TRAFFIC IMPACT ASSESSMENT

RESIDENTIAL SUBDIVISION
WATERFORD COUNTY (STAGES 81, 82,83)

PROPOSED LOT 2 OF LOT 112 DP734271, LOT 6121 DP1268036, LOT 6140 DP1284398, LOT 3001 DP1264314, LOT 2726 DP1237666, LOT 2531 DP1224018, LOT 2425 DP1224017 & LOT 4 DP1222785

24 DUCKENFIELD ROAD, 29 STILLWATER PARADE, 40 GOLDRING STREET, 3 CALDERA STREET, 18 DARKMOUTH STREET, 16 DARKMOUTH STREET, 9 ROCKMASTER STREET, EMPEROR PARADE & 261 SETTLERS BOULEVARD, CHISHOLM

PREPARED FOR: AVID PROPERTY GROUP

FEBRUARY 2023

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TRAFFIC IMPACT ASSESSMENT
AVID PROPERTY GROUP

WATERFORD COUNTY RESIDENTIALSUBDIVISION STAGES 81,82 & 83
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Intersect Traffic Pty Ltd (ABN: 43 112 606 952)

Address:
16 Mount Harris Drive
Maitland Vale NSW 2320
PO Box 268
East Maitland NSW 2323

Contact:
(Mob) 0423 324 188
Email: jeff@intersecttraffic.com.au

QUALITY ASSURANCE

This document has been prepared, checked, and released in accordance with the Quality Control Standards established by Intersect Traffic Pty Ltd.

Issue	Date	Description	By
A	15/01/23	Draft	JG
B	19/01/23	Edit	JG
C	22/02/23	Final Proof / Client Comments	JG
D	22/02/23	Approved	JG

This document has been authorised by

Date 22nd February 2023

Disclaimer

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1.0 INTRODUCTION

Intersect Traffic Pty Ltd (Intersect Traffic) was engaged by ADW Johnson on behalf of Avid Property Group to undertake a traffic impact assessment for a proposed 282 lot residential subdivision on proposed Lot 2 of Lot 112 DP734271, Lot 6121 DP1268036, Lot 6140 DP1284398, Lot 3001 DP1264314, Lot 2726 DP1237666, Lot 2531 DP1224018, Lot 2425 DP1224017 & Lot 4 DP1222785, 24 Duckenfield Road, 29 Stillwater Parade, 40 Goldring Street, 3 Caldera Street, 18 Darkmouth Street, 16 Darkmouth Street, 9 Rockmaster Street, Emperor Parade & 261 Settlers Boulevard, Chisholm.

The subdivision is within the Waterford County residential estate being stages 81, 82 & 83 of the residential estate. It is in the north-western corner of the site with connections to the existing Fontana Street, Malachite Street, Goldring Street, Caldera Street, Dasher Way, Spotwing Street, Aquata Street, Darkmouth Street, Emperor Parade, Rockmaster Street and Stillwater Parade. Access to McFarlanes Road and Raymond Terrace Road are provided from Settlers Boulevard which runs immediately to the east of the site. All new subdivision roads will be constructed to Maitland City Council requirements. The proposed subdivision plans are shown in ***Attachment A***. The land area covered in the subdivision is within the Thornton North Urban Release Area.

This report is required to support a development application to Maitland City Council as the consent authority. The report presents the findings of the traffic assessment and includes the following.

1. An outline of the existing situation near the site.
2. An assessment of the traffic impacts of the proposed development including the predicted traffic generation and its impact on existing road and intersection capacities.
3. Reviews parking, public transport, pedestrian, and cycle way requirements for the proposed development, including assessment against Council and Australian Standards.
4. Presentation of conclusions and recommendation.

2.0 SITE DESCRIPTION & LOCATION

The subject site is currently vacant rural land. The site is bounded by low lying rural land to the north and northwest and major sections of newly constructed low density residential dwellings within the Waterford County residential estate to the north, east and south. The development site is approximately: 1.7 kilometres from Raymond Terrace Road south of the site and 400 metres west of McFarlane's Road both via Settlers Boulevard. The development site's location within the context of surrounding buildings, land and roads is shown in the location plan provided as ***Figure 1***, below.

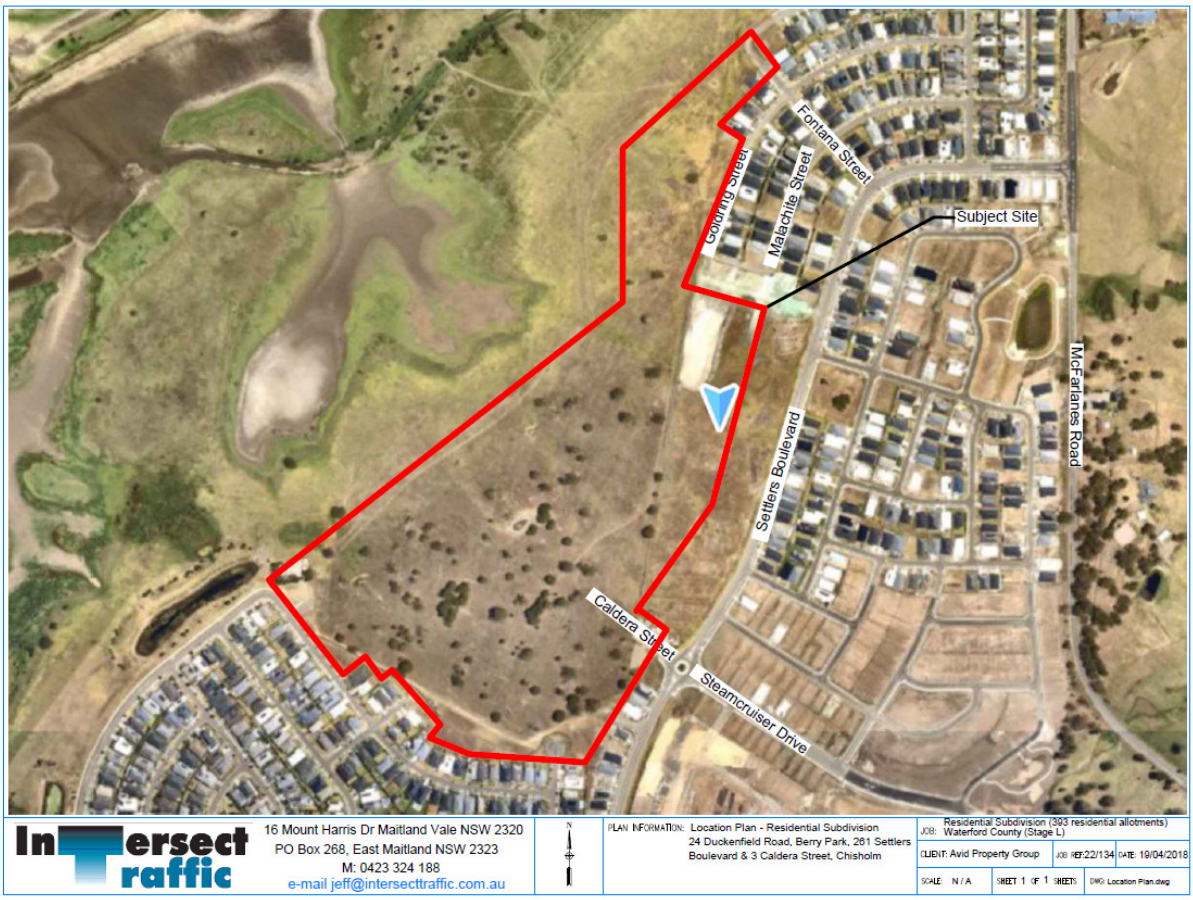


Figure 1 – Site Location

The site has the following property descriptors:

- Formal land titles of:
  - Proposed Lot 2 of Lot 112 DP 734721.
  - Lot 6121 DP1268036.
  - Lot 6140 DP1284398.
  - Lot 3001 DP 1264314.
  - Lot 2726 DP1237666.
  - Lot 2531 DP1224018.
  - Lot 2425 DP1224017; and
  - Lot 4 DP1222785.
- 24 Duckenfield Road, 29 Stillwater Parade, 40 Goldring Street, 3 Caldera Street, 18 Darkmouth Street, 16 Darkmouth Street, 9 Rockmaster Street, Emperor Parade & 261 Settlers Boulevard, Chisholm.
- Site development area of approximately 30 ha; and
- Land zoning of R1 – General Residential and C2 Environmental Conservation in accordance with Maitland LEP (2011).

The site currently has road frontages to Fontana Street, Malachite Street, Goldring Street, Caldera Street, Dasher Way, Spotwing Street, Aquata Street, Darkmouth Street, Emporer Parade, Rockmaster Street and Stillwater Parade with access provided by these streets. ***Photographs 1 & 2*** shows the existing site conditions and the Settlers Boulevard / Caldera Street / Steamcruiser Drive roundabout connection to the site.

Photograph 1 – Development site.

Photograph 2 – Settlers Boulevard / Caldera Street / Steamcrusier Drive roundabout.

3.0 EXISTING ROAD NETWORK

In terms of the local road network, the roads most likely to be impacted by the additional traffic generated by the proposed development will be Raymond Terrace Road, Dragonfly Drive, Harvest Boulevard, Heritage Drive, Settlers Boulevard and McFarlanes Road.

Raymond Terrace Road near the site is a classified main road (MR104) under the care and control of Transport for NSW (TfNSW) providing a single travel lane in both directions constructed to a typical rural standard. Lane widths are between 3.2 and 3.5 metres. Raymond Terrace Road performs the function of a sub-arterial road connecting Maitland to Raymond Terrace. On inspection the road was observed to be in good condition with an 80 km/h speed zoning along the site frontage. ***Photograph 3*** shows Raymond Terrace Road near the site.

Photograph 3 – Raymond Terrace Road at Settler's Boulevard intersection.

Settler's Boulevard, Harvest Boulevard, Heritage Drive and Dragonfly Drive are all local roads under the care and control of Maitland City Council which under a functional road hierarchy perform the function of a collector road as they collect and distribute traffic from the Waterford County and Harvest residential estates to the sub-arterial road network at Raymond Terrace Road. On inspection these roads were found to be two-lane two-way urban roads with kerb and gutter and longitudinal drainage and parking lanes on both sides of the road. Travel lane widths are in the order of 3.5 metres while parking lanes are generally 2 to 3.4 metres wide. A 50 km/h speed zoning exists within the residential estates except where the variable school zones exist near the catholic primary and high schools in Heritage Drive. The roads being relatively new construction are all in good condition. Dragonfly Drive and Harvest Boulevard have on-road cycle lanes along both sides of the road while off-road cycleways exist within Heritage Drive and Settler's Boulevard. An extensive concrete pedestrian footpath exists within each road reserve on both sides of the collector roads and one side of the road for most local roads except for Settler's Boulevard between Heritage Drive and Raymond Terrace Road. Settlers Boulevard in this location also has additional turning lanes provided at intersections. ***Photograph 4*** below shows Dragonfly Drive near the site, ***photograph 5*** below shows Heritage Boulevard near the site and ***Photograph 6*** below shows Settlers Boulevard near Raymond Terrace Road.

Photograph 4 – Dragonfly Drive near the site.

Photograph 5 – Harvest Boulevard.

Photograph 6 – Settlers Boulevard near site.

McFarlanes Road near the site connects Chisholm to Morpeth and is a local collector road under a functional road hierarchy classification. As such it is under the care and control of the Maitland City Council providing a single travel lane in both directions constructed to a typical sealed rural standard. Lane widths are between 3.2 and 3.5 metres with 1.5 to 2.0 metre shoulders. On inspection the road was observed to be in good condition with an 80 km/h speed zoning along the site frontage. ***Photograph 7*** shows McFarlanes Road at the Settlers Boulevard intersection.

Photograph 7 – McFarlanes Road / Settlers Boulevard intersection.

4.0 ROAD NETWORK IMPROVEMENTS

As part of the original planning for the Thornton North Urban Release Area a traffic study was undertaken by Parsons Brinckerhoff (2003) to inform the Thornton North Masterplan and it is understood this report has been recently reviewed by Maitland City Council. This study assessed the regional transport and traffic impacts of the urban release area and identified the required road and intersection upgrades required to mitigate the traffic impacts. These road and intersection upgrades were then included within the Thornton North S94 Contributions Plan so that all developers could pay their fair and reasonable contribution to the works.

Administration of the S94 developer contributions plan is the responsibility of Maitland City Council who must also organise and plan the construction works once development has reached the stage that triggers the required works. It is concluded that for this development payment of the required S94 developer contributions ensures that the external road network is upgraded to a suitable standard to cater satisfactorily for additional traffic generated by the subdivision. The latest schedule of works for the S94 contribution plan sourced from Maitland City Council's website is reproduced below. It is also noted the S94 developer contributions plan includes for additional cycleways in the area as shown below.

THORNTON NORTH CYCLEWAYS

Location			Est. Capital Cost	Est. Land Cost	Total Cost	Estimated Timing
Thornton R2	TN36	Somerset Dve to Raymond Terrace Road	$180,300	$0	$180,300	1500 lots
Thornton R2 - Supp	TN36S	Thornton Station to Raymond Terrace Road	$412,300	$0	$412,300	3000 lots
Scenic S5	TN37	Metford Station to Raymond Terrace Road	$250,000	$20,000	$270,000	4500 lots
TOTAL			$842,600	$20,000	**$862,600**	

THORNTON NORTH ROADS AND TRAFFIC FACILITIES

Services / Facilities		Location	Description	Est. Capital Cost	Est. Land Cost	Total Cost	Estimated Timing
Road Upgrades	TN38	Raymond Terrace Road	Intersection 4 to Haussman Drive	$5,992,357	$767,604	$6,759,961	Stage 1
	TN39		Haussman to The Boulevarde	$10,896,727	$303,002	$11,199,729	Stage 1
	TN40		The Boulevarde to Government Road	$6,969,829	$1,212,007	$8,181,836	Stage 2
	TN41		Government Road to McFarlanes Road	$6,984,612	$686,804	$7,671,416	Stage 2
	TN42	Haussman Drive	Raymond Terrace Road to Railway Avenue	$14,503,670	$3,313,871	$17,817,541	Stage 1
	TN44	Thornton Road	Railway Avenue and Glenwood Drive	$7,151,104	$59,828	$7,210,932	Stage 1
	TN45	McFarlanes Road	Government Road to TN52	$6,349,640	$579,568	$6,929,208	Stage 2
	TN46	Government Road	Raymond Terrace Road to Sommerset Drive	$1,674,814	$246,651	$1,921,465	Stage 1
Intersections	TN47	Raymond Terrace Road / New Intersection West		$1,216,758	$0	$1,216,758	Stage 1
	TN48	Haussman Drive / Raymond Terrace Road		$2,020,919	$0	$2,020,919	Stage 1
	TN49	The Boulevarde / Raymond Terrace Road		$1,246,019	$0	$1,246,019	Stage 1
	TN50	Raymond Terrace Road / Government Road		$2,140,733	$0	$2,140,733	Stage 2
	TN51	Raymond Terrace Road / McFarlanes Road		$1,432,678	$0	$1,432,678	Stage 2
	TN52	McFarlanes Road / The Boulevarde		$1,179,791	$0	$1,179,791	Stage 2
	TN53	Haussman Drive / Taylor Avenue		$1,981,514	$4,944	$1,986,458	Stage 1
	TN54	Railway Avenue / Glenroy Street		$3,794,138	$2,197,475	$5,991,613	Stage 1
	TN55	Huntingdale Drive / Thornton Drive		$1,137,841	$0	$1,137,841	Stage 1
	TN56	Thornton Road / Glenwood Drive		$3,678,586	$498,199	$4,176,785	Stage 1
	TN57	Government Road / New Intersection		$641,324	$0	$641,324	Stage 1
	TN58	Government Road / New Intersection		$641,324	$0	$641,324	Stage 1
New Roads	TN58	The Boulevarde (additional 4.0m wide median)		$1,354,847	$754,000	$2,108,847	Stages 1,2
	TN59	Fringe Road (additional 6.0m reserve, 1.5m for shared way and 2.5m parking lane)		$2,583,849	$120,000	$2,703,849	Stages 1,2
TOTAL				**$85,573,074**	**$10,743,953**	**$96,317,027**	

It is noted that the S94 contributions plan for the Thornton North area provides for contributions to the following road upgrades relevant to the road network around the site.

1. Raymond Terrace Road – upgrading to four lanes.
2. McFarlanes Road – upgrading.
3. Raymond Terrace Road / Haussman Drive intersection
4. Raymond Terrace Road / McFarlanes Road intersection
5. McFarlanes Road / The Boulevard intersection.

Note: - works at the Settlers Boulevard and Harvest Boulevard intersections with Raymond Terrace Road have already been completed as part of previous development works and the development of the Sophia Waters Residential Estate has included upgrading of the Raymond Terrace Road / McFarlanes Road intersection and parts of McFarlanes Road.

5.0 TRAFFIC VOLUMES

Existing traffic volumes on Raymond Terrace Road, Harvest Boulevard and Settlers Boulevard have been determined from manual traffic counts carried out by Northern Transport Planning and Engineering (NTPE) on behalf of Intersect Traffic at the Raymond Terrace Road / Settler's Boulevard signalised intersection and at the Raymond Terrace Road / Harvest Boulevard signalised intersection on Tuesday 10th October 2017 during peak AM and PM traffic periods between 8 am and 9 am and between 4.45 pm and 5.45 pm, respectively. Intersect Traffic also undertook traffic counts at the new Settlers Boulevard / McFarlanes Road T-intersection on Monday 12th December 2022. To represent the traffic in 2022 the 2017 peak hour count volumes have been increased by a 3 % estimated traffic growth per annum for 5 years. Predicted 2032 traffic volumes have also been calculated using a 3 % per annum background traffic growth rate representative of development growth within Waterford Estate and the Thornton North URA. The traffic count data collected during these counts are shown in ***Attachment B***. The two-way mid-block existing traffic volumes calculated from this data are shown below in ***Table 1.***

Table 1 – Existing and future AM & PM peak hour traffic volumes.

Road Section Year Period	2023AM (vtph)	2023PM (vtph)	2033AM (vtph)	2033PM (vtph)
Raymond Terrace Road (west of Harvest Boulevard)	1,866	1,928	2,508	2,591
Raymond Terrace Road (east of Harvest Boulevard)	1,913	1,943	2,571	2,611
Harvest Boulevard (north of Raymond Terrace Road)	116	126	156	170
Raymond Terrace Road (west of Settlers Boulevard)	1,428	1,395	1,919	1,874
Raymond Terrace Road (east of Settlers Boulevard)	1,186	1,159	1,594	1,558
Settlers Boulevard (north of Raymond Terrace Road)	813	583	1,092	784
McFarlanes Road north of Settlers Boulevard	189	129	254	173
McFarlanes Road south of Settlers Boulevard	130	119	175	160
Settlers Boulevard west of McFarlanes Road	105	76	141	102

6.0 ROAD CAPACITY

The capacity of urban roads is generally determined by the capacity of intersections. However, Table 4.3 of the *RTA's Guide to Traffic Generating Developments* provides some guidance on mid-block capacities for urban roads for a level of service (LoS) C. This table is reproduced below.

Table 4.3
Typical mid-block capacities for urban roads with interrupted flow

Type of Road	One-Way Mid-block Lane Capacity (pcu/hr)	
Median or inner lane:	Divided Road	1,000
	Undivided Road	900
Outer or kerb lane:	With Adjacent Parking Lane	900
	Clearway Conditions	900
	Occasional Parked Cars	600
4 lane undivided:	Occasional Parked Cars	1,500
	Clearway Conditions	1,800
4 lane divided:	Clearway Conditions	1,900

Source: - RTA's Guide to Traffic Generating Developments (2002).

It is noted however that for major collector and arterial roads it is still acceptable to have a LoS D operating with lane capacities up to 1,100 vtph.

Therefore, based on the information provided above the following road capacities are determined.

- Raymond Terrace Road as a major sub-arterial road would have a two-way mid-block capacity of up to 2,200 vtph if a level of service (LoS) D was considered acceptable;
- Settler's Boulevard / Harvest Boulevard / McFarlanes Road as collector roads would have a two-way mid-block capacity of up to 1,800 vph on the assumption that a LoS C was desirable on local roads.

The road capacities adopted in this assessment for the local road network impacted by this development are therefore as shown below in ***Table 2***.

Table 2 - Adopted Road Capacities

Street	Two Way Road Capacity (vph)
Raymond Terrace Road LoS D	2,200
Settlers Boulevard LoS C	1,800
Harvest Boulevard LoS C	1,800
McFarlanes Roade LoS C	1,800

The highest peak two-way traffic counts in 2023 for Raymond Terrace Road are 1,943 vtph, for Settlers Boulevard is 813 vtph, for Harvest Boulevard is 126 vtph and McFarlane's Road is 189 vtph (refer to ***Section 5***). These 2023 traffic volumes are well below all the relevant road network capacity thresholds shown in ***Table 2***. Therefore, based on the available traffic data it can be concluded that there is spare mid-block two-way road capacity within the local and state road network to cater for additional development. It is noted that Raymond Terrace Road does reach up to 2,611 vtph in 2033 which is in excess of the determined two-way mid-block road capacity for the road. Therefore prior to 2033 Raymond Terrace Road will need to be widened to provide additional travel lanes. However, this road upgrade is already identified in the Thornton North developer contributions plan and this development will contribute to this upgrading through the developer contributions paid for the subdivision.

7.0 ALTERNATE TRANSPORT MODES

Hunter Valley Buses operates service route 189 Stockland's Greenhills to Thornton and route 184 Stocklands Greenhills to Morpeth (***Figure 2*** below) within the vicinity of the development site. Route 189 runs along Raymond Terrace Road north along Harvest Boulevard to Dragonfly Drive then to Settlers Boulevard and onto Raymond Terrace Road. The nearest bus stops to the site would be in Dragonfly Drive approximately 120 metres west of Settlers Boulevard (see ***Photograph 8*** below). These are approximately 400 metres from the site. However, with further development of Waterford County this route is likely to change, and bus stops have been provided within Settlers Boulevard in the newer parts of the subdivision including opposite the site. Similarly, the Morpeth services which loop around Swan Street, Edward Street and James Street could be extended to the proposed development in the future if there was additional demand for the service.

This existing service provides access for residents to the major retail, commercial and medical facilities in the area as well as providing connection to local train stations on the Hunter Line.

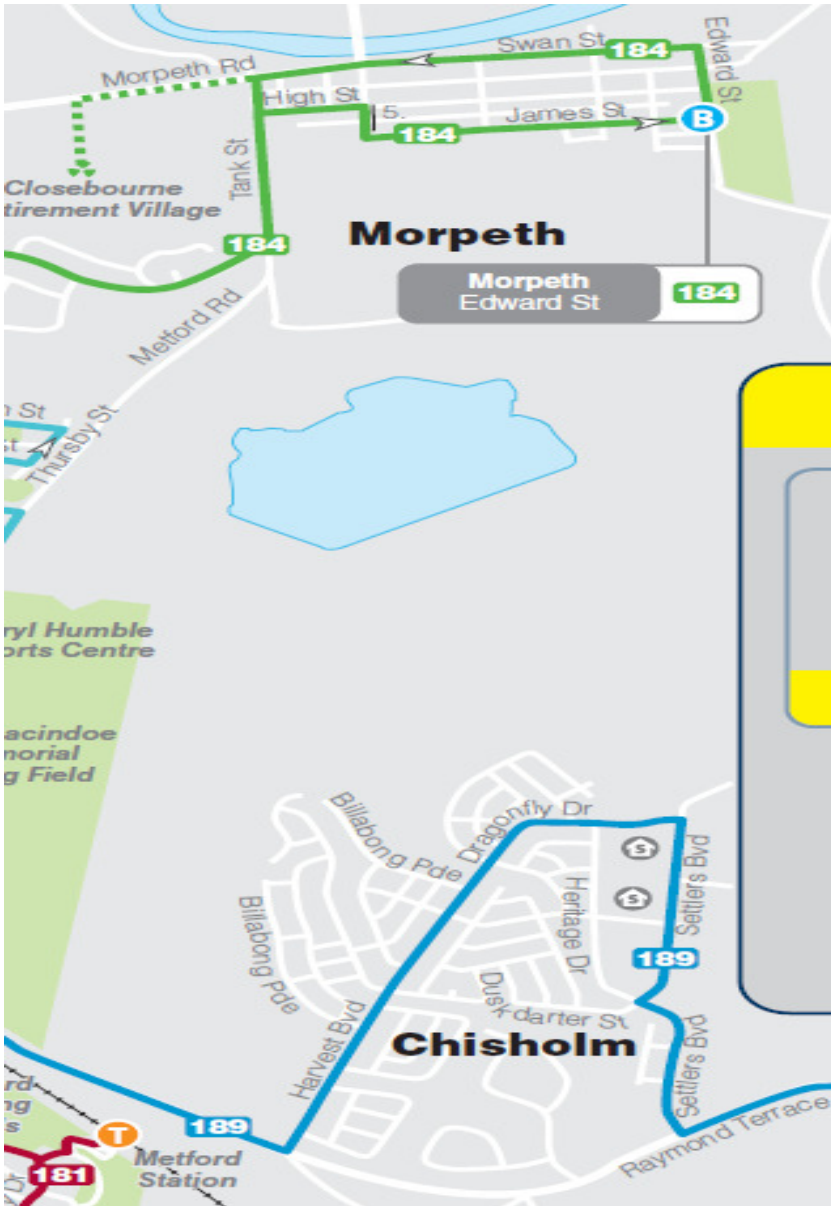


Figure 2 – Hunter Valley Buses Service Routes 184 & 189

An existing off road shared pedestrian / bicycle path runs along the eastern side of Settlers Boulevard which connects to the local Catholic schools and the future commercial precinct in Chisholm whilst also connecting to similar pathways in Dragonfly Drive and Heritage Drive thus connecting to existing nearby bus stops and to Raymond Terrace Road and McFarlanes Road. A 1.2 metre wide concrete pedestrian pathway exists along the western side of Settlers Boulevard both north and south of the site which will be extended along Settlers Boulevard to connect to each other as part of future development work for an already approved adjoining residential development. On-road cycle lanes are also provided on both sides of Settlers Boulevard, Dragonfly Drive and Harvest Boulevard near the site as well as on Raymond Terrace Road through the Settlers Boulevard and Harvest Boulevard signalised intersections and on McFarlanes Road through the Settlers Boulevard intersection. Pedestrian footpaths in the area are generally provided on both sides of the road along the collector roads and on one side only on the local streets. Typical pedestrian and cycle infrastructure on Settlers Boulevard is shown in ***Photographs 2, 4, 5, 6 & 7*** above.

Overall, it is considered that both the Waterford County residential estate has an extensive network of constructed concrete footpaths and on and off-road cycleways that would encourage this alternative transport mode trip making within these residential estates.

Photograph 8 – Bus stops Dragonfly Drive – west of Settlers Boulevard.

8.0 DEVELOPMENT PROPOSAL

The proposed development is a 282-lot residential subdivision of proposed Lot 2 of Lot 112 DP734271, Lot 6121 DP1268036, Lot 6140 DP1284398, Lot 3001 DP1264314, Lot 2726 DP1237666, Lot 2531 DP1224018, Lot 2425 DP1224017 & Lot 4 DP1222785, 24 Duckenfield Road, 29 Stillwater Parade, 40 Goldring Street, 3 Caldera Street, 18 Darkmouth Street, 16 Darkmouth Street, 9 Rockmaster Street, Emperor Parade & 261 Settlers Boulevard, Chisholm being stages 81, 82 & 83 of the Waterford County residential estate. The subdivision plan showing the proposed internal road network including connection to the existing external road network are shown in ***Attachment A***.

All new internal subdivision roads, improvements to existing roadways, footways and cycleways will be constructed to Maitland City Council requirements (Manual of Engineering Standards). The internal roads have the majority of internal intersections as priority give-way controlled T-intersections which not only provides suitable intersection control but represents best practice regarding road safety for subdivision design. There are approximately four (4) give way cross-intersections proposed on low volume streets that would operate with uninterrupted flow conditions even during peak traffic periods. Cross intersection connections on the collector roads are constructed as roundabouts to ensure suitable efficiency with larger traffic volumes during peak periods.

Access to the subdivision will be made available via the new subdivision roads which will connect the subject site from the existing Settlers Boulevard and other local streets constructed as part of previously approved subdivisions. The proposed layout and surrounding proposed and future development will allow residents to access McFarlane's Road to the north and Raymond Terrace Road to the south via either Dragonfly Drive and Harvest Boulevard or via Settler's Boulevard.

9.0 TRAFFIC GENERATION

The *RTA's Guide to Traffic Generating Development's* provides specific advice on the traffic generation potential of various land uses. However, the RMS released a Technical Direction in 2013 (TDT 2013/4) releasing the results of updated traffic surveys and as a result amended land use traffic generation rates. Regarding low density residential dwellings, the following amended advice is provided within the Technical Direction.

Rates.

Daily vehicle trips = 10.7 per dwelling in Sydney, 7.4 per dwelling in regional areas
Weekday average evening peak hour vehicle trips = 0.99 per dwelling in Sydney (maximum 1.39), 0.78 per dwelling in regional areas (maximum 0.90).
Weekday average morning peak hour vehicle trips = 0.95 per dwelling in Sydney (maximum 1.32), 0.71 per dwelling in regional areas (maximum 0.85).
*(The above rates do **not** include trips made internal to the subdivision, which may add up to an additional 25 %).*

Notwithstanding, Maitland City Council have previously advised for developments in the Thornton North Urban Release Area that they require the following rates to be used.

- 9.0 trips per dwelling.
- 0.85 vtph – AM weekday peak; and
- 0.9 vtph – PM weekday peak.

Therefore, based on this advice and noting the subdivision provides 282 residential allotments the likely traffic generation figures (rounded up) for the proposal are as follows.

Daily vehicle trips	= 282 x 9 = **2,538 vtpd.**
PM peak hour	= 282 x 0.9 = **254 vtph; and**
AM peak hour	= 282 x 0.85 = **240 vtph.**

These additional traffic volumes resulting from the development are adopted in this assessment.

10.0 TRIP DISTRIBUTION

Before carrying out any traffic assessment the additional external peak hour traffic generated by the development needs to be distributed through the adjoining road network. In distributing traffic onto the existing road network a review of the subdivision plan and an assessment of likely origins and destinations as well as a review of manual traffic count data collected at the Raymond Terrace Road / Settlers Boulevard, Raymond Terrace Road / Harvest Boulevard intersections and the Raymond Terrace Road / McFarlanes Road has been made. Further an afternoon traffic count at the Settler's Boulevard / Fontana Street intersection in December 2022 was undertaken to determine the trip distribution to the north and south along Settlers Boulevard and the following trip distribution is considered appropriate.

- In the AM peak 80% of traffic is outbound while in the PM peak 70% of traffic is inbound.
- 60% of traffic will utilise Settlers Boulevard south for access at Raymond Terrace Road.
- 20% will utilise Settlers Boulevard / Dragon Fly Drive / Harvest Drive for access at the Raymond Terrace Road.
- 20% of traffic will utilise Settlers Boulevard north for access at McFarlanes Road.
- Traffic at Settlers Boulevard south will be split 50:50 east and west on Raymond Terrace Road, and
- All traffic at Harvest Boulevard will have origin / destinations via Raymond Terrace Road west towards Maitland.
- At McFarlanes Road 70% of traffic has an origin / destination north.
- 70% of traffic will utilise the Settlers Boulevard / Caldera Street / Steamcruiser Drive roundabout for access to Settlers Boulevarde.
- 15% of traffic will utilise Fontana Street to access Settlers Boulevard with origin / destination towards McFarlanes Road; and
- 15% of traffic will utilise local streets to the west of the site to access Dragonfly Drive with origin / destination to Raymond Terrace Road via Harvest Boulevard.

Whilst there may be other routes used the amount of traffic using these routes is likely to be insignificant for assessment purposes. The resulting development traffic trip distribution is shown in ***Figure 3*** below.

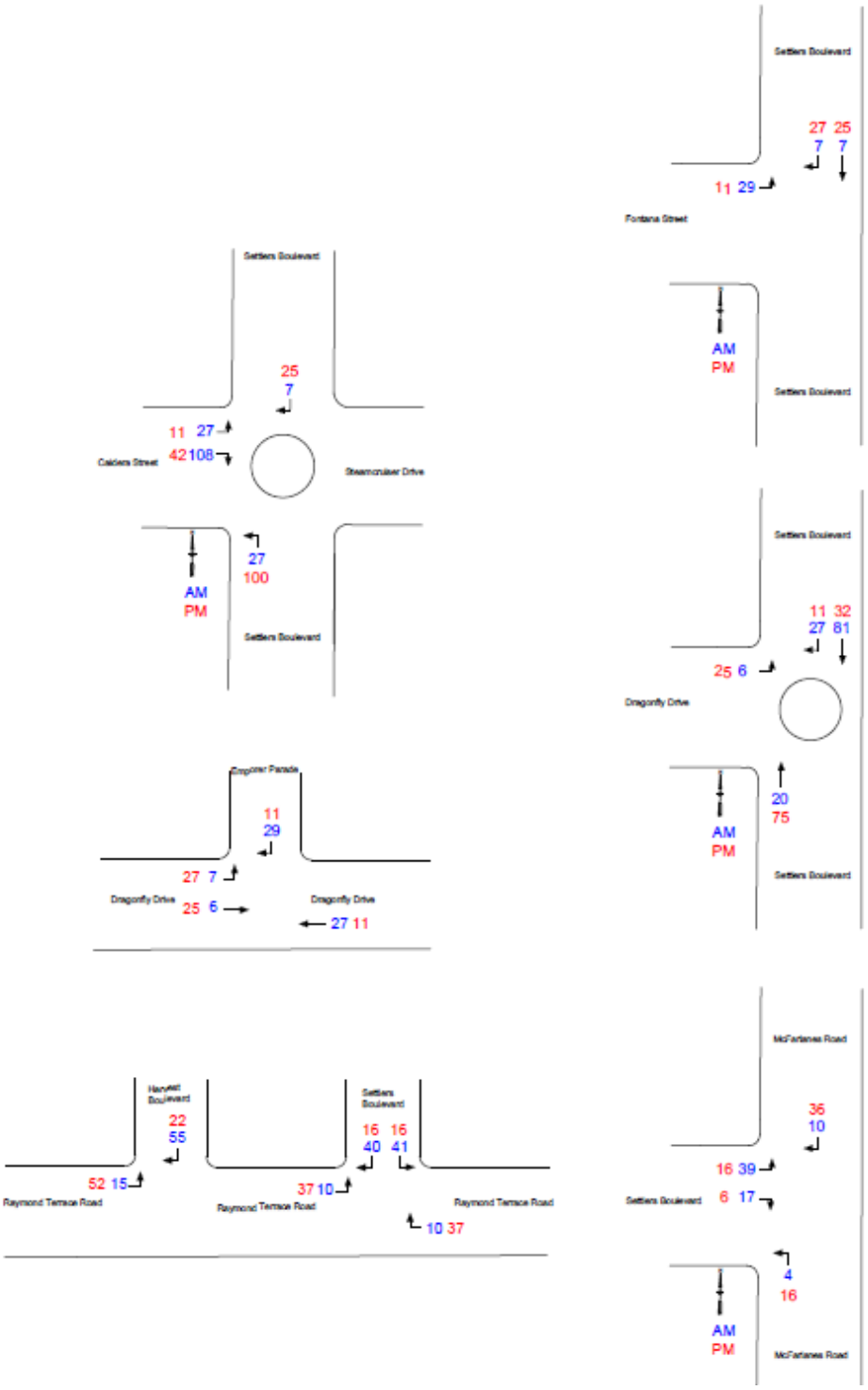


Figure 3 – Development Traffic Trip Distribution

11.0 TRAFFIC IMPACTS OF DEVELOPMENT

11.1 Road Network Capacity

It has previously been shown in ***Section 6*** of this report that the local road network is currently operating within its technical mid-block capacity. The existing and forecast traffic volumes collected and determined for the local network referred to in ***Section 5*** are impacted by the additional development generated for this development as per ***Figure 3***.

The addition of the traffic generated from the development onto the existing traffic volumes determined in ***Section 5*** will not result in the capacity thresholds determined in ***Section 6*** to be reached. With 3 % per annum traffic growth on the road network added to the development traffic over a ten-year period these road capacity thresholds are still not reached. The 3% p.a. background traffic growth has been used to account for normal background traffic growth (1.5% p.a.) plus future development of other areas of the Thornton North urban release area. This is demonstrated in ***Table 3*** below for the both the AM and PM peaks.

Table 3 - Road Capacity Assessment

Road Section Year Period	Capacity (vtph)	2023AM (vtph)	2023PM (vtph)	2033AM (vtph)	2033PM (vtph)	Development AM (vtph)	Development PM (vtph)
Raymond Terrace Road (west of Harvest Boulevard)	2200	1,935	2,006	2,577	2,669	69	78
Raymond Terrace Road (east of Harvest Boulevard)	2200	1,913	1,943	2,571	2,611	0	0
Harvest Boulevard (north of Raymond Terrace Road)	1800	185	200	225	244	69	74
Raymond Terrace Road (west of Settlers Boulevard)	1800	1,478	1,448	1,969	1,927	50	53
Raymond Terrace Road (east of Settlers Boulevard)	1800	1,237	1,212	1,645	1,611	51	53
Settlers Boulevard (north of Raymond Terrace Road)	1800	914	689	1,193	890	101	106
McFarlanes Road north of Settlers Boulevard	1,800	238	181	303	225	49	52
McFarlanes Road south of Settlers Boulevard	1,800	151	141	196	182	21	22
Settlers Boulevard west of McFarlanes Road	1800	174	150	210	176	69	74

Therefore, it can be concluded that the local and state road network subject to suitable intersection controls being in place has sufficient spare capacity to cater for the proposed development. However, Raymond Terrace Road will reach its capacity by about 2028 and will need to be widened as proposed in the developer contributions plan prior to 2028.

11.2 Intersection Capacity

The major intersections impacted by this development are:

- Raymond Terrace Road / Harvest Boulevard signalised intersection.
- Raymond Terrace Road / Settlers Boulevard signalised intersection; and
- McFarlanes Road / Settlers Boulevard T-intersection.

There will also be some impact on the Raymond Terrace Road / Haussman Drive, Raymond Terrace Road / McFarlanes Road and Raymond Terrace Road / Government Road intersections because of this development however the impact is deemed to be minor compared to the above intersections and demonstration the above listed Waterford County access intersections are not impacted by the development would suffice for this assessment. Further the external Raymond Terrace Road intersections are all identified within the Thornton North Developer Contributions Plan works schedule for upgrading therefore the payment of developer contributions by this development would represent its fair and reasonable contribution to any upgrading works, noting the Raymond Terrace Road / McFarlanes Road intersection was upgraded by the Sophia Waters residential development and the Raymond Terrace Road / Government Road intersection is to be upgraded by Maitland City Council in the near future. As such, no further analysis of these

intersections would be required particularly if the assessment of the Raymond Terrace Road / Harvest Boulevard and Raymond Terrace Road / Settlers Boulevard intersections show the development has no adverse impact on the operation of these intersections.

Assessment of the capacity of the three identified key intersections has been undertaken using the Sidra Intersection 9.1 intersection modelling software. This software package predicts likely delays, queue lengths and the levels of service that will occur at intersections. Assessment is then based on the level of service (LoS) requirements of TfNSW shown below:

Table 4.2
Level of service criteria for intersections

Level of Service	Average Delay per Vehicle (secs/veh)	Traffic Signals, Roundabout	Give Way & Stop Signs
A	< 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays & spare capacity	Acceptable delays & spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity & accident study required
E	57 to 70	At capacity; at signals, incidents will cause excessive delays Roundabouts require other control mode	At capacity, requires other control mode

Source: - RTA's Guide to Traffic Generating Developments (2002).

Assumptions made in this modelling were.

- Traffic distribution from the development is as per ***Figure 3.***
- Modelling carried out for 10-year horizon period expected to cater for full development of the proposed subdivision.
- Background traffic growth assumed to be 3% per annum on Raymond Terrace Road and McFarlanes Road being representative of normal background traffic growth plus likely additional traffic generated by other developments within the Thornton North urban release area.
- The Sidra Intersection models used were those developed by Intersect Traffic for the currently approved stages for the Waterford County estate in 2018, therefore already contain the additional traffic from the full development of these approved stages. Traffic generated from this development were added to these models therefore background traffic growth on both Settlers Boulevard and Harvest Boulevard does not need to be considered in the modelling as all future traffic is already included in the modelling. Therefore, background traffic growth on Harvest Boulevard and Settlers Boulevard in the modelling has been set at 0%.
- All intersections were modelled as currently constructed.

The results of the modelling for the intersections are summarised in ***Tables 4 to 6*** below. The Sidra movement summary tables are provided in ***Attachment C***.

Table 4 – Sidra Results (all vehicles) – Raymond Terrace Road / Harvest Boulevard

Modelled Peak	Degree of Saturation (v/c)	Average Delay (s)	Level of Service	95% back of queue length (cars)
2023 AM + development	0.778	28.0	B	21.2
2023 PM + development	0.881	28.7	C	31.8
2033 AM + development	0.910	48.6	D	36.5
2033 PM + development	1.040	52.3	D	73.7

This modelling shows the intersection will operate satisfactorily post development with average delays, LoS and 95% back of queue lengths all remaining at acceptable levels based on the TfNSW assessment criteria listed above. However, with 10 years background traffic growth on Raymond Terrace Road the intersection is likely to reach capacity by 2023. However, with the widening of Raymond Terrace Road to four lanes under the developer contributions plan it would give opportunity to provide a left turn slip lane and an additional right turn lane on Harvest Boulevard that would improve the intersection performance and provide additional capacity within the intersection. This could be undertaken with the Raymond Terrace Road widening works.

Table 5 – Sidra Results (all vehicles) – Raymond Terrace Road / Settlers Boulevard

Modelled Peak	Degree of Saturation (v/c)	Average Delay (s)	Level of Service	95% back of queue length (cars)
2023 AM + development	0.616	25.8	B	11.4
2023 PM + development	0.631	24.9	B	12.3
2033 AM + development	0.728	28.6	C	17.8
2033 PM + development	0.737	26.0	B	18.8

This modelling shows that the intersection would operate satisfactorily during both the AM and PM peak periods post development and would continue to do so post development and with 10 years traffic growth to 2033. Average delays, LoS and 95% back of queue lengths all remain at acceptable levels based on the TfNSW assessment criteria listed above.

Table 6 – Sidra Results (longest delay worst LoS) – McFarlanes Road / Settlers Boulevard

Modelled Peak	Degree of Saturation (v/c)	Worst Average Delay (s)	Worst Level of Service	95% back of queue length (cars)
2023 AM + development	0.182	7.2	A	0.7
2023 PM + development	0.183	7.9	A	0.8
2033 AM + development	0.250	7.4	A	1.1
2033 PM + development	0.265	8.6	A	1.2

This modelling shows that the intersection would operate satisfactorily during both the AM and PM peak periods post development and would continue to do so post development and with 10 years traffic growth to 2033. Average delays, LoS and 95% back of queue lengths all remain at acceptable levels based on the TfNSW assessment criteria listed above.

Overall, it is concluded that the subject subdivision will not have an adverse impact on the local and state road network through unacceptable intersection performance subject to the Thornton North Developer Contributions Plan being implemented by Maitland City Council.

11.3 Vehicular Access

Vehicular access to the site will be through the existing Harvest and Waterford County residential estates via two existing signalised intersections off Raymond Terrace Road (Harvest Boulevard and Settlers Boulevard) as well as a give way priority controlled CHR/AUL T-intersection off McFarlanes Road.

The lots being between 485 m^2 and 1,108 m^2 with road frontages exceeding 15 metres will have sufficient room to construct an urban residential access crossing from the local road network to each individual lot. These would need to be constructed to Maitland City Council requirements. The suitability of these accesses would be assessed at development application stage for each of the individual allotments.

11.4 Off-Street Car Parking

As a residential subdivision the development does not generate any on-site parking demand. However future development of each of the allotments will generate a parking demand and on-site car parking will need to be further assessed at the development application stage for the development of each individual allotment.

11.5 Internal Road layout

The proposed internal road layout is to be constructed in accordance with Maitland City Council's Manual of Engineering Standards road types and dimensions table and general best practice for intersection control. The following has been determined.

- Traffic volumes at all internal local intersections will be below the thresholds for uninterrupted flow conditions shown in in the following table (see below) sourced from Austroads *Guide to Traffic Management – Part 6 – Intersections, Interchanges & Crossings (2010)* for which the Guide states a detailed analysis to demonstrate adequate capacity is available is unlikely to be necessary. As such give way sign controls as proposed on the minor local road will be satisfactory and uninterrupted flow conditions will prevail.

Major road type[1]	Major road flow (vph)[2]	Minor road flow (vph)[3]
Two-lane	400	250
	500	200
	650	100
Four-lane	1000	100
	1500	50
	2000	25

Source: - Austroads *Guide to Traffic Management – Part 6 – Intersections, Interchanges & Crossings (2010)*

- Road reserve widths provided will be consistent with the requirements of the road types and dimension table within Maitland City Council's Manual of Engineering Standards (MOES).
- All connections between local collector roads will be provided with suitable intersection control such as roundabouts or give way priority-controlled T-intersections.

Overall, it is considered the proposed internal road layout will be satisfactory and compliant with Maitland City Council requirements.

12.0 PEDESTRIAN & CYCLE FACILITIES

As a residential subdivision the proposal is likely to generate additional pedestrian and bicycle traffic. Provision of pedestrian pathways / cycleways within the subdivision would provide benefit to pedestrians / cyclists and will need to be provided in accordance with Maitland City Council's subdivision standards and in accordance with Council's DCP requirements.

Further additional pedestrian pathways will be provided within the subdivision to ensure that not only is there external connectivity with external paths but internal connectivity with all lots within the subdivision is also achieved even with footpaths on one side of the road only. Overall, it is concluded a suitable pedestrian and cycleway network will be provided within the subdivision allowing connection to the existing infrastructure provided within the residential estate.

13.0 PUBLIC TRANSPORT FACILITIES

The proposed development will generate some additional public transport usage particularly regarding school bus services. From a review of the plans all lots will be within 400 metres from existing school bus routes adjoining the development. However, it is anticipated that the supply of public bus services will be provided to suit the demand in the new development area as residences are built and occupied as has occurred in other stages of the adjoining development. Hunter Valley Buses may consider linking its current Chisholm and Morpeth services once more demand is established by this development.

The provision of shelters and seats for new and existing bus stops does not appear to be part of the Thornton North developer contributions plan so it would not be expected that such facilities would be required within this subdivision until a demand for the public transport route is established. However, if required based on any advice from Transport NSW and Hunter Valley Buses appropriate conditions of consent would be agreeable.

Overall, it can be concluded the existing road network and the proposed subdivision provides suitable infrastructure to allow a suitable public transport service to support the site as the existing public transport services are considered suitable and convenient to the site to cater for any extra demand generated by the development.

14.0 CONCLUSIONS

This traffic impact assessment for a proposed 282 lot residential subdivision on proposed Lot 2 of Lot 112 DP734271, Lot 6121 DP1268036, Lot 6140 DP1284398, Lot 3001 DP1264314, Lot 2726 DP1237666, Lot 2531 DP1224018, Lot 2425 DP1224017 & Lot 4 DP1222785, 24 Duckenfield Road, 29 Stillwater Parade, 40 Goldring Street, 3 Caldera Street, 18 Darkmouth Street, 16 Darkmouth Street, 9 Rockmaster Street, Emperor Parade & 261 Settlers Boulevard, Chisholm has concluded.

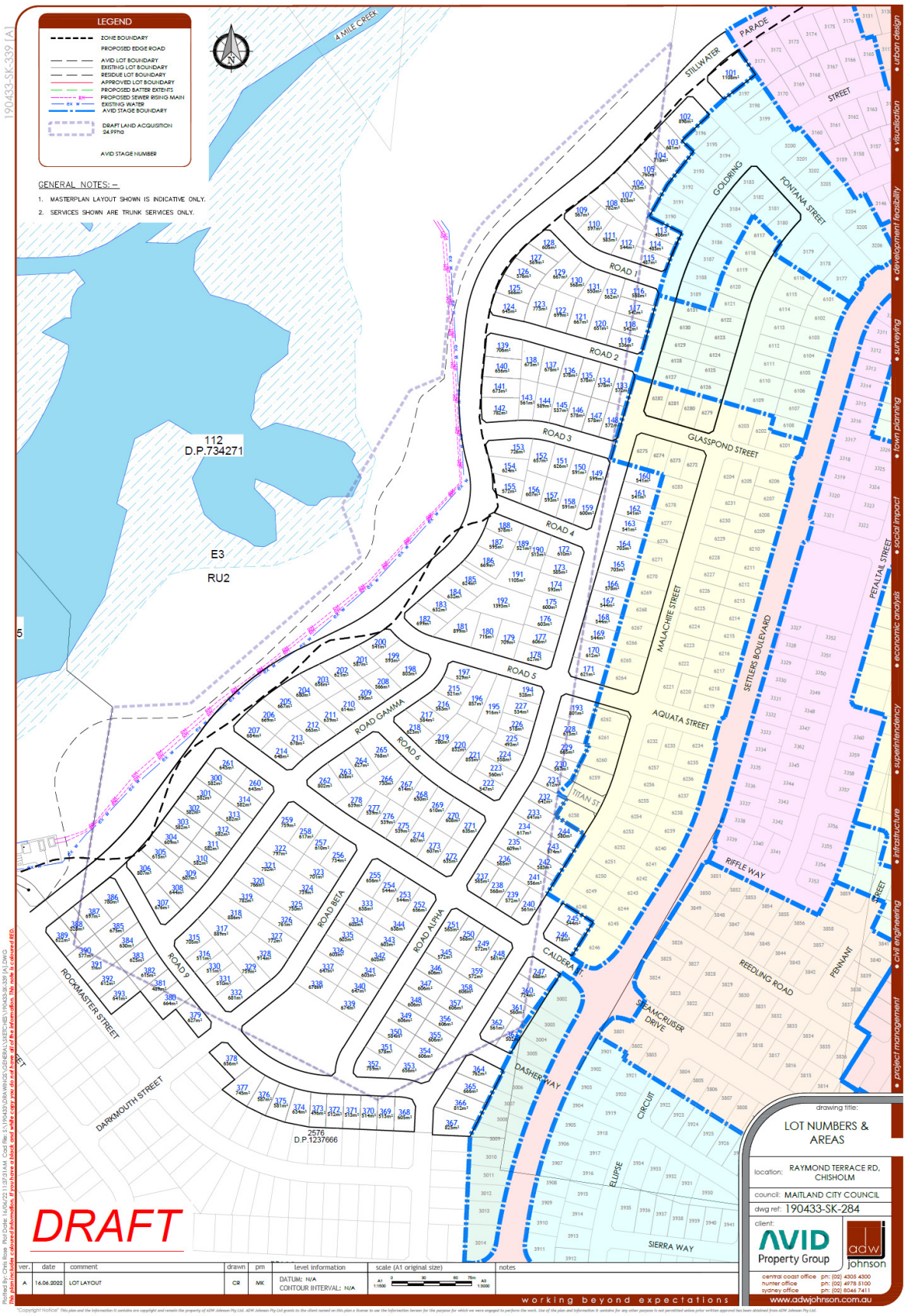
- Existing traffic volumes on the local and state road network are within the technical mid-block capacity standards for urban roads determined by Austroads and TFNSW.
- The local and state road network is currently operating with satisfactory levels of service and acceptable delay for motorists and has capacity to cater for additional traffic associated with new development in the area.
- The proposed subdivision is likely to generate an additional 240 vtph during the AM peak traffic period and 254 vtph during the PM peak traffic period or 2,538 vtpd.
- The local and state road network has sufficient spare capacity to cater for the development traffic generated by this development and other developments in the area without adversely impacting on the levels of service experienced by motorists on the road network through to at least 2033, subject to Raymond Terrace Road being widened to 4 lanes as per the Thornton North Developer Contributions Plan.
- SIDRA modelling of the Raymond Terrace Road / Harvest Boulevard signalised intersection, the Raymond Terrace Road / Settlers Boulevard signalised intersection and the McFarlanes Road / Settlers Boulevard priority-controlled T-intersection has shown that with the additional traffic from the proposed subdivision and other approved developments in the area included, these intersections will operate with satisfactory levels of service at least until 2033.
- By 2033 the Raymond Terrace Road / Harvest Boulevard signalised intersection may reach its capacity for the current layout and this intersection layout may need to be reviewed at some time in the future. In reality however it is unlikely to fail before 2033 as there is spare capacity within both the Settlers Boulevard accesses to Waterford County off Raymond Terrace Road and McFarlanes Road therefore as the Harvest Boulevard access gets more congested, traffic will be diverted to the other two accesses.
- The proposed lots are of suitable size to ensure an urban residential access crossing from the local road network to each individual lot. These would need to be constructed to Maitland City Council requirements. The suitability of these accesses would be assessed at development application stage for each of the individual allotments.
- That future development of the new allotments would be able to accommodate the required on-site car parking and the development will not generate an unacceptable on-street car parking demand that would adversely impact on the local road network.
- The proposed internal road layout is satisfactory and compliant with Maitland City Council Manual of Engineering Standards.
- A suitable pedestrian and cycleway network will be provided within the subdivision allowing connection to the existing infrastructure provided within both residential estates.
- The proposed development will generate additional public transport usage particularly regarding school bus services. However existing services are considered suitable and convenient to the site to cater for any extra demand generated by the development.

15.0 RECOMMENDATION

Having carried out this traffic impact assessment for the proposed 282 lot residential subdivision on proposed Lot 2 of Lot 112 DP734271, Lot 6121 DP1268036, Lot 6140 DP1284398, Lot 3001 DP1264314, Lot 2726 DP1237666, Lot 2531 DP1224018, Lot 2425 DP1224017 & Lot 4 DP1222785, 24 Duckenfield Road, 29 Stillwater Parade, 40 Goldring Street, 3 Caldera Street, 18 Darkmouth Street, 16 Darkmouth Street, 9 Rockmaster Street, Emperor Parade & 261 Settlers Boulevard, Chisholm it is recommended that the proposal can be supported from a traffic perspective as it will not adversely impact on the local and state road network and complies with all relevant Maitland City Council, Australian Standard and TfNSW requirements.

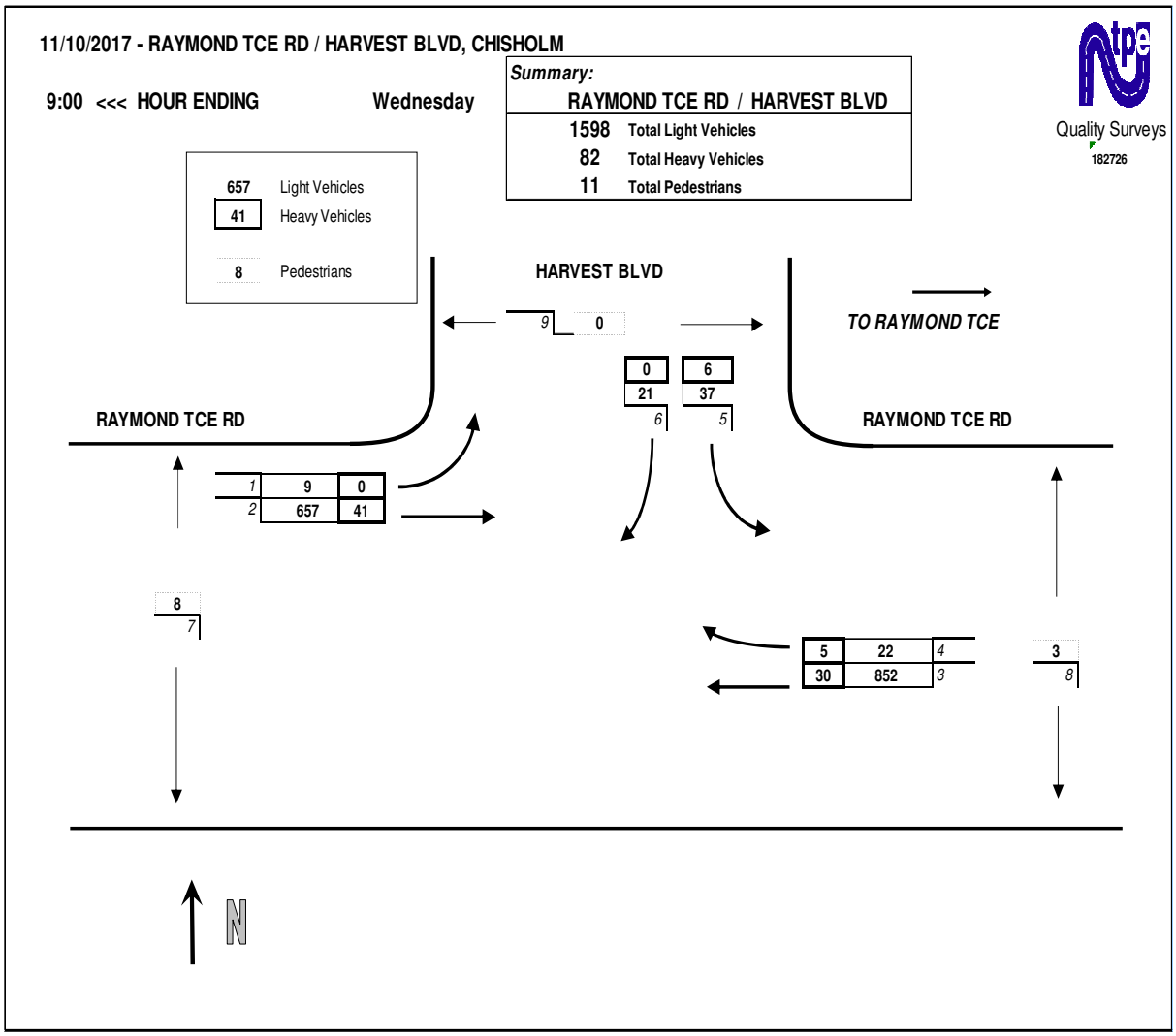
JR Garry BE (Civil), Masters of Traffic
Director
Intersect Traffic Pty Ltd

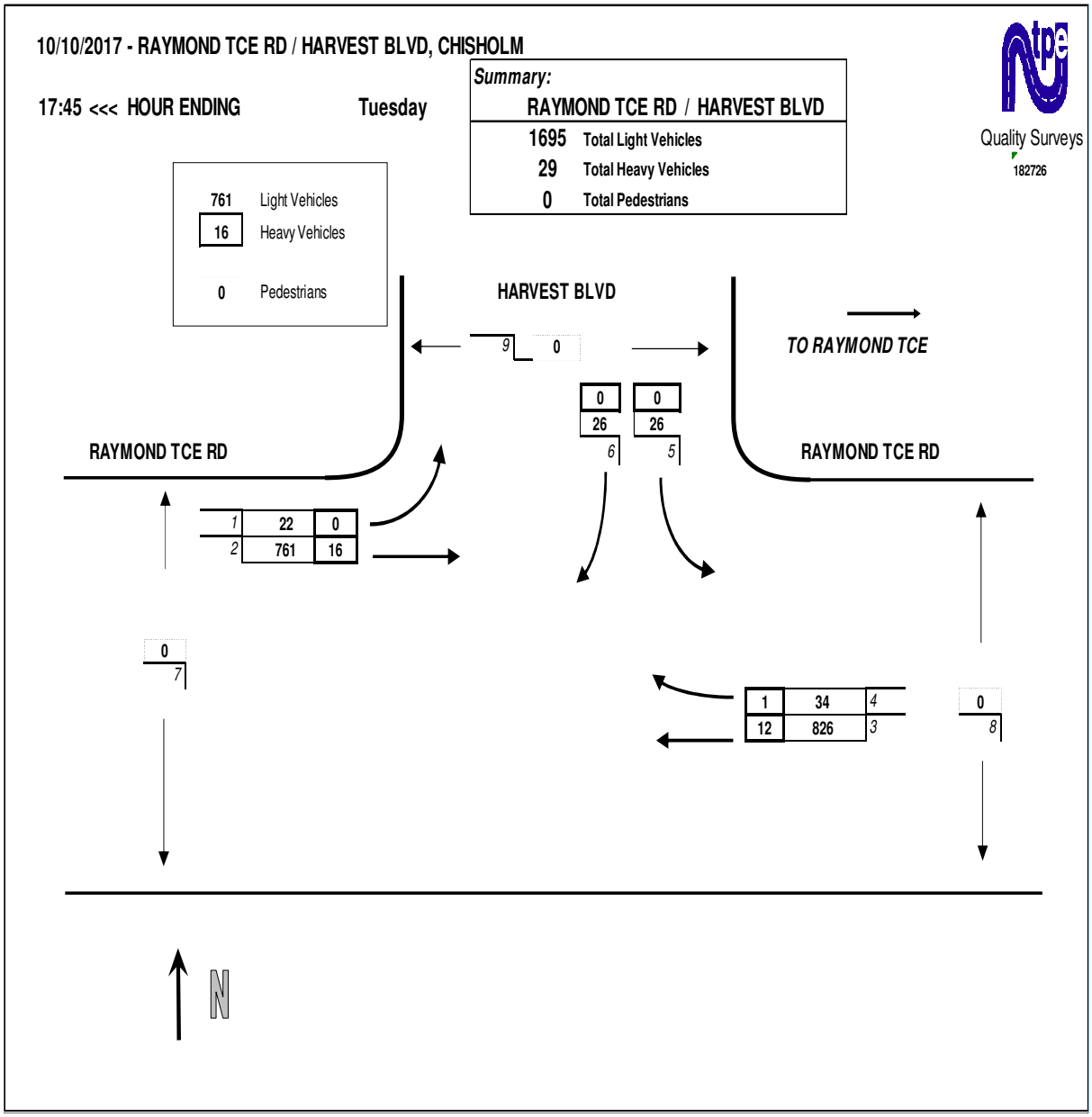
ATTACHMENT A
Subdivision Plan

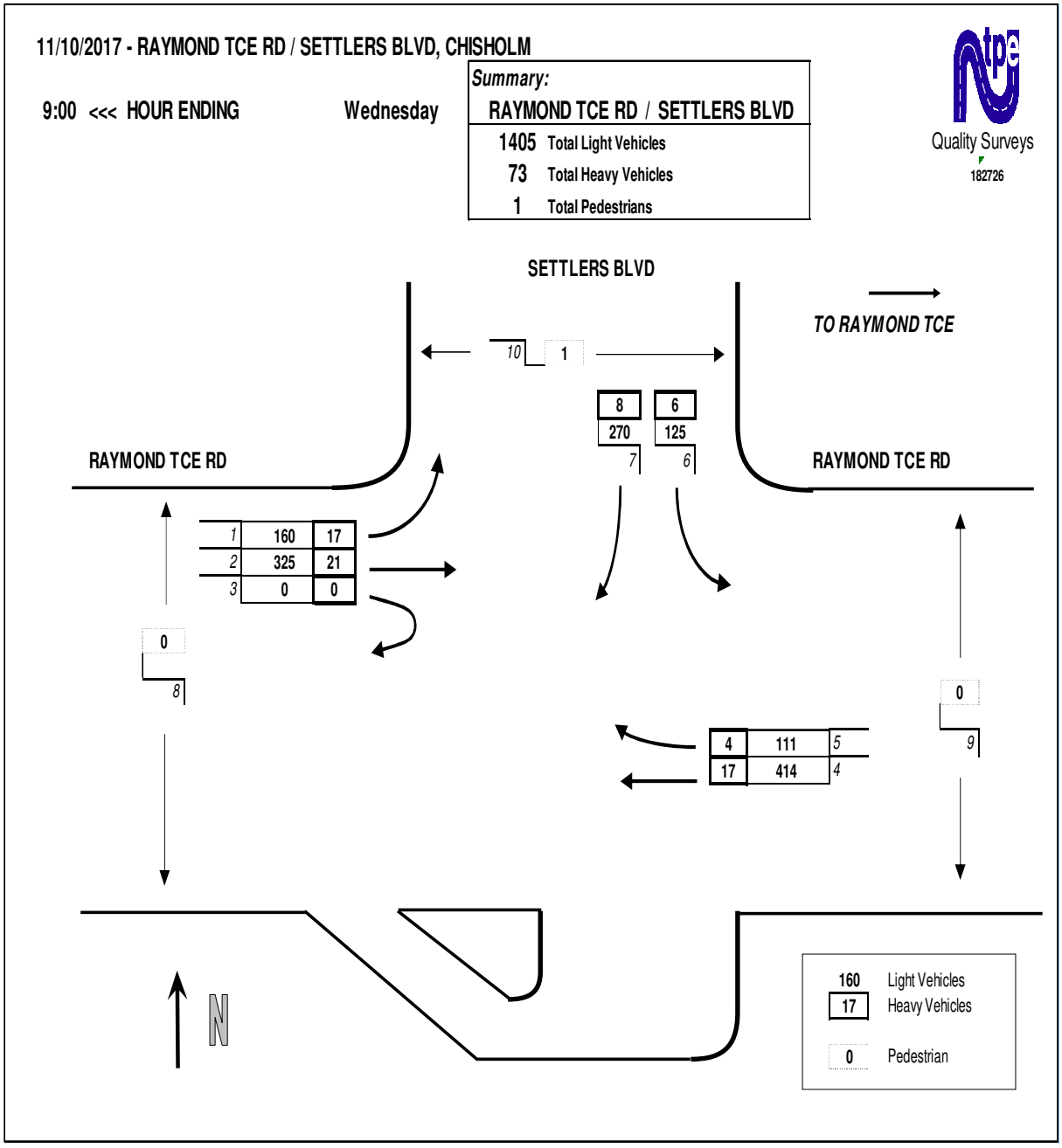

LEGEND
ZONE BOUNDARY
PROPOSED EDGE ROAD
AVID LOT BOUNDARY
EXISTING LOT BOUNDARY
RESIDUE LOT BOUNDARY
APPROVED LOT BOUNDARY
PROPOSED BATTER EXTENTS
PROPOSED SEWER RISING MAIN
EXISTING WATER
AVID STAGE BOUNDARY
DRAFT LAND ACQUISITION 24 PPTIO
AVID STAGE NUMBER
GENERAL NOTES: –
1. MASTERPLAN LAYOUT SHOWN IS INDICATIVE ONLY.
2. SERVICES SHOWN ARE TRUNK SERVICES ONLY.
4 MILE CREEK
112 D.P.734271
E3
RU2
2576 D.P.1237666
ROAD 1
ROAD 2
ROAD 3
ROAD 4
ROAD 5
ROAD 6
ROAD GAMMA
ROAD BETA
ROAD ALPHA
ROAD 9
PARADE
STILLWATER
STREET
GOLDRING
FONTANA STREET
GLASSPOND STREET
MALACHITE STREET
SETTLERS BOULEVARD
PEALTAIL STREET
AQUATA STREET
TITAN ST
RIFFLE WAY
CALDERA ST
REEDLING ROAD
PENNANT
STREAMCRUISER DRIVE
DASHER WAY
CIRCUIT
ELIPSE
SIERRA WAY
ROCKMASTER STREET
DARKMOUTH STREET
DRAFT
drawing title:
LOT NUMBERS & AREAS
location: RAYMOND TERRACE RD, CHISHOLM
council: MAITLAND CITY COUNCIL
dwg ref: 190433-SK-284
client: AVID Property Group
adw johnson
central coast office ph: (02) 4305 4300
hunter office ph: (02) 4978 5100
sydney office ph: (02) 8046 7411
www.adwjohnson.com.au
working beyond expectations
ver. A
date 16.06.2022
comment LOT LAYOUT
drawn CR
pm MK
level information DATUM: N/A CONTOUR INTERVAL: N/A
scale (A1 original size) A1 1:1000 A3 1:3000
notes
urban design
visualisation
development feasibility
surveying
town planning
social impact
economic analysis
superintendency
infrastructure
civil engineering
project management

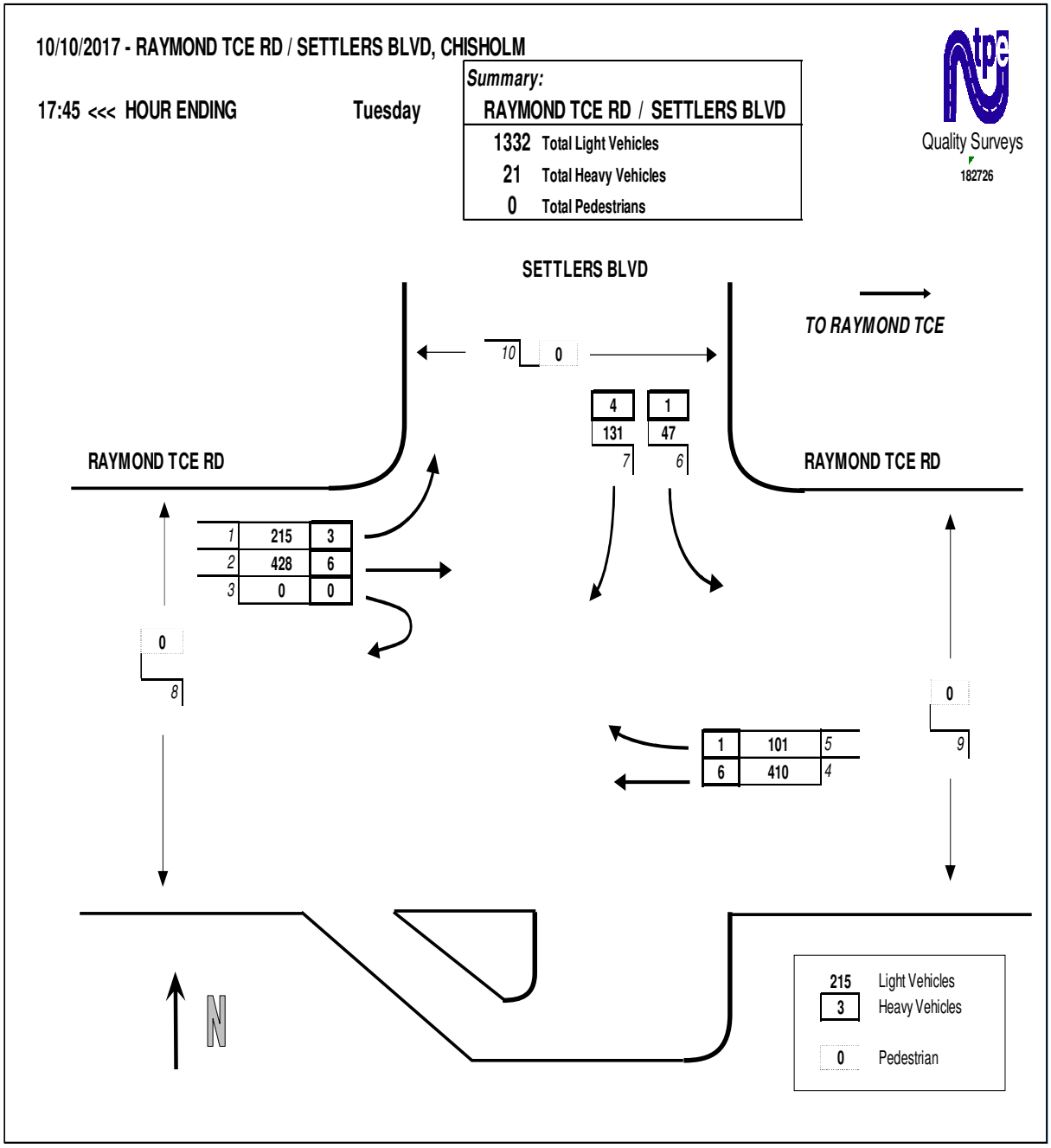
ATTACHMENT B

Traffic Count Data


11/10/2017 - RAYMOND TCE RD / HARVEST BLVD, CHISHOLM
9:00 <<< HOUR ENDING
Wednesday
Summary:
RAYMOND TCE RD / HARVEST BLVD
1598 Total Light Vehicles
82 Total Heavy Vehicles
11 Total Pedestrians
Quality Surveys
182726
657 Light Vehicles
41 Heavy Vehicles
8 Pedestrians
HARVEST BLVD
TO RAYMOND TCE
RAYMOND TCE RD
RAYMOND TCE RD
N

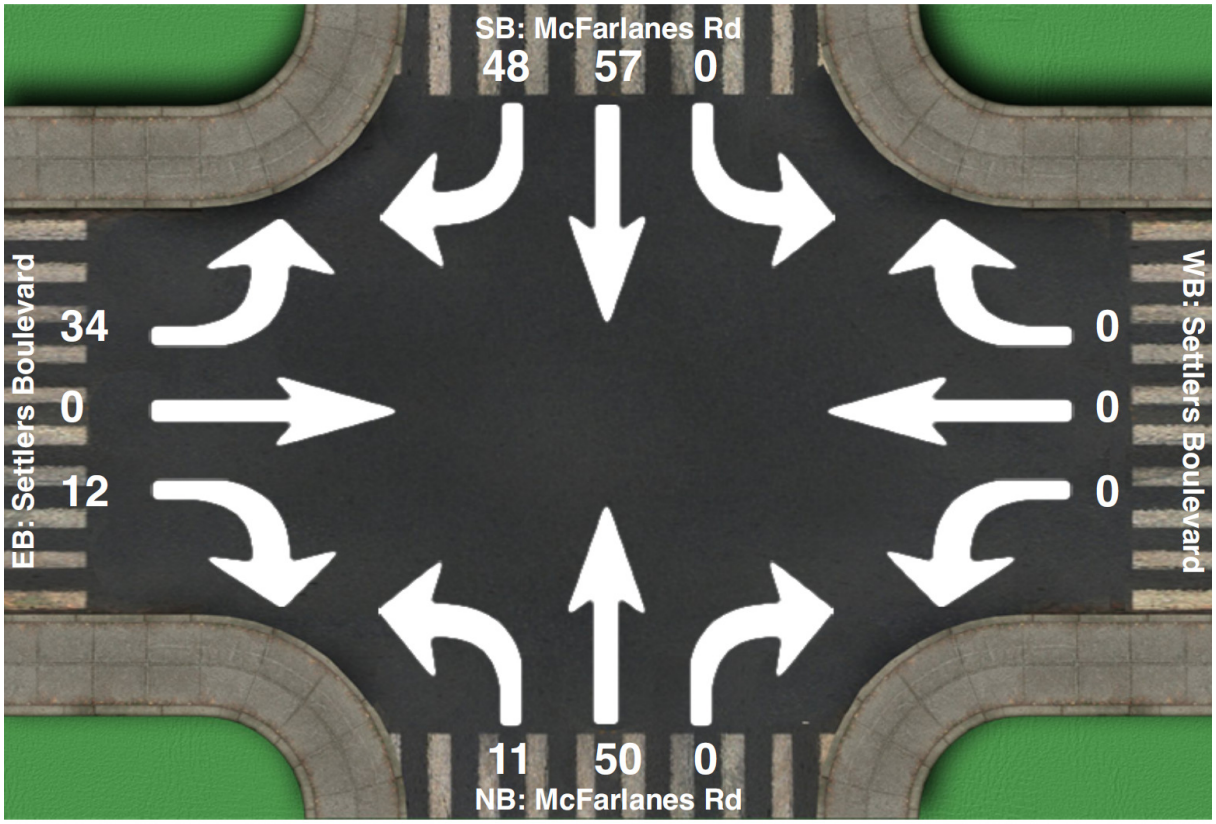

10/10/2017 - RAYMOND TCE RD / HARVEST BLVD, CHISHOLM
17:45 <<< HOUR ENDING
Tuesday
Summary:
RAYMOND TCE RD / HARVEST BLVD
1695 Total Light Vehicles
29 Total Heavy Vehicles
0 Total Pedestrians
Quality Surveys
182726
761 Light Vehicles
16 Heavy Vehicles
0 Pedestrians
HARVEST BLVD
TO RAYMOND TCE
RAYMOND TCE RD
RAYMOND TCE RD
9 0
0 0
26 26
6 5
1 22 0
2 761 16
0
7
1 34 4
12 826 3
0
8
N


11/10/2017 - RAYMOND TCE RD / SETTLERS BLVD, CHISHOLM
9:00 <<< HOUR ENDING
Wednesday
Summary:
RAYMOND TCE RD / SETTLERS BLVD
1405 Total Light Vehicles
73 Total Heavy Vehicles
1 Total Pedestrians
Quality Surveys
182726
SETTLERS BLVD
TO RAYMOND TCE
RAYMOND TCE RD
RAYMOND TCE RD
10
1
8
270
7
6
125
6
1 160 17
2 325 21
3 0 0
0
8
0
9
4 111 5
17 414 4
N
160 Light Vehicles
17 Heavy Vehicles
0 Pedestrian


10/10/2017 - RAYMOND TCE RD / SETTLERS BLVD, CHISHOLM
17:45 <<< HOUR ENDING
Tuesday
Summary:
RAYMOND TCE RD / SETTLERS BLVD
1332 Total Light Vehicles
21 Total Heavy Vehicles
0 Total Pedestrians
Quality Surveys
182726
SETTLERS BLVD
TO RAYMOND TCE
RAYMOND TCE RD
RAYMOND TCE RD
10 0
4 1
131 47
7 6
1 215 3
2 428 6
3 0 0
0
8
0
9
1 101 5
6 410 4
N
215 Light Vehicles
3 Heavy Vehicles
0 Pedestrian

Intersection Peak Hour

Location: McFarlanes Rd at Settlers Boulevard, Chisholm
GPS Coordinates: Lat=-32.742577, Lon=151.643167
Date: 2022-12-12
Day of week: Monday
Weather:
Analyst: Jeff



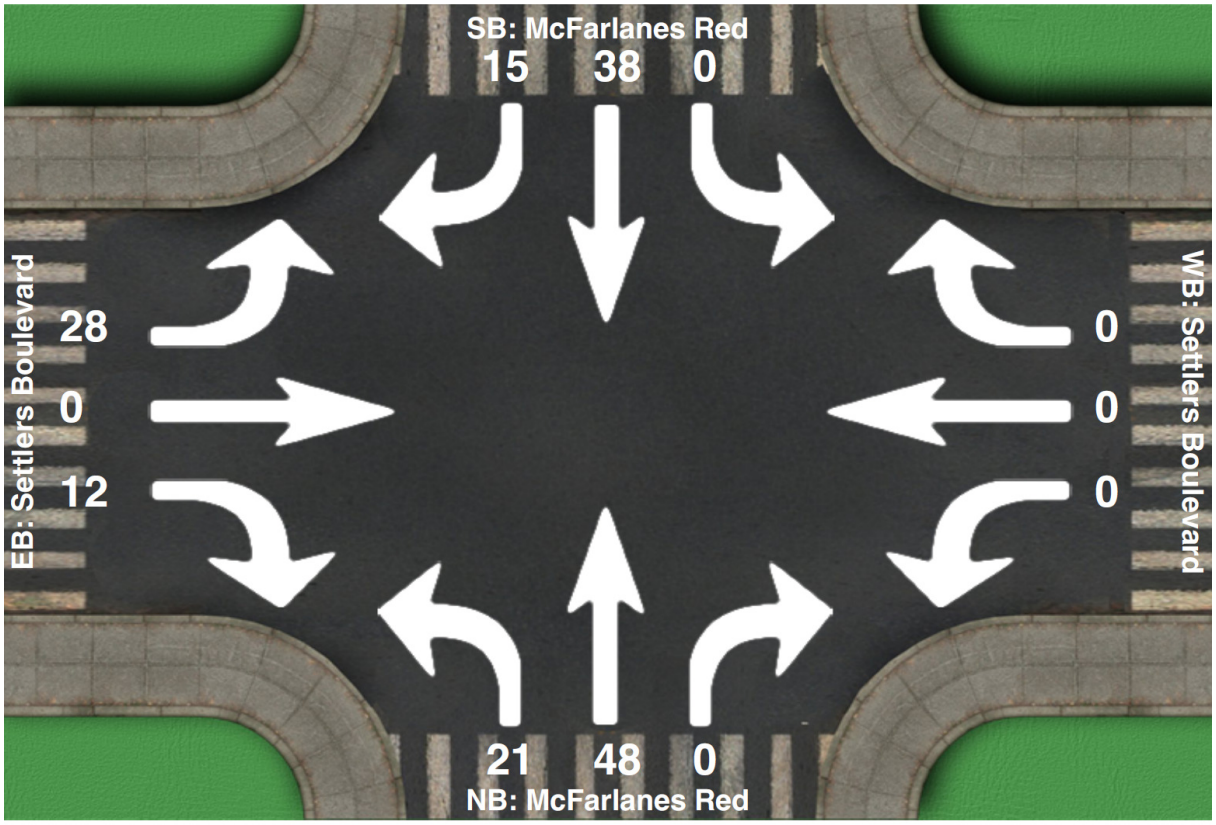
Intersection Peak Hour

08:00 - 09:00

	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	0	57	48	0	0	0	11	50	0	34	0	12	212
Factor	0.00	0.75	0.60	0.00	0.00	0.00	0.46	0.66	0.00	0.77	0.00	0.60	0.85
Approach Factor	0.82			0.00			0.73			0.72			

Intersection Peak Hour

Location: McFarlanes Red at Settlers Boulevard, Chisholm
GPS Coordinates: Lat=-32.742365, Lon=151.642369
Date: 2022-12-12
Day of week: Monday
Weather:
Analyst: Jeff



Intersection Peak Hour

15:00 - 16:00

	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	0	38	15	0	0	0	21	48	0	28	0	12	162
Factor	0.00	0.73	0.62	0.00	0.00	0.00	0.75	0.75	0.00	0.64	0.00	0.43	0.79
Approach Factor	0.70			0.00			0.78			0.56			

ATTACHMENT C

SIDRA Movement Summary Tables

MOVEMENT SUMMARY

Site: 101 [2023AM + development (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

Raymond Terrace Road / Harvest Boulevard signals
Includes all approved development plus Stages 81, 82 & 83.
Site Category: (None)
Signals - Actuated Isolated Cycle Time = 84 seconds (Site Practical Cycle Time)
Design Life Analysis (Final Year): Results for 5 years

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East: Raymond Terrace Road															
5	T1	All MCs	1046	3.5	1046	3.5	0.678	25.6	LOS B	17.7	127.5	0.86	0.76	0.86	53.1
6	R2	All MCs	97	5.4	97	5.4	*0.414	46.3	LOS D[11]	3.8	28.0	0.94	0.77	0.94	34.2
Approach			1143	3.7	1143	3.7	0.678	27.3	LOS B	17.7	127.5	0.87	0.76	0.87	50.7
North: Harvest Boulevard															
7	L2	All MCs	152	4.2	152	4.2	0.336	36.0	LOS C	5.2	37.6	0.84	0.77	0.84	37.0
9	R2	All MCs	331	0.0	331	0.0	*0.712	37.5	LOS C	12.7	88.6	0.95	0.83	0.95	36.2
Approach			482	1.3	482	1.3	0.712	37.0	LOS C	12.7	88.6	0.91	0.81	0.91	36.4
West: Raymond Terrace Road															
10	L2	All MCs	118	0.0	118	0.0	0.466	12.6	LOS A	10.8	78.1	0.75	0.70	0.75	43.9
11	T1	All MCs	836	6.0	836	6.0	*0.778	25.8	LOS B	21.2	156.2	0.87	0.78	0.87	52.5
Approach			954	5.2	954	5.2	0.778	24.2	LOS B	21.2	156.2	0.85	0.77	0.85	51.3
All Vehicles			2579	3.8	2579	3.8	0.778	28.0	LOS B	21.2	156.2	0.87	0.77	0.87	47.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

11 Level of Service is worse than the Level of Service Target specified in the Parameter Settings dialog.
* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
East: Raymond Terrace Road												
P2	Full	3	3	36.2	LOS D	0.0	0.0	0.93	0.93	51.6	20.0	0.39
North: Harvest Boulevard												
P3	Full	1	1	20.7	LOS C	0.0	0.0	0.70	0.70	36.1	20.0	0.55
West: Raymond Terrace Road												
P4	Full	8	9	20.0	LOS C	0.0	0.0	0.69	0.69	35.4	20.0	0.56
All Pedestrians		12	14	24.1	LOS C	0.0	0.0	0.75	0.75	39.5	20.0	0.51

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.

MOVEMENT SUMMARY

Site: 101 [2023PM + development (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

Raymond Terrace Road / Harvest Boulevard signals
Includes all approved development + Stages 81, 82 & 83
Site Category: (None)
Signals - Actuated Isolated Cycle Time = 93 seconds (Site Practical Cycle Time)
Design Life Analysis (Final Year): Results for 5 years

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East: Raymond Terrace Road															
5	T1	All MCs	1027	1.4	1027	1.4	0.618	24.6	LOS B	18.1	128.1	0.81	0.72	0.81	53.2
6	R2	All MCs	124	0.8	124	0.8	*0.391	46.3	LOS D[11]	5.1	36.3	0.91	0.78	0.91	34.2
Approach			1152	1.4	1152	1.4	0.618	26.9	LOS B	18.1	128.1	0.82	0.73	0.82	50.2
North: Harvest Boulevard															
7	L2	All MCs	71	0.0	71	0.0	0.186	41.4	LOS C	2.7	18.8	0.84	0.74	0.84	35.6
9	R2	All MCs	184	0.0	184	0.0	*0.486	41.9	LOS C	7.6	52.9	0.91	0.79	0.91	34.7
Approach			255	0.0	255	0.0	0.486	41.8	LOS C	7.6	52.9	0.89	0.78	0.89	34.9
West: Raymond Terrace Road															
10	L2	All MCs	249	0.0	249	0.0	0.528	16.1	LOS B	14.6	102.9	0.74	0.75	0.74	43.1
11	T1	All MCs	932	2.1	932	2.1	*0.881	30.6	LOS C	31.8	226.5	0.92	0.87	0.95	49.5
Approach			1182	1.7	1182	1.7	0.881	27.6	LOS B	31.8	226.5	0.88	0.84	0.91	48.0
All Vehicles			2588	1.4	2588	1.4	0.881	28.7	LOS C	31.8	226.5	0.86	0.78	0.87	47.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

11 Level of Service is worse than the Level of Service Target specified in the Parameter Settings dialog.
* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
East: Raymond Terrace Road												
P2	Full	1	1	40.7	LOS E[12]	0.0	0.0	0.94	0.94	56.1	20.0	0.36
North: Harvest Boulevard												
P3	Full	1	1	20.7	LOS C	0.0	0.0	0.67	0.67	36.1	20.0	0.55
West: Raymond Terrace Road												
P4	Full	1	1	22.0	LOS C	0.0	0.0	0.69	0.69	37.4	20.0	0.53
All Pedestrians		3	3	27.8	LOS C	0.0	0.0	0.76	0.76	43.2	20.0	0.46

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

MOVEMENT SUMMARY

Site: 101 [2033AM + development (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

Raymond Terrace Road / Harvest Boulevard signals
Includes all approved development + Stages 81,82 & 83.
Site Category: (None)
Signals - Actuated Isolated Cycle Time = 95 seconds (Site Practical Cycle Time)
Design Life Analysis (Final Year): Results for 15 years

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East: Raymond Terrace Road															
5	T1	All MCs	1405	3.5	1405	3.5	0.907	66.9	LOS E[11]	33.0	238.0	0.98	0.93	1.06	47.3
6	R2	All MCs	97	5.4	97	5.4	*0.396	50.4	LOS D[11]	4.3	31.2	0.93	0.77	0.93	32.9
Approach			1502	3.6	1502	3.6	0.907	65.8	LOS E[11]	33.0	238.0	0.98	0.92	1.05	46.0
North: Harvest Boulevard															
7	L2	All MCs	152	4.2	152	4.2	0.380	44.5	LOS D[11]	6.1	44.1	0.87	0.78	0.87	34.8
9	R2	All MCs	331	0.0	331	0.0	*0.805	44.7	LOS D[11]	14.9	104.1	0.98	0.85	0.98	33.8
Approach			482	1.3	482	1.3	0.805	44.7	LOS D[11]	14.9	104.1	0.95	0.82	0.95	34.1
West: Raymond Terrace Road															
10	L2	All MCs	118	0.0	118	0.0	0.545	12.8	LOS A	15.5	113.0	0.75	0.70	0.75	43.9
11	T1	All MCs	1123	6.0	1123	6.0	*0.910	31.1	LOS C	36.5	268.8	0.91	0.87	0.96	49.1
Approach			1241	5.4	1241	5.4	0.910	29.3	LOS C	36.5	268.8	0.90	0.86	0.94	48.5
All Vehicles			3226	4.0	3226	4.0	0.910	48.6	LOS D[11]	36.5	268.8	0.94	0.88	0.99	44.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

11 Level of Service is worse than the Level of Service Target specified in the Parameter Settings dialog.
* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
East: Raymond Terrace Road												
P2	Full	3	4	41.7	LOS E[12]	0.0	0.0	0.94	0.94	57.1	20.0	0.35
North: Harvest Boulevard												
P3	Full	1	1	19.6	LOS B	0.0	0.0	0.64	0.64	35.0	20.0	0.57
West: Raymond Terrace Road												
P4	Full	8	11	23.6	LOS C	0.0	0.0	0.71	0.71	39.0	20.0	0.51
All Pedestrians		12	17	27.8	LOS C	0.0	0.0	0.76	0.76	43.2	20.0	0.46

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

MOVEMENT SUMMARY

Site: 101 [2033PM + development (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

Raymond Terrace Road / Harvest Boulevard signals
Site Category: (None)
Signals - Actuated Isolated Cycle Time = 107 seconds (Site Practical Cycle Time)
Design Life Analysis (Final Year): Results for 15 years

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East: Raymond Terrace Road															
5	T1	All MCs	1381	1.4	1381	1.4	0.900	39.3	LOS C	35.6	252.0	0.97	0.92	1.03	46.2
6	R2	All MCs	124	0.8	124	0.8	*0.400	52.5	LOS D[11]	5.9	41.7	0.91	0.78	0.91	32.3
Approach			1505	1.4	1505	1.4	0.900	40.4	LOS C	35.6	252.0	0.97	0.91	1.02	44.6
North: Harvest Boulevard															
7	L2	All MCs	71	0.0	71	0.0	0.193	49.2	LOS D[11]	3.1	21.8	0.85	0.74	0.85	33.7
9	R2	All MCs	184	0.0	184	0.0	*0.505	48.2	LOS D[11]	8.7	61.2	0.92	0.80	0.92	32.7
Approach			255	0.0	255	0.0	0.505	48.5	LOS D[11]	8.7	61.2	0.90	0.78	0.90	33.0
West: Raymond Terrace Road															
10	L2	All MCs	249	0.0	249	0.0	0.623	16.1	LOS B	21.7	153.3	0.78	0.76	0.78	42.2
11	T1	All MCs	1253	2.1	1253	2.1	*1.040	74.5	LOS F[11]	73.7	525.3	0.94	1.21	1.34	31.2
Approach			1502	1.7	1502	1.7	1.040	64.8	LOS E[11]	73.7	525.3	0.92	1.13	1.24	32.6
All Vehicles			3262	1.4	3262	1.4	1.040	52.3	LOS D[11]	73.7	525.3	0.94	1.00	1.11	37.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

11 Level of Service is worse than the Level of Service Target specified in the Parameter Settings dialog.
* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
East: Raymond Terrace Road												
P2	Full	1	1	47.7	LOS E[12]	0.0	0.0	0.94	0.94	63.1	20.0	0.32
North: Harvest Boulevard												
P3	Full	1	1	20.4	LOS C	0.0	0.0	0.62	0.62	35.7	20.0	0.56
West: Raymond Terrace Road												
P4	Full	1	1	25.6	LOS C	0.0	0.0	0.69	0.69	41.0	20.0	0.49
All Pedestrians		3	4	31.2	LOS D	0.0	0.0	0.75	0.75	46.6	20.0	0.43

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.

MOVEMENT SUMMARY

Site: 101 [AM 2023 + dev (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

McFarlanes Road / Settlers Boulevard T intersection
CHR/AUL
Includes all approved developments plus Stages 81, 82 & 83
Site Category: (None)
Give-Way (Two-Way)
Design Life Analysis (Final Year): Results for 5 years

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: McFarlanes Road south															
1	L2	All MCs	28	5.0	28	5.0	0.016	7.0	LOS A	0.0	0.0	0.00	0.63	0.00	62.9
2	T1	All MCs	61	5.0	61	5.0	0.032	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	80.0
Approach			89	5.0	89	5.0	0.032	2.2	NA	0.0	0.0	0.00	0.20	0.00	73.7
North: McFarlanes Road north															
8	T1	All MCs	70	5.0	70	5.0	0.037	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	80.0
9	R2	All MCs	56	5.0	56	5.0	0.044	7.2	LOS A	0.2	1.3	0.19	0.59	0.19	53.0
Approach			126	5.0	126	5.0	0.044	3.2	NA	0.2	1.3	0.09	0.26	0.09	65.2
West: Settlers Boulevard															
10	L2	All MCs	223	5.0	223	5.0	0.182	4.9	LOS A	0.7	5.4	0.17	0.51	0.17	52.0
12	R2	All MCs	121	5.0	121	5.0	0.123	5.9	LOS A	0.5	4.0	0.37	0.58	0.37	51.4
Approach			344	5.0	344	5.0	0.182	5.2	LOS A	0.7	5.4	0.24	0.53	0.24	51.8
All Vehicles			559	5.0	559	5.0	0.182	4.3	NA	0.7	5.4	0.16	0.42	0.16	57.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

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MOVEMENT SUMMARY

Site: 101 [PM 2023 + dev (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

McFarlanes Road / Settlers Boulevard T intersection
CHR/AUL
Includes all approved developments + Stages 81, 82 & 83
Site Category: (None)
Give-Way (Two-Way)
Design Life Analysis (Final Year): Results for 5 years

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: McFarlanes Road south															
1	L2	All MCs	144	5.0	144	5.0	0.080	7.0	LOS A	0.0	0.0	0.00	0.63	0.00	62.9
2	T1	All MCs	59	5.0	59	5.0	0.031	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	80.0
Approach			203	5.0	203	5.0	0.080	5.0	NA	0.0	0.0	0.00	0.45	0.00	67.0
North: McFarlanes Road north															
8	T1	All MCs	46	5.0	46	5.0	0.025	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	80.0
9	R2	All MCs	209	5.0	209	5.0	0.183	7.9	LOS A	0.8	5.8	0.34	0.63	0.34	52.6
Approach			255	5.0	255	5.0	0.183	6.5	NA	0.8	5.8	0.28	0.52	0.28	56.1
West: Settlers Boulevard															
10	L2	All MCs	62	5.0	62	5.0	0.051	4.8	LOS A	0.2	1.3	0.14	0.50	0.14	52.1
12	R2	All MCs	29	5.0	29	5.0	0.038	7.2	LOS A	0.2	1.1	0.48	0.63	0.48	50.6
Approach			92	5.0	92	5.0	0.051	5.6	LOS A	0.2	1.3	0.25	0.54	0.25	51.6
All Vehicles			549	5.0	549	5.0	0.183	5.8	NA	0.8	5.8	0.17	0.50	0.17	58.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

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MOVEMENT SUMMARY

Site: 101 [AM 2033 + dev (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

McFarlanes Road / Settlers Boulevard T intersection
CHR/AUL
Includes all approved developments and Stages 81, 82 & 83
Site Category: (None)
Give-Way (Two-Way)
Design Life Analysis (Final Year): Results for 15 years

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: McFarlanes Road south															
1	L2	All MCs	38	5.0	38	5.0	0.021	7.0	LOS A	0.0	0.0	0.00	0.63	0.00	62.9
2	T1	All MCs	82	5.0	82	5.0	0.043	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	80.0
Approach			120	5.0	120	5.0	0.043	2.2	NA	0.0	0.0	0.00	0.20	0.00	73.7
North: McFarlanes Road north															
8	T1	All MCs	93	5.0	93	5.0	0.049	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	80.0
9	R2	All MCs	75	5.0	75	5.0	0.060	7.4	LOS A	0.2	1.8	0.23	0.60	0.23	52.9
Approach			169	5.0	169	5.0	0.060	3.3	NA	0.2	1.8	0.10	0.27	0.10	65.1
West: Settlers Boulevard															
10	L2	All MCs	300	5.0	300	5.0	0.250	5.0	LOS A	1.1	8.0	0.21	0.51	0.21	51.9
12	R2	All MCs	162	5.0	162	5.0	0.180	6.5	LOS A	0.8	6.0	0.44	0.62	0.44	51.0
Approach			462	5.0	462	5.0	0.250	5.6	LOS A	1.1	8.0	0.29	0.55	0.29	51.6
All Vehicles			751	5.0	751	5.0	0.250	4.5	NA	1.1	8.0	0.20	0.43	0.20	57.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

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Project: D:\Work\2022\22.134 - Waterford County Chisholm\Sidra\McFarlanes Settlers\McFarlanes Rd Settlers Bvd T Intn.sip9

MOVEMENT SUMMARY

Site: 101 [PM 2033 + dev (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

McFarlanes Road / Settlers Boulevard T
CHR/AUL
Includes all approved developments Plus Stages 81, 82 & 83
Site Category: (None)
Give-Way (Two-Way)
Design Life Analysis (Final Year): Results for 15 years

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: McFarlanes Road south															
1	L2	All MCs	194	5.0	194	5.0	0.108	7.1	LOS A	0.0	0.0	0.00	0.63	0.00	62.9
2	T1	All MCs	79	5.0	79	5.0	0.042	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	80.0
Approach			272	5.0	272	5.0	0.108	5.0	NA	0.0	0.0	0.00	0.45	0.00	67.0
North: McFarlanes Road north															
8	T1	All MCs	62	5.0	62	5.0	0.033	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	80.0
9	R2	All MCs	280	5.0	280	5.0	0.265	8.4	LOS A	1.2	8.9	0.43	0.67	0.43	52.3
Approach			343	5.0	343	5.0	0.265	6.9	NA	1.2	8.9	0.35	0.55	0.35	55.9
West: Settlers Boulevard															
10	L2	All MCs	84	5.0	84	5.0	0.069	4.9	LOS A	0.3	1.9	0.17	0.51	0.17	52.0
12	R2	All MCs	39	5.0	39	5.0	0.062	8.6	LOS A	0.2	1.8	0.56	0.71	0.56	49.6
Approach			123	5.0	123	5.0	0.069	6.1	LOS A	0.3	1.9	0.30	0.57	0.30	51.2
All Vehicles			738	5.0	738	5.0	0.265	6.1	NA	1.2	8.9	0.21	0.52	0.21	58.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

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Project: D:\Work\2022\22.134 - Waterford County Chisholm\Sidra\McFarlanes Settlers\McFarlanes Rd Settlers Bvd T Intn.sip9

MOVEMENT SUMMARY

Site: 101 [2023AM + development (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

Raymond Terrace Road / Settlers Boulevard signals
Includes all approved developments and Stages 81,82 & 83.
Site Category: (None)
Signals - Actuated Isolated Cycle Time = 75 seconds (Site Practical Cycle Time)
Design Life Analysis (Final Year): Results for 5 years

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East: Raymond Terrace Road															
5	T1	All MCs	600	3.5	600	3.5	0.546	25.3	LOS B	9.9	71.4	0.85	0.72	0.85	52.2
6	R2	All MCs	127	3.3	127	3.3	*0.405	39.1	LOS C	4.3	31.0	0.91	0.78	0.91	36.6
Approach			728	3.4	728	3.4	0.546	27.7	LOS B	9.9	71.4	0.86	0.73	0.86	48.6
North: Settlers Boulevard															
7	L2	All MCs	278	2.3	278	2.3	0.498	17.0	LOS B	9.8	69.7	0.79	0.79	0.79	41.3
9	R2	All MCs	348	2.4	348	2.4	*0.546	36.5	LOS C	9.8	69.7	0.86	0.80	0.86	39.2
Approach			626	2.4	626	2.4	0.546	27.9	LOS B	9.8	69.7	0.83	0.79	0.83	40.1
West: Raymond Terrace Road															
10	L2	All MCs	165	10.8	165	10.8	0.144	12.5	LOS A	2.2	16.9	0.38	0.71	0.38	49.8
11	T1	All MCs	516	5.0	516	5.0	*0.616	24.7	LOS B	11.4	83.1	0.85	0.72	0.85	52.2
12u	U	All MCs	1	0.0	1	0.0	0.005	36.7	LOS C	0.0	0.3	0.83	0.62	0.83	42.3
Approach			683	6.4	683	6.4	0.616	21.8	LOS B	11.4	83.1	0.74	0.72	0.74	51.6
All Vehicles			2037	4.1	2037	4.1	0.616	25.8	LOS B	11.4	83.1	0.81	0.75	0.81	46.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
East: Raymond Terrace Road												
P2	Full	1	1	31.7	LOS D	0.0	0.0	0.92	0.92	47.1	20.0	0.42
North: Settlers Boulevard												
P3	Full	1	1	27.3	LOS C	0.0	0.0	0.85	0.85	42.7	20.0	0.47
West: Raymond Terrace Road												
P4	Full	1	1	31.7	LOS D	0.0	0.0	0.92	0.92	47.1	20.0	0.42
All Pedestrians		3	3	30.3	LOS D	0.0	0.0	0.90	0.90	45.6	20.0	0.44

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.

MOVEMENT SUMMARY

Site: 101 [2023PM + development (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

Raymond Terrace Road / Settlers Boulevard signals
Includes all approved developments + Stages 81, 82 & 83
Site Category: (None)
Signals - Actuated Isolated Cycle Time = 73 seconds (Site Practical Cycle Time)
Design Life Analysis (Final Year): Results for 5 years

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East: Raymond Terrace Road															
5	T1	All MCs	592	1.2	592	1.2	0.495	22.5	LOS B	9.1	64.6	0.82	0.70	0.82	54.0
6	R2	All MCs	297	0.4	297	0.4	*0.585	33.4	LOS C	9.4	65.8	0.90	0.82	0.90	38.8
Approach			889	0.9	889	0.9	0.585	26.2	LOS B	9.4	65.8	0.85	0.74	0.85	47.8
North: Settlers Boulevard															
7	L2	All MCs	152	0.7	152	0.7	0.372	22.0	LOS B	5.4	38.3	0.83	0.77	0.83	39.4
9	R2	All MCs	144	2.9	144	2.9	*0.407	44.0	LOS D[11]	5.4	38.3	0.90	0.77	0.90	36.8
Approach			296	1.8	296	1.8	0.407	32.7	LOS C	5.4	38.3	0.87	0.77	0.87	38.1
West: Raymond Terrace Road															
10	L2	All MCs	295	1.1	295	1.1	0.285	16.9	LOS B	5.5	38.6	0.54	0.75	0.54	47.3
11	T1	All MCs	580	1.3	580	1.3	*0.631	23.0	LOS B	12.3	87.1	0.84	0.72	0.84	53.5
12u	U	All MCs	1	0.0	1	0.0	0.003	29.3	LOS C	0.0	0.2	0.73	0.64	0.73	46.2
Approach			876	1.2	876	1.2	0.631	20.9	LOS B	12.3	87.1	0.74	0.73	0.74	51.2
All Vehicles			2060	1.2	2060	1.2	0.631	24.9	LOS B	12.3	87.1	0.80	0.74	0.80	47.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

11 Level of Service is worse than the Level of Service Target specified in the Parameter Settings dialog.
* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
East: Raymond Terrace Road												
P2	Full	1	1	30.7	LOS D	0.0	0.0	0.92	0.92	46.1	20.0	0.43
North: Settlers Boulevard												
P3	Full	1	1	25.5	LOS C	0.0	0.0	0.84	0.84	40.9	20.0	0.49
West: Raymond Terrace Road												
P4	Full	1	1	30.7	LOS D	0.0	0.0	0.92	0.92	46.1	20.0	0.43
All Pedestrians		3	3	29.0	LOS C	0.0	0.0	0.89	0.89	44.4	20.0	0.45

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

MOVEMENT SUMMARY

Site: 101 [2033AM + development (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

Raymond Terrace Road / Settlers Boulevard signals
Includes all approved developments plus Stages 81,82,83
Site Category: (None)
Signals - Actuated Isolated Cycle Time = 86 seconds (Site Practical Cycle Time)
Design Life Analysis (Final Year): Results for 15 years

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East: Raymond Terrace Road															
5	T1	All MCs	807	3.5	807	3.5	0.645	27.6	LOS B	15.3	110.1	0.86	0.75	0.86	50.9
6	R2	All MCs	127	3.3	127	3.3	*0.402	43.4	LOS D[11]	4.9	35.3	0.91	0.78	0.91	35.1
Approach			934	3.4	934	3.4	0.645	29.7	LOS C	15.3	110.1	0.87	0.75	0.87	48.0
North: Settlers Boulevard															
7	L2	All MCs	278	2.3	278	2.3	0.525	19.4	LOS B	11.5	82.3	0.82	0.80	0.82	39.2
9	R2	All MCs	348	2.4	348	2.4	*0.575	44.0	LOS D[11]	11.5	82.3	0.88	0.81	0.88	37.2
Approach			626	2.4	626	2.4	0.575	33.1	LOS C	11.5	82.3	0.85	0.80	0.85	38.1
West: Raymond Terrace Road															
10	L2	All MCs	165	10.8	165	10.8	0.140	12.5	LOS A	2.4	18.1	0.36	0.70	0.36	49.8
11	T1	All MCs	694	5.0	694	5.0	*0.728	26.8	LOS B	17.8	129.7	0.87	0.75	0.87	50.9
12u	U	All MCs	2	0.0	2	0.0	0.007	40.7	LOS C	0.1	0.4	0.83	0.64	0.83	40.4
Approach			861	6.1	861	6.1	0.728	24.1	LOS B	17.8	129.7	0.77	0.74	0.77	50.6
All Vehicles			2421	4.1	2421	4.1	0.728	28.6	LOS C	17.8	129.7	0.83	0.76	0.83	45.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

11 Level of Service is worse than the Level of Service Target specified in the Parameter Settings dialog.
* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
East: Raymond Terrace Road												
P2	Full	1	1	35.4	LOS D	0.0	0.0	0.91	0.91	50.8	20.0	0.39
North: Settlers Boulevard												
P3	Full	1	1	26.9	LOS C	0.0	0.0	0.79	0.79	42.3	20.0	0.47
West: Raymond Terrace Road												
P4	Full	1	1	37.2	LOS D	0.0	0.0	0.93	0.93	52.6	20.0	0.38
All Pedestrians		3	4	33.2	LOS D	0.0	0.0	0.88	0.88	48.5	20.0	0.41

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

MOVEMENT SUMMARY

Site: 101 [2033PM + development (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

Raymond Terrace Road / Settlers Boulevard signals
Includes all approved developments plus stages 81,82 & 83
Site Category: (None)
Signals - Actuated Isolated Cycle Time = 82 seconds (Site Practical Cycle Time)
Design Life Analysis (Final Year): Results for 15 years

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East: Raymond Terrace Road															
5	T1	All MCs	795	1.2	795	1.2	0.578	23.3	LOS B	13.6	96.0	0.82	0.71	0.82	53.6
6	R2	All MCs	297	0.4	297	0.4	*0.657	39.1	LOS C	11.0	77.0	0.93	0.83	0.93	36.6
Approach			1092	1.0	1092	1.0	0.657	27.6	LOS B	13.6	96.0	0.85	0.74	0.85	47.6
North: Settlers Boulevard															
7	L2	All MCs	152	0.7	152	0.7	0.364	27.6	LOS B	5.9	41.7	0.82	0.77	0.82	38.4
9	R2	All MCs	144	2.9	144	2.9	*0.398	44.6	LOS D[11]	5.9	41.7	0.90	0.77	0.90	35.7
Approach			296	1.8	296	1.8	0.398	35.9	LOS C	5.9	41.7	0.86	0.77	0.86	37.0
West: Raymond Terrace Road															
10	L2	All MCs	295	1.1	295	1.1	0.262	15.8	LOS B	5.4	38.3	0.48	0.74	0.48	48.0
11	T1	All MCs	779	1.3	779	1.3	*0.737	24.0	LOS B	18.8	132.8	0.85	0.74	0.85	52.9
12u	U	All MCs	2	0.0	2	0.0	0.005	34.0	LOS C	0.0	0.3	0.76	0.64	0.76	43.7
Approach			1075	1.2	1075	1.2	0.737	21.7	LOS B	18.8	132.8	0.75	0.74	0.75	51.4
All Vehicles			2463	1.2	2463	1.2	0.737	26.0	LOS B	18.8	132.8	0.81	0.74	0.81	47.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

11 Level of Service is worse than the Level of Service Target specified in the Parameter Settings dialog.
* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
East: Raymond Terrace Road												
P2	Full	1	1	35.2	LOS D	0.0	0.0	0.93	0.93	50.6	20.0	0.40
North: Settlers Boulevard												
P3	Full	1	1	24.2	LOS C	0.0	0.0	0.77	0.77	39.6	20.0	0.51
West: Raymond Terrace Road												
P4	Full	1	1	35.2	LOS D	0.0	0.0	0.93	0.93	50.6	20.0	0.40
All Pedestrians		3	4	31.5	LOS D	0.0	0.0	0.87	0.87	46.9	20.0	0.43

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)