Cornish Land, East Leppington

DCP Road Network Revisions Proposal

Traffic Assessment

September 2014

Prepared for

The Cornish Group

Prepared by

ARC Traffic + Transport

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Introduction

The Cornish Group (**Cornish**) proposes amendments to the Camden Growth Centre Precincts Development Control Plan 2012 (**CGCP DCP**), that would allow for revisions to the design of the internal road network (the **Proposal**) within the Cornish Land (the **Site**), which lies within the East Leppington Growth Precinct (**ELGP**) south of **Camden Valley Way**.

The Proposal provides a connected street network that retains access to available facilities and services (within the broader **ELGP**); removes a **cul-de-sac** street; provides a new local **access road** connection to **St Andrews Road**; and a new local **access road** connection to the **Willowdale** sub-division immediately north of the Site. The key components of the Proposal include: -

- No change to the lot yield of the Site over than provided for in the CGCP DCP (and per original the pre-DCP assessment of Site traffic generation and distribution).
- The retention of a generally linear network of local **access roads** within the Site,
- The retention of the CGCP DCP street hierarchy/profiles.
- A rationalisation of access intersections to the broader ELPG road network – and specifically to **Collector Road 1** - which runs along the western boundary of the Site.

This Traffic Assessment (**TA**) has been prepared by ARC Traffic + Transport (**ARC**) to examine the access, traffic and design issues associated with the Proposal, and will accompany a Development Application (**DA**) prepared by SMEC Urban (**SMEC**) on behalf of Cornish. To appropriately provide a detailed assessment of the Proposal, ARC has completed the following: -

- Reviewed CGCP DCP and the background traffic and transport assessment upon which CGCP DCP (and indeed general traffic planning for the ELGP) is based – the East Leppington Precinct Traffic Assessment (**ELP TA**) 2012 prepared by Cardno.
- Determined key traffic generation and distribution factors appropriate to the Site, and prepared a traffic distribution assessment of the Proposal.
- Assessed potential **access road** and intersection impacts arising from the Proposal.
- Reviewed the design of the internal road network, including the provision of appropriate road profiles and intersection designs.

For ease of reference through this TA – and in line with previous ELGP assessments – Camden Valley Way is considered to be west of the Site; St Andrews Road to the south of the Site; and Denham Court Road to the north of the Site.

1 The Site

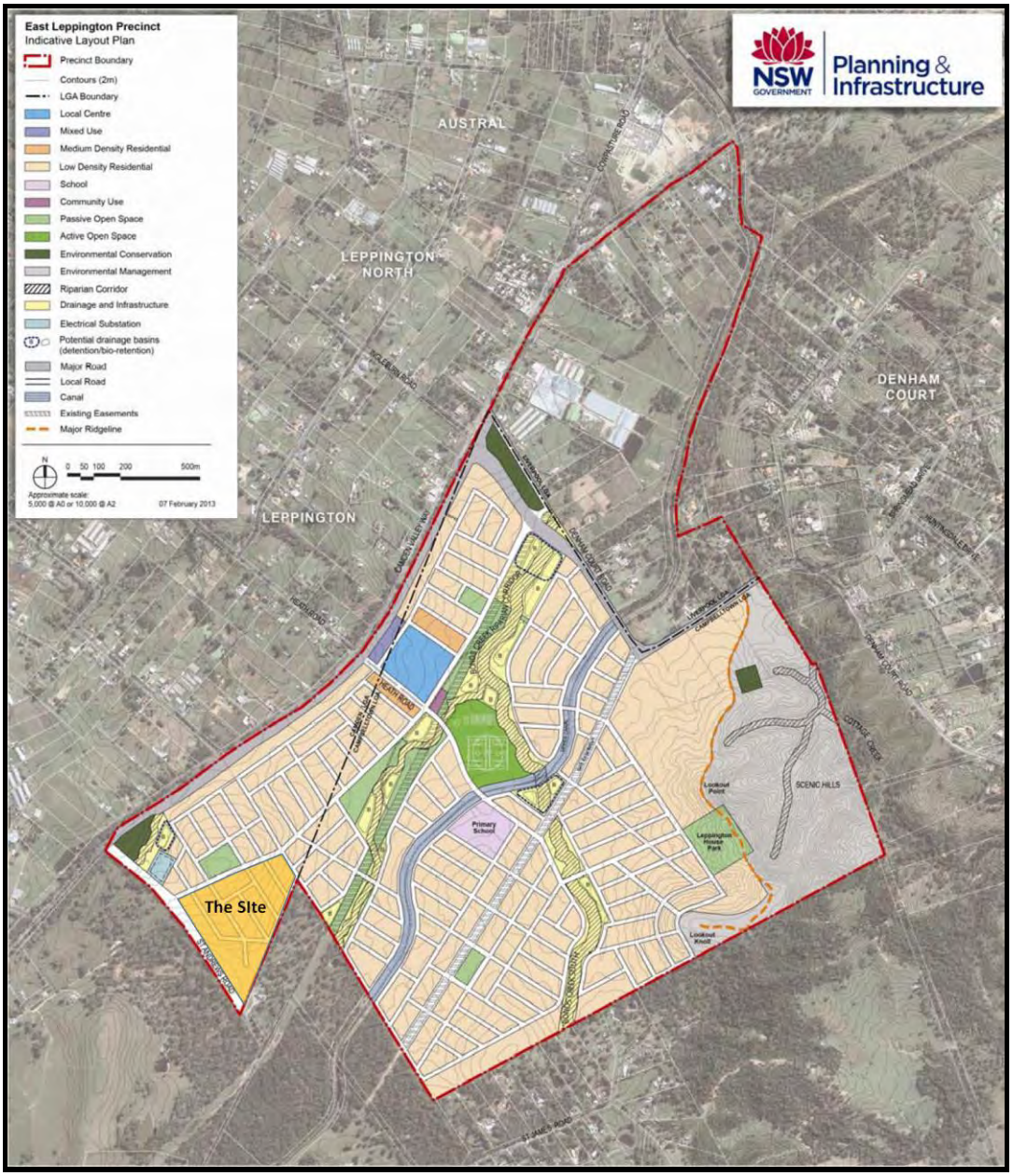
1.1 The East Leppington Growth Precinct

The Site lies within the ELGP, and specifically within that part of the ELGP within the Camden LGA immediately east of **Camden Valley Way**. The ELGP – the majority of which lies within the Campbelltown City Council LGA - has been identified as having the potential for up to 4,100 residential dwellings as well as community, retail and recreational provisions. Further to detailed planning, including significant traffic and transport assessment, the development and design of the portion of the ELGP within the Camden LGA was provided for in the CGCP DCP.

The Site itself is located in the southern part of the ELGP and accounts for approximately one third of the sub-precinct lying within the Camden LGA. The Site is bounded by **Collector Road 1** to the immediate west; the Willowdale subdivision to the north; undeveloped land to the east within the Campbelltown LGA (not included in CGCP DCP, nor at this timed zoned for residential development by Campbelltown City Council); and **St Andrews Road** to the south.

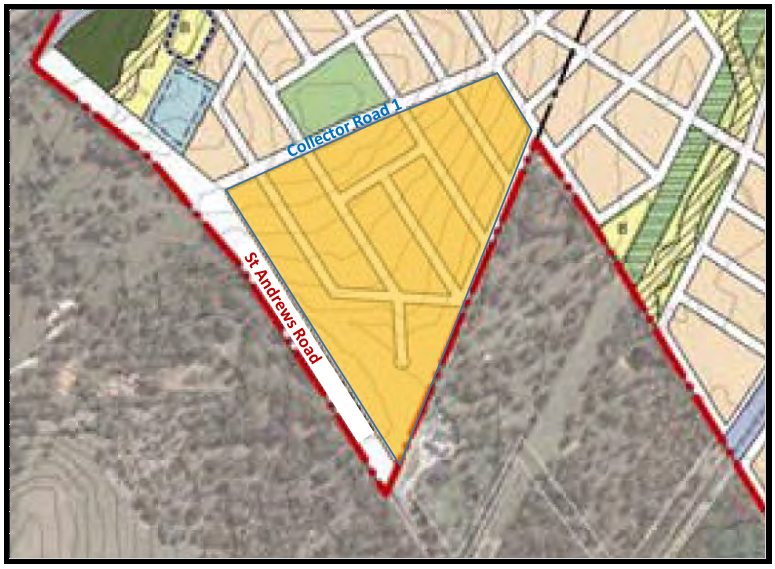
The Site within the broader ELGC is shown in **Figure 1.1.1**. A more detailed plan of the Site (as per the CGCP DCP) is shown in **Figure 1.1.2**.

Figure 1.1.1 East Leppington Growth Precinct



Source: *CGCP DCP*

Figure 1.1.2 Cornish Site as per CGCP DCP



Source: CGCP DCP

1.2 The Site

It is our understanding that the CGCP DCP provides for the Site to be developed for approximately 210 – 220 dwellings (approximately 5% of the total ELGP yield). Unlike many other sub-divisions within the ELGP, the Site provides only for residential development, with other key provisions – such as retail and community services, recreation and social facilities - provided in the broader ELGP (and specifically to the north of the Site).

1.3 Road Network

1.3.1 Road Planning Principles

Road network design principles for the ELGP are provided in CGCP DCP; from the perspective of this assessment, key *Objectives* outlined in CGCP DCP include: -

- *To establish a hierarchy of interconnected streets that give safe, convenient and clear access within and beyond the Precinct;*
- *To contribute to the creation of an interesting and attractive streetscape; and*
- *Provide a safe and convenient public transport, pedestrian and cycleway network*.

CGCP DCP then provides the following key *Controls*: -

1. *The design and construction of streets is to be consistent with the relevant typical designs…*

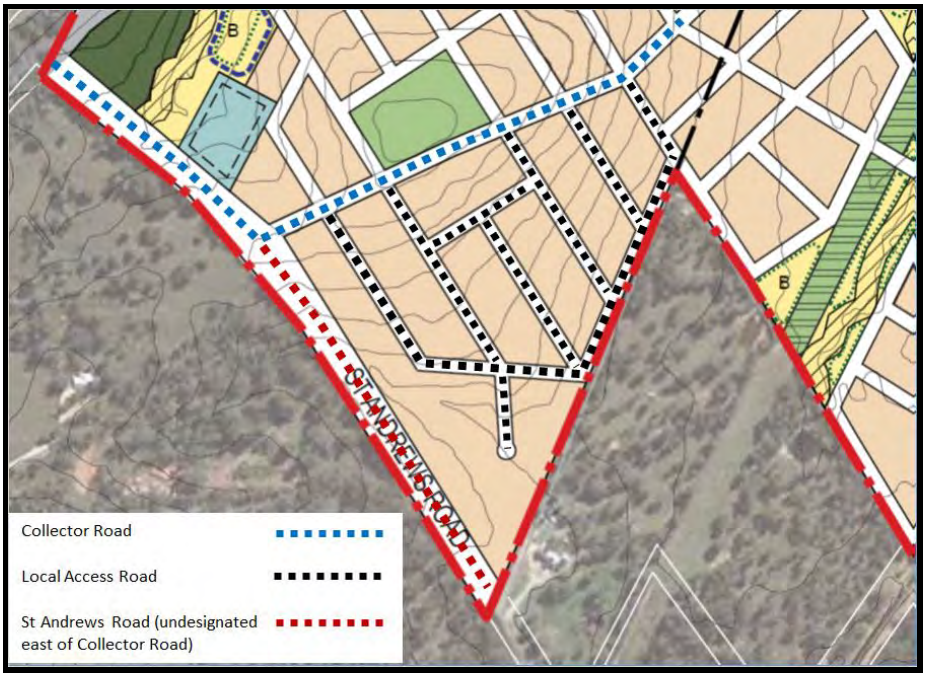
2. *The typical designs…are based on minimum dimensions.*
3. *All Collector Roads, Sub-arterial Roads, Arterial Roads and Transit Boulevards, and local streets which form part of a bus route identified by the Transport for NSW, are to have at least one travel lane in each direction with a minimum width of 3.5 metres, suitable for buses. Intersections on bus routes are to be designed to accommodate bus manoeuvrability.*
4. ***Alternative street designs for local streets and access ways may be permitted on a case by case basis if they preserve the functional objectives and requirements of the design standards**.*
5. *Roads in the relevant Precinct are to be constructed in accordance with the hierarchy shown on the Precinct road hierarchy figure in the relevant Precinct Schedule.*
6. ***The locations and alignments of all roads are to be generally in accordance with the locations shown on the Precinct road hierarchy figure in the relevant Precinct Schedule**.*
7. *Where any variation to the residential street network indicated at the Precinct road hierarchy figure, is proposed, the alternative street network is to be designed to:*
    - *create a permeable network that is based on a modified grid system,*
    - *encourage walking and cycling,*
    - *minimise travel distances for all modes of transport,*
    - *maximise connectivity between residential areas and community facilities, open space and centres,*
    - *take account of topography and site drainage, and accommodate the retention of significant vegetation,*
    - *optimise solar access opportunities for dwellings,*
    - *provide frontage to and maximise surveillance of open space and drainage lands,*
    - *provide views and vistas to landscape features and visual connections to nodal points and centres,*
    - *maximise the effectiveness of water sensitive urban design measures,*
    - *ensure that noise impacts from major roads are considered and are able to be effectively mitigated without the use of noise walls.*
    - *minimise the use of cul-de-sacs. However, if required, they are to be designed in accordance with Council's Engineering Standards,*
    - *comply with the requirements of Planning for Bushfire Protection 2006*

ARC notes that the broader DA that this TA accompanies speaks to the *Controls* relating to issues such as topography; drainage; solar access; surveillance of open space; views and vistas; noise; and bushfire provisions.

1.3.2 Site Road Network

The road network within and immediately external to the ELGC as presented in CGCP DCP is based on a hierarchy of **arterial**, **sub-arterial**, **transit boulevard**, **collector** and local **access roads**; the CGCP DCP road network for the Site is shown below in **Figure 1.3.2**.

Figure 1.3.2 Site Road Network Hierarchy (CGCP DCP)



Source: CGCP DCP

Briefly, ARC notes that **St Andrews Road** east of **Collector Road 1** does not have a hierarchical designation in CGCP DCP, and is noted only as an '*existing road*'. It is the understanding of ARC that the potential exists for the rezoning of land south and east of the ELGP (and specifically immediately south and east of the Site) with access potentially to be provided – to some extent – via **St Andrews Road**. A rezoning application providing for such would necessarily be submitted to Campbelltown City Council (and likely Camden Council) and would require a detailed assessment of future access [and traffic] requirements. The assessment of such 'potential' is outside the scope of this TA.

1.3.3 Key Roads

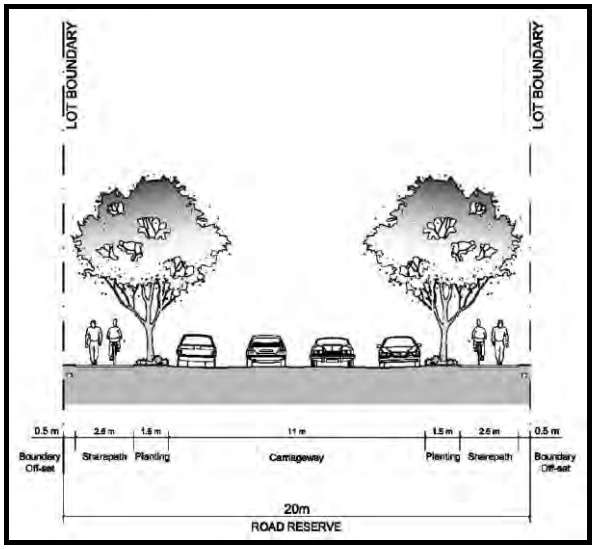
With reference to **Figure 1.3.2** above, key Site roads (as per CGCP DCP) include: -

- **Collector Road 1**

  Collector Road 1 runs parallel to **Camden Valley Way** through the western 'third' of the broader ELGC - it links from **Denham Court Road** south through a roundabout intersection with **Heath Road**, and south again to an intersection with **St Andrews Road**. **Collector Road 1** forms the western boundary of the Site.

  Collector Road 1 will be constructed in accordance with the CGCP DCP collector road profile as shown below in **Figure 1.3.3.1**, and would specifically provide for an internal (ELGP) bus route.

Figure 1.3.3.1 **Collector Road** Profile

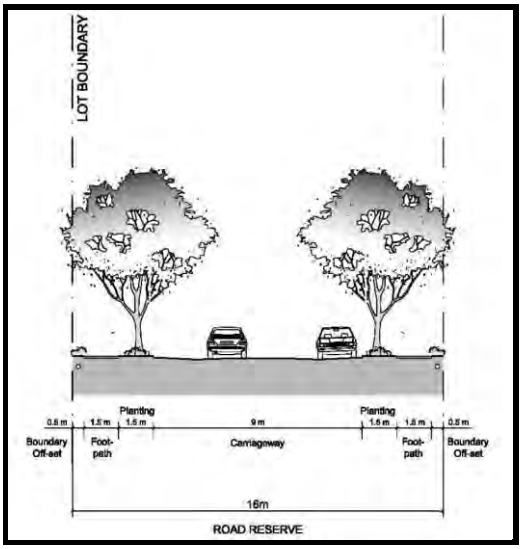


Source: CGCP DCP

➢ **Access Roads**

The CGCP DCP provides for a total of 7 local **access roads** - including one **cul-de-sac** – within the Site, generally providing primarily east-west links to **Collector Road 1**, but with little cross (north-south) connectivity. While CGCP DCP has provisions for the redesign of local access roads (as per CGCP DCP *Control 4* quoted in **Section 1.3.1** above) that would potentially allow [for example] 'minor access roads' such as provided in other Camden DCPs (including for example Camden DCP 2011 for Spring Farm), the current CGCP DCP road network for the Site suggests that all roads would likely be developed with reference to the CGCP DCP in line with the local **access road** profile shown below.

Figure 1.3.3.2 **Access Road** Profile



Source: CGCP DCP

- **Intersections**

As discussed above, key CGCP DCP interface intersections – being those intersections linking the Site to the broader road network – include numerous (five) priority intersections to **Collector Road 1**. All of these intersections are shown as four way intersections in CGCP DCP, i.e. each would have an approach to **Collector Road 1** from both the Site and from the Willowdale subdivision to the immediate west of **Collector Road 1**. CGCP DCP does not provide for any access from the Site directly to **St Andrews Road** east of **Collector Road 1**.

Within the Site, CGCP DCP shows most intersections would be designed as three approach [priority] intersections. A four way [priority] intersection is also indicated, with the minor fourth approach being a **cul-de-sac**.

1.4 Traffic Characteristics

As discussed in the **Introduction**, a detailed traffic assessment of the ELGP is provided in the 2012 ELP TA (and in subsequent Addenda). This section references the key traffic and distribution characteristics provided in the ELP TA so as to determine the specific traffic characteristics of the Site.

1.4.1 Traffic Generation

The ELP TA forecasts a traffic generation of 9 daily trips per [low density] residential dwelling, with 10% of trips generated during the peak hour (i.e. 0.9 trips per dwelling in the AM and PM peak hour). Importantly, the ELP TA provides an assessment of the broader ELGP on the basis of a total of 4,500 dwellings generating some 37,000 vehicle trips per day (**vpd**); and 3,700 peak hour vehicle trips (**vph**). As stated in **Section 1.2**, it is our understanding that the ELGP yield has since been revised [down] to a yield estimate of approximately 4,100 dwellings, but the ELP TA assesses the higher yield potential (and therefore high trip generation). Applied holistically to the 'travel zones' identified in Figure 5.1 of the ELP TA, this suggests that the Site was assessed on the basis of 220 - 230 dwellings.

The CGCP DCP estimate of up to 220 residential lots within the Site would generate approximately 1,980vpd; and approximately 198vph in the peak periods.

1.4.2 Trip Distribution

The ELP TA distribution of trips, based on census data and RTA/RMS guidelines including the RTA Guide to Traffic Generating Developments (**RTA Guide**), is as follows: -

- 75% of trips external to the ELGP, 25% of trips internal to the ELGP (i.e. shops, schools, local visits)
- Of internal trips: -
    - Proportional distribution between ELGP travel zones (as described in Section 5.1 of the ELGP TA)

- Of external trips: -
  - **Camden Valley Way** South 20%
  - **Camden Valley Way** North 30%
  - **Heath Road** 5%
  - **Ingleburn Road** 10%
  - **Cowpasture Road** 5%
  - **Denham Court Road** 30%

Applying this distribution profile to a lot estimate for the Site (220 lots) provides trip characteristics as summarised in **Table 1.4.2** below.

Table 1.4.2 Site Trip Distribution

Origin/Destination	%	Site Trips	AM		PM	
			IN	OUT	IN	OUT
			70%	30%	30%	70%
External	**75%**					
Camden Valley Way South	20%	30	21	9	9	21
Camden Valley Way North	30%	45	31	13	13	31
Heath Road	5%	7	5	2	2	5
Ingleburn Road	10%	15	10	4	4	10
Cowpasture Road	5%	7	5	2	2	5
Denham Court Road	30%	45	31	13	13	31
Internal (ELPG)	**25%**	50	35	15	15	35
Total	**100%**	**198**	**139**	**59**	**59**	**139**

With reference to **Table 1.4.2** above, the majority of external Site trips are generated to/from the north of the Site (approximately 120vph) with the only exception being trips to/from the south (**Camden Valley Way** south – approximately 30vph). Similarly, all internal trips (approximately 50vph) are forecast to travel to the north of the Site (via **Collector Road 1**) as all ELPG internal services and facilities are located to the north of the Site.

Importantly, the ELP TA was based on the Site providing a number of access intersections to **Collector Road 1** and a number of intersections to **St Andrews Road** also. While the ELP TA does not provide any significant detail of internal intersection operations [based on what are for the most part low traffic generating intersections] ARC has provided a more detailed assessment of local flows adjacent to the Site as it is important to determine whether the Proposal will generate impacts in the local network as opposed to the 'current' [ELP TA or CGCP DCP] road networks. This assessment is detailed in **Section 2**.

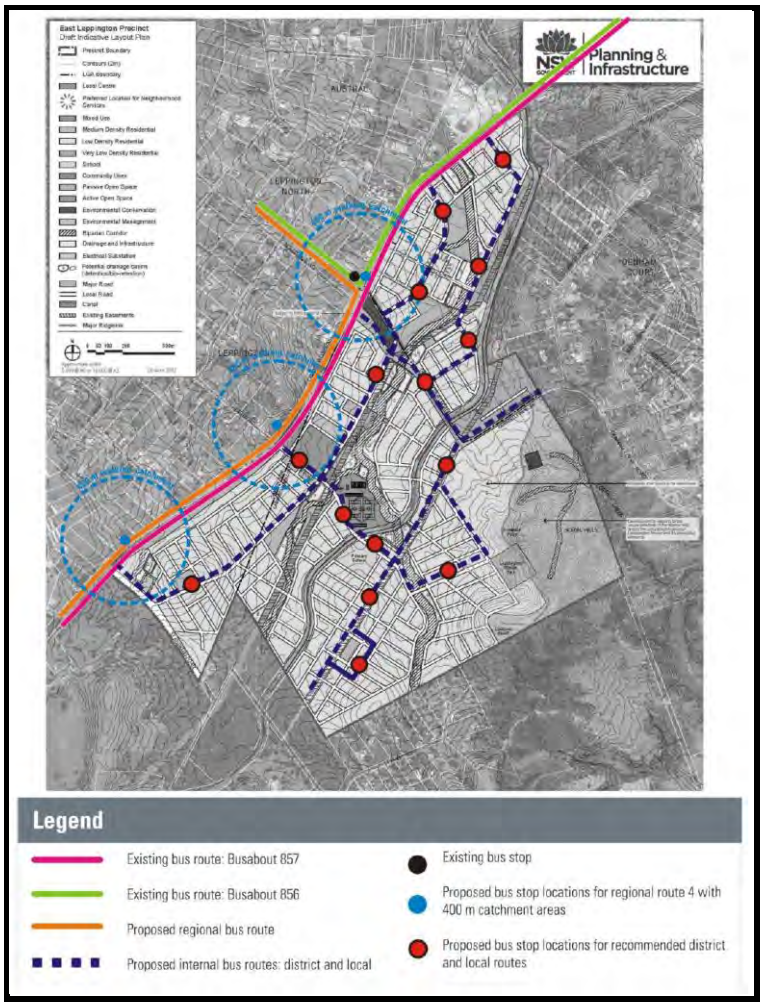
1.5 Public Transport, Pedestrian & Cycle

1.5.1 Bus Services

The CGCP DCP provides for the introduction of a local bus services through the ELPG, linking residents throughout the ELGP to the services hub to the north (centred around **Heath Road**) and more broadly along key residential roads throughout the ELPG. It is the opinion of ARC that future services would also provide a link to Leppington Railway Station, which is currently under construction.

The future ELPG bus routes are shown in **Figure 1.5.1** below.

Figure 1.5.1 ELGP Bus Routes



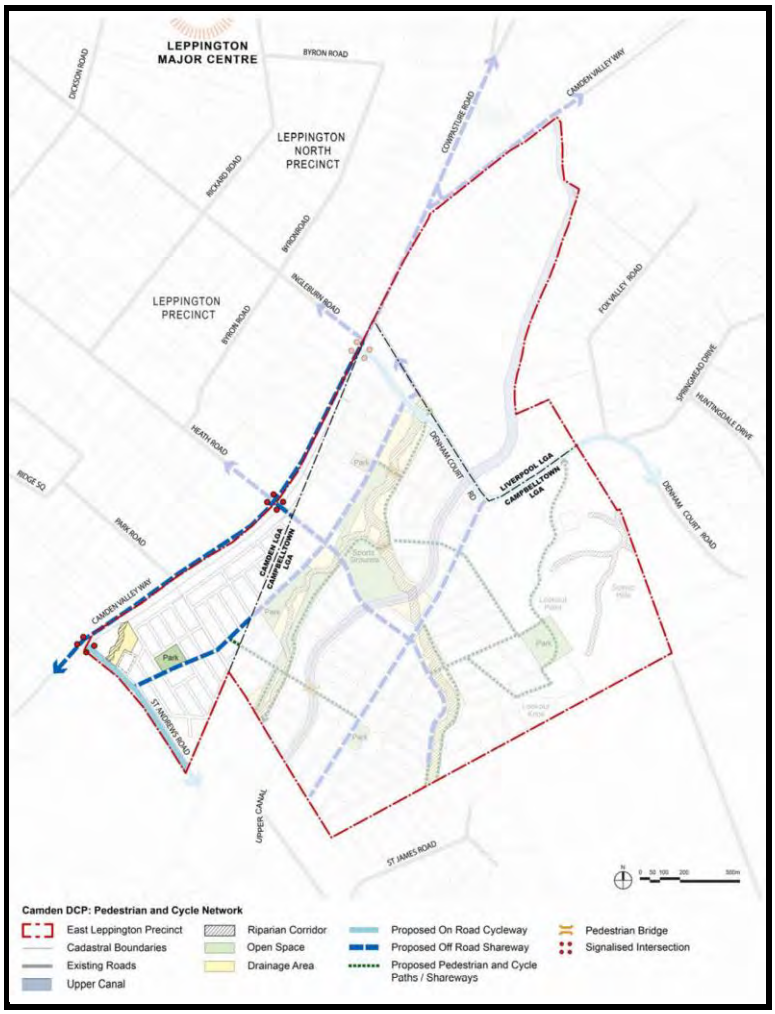
Source: ELP TA

Further to **Figure 1.5.1** above, the CGCP DCP identifies a bus route running along **Collector Road 1** adjacent to the Site (then to **St Andrews Road** at **Camden Valley Way**); the Proposal would in no way alter the proposed bus route along **Collector Road 1**.

1.5.2 Pedestrian & Cycle Facilities

Key pedestrian and cycle links will be provided through the ELGP along the skeletal collector roads which run north-south and east-west; these routes would be augmented by paths along riparian corridors; and on-road cycleways in **St Andrews Road** (west of **Collector Road 1**) and **Denham Court Road**. The future pedestrian and cycle network is shown in **Figure 1.5.2** below.

1.5.2 Future Pedestrian & Cycle Network



Source: CGCP DCP

Road profiles for the **collector roads** and **access roads** (as shown in **Section 1.3.3** above) provide for footpaths on both sides of all **access roads**, and shared paths on both sides of all **collector roads**. The Proposal would in no way alter the provision of pedestrian paths as per the CGCP DCP profiles. However, it does provide additional road (and therefore pedestrian and cycle) links to both the Willowdale sub-division to the north (and from there more immediate access to the ELGP 'central' park precinct); and to **St Andrews Road**. Additionally, the proposed **access road** to **Collector Road 1** is central to all residents, and meets **Collector Road 1** opposite a future park (within Willowdale).

2 The Proposal – Traffic Analysis

As discussed in the **Introduction**, the Proposal provides for revisions to the Site road network as provided in the CGCP DCP. This section of the assessment examines whether the proposed revisions have the potential to impact the broader ELPG network (and specifically impact **Collector Road 1** and/or **St Andrews Road** adjacent to the Site).

2.1 The ELP TA Road Network Assessment

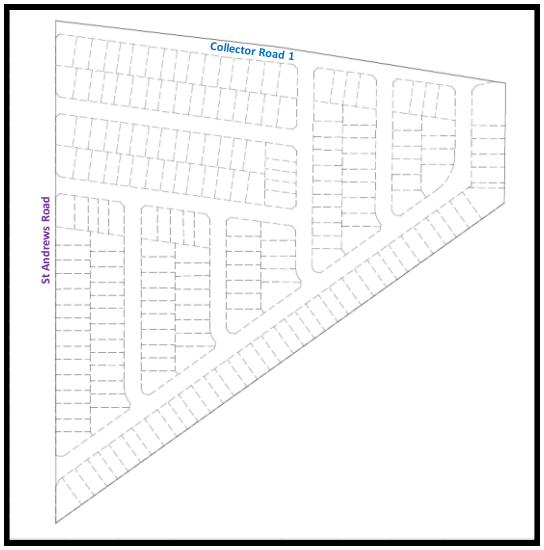
Further to the general traffic characteristics of the ELP TA detailed in **Section 1.4** above, ARC has prepared a trip generation and distribution model for the Site to examine the specific distribution of traffic flows to the interface intersections along **Collector Road 1** and **St Andrews Road**; and the total Site flows being generated to the north and south of the Site.

2.1.1 ELP TA Road Network

Based on information provided to ARC by SMEC (and in turn Cardno) it is our understanding that the ELP TA used a road network for the Site different to that shown in the final ELP TA; and different to both the CGCP DCP and Proposal road networks. While the ELP TA does not provide any detailed modelling of internal [to the ELGP] intersections (i.e. those along **Collector Road 1** adjacent to the Site) nor of internal roads (i.e. those within the Site or Willowdale) the road network used would still have a bearing on the distribution of trips from the travel zone [7] in which the Site and Willowdale lie, specifically in regard to trips that might use **St Andrews Road** to/from **Camden Valley Way** north.

The ELP TA road network for the Site is shown below in **Figure 2.1.1**.

Figure 2.1.1 ELP TA Site Road Network



Source: Cardno

2.1.2 Willowdale Traffic Characteristics

The ARC modelling has necessarily required the modelling of the Willowdale subdivision to the immediate west of the Site, which – depending on the road network - would generate trips to the same intersections as the Site.

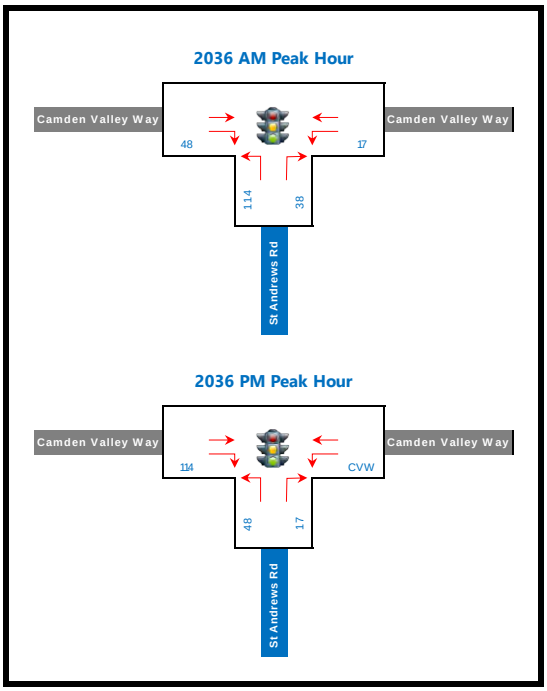
To determine the potential trip generation of Willowdale to **Collector Road 1**, ARC has reviewed available Willowdale Masterplan documents, as well as the Willowdale Precinct 2 Civil Subdivision Development Application 2013. Based on this information, ARC estimates a yield of approximately 180 residential dwellings within Willowdale; these trips would have the same distribution characteristics as the Site, though the ELP TA assessment does not provide for any vehicle access from Willowdale to **St Andrews Road** north of **Collector Road 1**.

ARC notes that further information is not available in regard to the Willowdale road network modelled in the ELP TA, and as such ARC has used the Willowdale road network shown in the CGCP DCP to assess the general distribution outcomes of the ELP TA model.

2.1.3 Local Distribution

Traffic data provided in Appendix B of the ELP TA provides turning flows for the intersection of **Camden Valley Way** & **St Andrews Road** (which remain consistent across every ELP TA forecast year through 2036); these flows are shown below in **Figure 2.1.3**.

Figure 2.1.3 Turning Volumes, **Camden Valley Way** & **St Andrews Road**



Source: ELP TA Appendix B

Looking at these flow forecasts – and referencing the general trip characteristics (of the Site and Willowdale) as detailed in **Section 1.4** - the following route distribution patterns are evident: -

- Trips to/from **Heath Road**, **Ingleburn Road** (via a new intersection with **Camden Valley Way** & **Denham Court Road**) and to/from **Denham Court Road** itself will use **Collector Road 1** north of the Site; if this were not the case, left turn trips **St Andrews Road** to **Camden Valley Way**, and right turn trips **Camden Valley Way** to **St Andrews Road**, would be significantly higher.

- A percentage of trips to **Camden Valley Way** north and to Cowpasture Road will use **Collector Road 1** to **St Andrews Road**, and thence the intersection with **Camden Valley Way**.

  With reference to the ELP TA traffic characteristics outlined in **Section 1.4** above, the combined generation of the Site and Willowdale to the north (**Camden Valley Way** north, and to **Cowpasture Road**) is estimated at approximately 95vph. As shown in **Figure 2.1.3**, only some 55vph are forecast to turn right from **St Andrews Road** to **Camden Valley Way** or left from **Camden Valley Way** to **St Andrews Road**. Reasonably, these could only be trips from the Site or Willowdale, as for all other ELGP precincts more efficient routes to the north (including to **Heath Road** and **Ingleburn Road** north of **Camden Valley Way**) are provided by the **Camden Valley Way** intersections with **Heath Road** or **Denham Court Road**.

  ARC estimates therefore that approximately 60% of northern trips generated by the Site and by Willowdale would use **St Andrews Road** to/from **Camden Valley Way** north. These trips would most likely be generated by residents in the 'southern' parts of the Site and Willowdale. The remaining 40% of northern trips would use **Collector Road 1** north of the Site (and thence **Heath Road** or **Denham Court Road** to **Camden Valley Way** north); these trips would most likely be generated by residents in the 'northern' parts of the Site and Willowdale.

- All Site and Willowdale trips to/from **Camden Valley Way** south will use **Collector Road 1** to **St Andrews Road**, and thence the intersection with **Camden Valley Way**.

2.1.4 Through Trips

Further reference to the traffic flows reported in **Figure 2.1.3** to and from the south at the intersection of **Camden Valley Way** & **St Andrews Road** indicates that a significant number of trips from the broader ELGC use **Collector Road 1** to **St Andrews Road** to **Camden Valley Way** south (and vice versa). The trip generation of the Site and Willowdale to the south is estimated at approximately 50vph, while the forecast flow is some three times this estimate. Given that all Site and Willowdale southern trips would use **St Andrews Road** – and there is no other Site/Willowdale generation to/from the south - through trips can therefore be estimated at approximately 110 - 20vph.

These through trips are predominantly southbound in the AM peak (approximately 90vph) with the remainder being northbound trips (approximately 30vph); and vice versa in the PM peak.

2.1.4 ELP TA Road Network Site Trips

With consideration of the traffic characteristics outlined in sections above, and with consideration of the ELP TA road network, ARC has determined Site flows to both **Collector Road 1** and to **St Andrews Road**. These are shown in **Figure 2.1.4.1** (AM) and **Figure 2.1.4.2** (PM).

Figure 2.1.4.1 ELP TA Road Network Site AM Peak Trips

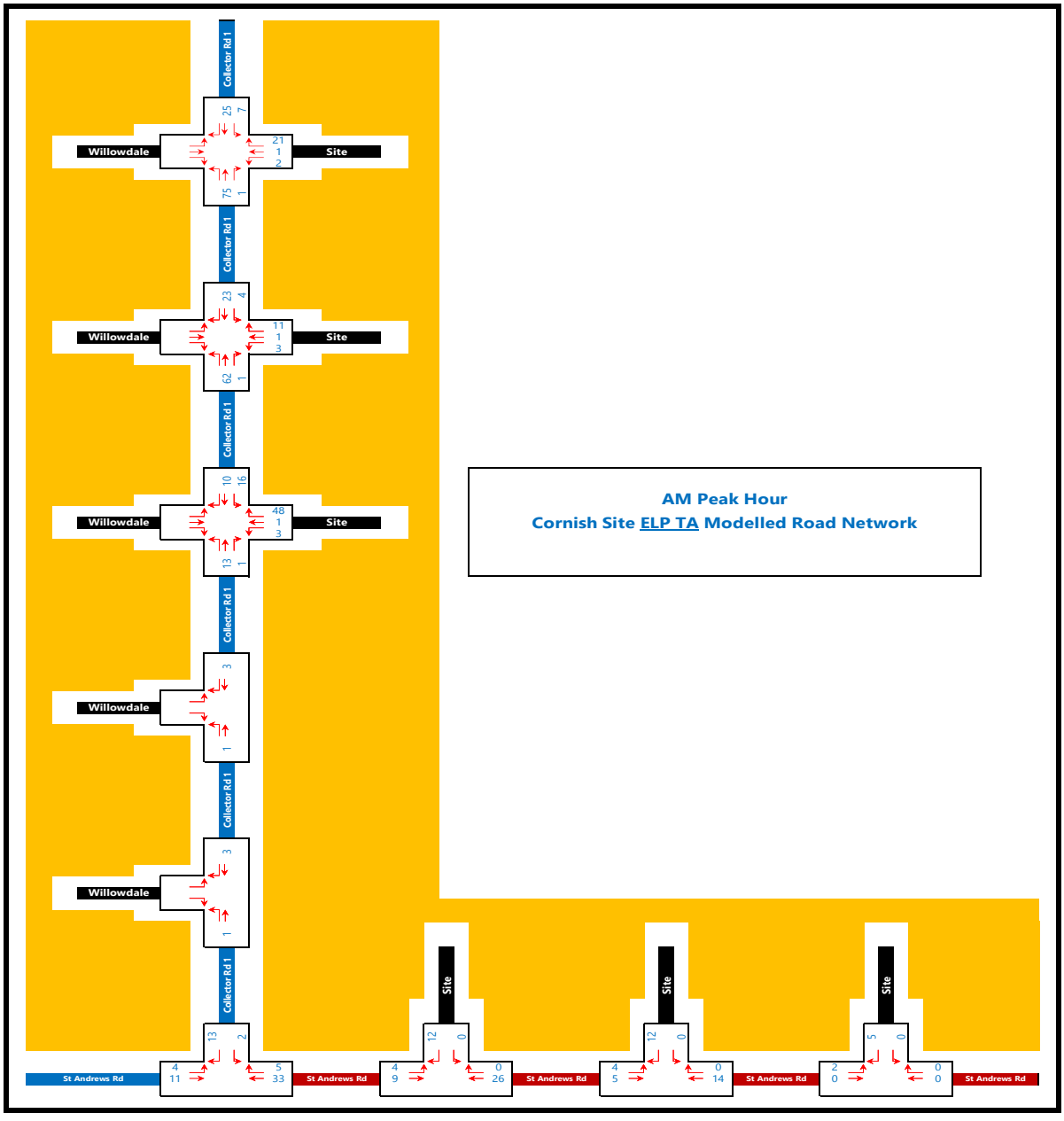
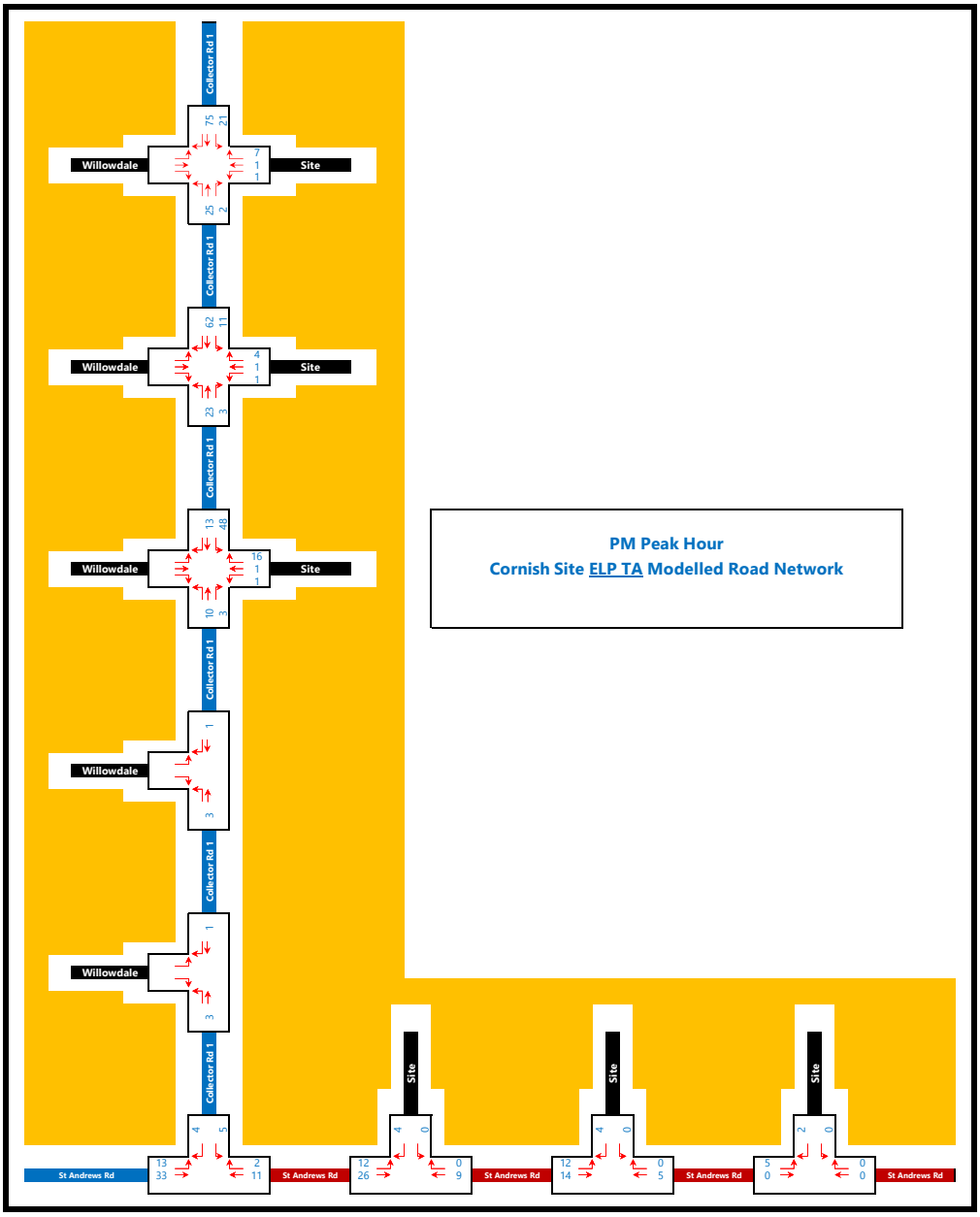


Figure 2.1.4.2 ELP TA Modelled Site PM Peak Trips



2.1.5 ELP TA Total Trips

With consideration of the traffic characteristics outlined in sections above, ARC has determined Willowdale and through trip distribution to both **Collector Road 1** and to **St Andrews Road**. Combined with the Site flows as shown above, the total future flows as per the ELP TA road network for the Site, combined with the CGCP DCP Willowdale road network, are shown in **Figure 2.1.5.1** (AM) and **Figure 2.1.5.2** (PM).

Figure 2.1.5.1 ELP TA Road Network Total AM Peak Trips

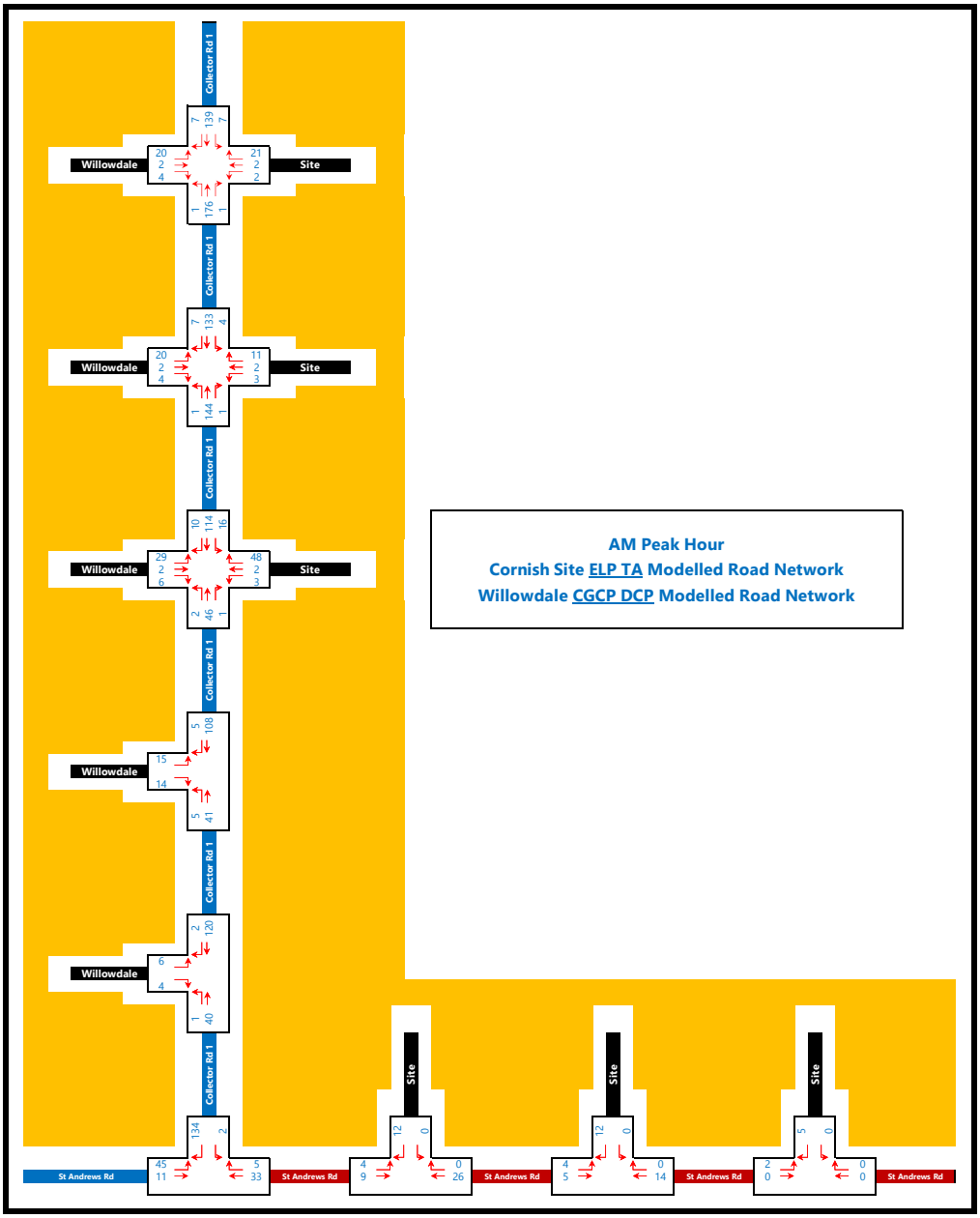
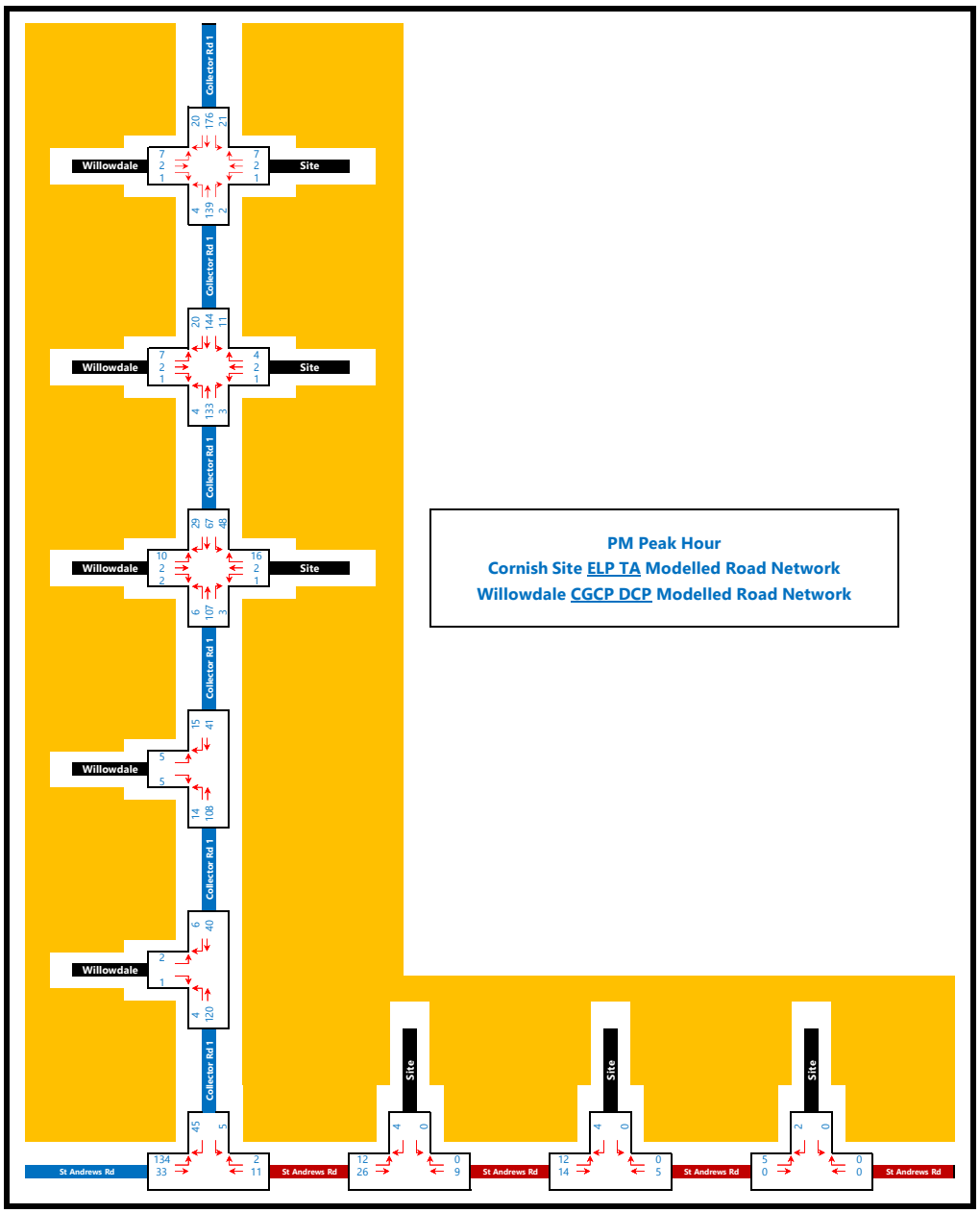


Figure 2.1.5.2 ELP TA Road Network Total PM Peak Trips



2.1.6 Key ELP TA Road Network Traffic Flows

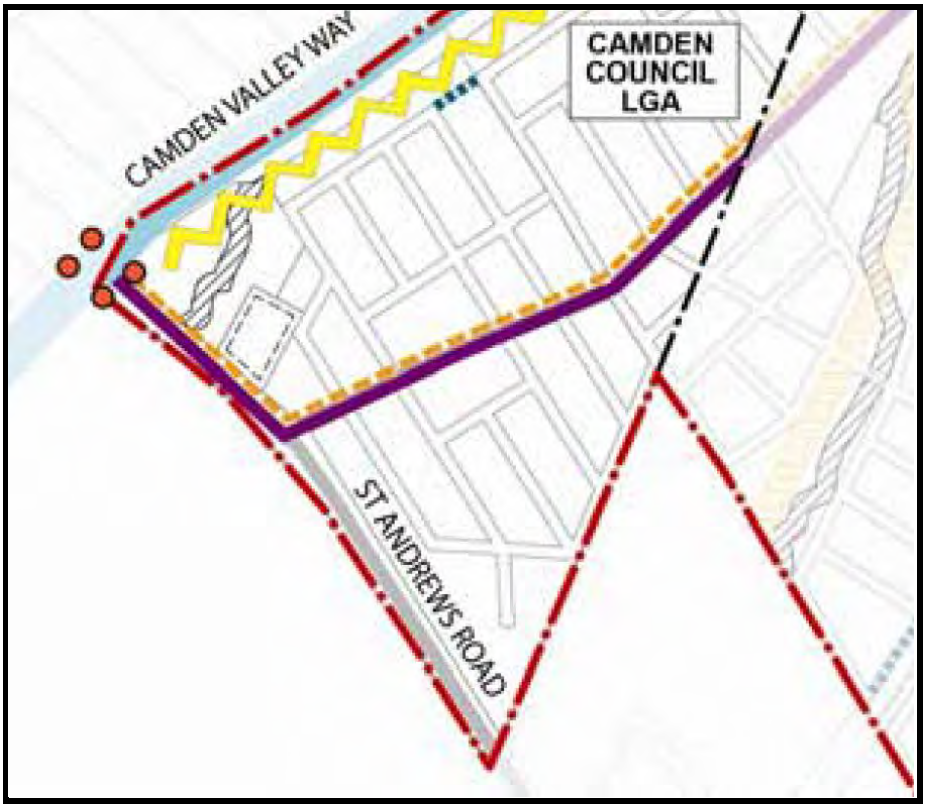
The traffic flows in the figures above indicate two-way traffic flows in **Collector Road 1** north of the Site of some 370vph; and two-way flows in **St Andrews Road** west of **Collector Road 1** of some 220vph. These flows compare well to the reported [daily] traffic flows in Section 5.2 of the ELP TA and with the forecast flows shown in **Figure 2.1.3** above, though it must be noted again that the ELP TA reported figures are some 10% higher than anticipated flows (based on modelling of 4,500 dwellings). In our opinion, these two-way flows at each 'end' of the Site are the flows by which the CGCP DCP and Proposal road networks can be compared, specifically to determine whether either network results in a significantly higher distribution to either the north of the Site or south of the Site such as would potentially impact the broader road network.

2.2 CGCP DCP Road Network Assessment

2.2.1 Road Network

To assess the CGCP DCP road network, ARC has completed the same analysis as that provided for the ELP TA road network assessment, but used the [indicative] CGCP DCP road network as shown below in **Figure 2.2.1**.

Figure 2.2.1 CGCP DCP Road Network



Source: CGCP DCP

As shown in **Figure 2.2.1**, the CGCP DCP provides for 5 access roads to **Collector Road 1** from both the Site and from Willowdale; but no access to **St Andrews Road** (from either site).

2.2.2 CGCP DCP Road Network Site Trips

With consideration of the traffic characteristics outlined in sections above, and with consideration of the CGCP DCP road network, ARC has determined Site flows to both **Collector Road 1** and to **St Andrews Road**. These are shown in **Figure 2.2.2.1** (AM) and **Figure 2.2.2.2** (PM).

Figure 2.2.2.1 CGCP DCP Road Network Site AM Peak Trips

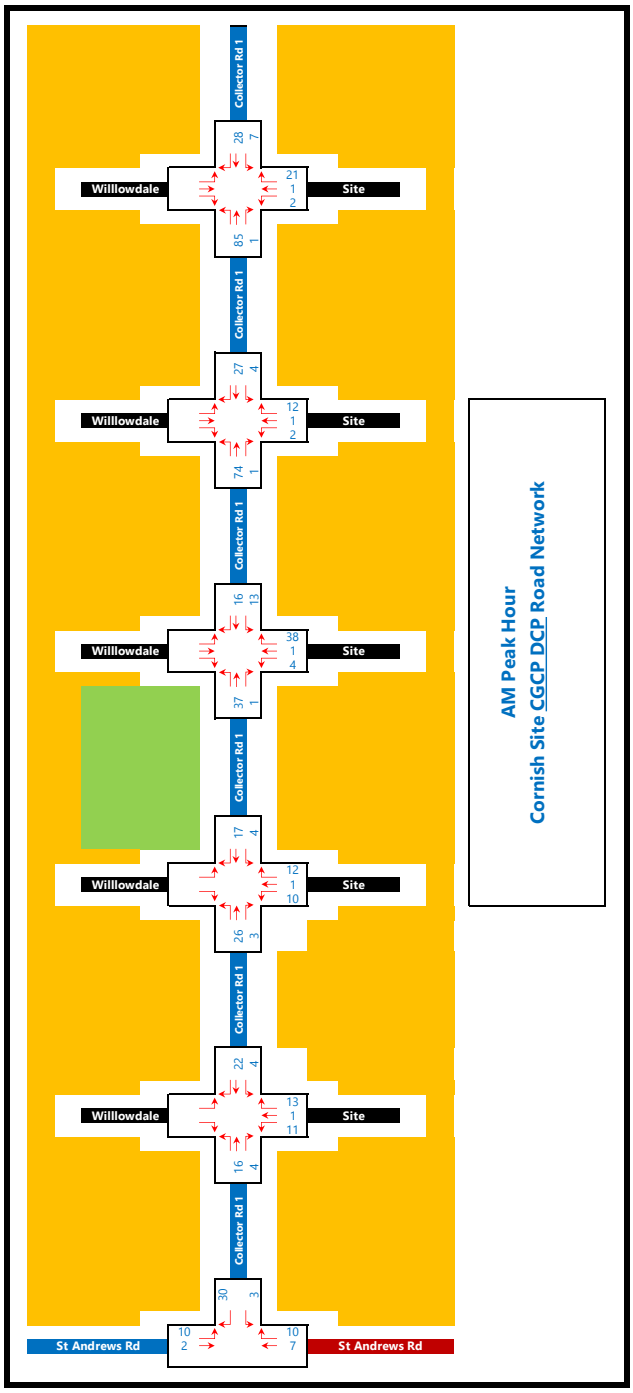
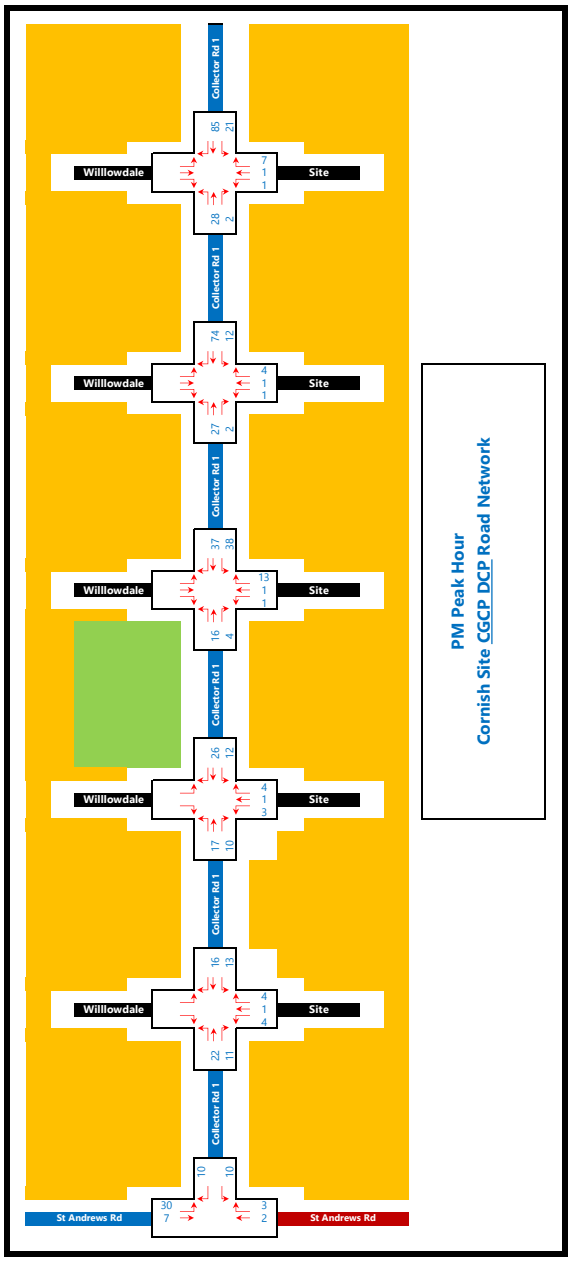


Figure 2.2.2.2 CGCP DCP Road Network Site PM Peak Trips



2.2.3 CGCP DCP Total Trips

With consideration of the traffic characteristics outlined in sections above, ARC has determined Willowdale and through trip distribution to both **Collector Road 1** and to **St Andrews Road**. Combined with the Site flows as shown above, the total future flows as per the CGCP DCP road network (for both the Site and Willowdale) are shown in **Figure 2.2.3.1** (AM) and **Figure 2.2.3.2** (PM).

Figure 2.2.3.1 CGCP DCP Road Network Total AM Peak Trips

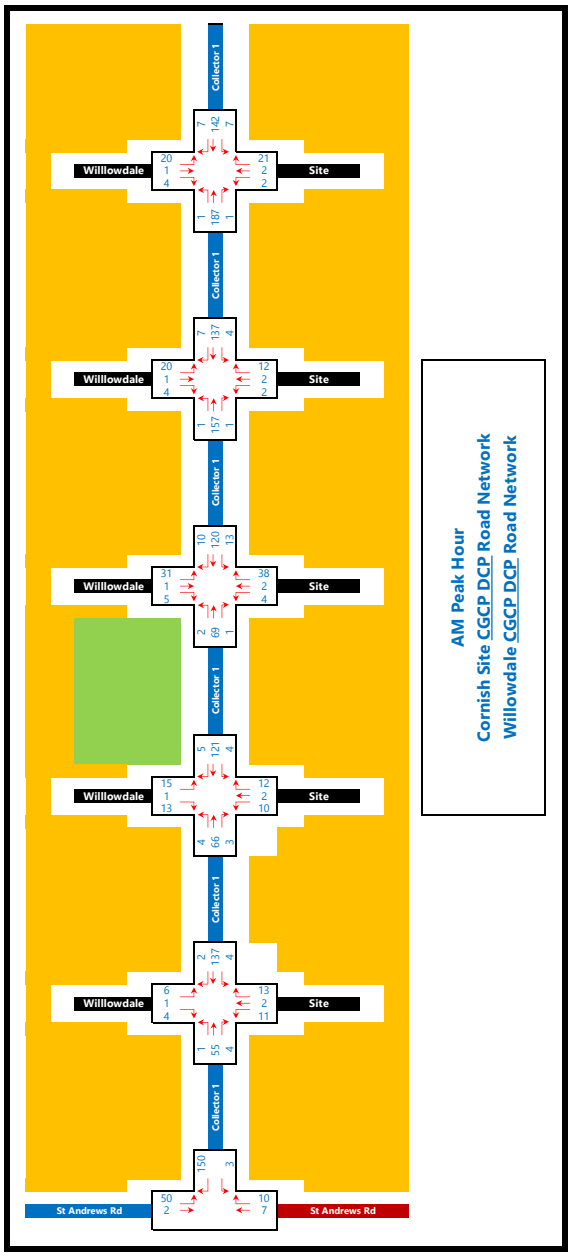
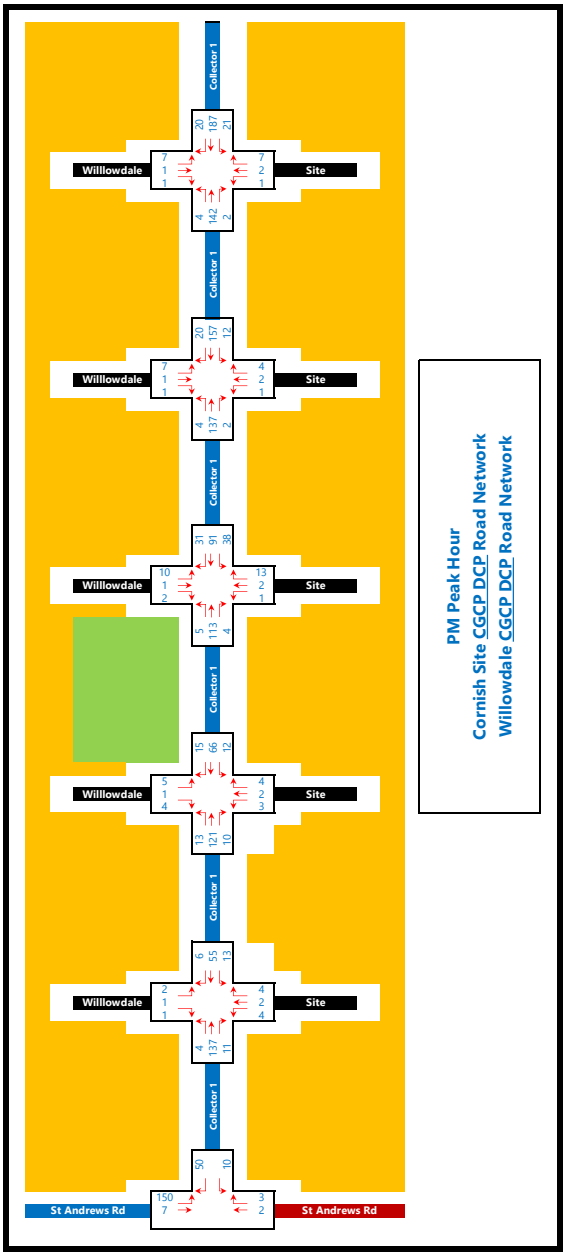


Figure 2.2.3.2 CGCP DCP Road Network Total PM Peak Trips



2.2.4 Key Traffic Flows

The traffic flows in the figures above indicate two-way traffic flows in **Collector Road 1** north of the Site of some 385vph; and two-way flows in **St Andrews Road** west of **Collector Road 1** of some 205vph, i.e. a very marginal addition of trips to the north. The additional trips to the north are exclusively trips from the Site and Willowdale using **Collector Road 1** north of the Site for access to/from **Camden Valley Way** north, in our opinion a result of the absence of direct access to **St Andrews Road** (to/from the Site east of **Collector Road 1**) which makes the **St Andrews Road** to **Camden Valley Way** north viable for more [specifically Site] trips.

Notwithstanding, the difference in flows is in and of itself very minor.

2.3 Proposal Road Network Assessment

2.3.1 Proposal Road Network

To assess the Proposal, ARC has completed the same analysis as that provided for the ELP TA and CGCP DCP road networks, but used the proposed road network as shown below in **Figure 2.3.1**; ARC notes that **Collector Road 1** is shown as "Road No.1"

Figure 2.3.1 Proposed Road Network

Source: SMEC

As shown in **Figure 2.3.1**, the proposed road network provides for a single **access road** to **Collector Road 1** and an **access road** connection to **St Andrews Road**. A local **access road** link is also be provided to the north (to the northern Willowdale sub-division.

2.3.2 Proposed Road Network Site Trips

With consideration of the traffic characteristics outlined in sections above, and with consideration of the proposed road network, ARC has determined Site flows to both **Collector Road 1** and to **St Andrews Road**. These are shown in **Figure 2.2.2.1** (AM) and **Figure 2.2.2.2** (PM).

Figure 2.3.2.1 Proposed Road Network Site AM Peak Trips

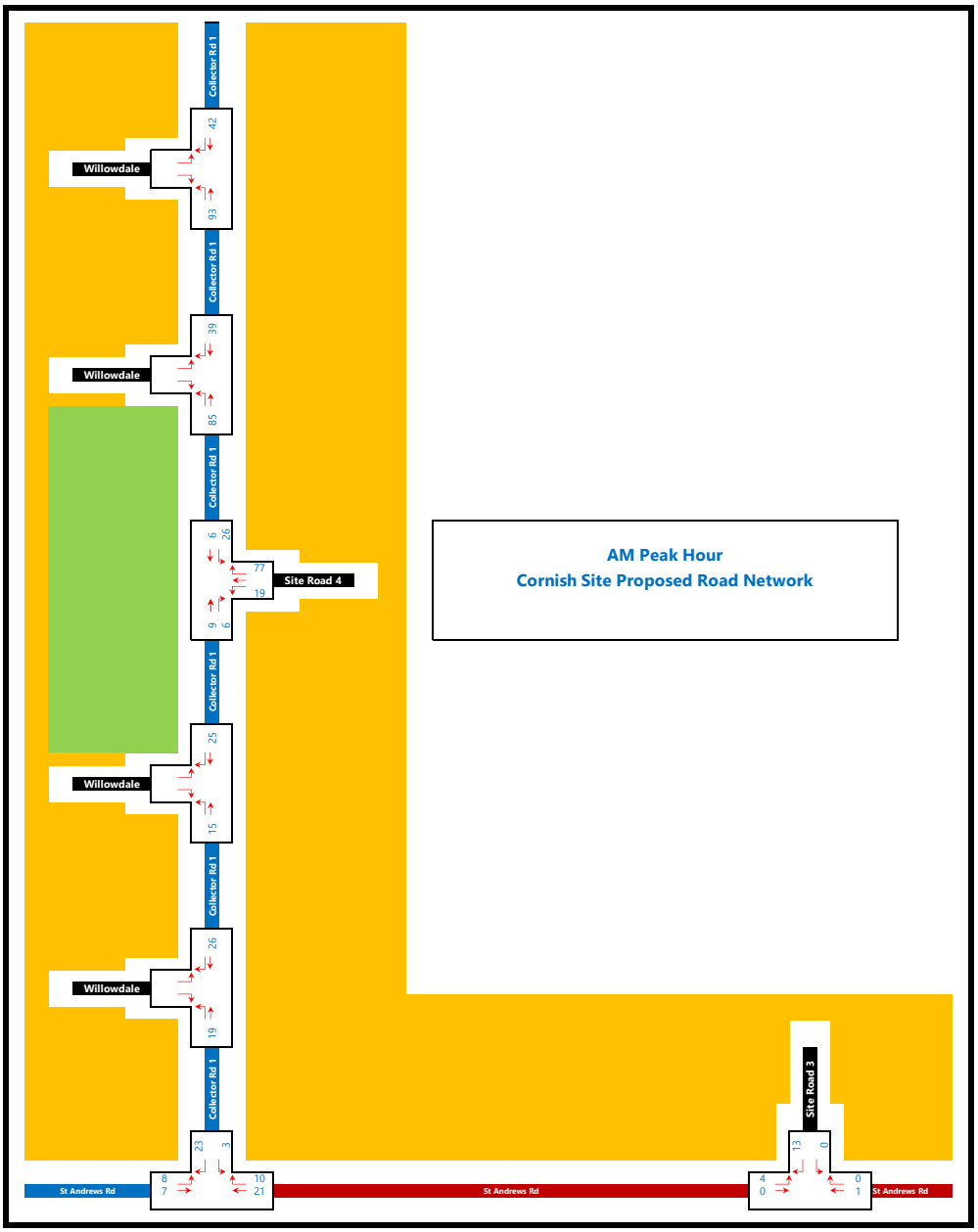
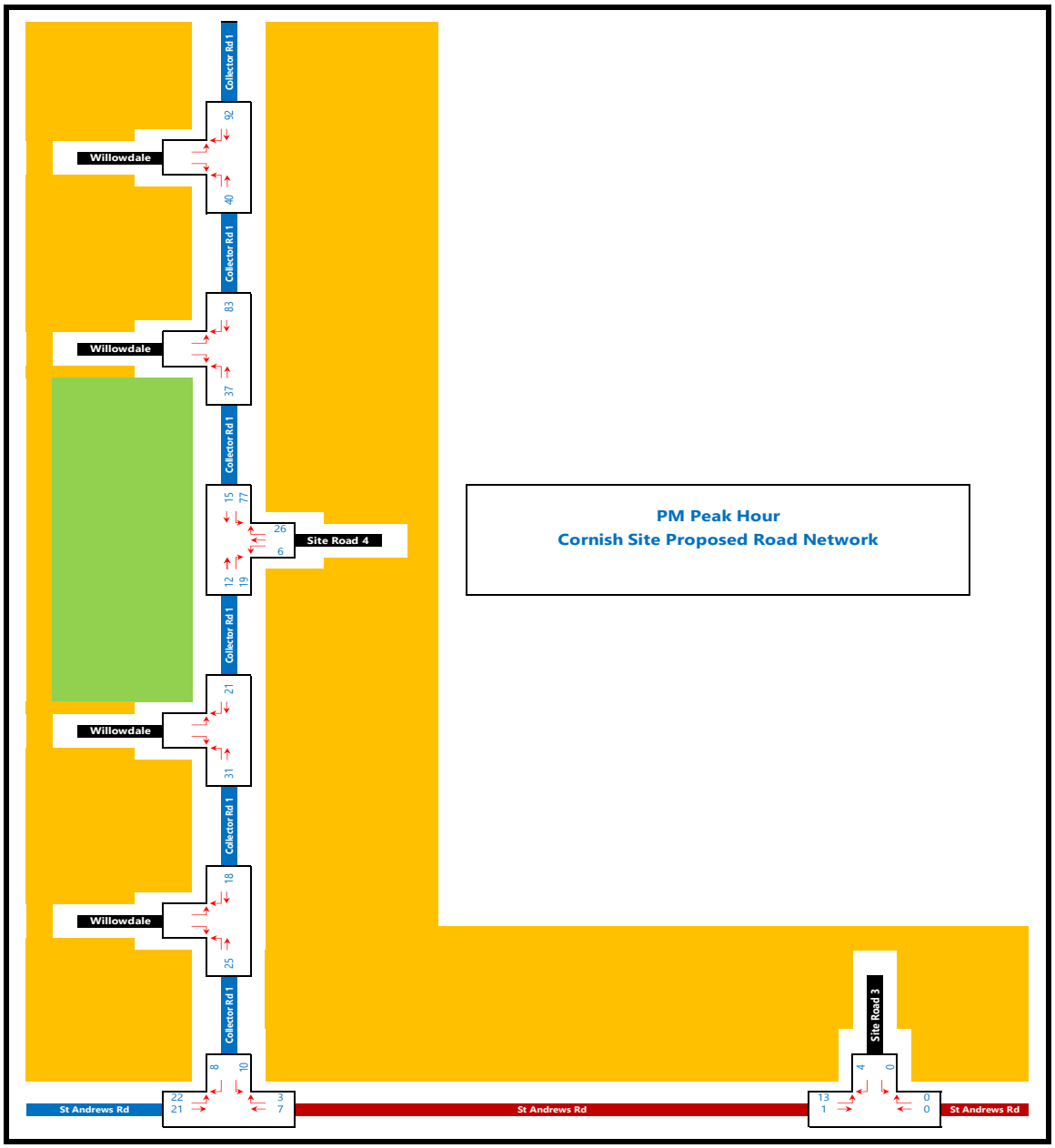


Figure 2.3.2.2 Proposed Road Network Site PM Peak Trips



2.3.3 Proposed Road Network Total Trips

With consideration of the traffic characteristics outlined in sections above, ARC has determined Willowdale and through trip distribution to both **Collector Road 1** and to **St Andrews Road**. Combined with the Site flows as shown above, the total future flows as per the proposed Site road network and Willowdale Masterplan road network are shown in **Figure 2.3.3.1** (AM) and **Figure 2.3.3.2** (PM).

Figure 2.3.3.1 Proposed Road Network Total AM Peak Trips

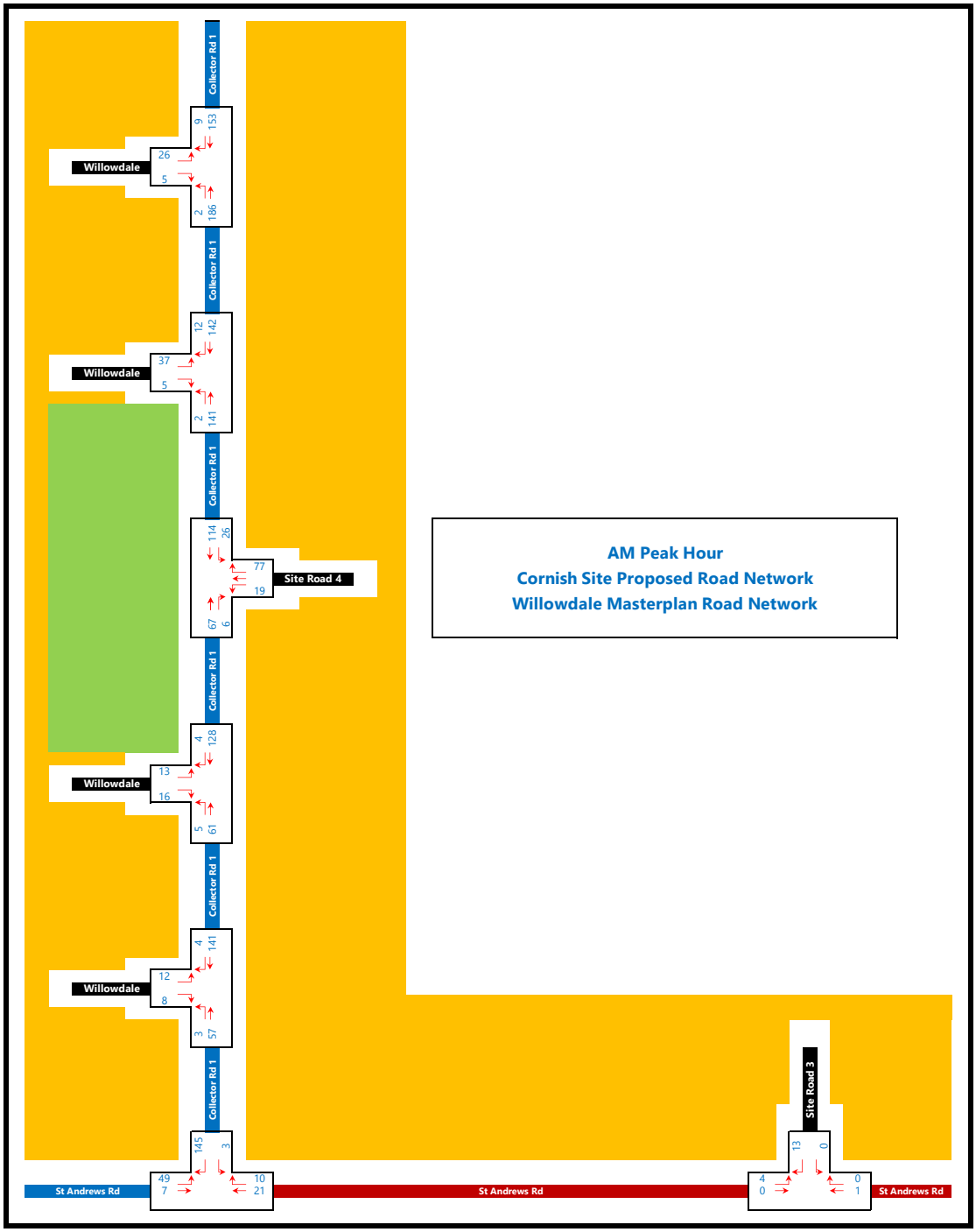
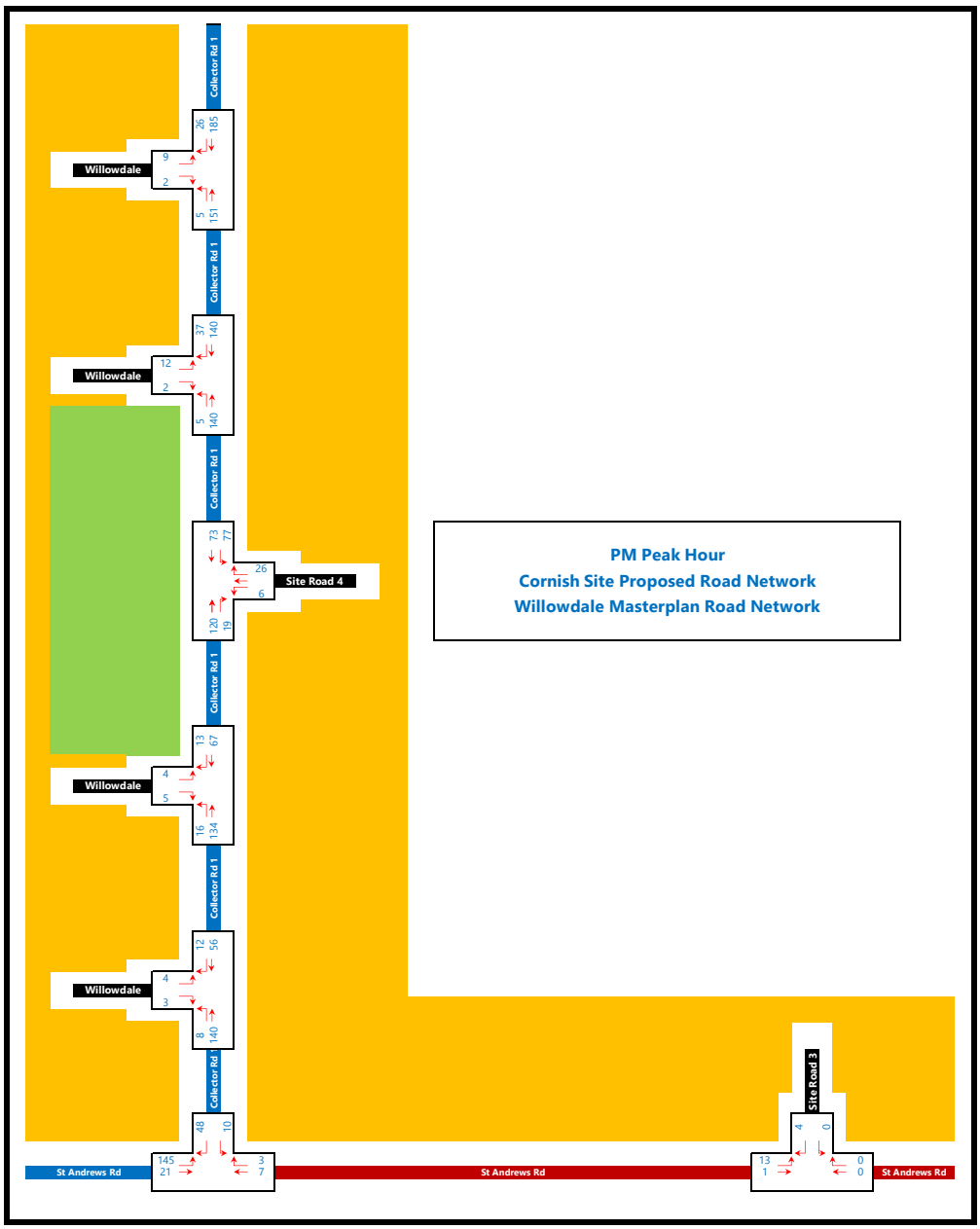


Figure 2.3.3.2 Proposed Road Network Total PM Peak Trips



2.3.4 Key Traffic Flows

The traffic flows in the figures above indicate two-way traffic flows in **Collector Road 1** north of the Site of some 370vph; and two-way flows in **St Andrews Road** west of **Collector Road 1** of some 225vph, i.e. almost identical flows to those forecast with reference to the ELP TA road network. Essentially, the Proposal provides for the retention of a minor additional generation to the intersection of **Camden Valley Way** & **St Andrews Road** for trips to/from the north as a result of direct Site access to **St Andrews Road**.

ARC also notes the potential for a minor further reduction in both Site and Willowdale trips to/from the north via **Collector Road 1**, as some [very] local trips may choose to use the internal local **access roads** which link adjacent sub-divisions north-south, for example via **Site Road 2** between the Site and Willowdale to the immediate north.

2.4 Road Network Assessment Conclusions

2.4.1 External Road Network

Notwithstanding the need to examine the performance of the intersections 'resulting' from the Proposal (and the Willowbank Masterplan) road network – see **Section 2.5** below - it is the conclusion of ARC that the proposed Site road network revisions would have no significant impact on the previously determined (in the ELP TA) trip generation to both **Collector Road 1** north of the Site, or **St Andrews Road** east of **Camden Valley Way**. Similarly, a more detailed interrogation of the modelling data shows that the turning volumes at the intersection of **Camden Valley Way** & **St Andrews Road** are almost identical to [though marginally lower due to the higher lot yield estimates used in] the ELP TA forecast turning volumes.

Given the built-in 'worst case' dwelling yield in the ELP TA modelling, both the CGCP DCP and Proposal road networks would generate flows to the north and south of the Site in no way significantly different from the ELP TA forecasts. Notwithstanding – and though minor – the Proposed road network would retain more of the forecast distribution potential to **Camden Valley Way** north via **St Andrews Road** through the provision of direct access to **St Andrews Road** south of **Collector Road 1**.

2.4.2 Internal Site Road Network

With reference to the total traffic flows reported in **Section 2.3** above, **Site Road 4** would generate a peak flow of approximately 125 – 130vph. This is a flow well below RMS environmental (and general) capacity for a local **access road**; Table 4.6 of the RTA Guide indicates an environmental target flow of 200vph (and a maximum flow of 300vph) for a local street (the equivalent of a local **access road**); the peak flow in **Site Road 4** would therefore be well below the environmental target flow.

While this flow is higher than would be generated under the multiple interface intersection [ELP TA and CGCP DCP] road networks, it is in our opinion a more than appropriate flow to a local **access road**, particularly when developed in accordance with the CGCP DCP **access road** profile.

In all other internal Site **access roads**, flows would be lower than that in **Site Road 4**, and indeed well under 100vph in almost all roads. Again, the provision of **access road** profiles throughout the Site would provide more than appropriately for the forecast internal traffic flows.

2.5 Intersection Performance

2.5.1 Collector Road 1 & Site Road 4

The Proposal will result in a 'concentration' of trips at the intersection of **Collector Road 1** & **Site Road 4**, which would be a three way junction under priority ("Give Way") control. In order to determine the operation of the intersection, ARC has used the SIDRA model, which provides key performance information including level of service, average delays and degree of saturation.

Using the traffic flows shown in **Figure 2.3.3.1** and **Figure 2.3.3.2** – which importantly are not forecast to increase through 2036 (other than further to development additional to that in the ELGP) - the SIDRA modelling provides the following: -

- **AM Peak Hour**
  - Level of Service A
  - Average Delay 3.1 seconds
  - Worst Delay 7.5 seconds
  - Degree of Saturation 0.089

- **PM Peak Hour**
  - Level of Service A
  - Average Delay 2.9 seconds
  - Worst Delay 7.6 seconds
  - Degree of Saturation 0.083

In summary, the intersection of **Collector Road 1** and **Site Road 4** will operate at a very high level of service further to the Proposal, with no significant delays to any approach.

2.5.2 Collector Road 1 & St Andrews Road

The only other significant concentration of trips in the local network would be at the intersection of **Collector Road 1** & **St Andrews Road**; while the total traffic volume at the intersection would be ostensibly identical to a forecast with reference to CGCP DCP, a small percentage would be generated to and fro **St Andrews Road** east of **Collector Road 1**, and thus be opposed trips to the flow from **Collector Road 1**, and specifically to the right turn flow **Collector Road 1** to **St Andrews Road**.

Based on modelling of the intersection as a three way junction under priority ["Give Way" to **St Andrews Road**] control, and using again the traffic flows shown in **Figure 2.3.3.1** and **Figure 2.3.3.2**, the SIDRA modelling provides the following: -

- **AM Peak Hour**
  - Level of Service A
  - Average Delay 6.0 seconds
  - Worst Delay 7.0 seconds
  - Degree of Saturation 0.127

- **PM Peak Hour**
  - Level of Service A
  - Average Delay 5.8 seconds
  - Worst Delay 7.2 seconds
  - Degree of Saturation 0.094

In summary, the intersection of **Collector Road 1** & **St Andrews Road** would operate at a very good level of service well into the future under priority control. Essentially, the opposed flow to/from **St Andrews Road** east remains only moderate, and as such has not significant impact in regard to delaying trips (and particularly right turn trips) from **Collector Road 1**.

The Willowdale Precinct 2 Civil Subdivision Development Application provides for a roundabout to be built at the intersection. The provision of a roundabout is a relatively standard intersection control at the junction of **collector roads** (for example for all collector road junctions within Spring Farm); however, with consideration of the current designation of **St Andrews Road** outside of the 'road hierarchy' – and moreover with reference to the minimal generation to and from **St Andrews Road** south of **Collector Road 1** – there is not in our opinion any immediate necessity for a roundabout. Unlike the **collector road** junctions referred to above in Spring Farm – or at the roundabout intersections of **Collector Road 1** & **Heath Road** - the eastern approach of **St Andrews Road** simply does not generate a '**collector road**' traffic flows.

Notwithstanding – and as touched on in sections above – ARC recognises the potential for the future residential subdivision to the immediate south of the ELGP to have future connection to **St Andrews Road**. Emerald Hills have been approved through the Gateway planning process, and reference to the available 2012 Planning Proposal report for Emerald Hills indicates the potential for a new approach leg to the intersection of **St Andrews Road** & **Collector Road 1**.

If this were to be case, the provision of additional access via **St Andrews Road** (from future development to the east) and a new southern leg to the intersection with **Collector Road 1** would certainly increase the potential demand for a roundabout, not only for appropriate intersection control, but perhaps also as a result of **St Andrews Road** south of **Collector Road 1** actually being upgraded to '**collector road**' status, and therefore forming a **collector road** junction.

Again, the future operation of the intersection under such conditions is outside the scope of this TA, and would necessarily be assessed as part of future detailed investigations for these adjacent developments.

2.6 Traffic Management Proposals

Finally, ARC has examined the need for traffic control management and other measures within the Site.

2.6.1 Intersection Control

As per our recent work in Spring Farm, it is the opinion of ARC that internal three way intersections ("T" Intersections) do not require signage; the prioritisation of traffic is in our opinion patently apparent at such intersections. Conversely, ARC would recommendation the provision of "Give Way" signage at the interface intersections of **Collector Road 1** & **Site Road 4**; and of **St Andrews Road** & **Site Road 3**.

2.6.2 Street Design

As discussed in sections above, internal access roads will be developed in line with the CGCP DCP access road profile. This profile inherently has a built traffic calming potential, allowing for on-street parking which narrows the trafficable lanes, and street tree planting which encloses each road. Moreover, the provision of footpaths on all roads provides for excellent pedestrian access.

3 Conclusions

Further to a detailed assessment of the Proposal, ARC has concluded the following: -

- The Proposal would have no impact on the provision of public transport, with internal bus services forecast to operate along **Collector Road** 1 in an identical manner to that proposed in the CGCP DCP and ELP TA.

- The Proposal would retain CGCP DCP road profiles – and specifically the provision of **access roads** throughout the Site. The proposed new **access road** link to Willowdale immediately north of the Site would increase pedestrian and cycle access to the central ELGP reserve/recreation area.

- The Proposal would not increase Site trip generation above limits provided for in the CGCP DCP, nor above the generation forecasts provided in the ELP TA, upon which traffic planning for the Site (and broader ELGP) is based.

- The trip distribution of the Site further to the Proposal would be almost identical to the distribution determined in the ELP TA, specifically as a result of the introduction of an access link between the Site and **St Andrews Road** east of **Collector Road 1**.

- The key interface intersections of **Collector Road 1** & **Site Road 4**, and **St Andrews Road** & **Site Road 3**, will operate at a good level of service for the foreseeable future, with minimal delays and significant spare capacity.

- The key external intersection of **Collector Road 1** & **St Andrews Road** will operate at a good level of service as a priority intersection for the foreseeable future.