passenger	18	M	Not Injured

ACCIDENT COUNT: 12

Accident No	T20090006557	**Light**	Day	**DCA/Accident**	181 Off right bend into object/parked vehicle	**Location (Road Names)**	On Grahamvale Road btw Ford Road & Mcgill Street (466 m N of Mcgill)
Date/Time	23/2/2009 Mon 11:20	**Road**	Dry				
Severity	Other Injury	**Atmosphere**	Clear	**Sub DCA**	Hit Guard rail		
Traffic Control	No control	**Total Vehicles**	Total Veh=1		No vehicle mounted/struck		
Map Refs	VCD ED7 673 U5 (U4)	**Killed**	0		Leaves carriageway to left		
Road Number	5982	**Serious Injury**	0	**Sub DCA Code**	Q07,V01,W01		
KM from Start	12.761 Km , Shepparton	**Other Injury**	1		**PERSON INJURY DETAILS**		
Speed Zone	80 km/hr	**Not Injury**	0	**Vehicle,DIR.(+DCA arrow)**	**Road User**	**Age**	**Sex**	**Injury Level**
Urbanisation	Rural			PM B-DOUBLE, N(1)	Driver	28	M	Injured, needed treatment

ATTACHMENT C – DESIGN STANDARD REFERENCES

Figure C1: Table 2 from Council's Infrastructure Design Manual

INFRASTRUCTURE DESIGN MANUAL

TABLE 2 - URBAN ROAD / STREET CHARACTERISTICS

Street Type	Indicative Maximum Traffic Volume	Carriageway Width	Minimum Reserve Width See Note 5 & 6	Minimum Verge Width	Parking Provision within Carriageway	Pedestrian / Cycle Provision within Road Reserve	Kerbing
Access Lane (second road frontage)	300 veh/day	5.5m	As determined by turning movements		Yes one side	No footpath	Nil if concrete road with central drain or SM2 or modified SM2 See note 3
Access Place	300 veh/day max. (maximum length 100m)	6.0m	14.0m	3.5m See Note 2	Yes (one side)	Footpath both sides No separate cycle provision	B2,SM2 or modified SM2 See note 3
Access Street	1000 veh/day max	7.5m	16.0m	3.5m See Note 2	Yes (both sides)	Footpath both sides No separate cycle provision	B2, SM2 or modified SM2 See note 3
Collector/Connector Street Level 1	3000 veh/day max	11.0m	24.0m	6.0m	Yes (both sides)	Shared path both sides	Barrier B2 Kerb outstands or splitters required at intersections and pedestrian crossing points
Collector/Connector Street Level 2 (alternatively called trunk collector)	6000 veh/day max	2 x 7.0m + 5.0m median	34.0m	6.0m	Yes (both sides)	Footpath both sides Shared path both sides	Barrier B2
Residential Court Bowl	n/a	10.0m radius	28.0m	3.5m See Note 2	n/a	Footpath both sides No separate cycle provision	SM2 or modified SM2 See note 3
Commercial Street	n/a	22.0m	32.0m	5.0m	Yes (both sides)	Footpath both sides Cycle provision where directed	Barrier B2
Industrial Street	n/a	12.5m See Note 1 below	25.0m	6.0m See Note 4	Yes (both sides)	Yes	Barrier B2
Industrial Court Bowl	n/a	15.0m radius	37.0m	3.5m	n/a	n/a	Barrier B2

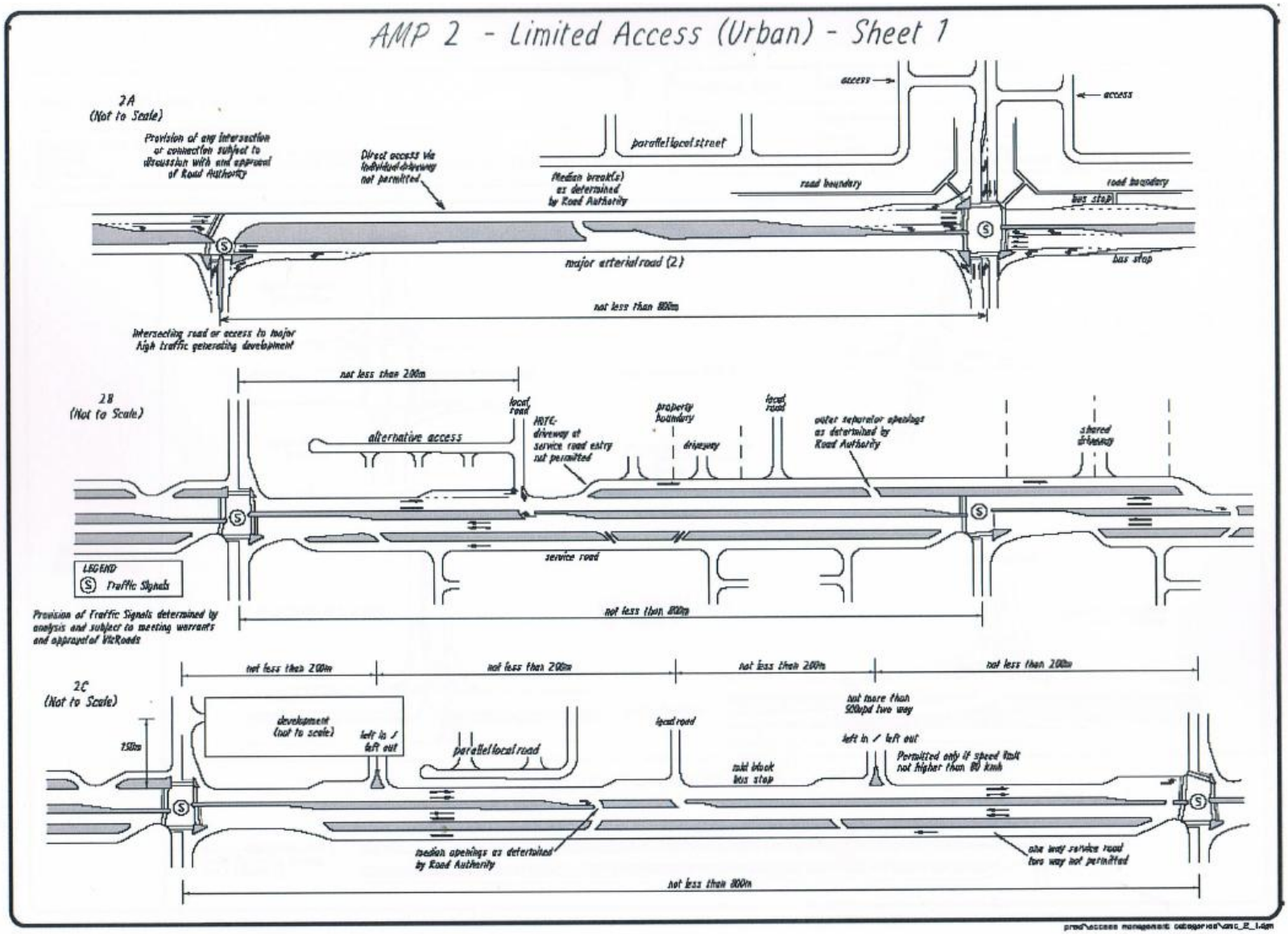


Figure C2: AMP 2 – Sheet 1 (source – VicRoads draft Access Management Policies May 2006)

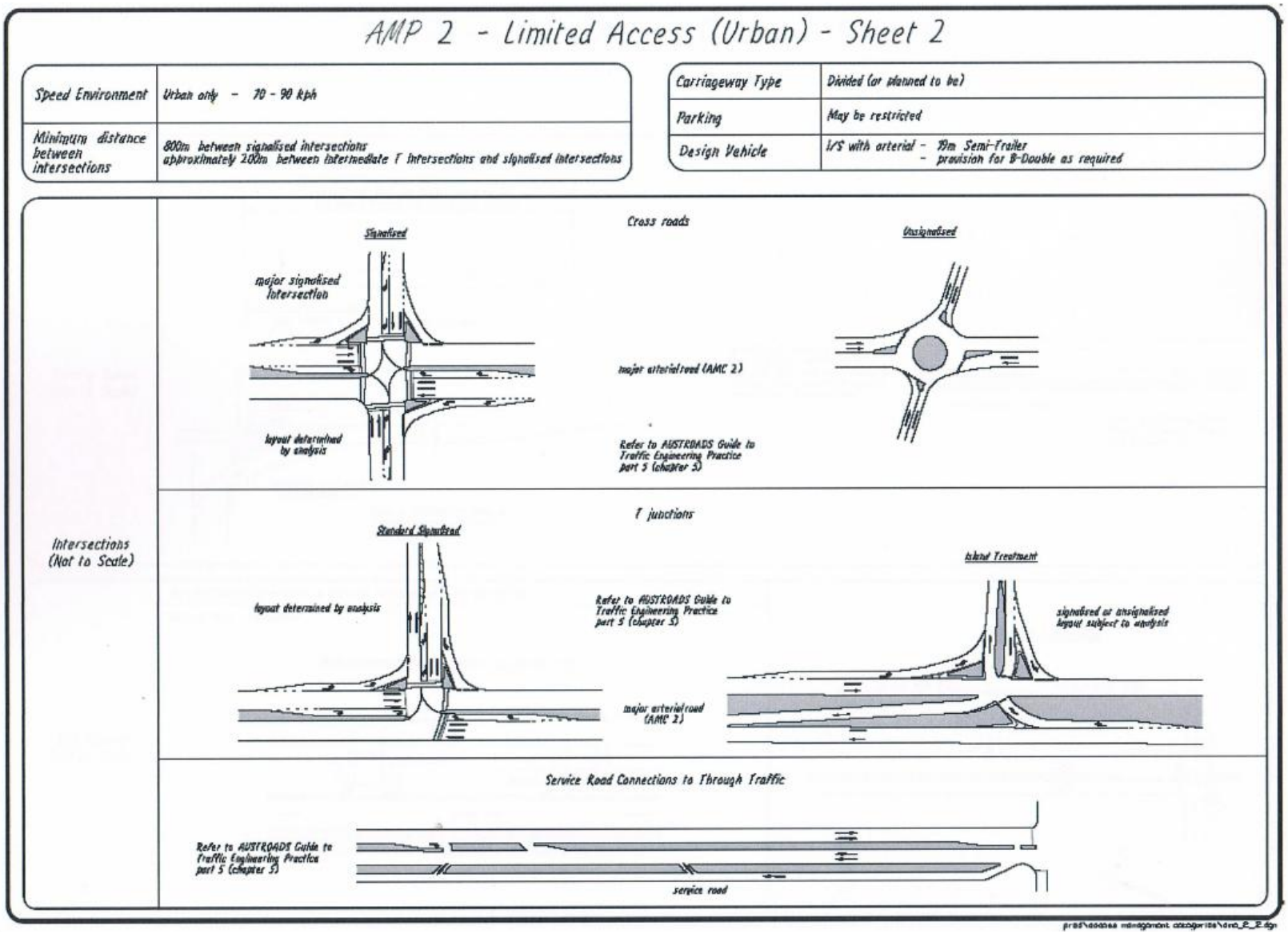


Figure C3: AMP 2 – Sheet 2 (source – VicRoads draft *Access Management Policies* May 2006)

ATTACHMENT D – SIDRA MOVEMENT SUMMARIES

MOVEMENT SUMMARY

Site: Verney at Access A PM

Verney Rd at Access A
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Verney Rd											
2	T	315	2.0	0.164	0.0	LOS A	0.0	0.0	0.00	0.00	70.0
3	R	407	2.0	0.395	12.3	LOS B	2.3	16.7	0.51	0.80	51.0
Approach		722	2.0	0.395	6.9	NA	2.3	16.7	0.29	0.45	57.9
East: Internal Road											
4	L	524	2.0	0.599	10.8	LOS B	5.4	38.6	0.60	0.91	39.7
6	R	105	2.0	0.673	48.6	LOS E	3.3	23.4	0.94	1.18	23.0
Approach		629	2.0	0.673	17.2	LOS C	5.4	38.6	0.66	0.95	35.4
North: Verney Road											
7	L	81	2.0	0.044	9.9	LOS A	0.0	0.0	0.00	0.71	53.9
8	T	258	2.0	0.134	0.0	LOS A	0.0	0.0	0.00	0.00	70.0
Approach		339	2.0	0.134	2.4	NA	0.0	0.0	0.00	0.17	65.4
All Vehicles		1691	2.0	0.673	9.8	NA	5.4	38.6	0.37	0.58	48.4

MOVEMENT SUMMARY

Site: Verney at Hawkins PM

Verney Road at Hawkins Street
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Verney Road											
1	L	146	2.0	0.080	9.9	LOS A	0.0	0.0	0.00	0.71	53.9
2	T	213	2.0	0.110	0.0	LOS A	0.0	0.0	0.00	0.00	70.0
Approach		359	2.0	0.110	4.0	NA	0.0	0.0	0.00	0.29	62.5
North: Verney Road											
8	T	320	2.0	0.166	0.0	LOS A	0.0	0.0	0.00	0.00	70.0
9	R	377	2.0	0.373	12.3	LOS B	2.1	14.9	0.52	0.80	51.0
Approach		697	2.0	0.373	6.6	NA	2.1	14.9	0.28	0.43	58.3
West: Hawkins Street											
10	L	294	2.0	0.331	8.5	LOS A	1.5	10.8	0.45	0.71	41.6
12	R	114	2.0	0.673	45.6	LOS E	3.4	24.1	0.93	1.19	23.8
Approach		407	2.0	0.673	18.8	LOS C	3.4	24.1	0.59	0.84	34.4
All Vehicles		1463	2.0	0.673	9.4	NA	3.4	24.1	0.30	0.51	50.2

MOVEMENT SUMMARY

Site: Ford at Access B PM

Ford Road at Access B
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Access B											
1	L	3	2.0	0.193	13.0	LOS B	0.8	5.5	0.55	0.69	44.1
3	R	95	2.0	0.193	13.2	LOS B	0.8	5.5	0.55	0.82	44.0
Approach		98	2.0	0.193	13.2	LOS B	0.8	5.5	0.55	0.82	44.0
East: Ford Road											
4	L	74	2.0	0.040	8.3	LOS A	0.0	0.0	0.00	0.67	49.0
5	T	197	2.0	0.102	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		271	2.0	0.102	2.2	NA	0.0	0.0	0.00	0.18	56.5
West: Ford Road											
11	T	155	2.0	0.082	1.2	LOS A	0.6	4.1	0.41	0.00	52.8
12	R	2	2.0	0.082	9.6	LOS A	0.6	4.1	0.41	0.97	49.2
Approach		157	2.0	0.082	1.3	NA	0.6	4.1	0.41	0.01	52.7
All Vehicles		525	2.0	0.193	4.0	NA	0.8	5.5	0.22	0.25	52.6

MOVEMENT SUMMARY

Site: Grahamvale at Access C Rbt

Grahamvale Road at Access C - Roundabout option
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Grahamvale Road											
1	L	1349	2.0	0.797	10.2	LOS B	13.1	93.2	0.26	0.56	58.4
2	T	285	2.0	0.261	9.2	LOS A	1.4	9.7	0.13	0.56	60.7
Approach		1635	2.0	0.797	10.0	LOS B	13.1	93.2	0.24	0.56	58.8
North: Grahamvale Road											
8	T	255	2.0	0.287	10.6	LOS B	1.3	9.4	0.47	0.70	57.6
9	R	22	2.0	0.287	16.4	LOS B	1.3	9.4	0.47	0.88	53.8
Approach		277	2.0	0.287	11.1	LOS B	1.3	9.4	0.47	0.71	57.3
West: Access C											
10	L	26	2.0	0.163	5.7	LOS A	0.7	5.3	0.38	0.52	42.9
12	R	355	2.0	0.163	10.0	LOS B	0.7	5.3	0.38	0.67	40.4
Approach		381	2.0	0.163	9.7	LOS A	0.7	5.3	0.38	0.66	40.5
All Vehicles		2293	2.0	0.797	10.1	LOS B	13.1	93.2	0.29	0.60	54.9

MOVEMENT SUMMARY

Site: Grahamvale at Access C
Sig - 90:10

Grahamvale Road at Access C - Signals option
Signals - Fixed Time Cycle Time = 40 seconds (Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Grahamvale Road											
1	L	297	2.0	0.432	18.7	LOS B	4.5	32.0	0.79	0.80	39.6
2	T	285	2.0	0.395	10.2	LOS B	4.2	30.2	0.78	0.65	44.2
Approach		582	2.0	0.432	14.6	LOS B	4.5	32.0	0.78	0.73	41.8
North: Grahamvale Road											
8	T	255	2.0	0.353	10.0	LOS B	3.7	26.4	0.76	0.63	44.4
9	R	22	2.0	0.090	20.6	LOS C	0.3	2.4	0.76	0.71	38.3
Approach		277	2.0	0.353	10.9	LOS B	3.7	26.4	0.76	0.64	43.9
West: Access C											
10	L	26	2.0	0.320	19.7	LOS B	2.9	20.8	0.79	0.78	38.8
12	R	355	2.0	0.320	19.8	LOS B	2.9	20.8	0.79	0.79	38.8
Approach		381	2.0	0.320	19.8	LOS B	2.9	20.8	0.79	0.79	38.8
All Vehicles		1240	2.0	0.432	15.3	LOS B	4.5	32.0	0.78	0.73	41.2

MOVEMENT SUMMARY

Site: Grahamvale at Access C
Sig - 80:20

Grahamvale Road at Access C - Signals option
Signals - Fixed Time Cycle Time = 40 seconds (Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Grahamvale Road											
1	L	320	2.0	0.466	18.9	LOS B	4.9	35.1	0.80	0.81	39.5
2	T	285	2.0	0.395	10.2	LOS B	4.2	30.2	0.78	0.65	44.2
Approach		605	2.0	0.466	14.8	LOS B	4.9	35.1	0.79	0.73	41.6
North: Grahamvale Road											
8	T	255	2.0	0.353	10.0	LOS B	3.7	26.4	0.76	0.63	44.4
9	R	24	2.0	0.101	21.5	LOS C	0.4	2.7	0.79	0.71	37.7
Approach		279	2.0	0.353	11.0	LOS B	3.7	26.4	0.76	0.64	43.8
West: Access C											
10	L	26	2.0	0.322	19.7	LOS B	2.9	21.0	0.79	0.78	38.8
12	R	357	2.0	0.322	19.8	LOS B	2.9	21.0	0.79	0.79	38.8
Approach		383	2.0	0.322	19.8	LOS B	2.9	21.0	0.79	0.79	38.8
All Vehicles		1267	2.0	0.466	15.5	LOS B	4.9	35.1	0.79	0.73	41.2

MOVEMENT SUMMARY

Site: Verney & Pine at Access D PM

Verney Road at Pine Road & Access D
Signals - Fixed Time Cycle Time = 50 seconds (Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Verney Road											
1	L	161	2.0	0.328	22.3	LOS C	3.0	21.5	0.79	0.78	37.2
2	T	400	2.0	0.649	16.6	LOS B	8.8	62.8	0.91	0.80	38.8
3	R	84	2.0	0.302	28.0	LOS C	1.9	13.3	0.89	0.77	33.8
Approach		645	2.0	0.649	19.5	LOS B	8.8	62.8	0.88	0.79	37.7
East: Access "D"											
4	L	95	2.0	0.468	19.1	LOS B	6.9	49.0	0.75	0.88	41.1
5	T	297	2.0	0.468	10.9	LOS B	6.9	49.0	0.75	0.65	43.0
6	R	1	2.0	0.002	19.9	LOS B	0.0	0.1	0.67	0.63	38.7
Approach		393	2.0	0.468	12.9	LOS B	6.9	49.0	0.75	0.70	42.5
North: Verney Road											
7	L	1	2.0	0.002	20.5	LOS C	0.0	0.1	0.69	0.62	38.3
8	T	328	2.0	0.533	15.5	LOS B	6.8	48.4	0.87	0.73	39.7
9	R	14	2.0	0.062	28.8	LOS C	0.3	2.1	0.87	0.70	33.5
Approach		343	2.0	0.533	16.1	LOS B	6.8	48.4	0.87	0.73	39.4
West: Pine Road											
10	L	20	2.0	0.051	16.8	LOS B	0.3	2.0	0.59	0.69	41.1
11	T	263	2.0	0.627	14.3	LOS B	7.7	55.0	0.87	0.75	39.7
12	R	107	2.0	0.627	22.6	LOS C	7.7	55.0	0.87	0.88	38.7
Approach		391	2.0	0.627	16.7	LOS B	7.7	55.0	0.85	0.78	39.5
All Vehicles		1772	2.0	0.649	16.8	LOS B	8.8	62.8	0.84	0.76	39.4

MOVEMENT SUMMARY

Site: Verney & Pine at Access D GW

Verney Road at Pine Road & Access "D"
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: RoadName											
1	L	161	2.0	0.088	8.3	LOS A	0.0	0.0	0.00	0.67	49.0
2	T	400	2.0	0.208	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
3	R	84	2.0	0.081	9.8	LOS A	0.3	2.3	0.40	0.69	47.1
Approach		645	2.0	0.208	3.3	NA	0.3	2.3	0.05	0.26	55.0
East: Access "D"											
4	L	95	2.0	1.509	501.0	LOS F	92.6	659.4	1.00	7.00	4.1
5	T	297	2.0	1.509	499.8	LOS F	92.6	659.4	1.00	4.88	4.1
6	R	1	2.0	0.008	33.7	LOS D	0.0	0.2	0.86	0.91	31.1
Approach		393	2.0	1.509	498.8	LOS F	92.6	659.4	1.00	5.38	4.1
North: Verney Road											
7	L	1	2.0	0.001	8.2	LOS A	0.0	0.0	0.00	0.67	49.0
8	T	328	2.0	0.171	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
9	R	14	2.0	0.017	11.0	LOS B	0.1	0.4	0.50	0.71	46.1
Approach		343	2.0	0.171	0.5	NA	0.1	0.4	0.02	0.03	59.3
West: Pine Road											
10	L	20	2.0	0.028	11.0	LOS B	0.1	0.7	0.47	0.72	46.1
11	T	263	2.0	2.318	1233.9	LOS F	141.3	1006.1	1.00	5.97	1.7
12	R	107	2.0	2.318	1235.1	LOS F	141.3	1006.1	1.00	5.30	1.7
Approach		391	2.0	2.318	1171.6	LOS F	141.3	1006.1	0.97	5.52	1.8
All Vehicles		1772	2.0	2.318	370.1	NA	141.3	1006.1	0.46	2.51	5.4

ATTACHMENT E – TRAFFIC ESTIMATES

Figure E1: Traffic Generation Estimates (based on 90%/10% split in AM)

Precinct	Area (ha)	Lots @ 11/ha	Peak Traffic @ 0.8vph/lot (vph)	Distribution Split	Distribution Access Point Direction	Distribution Access Point vph	Prescinct Totals (vph)	Orientation AM IN (10%)	Orientation AM OUT (90%)	Orientation PM IN (70%)	Orientation PM OUT (30%)
Stage 1: only precincts 6 & 7 and community hub developed with all traffic via access A											
6	18.16	200	160	100%	A (west)	160					
7	8.626	95	76	100%	A (west)	76					
Comm. Hub	1350m²		169	10%	A (west)	17	253	25	227	177	76
Stage 2: preceincts 6, 7 & 1 and community hub developed with traffic split between access A & B											
6	18.16	200	160	92%	A (west)	147					
7	8.626	95	76	92%	A (west)	70					
Comm. Hub	1350m²		169	10%	A (west)	17					
1	23.04	253	203	92%	A (west)	187	420	42	378	294	126
6	18.16	200	160	8%	B (north)	13					
7	8.626	95	76	8%	B (north)	6					
1	23.04	253	203	8%	B (north)	16	35	4	32	25	11
			438	100%			455				
Stage 3: precincts 6, 7, 1, 2, 3, 4 & 5 developed and school included, traffic split between access A, B & C											
6	18.16	200	160	63%	A (west)	101					
7	8.626	95	76	63%	A (west)	48					
Comm. Hub	1350m²		169	10%	A (west)	17					
1	23.04	253	203	63%	A (west)	128					
2	25.04	275	220	63%	A (west)	139					
3	17.01	187	150	63%	A (west)	94					
4	13.67	150	120	63%	A (west)	76					
5	11.11	122	98	63%	A (west)	62	664	66	597	465	199
6	18.16	200	160	8%	B (north)	13					
7	8.626	95	76	8%	B (north)	6					
1	23.04	253	203	8%	B (north)	16					
2	25.04	275	220	8%	B (north)	18					
3	17.01	187	150	8%	B (north)	12					
4	13.67	150	120	8%	B (north)	10					
5	11.11	122	98	8%	B (north)	8	82	8	74	57	25
6	18.16	200	160	29%	C (east)	46					
7	8.626	95	76	29%	C (east)	22					
1	23.04	253	203	29%	C (east)	59					
2	25.04	275	220	29%	C (east)	64					
Grahamvale School	600 students + 35 staff		635	37%	C (east)	235					
3	17.01	187	150	29%	C (east)	43					
4	13.67	150	120	29%	C (east)	35					
5	11.11	122	98	29%	C (east)	28	533	171	362	302	230
			1242	100%			1278				
Stage 4: all precincts, hub and school fully developed with traffic split between access A, B, C & D											
6	18.16	200	160	30%	A (west)	48					
7	8.626	95	76	30%	A (west)	23					
Comm. Hub	1350m²		169	10%	A (west)	17					
1	23.04	253	203	30%	A (west)	61					
2	25.04	275	220	30%	A (west)	66					
3	17.01	187	150	30%	A (west)	45					
4	13.67	150	120	30%	A (west)	36					
5	11.11	122	98	30%	A (west)	29					
9	18.23	201	160	30%	A (west)	48					
10	12.22	134	108	30%	A (west)	32	405	41	365	284	122
6	18.16	200	160	8%	B (north)	13					
7	8.626	95	76	8%	B (north)	6					
1	23.04	253	203	8%	B (north)	16					
2	25.04	275	220	8%	B (north)	18					
3	17.01	187	150	8%	B (north)	12					
4	13.67	150	120	8%	B (north)	10					
5	11.11	122	98	8%	B (north)	8					
9	18.23	201	160	8%	B (north)	13					
10	12.22	134	108	8%	B (north)	9	104	10	93	72	31
6	18.16	200	160	29%	C (east)	46					
7	8.626	95	76	29%	C (east)	22					
1	23.04	253	203	29%	C (east)	59					
2	25.04	275	220	29%	C (east)	64					
Grahamvale School	600 students + 35 staff		635	32%	C (east)	203					
3	17.01	187	150	29%	C (east)	43					
4	13.67	150	120	29%	C (east)	35					
5	11.11	122	98	29%	C (east)	28					
9	18.23	201	160	29%	C (east)	47					
10	12.22	134	108	29%	C (east)	31	579	133	402	327	209
6	18.16	200	160	33%	D (west)	53					
7	8.626	95	76	33%	D (west)	25					
1	23.04	253	203	33%	D (west)	67					
2	25.04	275	220	33%	D (west)	73					
Grahamvale School	600 students + 35 staff		635	5%	D (west)	32					
3	17.01	187	150	33%	D (west)	49					
4	13.67	150	120	33%	D (west)	40					
5	11.11	122	98	33%	D (west)	32					
9	18.23	201	160	33%	D (west)	53					
10	12.22	134	108	33%	D (west)	35	459	88	415	329	174
			1510	100%			1546				

AM orientation split

IN 10% OUT 90%

Stage 1 Internal Traffic Volumes

	vph	vpd	Road Class
Access A	253	2526	Collector Level 1

Peak Turn Movements at each Access

	Dir	Split	Dir	Split
	IN	5/25	OUT	5/25
Access A	294	49 N	378	63 N
		245 S		315 S
Hawkins	from	177 W	to	227 W
		69 S		88 S

Peak Through Traffic

Verney Road (2008 x 1.2)

AM	PM
202 NB	299 NB
304 SB	245 SB
505 Σ	544 Σ

Indicative Turn Treatment

At Access A

Q_L	Q_R	Q_{T1}	Q_{T2}	Q_M	Treatment
63	315	245	299	607	CHR & AUL(S)

At Hawkins Street

Q_L	Q_R	Q_{T1}	Q_{T2}	Q_M	Treatment
0	177	304	202	505	CHR

Stage 2 Internal Traffic Volumes

	vph	vpd	Road Class
Access A	420	4203	Trunk Collector
Access B	35	351	Access Street

Peak Turn Movements at each Access

	Dir	Split	Dir	Split
	IN	5/25	OUT	5/25
Access A	465	77 N	597	100 N
		387 S		498 S
Hawkins	from	279 W	to	358 W
		108 S		139 S

Peak Through Traffic

Verney Road (2008 x 1.2)

AM	PM
202 NB	299 NB
304 SB	245 SB
505 Σ	544 Σ

Indicative Turn Treatment

At Access A

Q_L	Q_R	Q_{T1}	Q_{T2}	Q_M	Treatment
100	498	245	299	643	CHR & AUL(S)

At Hawkins Street

Q_L	Q_R	Q_{T1}	Q_{T2}	Q_M	Treatment
139	279	304	202	645	CHR & AUL(S)

Stage 3 Internal Traffic Volumes

	vph	vpd	Road Class
Access A	664	6636	Trunk Collector
Access B	82	821	Access Street
Access C	533	5327	Trunk Collector

Peak Turn Movements at each Access

	Dir	Split	Dir	Split
	IN	2/27	OUT	2/27
Access C	171	12 N	362	25 N
AM		159 S		337 S
PM	302	21 N	230	16 N
		282 S		214 S

Peak Through Traffic

Grahamvale Road (2003 x 1.2)

AM	PM
226 NB	271 NB
269 SB	242 SB
494 Σ	514 Σ

Indicative Turn Treatment

Q_L	Q_R	Q_{T1}	Q_{T2}	Q_M	Treatment
159	12	242	271	673	CHR & AUL

Stage 4 Internal Traffic Volumes

	vph	vpd	Road Class
Access A	405	4052	Trunk Collector
Access B	104	1036	Collector Level 1
Access C	579	5786	Trunk Collector
Access D	459	4589	Trunk Collector
		15464	

Peak Turn Movements at each Access

	Dir	Split	Dir	Split
	IN	100%	OUT	100%
Access B				
AM	10	10 E	93	93 E
PM	72	72 E	31	31 E

Peak Through Traffic

Ford Road (2010 x 1.16)

AM	PM
242 EB	147 EB
172 WB	187 WB
414 Σ	334 Σ

Indicative Turn Treatment

Q_L	Q_R	Q_{T1}	Q_{T2}	Q_M	Treatment
70	2	147	187	187	AUL(S)

Peak Turn Movements at each Access

	Dir	Split	Dir	Split
	IN	2/27	OUT	2/27
Access C				
AM	133	9 N	402	28 N
		124 S		374 S
PM	327	23 N	209	14 N
		304 S		194 S

Grahamvale Road (2003 x 1.2)

AM	PM
226 NB	271 NB
269 SB	242 SB
494 Σ	514 Σ

Q_L	Q_R	Q_{T1}	Q_{T2}	Q_M	Treatment
124	9	242	271	638	CHR & AUL

Peak Turn Movements at each Access

	Dir	Split	Dir	Split
	IN	8/25	OUT	8/25
Access D				
AM	88	21 S	415	101 S
		67 W		314 W
		0 N		0 N
PM	329	80 S	174	42 S
		250 W		132 W
		0 N		0 N

Verney Road (2008 x 1.2)

AM	PM
202 NB	299 NB
304 SB	245 SB
505 Σ	544 Σ

Q_L	Q_R	Q_{T1}	Q_{T2}	Q_M	Treatment
132	0	299	245	675	CHR

Figure E2: Traffic Generation Estimates (based on 80%/20% split in AM)

Precinct	Area (ha)	Lots @ 11/ha	Peak Traffic @ 0.8vph/lot (vph)	Distribution Split	Distribution Access Point Direction	Distribution Access Point vph	Prescinct Totals (vph)	Orientation AM IN (20%)	Orientation AM OUT (80%)	Orientation PM IN (70%)	Orientation PM OUT (30%)
Stage 1: only precincts 6 & 7 and community hub developed with all traffic via access A											
6	18.16	200	160	100%	A (west)	160					
7	8.626	95	76	100%	A (west)	76					
Comm. Hub	1350m²		169	10%	A (west)	17	253	51	202	177	76
		295	404								
Stage 2: precincts 6, 7 & 1 and community hub developed with traffic split between access A & B											
6	18.16	200	160	92%	A (west)	147					
7	8.626	95	76	92%	A (west)	70					
Comm. Hub	1350m²		169	10%	A (west)	17					
1	23.04	253	203	92%	A (west)	187	420	84	336	294	126
6	18.16	200	160	8%	B (north)	13					
7	8.626	95	76	8%	B (north)	6					
1	23.04	253	203	8%	B (north)	16	35	7	28	25	11
		548	438	100%			455				
Stage 3: precincts 6, 7, 1, 2, 3, 4 & 5 developed and school included, traffic split between access A, B & C											
6	18.16	200	160	63%	A (west)	101					
7	8.626	95	76	63%	A (west)	48					
Comm. Hub	1350m²		169	10%	A (west)	17					
1	23.04	253	203	63%	A (west)	128					
2	25.04	275	220	63%	A (west)	139					
3	17.01	187	150	63%	A (west)	94					
4	13.67	150	120	63%	A (west)	76					
5	11.11	122	98	63%	A (west)	62	664	133	531	465	199
6	18.16	200	160	8%	B (north)	13					
7	8.626	95	76	8%	B (north)	6					
1	23.04	253	203	8%	B (north)	16					
2	25.04	275	220	8%	B (north)	18					
3	17.01	187	150	8%	B (north)	12					
4	13.67	150	120	8%	B (north)	10					
5	11.11	122	98	8%	B (north)	8	82	16	66	57	25
6	18.16	200	160	29%	C (east)	46					
7	8.626	95	76	29%	C (east)	22					
1	23.04	253	203	29%	C (east)	59					
2	25.04	275	220	29%	C (east)	64					
Grahamvale School	600 students + 35 staff		635	37%	C (east)	235					
3	17.01	187	150	29%	C (east)	43					
4	13.67	150	120	29%	C (east)	35					
5	11.11	122	98	29%	C (east)	28	533	201	332	302	230
		1283	1242	100%			1278				
Stage 4: all precincts, hub and school fully developed with traffic split between access A, B, C & D											
6	18.16	200	160	30%	A (west)	48					
7	8.626	95	76	30%	A (west)	23					
Comm. Hub	1350m²		169	10%	A (west)	17					
1	23.04	253	203	30%	A (west)	61					
2	25.04	275	220	30%	A (west)	66					
3	17.01	187	150	30%	A (west)	45					
4	13.67	150	120	30%	A (west)	36					
5	11.11	122	98	30%	A (west)	29					
9	18.23	201	160	30%	A (west)	48					
10	12.22	134	108	30%	A (west)	32	405	81	324	284	122
6	18.16	200	160	8%	B (north)	13					
7	8.626	95	76	8%	B (north)	6					
1	23.04	253	203	8%	B (north)	16					
2	25.04	275	220	8%	B (north)	18					
3	17.01	187	150	8%	B (north)	12					
4	13.67	150	120	8%	B (north)	10					
5	11.11	122	98	8%	B (north)	8					
9	18.23	201	160	8%	B (north)	13					
10	12.22	134	108	8%	B (north)	9	104	21	83	72	31
6	18.16	200	160	29%	C (east)	46					
7	8.626	95	76	29%	C (east)	22					
1	23.04	253	203	29%	C (east)	59					
2	25.04	275	220	29%	C (east)	64					
Grahamvale School	600 students + 35 staff		635	32%	C (east)	203					
3	17.01	187	150	29%	C (east)	43					
4	13.67	150	120	29%	C (east)	35					
5	11.11	122	98	29%	C (east)	28					
9	18.23	201	160	29%	C (east)	47					
10	12.22	134	108	29%	C (east)	31	579	171	364	327	209
6	18.16	200	160	33%	D (west)	53					
7	8.626	95	76	33%	D (west)	25					
1	23.04	253	203	33%	D (west)	67					
2	25.04	275	220	33%	D (west)	73					
Grahamvale School	600 students + 35 staff		635	5%	D (west)	32					
3	17.01	187	150	33%	D (west)	49					
4	13.67	150	120	33%	D (west)	40					
5	11.11	122	98	33%	D (west)	32					
9	18.23	201	160	33%	D (west)	53					
10	12.22	134	108	33%	D (west)	35	459	131	372	329	174
		1618	1510	100%			1546				

AM orientation split

IN 20% OUT 80%

Stage 1 Internal Traffic Volumes

	vph	vpd	Road Class
Access A	253	2526	Collector Level 1

Peak Turn Movements at each Access

		Dir	Split	Dir	Split
		IN	5/25	OUT	5/25
Access A	294	49	N	336	56 N
		245	S		280 S
Hawkins	from	177	W	to	202 W
		69	S		78 S

Peak Through Traffic

Verney Road (2008 x 1.2)

AM		PM	
202	NB	299	NB
304	SB	245	SB
505	Σ	544	Σ

Indicative Turn Treatment

At Access A

Q_L	Q_R	Q_{T1}	Q_{T2}	Q_M	Treatment
56	280	245	299	600	CHR & AUL(S)

At Hawkins Street

Q_L	Q_R	Q_{T1}	Q_{T2}	Q_M	Treatment
0	177	304	202	505	CHR

Stage 2 Internal Traffic Volumes

	vph	vpd	Road Class
Access A	420	4203	Trunk Collector
Access B	35	351	Access Street

Peak Turn Movements at each Access

		Dir	Split	Dir	Split
		IN	5/25	OUT	5/25
Access A	465	77	N	531	88 N
		387	S		442 S
Hawkins	from	279	W	to	319 W
		108	S		124 S

Peak Through Traffic

Verney Road (2008 x 1.2)

AM		PM	
202	NB	299	NB
304	SB	245	SB
505	Σ	544	Σ

Indicative Turn Treatment

At Access A

Q_L	Q_R	Q_{T1}	Q_{T2}	Q_M	Treatment
88	442	245	299	632	CHR & AUL(S)

At Hawkins Street

Q_L	Q_R	Q_{T1}	Q_{T2}	Q_M	Treatment
0	279	304	202	505	CHR

Stage 3 Internal Traffic Volumes

	vph	vpd	Road Class
Access A	664	6636	Trunk Collector
Access B	82	821	Access Street
Access C	533	5327	Trunk Collector

Peak Turn Movements at each Access

		Dir	Split	Dir	Split
		IN	2/27	OUT	2/27
Access C					
AM	201	14	N	332	23 N
		187	S		309 S
PM	302	21	N	230	16 N
		282	S		214 S

Peak Through Traffic

Grahamvale Road (2003 x 1.2)

AM		PM	
226	NB	271	NB
269	SB	242	SB
494	Σ	514	Σ

Indicative Turn Treatment

Q_L	Q_R	Q_{T1}	Q_{T2}	Q_M	Treatment
187	14	242	271	700	CHR & AUL

Stage 4 Internal Traffic Volumes

	vph	vpd	Road Class
Access A	405	4052	Trunk Collector
Access B	104	1036	Collector Level 1
Access C	579	5786	Trunk Collector
Access D	459	4589	Trunk Collector
		15464	

Peak Turn Movements at each Access

		Dir	Split	Dir	Split
		IN	100%	OUT	100%
Access B					
AM	21	21	E	83	83 E
PM	72	72	E	31	31 E

Peak Through Traffic

Ford Road (2010 x 1.16)

AM		PM	
242	EB	147	EB
172	WB	187	WB
414	Σ	334	Σ

Indicative Turn Treatment

Q_L	Q_R	Q_{T1}	Q_{T2}	Q_M	Treatment
21		147	187	187	AUL(S)

Peak Turn Movements at each Access

		Dir	Split	Dir	Split
		IN	2/27	OUT	2/27
Access C					
AM	171	12	N	364	25 N
		159	S		339 S
PM	327	23	N	209	14 N
		304	S		194 S

Peak Through Traffic

Grahamvale Road (2003 x 1.2)

AM		PM	
226	NB	271	NB
269	SB	242	SB
494	Σ	514	Σ

Indicative Turn Treatment

Q_L	Q_R	Q_{T1}	Q_{T2}	Q_M	Treatment
159	12	242	271	673	CHR & AUL

Peak Turn Movements at each Access

		Dir	Split	Dir	Split
		IN	8/25	OUT	8/25
Access D					
AM	131	32	S	372	90 S
		99	W		282 W
		0	N		0 N
PM	329	80	S	174	42 S
		250	W		132 W
		0	N		0 N

Peak Through Traffic

Verney Road (2008 x 1.2)

AM		PM	
202	NB	299	NB
304	SB	245	SB
505	Σ	544	Σ

Indicative Turn Treatment

Q_L	Q_R	Q_{T1}	Q_{T2}	Q_M	Treatment
0	90	299	245	544	CHR