Amendment C106 to the Mitchell Planning Scheme and the Beveridge North West Precinct Structure Plan (PSP) – Traffic Matters

Expert Witness Statement

(Planning Panel Reference – Amendment C106)

STATEMENT TO THE PLANNING PANELS VICTORIA

by Ali Abdou, DIRECTOR

6 July 2020

Project No. 190900

Final Report: 6/07/2020

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ATTACHMENT D SIDRA ANALYSIS RESULTS

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ATTACHMENT F SPRING HILL CONE – ROAD HIERARCHY PLAN

1 QUALIFCATIONS

My name is Ali Abdou and I practice as a Director with Trafficworks Pty Ltd at the First Floor, 132 Upper Heidelberg Road, Ivanhoe 3079.

My educational qualifications and membership of professional associations are as follows:

- Bachelor of Engineering in Civil Engineering (Honours), Victoria University
- Member, Institution of Engineers, Australia
- Member, Australian Institute of Traffic and Planning Management Incorporated.

I have over 17 years' experience in traffic engineering, 3 years with Hume City Council, 3 years with VicRoads and 11 years in private practice with John Piper Traffic, CPG Australia (CPG) and Trafficworks Pty Ltd. I joined Trafficworks Pty Ltd in April 2012.

My areas of expertise include, traffic and parking impact assessments and traffic design for a variety of developments, road safety auditing and general traffic engineering and road safety.

A copy of the relevant information that is required to accord with Panel's Guide to Expert Evidence is attached at Attachment A to this report.

My declaration in regard to this statement is provided in Section 9.

2 BACKGROUND

2.1 Introduction

The Beveridge North West Precinct Structure Plan (PSP) was prepared and made available for public exhibition in August 2019.

The Victorian Planning Authority (VPA) prepared Amendment C106 to the Mitchell Planning Scheme for the Beveridge North West PSP and includes the following changes:

- rezoning land in the PSP area to Urban Growth Zone 3 (UGZ3) and Rural Conservation Zone (RCZ)
- inserts Schedule 3 to Clause 37.07 Urban Growth Zone (UGZ) into the Mitchell Planning Scheme
- inserts Schedule 4 to Clause 43.03 Incorporated Plan Overlay (IPO) into the Mitchell Planning Scheme
- deletes the Erosion Management Overlay (EMO) and Vegetation Protection Overlay Schedule 1 and Schedule 2 (VPO1, VPO2) from land in the Amendment area
- incorporates the Beveridge North West PSP into the planning scheme by listing it in the Schedule to Clause 72.04.

The VPA has proposed two north-south arterial roads within the Beveridge North West PSP, which also extends through the Wallan South PSP to Taylors Lane.

Crystal Group owns approximately 530 ha of land adjoining the northern boundary of the PSP area situated at 175 Northern Highway, Wallan. The Crystal Group Land is included within the proposed Wallan South PSP area and is comprised of a number of titles.

Wally Mott (part of Crystal Group) owns a parcel of land within the Beveridge North West PSP area situated also at 175 Northern Highway, Wallan, comprised of a single title known as Lot 2 on LP6747. This land is approximately 116ha in area and is used for farming and agricultural purposes.

Crystal Group's key concern is the layout of connector and arterial roads. They generally support the road layout as demonstrated in the exhibited PSP, and an indicative subdivision of the Crystal Group Land has been prepared on that basis (refer to Figure 3). However, Crystal Group seek to re-align one of the proposed north-south arterial roads through the Wallan South PSP to the Northern Highway, instead of continuing to Taylors Lane.

Crystal Group are also concerned about the internal road configuration, and whether any changes might be necessary having regard to development potential in the vicinity of the Spring Hill Cone. In addition, Crystal Group wish to enhance the visual and landscape character of Spring Hill Cone by designating it as open space / nature amphitheatre/ recreation reserve with a ring road network around the perimeter of Spring Hill Cone.

I have been engaged by HWL Ebsworth Lawyers on behalf of Crystal Group to prepare an independent expert witness statement of evidence addressing:

- the re-alignment of Patterson Road (eastern north-south arterial road) connecting through to the Northern Highway
- subsequently the requirement of an east-west road (Hadfield Road) between the Wallan South PSP and the Beveridge North West PSP
- the requirement for signalised intersections at the two proposed north-south arterial roads with the east-west road (Hadfield Road) between the Wallan South PSP and the Beveridge North PSP
- the internal road configuration to facilitate development potential in the vicinity of the Spring Hill Cone.

Crystal Group has submitted a request for the VPA's decision to be reviewed by Planning Panels Victoria, pursuant to section 149 (1)(a) of the Planning and Environment Act 1978, with a hearing set for 5 August 2020.

2.2 References

References used in the preparation of this statement include the following:

- Austroads Guide to Road Design - Part 4A: Unsignalised and Signalised Intersections, 2017
- Austroads Guide to Traffic Management – Part 5: Road Management
- *RTA Guide to Traffic Generating Developments, Version 2.2, October 2002*
- *Victoria Planning Authority (VPA), Engineering Design and Construction Manual for Subdivision in Growth Areas, Decmeber 2019*

Documents provided by the client include:

- Melbourne's North Growth Corridor – Future Transport Challenges, prepared by GTA Consultants, dated 31 October 2019
- Beveridge North West Precinct Structure Plan – Background Report, prepared by VPA, dated August 2019
- Beveridge North West Precinct Structure Plan, prepared by VPA, dated August 2019
- Beveridge North West PSP – Strategic Transport Modelling Assessment, prepared by GTA Consultants, dated 10 December 2018
- Letter from Crystal Group, dated 6 October 2019, submission in response to the changes proposed by the VPA pursuant to Amendment C106
- Letter from Wally Mott, dated 7 October 2019, submission in response to the changes proposed by the VPA pursuant to Amendment C106
- Mitchell Planning Scheme – Amendment C106 Explanatory Report and Instruction Sheet, prepared by Mitchell Shire Council
- VPA Submission Summary – Beveridge North West PSP – Amendment C106 (Version 1), prepared by VPA, dated 26 June 2020.
- Beveridge Williams functional layout plan (issue P5) – 175 Northern Highway, Wallan

- 175 Northern Highway, Wallan – Proposed Quarry Development Transport Impact Assessment, prepared by GTA Consultants
- Spring Hill Cone concept plans, prepared by Hayball
- Proposed Layout Plan Spring Hill, prepared by Millar Merrigan.

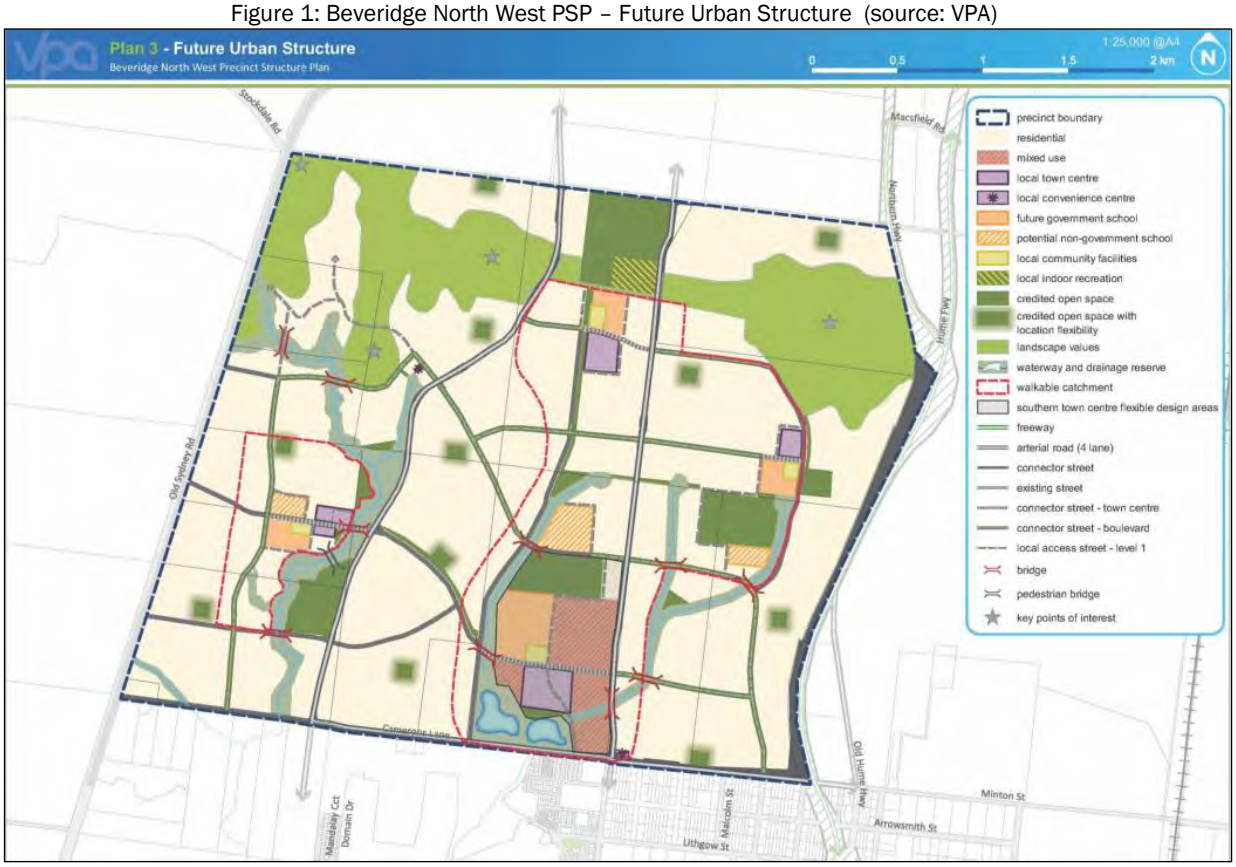
3 PRECINCT STRUCTURE PLAN

3.1 Beveridge North West PSP

The Beveridge North West (BNW) PSP is located approximately 42 km north of Melbourne's CBD and is located within the North Growth Corridor. The site is approximately 1,250 hectares of land bounded by Hadfield Road reserve to the north, Camerons Lane to the south, Northern Highway to the east and Old Sydney Road to the west. Spring Hill Cone which has been earmark as an area of landscape value, is located within the Beveridge North West PSP.

Figure 1 provides a future urban structure plan for BNW PSP.

Figure 1: Beveridge North West PSP – Future Urban Structure (source: VPA)



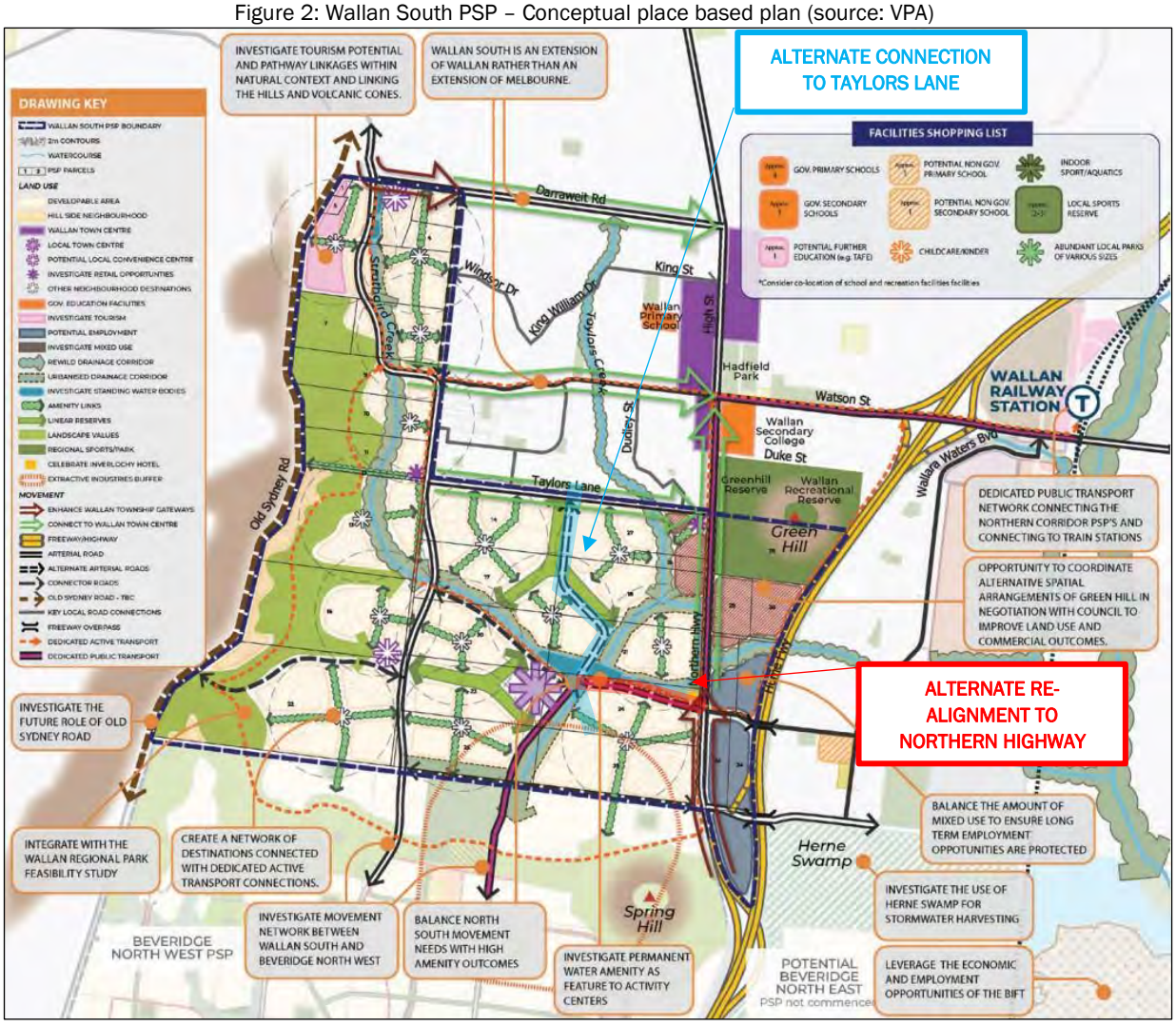
3.2 Wallan South PSP

The Wallan South (WS) PSP is located to the north of the BNW PSP. The site is generally bound by Taylors Lane / Darraweit Road to the north, Hadfield Road reserve to the south, Northern Highway to the east and Old Sydney Road to the west. Wallan South is expected to have a residential focus and supported by associated services and facilities such as town centres, schools, community centres and parks.

Figure 2 provides a conceptual place based plan for WS PSP.

The conceptual place based plan indicates alternate arterial roads – one that essentially connects the town centre to Taylors Lane and the other alternate arterial road providing a re-aligned connection from the town centre through to Northern Highway.

Figure 2: Wallan South PSP – Conceptual place based plan (source: VPA)



3.3 Road Network

The roads surrounding the subject site are described in the subsequent sections of the report.

3.3.1 Northern Highway

Northern Highway (Route B 75) is a two-lane two-way arterial road managed by the Department of Transport (DoT, formerly VicRoads) and is aligned in a north-south direction in the vicinity of the subject site. Northern Highway provides a connection between Beveridge and Hume Freeway interchange to the south and Wallan, Kilmore and Echuca to the north.

A posted limit of 100 km/h currently applies to Northern Highway in the vicinity of the site, with the speed limit reducing to 80 km/h approximately 400 – 450 m south of the Taylors Lane intersection towards the Wallan township.

Ultimately, the length of Northern Highway will be widened to become a divided four-lane two-way arterial road.

3.3.2 Taylors Lane

Taylors Lane is a two-lane two-way collector road managed by Mitchell Shire Council and is aligned in an east-west direction. Taylors Lane provides a connection between High Street (Northern Highway) to the east and Rowes Lane to the west, with local connection to general residential properties along the northern side of the road length.

The posted speed limit of 60 km/h applies along the length of Taylors Lane.

Ultimately, Taylors Lane may be widened to become a secondary arterial road.

3.3.3 Old Sydney Road

Old Sydney Road is a two-way road managed by Mitchell Shire Council and is aligned in a north-south direction. Old Sydney Road provides a connection between Northern Highway (Bylands) to the north and Mickleham Road (Mickleham) to the south.

Old Sydney Road is an unsealed gravel road north of Stockdale Road (adjacent to BNW PSP), becoming a sealed carriageway south of Stockdale Road (adjacent to WS PSP).

The default rural speed limit of 100 km/h applies along the length of Old Sydney Road.

3.3.4 Macsfield Road

Macsfield Road is a two-way sealed local access road managed by the Mitchell Shire Council and is aligned in an east-west direction. It provides a connection between Northern Highway to the west and the properties along its length to the east. There is currently a single lane bridge over the Hume Freeway with no through access east of the Hume Freeway.

The default rural speed limit of 100 km/h applies along the length of Macsfield Road.

Ultimately, Macsfield Road is proposed to be upgraded into a two-lane two-way connector street, connecting to Wallara Waters Boulevard providing access to the residential development east of the Hume Freeway. This includes a two-lane bridge over the Hume Freeway, to connect to the Northern Highway.

4 AMENDMENTS SOUGHT

4.1 Re-alignment of Patterson Road

Crystal Group seek to re-align the proposed eastern north-south arterial road (indicated as Patterson Road in the BNW PSP) through the Wallan South PSP and then east to the Northern Highway, instead of continuing north to Taylors Lane (referred to as one of the alternate arterial roads in the conceptual place based plan – Figure 2). This re-aligned north-south arterial road is proposed to provide a connection to the Northern Highway at the Macsfield Road intersection and become a signalised cross intersection.

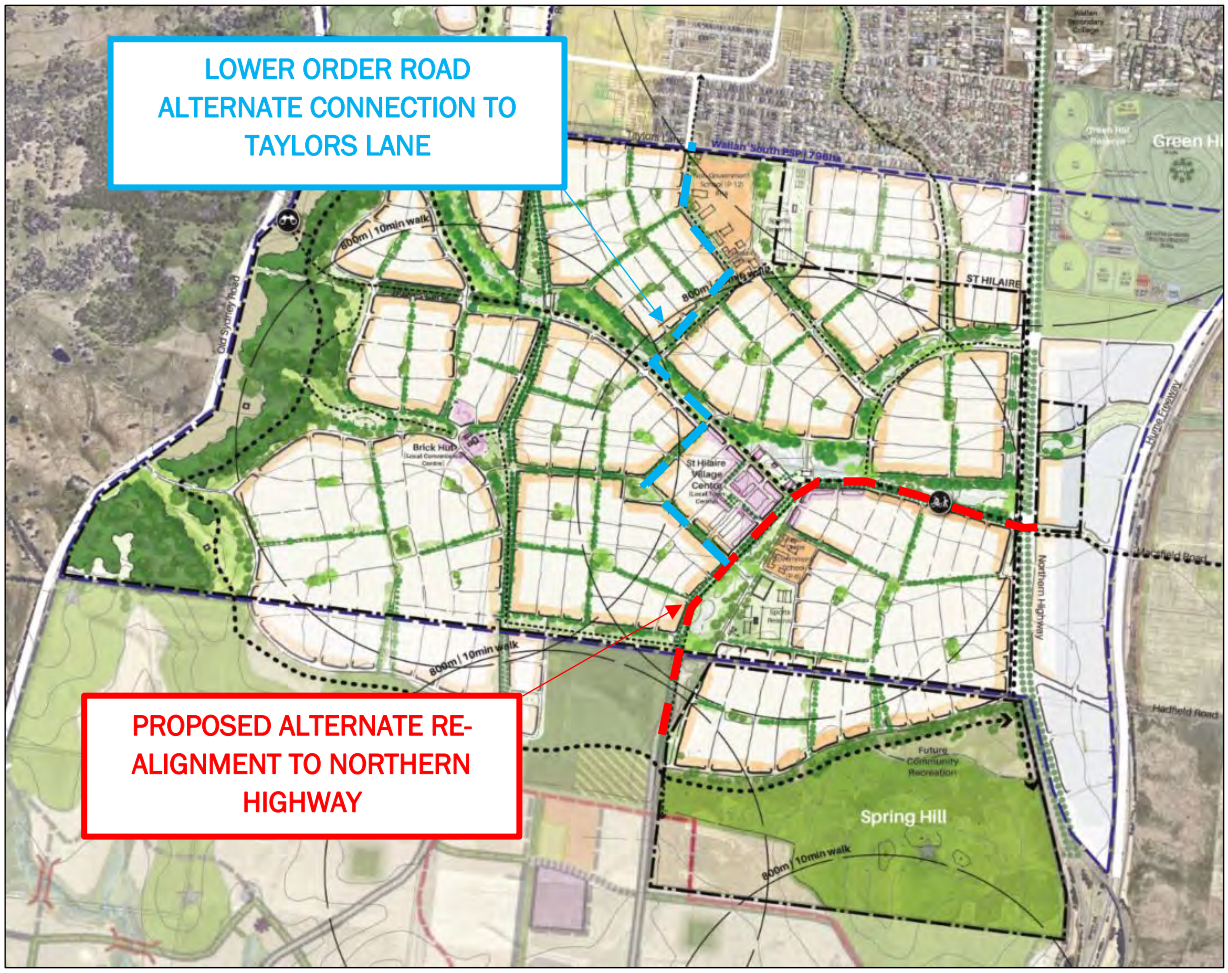
Figure 3 shows the indicative subdivision of the Crystal Group Land prepared generally in line with the road layout as demonstrated in the exhibited PSP.

The Wallan South PSP – Conceptual place based plan (Figure 2) indicates that the eastern north-south arterial road (indicated as Patterson Road in the BNW PSP) **continuing north to Taylors Lane as an Alternate Road** and **also indicates a connection to Macsfield Road as another Alternate Road**, however, this section with a dedicated transport link.

This report seeks to assess the connection to Macsfield Road as the preferred Alternate Road, without impacting the local road network as a result of introducing a lower order connection north to Taylors Lane.

The proposed re-alignment of Patterson Road is shown in Figure 3.

Figure 3: St Hilaire concept masterplan – Proposed re-alignment



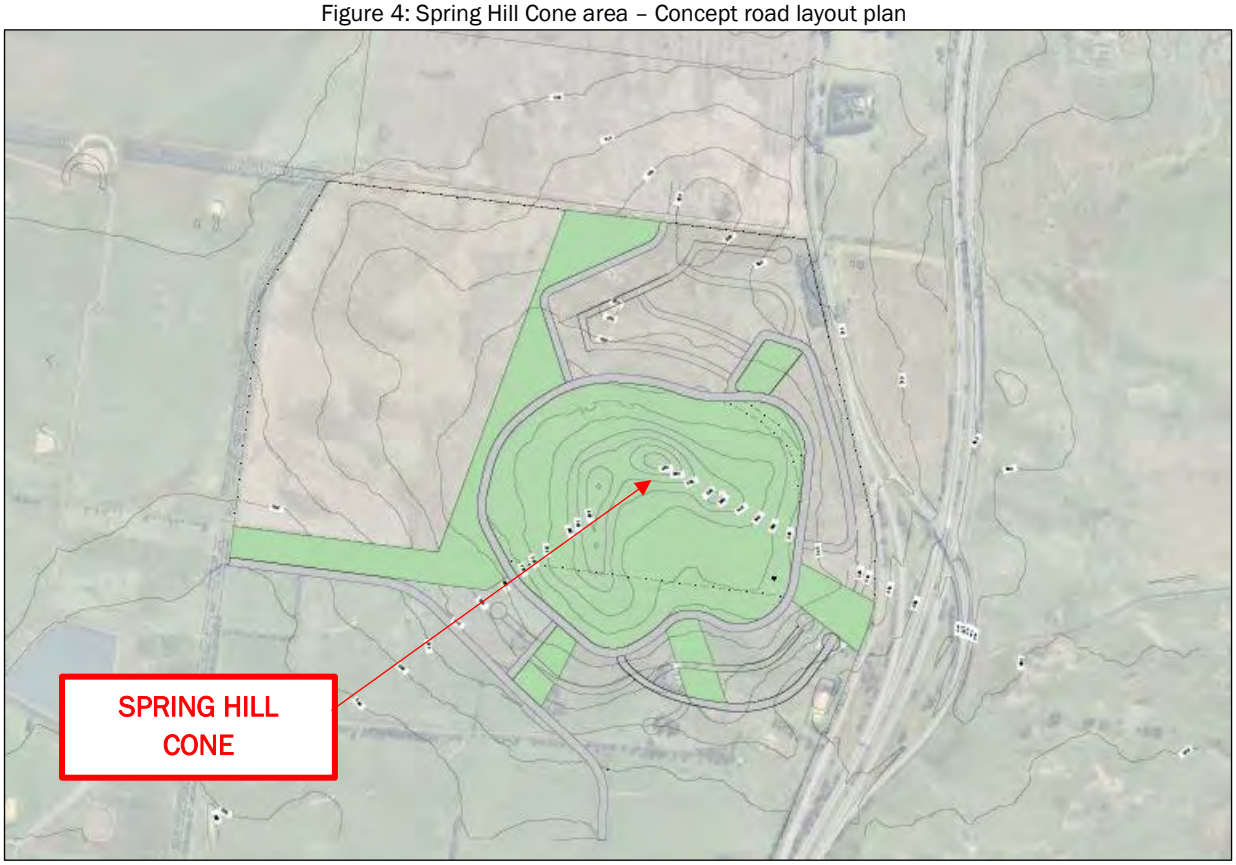
4.2 Spring Hill Cone Internal Road Layout

Crystal Group have raised concerns with whether any changes might be necessary to the internal road layout having regard to development potential in the vicinity of the Spring Hill Cone. Crystal Group sought traffic advice for the proposed ring road operation, configuration and cross section.

In addition, Crystal Group wish to enhance the visual and landscape character of Spring Hill Cone by designating it as open space / nature amphitheatre / recreation reserve with a ring road network around the perimeter of Spring Hill Cone to maximise people's ability to view the landscape.

A concept road layout plan for Spring Hill Cone is shown in Figure 4.

Figure 4: Spring Hill Cone area – Concept road layout plan



5 TRAFFIC VOLUMES

5.1 Interim and Ultimate Design Year Traffic Volumes

A report titled *Beveridge North West PSP – Strategic Transport Modelling Assessment* was prepared by GTA Consultants on behalf of the VPA to provide traffic modelling for the Beveridge North West PSP and the anticipated surrounding road network. The report provides two-hour traffic volumes along the approaches for key intersections within the Beveridge North West PSP road network as well as for the anticipated road network within the Wallan South PSP for both the interim (2031) and ultimate (2046) design years.

Anticipated traffic volumes for interim and ultimate design years were obtained from the report for the following key intersections:

1. Northern Highway / Taylors Lane
2. Northern Highway / east-west arterial road (near Macsfield Road)
3. Northern Highway / Hadfield Road
4. Eastern north-south arterial road / Patterson Road / Hadfield Road
5. Western north-south arterial road / Hadfield Road
6. Patterson Road / Camerons Lane

Figures 5 - 8 provide the AM and PM peak two-hour traffic volumes for the interim and ultimate design years for the locations of the above intersections.

For the purpose of this assessment, the two-hour traffic volumes were converted to peak hour traffic volumes (i.e. vehicles per hour (vph)) for the interim and ultimate design years. A conversion factor of 55% was assumed for the peak hour traffic volumes on each of the intersections. Table 1 and 2 provides a summary of the peak hour traffic volumes for the interim and ultimate design years respectively.

Figure 5: 2031 – AM peak two-hour traffic volumes (source: GTA Consultants)

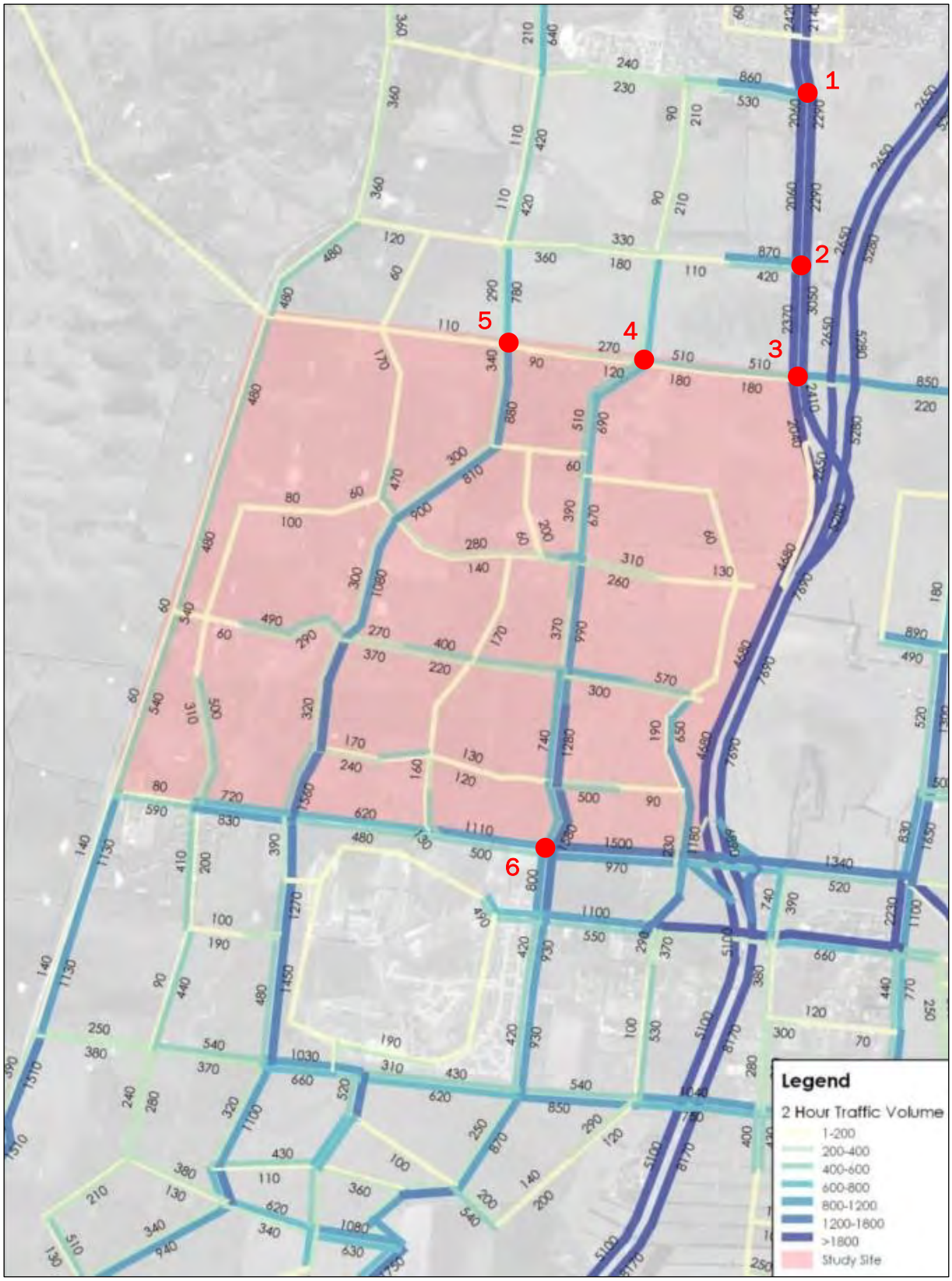


Figure 6: 2031 – PM peak two-hour traffic volumes (source: GTA Consultants)

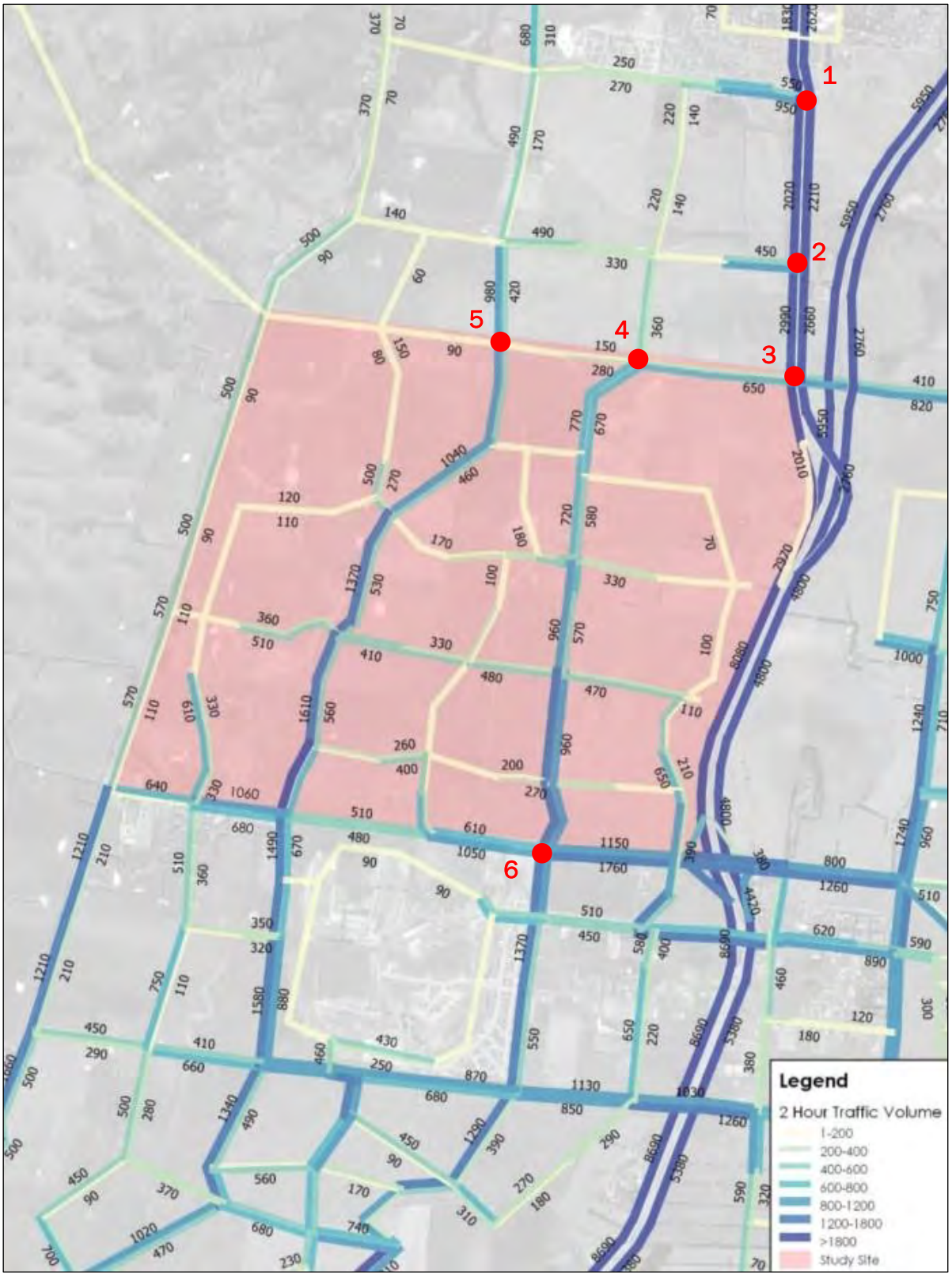


Figure 7: 2046 – AM peak two-hour traffic volumes (source: GTA Consultants)

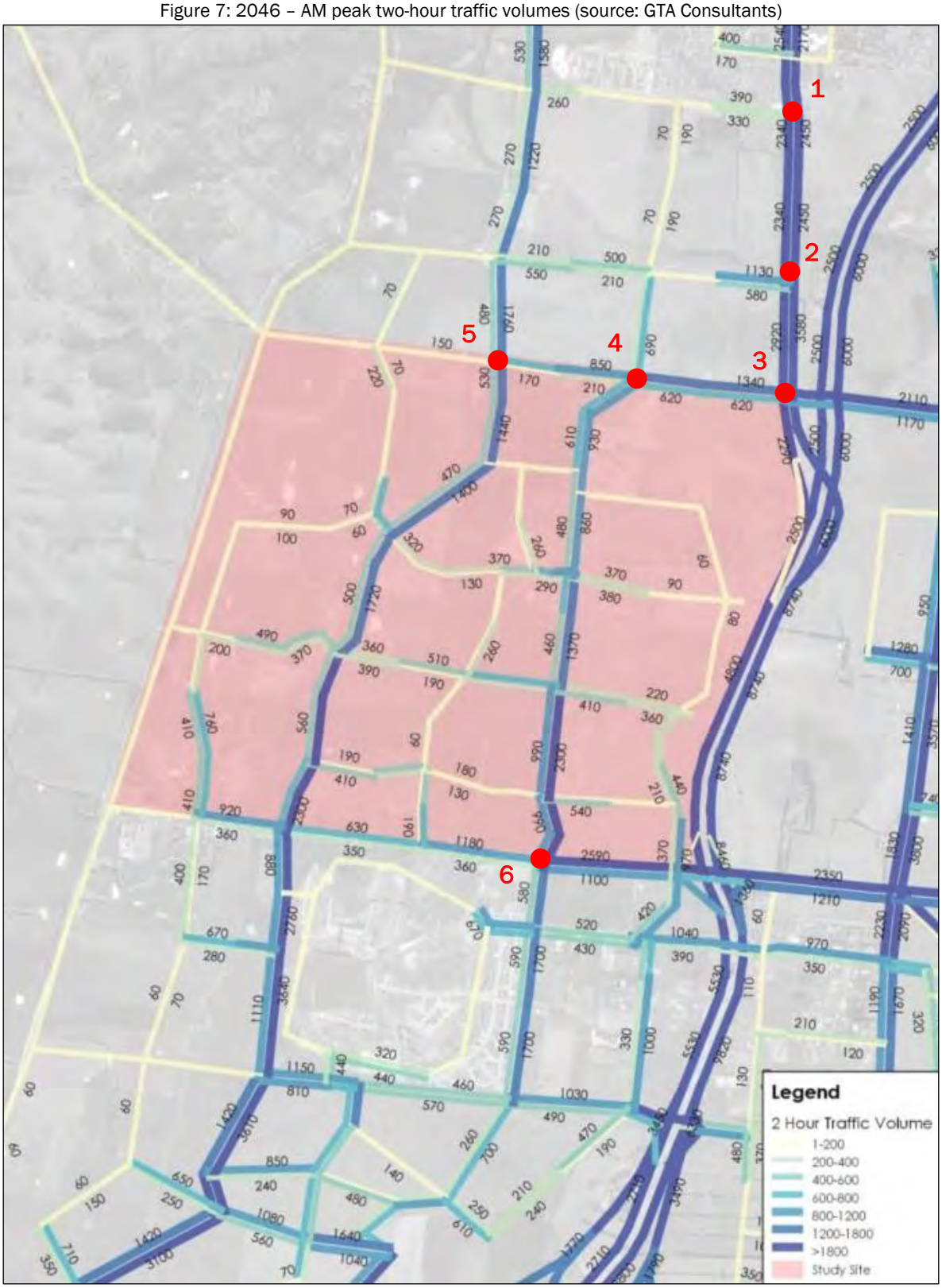


Figure 8: 2046 – PM peak two-hour traffic volumes (source: GTA Consultants)

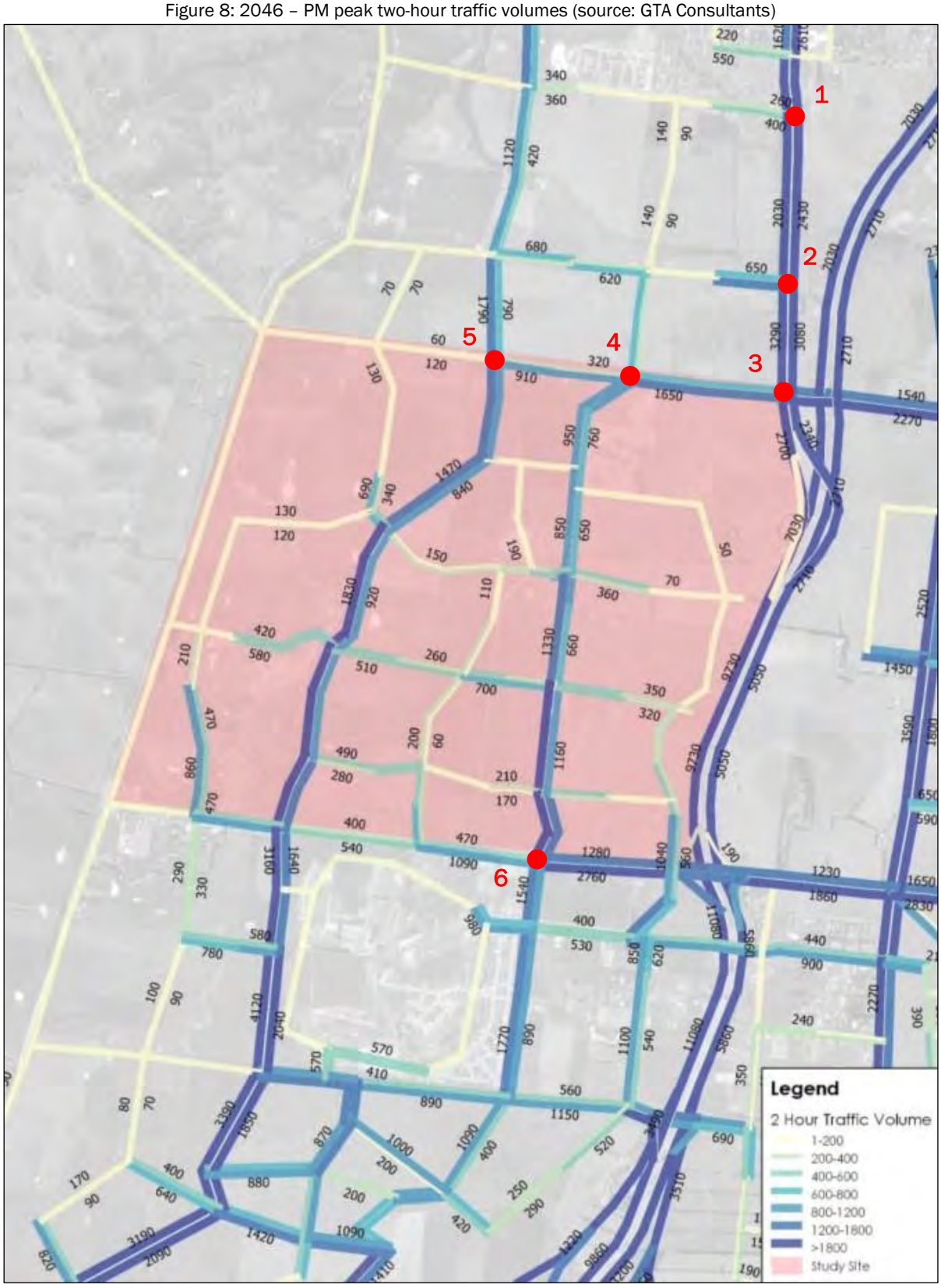


Table 1: Summary of peak hour traffic volumes for the interim design year (2031)

	Intersection	Movements	Interm Design Year (2031)							
			Peak 2-Hour Traffic Volumes				Peak Hour Traffic Volumes (vph)			
			Arrival		Departure		Arrival		Departure	
			AM	PM	AM	PM	AM	PM	AM	PM
1	Northern Highway / Taylors Lane	Northern Highway (south approach)	2,060	2,020	2,290	2,210	1,133	1,111	1,260	1,216
		Northern Highway (north approach)	2,140	2,620	2,420	1,830	1,177	1,441	1,331	1,007
		Taylors Lane (west approach)	860	550	530	950	473	303	292	523
2	Northern Highway / Re-aligned Arterial Road	Northern Highway (south approach)	2,370	2,990	3,050	2,660	1,304	1,645	1,678	1,463
		Northern Highway (north approach)	2,290	2,210	2,060	2,020	1,260	1,216	1,133	1,111
		Re-aligned Arterial Road (west approach)	870	450	420	970*	479	248	231	534
3	Northern Highway / Hadfield Road	Northern Highway (south approach)	2,040	2,010	2,410	2,040*	1,122	1,106	1,326	1,122
		Hadfield Road (east approach)	220	820	850	410	121	451	468	226
		Northern Highway (north approach)	3,050	2,660	2,370	2,990	1,678	1,463	1,304	1,645
		Hadfield Road (west approach)	510	380*	180	650	281	209	99	358
4	Re-aligned Arterial Road / Patteron Road / Hadfield Road	Patteron Road (south approach)	510	770	690	670	281	424	380	369
		Hadfield Road (east approach)	180	650	510	380*	99	358	281	209
		Re-aligned Arterial Road (west approach)	610*	360	280*	600*	336	198	154	330
		Hadfield Road (west approach)	270	150	90	280	149	83	50	154
5	Western North-South Arterial Road / Hadfield Road	Western North-South Arterial Road (south approach)	340	1,000*	880	400*	187	550	484	220
		Hadfield Road (east approach)	90	100*	80*	150	50	55	44	83
		Western North-South Arterial Road (north approach)	780	420	290	980	429	231	160	539
		Hadfield Road (west approach)	110	100*	70*	90	61	55	39	50
6	Patterson Road / Camerons Lane	Patterson Road (south approach)	800	1,230*	1,660*	1,200*	440	677	913	660
		Camerons Lane (east approach)	970	1,760	1,500	1,150	534	968	825	633
		Patterson Road (north approach)	1,580	1,200*	800*	1,400*	869	660	440	770
		Camerons Lane (west approach)	1,110	610	500	1,050	611	336	275	578

**Where no traffic volume data was provided for the arrival / departure approaches, the traffic volumes were conservatively based on the ranges provided within the strategic transport model (i.e. based on the colour ranges within the legend)*

Table 2: Summary of peak hour traffic volumes for the ultimate design year (2046)

	Intersection	Movements	Ultimate Design Year (2046)							
			Peak 2-Hour Traffic Volumes				Peak Hour Traffic Volumes (vph)			
			Arrival		Departure		Arrival		Departure	
			AM	PM	AM	PM	AM	PM	AM	PM
1	Northern Highway / Taylors Lane	Northern Highway (south approach)	2,340	2,030	2,450	2,430	1,287	1,117	1,348	1,337
		Northern Highway (north approach)	2,170	2,610	2,540	1,620	1,194	1,436	1,397	891
		Taylors Lane (west approach)	390	260	330	400	215	143	182	220
2	Northern Highway / Re-aligned Arterial Road	Northern Highway (south approach)	2,920	3,290	3,580	3,080	1,606	1,810	1,969	1,694
		Northern Highway (north approach)	2,450	2,430	2,340	2,030	1,348	1,337	1,287	1,117
		Re-aligned Arterial Road (west approach)	1,130	650	580	1,260*	622	358	319	693
3	Northern Highway / Hadfield Road	Northern Highway (south approach)	2,290	2,700	2,740*	2,340	1,260	1,485	1,507	1,287
		Hadfield Road (east approach)	1,170	2,270	2,110	1,540	644	1,249	1,216	847
		Northern Highway (north approach)	3,580	3,080	2,920	3,290	1,969	1,694	1,606	1,810
		Hadfield Road (west approach)	1,340	700*	620	1,650	737	385	341	908
4	Re-aligned Arterial Road / Patteron Road / Hadfield Road	Patteron Road (south approach)	610	950	930	1,000*	336	523	512	550
		Hadfield Road (east approach)	620	1,650	1,340	700*	341	908	737	385
		Re-aligned Arterial Road (west approach)	690	400*	290*	710*	380	220	160	391
		Hadfield Road (west approach)	850	320	210	910	468	176	116	501
5	Western North-South Arterial Road / Hadfield Road	Western North-South Arterial Road (south approach)	530	1,270*	1,440	800*	292	699	792	440
		Hadfield Road (east approach)	170	910	600*	320	94	501	330	176
		Western North-South Arterial Road (north approach)	1,760	790	480	1,790	968	435	264	985
		Hadfield Road (west approach)	150	60	90*	120	83	33	50	66
6	Patterson Road / Camerons Lane	Patterson Road (south approach)	580	1,540	1,420*	1,090*	319	847	880	550
		Camerons Lane (east approach)	1,100	2,760	2,590	1,280	605	1,518	1,425	704
		Patterson Road (north approach)	2,500*	1,200*	990	2,510*	1,375	660	545	1,381
		Camerons Lane (west approach)	1,180	470	360	1,090	649	259	198	600

**Where no traffic volume data was provided for the arrival / departure approaches, the traffic volumes were conservatively based on the ranges provided within the strategic transport model (i.e. based on the colour ranges within the legend)*

5.2 Estimated Turning Movement Volumes

Based on the arrival and departure traffic volumes for each of the intersections, a high-level volume balancing assessment was undertaken to establish the turning movements volumes for both the interim and ultimate design years. The assessment involved applying percentage directional splits on the arrival volumes and approximately matching the departure flows on each of the legs of the intersection.

Estimated turning movement volumes for the interim and ultimate year are provided in Figures 9 and 10, respectively.

Figure 9: Estimated turning movement volumes – Interim (2031)

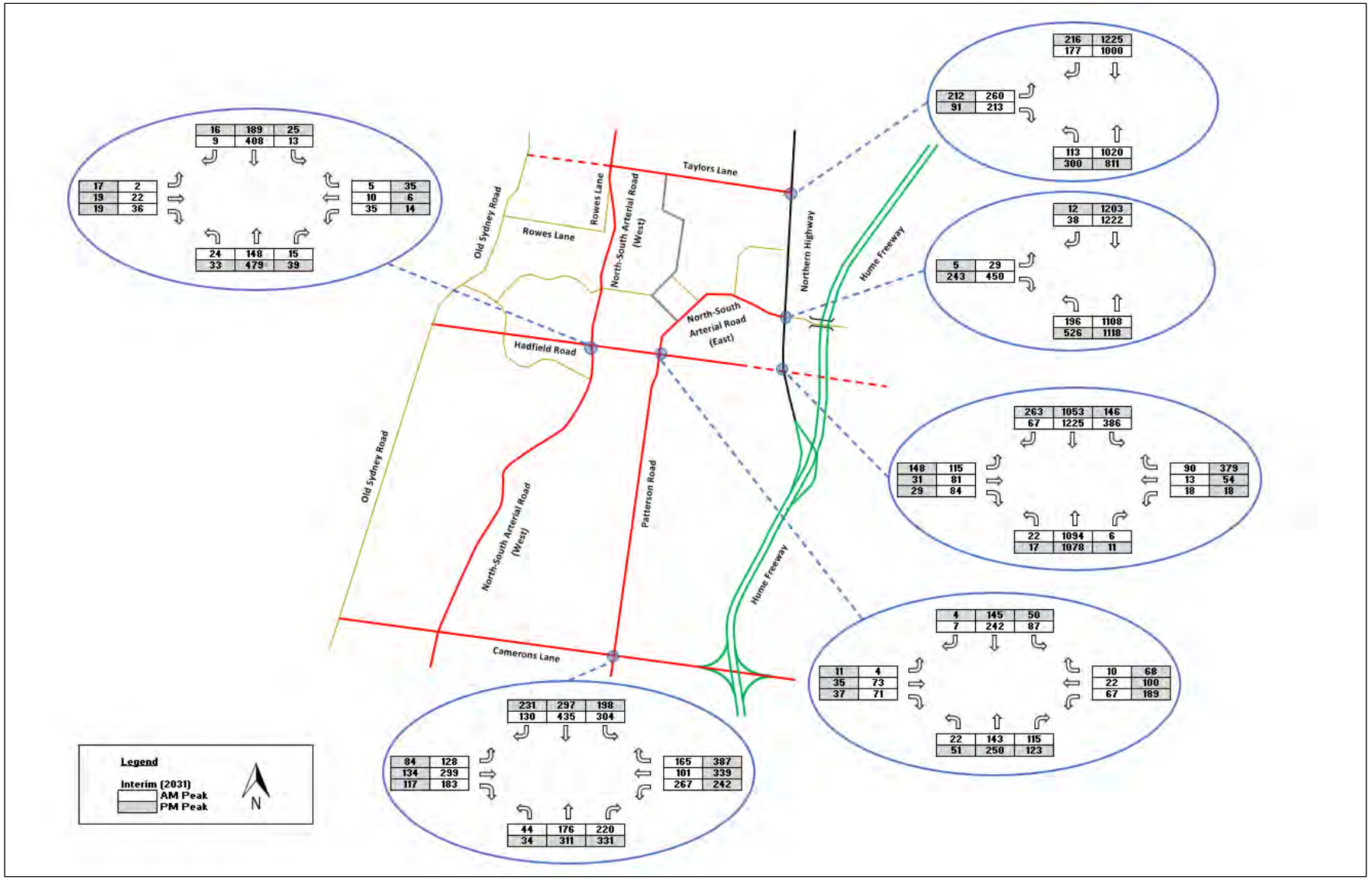
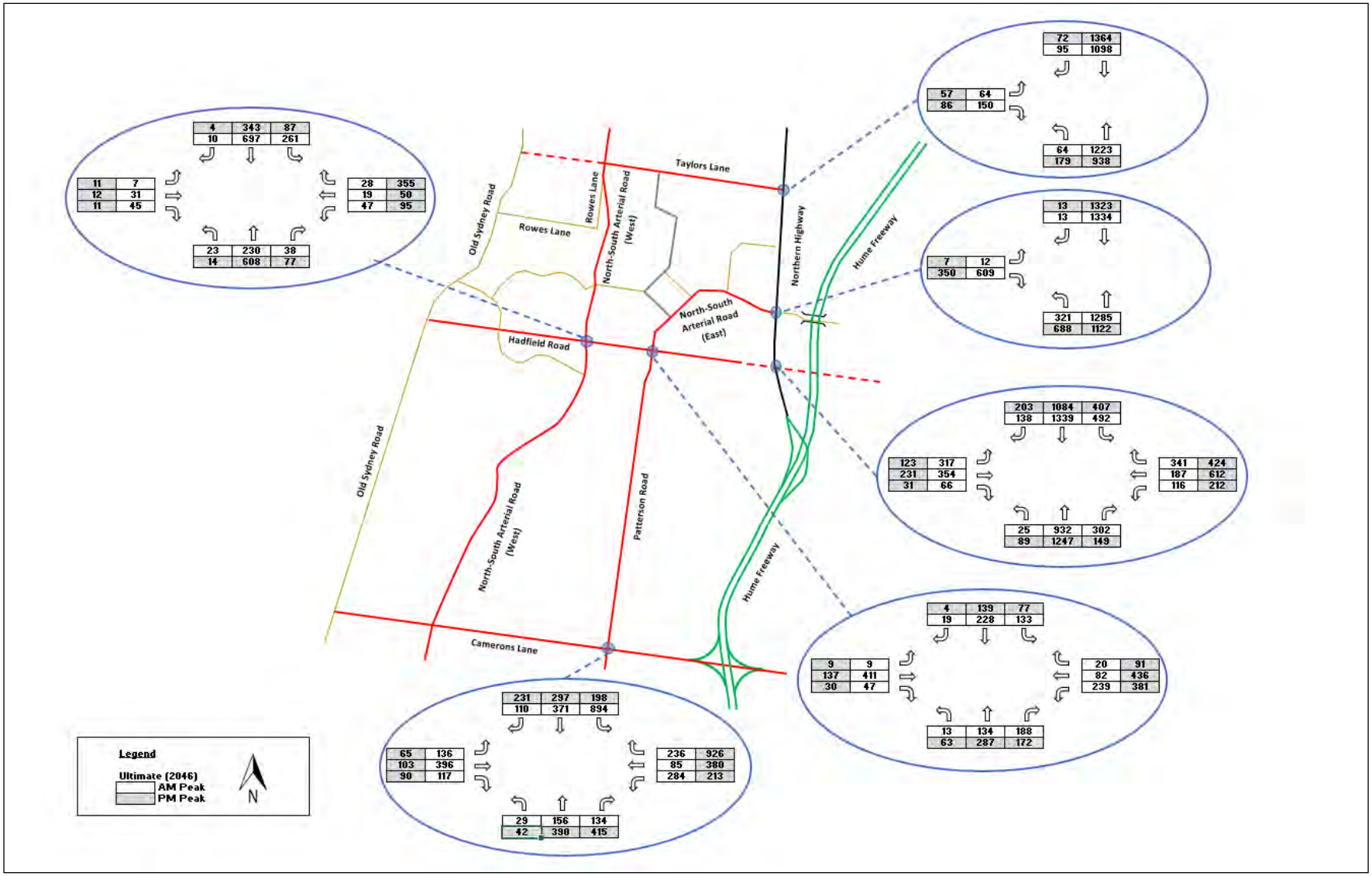


Figure 10: Estimated turning movement volumes – Ultimate (2046)



6 KEY TRAFFIC ISSUES

6.1 Re-alignment of Patterson Road

The *Beveridge North West PSP – Strategic Transport Modelling Assessment* prepared by GTA Consultants on behalf of the VPA was utilised to establish the anticipated traffic volumes at key intersections for the interim (2031) and ultimate (2046) design years. These volumes were used to undertake an assessment to determine the appropriateness of re-aligning the eastern north-south arterial to the east to form an intersection at the Northern Highway and Macsfield Road.

The land uses north of the Wallan South PSP / Taylors Lane are predominantly residential which does not lend itself as an attractor of traffic from within the BNW BSP. Therefore, it is more likely that traffic from the Beveridge North West PSP travelling north along Patterson Road wanting to travel to Wallan and beyond are more likely to utilise the re-aligned eastern arterial road that connects to the Northern Highway in lieu of the alternate eastern north-south arterial road within Wallan South PSP. This does not mean that a connection is not required to Taylors Lane, but rather the provision of a lower order road servicing the local catchment is expected to suffice.

A high-level re-distribution of the traffic volumes was undertaken and the impact on the surrounding road network and intersections were determined. The analysis has assumed the re-alignment of the eastern north-south arterial to the east to form an intersection at Northern Highway and Macsfield Road. It should be noted that the strategic transport modelling prepared by GTA Consultants does not consider the Macsfield Road connection to the Northern Highway as part of the assessment. Some high-level conservative assumptions were made.

The strategic transport model indicates a daily traffic volume of under 2,000 vpd along the alternate eastern north-south arterial road (Patterson Road) to Taylors Lane for the both interim and ultimate design years. This anticipated traffic volumes are within an intended capacity for an access street. Therefore, an arterial road connection is not required to Taylors Lane based on the strategic transport model.

6.2 Requirement of Hadfield Road

The VPA notes that Hadfield Road is located within the Wallan South PSP area, and is outside the scope of Amendment C106.

An investigation was undertaken at the Hadfield Road and Northern Highway connection to determine the requirement of Hadfield Road as an east-west arterial road. The investigation revealed that the Hadfield Road and Northern Highway connection is considered inappropriate for the following reasons:

- sight line restrictions due to a bend on the Northern Highway, north of Hadfield Road
- the close proximity of this intersection to the Hume Freeway / Northern Highway interchange – potentially limiting flexibility for future interchange upgrades
- does not take advantage of an existing Section 173 agreement which requires a developer on the east side of the Hume freeway to provide an overpass along Macsfield Road (to the Northern Highway). Refer to Attachment B which shows the Section 173 agreement plans as provided by the Crystal Group.

It also understood that the Department of Transport – DoT (formerly VicRoads) directed the provision of a signalised intersection north of the Hadfield Road reserve for an approved quarry development access. This is due to the Hadfield Road reserve passing over a localised high point in close proximity to the Northern Highway and significant work costs to achieve a desirable maximum grade of 5% due to the localised high point. A statement relating specifically to this point was provided in a report titled *175 Northern Highway, Wallan Proposed Quarry Development – Transport Impact Assessment* prepared by GTA Consultants, states:

> *It is not clear on what basis the current location of the Hadfield Road paper road reserve (Right of Way) was chosen. Upon review of proposed alignment on site, together with approximate contour plans, the current road reserve passes over a localised high point to the north east of the subject site (for information, the high point is a volcanically created scoria spout). Given that Hadfield Road is expected to be an arterial road, it will require significant works to achieve desirable maximum grades of 5% (or an absolute grade of 7%). Even in the interim, when considering only the access road for the quarry within the Hadfield Road reserve, such maximum grades are required to ensure access by vehicles up to and including B-Doubles can occur.*
>
> *On this basis, it is recommended that, and as directed by VicRoads previously, the site access be located to enable the quarry access road to avoid the localised high point to the east.*

Furthermore, the quarry development has indicated resources availability beyond 17 years. The provision of an intersection at Hadfield Road and Northern Highway will result in two signalised intersections within 150 m of each other which could introduce unintended road safety issues associated with traffic signals in close proximity to one another. This is contrary to the Austroads Guide to Traffic Management – Part 5: Road Management for arterial roads where intersections should be no less than 800 m apart. Once the quarry has been depleted, the signalised intersection for the quarry access is anticipated to be removed. Once removed, the re-aligned arterial road signalised intersection will be approximately 800 m from the Hume Freeway / Northern Highway interchange and therefore, will generally be in line with the access management principles.

6.3 Hadfield Road Intersections

The Hadfield Road intersections at the proposed north-south arterial roads between the Wallan South PSP and the Beveridge North PSP were analysed to determine their layout configuration and requirement.

Considering that it is proposed that there will be no connection to the Northern Highway via Hadfield Road as discussed in section 6.1 and section 6.2 above, it is assumed that Hadfield Road will be de-classified from an arterial road to a lower order road.

It is proposed that the section of Hadfield Road between the Northern Highway and Patterson Road is likely to be absorbed within the internal subdivision road network. A high-level assessment has been conducted to determine the type of intersection control from an operation and safety perspective.

It is understood that the intersection at the western north-south arterial road with Hadfield Road will remain as a cross-intersection and analysis has been conducted to determine if the intersection control could be a roundabout or traffic signals.

6.4 Spring Hill Cone Internal Road Network

Crystal Group want to investigate any changes that might be necessary having regard to development potential in the vicinity of the Spring Hill Cone. Crystal Group wish to enhance the visual and landscape character of Spring Hill Cone by designating it as open space / nature amphitheatre with a ring road network around the perimeter of Spring Hill Cone to maximise people's ability to view the landscape.

Due to the Spring Hill Cone topography some roads may be steep and may result in restricted sight lines due to horizontal and vertical alignments.

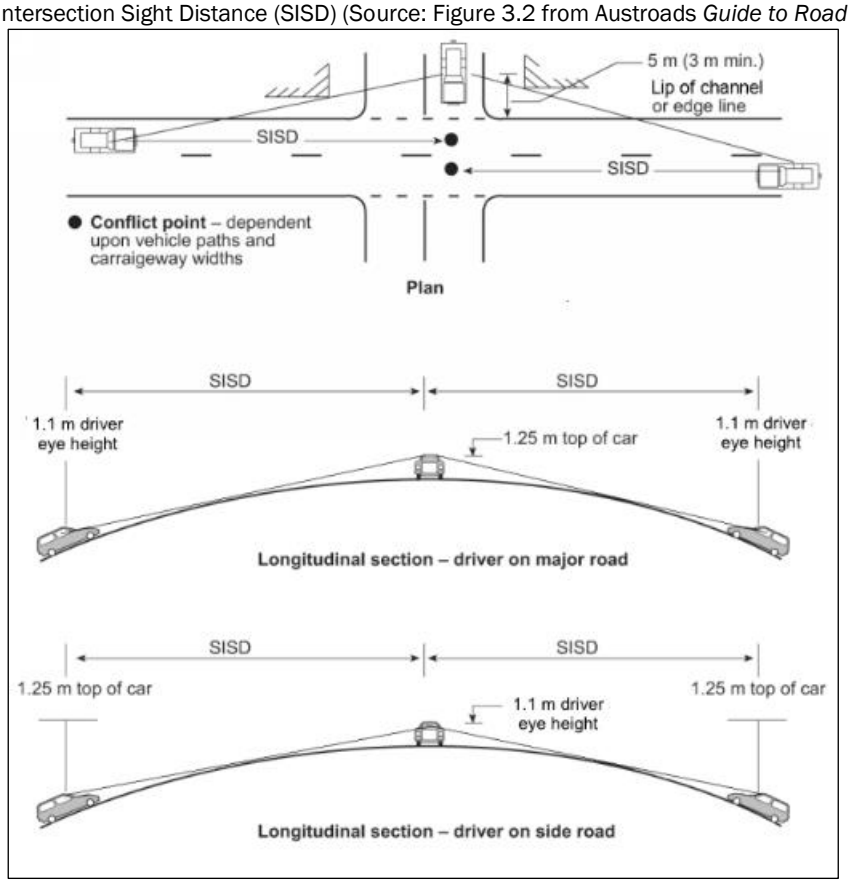
An assessment of the internal road configuration, the street hierarchy (i.e. road classification/cross sections) based on the anticipated traffic volumes required to facilitate development potential in the vicinity of the Spring Hill Cone was undertaken.

7 ASSESSMENT

7.1 Sight Distance

The visibility criterion normally applied to intersections is Safe Intersection Sight Distance (SISD). This is nominated in the Austroads Guide to Road Design, Part 4A (AGRD4) as the minimum distance which should be provided on the major road at any intersection (refer to Section 3.2.2 in AGRD4A) and provides sufficient distance for a driver of a vehicle on the major road to observe a vehicle from the minor access approach moving into a collision situation (e.g. in the worst case, stalling across the traffic lanes) and to decelerate to a stop before reaching the collision point (refer Figure 11).

Figure 11: Safe Intersection Sight Distance (SISD) (Source: Figure 3.2 from Austroads *Guide to Road Design Part 4A*)



The minimum SISD criterion specified in Table 3.2 of the Austroads Guide requires clear visibility for a desirable minimum distance of 285 m, relating to the general reaction time R_T of 2.0 seconds and a design speed of 110 km/h. This sight distance is applicable to Northern Highway at the intersection with the proposed east-west road (Hadfield Road).

Based on site observations, the visibility requirement, measured 5.0 m back from the edge of traffic lane, is restricted due to the bend to the north.

The sight lines within Spring Hill Cone also require clear visibility for desirable minimum distances of 97m and 123 m for 50 km/h and 60km/h design speeds, respectively.

7.2 Traffic Re-distribution

Due to the restricted sight distances at the Northern Highway and Hadfield Road intersection, it is concluded that vehicular access to the Northern Highway via Hadfield Road should not be provided. It is proposed that vehicular access to the Northern Highway will be provided by re-aligning the eastern north-south arterial to the east at the intersection of the Northern Highway and Macsfield Road, instead of extending north to Taylors Lane.

Traffic modelled (by GTA) to utilise Hadfield Road will be required to access the Northern Highway / Hume Freeway via the re-aligned arterial road and the Macsfield Road intersection and the surrounding road network. The re-distributed traffic volumes along Hadfield Road are described in the subsequent sections of this report.

Scenario 1 will involve the re-distribution of 100% of the traffic to the re-aligned road and Scenario 2 will involve the re-distribution of 50% of the traffic to the re-aligned road.

7.2.1 Traffic Redistribution Scenario 1

The traffic volumes as modelled in the strategic transport model along Hadfield Road for scenario 1 were re-distributed as follows:

- Hadfield Road – western approach:
    - 100% of traffic previously on Hadfield Road on the western approach were relocated to the re-aligned eastern north-south arterial road
- Hadfield Road – eastern approach:
    - 100% of traffic previously on Hadfield road on the eastern approach were relocated to Macsfield Road

A diagram illustrating the re-distributed traffic routes for scenario 1 is shown in Figure 12.

The impacted arrival and departure traffic volumes for each intersection for the interim and ultimate design year are provided respectively in Tables 3 and 4. The intersections were rebalanced to provide the estimated turning movement volumes for the re-distributed traffic along Hadfield Road for the interim and ultimate design year, shown respectively in Figures 13 and 14.

Figure 12: Scenario 1 – Re-distributed traffic routes

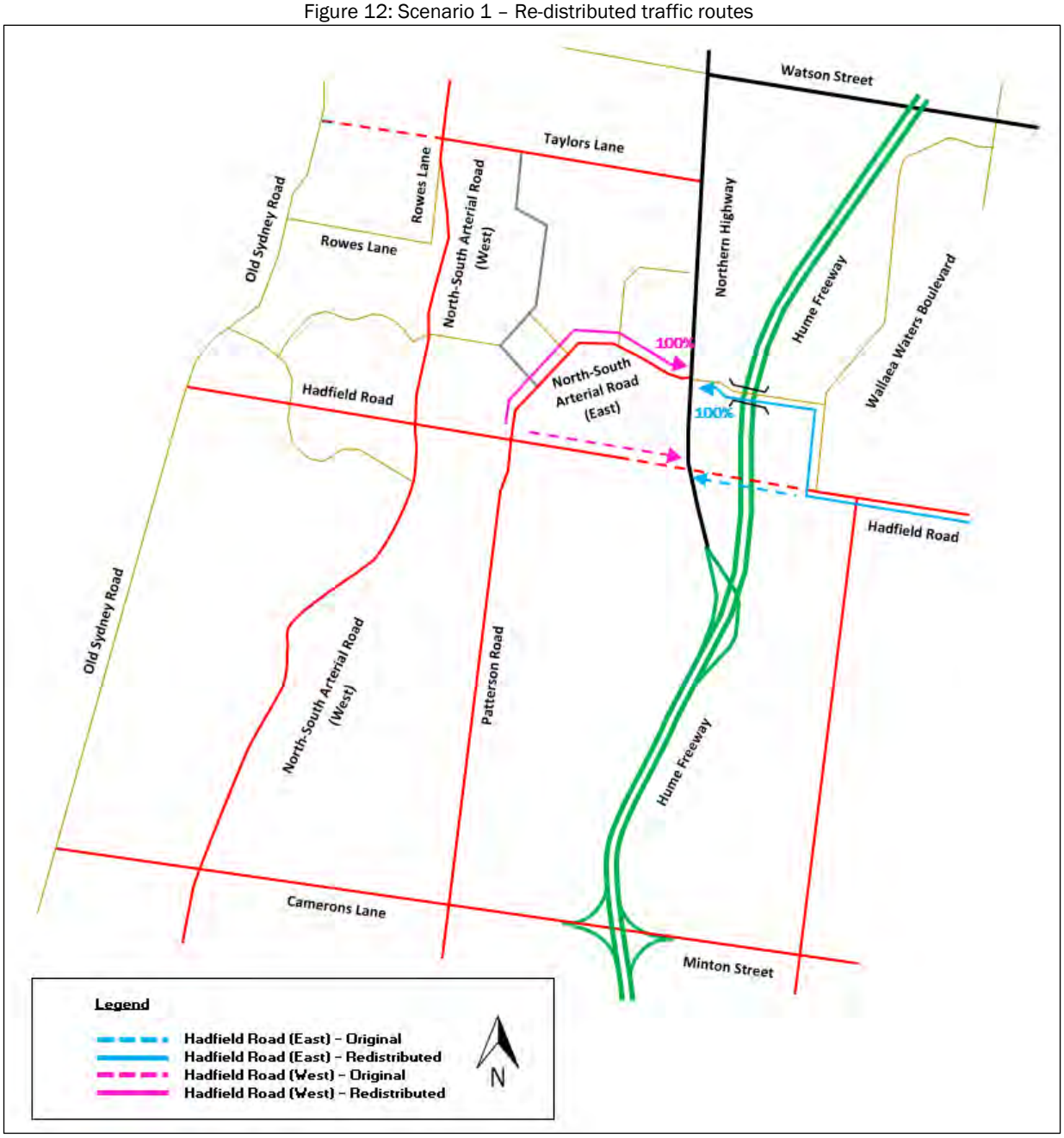


Table 3: Scenario 1 – Re-distributed traffic volumes for the interim design year (2031)*

	Intersection	Movements	Interm Design Year (2031)							
			Peak 2-Hour Traffic Volumes				Peak Hour Traffic Volumes (vph)			
			Arrival		Departure		Arrival		Departure	
			AM	PM	AM	PM	AM	PM	AM	PM
1	Northern Highway / Taylors Lane	Northern Highway (south approach)	2,060	2,020	2,290	2,210	1,133	1,111	1,260	1,216
		Northern Highway (north approach)	2,140	2,620	2,420	1,830	1,177	1,441	1,331	1,007
		Taylors Lane (west approach)	860	550	530	950	473	303	292	523
2	Northern Highway / Re-aligned Arterial Road / Macsfield Road	Northern Highway (south approach)	2,370	2,990	3,050	2,660	1,304	1,645	1,678	1,463
		Macsfield Road (east approach)	220	820	850	410	121	451	468	226
		Northern Highway (north approach)	2,290	2,210	2,060	2,020	1,260	1,216	1,133	1,111
		Re-aligned Arterial Road (west approach)	1,380	830	600	1,620	759	457	330	891
3	Northern Highway / Hadfield Road	Northern Highway (south approach)								
		Hadfield Road (east approach)								
		Northern Highway (north approach)								
		Hadfield Road (west approach)								
4	Re-aligned Arterial Road / Patteron Road / Hadfield Road	Patteron Road (south approach)	510	770	690	670	281	424	380	369
		Hadfield Road (east approach)	36	130	102	76	20	72	56	42
		Re-aligned Arterial Road (west approach)	790	1,010	790	980	435	556	435	539
		Hadfield Road (west approach)	270	150	90	280	149	83	50	154
5	Western North-South Arterial Road / Hadfield Road	Western North-South Arterial Road (south approach)	340	1,000	880	400	187	550	484	220
		Hadfield Road (east approach)	90	100	80	150	50	55	44	83
		Western North-South Arterial Road (north approach)	780	420	290	980	429	231	160	539
		Hadfield Road (west approach)	110	100	70	90	61	55	39	50
6	Patterson Road / Camerons Lane	Patterson Road (south approach)	800	1,230	1,660	1,200	440	677	913	660
		Camerons Lane (east approach)	970	1,760	1,500	1,150	534	968	825	633
		Patterson Road (north approach)	1,580	1,200	800	1,400	869	660	440	770
		Camerons Lane (west approach)	1,110	610	500	1,050	611	336	275	578

**Red figures imply an increase in traffic volumes when compared to the strategic transport modelling.*

Table 3: Scenario 1 – Re-distributed traffic volumes for the ultimate design year (2046)*

	Intersection	Movements	Ultimate Design Year (2046)							
			Peak 2-Hour Traffic Volumes				Peak Hour Traffic Volumes (vph)			
			Arrival		Departure		Arrival		Departure	
			AM	PM	AM	PM	AM	PM	AM	PM
1	Northern Highway / Taylors Lane	Northern Highway (south approach)	2,340	2,030	2,450	2,430	1,287	1,117	1,348	1,337
		Northern Highway (north approach)	2,170	2,610	2,540	1,620	1,194	1,436	1,397	891
		Taylors Lane (west approach)	390	260	330	400	215	143	182	220
2	Northern Highway / Re-aligned Arterial Road / Macsfield Road	Northern Highway (south approach)	2,920	3,290	3,580	3,080	1,606	1,810	1,969	1,694
		Macsfield Road (east approach)	1,170	2,270	2,110	1,540	644	1,249	1,161	847
		Northern Highway (north approach)	2,450	2,430	2,340	2,030	1,348	1,337	1,287	1,117
		Re-aligned Arterial Road (west approach)	2,470	1,350	1,200	2,910	1,359	743	660	1,601
3	Northern Highway / Hadfield Road	Northern Highway (south approach)								
		Hadfield Road (east approach)								
		Northern Highway (north approach)								
		Hadfield Road (west approach)								
4	Re-aligned Arterial Road / Patteron Road / Hadfield Road	Patteron Road (south approach)	610	950	930	1,000	336	523	512	550
		Hadfield Road (east approach)	124	330	268	140	68	182	147	77
		Re-aligned Arterial Road (west approach)	1,310	2,050	1,630	1,410	721	1,128	897	776
		Hadfield Road (west approach)	850	320	210	910	468	176	116	501
5	Western North-South Arterial Road / Hadfield Road	Western North-South Arterial Road (south approach)	530	1,270	1,440	800	292	699	792	440
		Hadfield Road (east approach)	170	910	600	320	94	501	330	176
		Western North-South Arterial Road (north approach)	1,760	790	480	1,790	968	435	264	985
		Hadfield Road (west approach)	150	60	90	120	83	33	50	66
6	Patterson Road / Camerons Lane	Patterson Road (south approach)	580	1,540	1,420	1,090	319	847	781	600
		Camerons Lane (east approach)	1,100	2,760	2,590	1,280	605	1,518	1,425	704
		Patterson Road (north approach)	2,500	1,200	990	2,510	1,375	660	545	1,381
		Camerons Lane (west approach)	1,180	470	360	1,090	649	259	198	600

**Red figures imply an increase in traffic volumes when compared to the strategic transport modelling.*

Figure 13: Scenario 1 - Estimated turning movement volumes – Interim (2031)

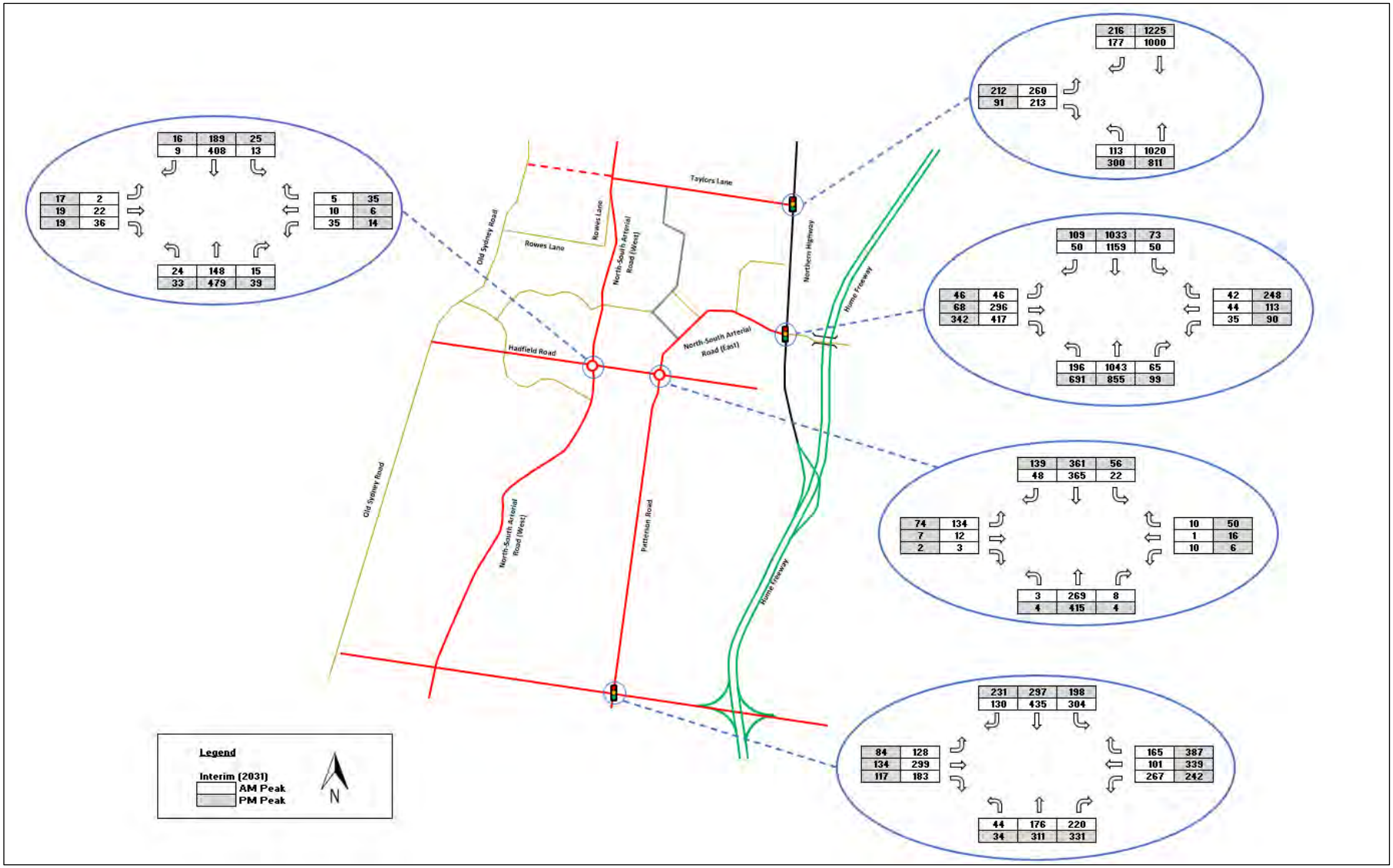
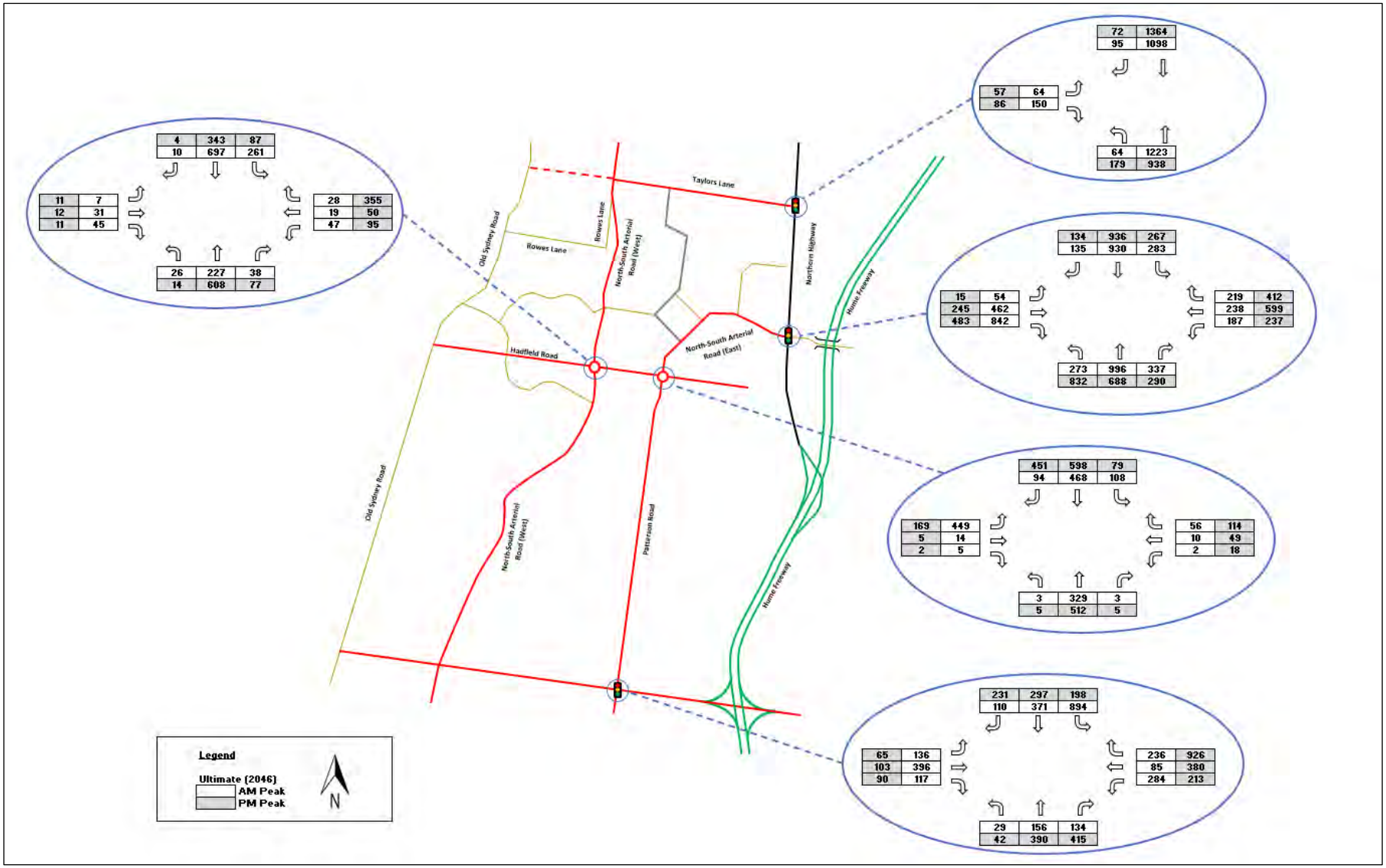


Figure 14: Scenario 1 - Estimated turning movement volumes – Ultimate (2046)



7.2.2 Traffic Re-distribution Scenario 2

The traffic volumes along Hadfield Road for scenario 2 were re-distributed as follows:

- Hadfield Road – western approach:
    - 50% of traffic previously on Hadfield Road on the western approach were relocated to the re-aligned eastern north-south arterial road
    - Remaining 50% of traffic will travel south along Patterson Road and then travel east along Camerons Lane
- Hadfield Road – eastern approach:
    - 50% of traffic previously on Hadfield road on the eastern approach were relocated to Macsfield Road
    - Remaining 50% of traffic will utilise the surrounding road network:
        - 17% of traffic will travel south and then travel west along Minton Street
        - 33% of traffic will travel north and then west along Watson Street, where 17% of traffic will travel north along the Northern Highway. The other 16% of traffic will travel south along the Northern Highway and then travel west along Taylors lane.

A diagram illustrating the re-distributed traffic routes for scenario 2 is shown in Figure 15.

The impacted arrival and departure traffic volumes for each intersection for the interim and ultimate design year are provided respectively in Tables 5 and 6. The intersections were re-balanced to provide the estimated turning movement volumes for the re-distributed traffic along Hadfield Road for the interim and ultimate design year, shown respectively in Figures 16 and 17.

Figure 15: Scenario 2 – Re-distributed traffic routes

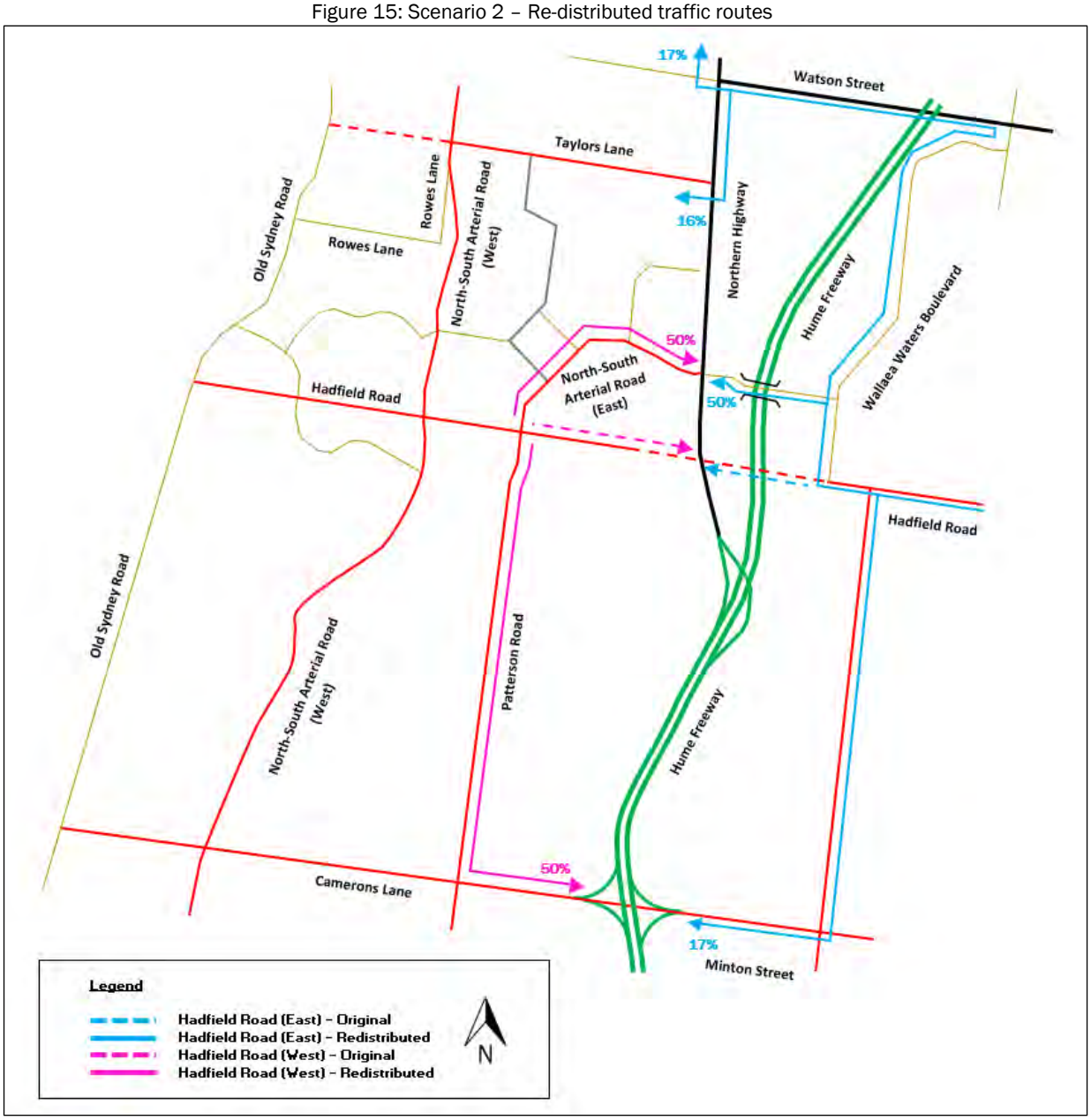


Table 5: Scenario 2 – Re-distributed traffic volumes for the interim design year (2031)*

	Intersection	Movements	Interm Design Year (2031)							
			Peak 2-Hour Traffic Volumes				Peak Hour Traffic Volumes (vph)			
			Arrival		Departure		Arrival		Departure	
			AM	PM	AM	PM	AM	PM	AM	PM
1	Northern Highway / Taylors Lane	Northern Highway (south approach)	2,060	2,020	2,290	2,210	1,133	1,111	1,260	1,216
		Northern Highway (north approach)	2,177	2,757	2,562	1,898	1,197	1,516	1,409	1,044
		Taylors Lane (west approach)	1,002	618	567	1,087	551	340	312	598
2	Northern Highway / Re-aligned Arterial Road / Macsfield Road	Northern Highway (south approach)	2,370	2,990	3,050	2,660	1,304	1,645	1,678	1,463
		Macsfield Road (east approach)	110	410	425	205	61	226	234	113
		Northern Highway (north approach)	2,290	2,210	2,060	2,020	1,260	1,216	1,133	1,111
		Re-aligned Arterial Road (west approach)	1,125	640	510	1,295	619	352	281	712
3	Northern Highway / Hadfield Road	Northern Highway (south approach)								
		Hadfield Road (east approach)								
		Northern Highway (north approach)								
		Hadfield Road (west approach)								
4	Re-aligned Arterial Road / Patteron Road / Hadfield Road	Patteron Road (south approach)	600	1,095	945	860	330	602	520	473
		Hadfield Road (east approach)	36	130	102	76	20	72	56	42
		Re-aligned Arterial Road (west approach)	700	685	535	790	385	377	294	435
		Hadfield Road (west approach)	270	150	90	280	149	83	50	154
5	Western North-South Arterial Road / Hadfield Road	Western North-South Arterial Road (south approach)	340	1,000	880	400	187	550	484	220
		Hadfield Road (east approach)	90	100	80	150	50	55	44	83
		Western North-South Arterial Road (north approach)	780	420	290	980	429	231	160	539
		Hadfield Road (west approach)	110	100	70	90	61	55	39	50
6	Patterson Road / Camerons Lane	Patterson Road (south approach)	800	1,230	1,660	1,200	440	677	913	660
		Camerons Lane (east approach)	1,060	2,085	1,755	1,340	583	1,147	965	737
		Patterson Road (north approach)	1,835	1,390	890	1,725	1,009	765	490	949
		Camerons Lane (west approach)	1,110	610	500	1,050	611	336	275	578

**Red figures imply an increase in traffic volumes when compared to the strategic transport modelling.*

Table 6: Scenario 2 – Re-distributed traffic volumes for the ultimate design year (2046)*

	Intersection	Movements	Ultimate Design Year (2046)							
			Peak 2-Hour Traffic Volumes				Peak Hour Traffic Volumes (vph)			
			Arrival		Departure		Arrival		Departure	
			AM	PM	AM	PM	AM	PM	AM	PM
1	Northern Highway / Taylors Lane	Northern Highway (south approach)	2,340	2,030	2,450	2,430	1,287	1,117	1,348	1,337
		Northern Highway (north approach)	2,365	2,988	2,892	1,877	1,301	1,644	1,590	1,032
		Taylors Lane (west approach)	390	260	330	400	215	143	182	220
2	Northern Highway / Re-aligned Arterial Road / Macsfield Road	Northern Highway (south approach)	2,920	3,290	3,580	3,080	1,606	1,810	1,969	1,694
		Macsfield Road (east approach)	585	1,135	1,055	770	322	624	580	424
		Northern Highway (north approach)	2,450	2,430	2,340	2,030	1,348	1,337	1,287	1,117
		Re-aligned Arterial Road (west approach)	1,800	1,000	890	2,085	990	550	490	1,147
3	Northern Highway / Hadfield Road	Northern Highway (south approach)								
		Hadfield Road (east approach)								
		Northern Highway (north approach)								
		Hadfield Road (west approach)								
4	Re-aligned Arterial Road / Patteron Road / Hadfield Road	Patteron Road (south approach)	920	1,775	1,600	1,350	506	976	880	743
		Hadfield Road (east approach)	124	330	268	140	68	182	147	77
		Re-aligned Arterial Road (west approach)	1,000	1,225	960	1,060	550	674	528	583
		Hadfield Road (west approach)	850	320	210	910	468	176	116	501
5	Western North-South Arterial Road / Hadfield Road	Western North-South Arterial Road (south approach)	530	1,270	1,440	800	292	699	792	440
		Hadfield Road (east approach)	170	910	600	320	94	501	330	176
		Western North-South Arterial Road (north approach)	1,760	790	480	1,790	968	435	264	985
		Hadfield Road (west approach)	150	60	90	120	83	33	50	66
6	Patterson Road / Camerons Lane	Patterson Road (south approach)	580	1,540	1,420	1,090	319	847	781	600
		Camerons Lane (east approach)	1,410	3,585	3,260	1,630	776	1,972	1,793	897
		Patterson Road (north approach)	3,170	1,550	1,300	3,335	1,744	853	715	1,834
		Camerons Lane (west approach)	1,180	470	360	1,090	649	259	198	600

**Red figures imply an increase in traffic volumes when compared to the strategic transport modelling.*

Figure 16: Scenario 2 - Estimated turning movement volumes – Interim (2031)

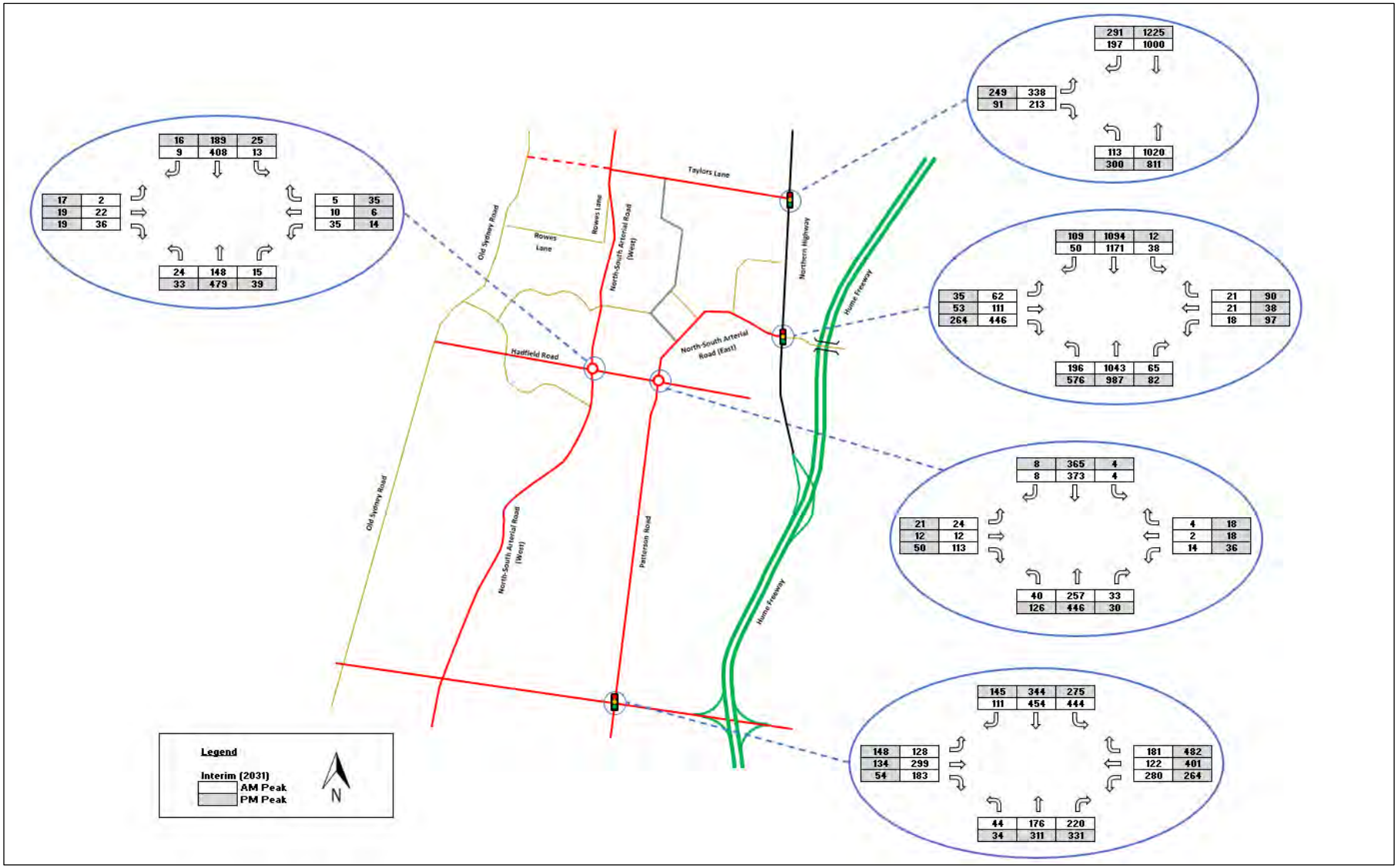
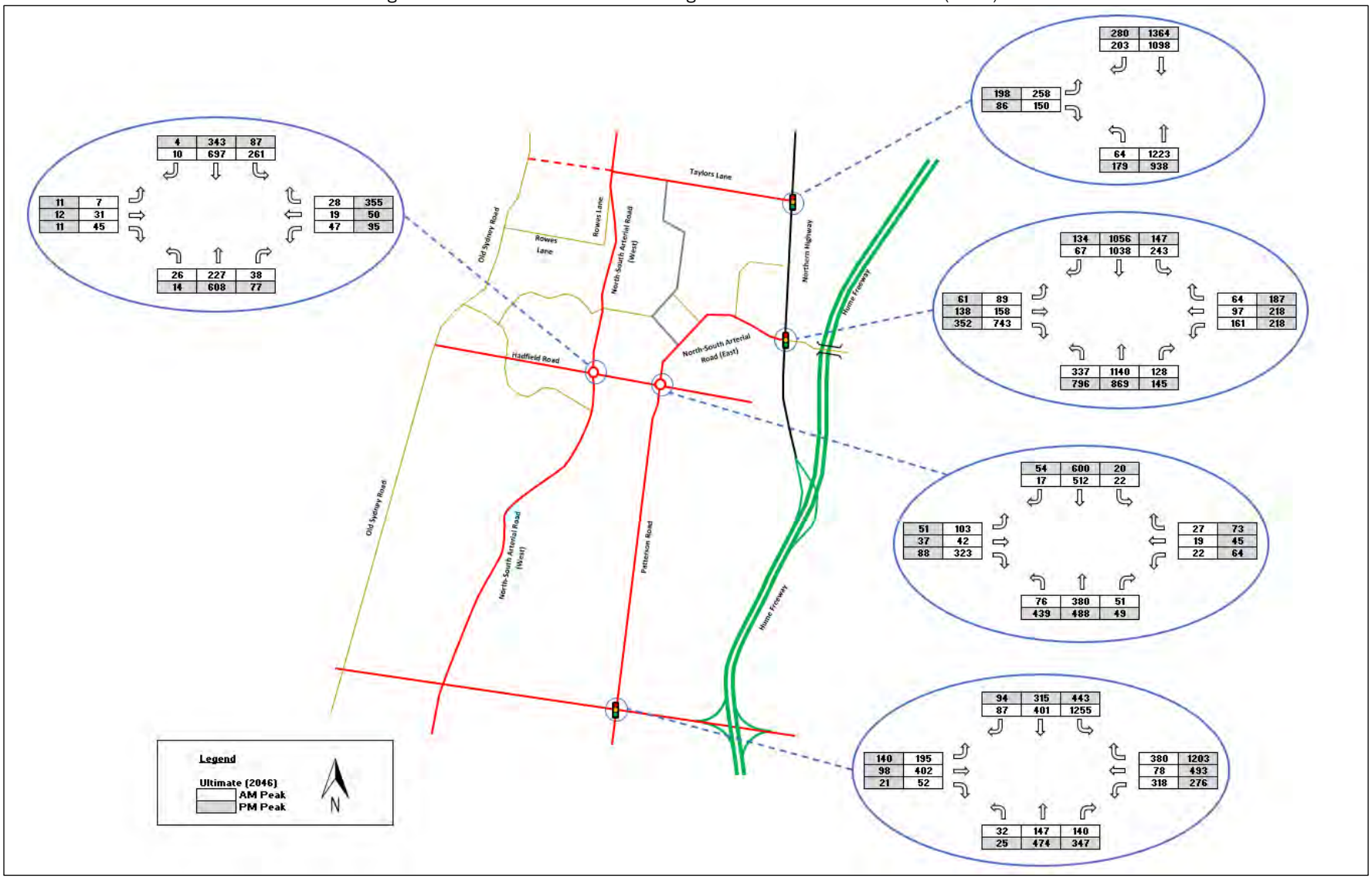


Figure 17: Scenario 2 - Estimated turning movement volumes – Ultimate (2046)



7.3 Mid-block Capacity

Based on the anticipated traffic volumes for the BNW PSP and the adjoining WS PSP , two-way traffic volumes along the re-aligned arterial road and Macsfield Road can be estimated in the vicinity of the signalised intersections with the Northern Highway (based on the estimated peak hour volumes being 10% of the daily traffic volume). The mid-block traffic volumes were taken for the ultimate (2046) design year.

As per Table 4 of the Road Elements of the *Engineering Design Construction Manual for Subdivision in Growth Areas*:

- A secondary arterial road cross section is intended to carry between 12,000 – 40,000 vpd.
- A trunk connector road cross section is intended to carry between 7,000 – 12,000 vpd.

Table 7 shows the estimated traffic volumes and cross sections.

Table 7: Mid-block traffic volumes and cross sections

Traffic Scenario	Road	Mid-block Traffic Volumes and Cross Sections		
		Volume (vpd)	Road Cross Section	Cross Section Suitability
Scenario 1	Re-aligned North-South Arterial Road	21,850	Secondary Arterial Road	**Yes**
	Macsfield Road	19,500	Trunk Connector Road	**No**
Scenario 2	Re-aligned Arterial Road	15,900	Secondary Arterial Road	**Yes**
	Macsfield Road	9,750	Trunk Connector Road	**Yes**

It can be concluded that Scenario 1 will result in the anticipated traffic volumes exceeding the intended capacity of the road. Therefore Scenario 2 is more likely to result in traffic volumes meeting the intended capacity of the road.

Notwithstanding the above, intersection analysis was undertaken to establish the intersection layout to assess the operation of the key intersections for both scenarios for the interim and ultimate design year.

7.4 Intersection Analysis

SIDRA software was utilised to analyse the intersections to determine the anticipated intersection operations for the proposed development.

The program produces statistics and information on the operation of an intersection but typically the main characteristics used to assess the operation of the intersection are the Degree of Saturation (DOS), the 95th percentile queue lengths and the average delay.

An explanation of the intersection operating characteristics is shown in Table 8.

Table 8: Definitions of intersection operation characteristics

Degree of Saturation (DOS)			Operation
Sign control	Roundabout	Traffic Signals	
< 0.6	< 0.6	< 0.6	Excellent operating conditions, minimal delays
0.6 - 0.699	0.6 - 0.699	0.6 - 0.699	Very good operating conditions, minimal delays
0.7 - 0.799	0.7 - 0.849	0.7 - 0.899	Good operating conditions, delays and queuing increasing
0.8 - 0.899	0.85 - 0.949	0.9 - 0.949	Fair operating conditions, delays and queues growing. Any interruption to flow such as minor incidents causes increasing delays
0.9 – 1.0	0.95 – 1.0	0.95 – 1.0	Poor operating conditions, flows starting to breakdown and queues and delays increase rapidly.
> 1.0	> 1.0	> 1.0	Very poor operating conditions with queues and delays increasing rapidly. Once queues develop it takes a significant time for queues to dissipate resulting in long delays to traffic movements

Intersection analysis was undertaken for the key surrounding intersections as a result of the re-alignment of the western north-south arterial road for the interim (2031) and ultimate (2046) design year. Both scenarios of the re-distributed Hadfield Road traffic volumes were analysed during the AM and PM peak periods. Analysis was untaken assuming the anticipated traffic volumes identified in section 7.2 with each intersection modelled in isolation.

A functional layout plan (issue P5) has been prepared by Beveridge Williams on behalf of Crystal Group for the signalised intersection of Northern Highway / Macsfield Road (refer to Attachment C). No other intersection layout was provided for intersections identified in section 5.1. Intersection layout were assumed to generally follow typical arterial road to arterial road intersections and arterial road to connector street intersections. The intersection layouts were adjusted (i.e. turn lane lengths, number of lanes and the provision of slip lanes) to maximise the efficiency of each intersection (aim for the key intersections to operate below practical capacity).

The intersection layouts analysed at Northern Highway / Macsfield Road and Patterson Road / Camerons Lane are shown in Figures 18 and 19. The other intersections layouts (in SIDRA) analysed are shown in Attachment D.

Other intersections along Patterson Road (eastern arterial road) between Hadfield Road reserve and Camerons Lane are likely to operate satisfactorily due to the re-distributed traffic being through traffic.

Figure 18: Northern Highway / Macsfield Road intersection layout

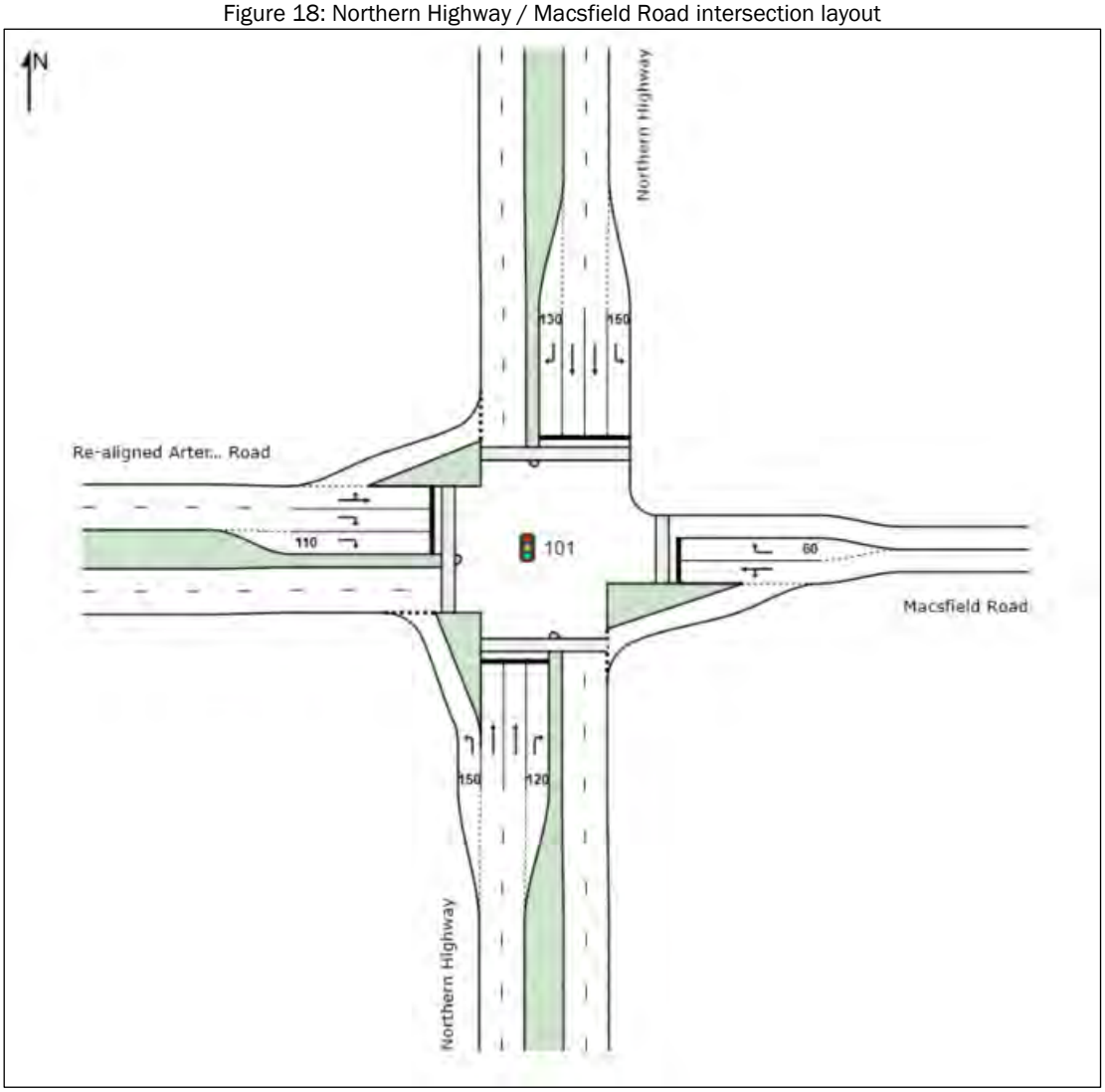
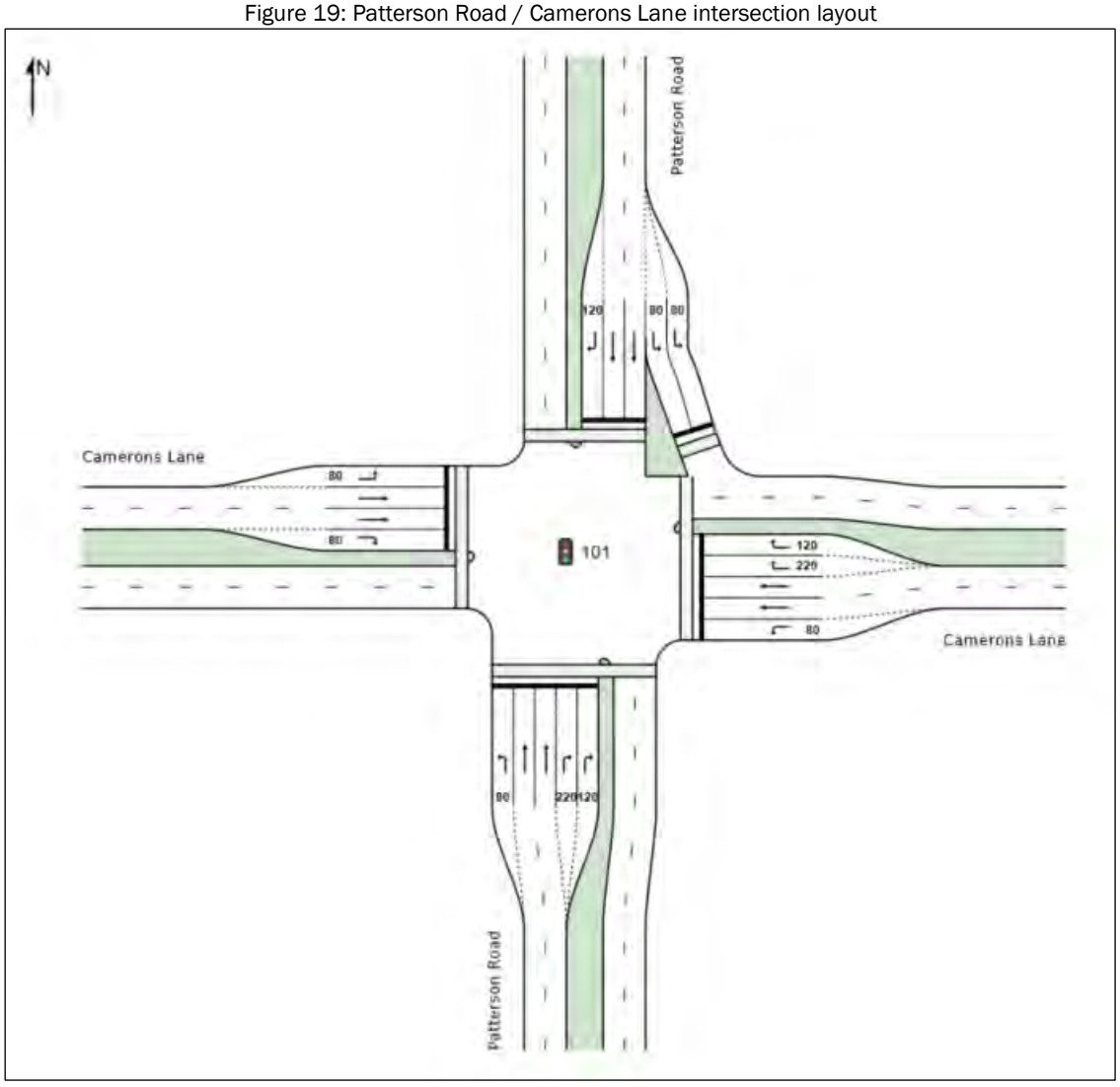


Figure 19: Patterson Road / Camerons Lane intersection layout



A practical DOS of 0.90 for signalised intersections and 0.85 for roundabout intersections were used as the maximum acceptable degree of saturation. A DOS below 0.90 for signalised intersections and 0.85 for roundabout intersections results in acceptable or better operating conditions. Above 0.90 for signalised intersections and 0.85 for roundabout intersections, the intersections result in flows starting to breakdown and queues and delays increase rapidly.

Table 9 provides a summary of the overall intersection operation at each of the four intersections modelled. Full SIDRA outputs are attached in Attachment D.

Table 9: Summary of SIDRA results

	Movements	Interim (2031)						Ultimate (2046)					
		DOS		95% Queue (m)		Average Delay (sec)		DOS		95% Queue (m)		Average Delay (sec)	
		AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Scenario 1	Northern Highway / Taylors Lane	0.785	0.619	205.4	147.4	31.1	23.3	0.731	0.625	28.1	177.7	23.3	18.1
	Northern Highway / Re-aligned Arterial Road / Macsfield Road	0.720	0.709	225.7	196.7	35.5	35.4	1.160	1.270	446.8	910.1	129.7	190.8
	Re-aligned Arterial Road / Patteron Road / Hadfield Road	0.153	0.174	6.1	8.2	4.4	5.2	0.519	0.350	24.7	20.2	5.3	6.7
	Western North-South Arterial Road / Hadfield Road	0.146	0.183	6.4	8.3	4.4	4.7	0.341	0.521	18.0	22.7	4.8	7.0
	Patterson Road / Camerons Lane	0.481	0.490	81.1	79.1	38.6	41.4	0.486	0.728	113.9	160.4	34.9	41.2
Scenario 2	Northern Highway / Taylors Lane	0.823	0.689	219.8	150.8	33.0	25.3	0.853	0.839	255.0	225.3	31.3	30.2
	Northern Highway / Re-aligned Arterial Road / Macsfield Road	0.665	0.630	208.6	188.7	31.1	28.9	0.887	0.893	299.5	274.5	51.2	47.3
	Re-aligned Arterial Road / Patteron Road / Hadfield Road	0.154	0.197	6.4	9.4	5.2	4.6	0.543	0.367	26.3	20.3	7.1	5.6
	Western North-South Arterial Road / Hadfield Road	0.146	0.183	6.4	8.3	4.4	4.7	0.341	0.521	18.0	22.7	4.8	7.0
	Patterson Road / Camerons Lane	0.486	0.474	85.9	79.7	37.7	39.2	0.672	0.758	189.5	202.1	32.9	36.5

The SIDRA analysis results indicate that the all intersections will operate under practical capacity for the following scenarios:

- Scenario 1 and 2 traffic re-distribution for the interim (2031) design year
- Scenario 2 traffic re-distribution for the ultimate (2046) design year

The SIDRA analysis results indicate that the Northern Highway /Eastern North-South Arterial Road / Macsfield Road intersection will operate over practical capacity for the following scenario:

- Scenario 1 traffic re-distribution for the ultimate (2046) design year

An additional intersection analysis was undertaken for the anticipated traffic volumes taking into account previous assumptions at the Hadfield Road and Northern Highway intersection as per the strategic transport model. The analysis indicated that this intersection would operate above practical capacity for the ultimate design year (2046) as a signalised or roundabout intersection (refer to Attachment D).

The mid-block capacity assessment and the SIDRA intersection analysis indicate that the realignment of the eastern north-south arterial (Patterson Road) to the Northern Highway, with a lower order road connection north to Taylors Lane, is the most suitable road layout.

8 SPRING HILL CONE

The Spring Hill Cone road network and road hierarchy is proposed to maximise the lot yield efficiency and be a permeable network. The road network generally runs along the contours to avoid steep road gradients. A circular route "ring road" will be provided as the main route around the cone.

Refer to Attachment E for the Spring Hill Concept Plan.

8.1 Lot Yield

The Spring Hill Cone is likely to accommodate 39.28 hectare of residential development, based on indicative lot layout prepared by Millar Merrigan on behalf of Crystal Group. A lot yield assessment for the Spring Hill Cone assumes between 15 – 20 lots per hectare. However, for the purpose of this assessment it was conservatively assumed that 20 lots per hectare would be analysed. This is in line with the BNW PSP and is likely to yield approximately 790 residential lots.

8.2 Ultimate Design Year Traffic Volumes

Two-hour traffic volumes along Hadfield Road and the connector street near the Spring Hill Cone were obtained from the strategic transport modelling prepared by GTA Consultants. It was established in section 6.3 that Hadfield Road will become a lower order road and will be absorbed within the internal subdivision road network between Patterson Road and the Northern Highway. A conservative factor of 20% has been assumed for the traffic volumes along Hadfield Road.

A conversion factor of 55% was assumed for the peak hour traffic volumes for each road length. The estimated traffic volumes for the ultimate (2046) design year are as follows:

- Connector street (loops to / from Patterson Road), south of the Spring Hill Cone:
    - Eastbound:
        - AM Peak – 28 vehicles per hour (vph)
        - PM Peak – 33 vph
    - Westbound:
        - AM Peak – 28 vph
        - PM Peak – 33 vph
- Hadfield Road, north of the Spring Hill Cone:
    - Eastbound:
        - AM Peak – 147 vph
        - PM Peak – 77 vph
    - Westbound:
        - AM Peak – 68 vph
        - PM Peak – 182 vph

8.3 Traffic Generation

The RTA *Guide to Traffic Generating Developments 2002* used to estimate traffic generation from developments recommends:

- for residential houses (standard lots)
    - o a daily rate of 9 trips per dwelling
    - o a weekday peak hour rate of 0.85 trips per dwelling.

The Infrastructure Design Manual (IDM) indicates a daily rate of 10 trips per dwelling. For the purposes of this assessment, the higher traffic generation rate will be applied.

It is assumed that the traffic generated by the sporting and recreational uses within the Spring Hill Cone is internally generated and peak hour trips have been accounted for in the residential traffic generation rates.

Table 10 shows a summary of the traffic generation from the Spring Hill Cone.

Table 10: Daily and peak traffic volumes generated by the Spring Hill Cone

Lot Type	Quantity	Unit	IDM / RTA Traffic Generation Rate		Traffic Generation	
			Daily Vehicle Trips (per unit)	Peak Vehicle Trips (per unit)	Daily Vehicle Trips (vpd)	Peak Vehicle Trips (vph)
Standard	790	Dwelling	10	0.85	7,900	672
TOTAL					**7,900**	**672**

8.4 Traffic Distribution

The peak hour traffic flow is assumed to be distributed as follows:

AM peak	80% leaving	20% entering
PM peak	30% leaving	70% entering

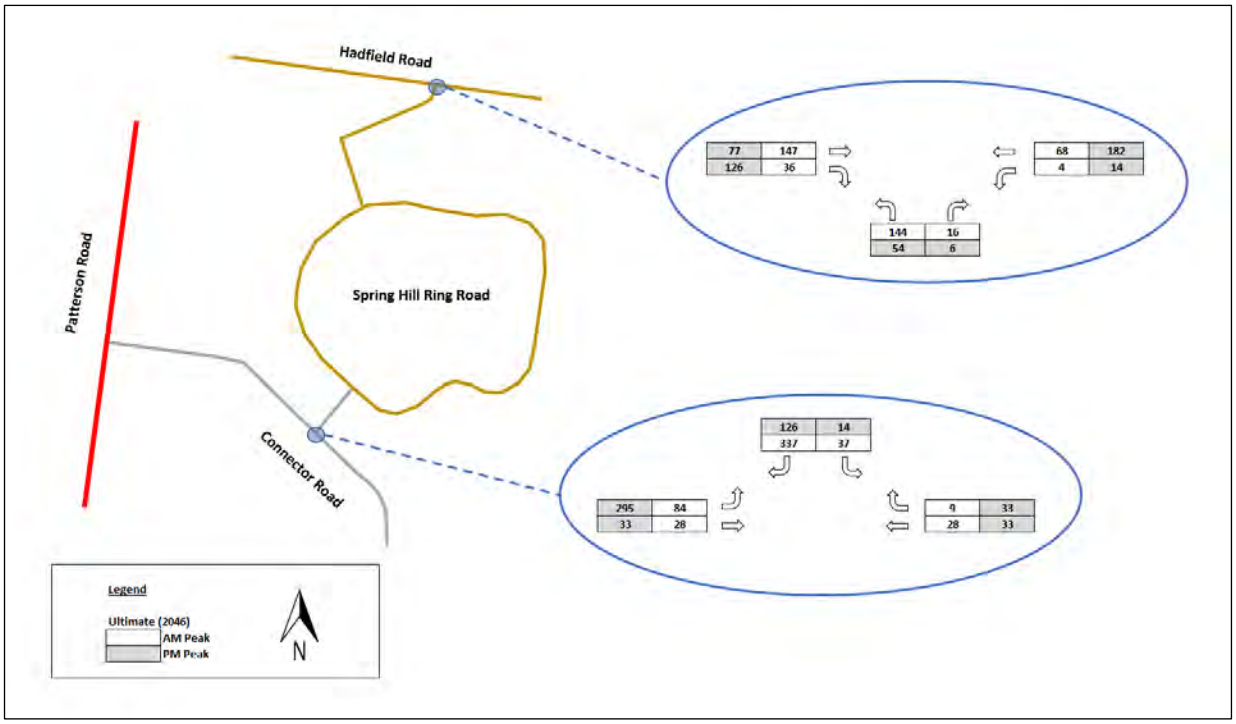
Access to the Spring Hill Cone is proposed to be provided via a connector street south of the Spring Hill Cone. Access is also provided to the north connecting to the internal road network within the Wallan South PSP. It is assumed that all traffic generated will be to and from the Spring Hill Cone with no allowance for the low level of internal trips that may occur.

It assumed that 70% of traffic will travel to and from the Spring Hill Cone via the connector street south of the Spring Hill Cone, where 90% will travel west to Patterson Road and the remaining 10% will travel south along the connector street. The other 30% of traffic will travel to and from the Spring Hill Cone via the access north of the Spring Hill Cone, where 90% will travel west and the remaining 10% will travel east.

8.5 Anticipated Traffic Volumes

The estimated traffic distribution during the AM and PM peak hours for the Spring Hill Cone for the ultimate design year is shown in Figure 20.

Figure 20: Estimated peak hour traffic distribution of the Spring Hill Cone



8.6 Intersection Design and Traffic Calming

It is expected that the proposed development will operate under the default urban 50 km/h speed limit. The design of the access street should aim to meet the VPA's target operating speeds of 30 - 40 km/h. If speeds greater 40 km/h are possible the installation of calming devices can be introduced. Traffic calming devices could include raised pedestrian wombat crossings in the vicinity of the localised public open spaces where the demand for pedestrian crossing the ring road is likely to occur.

It is desirable that Connector Street / Connector Street intersection within Spring Hill Cone be controlled with a roundabout.

It is concluded that the internal road network is likely to operate within the target speeds of 30 - 40 km/h.

8.7 Mid-block Capacity – Spring Hill Cone

Based on the anticipated traffic volumes, the two-way traffic volumes within the Spring Hill Cone can be estimated (based on the estimated peak hour volumes being 10% of the daily traffic volume). The mid-block traffic volumes were taken for the ultimate (2046) design year.

As per Table 4 of the Road Elements of the *Engineering Design Construction Manual for Subdivision in Growth Areas*:

- An access place cross section is intended to carry between 300 – 1,000 vpd
- An access street 1 cross section is intended to carry between 1,000 – 2,000 vpd
- An access street 2 cross section is intended to carry between 2,000 – 3,000 vpd

- A connector street cross section is intended to carry between 3,000 – 7,000 vpd.

Table 11 shows the estimated traffic volumes and cross sections.

Table 11: Mid-block traffic volumes and cross sections

Roads within Spring Hill Cone	Mid-block Traffic Volumes and Cross Sections	
	Volume (vpd)	Cross Section Suitability
Connector Street	4,870	**Yes**
Access Street 2	2,335*	**Yes**

**it is assumed that the traffic travelling to / from the connector street is split 50/50*

The remaining road cross sections are anticipated to be well below the indented capacity.

It can be concluded that the proposed road network for the Spring Hill Cone will operate within the intended capacity of the roads.

The anticipated road hierarchy / cross section is shown in Attachment F.

9 CONCLUSION

I have been engaged by HWL Ebsworth Lawyers on behalf of Crystal Group to prepare an Expert Witness Statement addressing:

- the re-alignment of Patterson Road (eastern north-south arterial road) connecting through to the Northern Highway
- subsequently the requirement of an east-west road (Hadfield Road) between the Wallan South PSP and the Beveridge North West PSP
- the requirement for signalised intersections at the two proposed north-south arterial roads with the east-west road (Hadfield Road) between the Wallan South PSP and the Beveridge North PSP
- the internal road configuration to facilitate development potential in the vicinity of the Spring Hill Cone.

I have arrived at the conclusions outlined below:

- The Wallan South PSP conceptual place based plan indicates alternate arterial roads – one that essentially connects the town centre to Taylors Lane and the other alternate arterial road providing a re-aligned connection from the town centre through to Northern Highway
- The land uses north of the Wallan South PSP / Taylors Lane are predominantly residential. Therefore, it is more likely that traffic from the Beveridge North West PSP travelling north along Patterson Road, wanting to travel to Wallan and beyond, are more likely to utilise the re-aligned eastern arterial road that connects to the Northern Highway, in lieu of the alternate eastern north-south arterial road within Wallan South PSP
- The strategic transport model indicates a daily traffic volume of under 2,000 vpd along the alternate eastern north-south arterial road (Patterson Road) to Taylors Lane for both the interim and ultimate design years. This anticipated traffic volumes is within an intended capacity for an access street. Therefore, an arterial road connection is not required to Taylors Lane based on the strategic transport model
- A connection to the Taylors Lane should be of a lower order road servicing the local catchment
- Hadfield Road and Northern Highway connection is considered inappropriate for the following reasons:
    - sight line restrictions due to a bend on the Northern Highway, north of Hadfield Road
    - the close proximity of this intersection to the Hume Freeway / Northern Highway interchange – potentially limiting flexibility for future interchange upgrades
    - does not take advantage of an existing Section 173 agreement which requires a developer on the east side of the Hume freeway to provide an overpass along Macsfield Road.
- Department of Transport – DoT (formerly VicRoads) directed the provision of a signalised intersection north of the Hadfield Road reserve for an approved quarry development access. This is due to the Hadfield Road reserve passing over a localised high point in close proximity to the Northern Highway and would result in significant roadwork costs to achieve a desirable maximum grade of 5% due to the localised high point

- The quarry development has indicated resources availability beyond 17 years. The provision of an intersection at Hadfield Road and Northern Highway will result in two signalised intersections within 150 m of each other, which could introduce unintended road safety issues associated with traffic signals in close proximity to one another. This is contrary to the Austroads Guide to Traffic Management – Part 5: Road Management for arterial roads where intersections should be no less than 800 m apart. Once the quarry has been depleted, the signalised intersection for the quarry access is anticipated to be removed. Once removed, the re-aligned arterial road signalised intersection at Macsfield Road will be approximately 800 m from the Hume Freeway / Northern Highway interchange and therefore, will generally be in line with the access management principles
- The section of Hadfield Road between the Northern Highway and Patterson Road is likely to be absorbed within the internal subdivision road network
- The intersection and mid-black traffic analysis has concluded that the realignment of the eastern north-south arterial road (Patterson Road) to the Northern Highway opposite to Macsfield Road provides the optimal road layout
- The analysis at the Hadfield Road and Northern Highway intersection for the volumes indicated in the strategic transport model indicated that this intersection would operate above practical capacity for the ultimate design year (2046)
- The development potential indicative layout plan within the Spring Hill Cone could yield approximately 790 residential lots
- The Connector Street / Connector Street intersection within Spring Hill Cone be controlled with a roundabout
- The internal road network within Spring Hill Cone is likely to operate within the target speeds of 30 - 40 km/h
- The proposed road network for the Spring Hill Cone will operate within the intended capacity of the roads
- The sight lines for the intersections within Spring Hill Cone will require clear visibility for desirable minimum distances of 97m and 123 m for 50 km/h and 60km/h design speeds, respectively.

In summary, it is my opinion that:

- The eastern north-south arterial road (Patterson Road) can be re-aligned through the Wallan South PSP connecting to the Northern Highway at Macsfield Road, instead of connecting to Taylors Lane
- The re-distributed traffic volumes can be accommodated within the road network and typical VPA intersection configurations
- The proposed road network based on the anticipated lot yield within Spring Hill Cone is considered satisfactory and is unlikely to impact on residential amenity
- Roundabout or traffic signal intersection controls will be required at the north-south arterials with a lower order road along the Hadfield Road reserve.

I have made all the inquiries that I believe are desirable and appropriate and no matters of significance which I regard as relevant have to my knowledge been withheld from the Panel.

Ali Abdou

BE (Civil) (Hons), M.I.E.Aust.

ATTACHMENT A
REQUIREMENTS OF PANEL'S GUIDE TO EXPERT EVIDENCE

Name

Ali Abdou – Director

Address

Trafficworks Pty Ltd

First Floor, 132 Upper Heidelberg Road, Ivanhoe, 3079

Qualifications

- Bachelor of Engineering in Civil Engineering (Honours), Victoria University
- Member, Institution of Engineers, Australia
- Member, Australian Institute of Traffic and Planning Management Incorporated

Experience

I have over 17 years' experience in traffic engineering, 3 years with Hume City Council, 3 years with VicRoads and 11 years in private practice with John Piper Traffic, CPG Australia (CPG) and Trafficworks Pty Ltd. I joined Trafficworks Pty Ltd in April 2012.

Areas of Expertise

My areas of expertise include, traffic and parking impact assessments and traffic design for a variety of developments, road safety auditing and general traffic engineering and road safety.

Expertise to Prepare this Assessment

My experience gathered over 17 years practice as a traffic engineer includes a number of assessments of developments in metropolitan and regional centres and issues relating to the interaction of traffic on both arterial roads and local streets. I am therefore qualified to provide an expert assessment in relation to the proposed development.

Instructions

I have been engaged by HWL Ebsworth Lawyers on behalf of Crystal Group to prepare an independent expert witness statement of evidence addressing:

- the re-alignment of Patterson Road (eastern north-south arterial road) connecting through to the Northern Highway
- subsequently the requirement of an east-west road (Hadfield Road) between the Wallan South PSP and the Beveridge North West PSP
- the requirement for signalised intersections at the two proposed north-south arterial roads with the east-west road (Hadfield Road) between the Wallan South PSP and the Beveridge North PSP
- the internal road configuration to facilitate development potential in the vicinity of the Spring Hill Cone.

Crystal Group has submitted a request for the VPA's decision to be reviewed by Planning Panels Victoria, pursuant to section 149 (1)(a) of the Planning and Environment Act 1978, with a hearing set for 5 August 2020.

Assistance Received in Preparing this Statement

In preparing this Expert Witness Statement, I have had assistance from fellow employees at Trafficworks, including the provision of editorial and peer reviews.

However, I am the principal author of this Expert Witness Statement and all the conclusions and recommendations are mine.

Documents Taken into Account

1. Melbourne's North Growth Corridor – Future Transport Challenges, prepared by GTA Consultants, dated 31 October 2019
2. Beveridge North West Precinct Structure Plan – Background Report, prepared by VPA, dated August 2019
3. Beveridge North West Precinct Structure Plan, prepared by VPA, dated August 2019
4. Beveridge North West PSP – Strategic Transport Modelling Assessment, prepared by GTA Consultants, dated 10 December 2018
5. Letter from Crystal Group, dated 6 October 2019, submission in response to the changes proposed by the VPA pursuant to Amendment C106
6. Letter from Wally Mott, dated 7 October 2019, submission in response to the changes proposed by the VPA pursuant to Amendment C106
7. Mitchell Planning Scheme – Amendment C106 Explanatory Report and Instruction Sheet, prepared by Mitchell Shire Council
8. VPA Submission Summary – Beveridge North West PSP – Amendment C106 (Version 1), prepared by VPA, dated 26 June 2020.
9. Beveridge Williams functional layout plan (issue P5) – 175 Northern Highway, Wallan
10. 175 Northern Highway, Wallan – Proposed Quarry Development Transport Impact Assessment, prepared by GTA Consultants
11. Spring Hill Cone concept plans, prepared by Hayball
12. Proposed Layout Plan Spring Hill, prepared by Millar Merrigan.

ATTACHMENT B
SECTION 173 AGREEMENT PLANS

NOT TO SCALE

CONCEPTUAL PLAN ONLY
NOT APPROVED FOR CONSTRUCTION

DATE: OCT 17

THIS DRAWING IS NOT TO BE COPIED OR SCALED

VERSION	REMARKS

DRAWN BY -
MELWAY -
DATUM -

REEDS CONSULTING
LAND SURVEYING
CIVIL ENGINEERING
PLANNING
DEVELOPMENT CONSULTING
www.reedsconsulting.com.au
engineering@reedsconsulting.com.au
Lvl 6, 440 Elizabeth Street Melbourne Victoria 3000
p (03) 8660 3000

MITCHELL SHIRE COUNCIL
WALLARA WATERS ESTATE, WALLAN
PROPOSED MACSFIELD ROAD /
HUME FREEWAY OVERPASS CONNECTION
CONCEPT PLAN

DRAWING No. 1C1
VERSION A
REFERENCE 20569E
SHEET 1 OF 1

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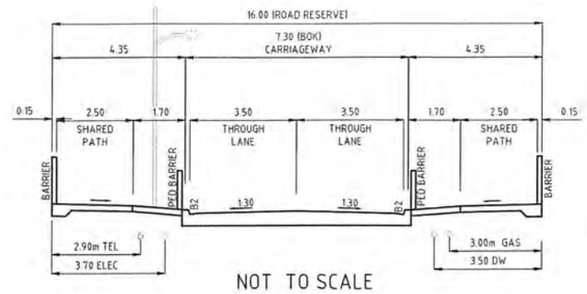
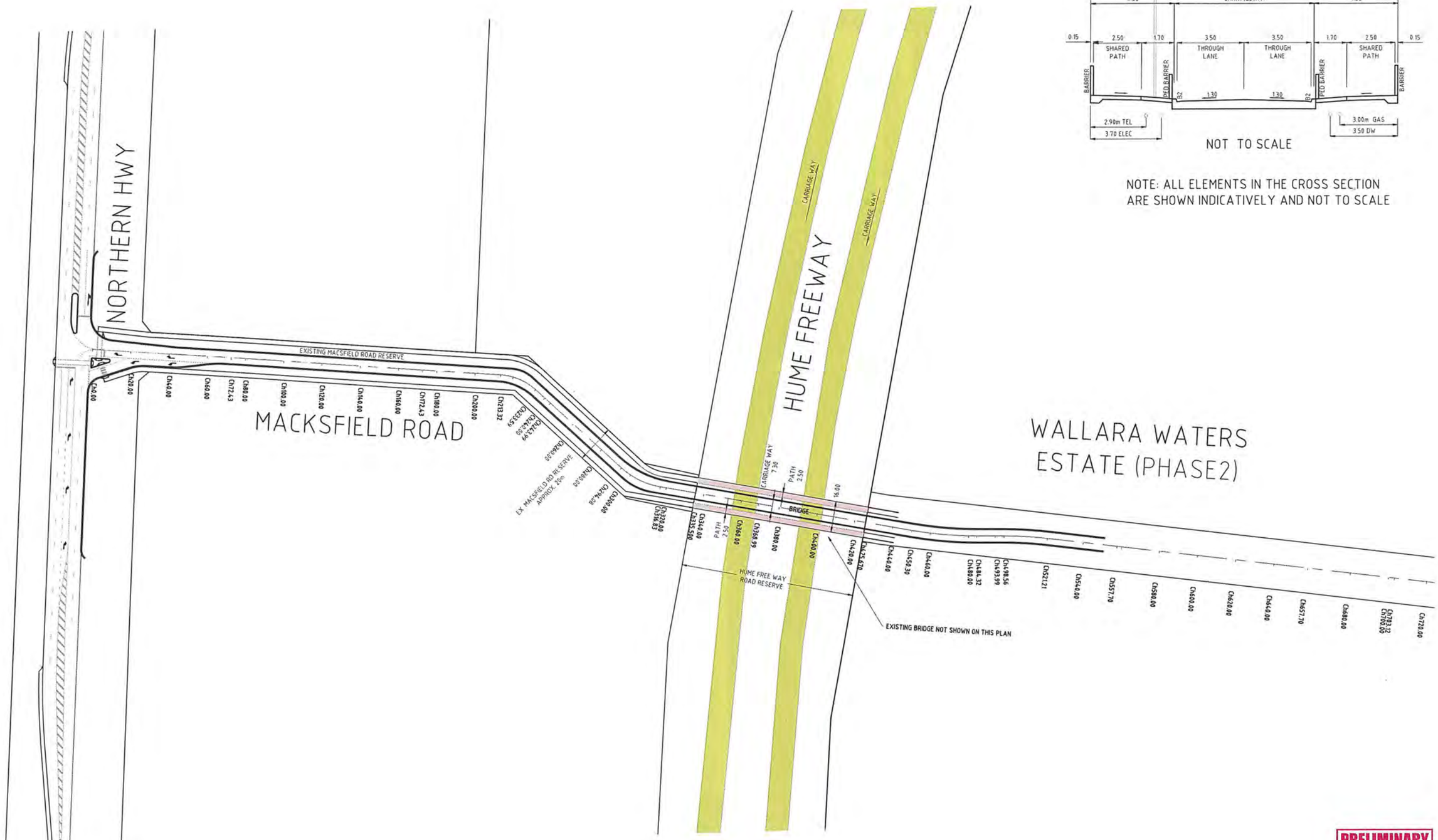


NOT TO SCALE

NOTE: ALL ELEMENTS IN THE CROSS SECTION ARE SHOWN INDICATIVELY AND NOT TO SCALE



WALLARA WATERS ESTATE (PHASE2)

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Scale 1:1000 @ A1

PRELIMINARY PLAN ONLY
NOT APPROVED FOR CONSTRUCTION

PLAN UPDATED ON 2017.11.28

THIS DRAWING IS NOT TO BE COPIED OR SCALED

VERSION	REMARKS		
B	NORTHERN HWY INTERSECTION ADDED	27.03.17	JB
A	PRELIMINARY ISSUE	23.03.17	JB

DRAWN BY	N. ROBINSON	DESIGNED BY	J. BOSCO
MELWAY	646, E12	CHECKED BY	X.XXXXX
DATUM	AHD	AUTHORISED BY	X.XXXXX

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MITCHELL SHIRE COUNCIL
WALLARA WATERS ESTATE PHASE 2
MACSFIELD CONNECTOR ROAD - TO NORTHEN HWY
LAYOUT PLAN

DRAWING No.	VERSION
G10	B
REFERENCE	
20569E/PH2	
SHEET	
1 OF 3	

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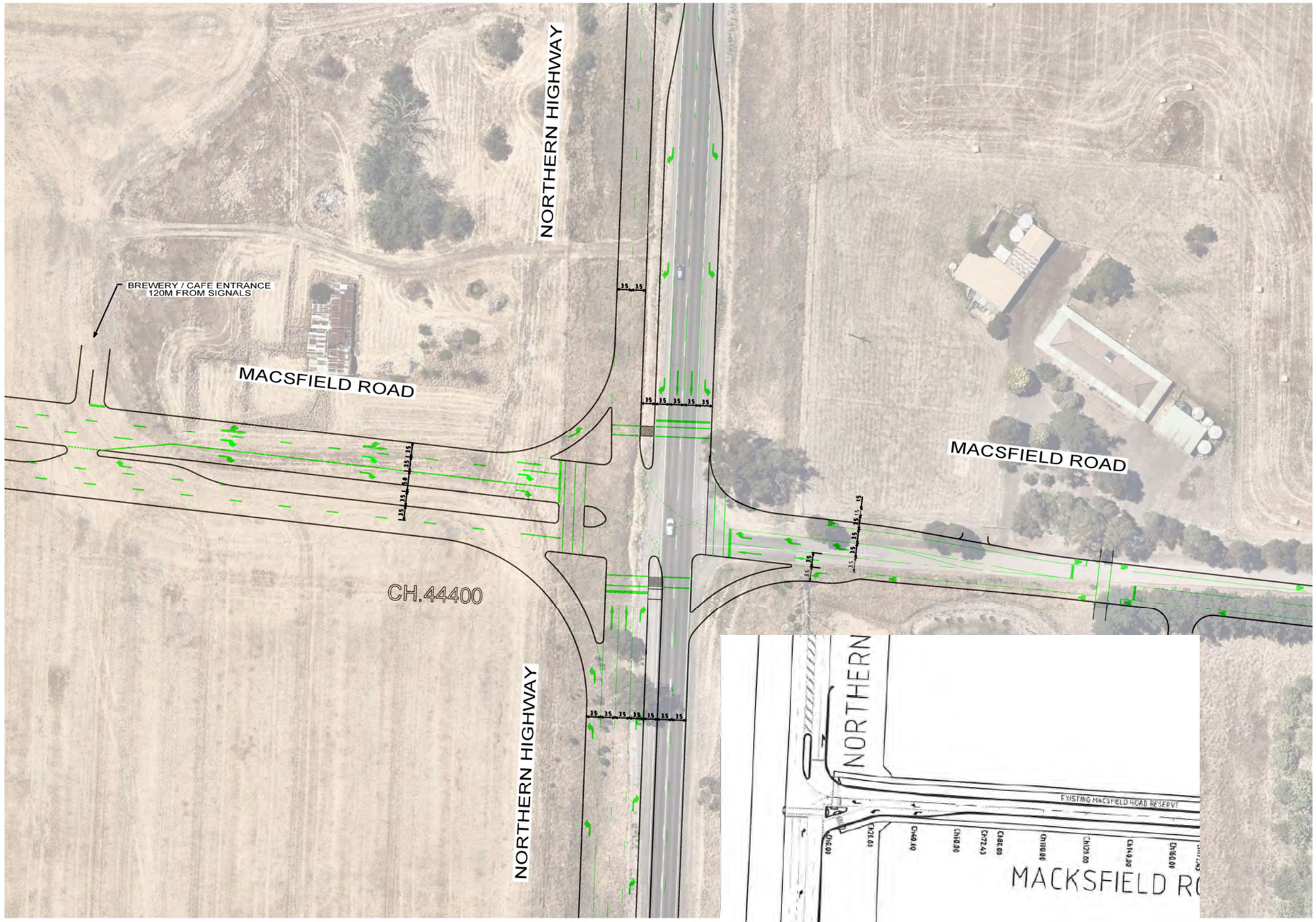
ATTACHMENT C
175 NORTHERN HIGHWAY WALLAN FUNCTIONAL LAYOUT PLAN



ISSUE	AMENDMENT
P1	PRELIMINARY ISSUE FOR COMMENT
P2	
P3	
P4	

GENERAL NOTES

1. AERIAL PHOTOGRAPHY OBTAINED VIA NEARMAP UNDER BEVERIDGE WILLIAMS LICENSING AGREEMENT.
2. BASE INFORMATION FROM BEVERIDGE WILLIAMS.

DESIGNED: S. DEFREITAS

APPROVED: E. ANINIPOC

CLIENT: CRYSTAL GROUP

DATE: 07/05/2020

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SCALE OF METRES: HOR 0 10 20

175 NORTHERN HIGHWAY
WALLAN
FUNCTIONAL LAYOUT PLAN

PROJECT REF	STAGE NO	DRAWING NO.	SHEET NO.	ISSUE
1901232	01	01	1 OF 1	P5

15/05/2020 Airong LD
1:50 20 PM 1901232-FLP-01-24.dgn

ATTACHMENT D
SIDRA ANALYSIS RESULTS

USER REPORT FOR SITE

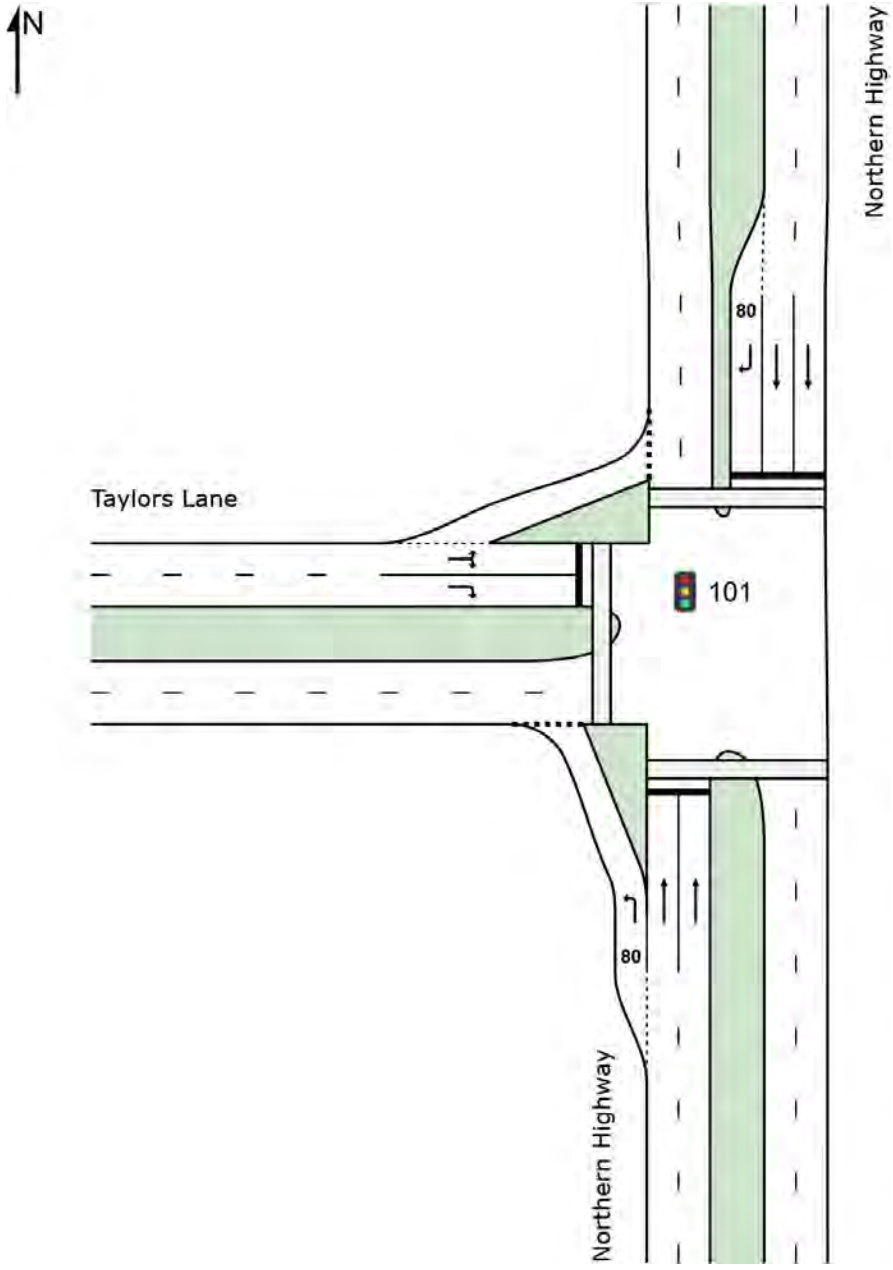
Project: 190900_SIDRA_Beveridge NW PSP_200701 **Template: Site User Report**

Site: 101 [100% - Interim - Northern Hwy / Taylors Lane - AM]

New Site
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 110 seconds (Site User-Given Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Variable Phasing
Reference Phase: Phase C
Input Phase Sequence: A, C, D, F
Output Phase Sequence: A, C, D, F

Site Layout



Lane Use and Performance

	Demand Flows Total veh/h	Demand Flows HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Northern Highway													
Lane 1	119	3.0	1482	0.080	100	9.0	LOS A	1.1	7.7	Short	80	0.0	NA
Lane 2	512	8.0	652[1]	0.785	100	33.4	LOS C	24.4	182.6	Full	500	0.0	0.0
Lane 3	561	8.0	715	0.785	100	34.0	LOS C	27.5	205.4	Full	500	0.0	0.0
Approach	1193	7.5		0.785		31.2	LOS C	27.5	205.4				
North: Northern Highway													
Lane 1	526	8.0	1073	0.491	100	14.8	LOS B	16.6	123.8	Full	500	0.0	0.0
Lane 2	526	8.0	1073	0.491	100	14.8	LOS B	16.6	123.8	Full	500	0.0	0.0
Lane 3	186	3.0	251	0.744	100	60.0	LOS E	10.3	73.7	Short	80	0.0	NA
Approach	1239	7.2		0.744		21.6	LOS C	16.6	123.8				
West: Taylors Lane													
Lane 1	334	3.0	442	0.756	100	50.9	LOS D	15.2	109.4	Full	500	0.0	0.0
Lane 2	164	3.0	217	0.756	100	60.7	LOS E	9.2	66.0	Full	500	0.0	0.0
Approach	498	3.0		0.756		54.1	LOS D	15.2	109.4				
Intersection	2929	6.6		0.785		31.1	LOS C	27.5	205.4				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

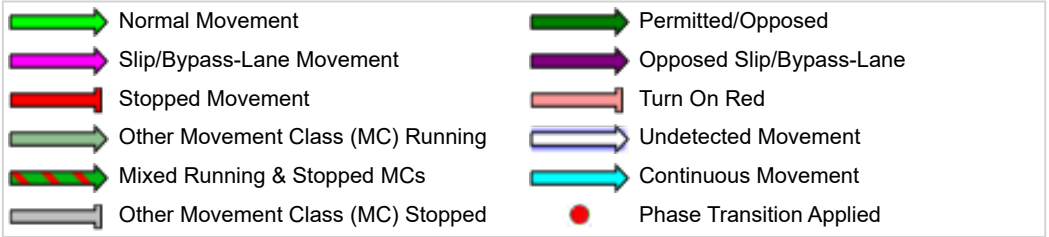
Phase Timing Summary

Phase	A	C	D	F
Phase Change Time (sec)	91	0	22	43
Green Time (sec)	13	17	15	42
Phase Time (sec)	18	23	21	48
Phase Split	16%	21%	19%	44%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence

REF: Reference Phase
VAR: Variable Phase

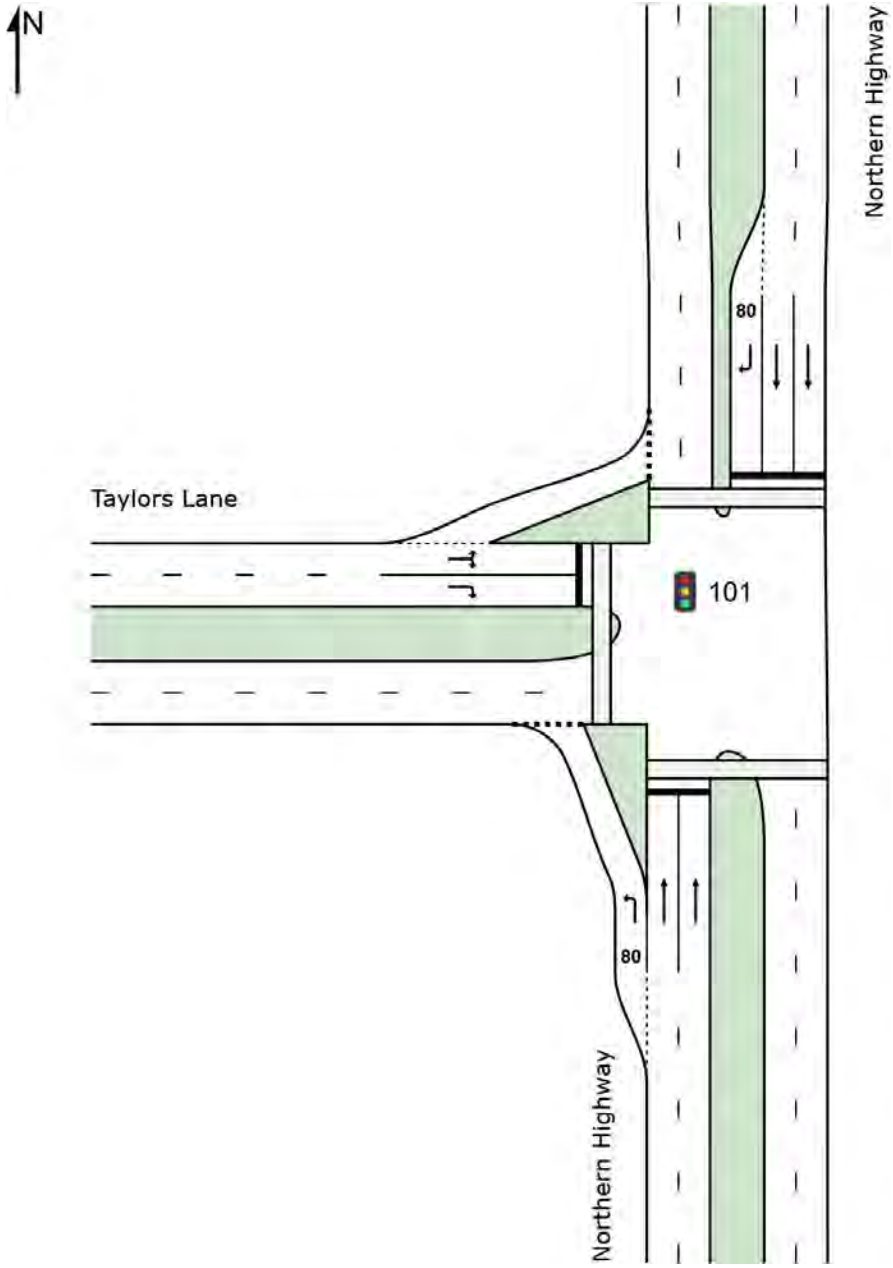


Site: 101 [100% - Interim - Northern Hwy / Taylors Lane - PM]

New Site
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 110 seconds (Site User-Given Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Variable Phasing
Reference Phase: Phase C
Input Phase Sequence: A, C, D, F
Output Phase Sequence: A, C, D, F

Site Layout



Lane Use and Performance

	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Northern Highway													
Lane 1	316	3.0	1422	0.222	100	9.7	LOS A	3.7	26.3	Short	80	0.0	NA
Lane 2	427	8.0	698	0.611	100	30.1	LOS C	18.6	139.0	Full	500	0.0	0.0
Lane 3	427	8.0	698	0.611	100	30.1	LOS C	18.6	139.0	Full	500	0.0	0.0
Approach	1169	6.6		0.611		24.6	LOS C	18.6	139.0				
North: Northern Highway													
Lane 1	652	8.0	1175	0.555	100	12.4	LOS B	19.7	147.4	Full	500	0.0	0.0
Lane 2	638	8.0	1149	0.555	100	12.3	LOS B	19.0	142.5	Full	500	0.0	0.0
Lane 3	227	3.0	367	0.619	100	51.1	LOS D	11.4	81.5	Short	80	0.0	NA
Approach	1517	7.3		0.619		18.2	LOS B	19.7	147.4				
West: Taylors Lane													
Lane 1	255	3.0	462	0.551	100	38.2	LOS D	10.5	75.5	Full	500	0.0	0.0
Lane 2	64	3.0	117	0.551	100	63.3	LOS E	3.6	25.8	Full	500	0.0	0.0
Approach	319	3.0		0.551		43.3	LOS D	10.5	75.5				
Intersection	3005	6.6		0.619		23.3	LOS C	19.7	147.4				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

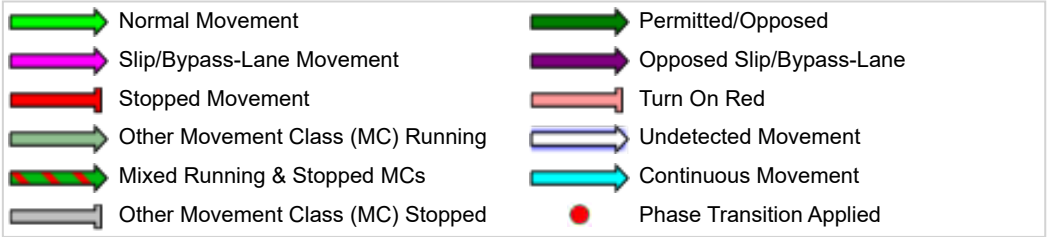
Phase Timing Summary

Phase	A	C	D	F
Phase Change Time (sec)	97	0	22	50
Green Time (sec)	7	17	22	41
Phase Time (sec)	12	23	28	47
Phase Split	11%	21%	25%	43%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence

REF: Reference Phase
VAR: Variable Phase

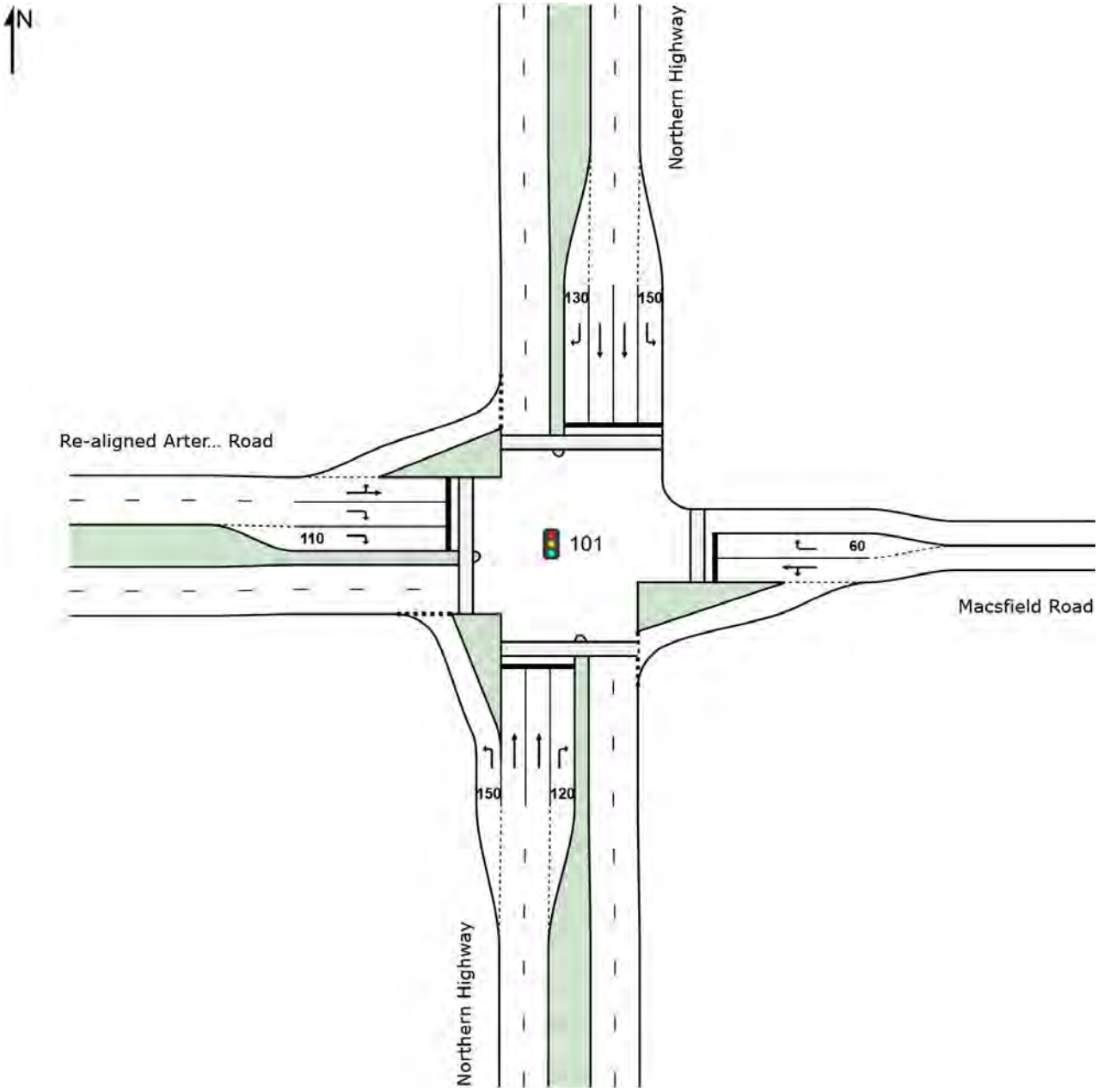


Site: 101 [100% - Interim - Northerm Hwy / Re-aligned Arterial Rd / Macsfield Rd - AM]

New Site
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 125 seconds (Site User-Given Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Variable Phasing
Reference Phase: Phase C
Input Phase Sequence: A, B1*, B2*, C, D, E1*, E2*, F
Output Phase Sequence: A, B1*, C, D, E1*, F
(* Variable Phase)

Site Layout



Lane Use and Performance

	Demand Flows Total veh/h	Demand Flows HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Northern Highway													
Lane 1	206	3.0	1575	0.131	100	8.1	LOS A	1.3	9.4	Short	150	0.0	NA
Lane 2	549	8.0	854	0.643	100	27.9	LOS C	25.5	190.7	Full	500	0.0	0.0
Lane 3	549	8.0	854	0.643	100	27.9	LOS C	25.5	190.7	Full	500	0.0	0.0
Lane 4	68	3.0	103	0.665	100	74.5	LOS E	4.4	31.8	Short	120	0.0	NA
Approach	1373	7.0		0.665		27.2	LOS C	25.5	190.7				
East: Macsfield Road													
Lane 1	83	3.0	182	0.458	100	50.9	LOS D	3.5	25.4	Full	200	0.0	0.0
Lane 2	44	3.0	88	0.501	100	72.8	LOS E	2.8	20.3	Short	60	0.0	NA
Approach	127	3.0		0.501		58.5	LOS E	3.5	25.4				
North: Northern Highway													
Lane 1	53	3.0	779	0.068	100	29.5	LOS C	1.9	13.4	Short	150	0.0	NA
Lane 2	610	8.0	839	0.727	100	30.1	LOS C	30.2	225.7	Full	500	0.0	0.0
Lane 3	610	8.0	839	0.727	100	30.1	LOS C	30.2	225.7	Full	500	0.0	0.0
Lane 4	53	3.0	88	0.597	100	75.2	LOS E	3.4	24.5	Short	130	0.0	NA
Approach	1325	7.6		0.727		31.9	LOS C	30.2	225.7				
West: Re-aligned Arterial Road													
Lane 1	349	3.0	500	0.698	100	54.2	LOS D	19.0	136.5	Full	500	0.0	0.0
Lane 2	219	3.0	426	0.515	100	51.0	LOS D	11.8	84.4	Full	500	0.0	0.0
Lane 3	219	3.0	426	0.515	100	51.0	LOS D	11.8	84.4	Short	110	0.0	NA
Approach	788	3.0		0.698		52.4	LOS D	19.0	136.5				
Intersection	3614	6.2		0.727		35.5	LOS D	30.2	225.7				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

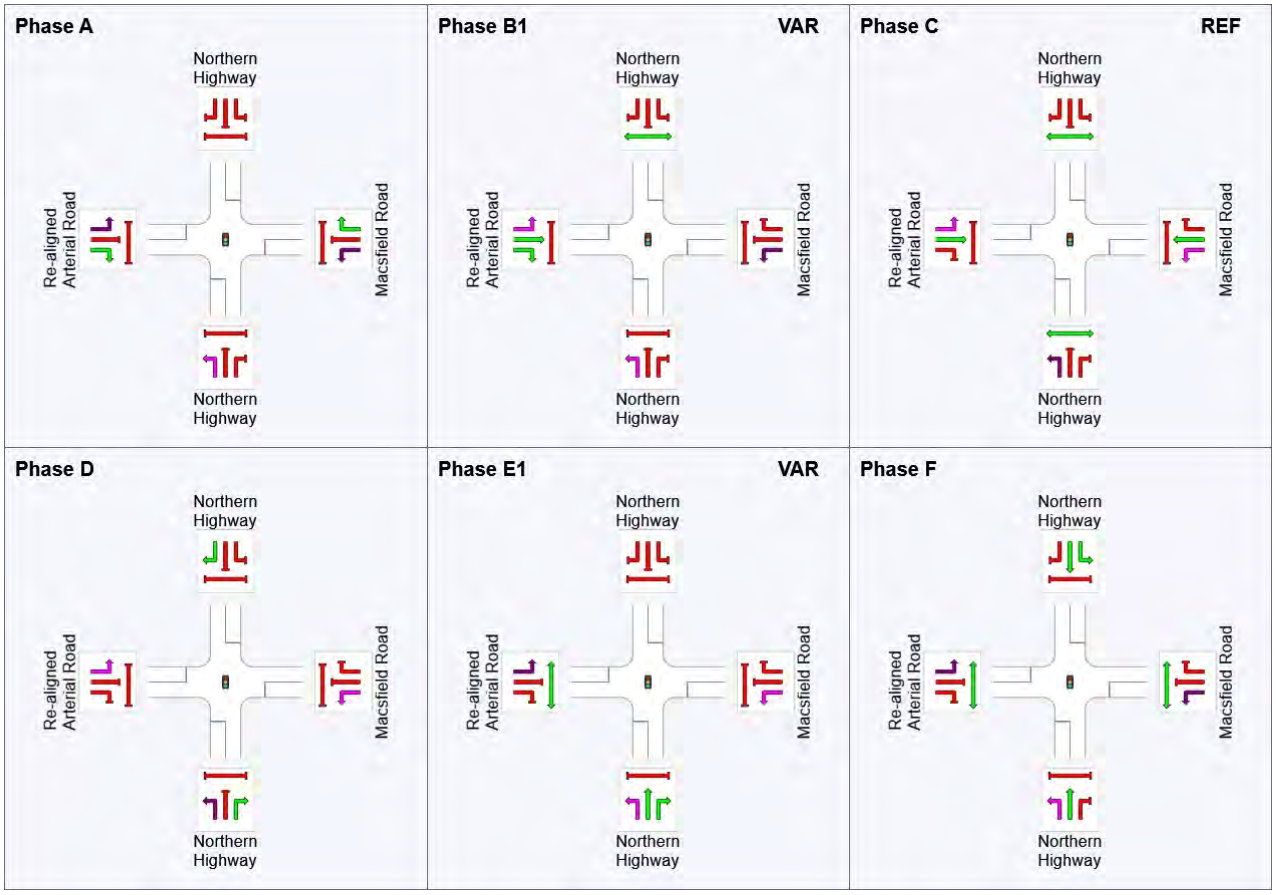
Phase Timing Summary

Phase	A	B1	C	D	E1	F
Phase Change Time (sec)	90	102	0	15	27	28
Green Time (sec)	6	17	9	6	***	56
Phase Time (sec)	12	23	15	12	1	62
Phase Split	10%	18%	12%	10%	1%	50%

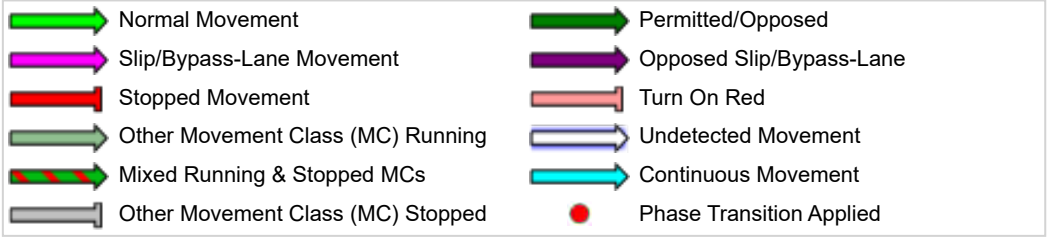
See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

*** No green time has been calculated for this phase because the next phase starts during its intergreen time. This occurs with overlap phasing where there is no single movement connecting this phase to the next, or where the only such movement is a dummy movement with zero minimum green time specified.
If a green time is required for this phase, specify a dummy movement with a non-zero minimum green time.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

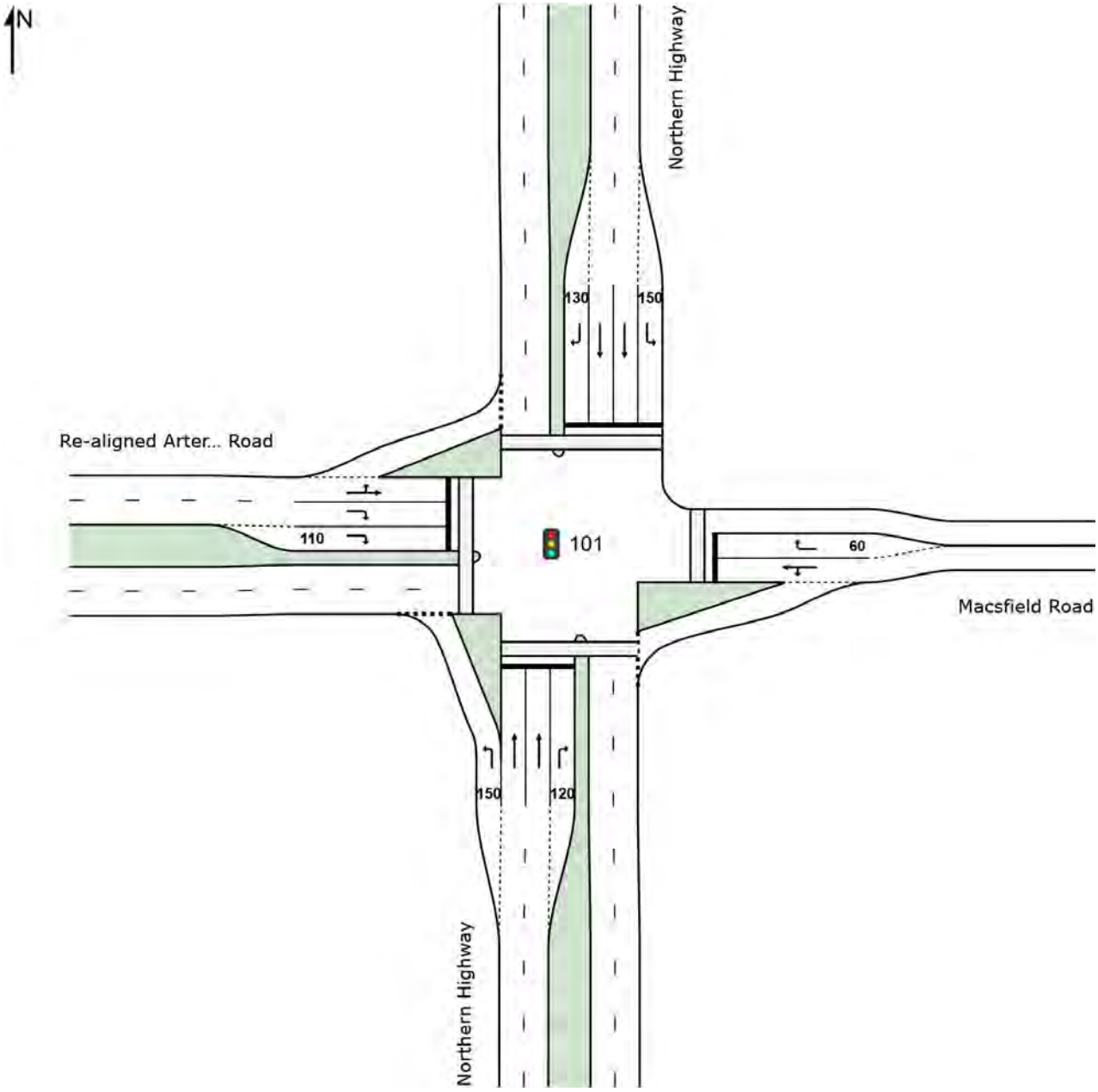


Site: 101 [100% - Interim - Northerm Hwy / Re-aligned Arterial Rd / Macsfield Rd - PM]

New Site
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 125 seconds (Site User-Given Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Variable Phasing
Reference Phase: Phase C
Input Phase Sequence: A, B1*, B2*, C, D, E1*, E2*, F
Output Phase Sequence: A, B2*, C, D, F
(* Variable Phase)

Site Layout



Lane Use and Performance

	Demand Flows Total veh/h	Demand Flows HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Northern Highway													
Lane 1	727	3.0	1420	0.512	100	10.8	LOS B	13.2	95.1	Short	150	0.0	NA
Lane 2	450	8.0	809	0.556	100	28.3	LOS C	20.3	151.9	Full	500	0.0	0.0
Lane 3	450	8.0	809	0.556	100	28.3	LOS C	20.3	151.9	Full	500	0.0	0.0
Lane 4	104	3.0	162	0.645	100	69.7	LOS E	6.5	46.6	Short	120	0.0	NA
Approach	1732	5.6		0.645		23.4	LOS C	20.3	151.9				
East: Macsfield Road													
Lane 1	214	3.0	333	0.642	100	54.1	LOS D	10.9	78.3	Full	200	0.0	0.0
Lane 2	261	3.0	382[1]	0.684	100	55.7	LOS E	14.9	107.3	Short	60	0.0	NA
Approach	475	3.0		0.684		55.0	LOS D	14.9	107.3				
North: Northern Highway													
Lane 1	77	3.0	750	0.103	100	31.2	LOS C	2.8	20.4	Short	150	0.0	NA
Lane 2	544	8.0	809	0.672	100	30.3	LOS C	26.3	196.7	Full	500	0.0	0.0
Lane 3	544	8.0	809	0.672	100	30.3	LOS C	26.3	196.7	Full	500	0.0	0.0
Lane 4	115	3.0	162	0.710	100	71.1	LOS E	7.3	52.2	Short	130	0.0	NA
Approach	1279	7.3		0.710		34.0	LOS C	26.3	196.7				
West: Re-aligned Arterial Road													
Lane 1	120	3.0	190	0.630	100	59.5	LOS E	6.1	44.0	Full	500	0.0	0.0
Lane 2	180	3.0	250	0.720	100	64.4	LOS E	11.0	79.3	Full	500	0.0	0.0
Lane 3	180	3.0	250	0.720	100	64.4	LOS E	11.0	79.3	Short	110	0.0	NA
Approach	480	3.0		0.720		63.2	LOS E	11.0	79.3				
Intersection	3965	5.5		0.720		35.4	LOS D	26.3	196.7				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

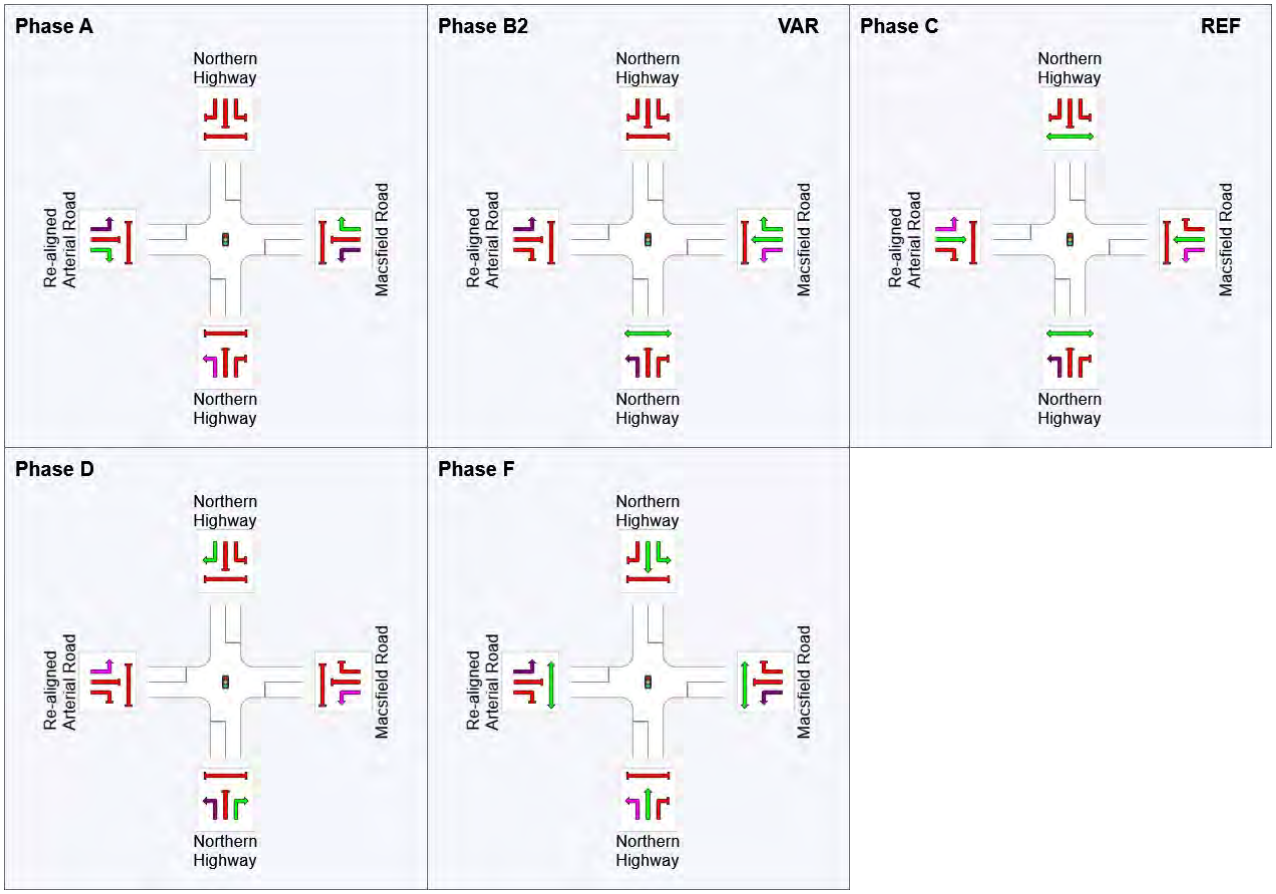
1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Phase Timing Summary

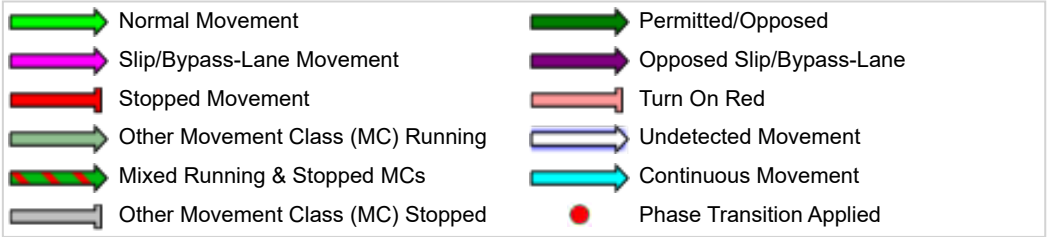
Phase	A	B2	C	D	F
Phase Change Time (sec)	93	116	0	16	33
Green Time (sec)	17	3	10	11	54
Phase Time (sec)	23	9	16	17	60
Phase Split	18%	7%	13%	14%	48%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



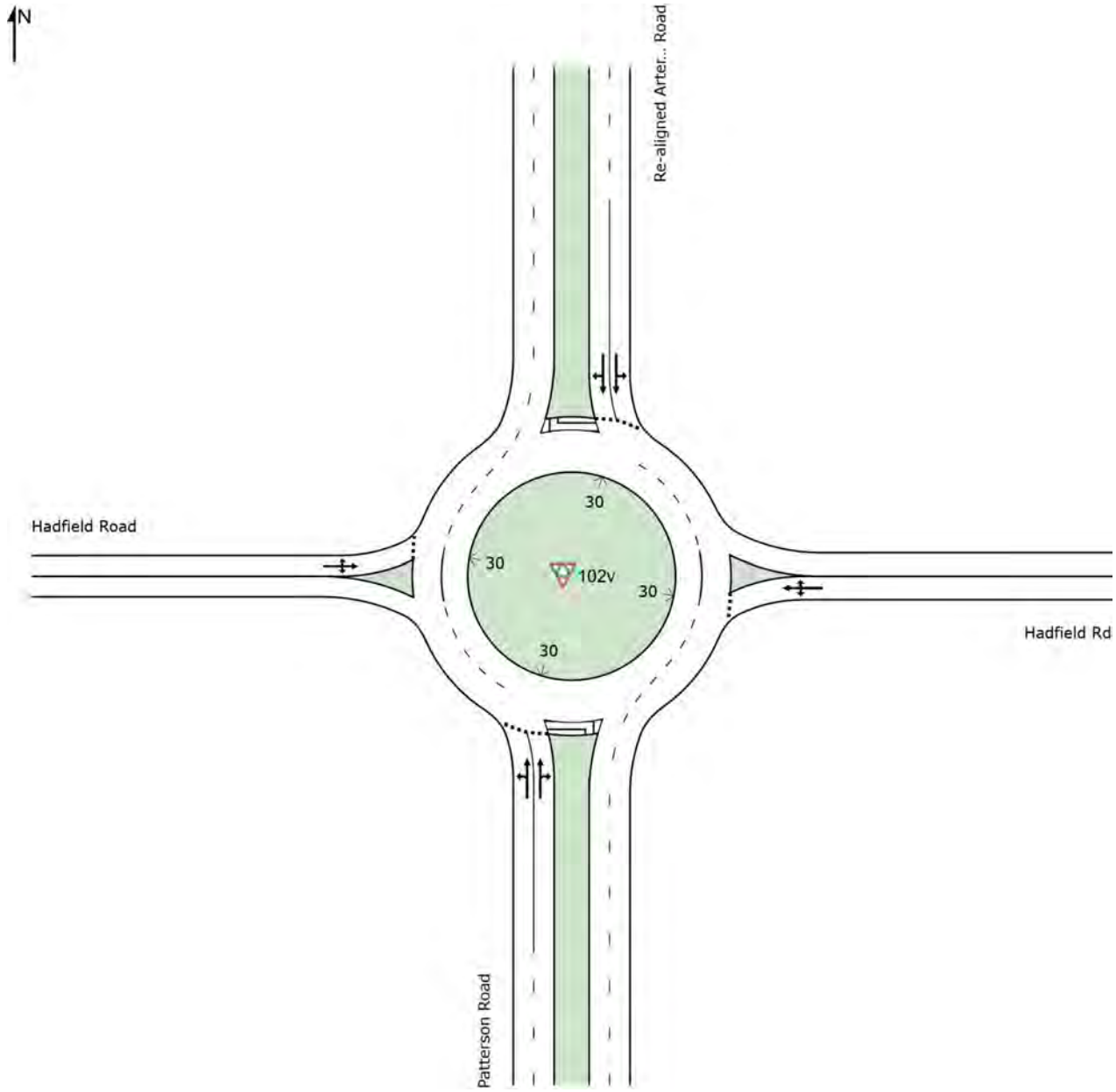
REF: Reference Phase
VAR: Variable Phase



Site: 102v [100% - Interim - Re-aligned Arterial Rd / Patterson Rd / Hadfield Rd - AM]

New Site
Site Category: (None)
Roundabout

Site Layout



Lane Use and Performance													
	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Patterson Road													
Lane 1[d]	159	3.0	1698	0.094	100	3.8	LOS A	0.5	3.7	Full	500	0.0	0.0
Lane 2	135	3.0	1442	0.094	100	4.2	LOS A	0.5	3.7	Full	500	0.0	0.0
Approach	295	3.0		0.094		4.0	LOS A	0.5	3.7				
East: Hadfield Rd													
Lane 1[d]	22	3.0	992	0.022	100	7.5	LOS A	0.1	0.6	Full	500	0.0	0.0
Approach	22	3.0		0.022		7.5	LOS A	0.1	0.6				
North: Re-aligned Arterial Road													
Lane 1[d]	248	3.0	1788	0.139	100	3.6	LOS A	0.8	6.1	Full	500	0.0	0.0
Lane 2	210	3.0	1513	0.139	100	5.0	LOS A	0.8	6.0	Full	500	0.0	0.0
Approach	458	3.0		0.139		4.3	LOS A	0.8	6.1				
West: Hadfield Road													
Lane 1[d]	157	3.0	1022	0.153	100	4.9	LOS A	0.7	4.9	Full	500	0.0	0.0
Approach	157	3.0		0.153		4.9	LOS A	0.7	4.9				
Intersection	932	3.0		0.153		4.4	LOS A	0.8	6.1				

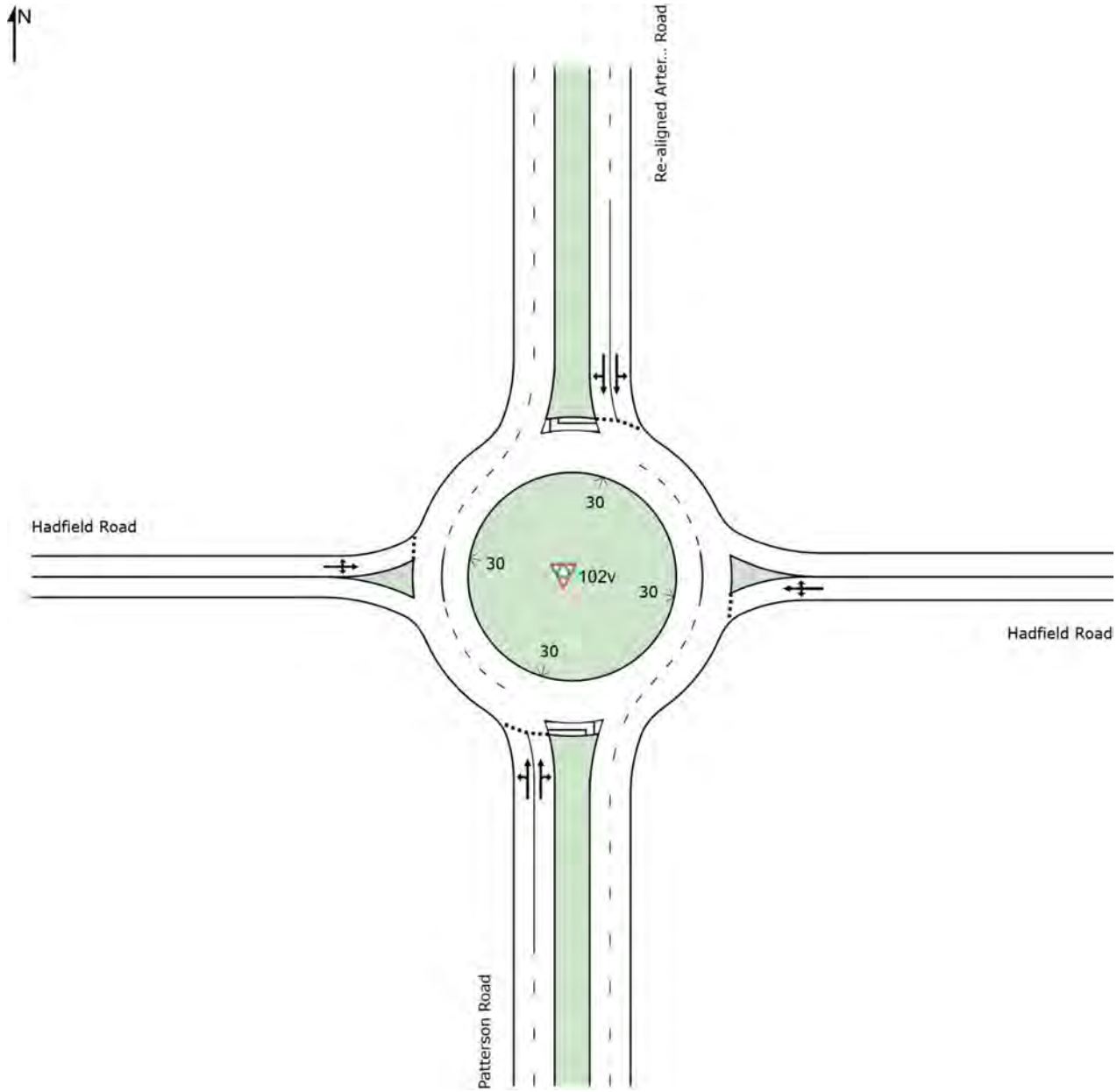
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Site: 102v [100% - Interim - Re-aligned Arterial Rd / Patterson Rd / Hadfield Rd - PM]

New Site
Site Category: (None)
Roundabout

Site Layout



Lane Use and Performance													
	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Patterson Road													
Lane 1[d]	245	3.0	1507	0.162	100	4.4	LOS A	1.0	7.0	Full	500	0.0	0.0
Lane 2	201	3.0	1236	0.162	100	4.8	LOS A	0.9	6.8	Full	500	0.0	0.0
Approach	445	3.0		0.162		4.6	LOS A	1.0	7.0				
East: Hadfield Road													
Lane 1[d]	76	3.0	951	0.080	100	9.1	LOS A	0.3	2.1	Full	500	0.0	0.0
Approach	76	3.0		0.080		9.1	LOS A	0.3	2.1				
North: Re-aligned Arterial Road													
Lane 1[d]	318	3.0	1828	0.174	100	3.6	LOS A	1.1	8.2	Full	500	0.0	0.0
Lane 2	267	3.0	1532	0.174	100	6.7	LOS A	1.1	8.1	Full	500	0.0	0.0
Approach	585	3.0		0.174		5.0	LOS A	1.1	8.2				
West: Hadfield Road													
Lane 1[d]	87	3.0	891	0.098	100	5.5	LOS A	0.4	3.0	Full	500	0.0	0.0
Approach	87	3.0		0.098		5.5	LOS A	0.4	3.0				
Intersection	1194	3.0		0.174		5.2	LOS A	1.1	8.2				

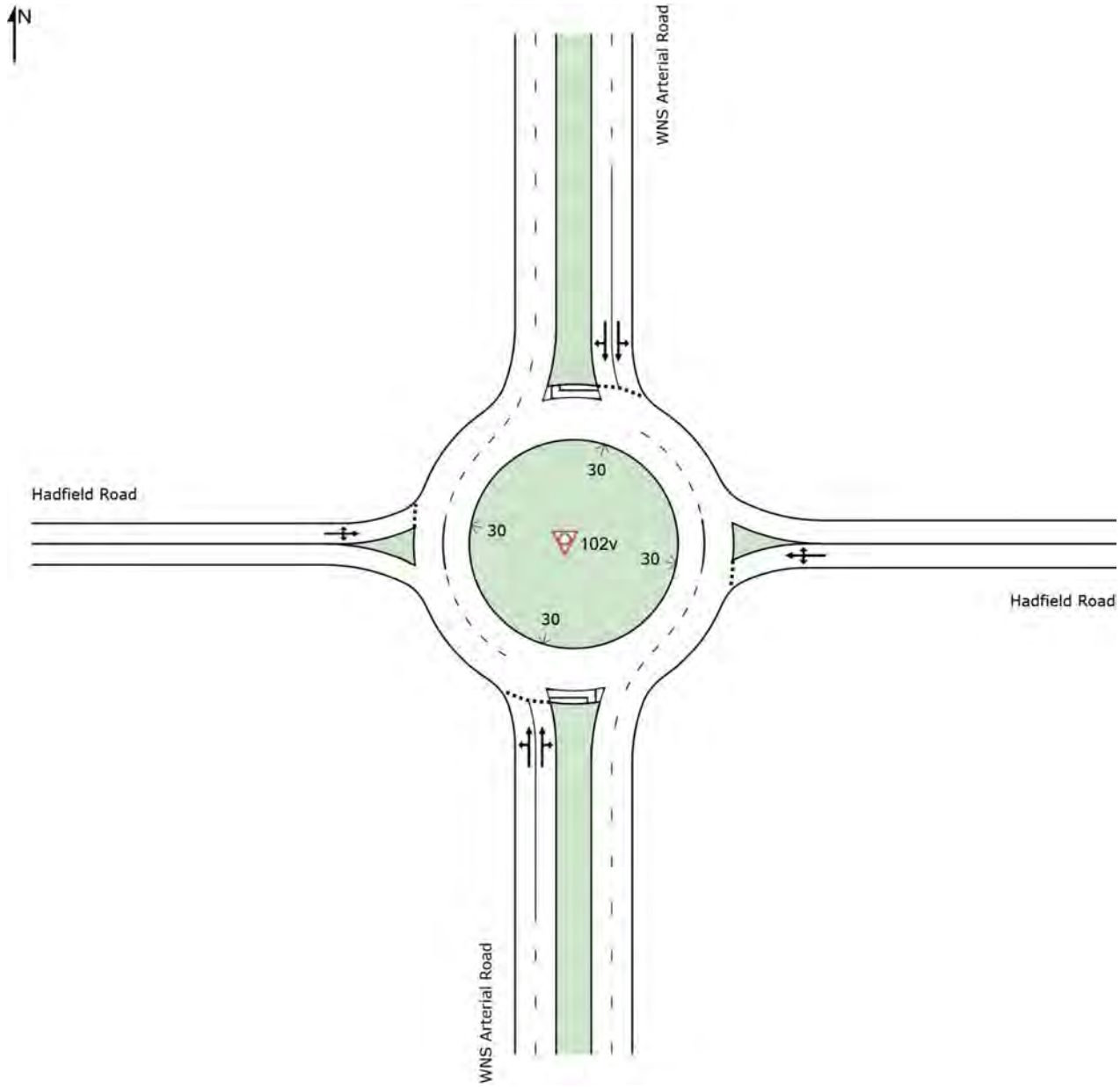
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Site: 102v [100% - Interim - WNS Arterial Rd / Hadfield Rd - AM]

New Site
Site Category: (None)
Roundabout

Site Layout



Lane Use and Performance													
	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: WNS Arterial Road													
Lane 1[d]	106	3.0	1759	0.060	100	3.6	LOS A	0.3	2.5	Full	500	0.0	0.0
Lane 2	90	3.0	1495	0.060	100	4.6	LOS A	0.3	2.4	Full	500	0.0	0.0
Approach	197	3.0		0.060		4.1	LOS A	0.3	2.5				
East: Hadfield Road													
Lane 1[d]	53	3.0	963	0.055	100	5.5	LOS A	0.2	1.4	Full	500	0.0	0.0
Approach	53	3.0		0.055		5.5	LOS A	0.2	1.4				
North: WNS Arterial Road													
Lane 1[d]	246	3.0	1680	0.146	100	3.8	LOS A	0.9	6.4	Full	500	0.0	0.0
Lane 2	207	3.0	1415	0.146	100	4.2	LOS A	0.9	6.3	Full	500	0.0	0.0
Approach	453	3.0		0.146		4.0	LOS A	0.9	6.4				
West: Hadfield Road													
Lane 1[d]	63	3.0	1115	0.057	100	7.7	LOS A	0.2	1.7	Full	500	0.0	0.0
Approach	63	3.0		0.057		7.7	LOS A	0.2	1.7				
Intersection	765	3.0		0.146		4.4	LOS A	0.9	6.4				

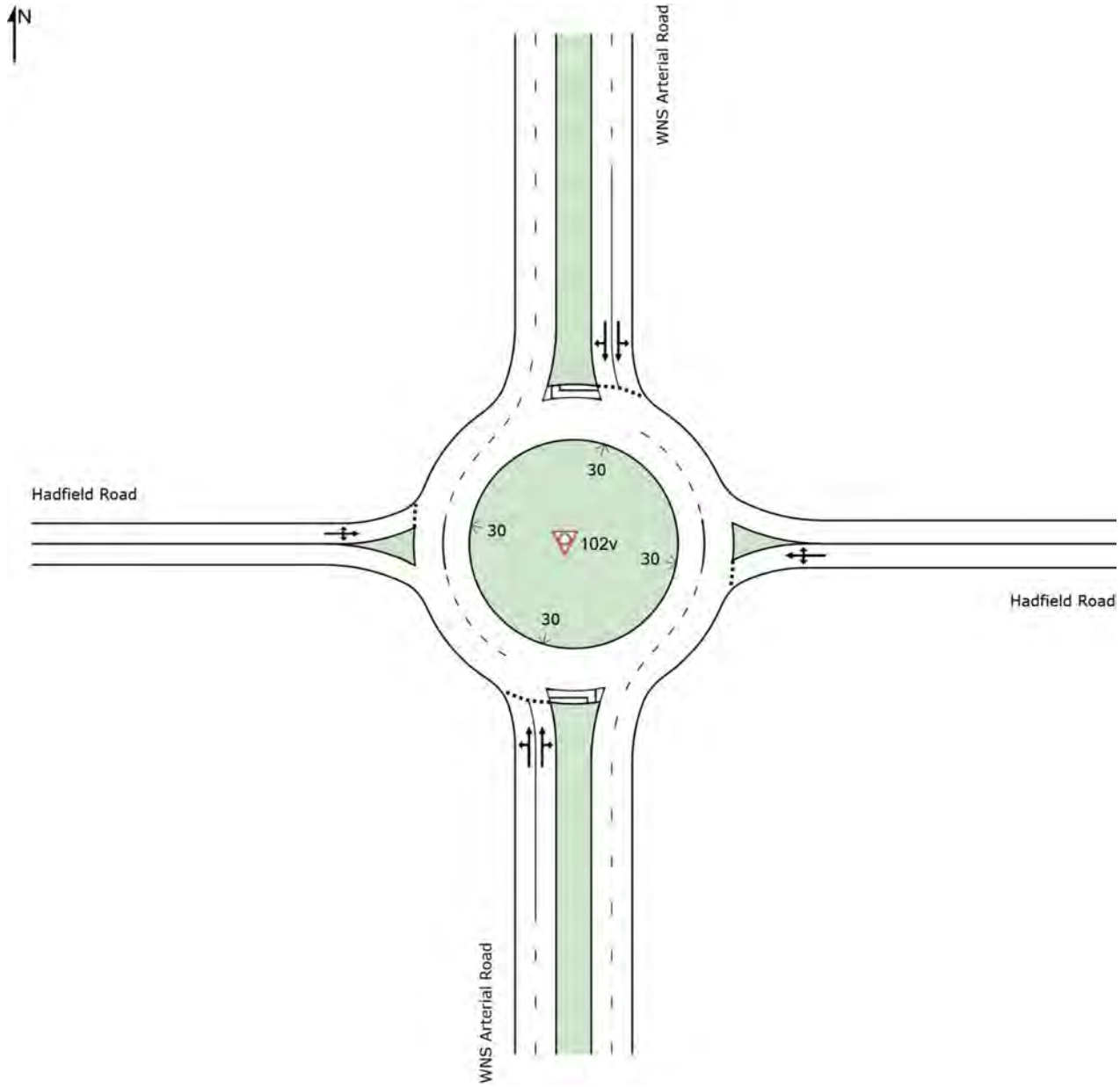
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Site: 102v [100% - Interim - WNS Arterial Rd / Hadfield Rd - PM]

New Site
Site Category: (None)
Roundabout

Site Layout



Lane Use and Performance													
	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: WNS Arterial Road													
Lane 1[d]	315	3.0	1717	0.183	100	3.8	LOS A	1.1	8.3	Full	500	0.0	0.0
Lane 2	265	3.0	1445	0.183	100	4.7	LOS A	1.1	8.2	Full	500	0.0	0.0
Approach	580	3.0		0.183		4.2	LOS A	1.1	8.3				
East: Hadfield Road													
Lane 1[d]	58	3.0	1094	0.053	100	7.9	LOS A	0.2	1.4	Full	500	0.0	0.0
Approach	58	3.0		0.053		7.9	LOS A	0.2	1.4				
North: WNS Arterial Road													
Lane 1[d]	131	3.0	1656	0.079	100	3.8	LOS A	0.5	3.3	Full	500	0.0	0.0
Lane 2	111	3.0	1401	0.079	100	4.8	LOS A	0.4	3.2	Full	500	0.0	0.0
Approach	242	3.0		0.079		4.3	LOS A	0.5	3.3				
West: Hadfield Road													
Lane 1[d]	58	3.0	868	0.067	100	7.6	LOS A	0.3	1.9	Full	500	0.0	0.0
Approach	58	3.0		0.067		7.6	LOS A	0.3	1.9				
Intersection	938	3.0		0.183		4.7	LOS A	1.1	8.3				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

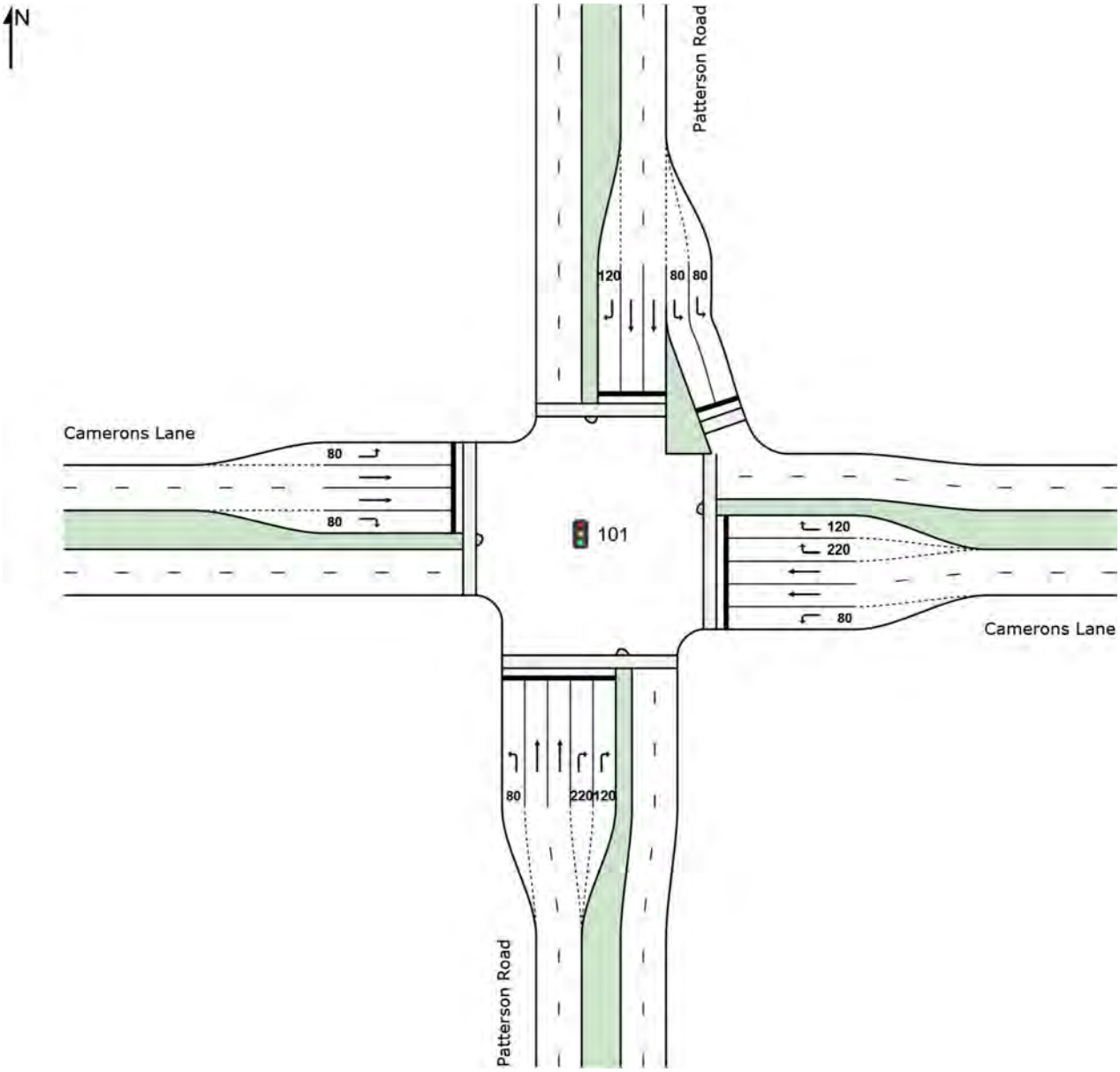
d Dominant lane on roundabout approach

Site: 101 [100% - Interim - Patterson Rd / Camerons Lane - AM]

New Site
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 110 seconds (Site User-Given Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Variable Phasing - Copy (2) (phase reduction applied)
Reference Phase: Phase C
Input Phase Sequence: A, B2, C, D, E2, F
Output Phase Sequence: A, C, D, E2, F

Site Layout



Lane Use and Performance

	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Patterson Road													
Lane 1	46	3.0	785	0.059	100	25.1	LOS C	1.4	10.3	Short	80	0.0	NA
Lane 2	93	3.0	299	0.310	100	45.3	LOS D	4.5	32.3	Full	500	0.0	0.0
Lane 3	93	3.0	299	0.310	100	45.3	LOS D	4.5	32.3	Full	500	0.0	0.0
Lane 4	116	3.0	251	0.462	100	54.2	LOS D	5.9	42.4	Short	220	0.0	NA
Lane 5	116	3.0	251	0.462	100	54.2	LOS D	5.9	42.4	Short	120	0.0	NA
Approach	463	3.0		0.462		47.8	LOS D	5.9	42.4				
East: Camerons Lane													
Lane 1	281	3.0	668	0.421	100	33.8	LOS C	11.3	81.1	Short	80	0.0	NA
Lane 2	53	3.0	334	0.159	100	42.1	LOS D	2.5	17.6	Full	500	0.0	0.0
Lane 3	53	3.0	334	0.159	100	42.1	LOS D	2.5	17.6	Full	500	0.0	0.0
Lane 4	87	3.0	401	0.217	100	43.9	LOS D	3.9	27.7	Short	220	0.0	NA
Lane 5	87	3.0	401	0.217	100	43.9	LOS D	3.9	27.7	Short	120	0.0	NA
Approach	561	3.0		0.421		38.5	LOS D	11.3	81.1				
North: Patterson Road													
Lane 1	160	3.0	969	0.165	100	19.9	LOS B	4.4	31.4	Short	80	0.0	NA
Lane 2	160	3.0	969	0.165	100	19.9	LOS B	4.4	31.4	Short	80	0.0	NA
Lane 3	229	3.0	492	0.465	100	37.6	LOS D	10.5	75.1	Full	500	0.0	0.0
Lane 4	229	3.0	492	0.465	100	37.6	LOS D	10.5	75.1	Full	500	0.0	0.0
Lane 5	137	3.0	434	0.315	100	43.2	LOS D	6.1	43.8	Short	120	0.0	NA
Approach	915	3.0		0.465		32.2	LOS C	10.5	75.1				
West: Camerons Lane													
Lane 1	135	3.0	852	0.158	100	23.7	LOS C	4.1	29.6	Short	80	0.0	NA
Lane 2	157	3.0	334	0.471	100	45.0	LOS D	7.8	55.7	Full	500	0.0	0.0
Lane 3	157	3.0	334	0.471	100	45.0	LOS D	7.8	55.7	Full	500	0.0	0.0
Lane 4	193	3.0	401	0.481	100	46.6	LOS D	9.2	65.7	Short	80	0.0	NA
Approach	642	3.0		0.481		41.0	LOS D	9.2	65.7				
Intersection	2581	3.0		0.481		38.6	LOS D	11.3	81.1				

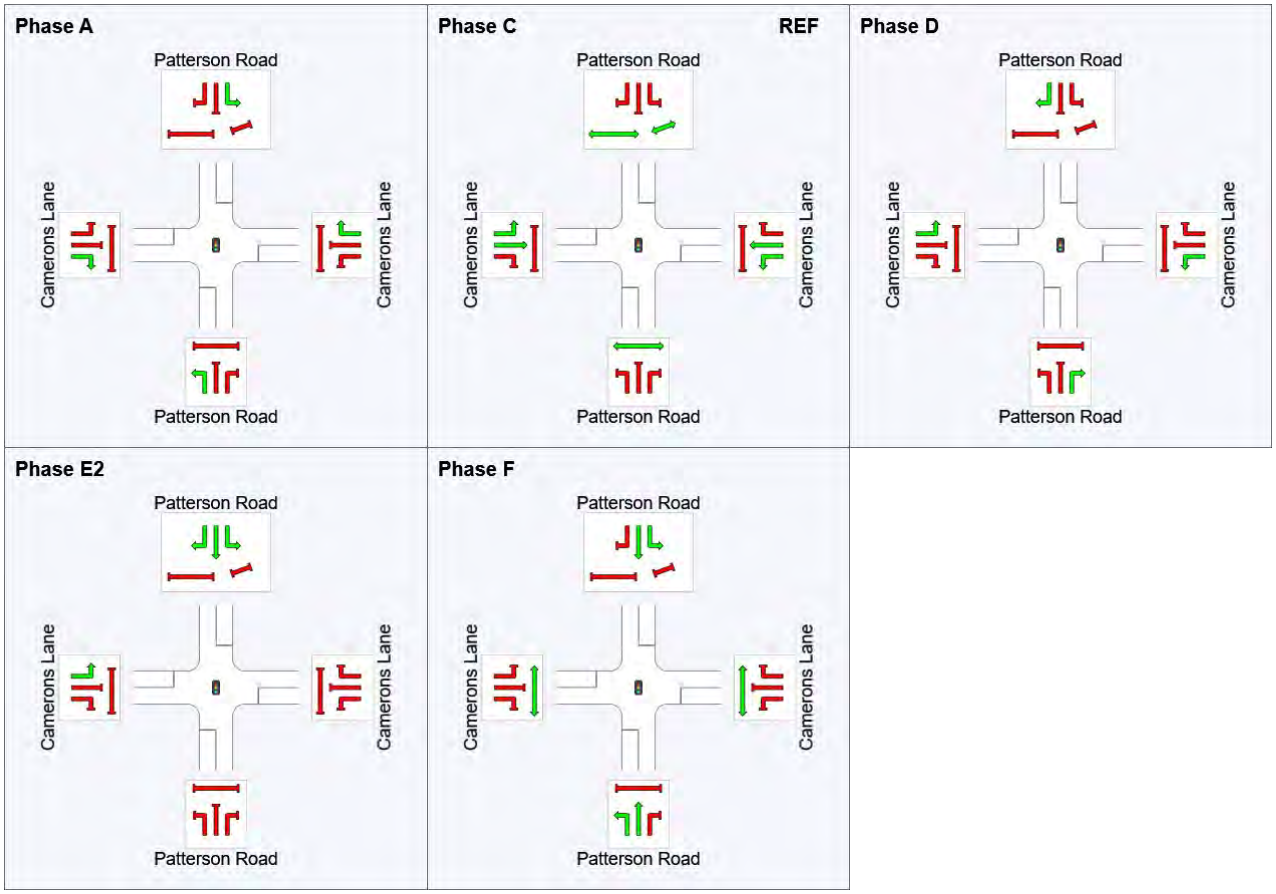
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Phase Timing Summary

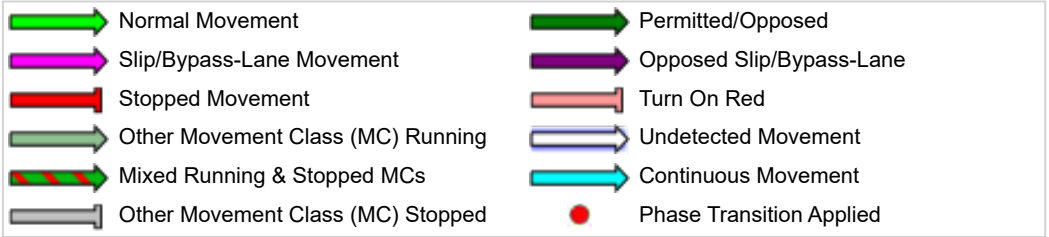
Phase	A	C	D	E2	F
Phase Change Time (sec)	80	0	25	46	57
Green Time (sec)	24	19	15	5	17
Phase Time (sec)	30	25	21	11	23
Phase Split	27%	23%	19%	10%	21%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

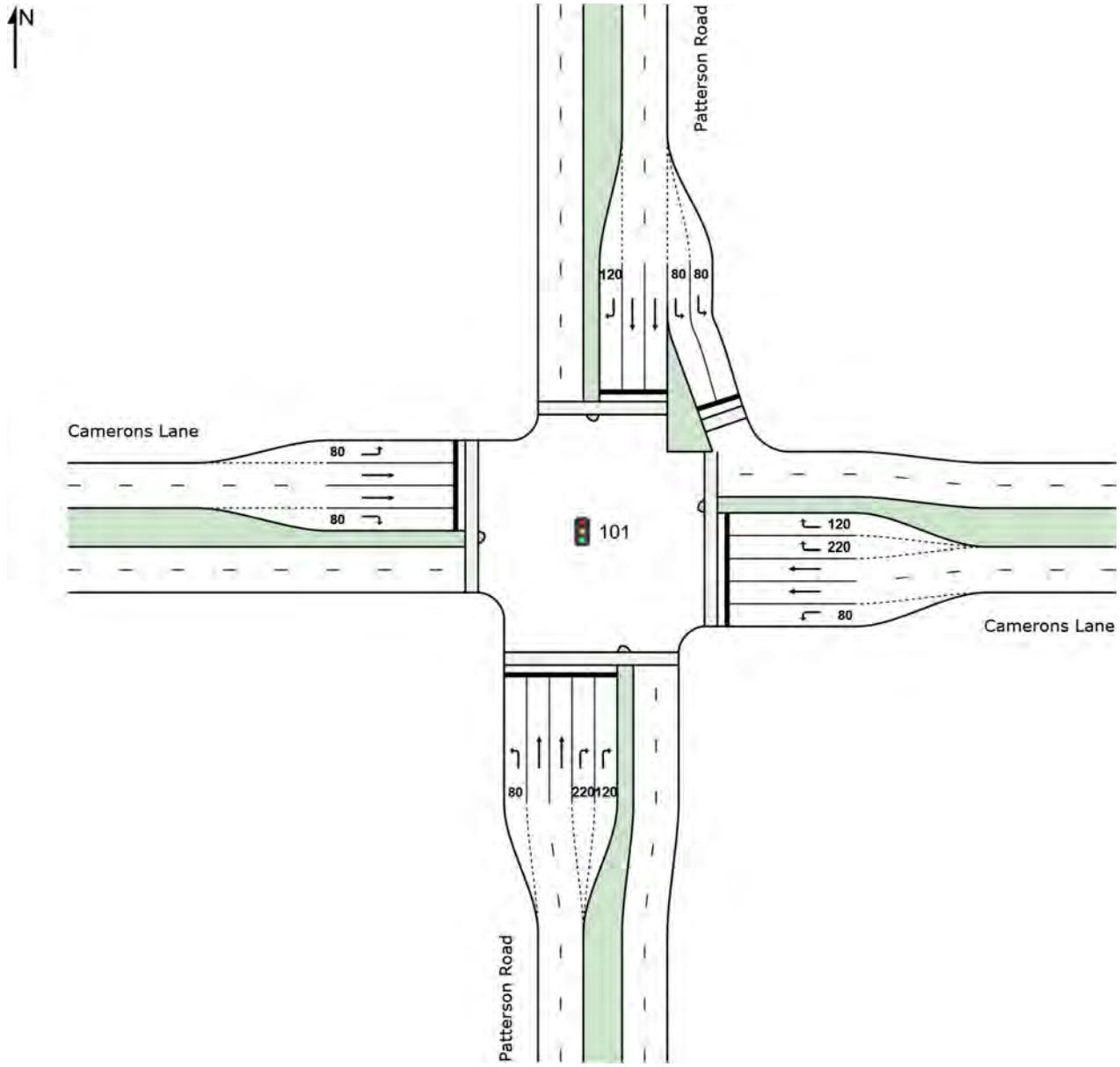


Site: 101 [100% - Interim - Patterson Rd / Camerons Lane - PM]

New Site
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 110 seconds (Site User-Given Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Variable Phasing - Copy (phase reduction applied)
Reference Phase: Phase C
Input Phase Sequence: A, B2, C, D, E1, F
Output Phase Sequence: A, B2, C, D, F

Site Layout



Lane Use and Performance

	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Patterson Road													
Lane 1	36	3.0	685	0.052	100	28.9	LOS C	1.2	8.7	Short	80	0.0	NA
Lane 2	164	3.0	334	0.490	100	45.1	LOS D	8.1	58.2	Full	500	0.0	0.0
Lane 3	164	3.0	334	0.490	100	45.1	LOS D	8.1	58.2	Full	500	0.0	0.0
Lane 4	174	3.0	501	0.348	100	40.4	LOS D	7.5	54.2	Short	220	0.0	NA
Lane 5	174	3.0	501	0.348	100	40.4	LOS D	7.5	54.2	Short	120	0.0	NA
Approach	712	3.0		0.490		42.0	LOS D	8.1	58.2				
East: Camerons Lane													
Lane 1	255	3.0	952	0.268	100	21.3	LOS C	7.5	54.1	Short	80	0.0	NA
Lane 2	178	3.0	369	0.484	100	43.4	LOS D	8.7	62.3	Full	500	0.0	0.0
Lane 3	178	3.0	369	0.484	100	43.4	LOS D	8.7	62.3	Full	500	0.0	0.0
Lane 4	204	3.0	451	0.452	100	43.9	LOS D	9.4	67.2	Short	220	0.0	NA
Lane 5	204	3.0	451	0.452	100	43.9	LOS D	9.4	67.2	Short	120	0.0	NA
Approach	1019	3.0		0.484		38.1	LOS D	9.4	67.2				
North: Patterson Road													
Lane 1	104	3.0	451	0.231	100	41.5	LOS D	4.5	32.3	Short	80	0.0	NA
Lane 2	104	3.0	451	0.231	100	41.5	LOS D	4.5	32.3	Short	80	0.0	NA
Lane 3	156	3.0	334	0.468	100	44.9	LOS D	7.7	55.3	Full	500	0.0	0.0
Lane 4	156	3.0	334	0.468	100	44.9	LOS D	7.7	55.3	Full	500	0.0	0.0
Lane 5	243	3.0	501	0.485	100	42.0	LOS D	11.0	79.1	Short	120	0.0	NA
Approach	764	3.0		0.485		43.1	LOS D	11.0	79.1				
West: Camerons Lane													
Lane 1	88	3.0	768	0.115	100	26.3	LOS C	2.9	20.5	Short	80	0.0	NA
Lane 2	71	3.0	176	0.401	100	53.0	LOS D	3.7	26.8	Full	500	0.0	0.0
Lane 3	71	3.0	176	0.401	100	53.0	LOS D	3.7	26.8	Full	500	0.0	0.0
Lane 4	123	3.0	267	0.461	100	53.3	LOS D	6.2	44.7	Short	80	0.0	NA
Approach	353	3.0		0.461		46.4	LOS D	6.2	44.7				
Intersection	2847	3.0		0.490		41.4	LOS D	11.0	79.1				

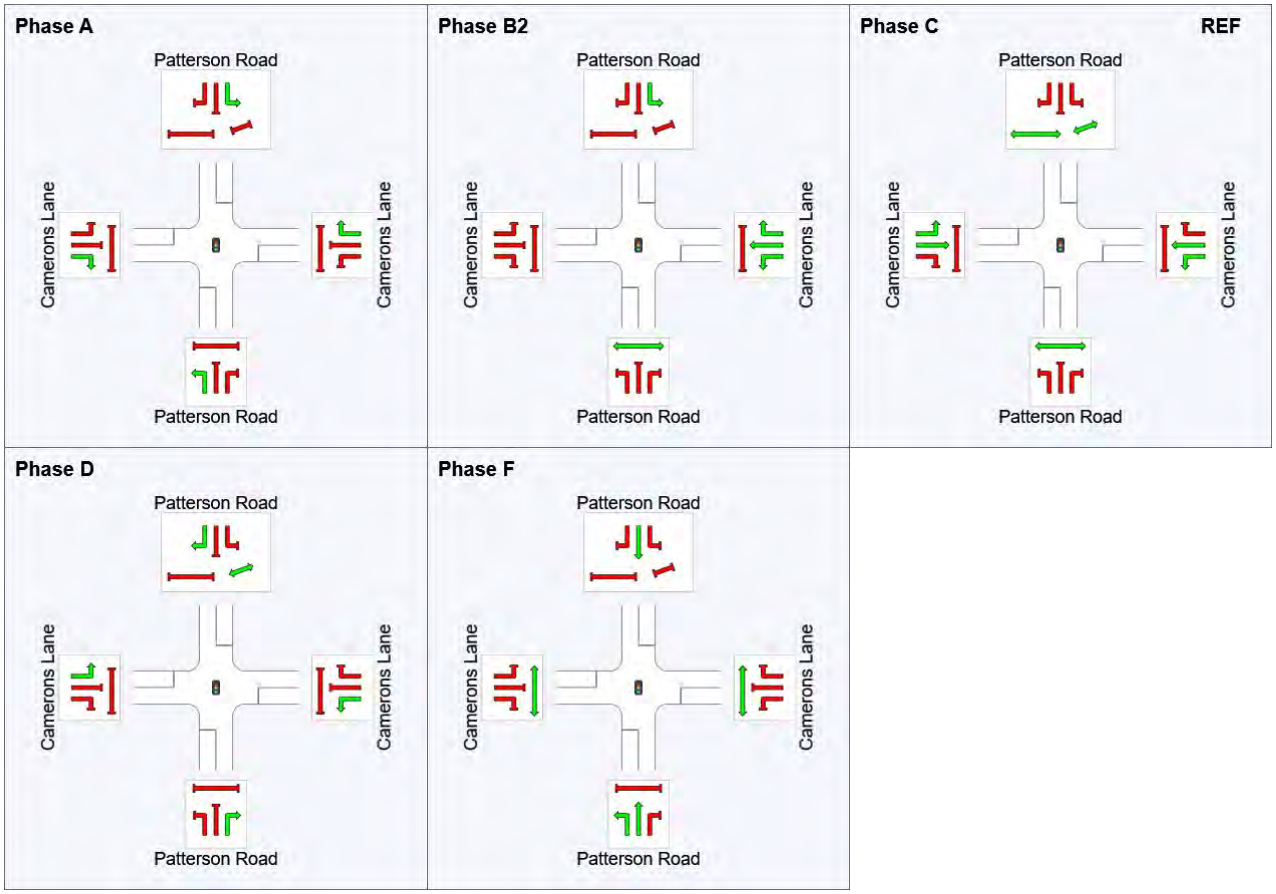
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Phase Timing Summary

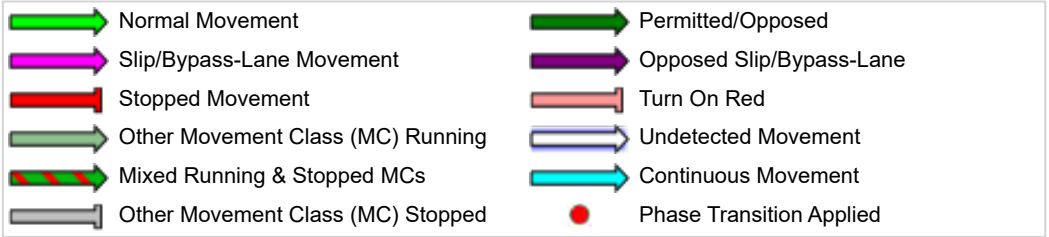
Phase	A	B2	C	D	F
Phase Change Time (sec)	77	99	0	16	52
Green Time (sec)	16	5	10	30	19
Phase Time (sec)	22	11	16	36	25
Phase Split	20%	10%	15%	33%	23%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

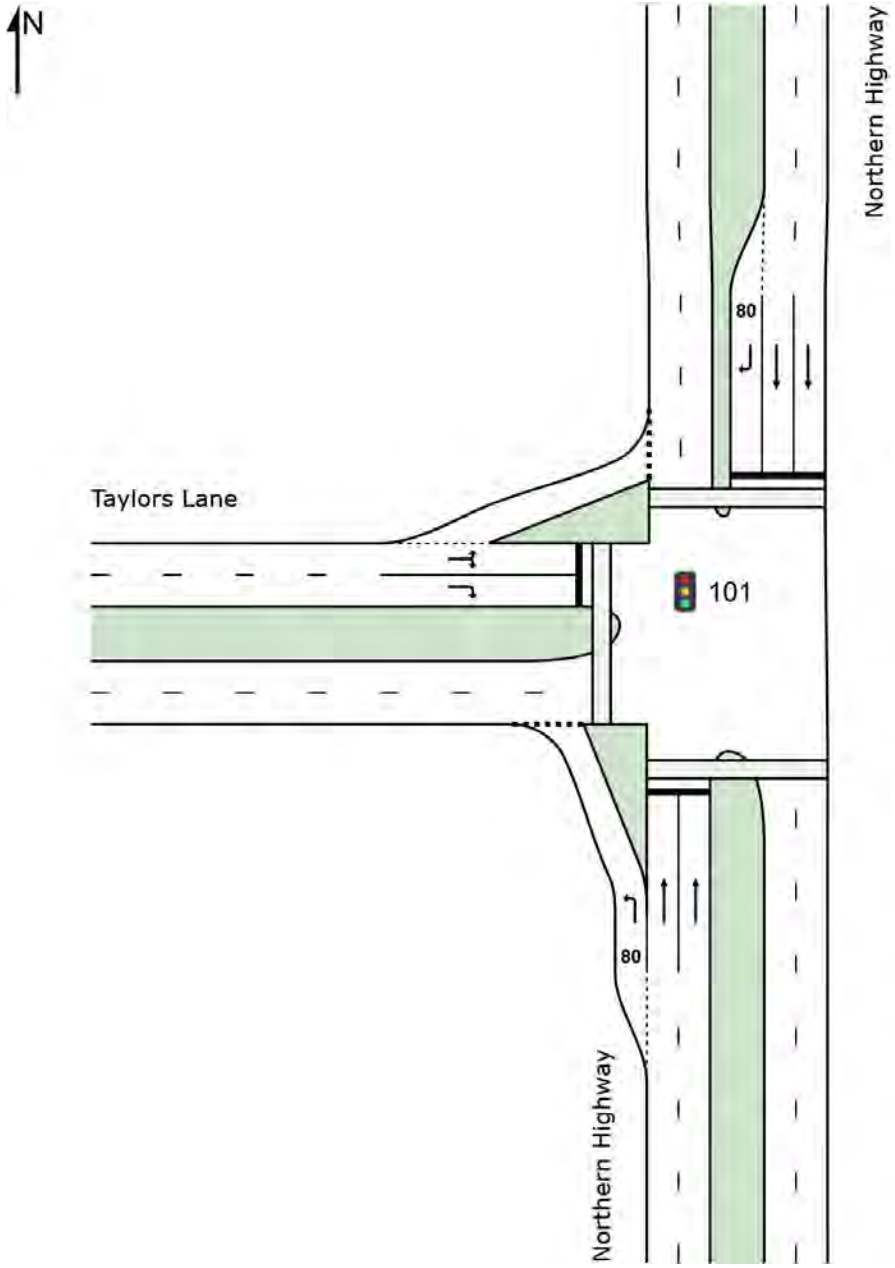


Site: 101 [100% - Ultimate - Northern Hwy / Taylors Lane - AM]

New Site
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 110 seconds (Site User-Given Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Variable Phasing
Reference Phase: Phase C
Input Phase Sequence: A, C, D, F
Output Phase Sequence: A, C, D, F

Site Layout



Lane Use and Performance													
	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Northern Highway													
Lane 1	67	3.0	1570	0.043	100	8.2	LOS A	0.4	2.9	Short	80	0.0	NA
Lane 2	627	8.0	858[1]	0.731	100	23.7	LOS C	26.0	194.8	Full	500	0.0	0.0
Lane 3	660	8.0	902	0.731	100	24.4	LOS C	28.1	210.5	Full	500	0.0	0.0
Approach	1355	7.8		0.731		23.3	LOS C	28.1	210.5				
North: Northern Highway													
Lane 1	578	8.0	1158	0.499	100	12.3	LOS B	16.9	126.1	Full	500	0.0	0.0
Lane 2	578	8.0	1158	0.499	100	12.3	LOS B	16.9	126.1	Full	500	0.0	0.0
Lane 3	100	3.0	150	0.665	100	63.7	LOS E	5.6	40.1	Short	80	0.0	NA
Approach	1256	7.6		0.665		16.4	LOS B	16.9	126.1				
West: Taylors Lane													
Lane 1	134	3.0	197	0.682	100	60.6	LOS E	6.6	47.5	Full	500	0.0	0.0
Lane 2	91	3.0	134	0.682	100	63.7	LOS E	5.2	37.0	Full	500	0.0	0.0
Approach	225	3.0		0.682		61.8	LOS E	6.6	47.5				
Intersection	2836	7.3		0.731		23.3	LOS C	28.1	210.5				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

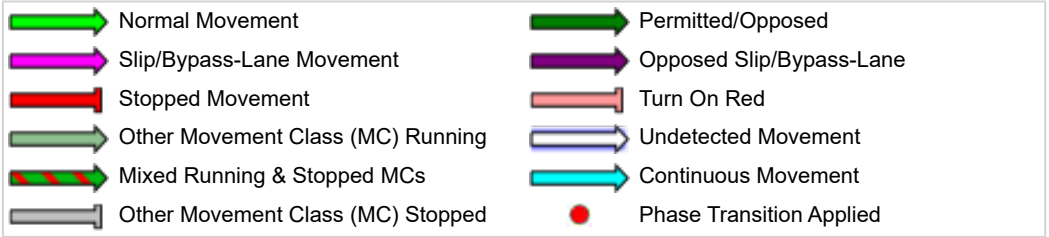
Phase Timing Summary

Phase	A	C	D	F
Phase Change Time (sec)	96	0	22	37
Green Time (sec)	8	17	9	53
Phase Time (sec)	13	23	15	59
Phase Split	12%	21%	14%	54%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence

REF: Reference Phase
VAR: Variable Phase

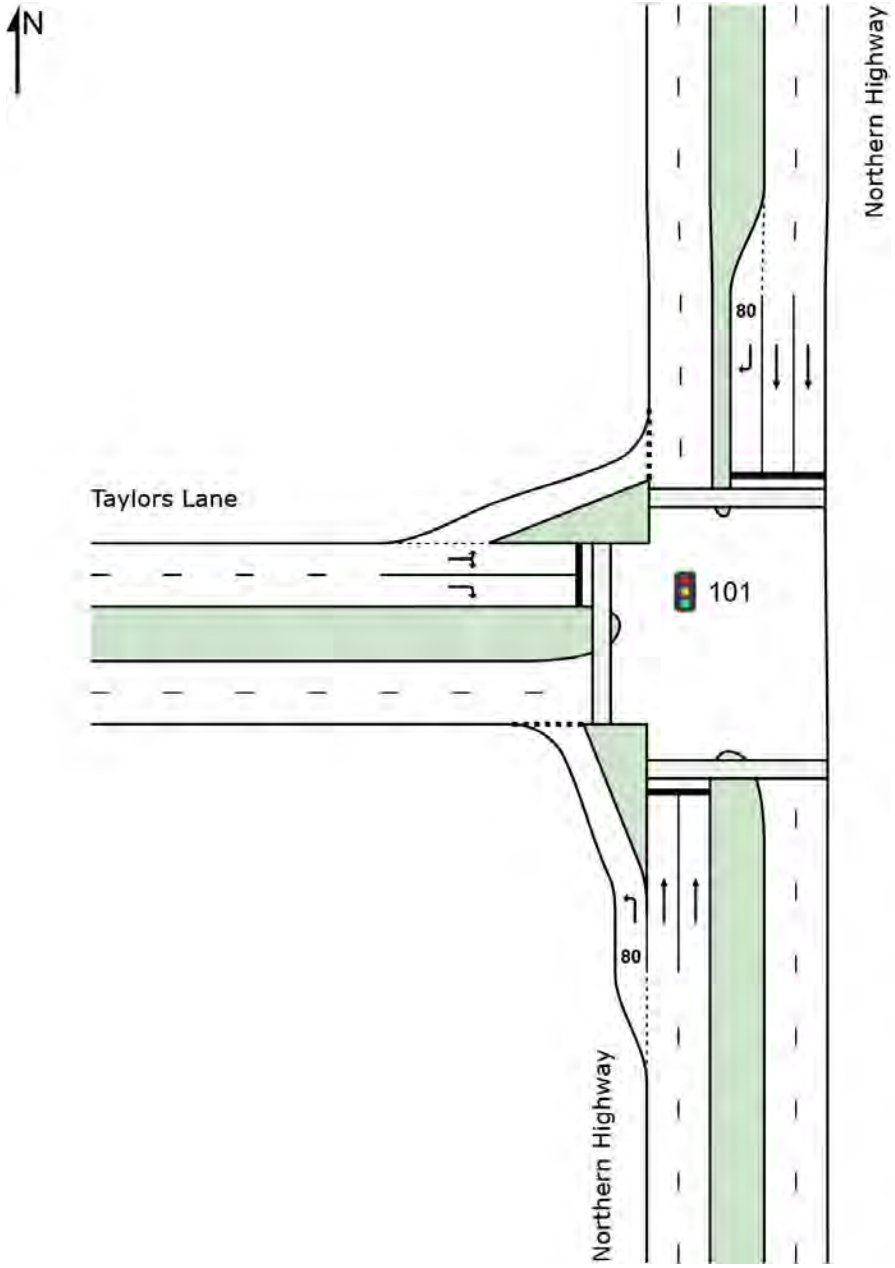


Site: 101 [100% - Ultimate - Northern Hwy / Taylors Lane - PM]

New Site
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 110 seconds (Site User-Given Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Variable Phasing
Reference Phase: Phase C
Input Phase Sequence: A, C, D, F
Output Phase Sequence: A, C, D, F

Site Layout



Lane Use and Performance													
	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Northern Highway													
Lane 1	188	3.0	1588	0.119	100	8.1	LOS A	1.1	7.9	Short	80	0.0	NA
Lane 2	494	8.0	936	0.527	100	19.9	LOS B	17.8	133.2	Full	500	0.0	0.0
Lane 3	494	8.0	936	0.527	100	19.9	LOS B	17.8	133.2	Full	500	0.0	0.0
Approach	1176	7.2		0.527		18.0	LOS B	17.8	133.2				
North: Northern Highway													
Lane 1	744	8.0	1192	0.625	100	12.8	LOS B	23.8	177.7	Full	500	0.0	0.0
Lane 2	691	8.0	1107[1]	0.625	100	12.2	LOS B	21.1	157.6	Full	500	0.0	0.0
Lane 3	76	3.0	150	0.504	100	62.0	LOS E	4.1	29.5	Short	80	0.0	NA
Approach	1512	7.7		0.625		15.0	LOS B	23.8	177.7				
West: Taylors Lane													
Lane 1	100	3.0	197	0.506	100	41.4	LOS D	3.9	28.2	Full	500	0.0	0.0
Lane 2	51	3.0	100	0.506	100	64.3	LOS E	2.9	20.5	Full	500	0.0	0.0
Approach	151	3.0		0.506		49.1	LOS D	3.9	28.2				
Intersection	2838	7.3		0.625		18.1	LOS B	23.8	177.7				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

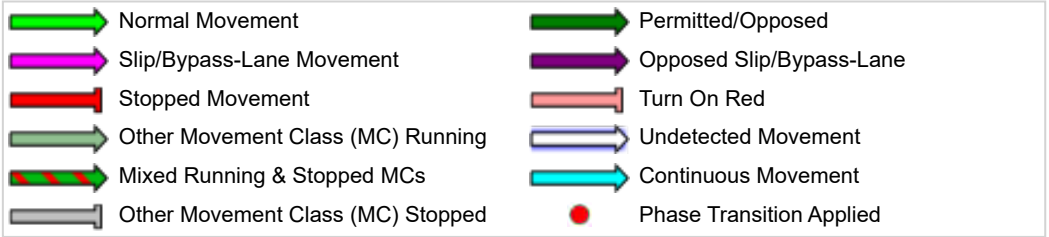
Phase Timing Summary

Phase	A	C	D	F
Phase Change Time (sec)	98	0	22	37
Green Time (sec)	6	17	9	55
Phase Time (sec)	11	23	15	61
Phase Split	10%	21%	14%	55%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence

REF: Reference Phase
VAR: Variable Phase

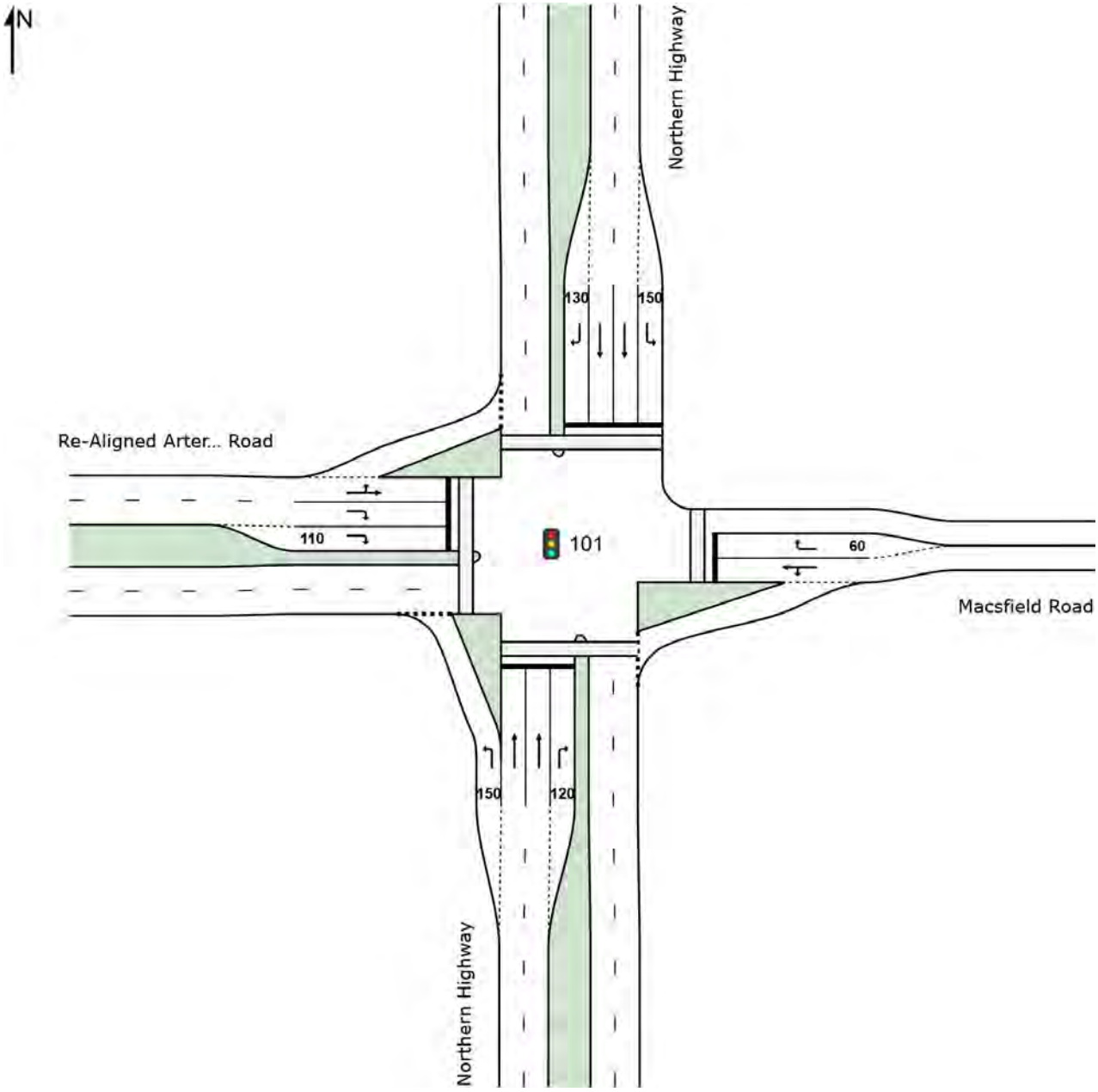


Site: 101 [100% - Ultimate - Northern Hwy / Re-Aligned Arterial Road / Macsfield Rd - AM]

New Site
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 125 seconds (Site User-Given Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Variable Phasing
Reference Phase: Phase C
Input Phase Sequence: A, B1*, B2*, C, D, E1*, E2*, F
Output Phase Sequence: A, B1*, C, D, E1*, F
(* Variable Phase)

Site Layout



Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Northern Highway													
Lane 1	287	3.0	1276	0.225	100	12.5	LOS B	5.3	38.4	Short	150	0.0	NA
Lane 2	539	8.0	599	0.900	100	57.1	LOS E	36.8	275.5	Full	500	0.0	0.0
Lane 3	509	8.0	566[1]	0.900	100	56.9	LOS E	34.3	256.9	Full	500	0.0	0.0
Lane 4	355	3.0	309	1.149	100	212.8	LOS F	45.0	323.4	Short	120	0.0	NA
Approach	1691	6.1		1.149		82.1	LOS F	45.0	323.4				
East: Macsfield Road													
Lane 1	447	3.0	422	1.060	100	97.4	LOS F	42.1	302.4	Full	200	0.0	42.9
Lane 2	231	3.0	220	1.046	100	134.9	LOS F	22.3	160.3	Short	60	0.0	NA
Approach	678	3.0		1.060		110.2	LOS F	42.1	302.4				
North: Northern Highway													
Lane 1	298	3.0	382	0.780	100	60.9	LOS E	18.1	130.2	Short	150	0.0	NA
Lane 2	489	8.0	435	1.126	100	186.0	LOS F	59.7	446.8	Full	500	0.0	0.0
Lane 3	489	8.0	435	1.126	100	186.0	LOS F	59.7	446.8	Full	500	0.0	0.0
Lane 4	142	3.0	147	0.967	100	96.7	LOS F	11.0	79.3	Short	130	0.0	NA
Approach	1419	6.4		1.126		150.8	LOS F	59.7	446.8				
West: Re-Aligned Arterial Road													
Lane 1	543	3.0	560	0.969	100	101.0	LOS F	47.4	340.6	Full	500	0.0	0.0
Lane 2	443	3.0	382	1.160	100	219.0	LOS F	57.9	415.9	Full	500	0.0	0.0
Lane 3	443	3.0	382	1.160	100	219.0	LOS F	57.9	415.9	Short	110	0.0	NA
Approach	1429	3.0		1.160		174.2	LOS F	57.9	415.9				
Intersection	5217	4.9		1.160		129.7	LOS F	59.7	446.8				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

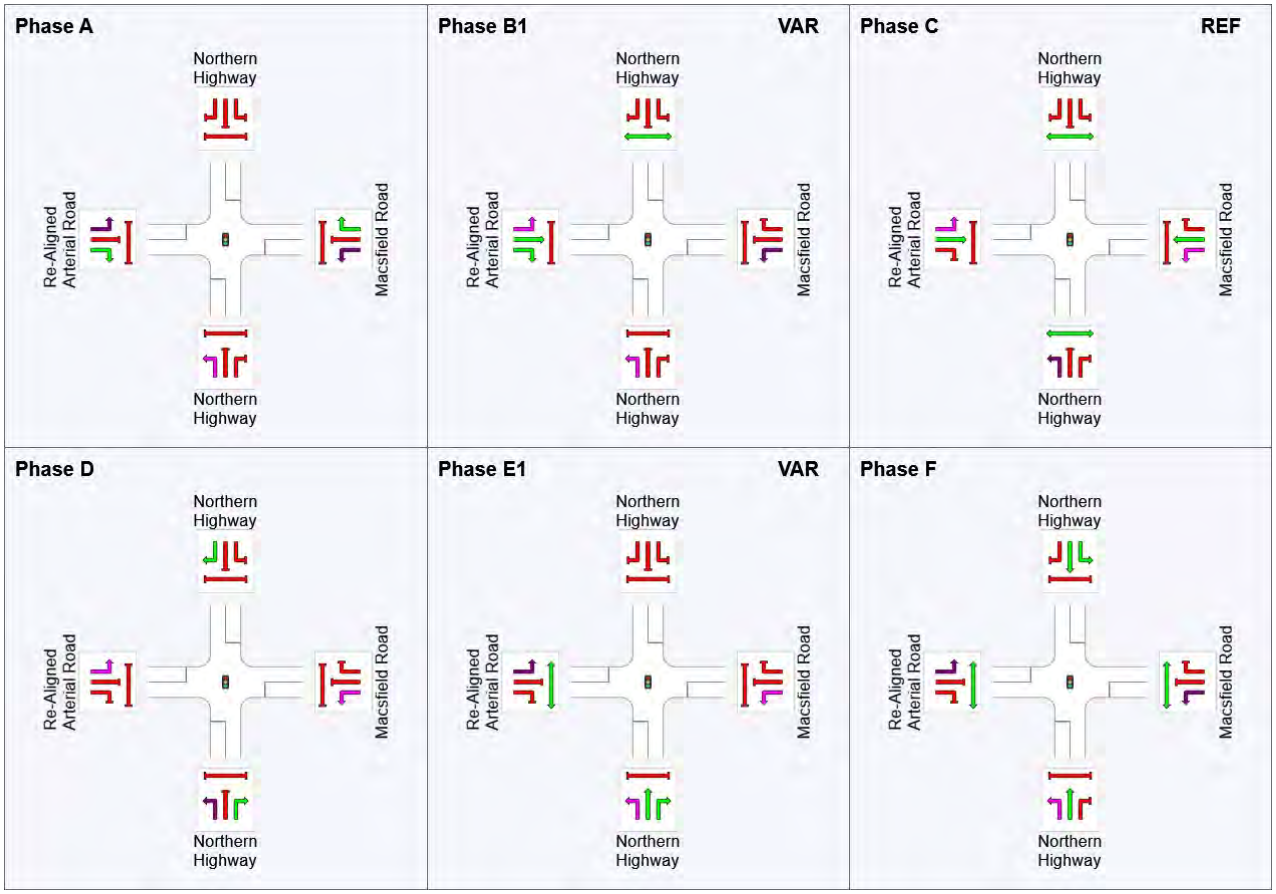
1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Phase Timing Summary

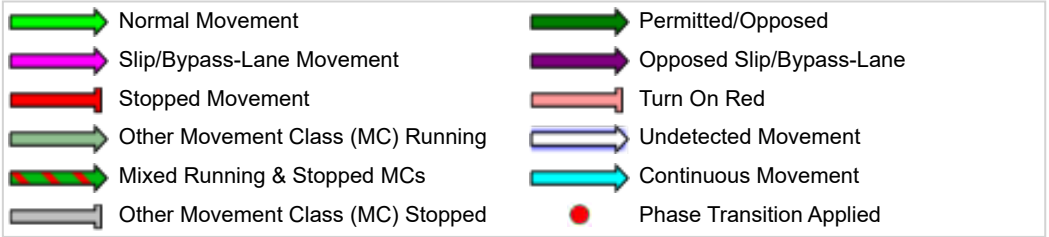
Phase	A	B1	C	D	E1	F
Phase Change Time (sec)	93	114	0	31	47	58
Green Time (sec)	15	5	25	10	5	29
Phase Time (sec)	21	11	31	16	11	35
Phase Split	17%	9%	25%	13%	9%	28%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

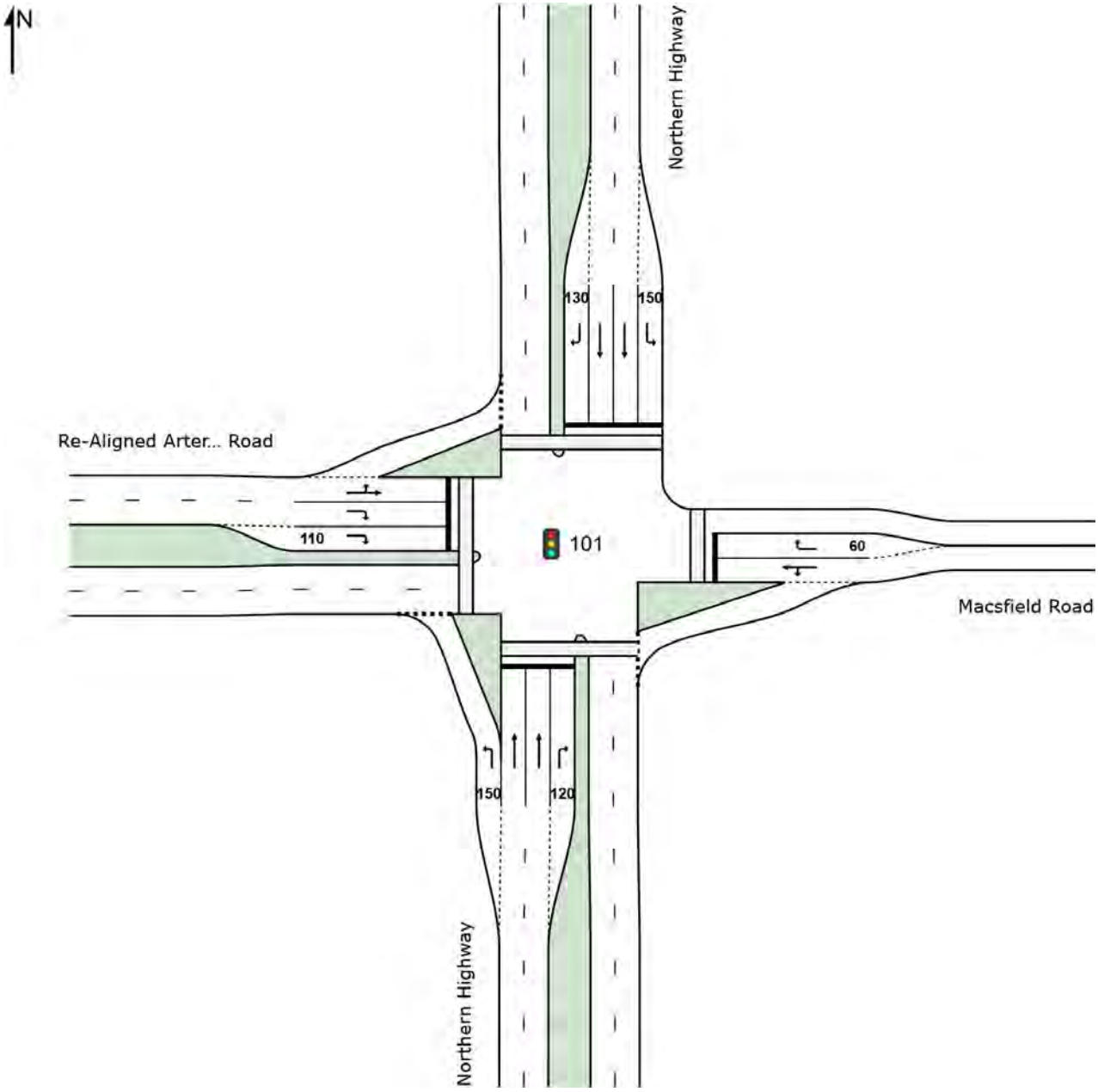


Site: 101 [100% - Ultimate - Northern Hwy / Re-Aligned Arterial Road / Macsfield Rd - PM]

New Site
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 125 seconds (Site User-Given Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Variable Phasing
Reference Phase: Phase C
Input Phase Sequence: A, B1*, B2*, C, D, E1*, E2*, F
Output Phase Sequence: A, B2*, C, D, E1*, F
(* Variable Phase)

Site Layout



Lane Use and Performance

	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Northern Highway													
Lane 1	876	3.0	972	0.901	100	46.2	LOS D	41.9	301.0	Short	150	0.0	NA
Lane 2	362	8.0	449	0.806	100	52.4	LOS D	22.1	165.7	Full	500	0.0	0.0
Lane 3	362	8.0	449	0.806	100	52.4	LOS D	22.1	165.7	Full	500	0.0	0.0
Lane 4	305	3.0	250	1.222	100	272.5	LOS F	44.4	318.7	Short	120	0.0	NA
Approach	1905	4.9		1.222		84.8	LOS F	44.4	318.7				
East: Macsfield Road													
Lane 1	880	3.0	693	1.270	100	274.6	LOS F	126.8	910.1	Full	200	0.0	100.0
Lane 2	434	3.0	377[1]	1.149	100	214.4	LOS F	57.9	415.7	Short	60	0.0	NA
Approach	1314	3.0		1.270		254.7	LOS F	126.8	910.1				
North: Northern Highway													
Lane 1	281	3.0	338	0.831	100	66.6	LOS E	18.1	129.8	Short	150	0.0	NA
Lane 2	493	8.0	390	1.265	100	300.4	LOS F	77.5	579.6	Full	500	0.0	18.4
Lane 3	493	8.0	390	1.265	100	300.4	LOS F	77.5	579.6	Full	500	0.0	18.4
Lane 4	141	3.0	191	0.738	100	70.0	LOS E	8.9	64.0	Short	130	0.0	NA
Approach	1407	6.5		1.265		230.6	LOS F	77.5	579.6				
West: Re-Aligned Arterial Road													
Lane 1	274	3.0	219	1.248	100	245.7	LOS F	43.0	308.6	Full	500	0.0	0.0
Lane 2	254	3.0	206	1.235	100	282.7	LOS F	37.7	270.9	Full	500	0.0	0.0
Lane 3	254	3.0	206	1.235	100	282.7	LOS F	37.7	270.9	Short	110	0.0	NA
Approach	782	3.0		1.248		269.8	LOS F	43.0	308.6				
Intersection	5408	4.6		1.270		190.8	LOS F	126.8	910.1				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

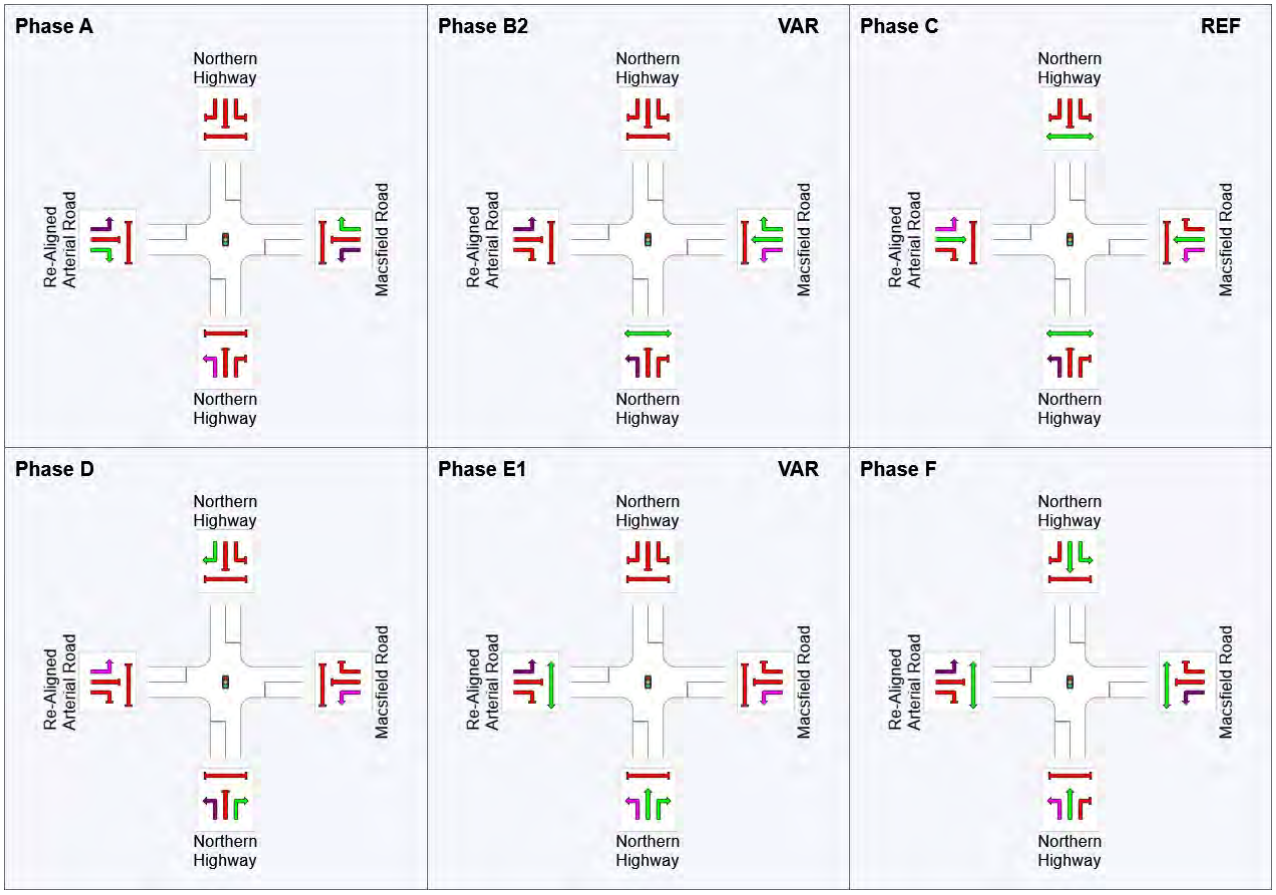
Phase Timing Summary

Phase	A	B2	C	D	E1	F
Phase Change Time (sec)	75	95	0	20	39	43
Green Time (sec)	14	24	14	13	***	26
Phase Time (sec)	20	30	20	19	4	32
Phase Split	16%	24%	16%	15%	3%	26%

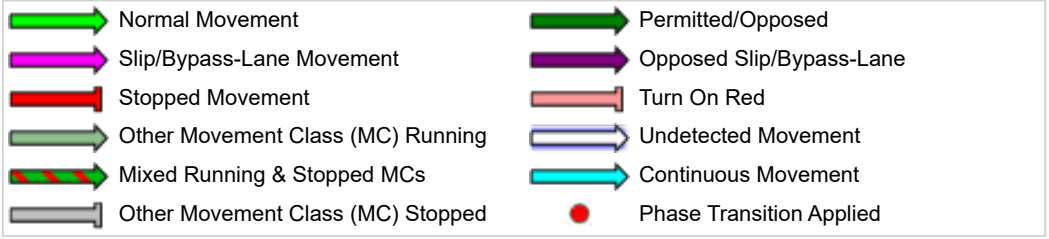
See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

*** No green time has been calculated for this phase because the next phase starts during its intergreen time. This occurs with overlap phasing where there is no single movement connecting this phase to the next, or where the only such movement is a dummy movement with zero minimum green time specified.
If a green time is required for this phase, specify a dummy movement with a non-zero minimum green time.

Output Phase Sequence



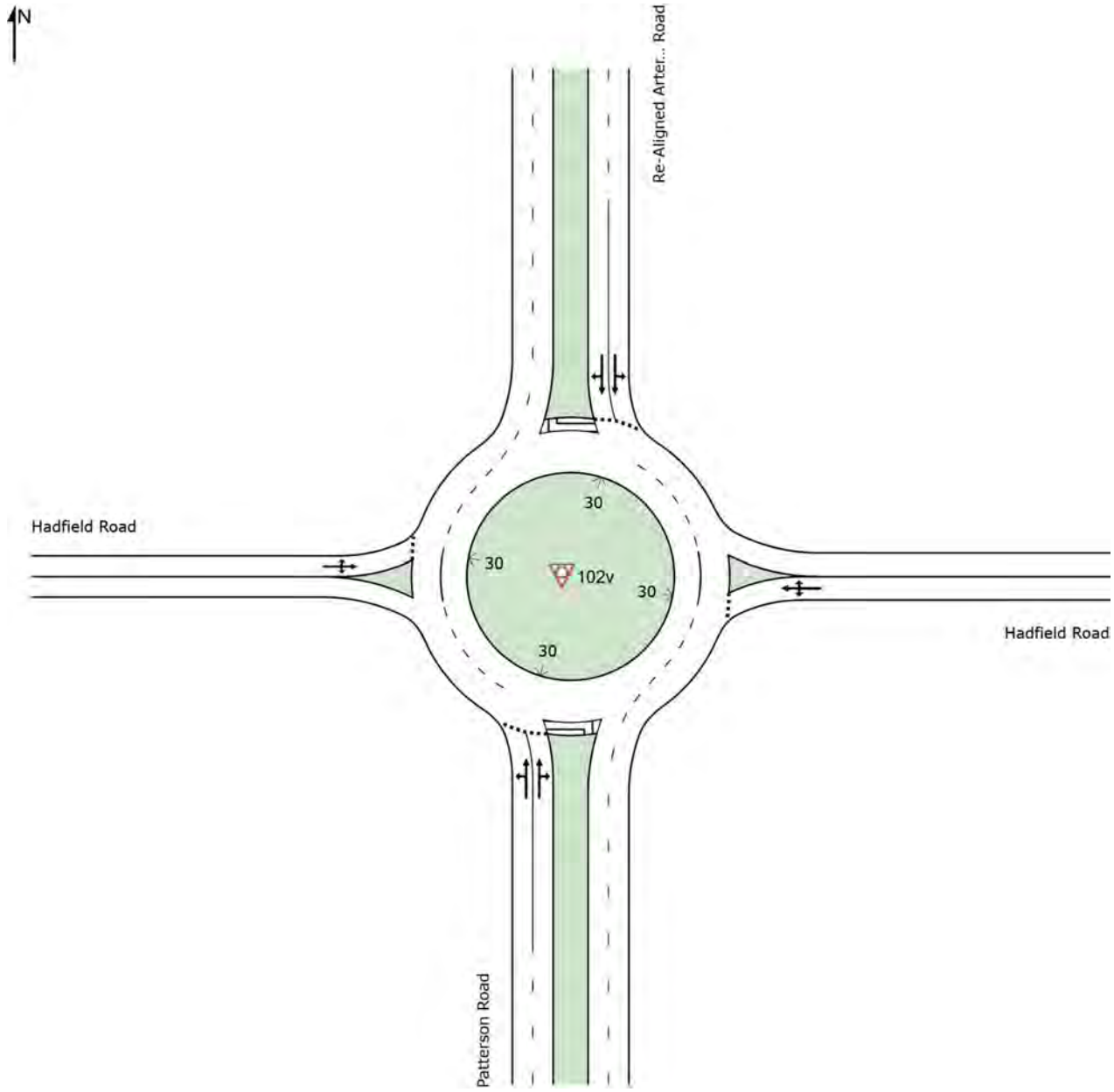
REF: Reference Phase
VAR: Variable Phase



Site: 102v [100% - Ultimate - Re-Aligned Arterial Road / Patterson Rd / Hadfield Rd - AM]

New Site
Site Category: (None)
Roundabout

Site Layout



Lane Use and Performance													
	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Patterson Road													
Lane 1[d]	193	3.0	1553	0.124	100	4.2	LOS A	0.7	5.2	Full	500	0.0	0.0
Lane 2	160	3.0	1291	0.124	100	4.5	LOS A	0.7	5.1	Full	500	0.0	0.0
Approach	353	3.0		0.124		4.3	LOS A	0.7	5.2				
East: Hadfield Road													
Lane 1[d]	72	3.0	921	0.078	100	10.1	LOS B	0.3	2.1	Full	500	0.0	0.0
Approach	72	3.0		0.078		10.1	LOS B	0.3	2.1				
North: Re-Aligned Arterial Road													
Lane 1[d]	383	3.0	1801	0.213	100	3.6	LOS A	1.5	11.1	Full	500	0.0	0.0
Lane 2	322	3.0	1512	0.213	100	5.4	LOS A	1.5	10.9	Full	500	0.0	0.0
Approach	705	3.0		0.213		4.5	LOS A	1.5	11.1				
West: Hadfield Road													
Lane 1[d]	493	3.0	949	0.519	100	6.5	LOS A	3.4	24.7	Full	500	0.0	0.0
Approach	493	3.0		0.519		6.5	LOS A	3.4	24.7				
Intersection	1622	3.0		0.519		5.3	LOS A	3.4	24.7				

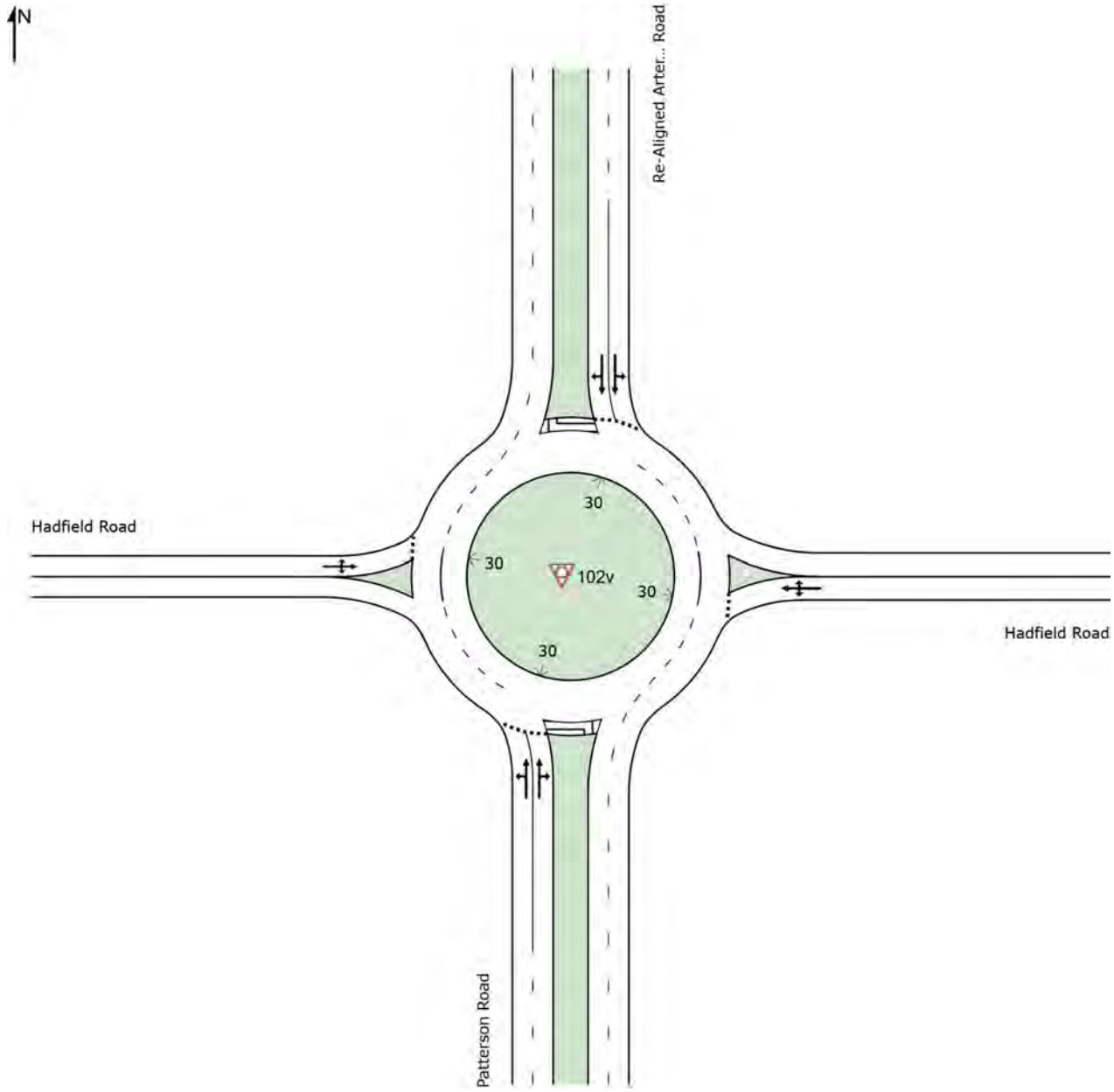
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Site: 102v [100% - Ultimate - Re-Aligned Arterial Road / Patterson Rd / Hadfield Rd - PM]

New Site
Site Category: (None)
Roundabout

Site Layout



Lane Use and Performance													
	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Patterson Road													
Lane 1[d]	315	3.0	1139	0.277	100	6.9	LOS A	2.0	14.4	Full	500	0.0	0.0
Lane 2	234	3.0	848	0.277	100	8.2	LOS A	1.8	13.1	Full	500	0.0	0.0
Approach	549	3.0		0.277		7.4	LOS A	2.0	14.4				
East: Hadfield Road													
Lane 1[d]	191	3.0	774	0.246	100	10.5	LOS B	1.0	7.0	Full	500	0.0	0.0
Approach	191	3.0		0.246		10.5	LOS B	1.0	7.0				
North: Re-Aligned Arterial Road													
Lane 1[d]	648	3.0	1849	0.350	100	3.6	LOS A	2.8	20.2	Full	500	0.0	0.0
Lane 2	540	3.0	1540	0.350	100	8.6	LOS A	2.8	20.0	Full	500	0.0	0.0
Approach	1187	3.0		0.350		5.9	LOS A	2.8	20.2				
West: Hadfield Road													
Lane 1[d]	185	3.0	775	0.239	100	6.3	LOS A	1.2	8.4	Full	500	0.0	0.0
Approach	185	3.0		0.239		6.3	LOS A	1.2	8.4				
Intersection	2113	3.0		0.350		6.7	LOS A	2.8	20.2				

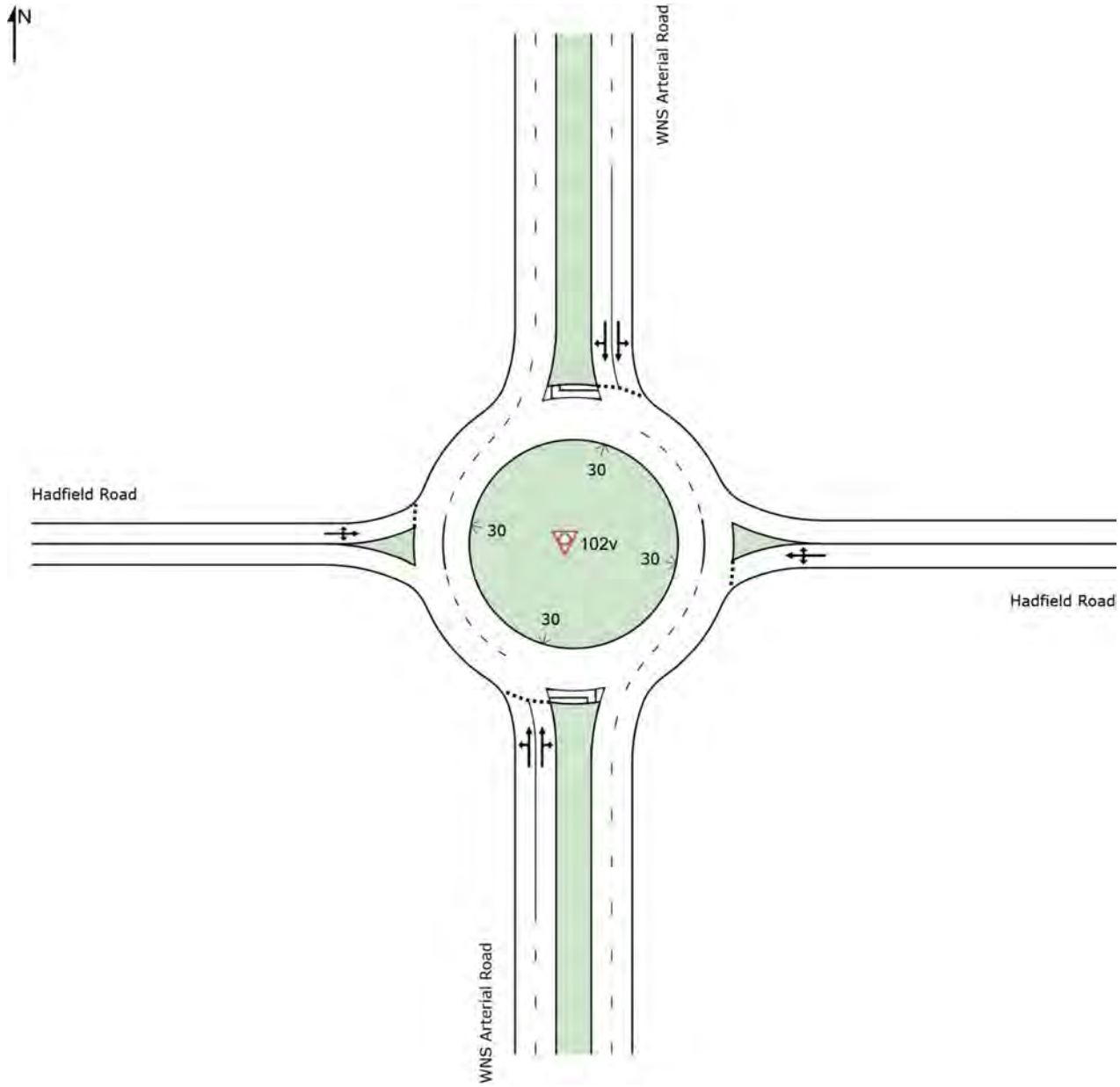
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Site: 102v [100% - Ultimate - WNS Arterial Rd / Hadfield Rd - AM]

New Site
Site Category: (None)
Roundabout

Site Layout



Lane Use and Performance													
	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: WNS Arterial Road													
Lane 1[d]	166	3.0	1691	0.098	100	3.8	LOS A	0.6	4.4	Full	500	0.0	0.0
Lane 2	140	3.0	1429	0.098	100	5.4	LOS A	0.6	4.3	Full	500	0.0	0.0
Approach	306	3.0		0.098		4.5	LOS A	0.6	4.4				
East: Hadfield Road													
Lane 1[d]	99	3.0	810	0.122	100	7.7	LOS A	0.5	3.6	Full	500	0.0	0.0
Approach	99	3.0		0.122		7.7	LOS A	0.5	3.6				
North: WNS Arterial Road													
Lane 1[d]	557	3.0	1631	0.341	100	4.1	LOS A	2.5	18.0	Full	500	0.0	0.0
Lane 2	462	3.0	1354	0.341	100	4.5	LOS A	2.5	17.7	Full	500	0.0	0.0
Approach	1019	3.0		0.341		4.3	LOS A	2.5	18.0				
West: Hadfield Road													
Lane 1[d]	87	3.0	1012	0.086	100	7.9	LOS A	0.4	2.6	Full	500	0.0	0.0
Approach	87	3.0		0.086		7.9	LOS A	0.4	2.6				
Intersection	1512	3.0		0.341		4.8	LOS A	2.5	18.0				

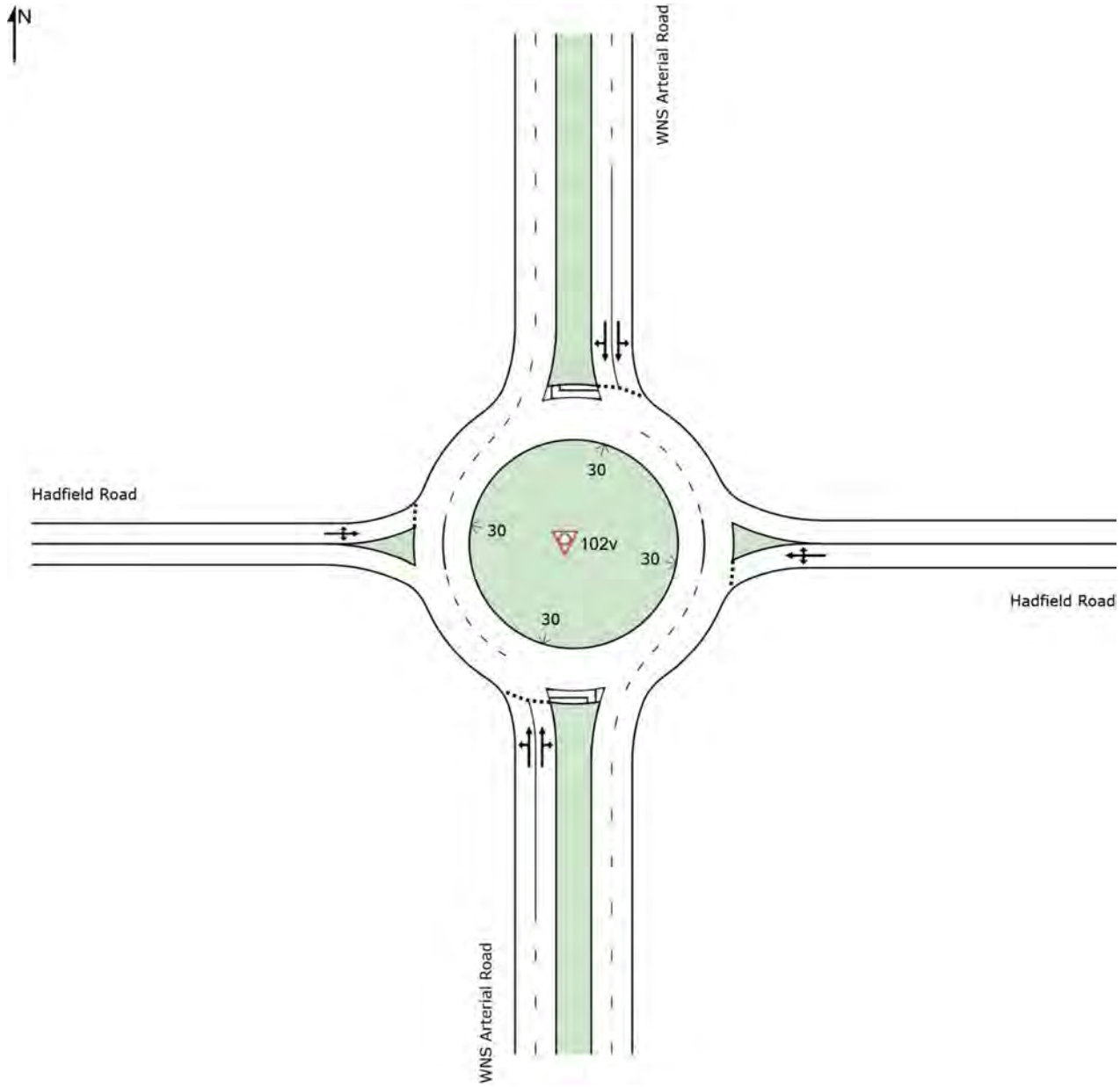
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Site: 102v [100% - Ultimate - WNS Arterial Rd / Hadfield Rd - PM]

New Site
Site Category: (None)
Roundabout

Site Layout



Lane Use and Performance													
	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: WNS Arterial Road													
Lane 1[d]	414	3.0	1253	0.330	100	5.6	LOS A	2.6	18.5	Full	500	0.0	0.0
Lane 2	322	3.0	976	0.330	100	7.8	LOS A	2.4	17.0	Full	500	0.0	0.0
Approach	736	3.0		0.330		6.6	LOS A	2.6	18.5				
East: Hadfield Road													
Lane 1[d]	526	3.0	1010	0.521	100	9.9	LOS A	3.2	22.7	Full	500	0.0	0.0
Approach	526	3.0		0.521		9.9	LOS A	3.2	22.7				
North: WNS Arterial Road													
Lane 1[d]	249	3.0	1620	0.154	100	4.0	LOS A	1.0	7.3	Full	500	0.0	0.0
Lane 2	208	3.0	1353	0.154	100	4.2	LOS A	1.0	7.1	Full	500	0.0	0.0
Approach	457	3.0		0.154		4.1	LOS A	1.0	7.3				
West: Hadfield Road													
Lane 1[d]	36	3.0	605	0.059	100	9.4	LOS A	0.3	2.0	Full	500	0.0	0.0
Approach	36	3.0		0.059		9.4	LOS A	0.3	2.0				
Intersection	1755	3.0		0.521		7.0	LOS A	3.2	22.7				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

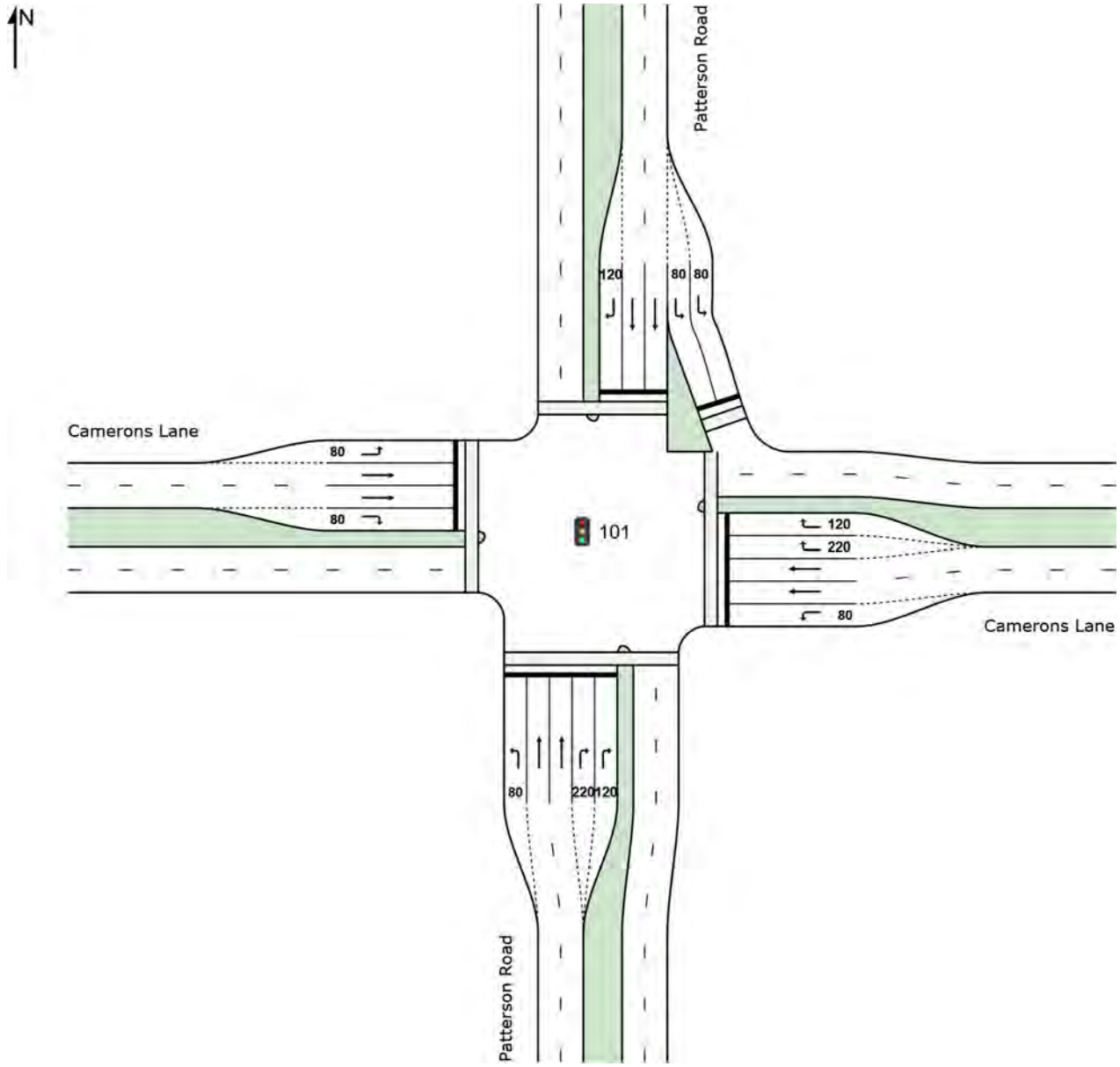
d Dominant lane on roundabout approach

Site: 101 [100% - Ultimate - Patterson Rd / Camerons Lane - AM]

New Site
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 110 seconds (Site User-Given Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Variable Phasing - Copy (2) (phase reduction applied)
Reference Phase: Phase C
Input Phase Sequence: A, B2, C, D, E2, F
Output Phase Sequence: A, C, D, E2, F

Site Layout



Lane Use and Performance

	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Patterson Road													
Lane 1	31	3.0	752	0.041	100	26.2	LOS C	1.0	6.9	Short	80	0.0	NA
Lane 2	82	3.0	316	0.260	100	43.9	LOS D	3.9	28.1	Full	500	0.0	0.0
Lane 3	82	3.0	316	0.260	100	43.9	LOS D	3.9	28.1	Full	500	0.0	0.0
Lane 4	71	3.0	150	0.469	100	60.4	LOS E	3.8	27.4	Short	220	0.0	NA
Lane 5	71	3.0	150	0.469	100	60.4	LOS E	3.8	27.4	Short	120	0.0	NA
Approach	336	3.0		0.469		49.2	LOS D	3.9	28.1				
East: Camerons Lane													
Lane 1	299	3.0	668	0.447	100	34.1	LOS C	12.2	87.4	Short	80	0.0	NA
Lane 2	45	3.0	439	0.102	100	36.1	LOS D	1.9	13.6	Full	500	0.0	0.0
Lane 3	45	3.0	439	0.102	100	36.1	LOS D	1.9	13.6	Full	500	0.0	0.0
Lane 4	124	3.0	351	0.354	100	47.9	LOS D	5.9	42.2	Short	220	0.0	NA
Lane 5	124	3.0	351	0.354	100	47.9	LOS D	5.9	42.2	Short	120	0.0	NA
Approach	637	3.0		0.447		39.8	LOS D	12.2	87.4				
North: Patterson Road													
Lane 1	471	3.0	969	0.486	100	23.2	LOS C	15.9	113.9	Short	80	0.0	NA
Lane 2	471	3.0	969	0.486	100	23.2	LOS C	15.9	113.9	Short	80	0.0	NA
Lane 3	195	3.0	545	0.359	100	34.0	LOS C	8.4	60.2	Full	500	0.0	0.0
Lane 4	195	3.0	545	0.359	100	34.0	LOS C	8.4	60.2	Full	500	0.0	0.0
Lane 5	116	3.0	367	0.315	100	46.6	LOS D	5.4	38.6	Short	120	0.0	NA
Approach	1447	3.0		0.486		28.0	LOS C	15.9	113.9				
West: Camerons Lane													
Lane 1	143	3.0	885	0.162	100	22.5	LOS C	4.3	30.5	Short	80	0.0	NA
Lane 2	208	3.0	439	0.475	100	40.0	LOS D	9.8	70.3	Full	500	0.0	0.0
Lane 3	208	3.0	439	0.475	100	40.0	LOS D	9.8	70.3	Full	500	0.0	0.0
Lane 4	123	3.0	351	0.351	100	47.8	LOS D	5.8	41.8	Short	80	0.0	NA
Approach	683	3.0		0.475		37.8	LOS D	9.8	70.3				
Intersection	3103	3.0		0.486		34.9	LOS C	15.9	113.9				

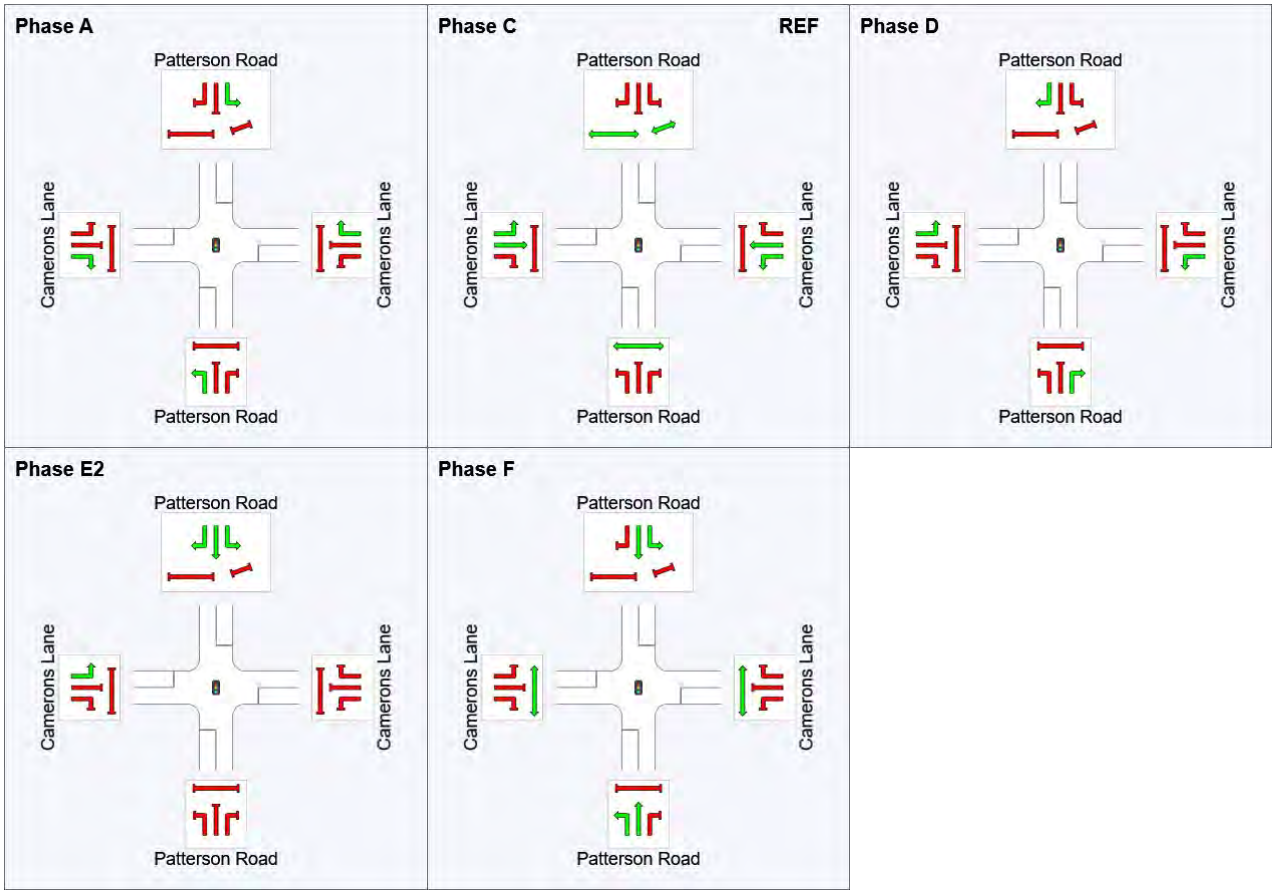
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Phase Timing Summary

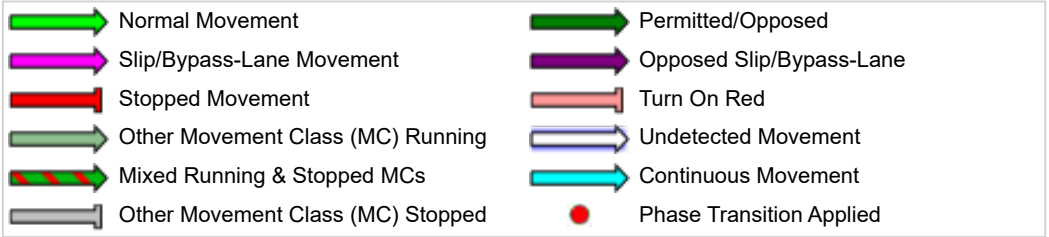
Phase	A	C	D	E2	F
Phase Change Time (sec)	83	0	31	46	59
Green Time (sec)	21	25	9	7	18
Phase Time (sec)	27	31	15	13	24
Phase Split	25%	28%	14%	12%	22%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

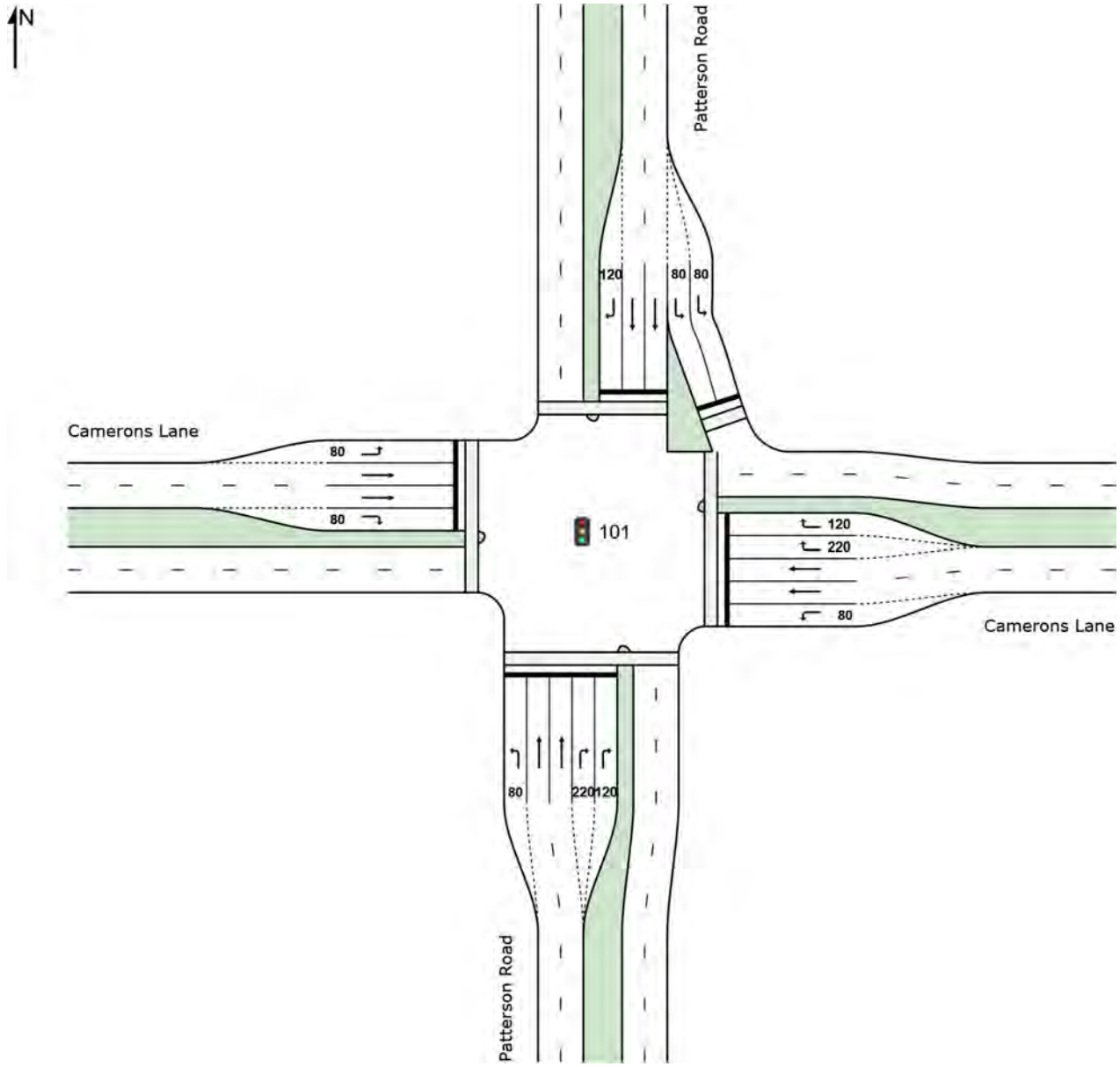


Site: 101 [100% - Ultimate - Patterson Rd / Camerons Lane - PM]

New Site
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 110 seconds (Site User-Given Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Variable Phasing - Copy
Reference Phase: Phase C
Input Phase Sequence: A, B2, C, D, E1, F
Output Phase Sequence: A, B2, C, D, E1, F

Site Layout



Lane Use and Performance

	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Patterson Road													
Lane 1	44	3.0	651	0.068	100	30.5	LOS C	1.5	11.1	Short	80	0.0	NA
Lane 2	205	3.0	299	0.687	100	49.4	LOS D	10.9	77.9	Full	500	0.0	0.0
Lane 3	205	3.0	299	0.687	100	49.4	LOS D	10.9	77.9	Full	500	0.0	0.0
Lane 4	218	3.0	351	0.623	100	50.5	LOS D	11.0	78.9	Short	220	0.0	NA
Lane 5	218	3.0	351	0.623	100	50.5	LOS D	11.0	78.9	Short	120	0.0	NA
Approach	892	3.0		0.687		49.0	LOS D	11.0	78.9				
East: Camerons Lane													
Lane 1	224	3.0	1002	0.224	100	19.3	LOS B	6.1	44.0	Short	80	0.0	NA
Lane 2	200	3.0	580	0.345	100	32.3	LOS C	8.4	60.1	Full	500	0.0	0.0
Lane 3	200	3.0	580	0.345	100	32.3	LOS C	8.4	60.1	Full	500	0.0	0.0
Lane 4	487	3.0	685	0.712	100	37.4	LOS D	22.3	160.4	Short	220	0.0	NA
Lane 5	487	3.0	685	0.712	100	37.4	LOS D	22.3	160.4	Short	120	0.0	NA
Approach	1599	3.0		0.712		33.6	LOS C	22.3	160.4				
North: Patterson Road													
Lane 1	104	3.0	685	0.152	100	30.1	LOS C	3.7	26.4	Short	80	0.0	NA
Lane 2	104	3.0	685	0.152	100	30.1	LOS C	3.7	26.4	Short	80	0.0	NA
Lane 3	156	3.0	281	0.556	100	48.3	LOS D	8.0	57.6	Full	500	0.0	0.0
Lane 4	156	3.0	281	0.556	100	48.3	LOS D	8.0	57.6	Full	500	0.0	0.0
Lane 5	243	3.0	334	0.728	100	53.9	LOS D	12.9	92.8	Short	120	0.0	NA
Approach	764	3.0		0.728		45.1	LOS D	12.9	92.8				
West: Camerons Lane													
Lane 1	68	3.0	568	0.120	100	34.7	LOS C	2.6	18.8	Short	80	0.0	NA
Lane 2	54	3.0	141	0.386	100	55.2	LOS E	2.9	21.0	Full	500	0.0	0.0
Lane 3	54	3.0	141	0.386	100	55.2	LOS E	2.9	21.0	Full	500	0.0	0.0
Lane 4	95	3.0	267	0.355	100	52.4	LOS D	4.7	33.7	Short	80	0.0	NA
Approach	272	3.0		0.386		49.1	LOS D	4.7	33.7				
Intersection	3526	3.0		0.728		41.2	LOS D	22.3	160.4				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

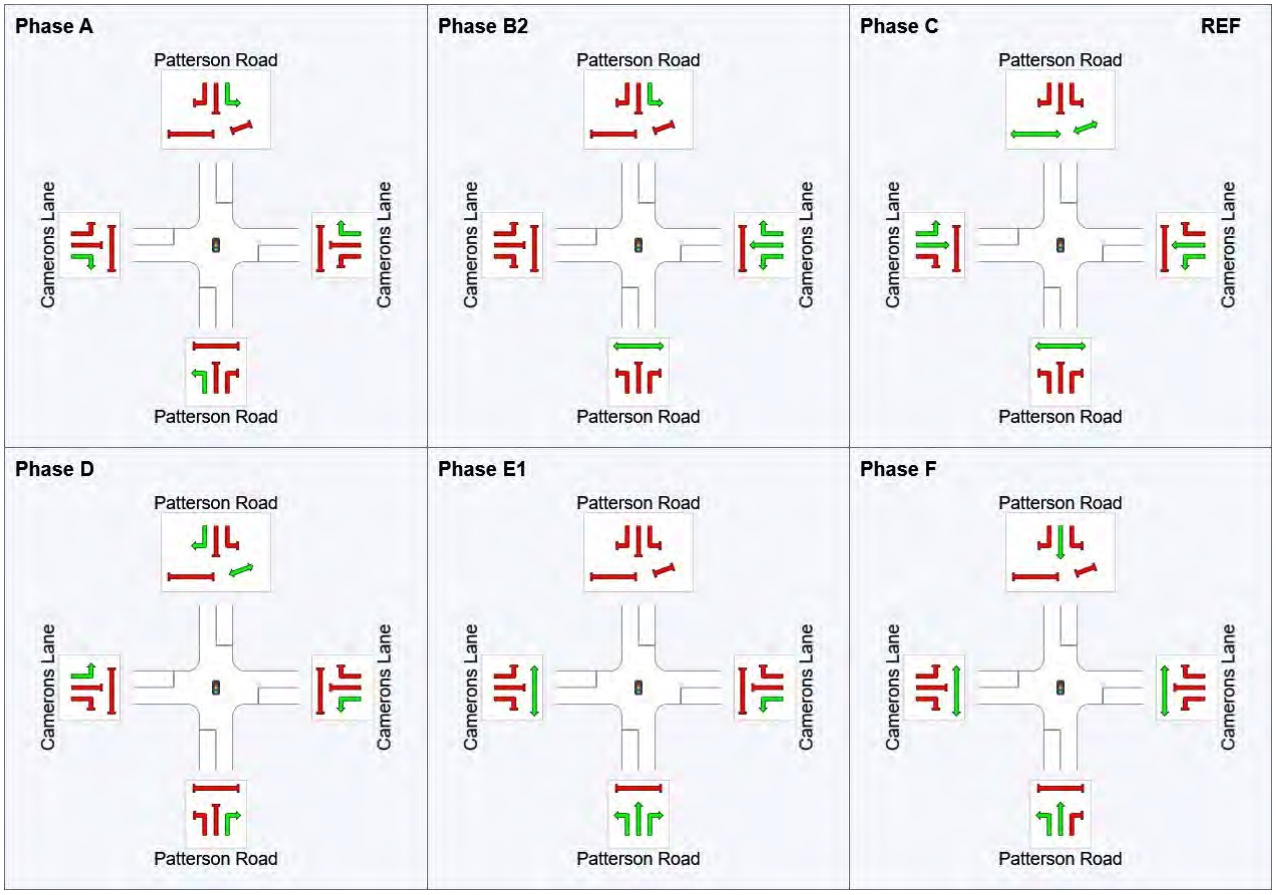
Phase Timing Summary

Phase	A	B2	C	D	E1	F
Phase Change Time (sec)	63	85	0	14	40	41
Green Time (sec)	16	19	8	20	***	16
Phase Time (sec)	22	25	14	26	1	22
Phase Split	20%	23%	13%	24%	1%	20%

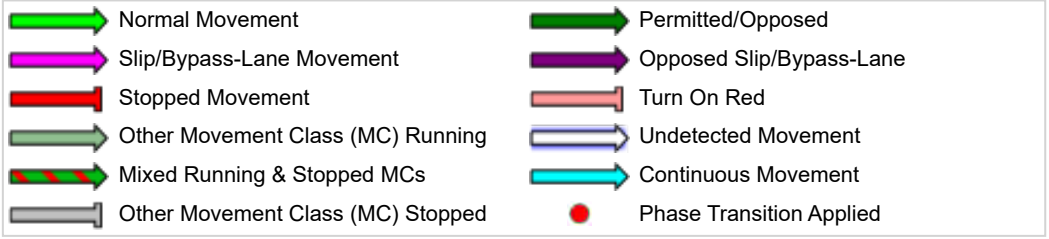
See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

*** No green time has been calculated for this phase because the next phase starts during its intergreen time. This occurs with overlap phasing where there is no single movement connecting this phase to the next, or where the only such movement is a dummy movement with zero minimum green time specified. If a green time is required for this phase, specify a dummy movement with a non-zero minimum green time.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

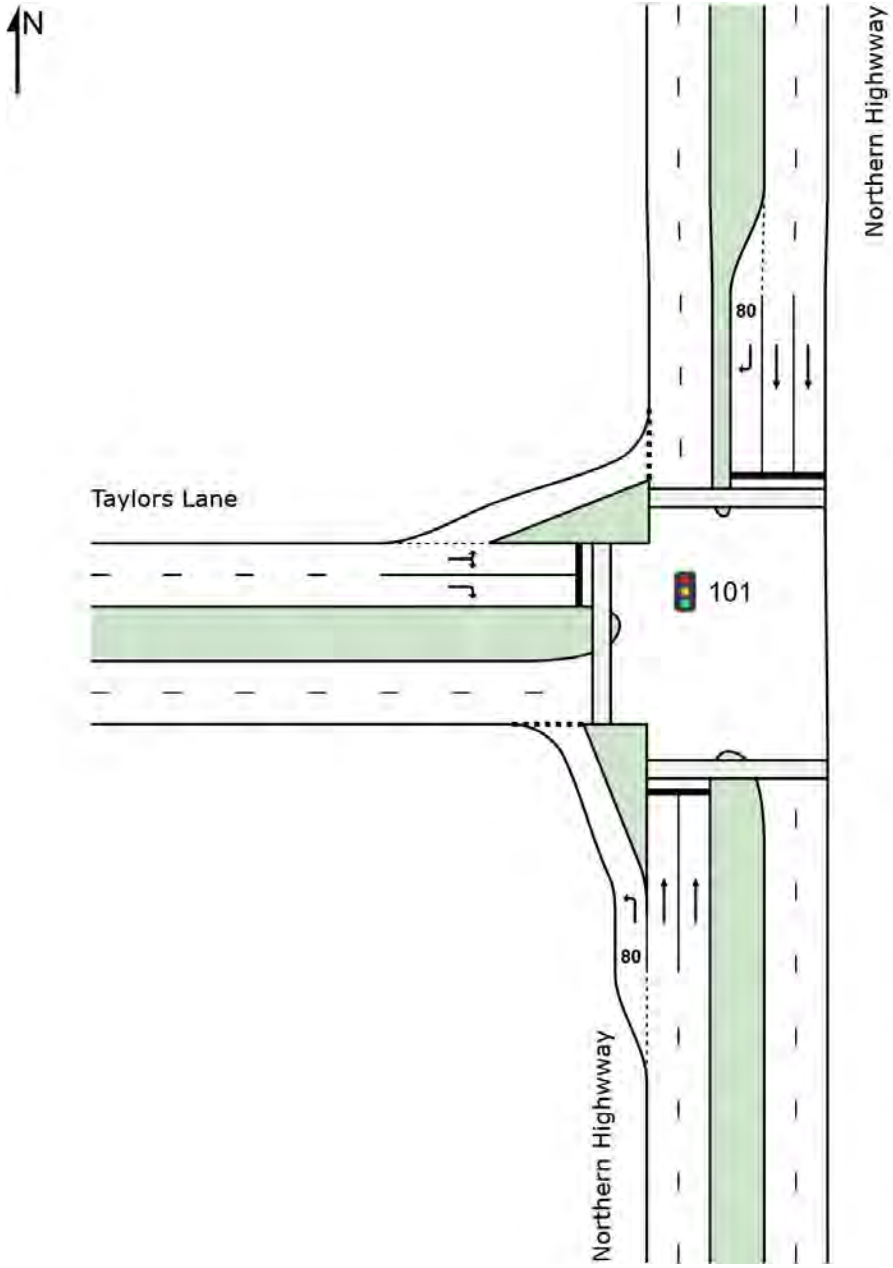


Site: 101 [50% - Interim- Northern Hwy / Taylors Lane - AM]

New Site
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 110 seconds (Site User-Given Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Variable Phasing
Reference Phase: Phase C
Input Phase Sequence: A, C, D, F
Output Phase Sequence: A, C, D, F

Site Layout



Lane Use and Performance													
	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Northern Highwway													
Lane 1	119	3.0	1462	0.081	100	9.2	LOS A	1.1	8.2	Short	80	0.0	NA
Lane 2	513	8.0	623[1]	0.823	100	37.9	LOS D	26.2	196.3	Full	500	0.0	0.0
Lane 3	561	8.0	681	0.823	100	38.4	LOS D	29.4	219.8	Full	500	0.0	0.0
Approach	1193	7.5		0.823		35.3	LOS D	29.4	219.8				
North: Northern Highwway													
Lane 1	526	8.0	1056	0.499	100	15.5	LOS B	16.9	126.5	Full	500	0.0	0.0
Lane 2	526	8.0	1056	0.499	100	15.5	LOS B	16.9	126.5	Full	500	0.0	0.0
Lane 3	207	3.0	267	0.776	100	60.4	LOS E	11.6	83.1	Short	80	0.0	NA
Approach	1260	7.2		0.776		22.9	LOS C	16.9	126.5				
West: Taylors Lane													
Lane 1	405	3.0	542	0.748	100	46.0	LOS D	17.4	125.2	Full	500	0.0	0.0
Lane 2	175	3.0	234	0.748	100	59.5	LOS E	9.7	69.7	Full	500	0.0	0.0
Approach	580	3.0		0.748		50.1	LOS D	17.4	125.2				
Intersection	3033	6.5		0.823		33.0	LOS C	29.4	219.8				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

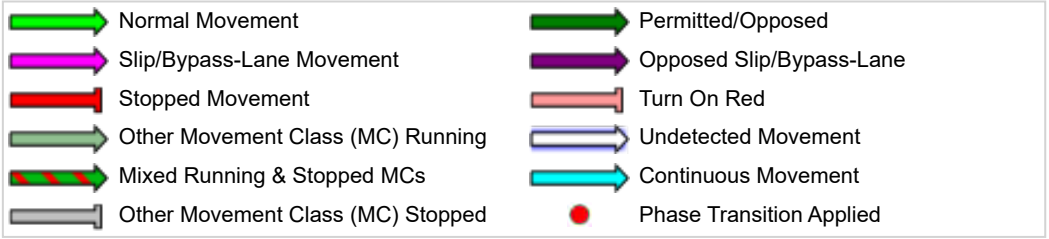
Phase Timing Summary

Phase	A	C	D	F
Phase Change Time (sec)	90	0	22	44
Green Time (sec)	14	17	16	40
Phase Time (sec)	19	23	22	46
Phase Split	17%	21%	20%	42%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence

REF: Reference Phase
VAR: Variable Phase

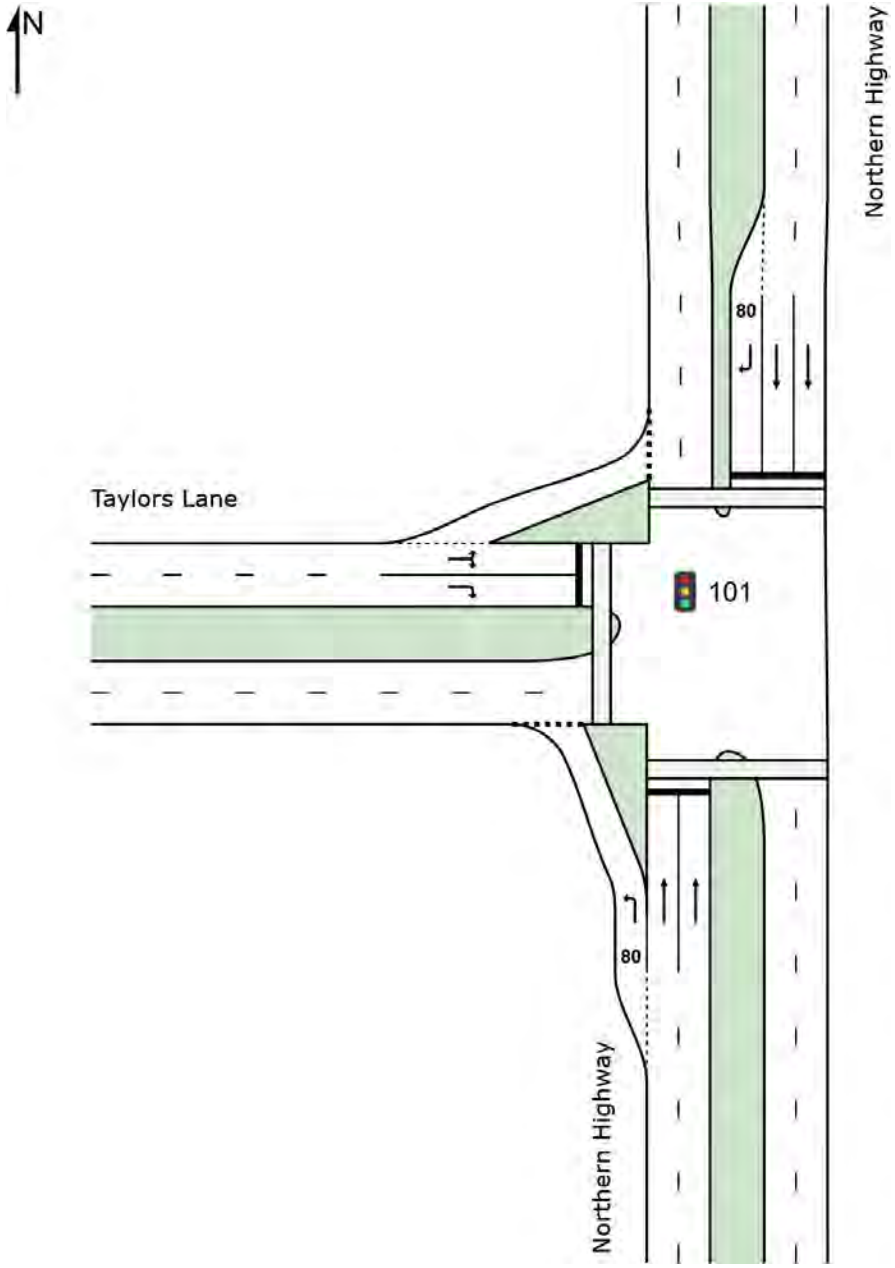


Site: 101 [50% - Interim - Northern Hwy / Taylors Lane - PM]

New Site
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 110 seconds (Site User-Given Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Variable Phasing
Reference Phase: Phase C
Input Phase Sequence: A, C, D, F
Output Phase Sequence: A, C, D, F

Site Layout



Lane Use and Performance

	Demand Flows Total veh/h	Demand Flows HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Northern Highway													
Lane 1	316	3.0	1342	0.235	100	10.8	LOS B	4.6	32.8	Short	80	0.0	NA
Lane 2	420	8.0	609	0.689	100	33.7	LOS C	19.3	144.4	Full	500	0.0	0.0
Lane 3	434	8.0	630	0.689	100	34.0	LOS C	20.2	150.8	Full	500	0.0	0.0
Approach	1169	6.6		0.689		27.6	LOS C	20.2	150.8				
North: Northern Highway													
Lane 1	655	8.0	1192	0.550	100	11.9	LOS B	19.4	144.8	Full	500	0.0	0.0
Lane 2	635	8.0	1155	0.550	100	11.7	LOS B	18.4	137.9	Full	500	0.0	0.0
Lane 3	306	3.0	451	0.679	100	48.1	LOS D	15.1	108.4	Short	80	0.0	NA
Approach	1596	7.0		0.679		18.7	LOS B	19.4	144.8				
West: Taylors Lane													
Lane 1	294	3.0	464	0.635	100	43.0	LOS D	12.6	90.4	Full	500	0.0	0.0
Lane 2	64	3.0	100	0.635	100	65.4	LOS E	3.6	26.2	Full	500	0.0	0.0
Approach	358	3.0		0.635		47.0	LOS D	12.6	90.4				
Intersection	3123	6.4		0.689		25.3	LOS C	20.2	150.8				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

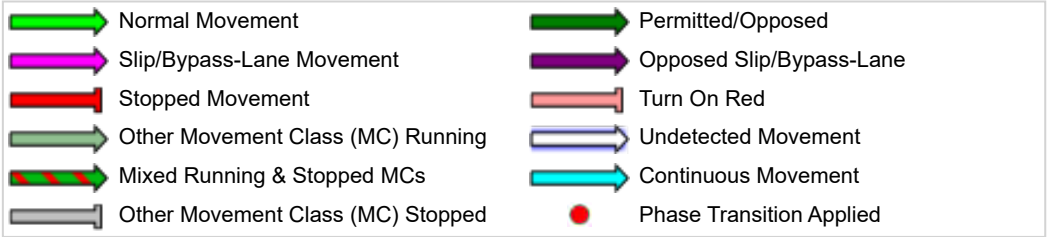
Phase Timing Summary

Phase	A	C	D	F
Phase Change Time (sec)	98	0	22	55
Green Time (sec)	6	17	27	37
Phase Time (sec)	11	23	33	43
Phase Split	10%	21%	30%	39%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence

REF: Reference Phase
VAR: Variable Phase

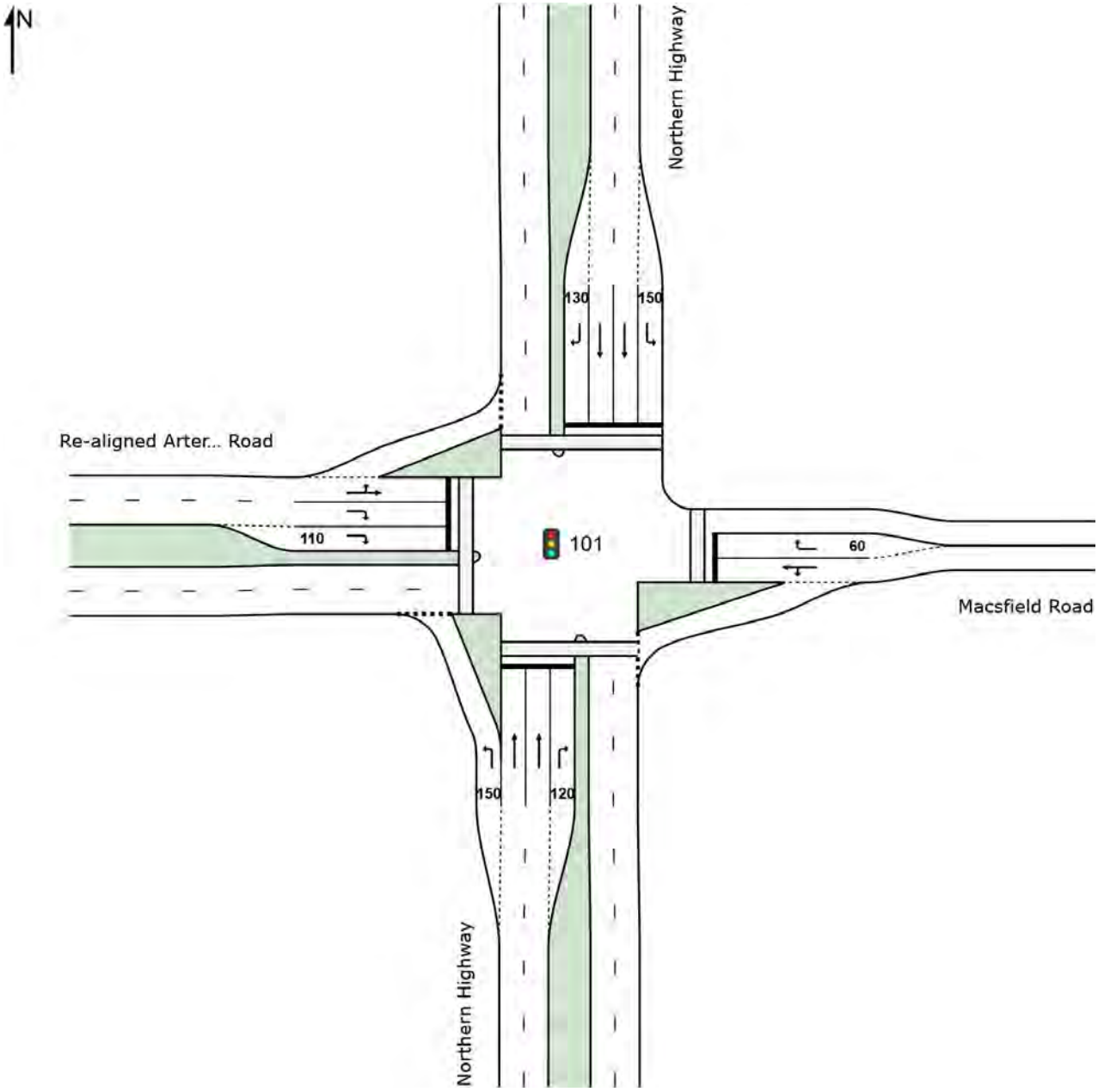


Site: 101 [50% - Interim - Northern Hwy / Re-aligned Arterial Rd / Macsfield Rd - AM]

New Site
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 125 seconds (Site User-Given Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Variable Phasing
Reference Phase: Phase C
Input Phase Sequence: A, B1*, B2*, C, D, E1*, E2*, F
Output Phase Sequence: A, B1*, C, D, E1*, F
(* Variable Phase)

Site Layout



Lane Use and Performance

	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Northern Highway													
Lane 1	206	3.0	1597	0.129	100	8.0	LOS A	1.2	8.4	Short	150	0.0	NA
Lane 2	549	8.0	944	0.582	100	23.1	LOS C	23.2	173.3	Full	500	0.0	0.0
Lane 3	549	8.0	944	0.582	100	23.1	LOS C	23.2	173.3	Full	500	0.0	0.0
Lane 4	68	3.0	103	0.665	100	74.5	LOS E	4.4	31.8	Short	120	0.0	NA
Approach	1373	7.0		0.665		23.4	LOS C	23.2	173.3				
East: Macsfield Road													
Lane 1	41	3.0	170	0.241	100	35.1	LOS D	1.6	11.3	Full	200	0.0	0.0
Lane 2	22	3.0	88	0.251	100	71.4	LOS E	1.4	9.9	Short	60	0.0	NA
Approach	63	3.0		0.251		47.8	LOS D	1.6	11.3				
North: Northern Highway													
Lane 1	40	3.0	867	0.046	100	25.7	LOS C	1.3	9.2	Short	150	0.0	NA
Lane 2	616	8.0	929	0.663	100	25.2	LOS C	27.9	208.6	Full	500	0.0	0.0
Lane 3	616	8.0	929	0.663	100	25.2	LOS C	27.9	208.6	Full	500	0.0	0.0
Lane 4	53	3.0	88	0.597	100	75.2	LOS E	3.4	24.5	Short	130	0.0	NA
Approach	1325	7.7		0.663		27.2	LOS C	27.9	208.6				
West: Re-aligned Arterial Road													
Lane 1	182	3.0	427	0.427	100	46.0	LOS D	8.5	61.3	Full	500	0.0	0.0
Lane 2	235	3.0	353	0.665	100	56.8	LOS E	13.5	96.8	Full	500	0.0	0.0
Lane 3	235	3.0	353	0.665	100	56.8	LOS E	13.5	96.8	Short	110	0.0	NA
Approach	652	3.0		0.665		53.8	LOS D	13.5	96.8				
Intersection	3413	6.4		0.665		31.1	LOS C	27.9	208.6				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

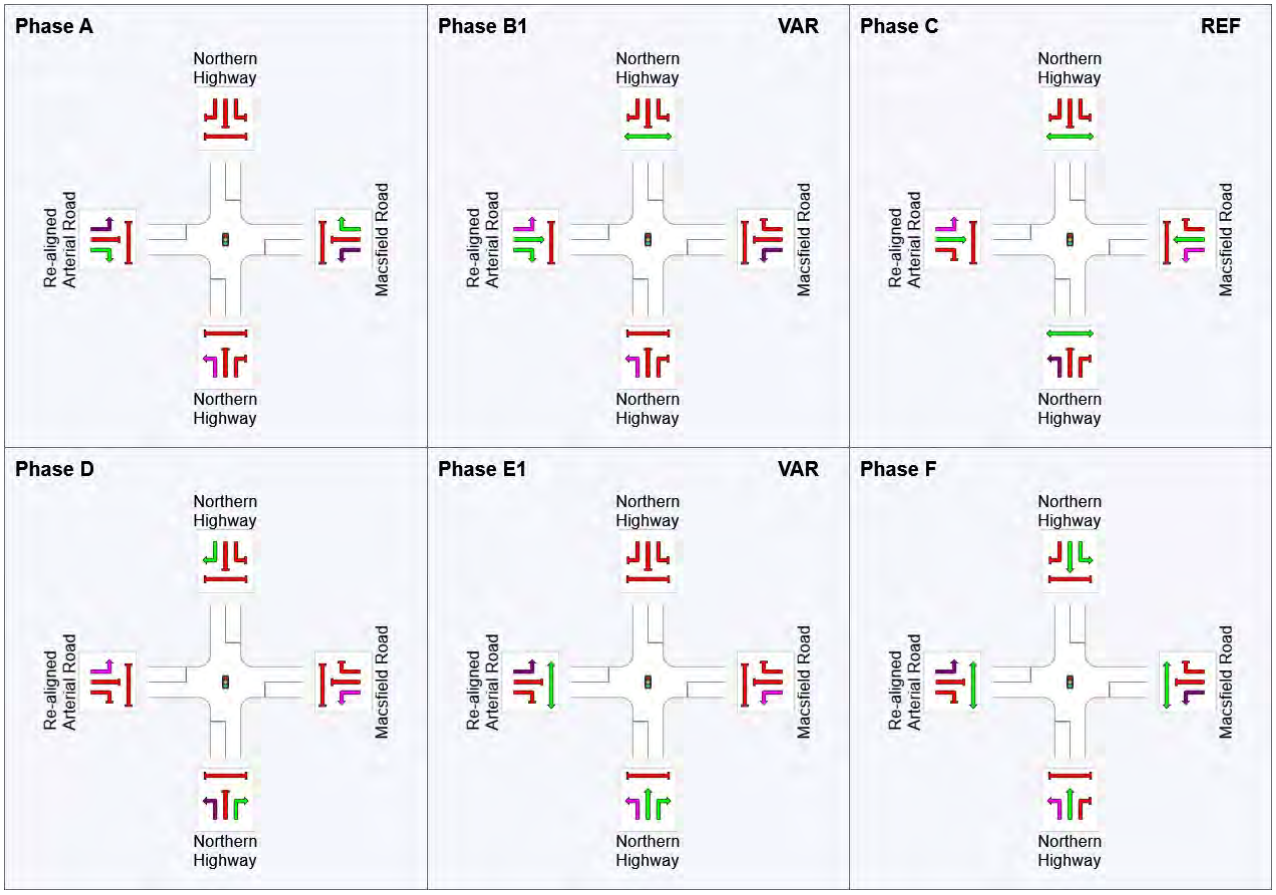
Phase Timing Summary

Phase	A	B1	C	D	E1	F
Phase Change Time (sec)	95	107	0	14	26	27
Green Time (sec)	6	12	8	6	***	62
Phase Time (sec)	12	18	14	12	1	68
Phase Split	10%	14%	11%	10%	1%	54%

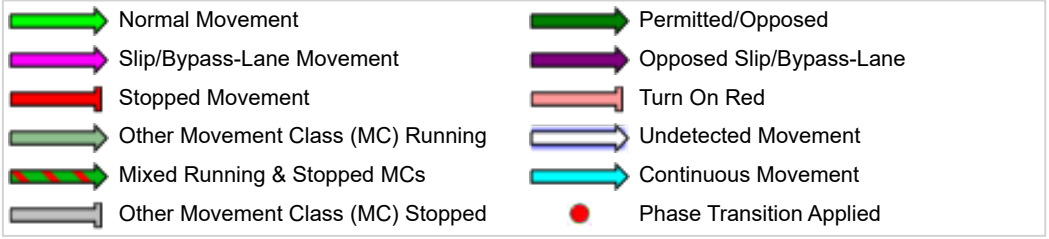
See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

*** No green time has been calculated for this phase because the next phase starts during its intergreen time. This occurs with overlap phasing where there is no single movement connecting this phase to the next, or where the only such movement is a dummy movement with zero minimum green time specified.
If a green time is required for this phase, specify a dummy movement with a non-zero minimum green time.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

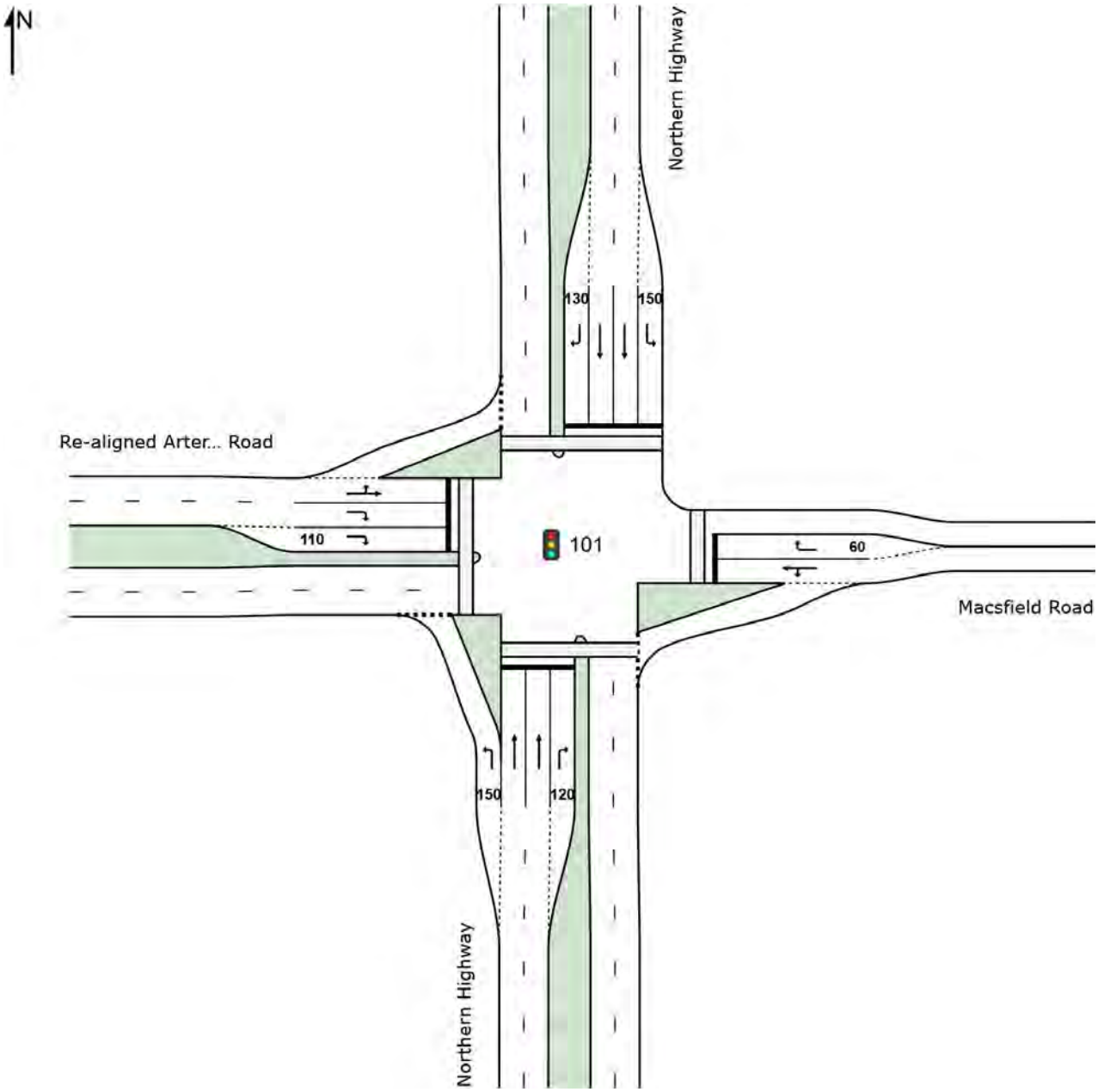


Site: 101 [50% - Interim - Northern Hwy / Re-aligned Arterial Rd / Macsfield Rd - PM]

New Site
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 125 seconds (Site User-Given Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Variable Phasing - Copy - Copy
Reference Phase: Phase C
Input Phase Sequence: A, C, D, F
Output Phase Sequence: A, C, D, F

Site Layout



Lane Use and Performance

	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Northern Highway													
Lane 1	606	3.0	1502	0.404	100	9.0	LOS A	6.9	49.6	Short	150	0.0	NA
Lane 2	519	8.0	929	0.559	100	23.3	LOS C	21.8	163.1	Full	500	0.0	0.0
Lane 3	519	8.0	929	0.559	100	23.3	LOS C	21.8	163.1	Full	500	0.0	0.0
Lane 4	86	3.0	191	0.452	100	65.7	LOS E	5.1	36.8	Short	120	0.0	NA
Approach	1732	6.0		0.559		20.4	LOS C	21.8	163.1				
East: Macsfield Road													
Lane 1	142	3.0	308	0.462	100	31.1	LOS C	4.9	34.9	Full	200	0.0	0.0
Lane 2	95	3.0	220	0.430	100	62.1	LOS E	5.5	39.6	Short	60	0.0	NA
Approach	237	3.0		0.462		43.5	LOS D	5.5	39.6				
North: Northern Highway													
Lane 1	13	3.0	867	0.015	100	25.3	LOS C	0.4	2.9	Short	150	0.0	NA
Lane 2	576	8.0	929	0.620	100	24.4	LOS C	25.2	188.7	Full	500	0.0	0.0
Lane 3	576	8.0	929	0.620	100	24.4	LOS C	25.2	188.7	Full	500	0.0	0.0
Lane 4	115	3.0	191	0.601	100	67.1	LOS E	7.0	50.0	Short	130	0.0	NA
Approach	1279	7.5		0.620		28.2	LOS C	25.2	188.7				
West: Re-aligned Arterial Road													
Lane 1	93	3.0	205	0.453	100	52.5	LOS D	4.3	30.7	Full	500	0.0	0.0
Lane 2	139	3.0	220	0.630	100	64.1	LOS E	8.4	60.1	Full	500	0.0	0.0
Lane 3	139	3.0	220	0.630	100	64.1	LOS E	8.4	60.1	Short	110	0.0	NA
Approach	371	3.0		0.630		61.2	LOS E	8.4	60.1				
Intersection	3618	6.0		0.630		28.9	LOS C	25.2	188.7				

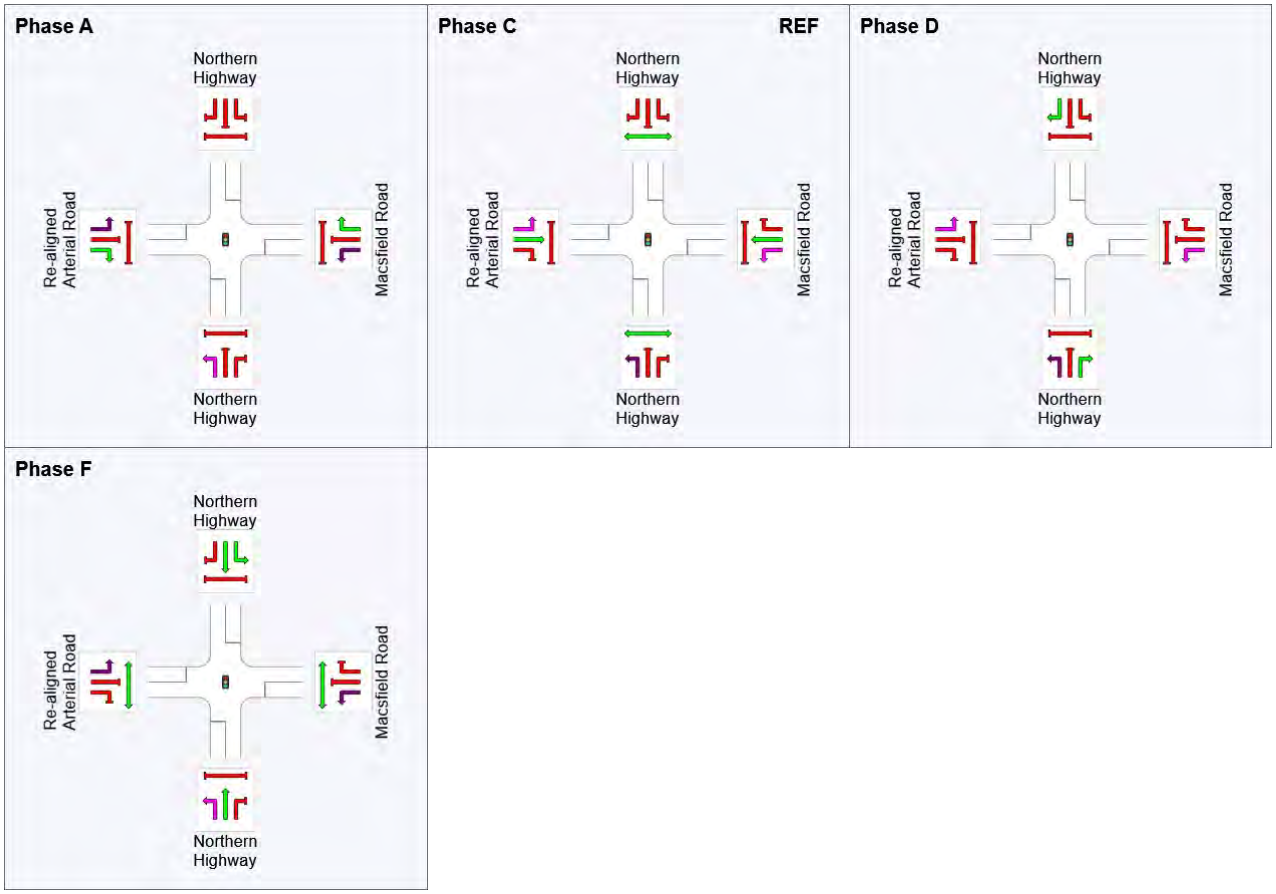
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Phase Timing Summary

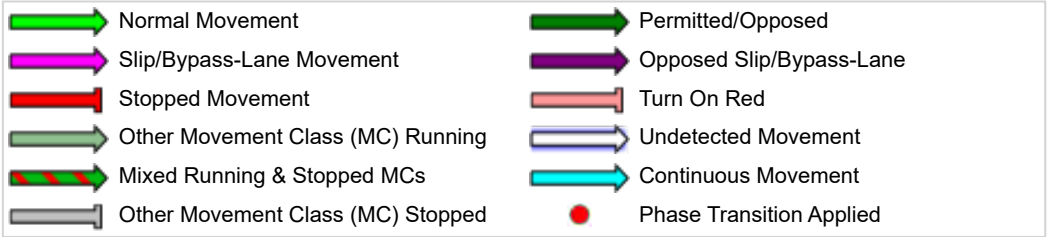
Phase	A	C	D	F
Phase Change Time (sec)	104	0	17	36
Green Time (sec)	15	11	13	62
Phase Time (sec)	21	17	19	68
Phase Split	17%	14%	15%	54%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



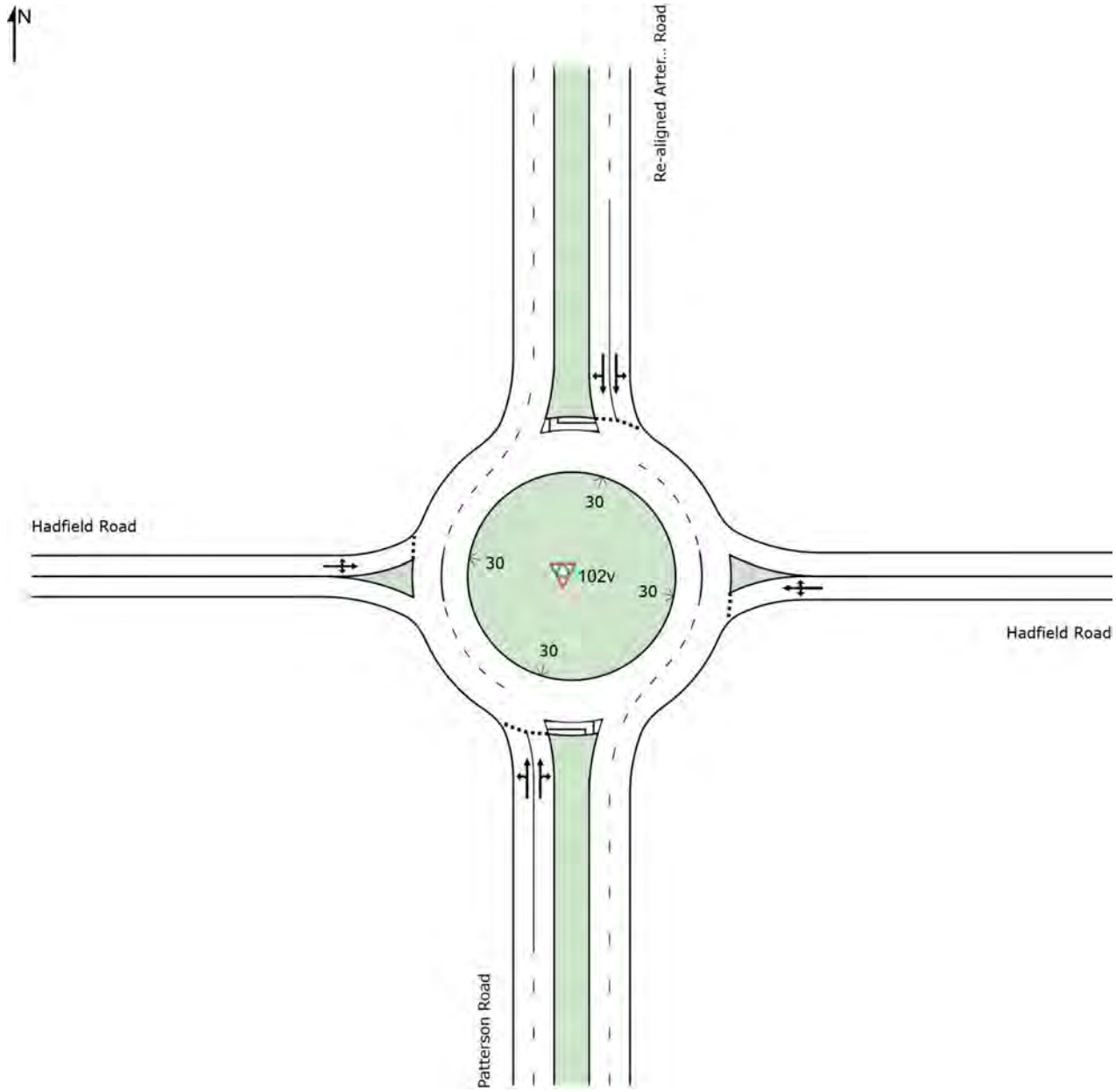
REF: Reference Phase
VAR: Variable Phase



Site: 102v [50% - Interim - Re-aligned Arterial Rd / Patterson Rd / Hadfield Rd - AM]

New Site
Site Category: (None)
Roundabout

Site Layout



Lane Use and Performance													
	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Patterson Road													
Lane 1[d]	188	3.0	1810	0.104	100	3.6	LOS A	0.6	4.4	Full	500	0.0	0.0
Lane 2	159	3.0	1526	0.104	100	4.9	LOS A	0.6	4.3	Full	500	0.0	0.0
Approach	347	3.0		0.104		4.2	LOS A	0.6	4.4				
East: Hadfield Road													
Lane 1[d]	21	3.0	937	0.022	100	6.2	LOS A	0.1	0.6	Full	500	0.0	0.0
Approach	21	3.0		0.022		6.2	LOS A	0.1	0.6				
North: Re-aligned Arterial Road													
Lane 1[d]	221	3.0	1549	0.143	100	4.2	LOS A	0.9	6.4	Full	500	0.0	0.0
Lane 2	184	3.0	1287	0.143	100	4.7	LOS A	0.9	6.2	Full	500	0.0	0.0
Approach	405	3.0		0.143		4.4	LOS A	0.9	6.4				
West: Hadfield Road													
Lane 1[d]	157	3.0	1019	0.154	100	9.2	LOS A	0.7	4.8	Full	500	0.0	0.0
Approach	157	3.0		0.154		9.2	LOS A	0.7	4.8				
Intersection	931	3.0		0.154		5.2	LOS A	0.9	6.4				

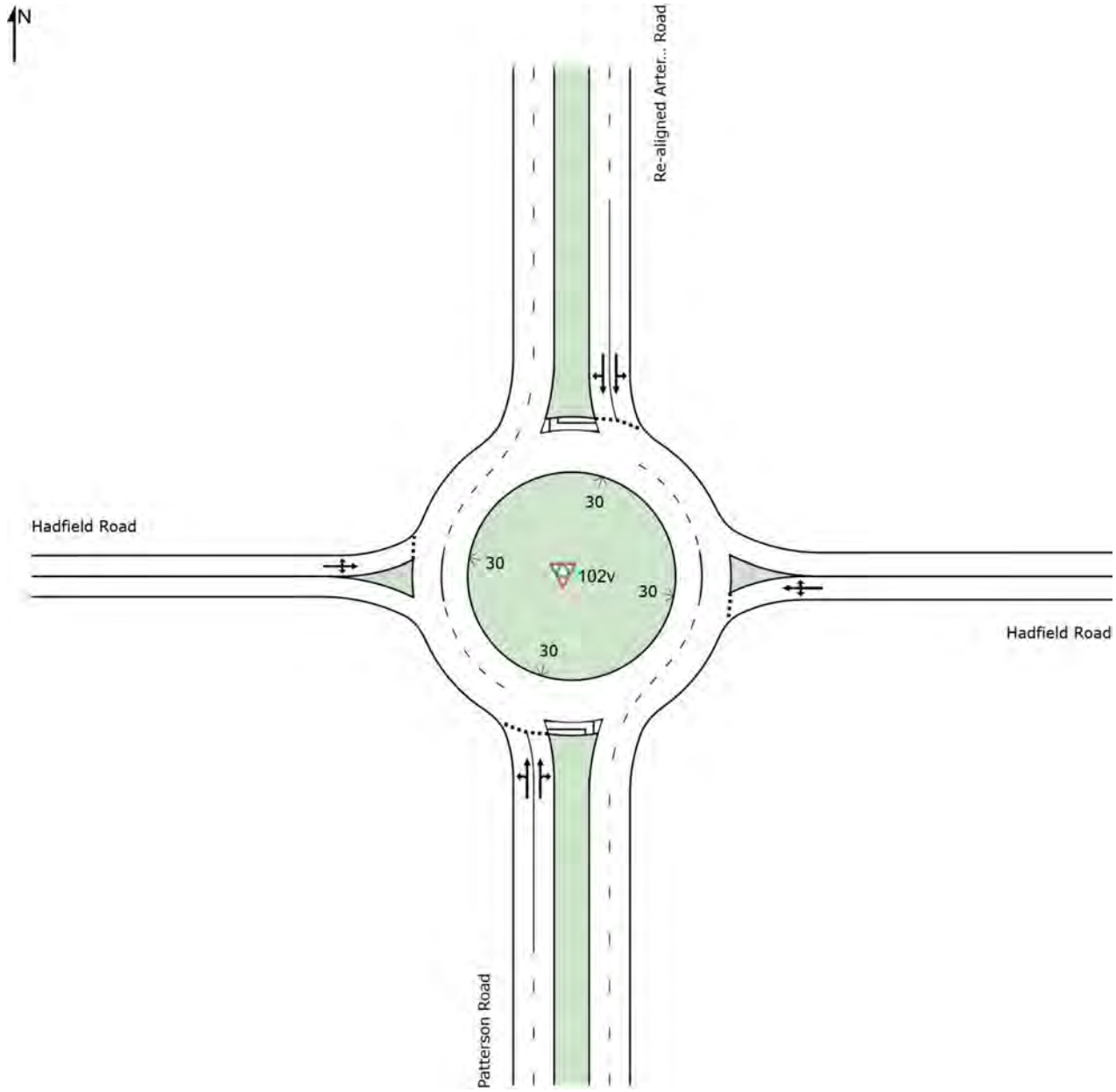
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Site: 102v [50% - Interim - Re-aligned Arterial Rd / Patterson Rd / Hadfield Rd - PM]

New Site
Site Category: (None)
Roundabout

Site Layout



Lane Use and Performance													
	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Patterson Road													
Lane 1[d]	344	3.0	1743	0.197	100	3.7	LOS A	1.3	9.4	Full	500	0.0	0.0
Lane 2	290	3.0	1467	0.197	100	4.4	LOS A	1.3	9.2	Full	500	0.0	0.0
Approach	634	3.0		0.197		4.0	LOS A	1.3	9.4				
East: Hadfield Road													
Lane 1[d]	76	3.0	976	0.078	100	6.3	LOS A	0.3	2.1	Full	500	0.0	0.0
Approach	76	3.0		0.078		6.3	LOS A	0.3	2.1				
North: Re-aligned Arterial Road													
Lane 1[d]	216	3.0	1642	0.131	100	3.9	LOS A	0.8	5.8	Full	500	0.0	0.0
Lane 2	181	3.0	1380	0.131	100	4.3	LOS A	0.8	5.7	Full	500	0.0	0.0
Approach	397	3.0		0.131		4.1	LOS A	0.8	5.8				
West: Hadfield Road													
Lane 1[d]	87	3.0	896	0.098	100	9.0	LOS A	0.4	3.0	Full	500	0.0	0.0
Approach	87	3.0		0.098		9.0	LOS A	0.4	3.0				
Intersection	1194	3.0		0.197		4.6	LOS A	1.3	9.4				

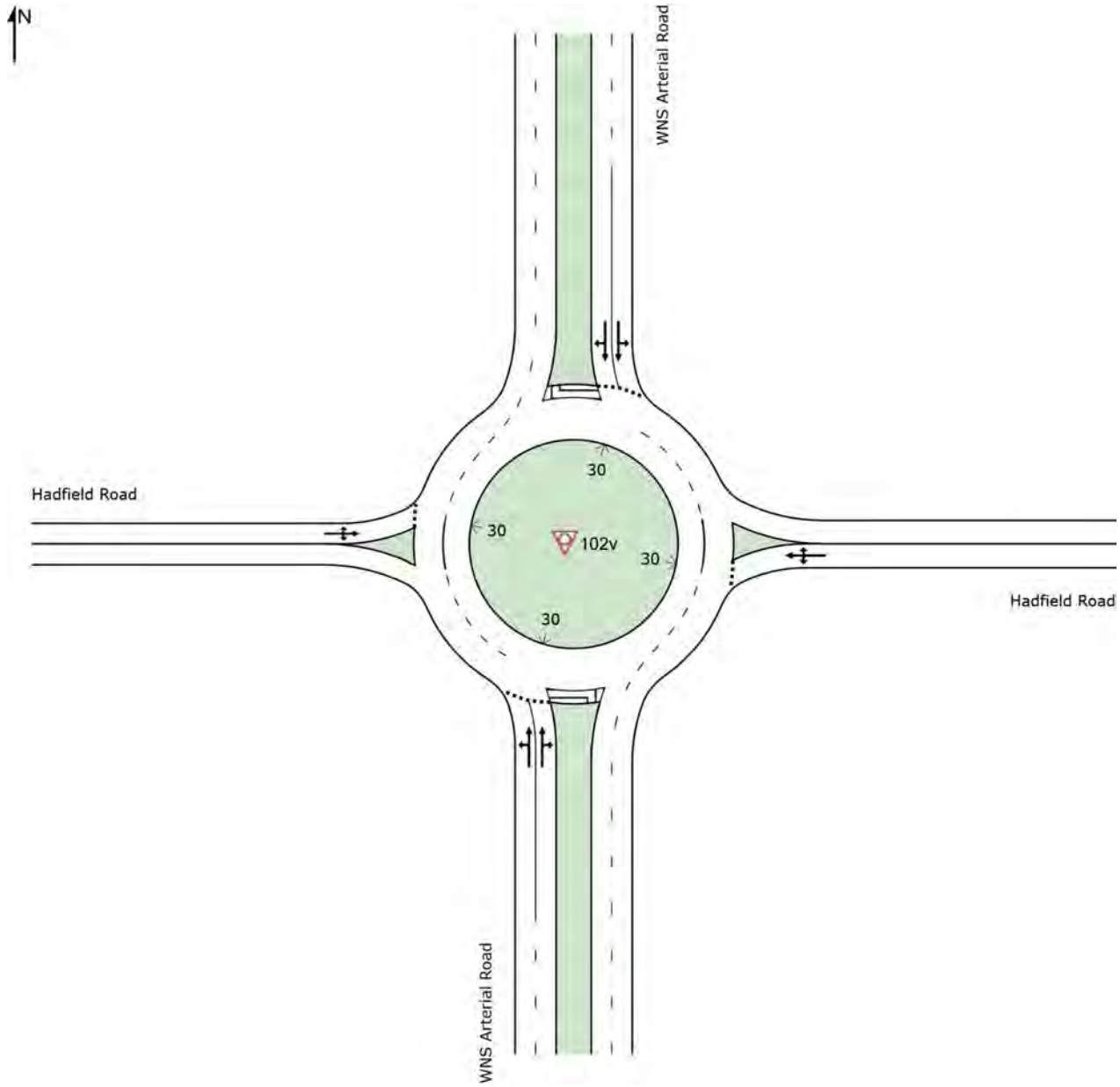
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Site: 102v [50% - Interim - WNS Arterial Rd / Hadfield Rd - AM]

New Site
Site Category: (None)
Roundabout

Site Layout



Lane Use and Performance													
	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: WNS Arterial Road													
Lane 1[d]	106	3.0	1759	0.060	100	3.6	LOS A	0.3	2.5	Full	500	0.0	0.0
Lane 2	90	3.0	1495	0.060	100	4.6	LOS A	0.3	2.4	Full	500	0.0	0.0
Approach	197	3.0		0.060		4.1	LOS A	0.3	2.5				
East: Hadfield Road													
Lane 1[d]	53	3.0	963	0.055	100	5.5	LOS A	0.2	1.4	Full	500	0.0	0.0
Approach	53	3.0		0.055		5.5	LOS A	0.2	1.4				
North: WNS Arterial Road													
Lane 1[d]	246	3.0	1680	0.146	100	3.8	LOS A	0.9	6.4	Full	500	0.0	0.0
Lane 2	207	3.0	1415	0.146	100	4.2	LOS A	0.9	6.3	Full	500	0.0	0.0
Approach	453	3.0		0.146		4.0	LOS A	0.9	6.4				
West: Hadfield Road													
Lane 1[d]	63	3.0	1115	0.057	100	7.7	LOS A	0.2	1.7	Full	500	0.0	0.0
Approach	63	3.0		0.057		7.7	LOS A	0.2	1.7				
Intersection	765	3.0		0.146		4.4	LOS A	0.9	6.4				

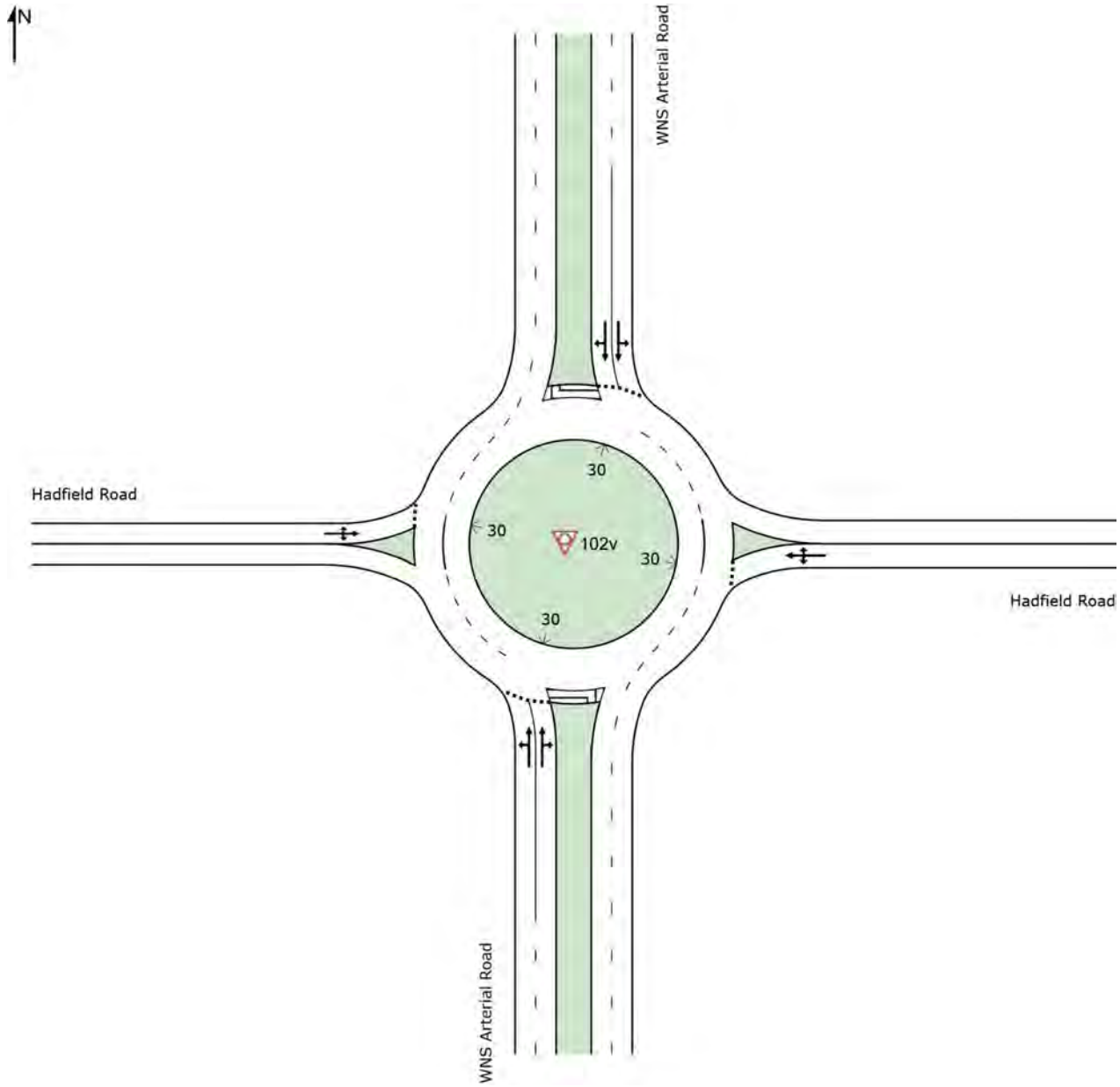
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Site: 102v [50% - Interim - WNS Arterial Rd / Hadfield Rd - PM]

New Site
Site Category: (None)
Roundabout

Site Layout



Lane Use and Performance													
	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: WNS Arterial Road													
Lane 1[d]	315	3.0	1717	0.183	100	3.8	LOS A	1.1	8.3	Full	500	0.0	0.0
Lane 2	265	3.0	1445	0.183	100	4.7	LOS A	1.1	8.2	Full	500	0.0	0.0
Approach	580	3.0		0.183		4.2	LOS A	1.1	8.3				
East: Hadfield Road													
Lane 1[d]	58	3.0	1094	0.053	100	7.9	LOS A	0.2	1.4	Full	500	0.0	0.0
Approach	58	3.0		0.053		7.9	LOS A	0.2	1.4				
North: WNS Arterial Road													
Lane 1[d]	131	3.0	1656	0.079	100	3.8	LOS A	0.5	3.3	Full	500	0.0	0.0
Lane 2	111	3.0	1401	0.079	100	4.8	LOS A	0.4	3.2	Full	500	0.0	0.0
Approach	242	3.0		0.079		4.3	LOS A	0.5	3.3				
West: Hadfield Road													
Lane 1[d]	58	3.0	868	0.067	100	7.6	LOS A	0.3	1.9	Full	500	0.0	0.0
Approach	58	3.0		0.067		7.6	LOS A	0.3	1.9				
Intersection	938	3.0		0.183		4.7	LOS A	1.1	8.3				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

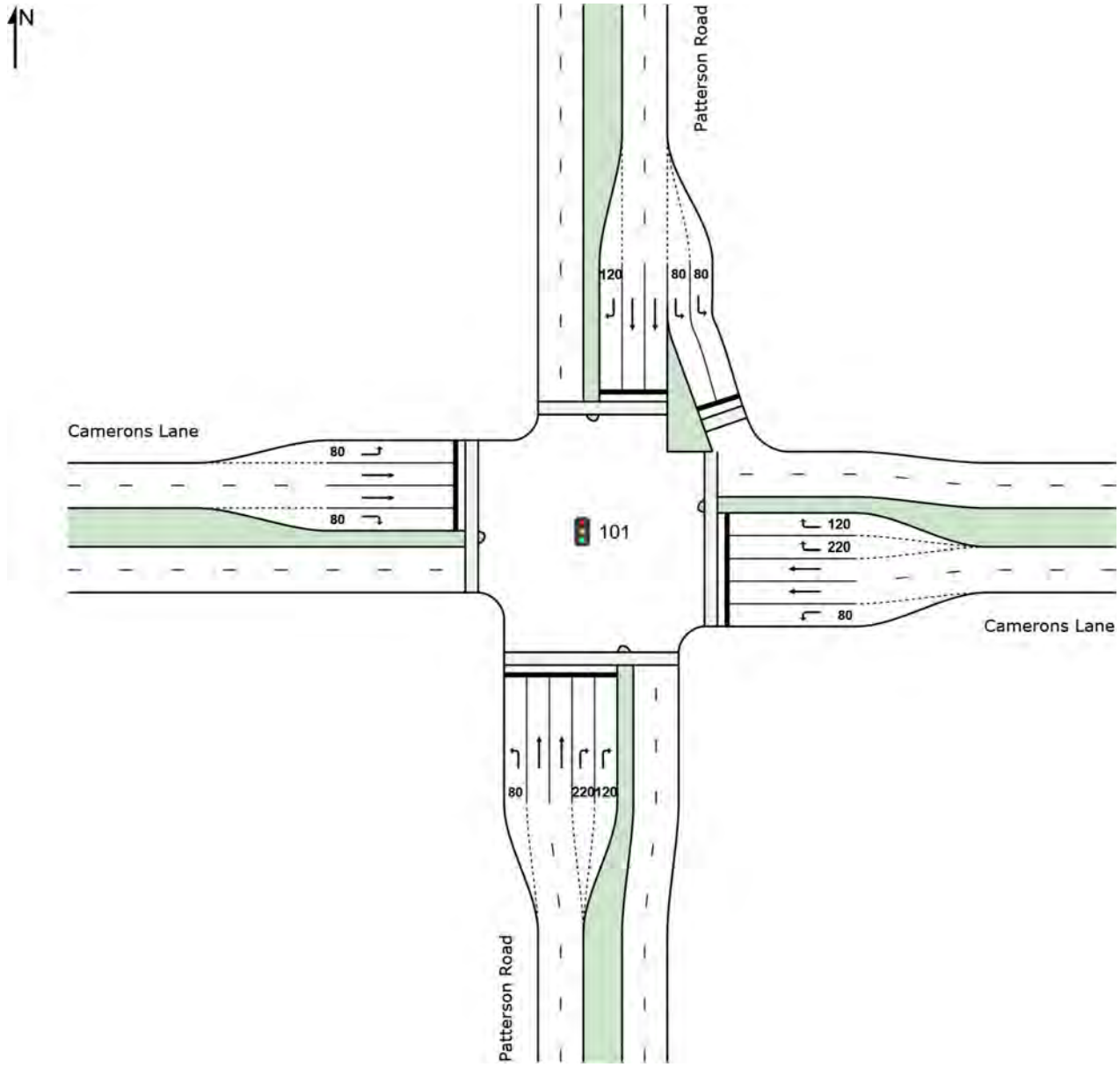
d Dominant lane on roundabout approach

Site: 101 [50% - Interim - Patterson Rd / Camerons Lane - AM]

New Site
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 110 seconds (Site User-Given Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Variable Phasing - Copy (2) (phase reduction applied)
Reference Phase: Phase C
Input Phase Sequence: A, B2, C, D, E2, F
Output Phase Sequence: A, C, D, E2, F

Site Layout



Lane Use and Performance

	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Patterson Road													
Lane 1	46	3.0	802	0.058	100	24.5	LOS C	1.4	10.1	Short	80	0.0	NA
Lane 2	93	3.0	316	0.293	100	44.2	LOS D	4.4	31.9	Full	500	0.0	0.0
Lane 3	93	3.0	316	0.293	100	44.2	LOS D	4.4	31.9	Full	500	0.0	0.0
Lane 4	116	3.0	251	0.462	100	54.2	LOS D	5.9	42.4	Short	220	0.0	NA
Lane 5	116	3.0	251	0.462	100	54.2	LOS D	5.9	42.4	Short	120	0.0	NA
Approach	463	3.0		0.462		47.3	LOS D	5.9	42.4				
East: Camerons Lane													
Lane 1	295	3.0	668	0.441	100	34.1	LOS C	12.0	85.9	Short	80	0.0	NA
Lane 2	64	3.0	334	0.192	100	42.4	LOS D	3.0	21.4	Full	500	0.0	0.0
Lane 3	64	3.0	334	0.192	100	42.4	LOS D	3.0	21.4	Full	500	0.0	0.0
Lane 4	95	3.0	401	0.238	100	44.1	LOS D	4.3	30.5	Short	220	0.0	NA
Lane 5	95	3.0	401	0.238	100	44.1	LOS D	4.3	30.5	Short	120	0.0	NA
Approach	614	3.0		0.441		38.9	LOS D	12.0	85.9				
North: Patterson Road													
Lane 1	234	3.0	969	0.241	100	20.6	LOS C	6.7	48.0	Short	80	0.0	NA
Lane 2	234	3.0	969	0.241	100	20.6	LOS C	6.7	48.0	Short	80	0.0	NA
Lane 3	239	3.0	492	0.486	100	37.8	LOS D	11.0	78.9	Full	500	0.0	0.0
Lane 4	239	3.0	492	0.486	100	37.8	LOS D	11.0	78.9	Full	500	0.0	0.0
Lane 5	117	3.0	418	0.280	100	43.7	LOS D	5.2	37.5	Short	120	0.0	NA
Approach	1062	3.0		0.486		30.9	LOS C	11.0	78.9				
West: Camerons Lane													
Lane 1	135	3.0	835	0.161	100	24.3	LOS C	4.2	30.1	Short	80	0.0	NA
Lane 2	157	3.0	334	0.471	100	45.0	LOS D	7.8	55.7	Full	500	0.0	0.0
Lane 3	157	3.0	334	0.471	100	45.0	LOS D	7.8	55.7	Full	500	0.0	0.0
Lane 4	193	3.0	401	0.481	100	46.6	LOS D	9.2	65.7	Short	80	0.0	NA
Approach	642	3.0		0.481		41.1	LOS D	9.2	65.7				
Intersection	2781	3.0		0.486		37.7	LOS D	12.0	85.9				

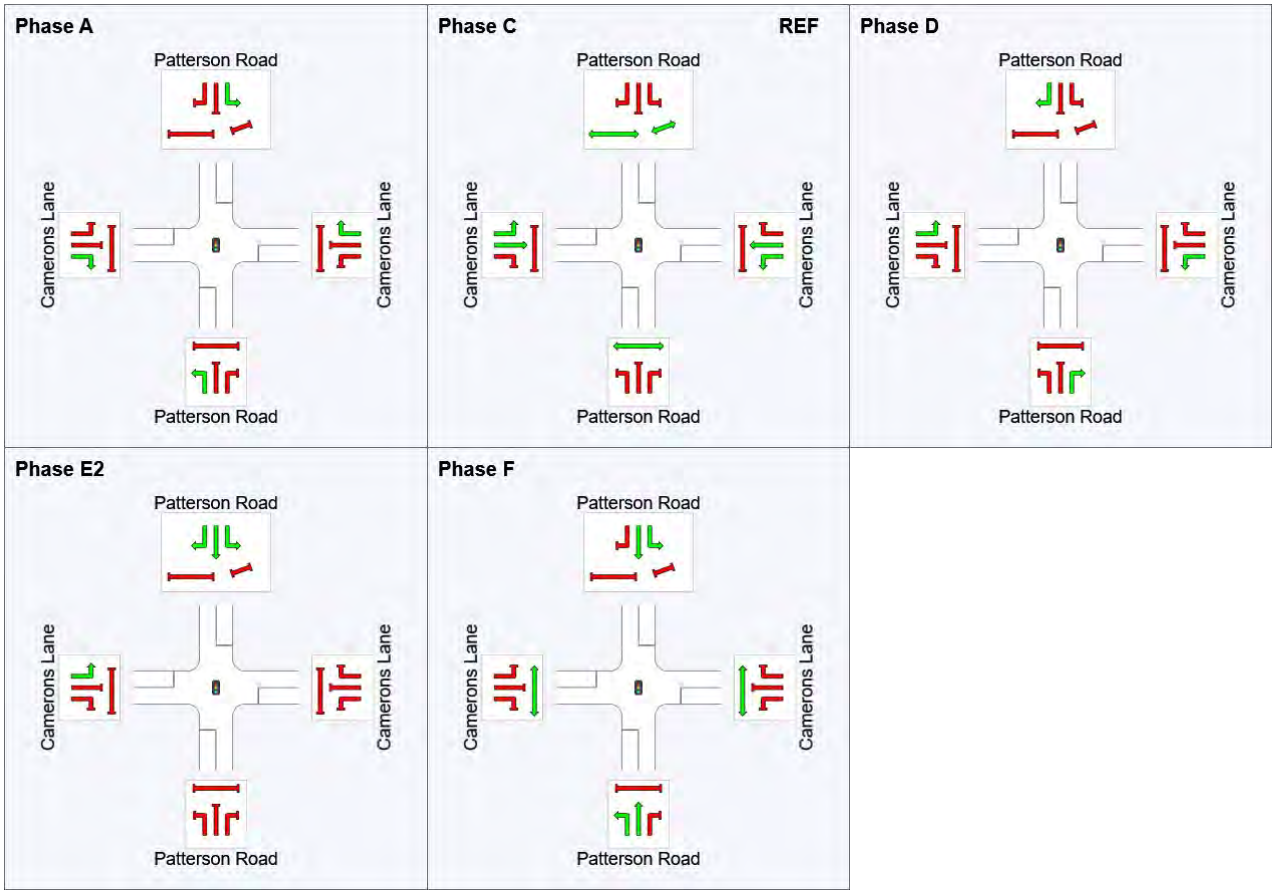
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Phase Timing Summary

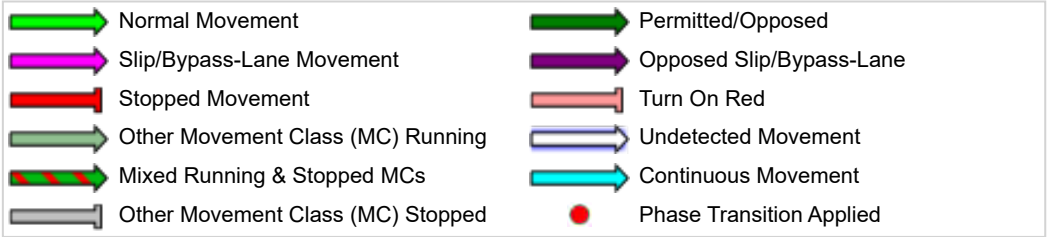
Phase	A	C	D	E2	F
Phase Change Time (sec)	80	0	25	46	56
Green Time (sec)	24	19	15	4	18
Phase Time (sec)	30	25	21	10	24
Phase Split	27%	23%	19%	9%	22%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

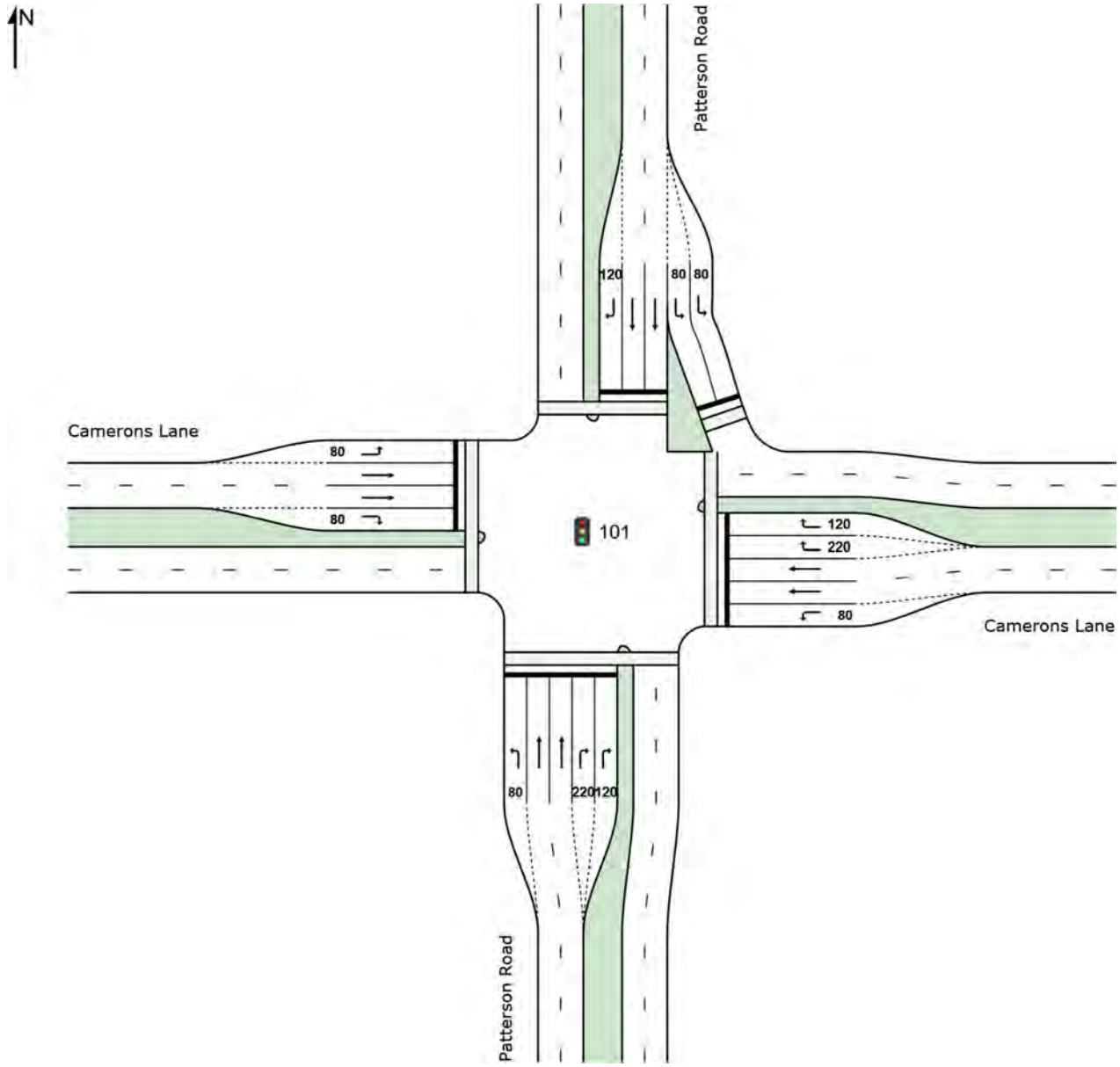


Site: 101 [50% - Interim - Patterson Rd / Camerons Lane - PM]

New Site
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 110 seconds (Site User-Given Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Variable Phasing - Copy (phase reduction applied)
Reference Phase: Phase C
Input Phase Sequence: A, B2, C, D, E1, F
Output Phase Sequence: A, B2, C, D, F

Site Layout



Lane Use and Performance

	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Patterson Road													
Lane 1	36	3.0	618	0.058	100	31.8	LOS C	1.3	9.2	Short	80	0.0	NA
Lane 2	164	3.0	387	0.423	100	42.0	LOS D	7.8	55.9	Full	500	0.0	0.0
Lane 3	164	3.0	387	0.423	100	42.0	LOS D	7.8	55.9	Full	500	0.0	0.0
Lane 4	174	3.0	367	0.474	100	48.2	LOS D	8.4	60.3	Short	220	0.0	NA
Lane 5	174	3.0	367	0.474	100	48.2	LOS D	8.4	60.3	Short	120	0.0	NA
Approach	712	3.0		0.474		44.5	LOS D	8.4	60.3				
East: Camerons Lane													
Lane 1	278	3.0	1019	0.273	100	19.2	LOS B	7.7	55.3	Short	80	0.0	NA
Lane 2	211	3.0	580	0.364	100	32.6	LOS C	8.9	63.9	Full	500	0.0	0.0
Lane 3	211	3.0	580	0.364	100	32.6	LOS C	8.9	63.9	Full	500	0.0	0.0
Lane 4	254	3.0	551	0.460	100	39.4	LOS D	11.1	79.7	Short	220	0.0	NA
Lane 5	254	3.0	551	0.460	100	39.4	LOS D	11.1	79.7	Short	120	0.0	NA
Approach	1207	3.0		0.460		32.4	LOS C	11.1	79.7				
North: Patterson Road													
Lane 1	145	3.0	551	0.263	100	37.1	LOS D	5.9	42.4	Short	80	0.0	NA
Lane 2	145	3.0	551	0.263	100	37.1	LOS D	5.9	42.4	Short	80	0.0	NA
Lane 3	181	3.0	387	0.468	100	42.4	LOS D	8.7	62.5	Full	500	0.0	0.0
Lane 4	181	3.0	387	0.468	100	42.4	LOS D	8.7	62.5	Full	500	0.0	0.0
Lane 5	153	3.0	367	0.415	100	47.6	LOS D	7.3	52.1	Short	120	0.0	NA
Approach	804	3.0		0.468		41.5	LOS D	8.7	62.5				
West: Camerons Lane													
Lane 1	156	3.0	618	0.252	100	33.9	LOS C	6.0	43.4	Short	80	0.0	NA
Lane 2	71	3.0	158	0.446	100	54.4	LOS D	3.8	27.2	Full	500	0.0	0.0
Lane 3	71	3.0	158	0.446	100	54.4	LOS D	3.8	27.2	Full	500	0.0	0.0
Lane 4	57	3.0	150	0.378	100	59.8	LOS E	3.0	21.8	Short	80	0.0	NA
Approach	354	3.0		0.446		46.3	LOS D	6.0	43.4				
Intersection	3077	3.0		0.474		39.2	LOS D	11.1	79.7				

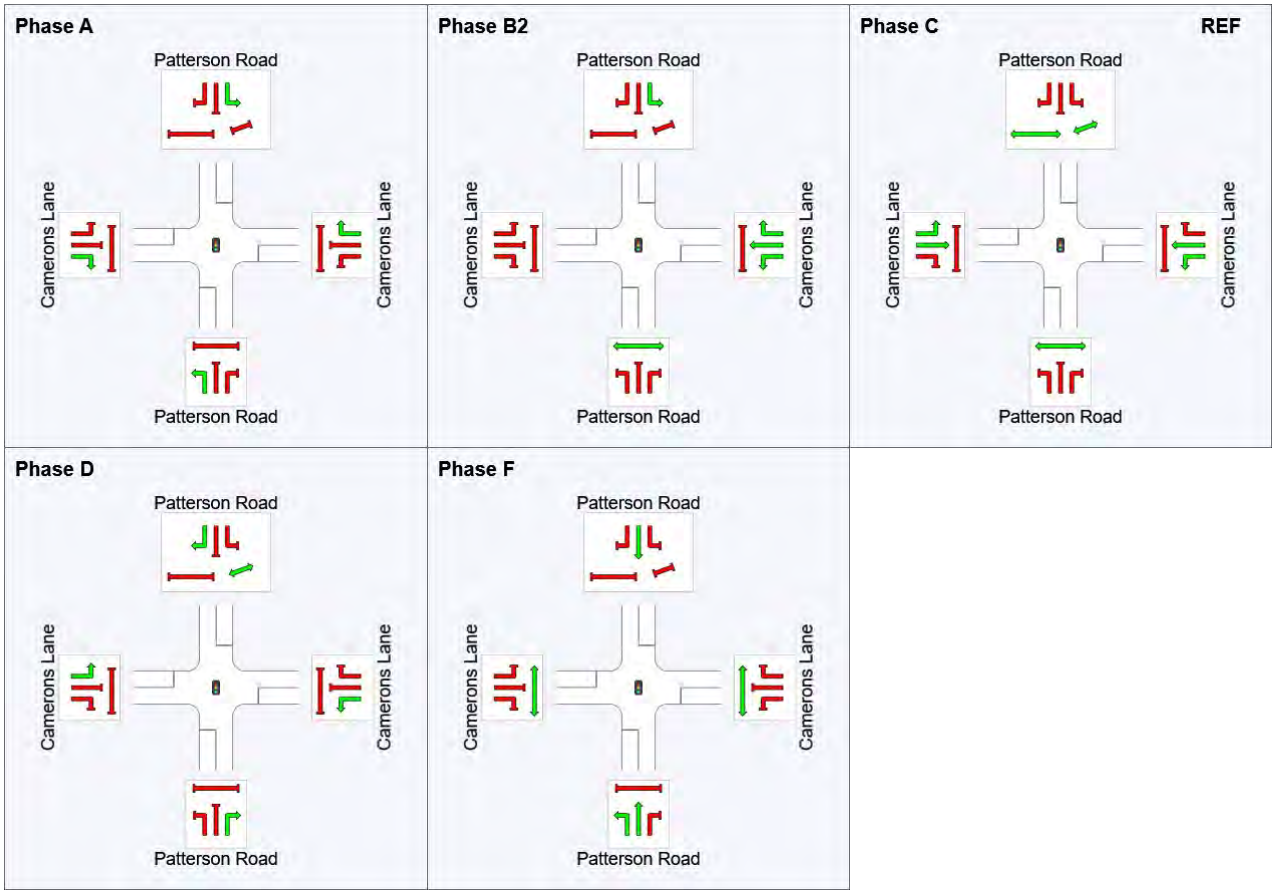
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Phase Timing Summary

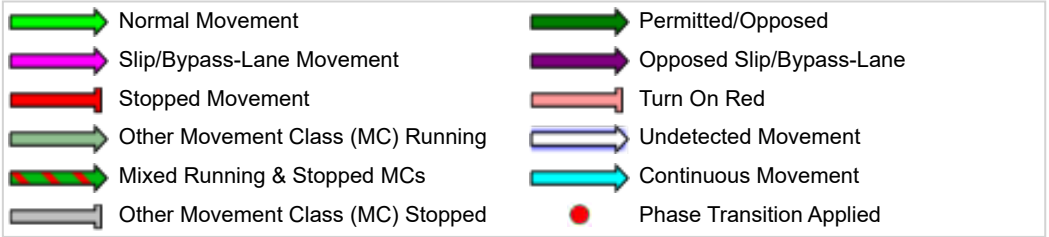
Phase	A	B2	C	D	F
Phase Change Time (sec)	71	86	0	15	43
Green Time (sec)	9	18	9	22	22
Phase Time (sec)	15	24	15	28	28
Phase Split	14%	22%	14%	25%	25%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

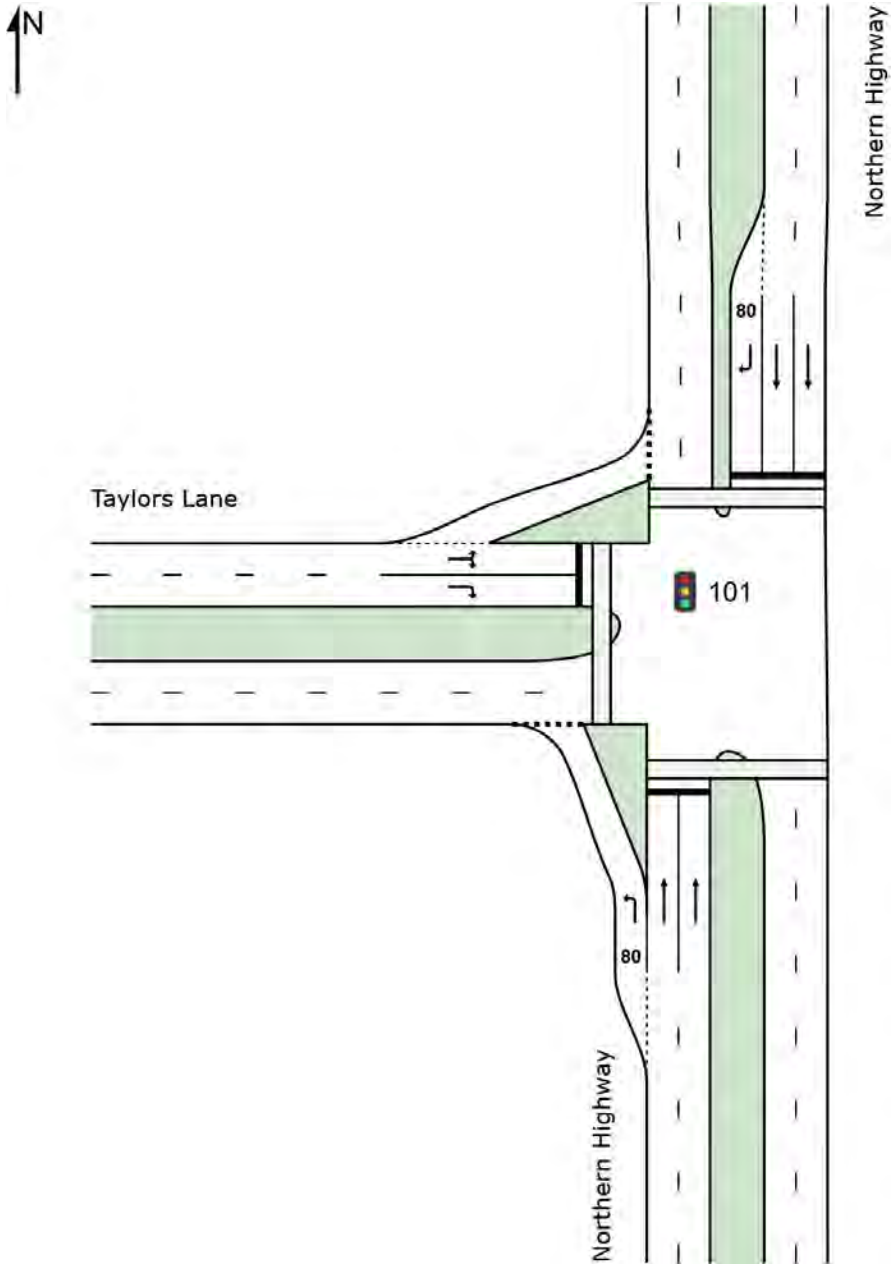


Site: 101 [50% - Ultimate - Northern Hwy / Taylors Lane - AM]

New Site
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 110 seconds (Site User-Given Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Variable Phasing
Reference Phase: Phase C
Input Phase Sequence: A, C, D, F
Output Phase Sequence: A, C, D, F

Site Layout



Lane Use and Performance

	Demand Flows Total veh/h	Demand Flows HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Northern Highway													
Lane 1	67	3.0	1461	0.046	100	9.3	LOS A	0.7	4.8	Short	80	0.0	NA
Lane 2	631	8.0	754[1]	0.837	100	35.2	LOS D	32.4	242.3	Full	500	0.0	0.0
Lane 3	656	8.0	783	0.837	100	35.5	LOS D	34.1	255.0	Full	500	0.0	0.0
Approach	1355	7.8		0.837		34.1	LOS C	34.1	255.0				
North: Northern Highway													
Lane 1	578	8.0	1141	0.507	100	12.9	LOS B	17.3	129.2	Full	500	0.0	0.0
Lane 2	578	8.0	1141	0.507	100	12.9	LOS B	17.3	129.2	Full	500	0.0	0.0
Lane 3	214	3.0	251	0.853	100	65.8	LOS E	12.7	91.0	Short	80	0.0	NA
Approach	1369	7.2		0.853		21.1	LOS C	17.3	129.2				
West: Taylors Lane													
Lane 1	316	3.0	420	0.753	100	52.1	LOS D	15.0	107.6	Full	500	0.0	0.0
Lane 2	113	3.0	150	0.753	100	64.2	LOS E	6.5	46.6	Full	500	0.0	0.0
Approach	429	3.0		0.753		55.2	LOS E	15.0	107.6				
Intersection	3154	6.9		0.853		31.3	LOS C	34.1	255.0				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

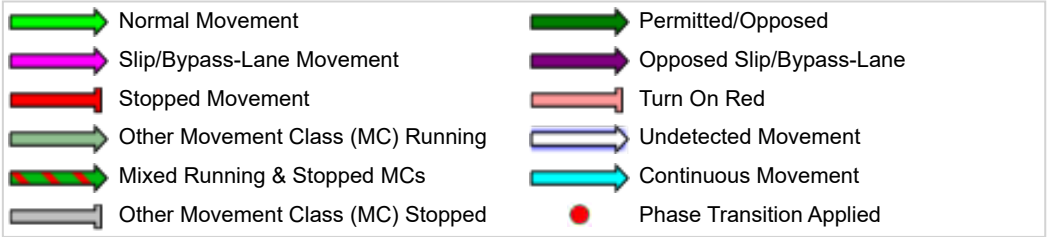
Phase Timing Summary

Phase	A	C	D	F
Phase Change Time (sec)	95	0	22	43
Green Time (sec)	9	17	15	46
Phase Time (sec)	14	23	21	52
Phase Split	13%	21%	19%	47%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence

REF: Reference Phase
VAR: Variable Phase

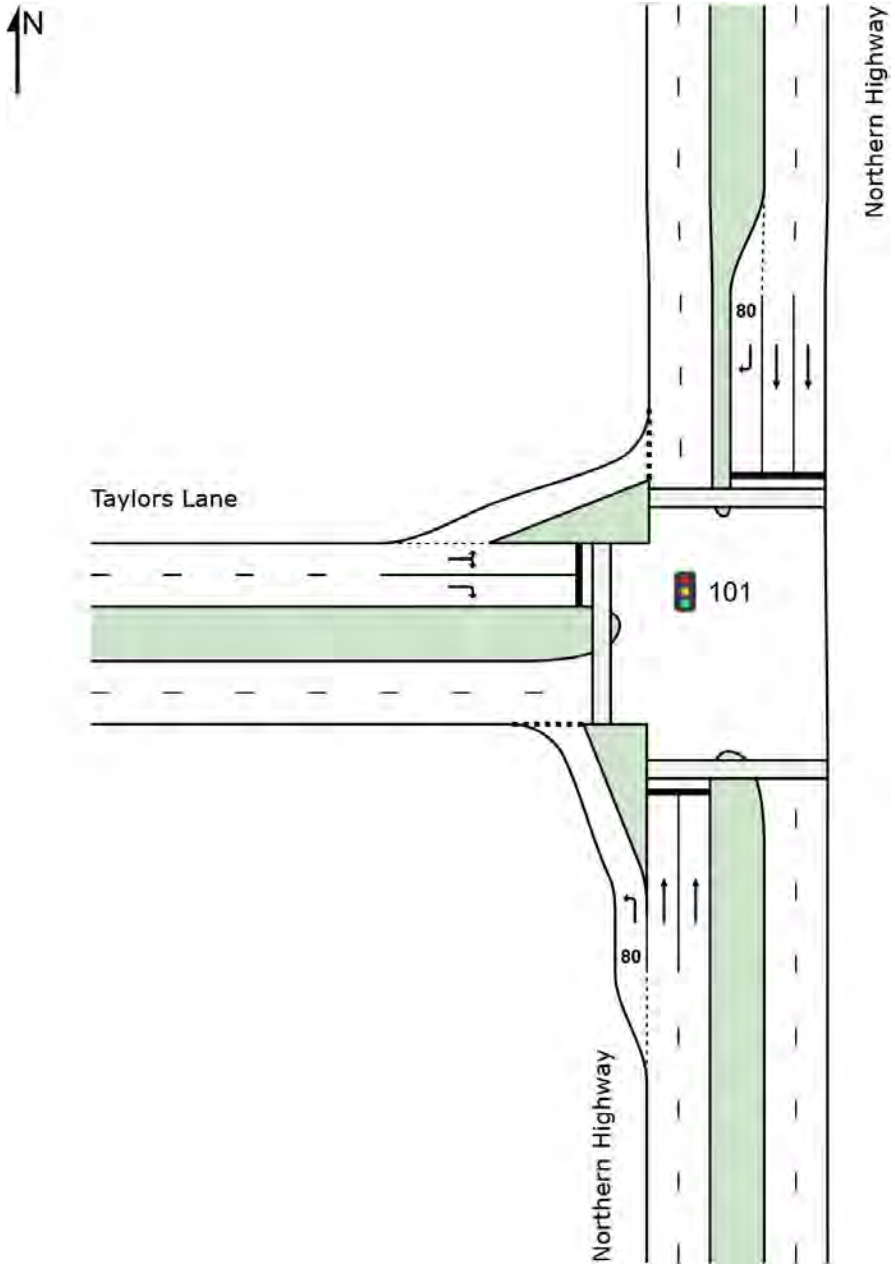


Site: 101 [50% - Ultimate - Northern Hwy / Taylors Lane - PM]

New Site
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 110 seconds (Site User-Given Phase Times)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times specified by the user
Phase Sequence: Variable Phasing
Reference Phase: Phase C
Input Phase Sequence: A, C, D, F
Output Phase Sequence: A, C, D, F

Site Layout



Lane Use and Performance

	Demand Flows Total veh/h	Demand Flows HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Northern Highway													
Lane 1	188	3.0	1368	0.138	100	10.4	LOS B	2.5	17.6	Short	80	0.0	NA
Lane 2	459	8.0	547[1]	0.839	100	41.5	LOS D	24.2	181.3	Full	500	0.0	0.0
Lane 3	529	8.0	630	0.839	100	42.1	LOS D	28.8	215.5	Full	500	0.0	0.0
Approach	1176	7.2		0.839		36.8	LOS D	28.8	215.5				
North: Northern Highway													
Lane 1	808	8.0	1124	0.719	100	16.4	LOS B	30.1	225.3	Full	500	0.0	0.0
Lane 2	628	8.0	873[1]	0.719	100	14.0	LOS B	20.0	149.5	Full	500	0.0	0.0
Lane 3	295	3.0	384	0.767	100	54.5	LOS D	15.8	113.6	Short	80	0.0	NA
Approach	1731	7.1		0.767		22.1	LOS C	30.1	225.3				
West: Taylors Lane													
Lane 1	239	3.0	400	0.597	100	47.6	LOS D	10.9	78.6	Full	500	0.0	0.0
Lane 2	60	3.0	100	0.597	100	65.0	LOS E	3.4	24.5	Full	500	0.0	0.0
Approach	299	3.0		0.597		51.1	LOS D	10.9	78.6				
Intersection	3205	6.8		0.839		30.2	LOS C	30.1	225.3				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

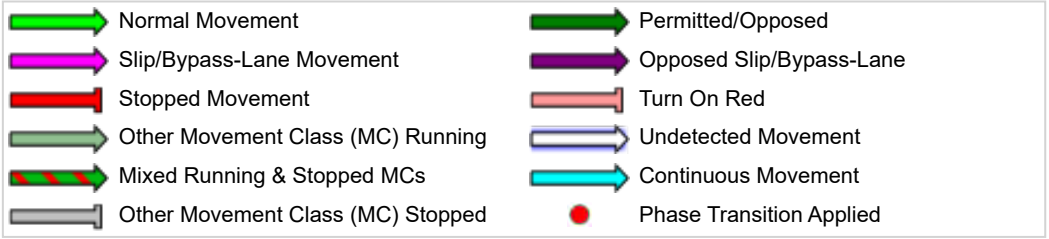
Phase Timing Summary

Phase	A	C	D	F
Phase Change Time (sec)	98	0	26	55
Green Time (sec)	6	20	23	37
Phase Time (sec)	12	26	29	43
Phase Split	11%	24%	26%	39%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence

REF: Reference Phase
VAR: Variable Phase

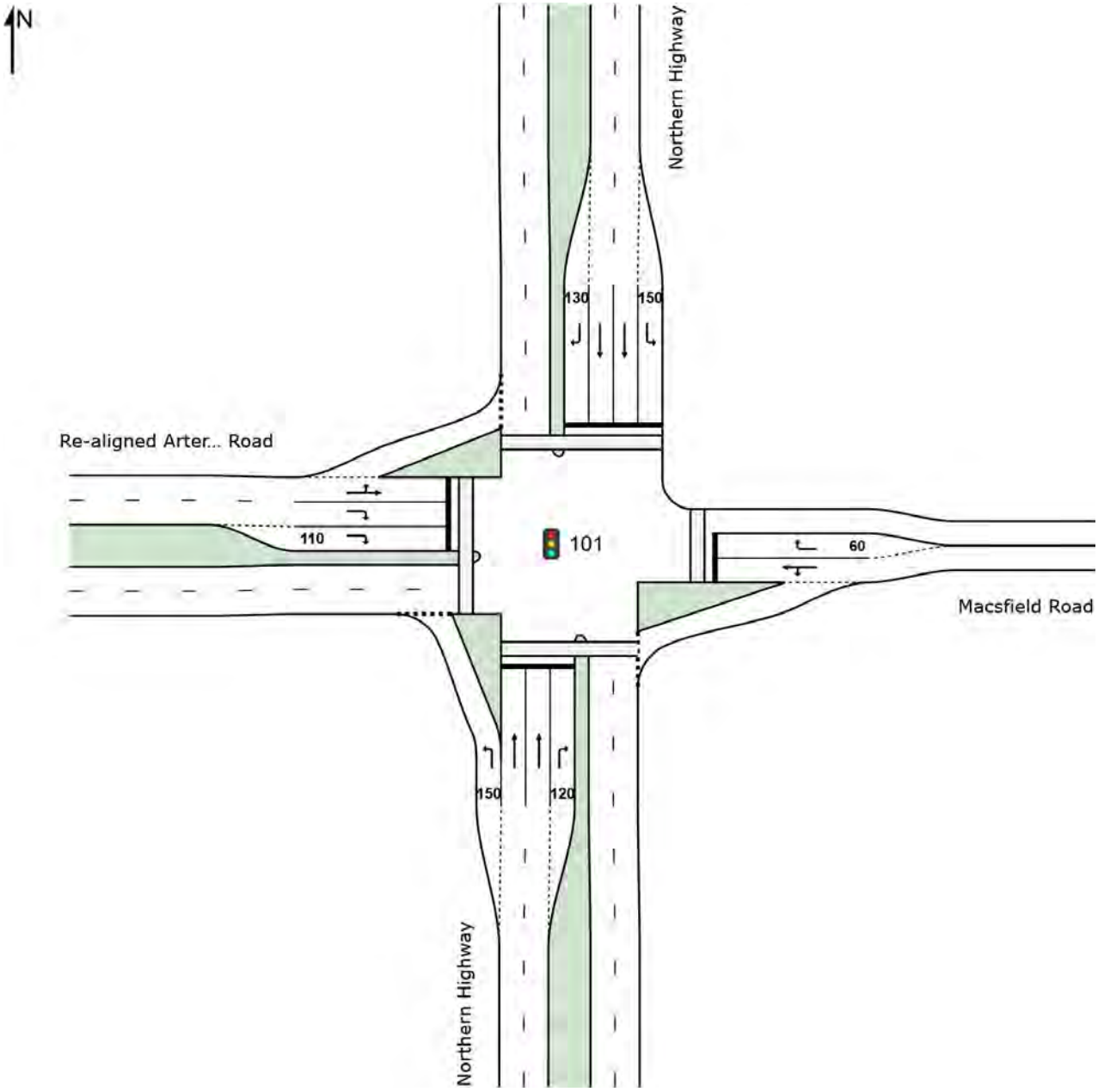


Site: 101 [50% - Ultimate - Northern Hwy / Re-aligned Arterial Rd / Macsfield Rd - AM]

New Site
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 125 seconds (Site User-Given Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Variable Phasing
Reference Phase: Phase C
Input Phase Sequence: A, B1*, B2*, C, D, E1*, E2*, F
Output Phase Sequence: A, B1*, C, D, E1*, F
(* Variable Phase)

Site Layout



Lane Use and Performance

	Demand Flows Total veh/h	Demand Flows HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Northern Highway													
Lane 1	355	3.0	1482	0.239	100	9.0	LOS A	3.7	26.3	Short	150	0.0	NA
Lane 2	616	8.0	694	0.887	100	49.7	LOS D	40.0	299.5	Full	500	0.0	0.0
Lane 3	584	8.0	658[1]	0.887	100	49.5	LOS D	37.4	279.9	Full	500	0.0	0.0
Lane 4	135	3.0	162	0.833	100	75.5	LOS E	9.0	64.4	Short	120	0.0	NA
Approach	1689	6.6		0.887		43.2	LOS D	40.0	299.5				
East: Macsfield Road													
Lane 1	272	3.0	363	0.748	100	57.6	LOS E	13.4	96.5	Full	200	0.0	0.0
Lane 2	67	3.0	147	0.458	100	67.5	LOS E	4.1	29.5	Short	60	0.0	NA
Approach	339	3.0		0.748		59.6	LOS E	13.4	96.5				
North: Northern Highway													
Lane 1	256	3.0	573	0.446	100	43.9	LOS D	12.4	89.3	Short	150	0.0	NA
Lane 2	553	8.0	629	0.879	100	51.8	LOS D	36.0	269.3	Full	500	0.0	0.0
Lane 3	540	8.0	614[1]	0.879	100	51.7	LOS D	34.9	261.3	Full	500	0.0	0.0
Lane 4	71	3.0	88	0.800	100	78.7	LOS E	4.7	34.1	Short	130	0.0	NA
Approach	1419	6.9		0.879		51.7	LOS D	36.0	269.3				
West: Re-aligned Arterial Road													
Lane 1	260	3.0	609	0.427	100	42.7	LOS D	11.4	81.9	Full	500	0.0	0.0
Lane 2	391	3.0	441	0.887	100	67.1	LOS E	26.6	191.0	Full	500	0.0	0.0
Lane 3	391	3.0	441	0.887	100	67.1	LOS E	26.6	191.0	Short	110	0.0	NA
Approach	1042	3.0		0.887		61.0	LOS E	26.6	191.0				
Intersection	4489	5.6		0.887		51.2	LOS D	40.0	299.5				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

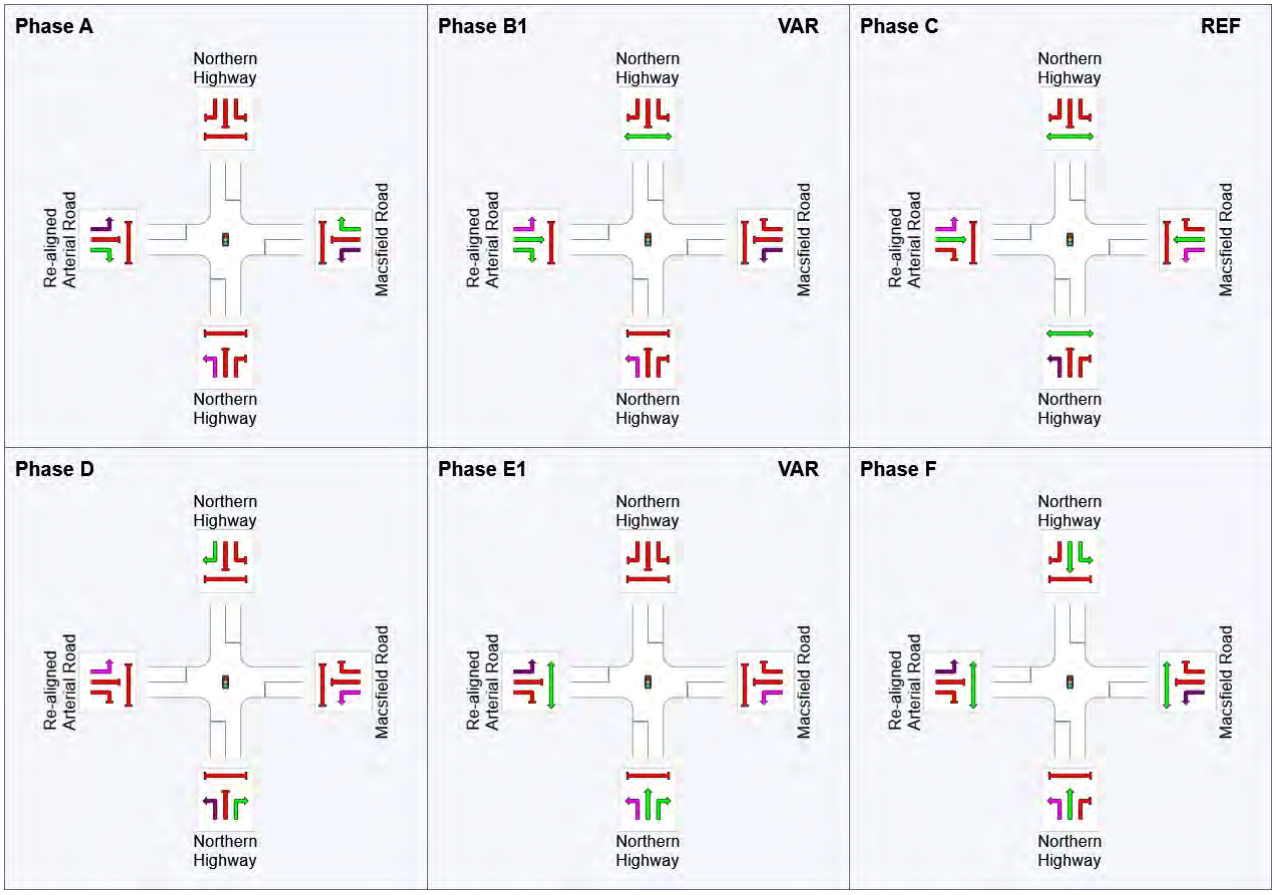
Phase Timing Summary

Phase	A	B1	C	D	E1	F
Phase Change Time (sec)	89	105	0	24	36	41
Green Time (sec)	10	14	18	6	***	42
Phase Time (sec)	16	20	24	12	5	48
Phase Split	13%	16%	19%	10%	4%	38%

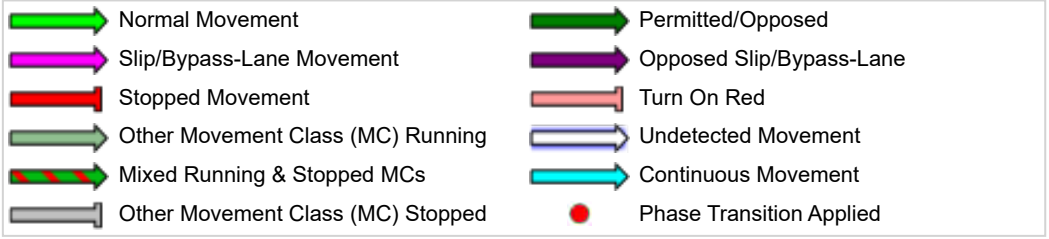
See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

*** No green time has been calculated for this phase because the next phase starts during its intergreen time. This occurs with overlap phasing where there is no single movement connecting this phase to the next, or where the only such movement is a dummy movement with zero minimum green time specified.
If a green time is required for this phase, specify a dummy movement with a non-zero minimum green time.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

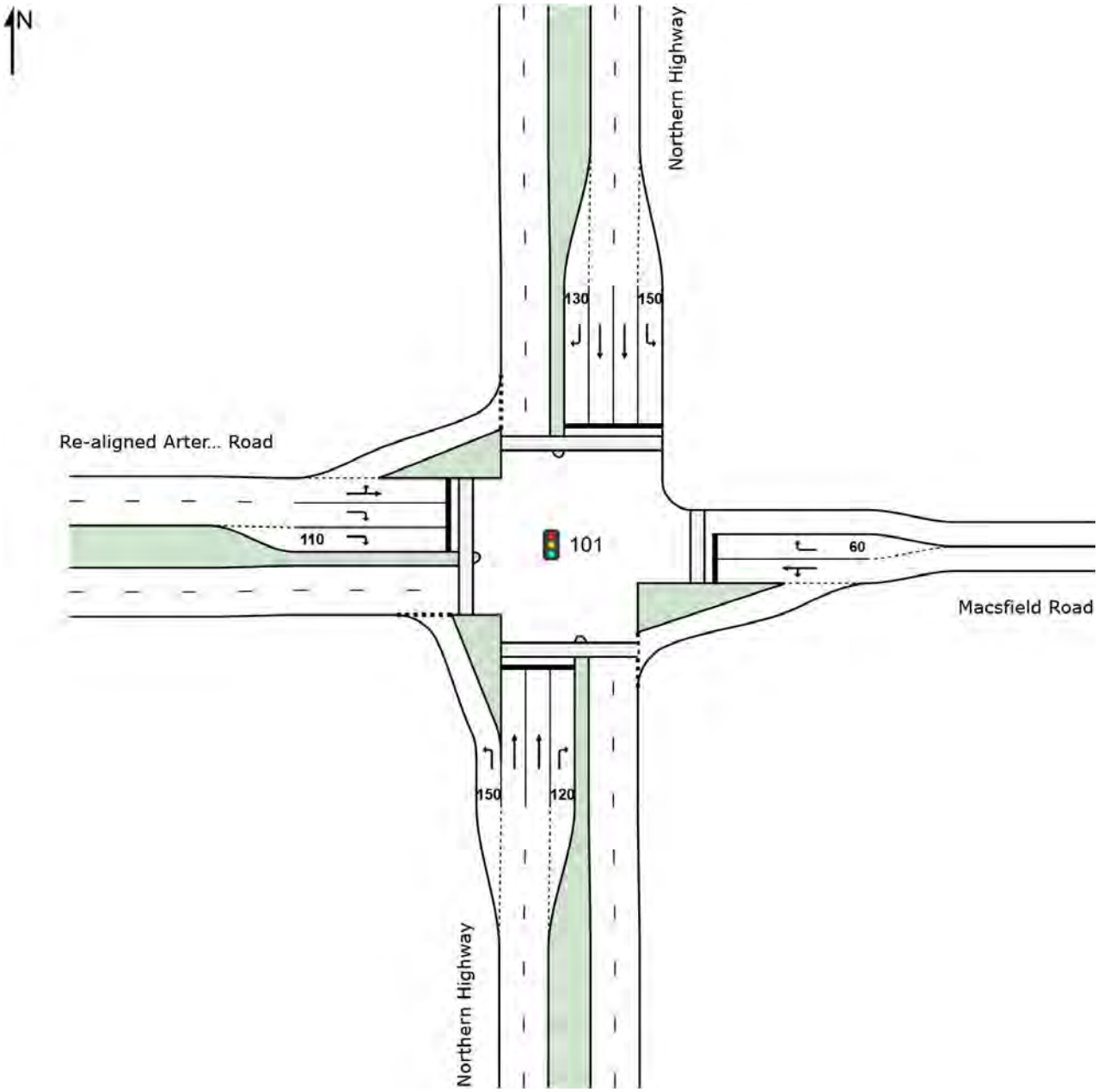


Site: 101 [50% - Ultimate - Northerm Hwy / Re-aligned Arterial Rd / Macsfield Rd - PM]

New Site
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 125 seconds (Site User-Given Phase Times)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times specified by the user
Phase Sequence: Variable Phasing - Copy - Copy
Reference Phase: Phase C
Input Phase Sequence: A, C, D, F
Output Phase Sequence: A, C, D, F

Site Layout



Lane Use and Performance

	Demand Flows Total veh/h	Demand Flows HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Northern Highway													
Lane 1	838	3.0	1257	0.666	100	16.4	LOS B	23.3	167.1	Short	150	0.0	NA
Lane 2	457	8.0	644	0.710	100	38.2	LOS D	24.1	180.6	Full	500	0.0	0.0
Lane 3	457	8.0	644	0.710	100	38.2	LOS D	24.1	180.6	Full	500	0.0	0.0
Lane 4	153	3.0	176	0.865	100	77.2	LOS E	10.4	74.4	Short	120	0.0	NA
Approach	1905	5.4		0.865		31.7	LOS C	24.1	180.6				
East: Macsfield Road													
Lane 1	459	3.0	525	0.875	100	63.6	LOS E	28.6	205.4	Full	200	0.0	7.4
Lane 2	197	3.0	220	0.893	100	76.9	LOS E	13.7	98.3	Short	60	0.0	NA
Approach	656	3.0		0.893		67.6	LOS E	28.6	205.4				
North: Northern Highway													
Lane 1	155	3.0	588	0.263	100	40.7	LOS D	7.0	50.0	Short	150	0.0	NA
Lane 2	566	8.0	644	0.878	100	51.0	LOS D	36.7	274.5	Full	500	0.0	0.0
Lane 3	546	8.0	621[1]	0.878	100	50.9	LOS D	35.1	262.4	Full	500	0.0	0.0
Lane 4	141	3.0	176	0.800	100	73.1	LOS E	9.2	66.0	Short	130	0.0	NA
Approach	1407	6.9		0.878		52.1	LOS D	36.7	274.5				
West: Re-aligned Arterial Road													
Lane 1	209	3.0	497	0.421	100	50.1	LOS D	10.1	72.9	Full	500	0.0	0.0
Lane 2	185	3.0	220	0.840	100	71.6	LOS E	12.3	88.0	Full	500	0.0	0.0
Lane 3	185	3.0	220	0.840	100	71.6	LOS E	12.3	88.0	Short	110	0.0	NA
Approach	580	3.0		0.840		63.9	LOS E	12.3	88.0				
Intersection	4548	5.2		0.893		47.3	LOS D	36.7	274.5				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

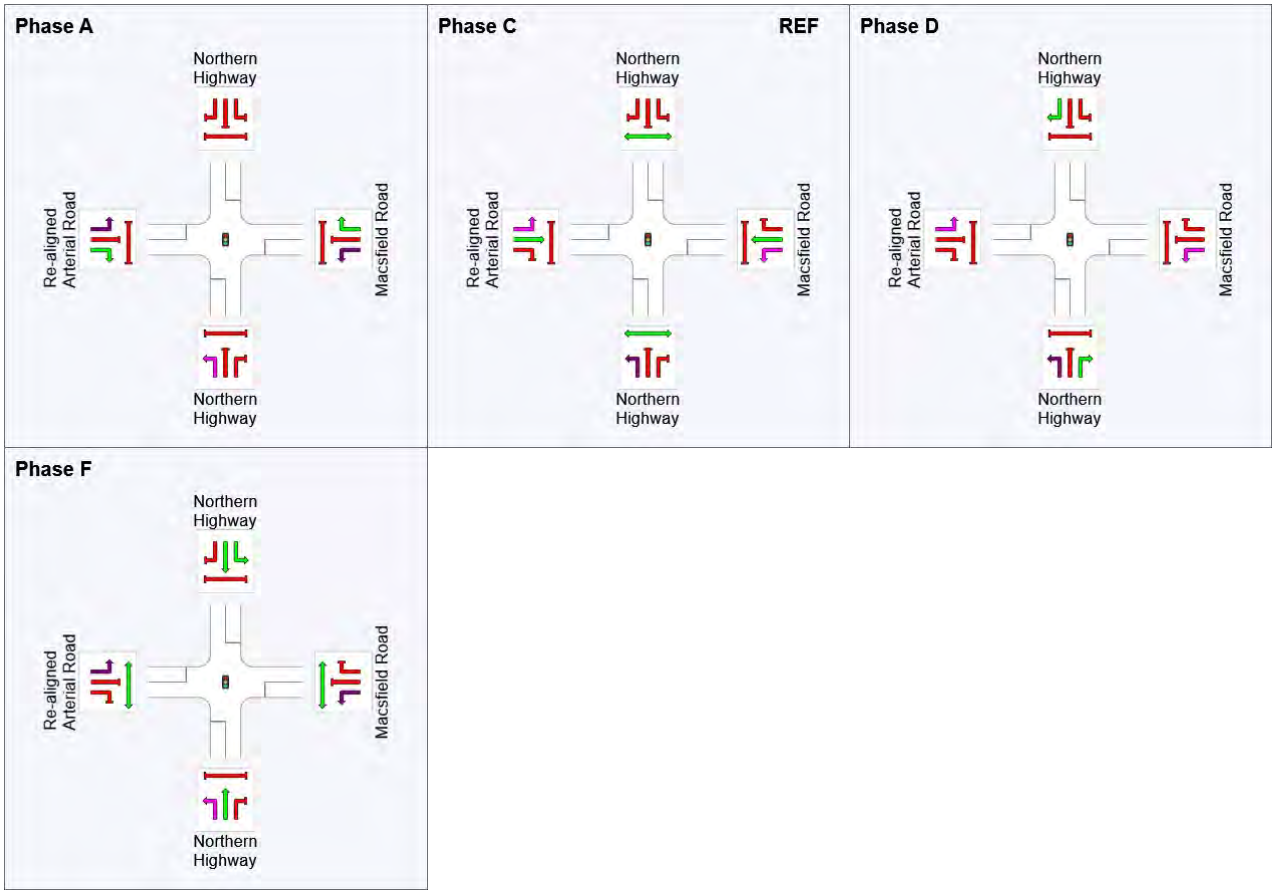
1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Phase Timing Summary

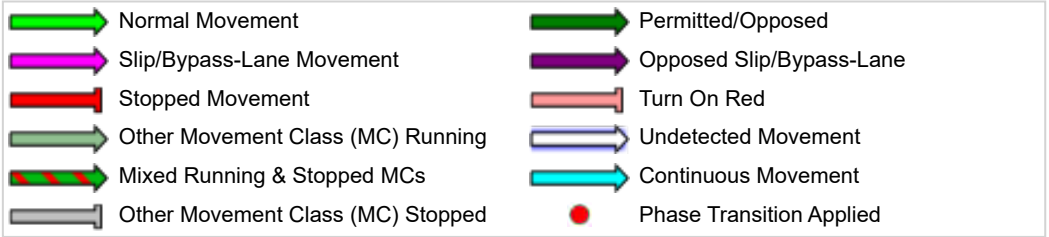
Phase	A	C	D	F
Phase Change Time (sec)	104	0	37	55
Green Time (sec)	15	31	12	43
Phase Time (sec)	21	37	18	49
Phase Split	17%	30%	14%	39%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



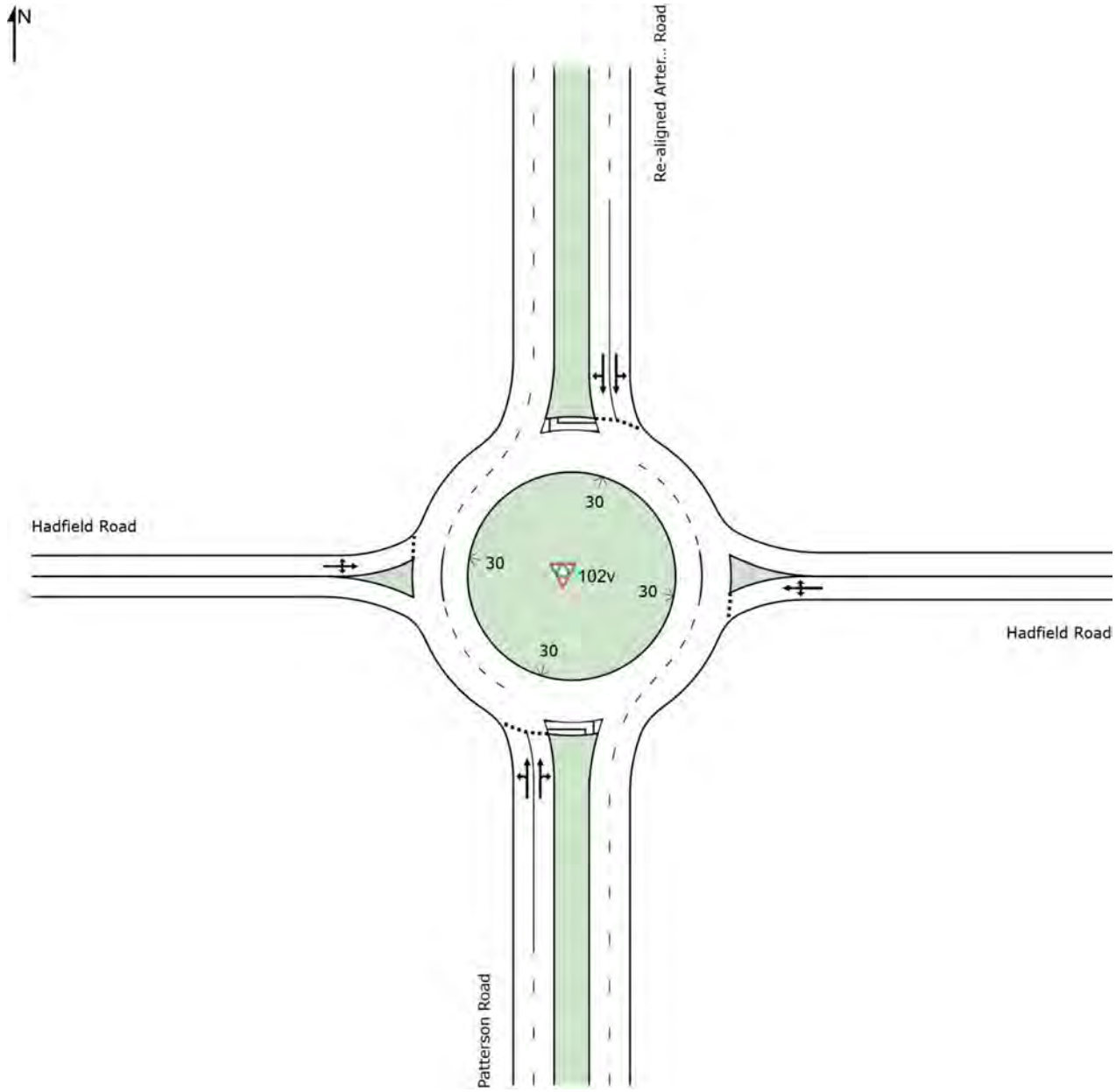
REF: Reference Phase
VAR: Variable Phase



Site: 102v [50% - Ultimate - Re-aligned Arterial Rd / Patterson Rd / Hadfield Rd - AM]

New Site
Site Category: (None)
Roundabout

Site Layout



Lane Use and Performance

	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Patterson Road													
Lane 1[d]	290	3.0	1694	0.171	100	3.8	LOS A	1.1	8.1	Full	500	0.0	0.0
Lane 2	244	3.0	1422	0.171	100	5.1	LOS A	1.1	7.9	Full	500	0.0	0.0
Approach	534	3.0		0.171		4.4	LOS A	1.1	8.1				
East: Hadfield Road													
Lane 1[d]	72	3.0	742	0.097	100	8.6	LOS A	0.4	3.0	Full	500	0.0	0.0
Approach	72	3.0		0.097		8.6	LOS A	0.4	3.0				
North: Re-aligned Arterial Road													
Lane 1[d]	326	3.0	1246	0.262	100	5.5	LOS A	2.0	14.1	Full	500	0.0	0.0
Lane 2	254	3.0	969	0.262	100	6.6	LOS A	1.8	13.0	Full	500	0.0	0.0
Approach	580	3.0		0.262		6.0	LOS A	2.0	14.1				
West: Hadfield Road													
Lane 1[d]	493	3.0	908	0.543	100	11.2	LOS B	3.7	26.3	Full	500	0.0	0.0
Approach	493	3.0		0.543		11.2	LOS B	3.7	26.3				
Intersection	1678	3.0		0.543		7.1	LOS A	3.7	26.3				

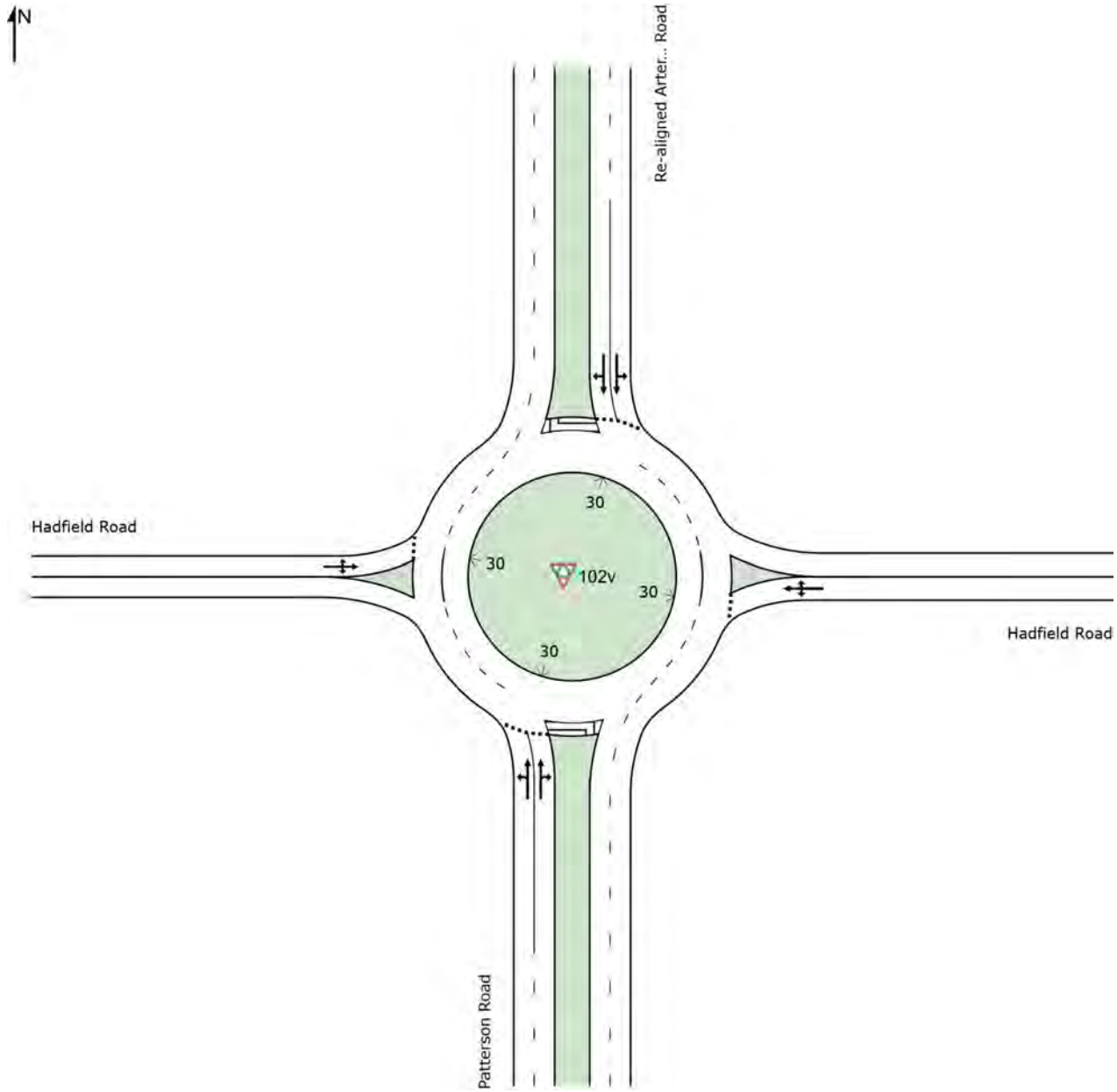
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Site: 102v [50% - Ultimate - Re-aligned Arterial Rd / Patterson Rd / Hadfield Rd - PM]

New Site
Site Category: (None)
Roundabout

Site Layout



Lane Use and Performance													
	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Patterson Road													
Lane 1[d]	564	3.0	1540	0.367	100	4.5	LOS A	2.8	20.3	Full	500	0.0	0.0
Lane 2	463	3.0	1263	0.367	100	5.4	LOS A	2.7	19.6	Full	500	0.0	0.0
Approach	1027	3.0		0.367		4.9	LOS A	2.8	20.3				
East: Hadfield Road													
Lane 1[d]	192	3.0	814	0.235	100	8.4	LOS A	1.0	7.2	Full	500	0.0	0.0
Approach	192	3.0		0.235		8.4	LOS A	1.0	7.2				
North: Re-aligned Arterial Road													
Lane 1[d]	389	3.0	1527	0.255	100	4.3	LOS A	1.8	12.9	Full	500	0.0	0.0
Lane 2	320	3.0	1254	0.255	100	5.6	LOS A	1.7	12.4	Full	500	0.0	0.0
Approach	709	3.0		0.255		4.9	LOS A	1.8	12.9				
West: Hadfield Road													
Lane 1[d]	185	3.0	792	0.234	100	9.5	LOS A	1.2	8.6	Full	500	0.0	0.0
Approach	185	3.0		0.234		9.5	LOS A	1.2	8.6				
Intersection	2114	3.0		0.367		5.6	LOS A	2.8	20.3				

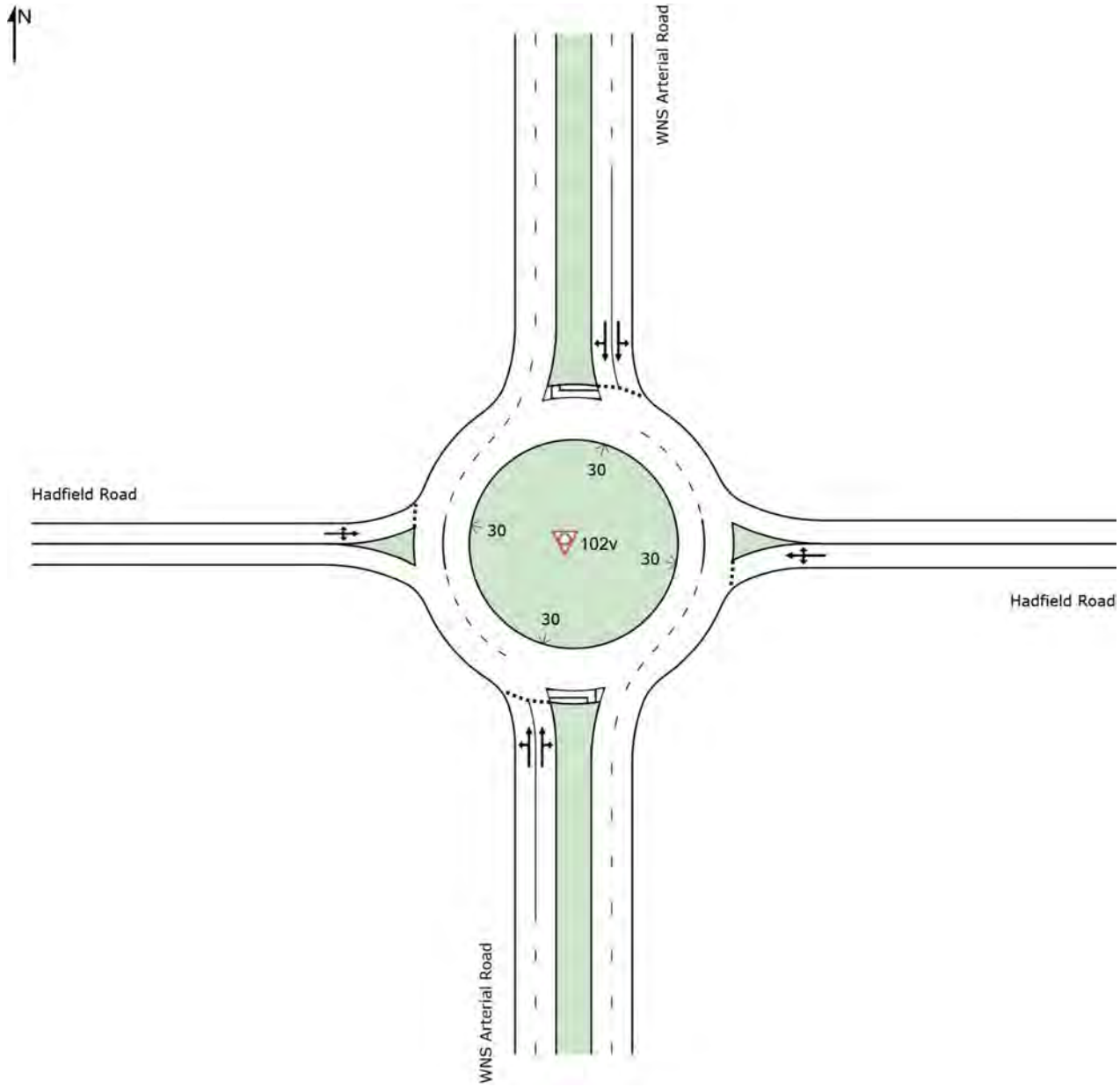
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Site: 102v [50% - Ultimate - WNS Arterial Rd / Hadfield Rd - AM]

New Site
Site Category: (None)
Roundabout

Site Layout



Lane Use and Performance													
	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: WNS Arterial Road													
Lane 1[d]	166	3.0	1691	0.098	100	3.8	LOS A	0.6	4.4	Full	500	0.0	0.0
Lane 2	140	3.0	1429	0.098	100	5.4	LOS A	0.6	4.3	Full	500	0.0	0.0
Approach	306	3.0		0.098		4.5	LOS A	0.6	4.4				
East: Hadfield Road													
Lane 1[d]	99	3.0	810	0.122	100	7.7	LOS A	0.5	3.6	Full	500	0.0	0.0
Approach	99	3.0		0.122		7.7	LOS A	0.5	3.6				
North: WNS Arterial Road													
Lane 1[d]	557	3.0	1631	0.341	100	4.1	LOS A	2.5	18.0	Full	500	0.0	0.0
Lane 2	462	3.0	1354	0.341	100	4.5	LOS A	2.5	17.7	Full	500	0.0	0.0
Approach	1019	3.0		0.341		4.3	LOS A	2.5	18.0				
West: Hadfield Road													
Lane 1[d]	87	3.0	1012	0.086	100	7.9	LOS A	0.4	2.6	Full	500	0.0	0.0
Approach	87	3.0		0.086		7.9	LOS A	0.4	2.6				
Intersection	1512	3.0		0.341		4.8	LOS A	2.5	18.0				

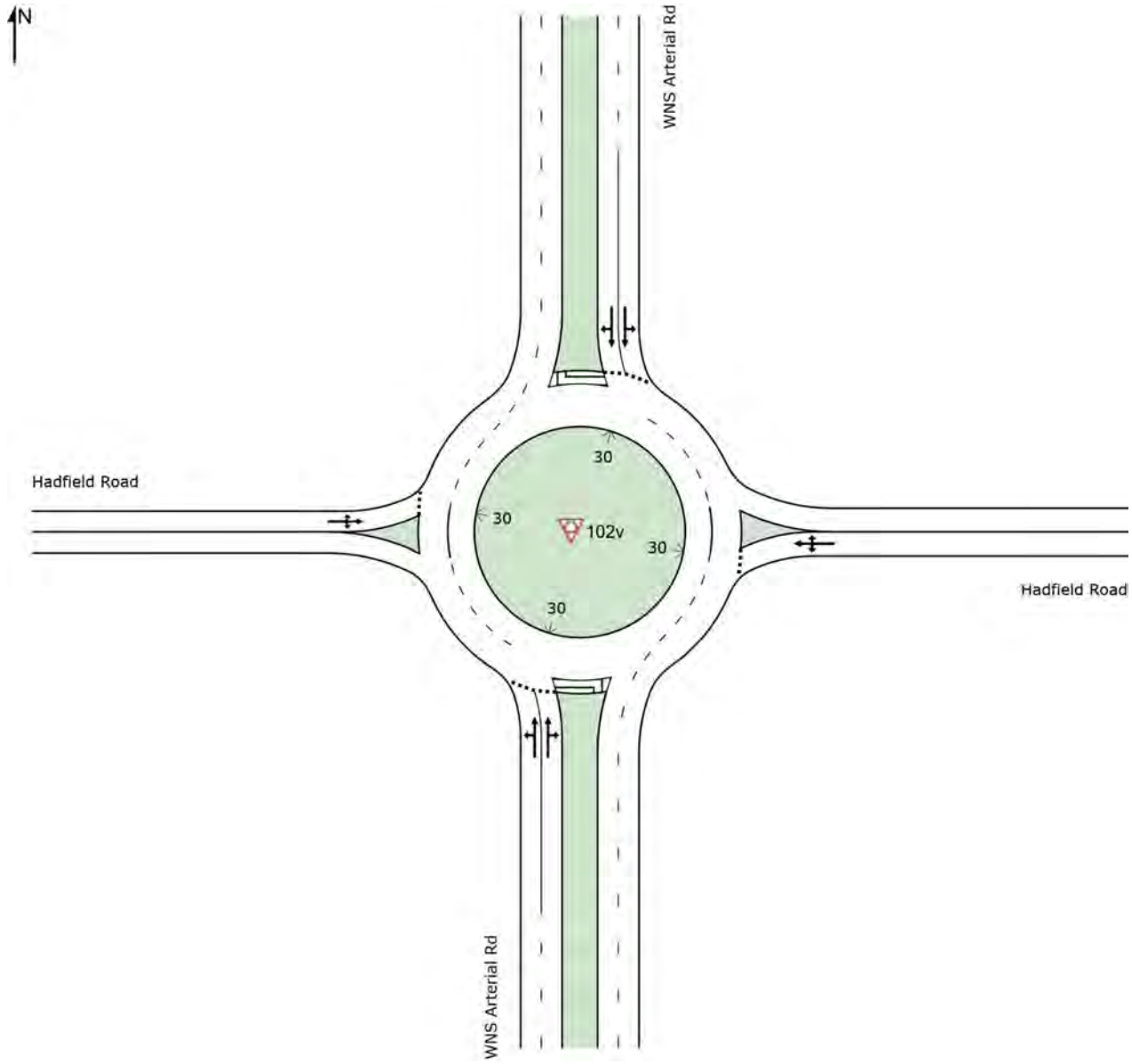
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Site: 102v [50% - Ultimate - WNS Arterial Rd / Hadfield Rd - PM]

New Site
Site Category: (None)
Roundabout

Site Layout



Lane Use and Performance													
	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: WNS Arterial Rd													
Lane 1[d]	414	3.0	1253	0.330	100	5.6	LOS A	2.6	18.5	Full	500	0.0	0.0
Lane 2	322	3.0	976	0.330	100	7.8	LOS A	2.4	17.0	Full	500	0.0	0.0
Approach	736	3.0		0.330		6.6	LOS A	2.6	18.5				
East: Hadfield Road													
Lane 1[d]	526	3.0	1010	0.521	100	9.9	LOS A	3.2	22.7	Full	500	0.0	0.0
Approach	526	3.0		0.521		9.9	LOS A	3.2	22.7				
North: WNS Arterial Rd													
Lane 1[d]	249	3.0	1620	0.154	100	4.0	LOS A	1.0	7.3	Full	500	0.0	0.0
Lane 2	208	3.0	1353	0.154	100	4.2	LOS A	1.0	7.1	Full	500	0.0	0.0
Approach	457	3.0		0.154		4.1	LOS A	1.0	7.3				
West: Hadfield Road													
Lane 1[d]	36	3.0	605	0.059	100	9.4	LOS A	0.3	2.0	Full	500	0.0	0.0
Approach	36	3.0		0.059		9.4	LOS A	0.3	2.0				
Intersection	1755	3.0		0.521		7.0	LOS A	3.2	22.7				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

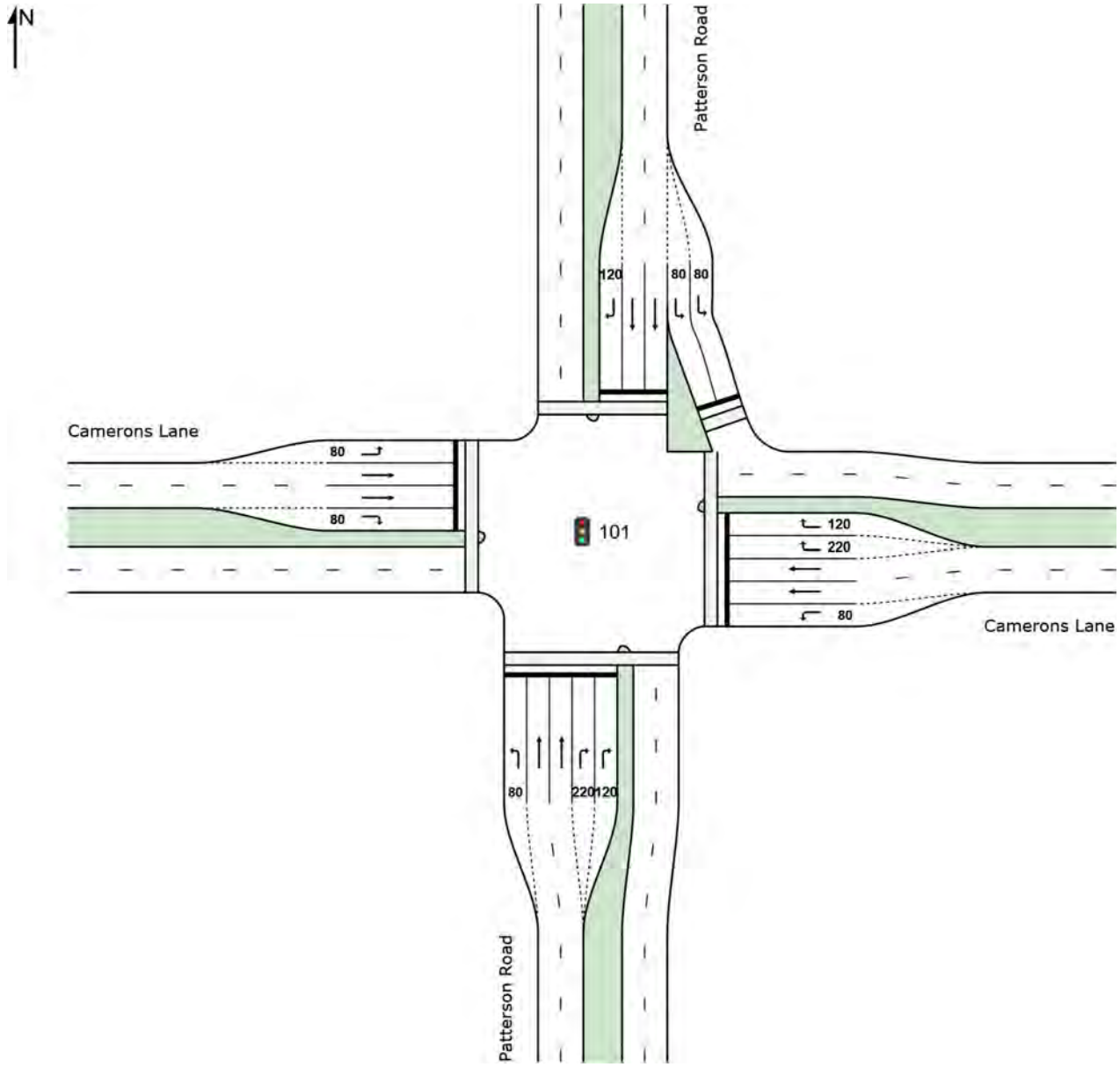
d Dominant lane on roundabout approach

Site: 101 [50% - Ultimate - Patterson Rd / Camerons Lane - AM]

New Site
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 110 seconds (Site User-Given Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Variable Phasing - Copy (2)
Reference Phase: Phase C
Input Phase Sequence: A, B2, C, D, E2, F
Output Phase Sequence: A, B2, C, D, E2, F

Site Layout



Lane Use and Performance

	Demand Flows Total veh/h	Demand Flows HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Patterson Road													
Lane 1	34	3.0	701	0.048	100	28.2	LOS C	1.1	8.0	Short	80	0.0	NA
Lane 2	77	3.0	369	0.210	100	40.7	LOS D	3.5	25.4	Full	500	0.0	0.0
Lane 3	77	3.0	369	0.210	100	40.7	LOS D	3.5	25.4	Full	500	0.0	0.0
Lane 4	74	3.0	117	0.630	100	64.1	LOS E	4.2	29.9	Short	220	0.0	NA
Lane 5	74	3.0	117	0.630	100	64.1	LOS E	4.2	29.9	Short	120	0.0	NA
Approach	336	3.0		0.630		49.8	LOS D	4.2	29.9				
East: Camerons Lane													
Lane 1	335	3.0	768	0.436	100	29.9	LOS C	12.7	91.2	Short	80	0.0	NA
Lane 2	41	3.0	580	0.071	100	29.3	LOS C	1.6	11.2	Full	500	0.0	0.0
Lane 3	41	3.0	580	0.071	100	29.3	LOS C	1.6	11.2	Full	500	0.0	0.0
Lane 4	200	3.0	501	0.399	100	41.0	LOS D	8.8	63.2	Short	220	0.0	NA
Lane 5	200	3.0	501	0.399	100	41.0	LOS D	8.8	63.2	Short	120	0.0	NA
Approach	817	3.0		0.436		35.3	LOS D	12.7	91.2				
North: Patterson Road													
Lane 1	752	3.0	1119	0.672	100	20.8	LOS C	26.4	189.5	Short	80	0.0	NA
Lane 2	569	3.0	846[1]	0.672	100	18.6	LOS B	17.0	122.3	Short	80	0.0	NA
Lane 3	211	3.0	545	0.388	100	34.3	LOS C	9.2	65.7	Full	500	0.0	0.0
Lane 4	211	3.0	545	0.388	100	34.3	LOS C	9.2	65.7	Full	500	0.0	0.0
Lane 5	92	3.0	284	0.323	100	51.2	LOS D	4.5	32.1	Short	120	0.0	NA
Approach	1835	3.0		0.672		24.7	LOS C	26.4	189.5				
West: Camerons Lane													
Lane 1	205	3.0	685	0.300	100	31.7	LOS C	7.7	55.5	Short	80	0.0	NA
Lane 2	212	3.0	316	0.669	100	48.1	LOS D	11.0	79.1	Full	500	0.0	0.0
Lane 3	212	3.0	316	0.669	100	48.1	LOS D	11.0	79.1	Full	500	0.0	0.0
Lane 4	55	3.0	251	0.218	100	52.2	LOS D	2.7	19.2	Short	80	0.0	NA
Approach	683	3.0		0.669		43.5	LOS D	11.0	79.1				
Intersection	3671	3.0		0.672		32.9	LOS C	26.4	189.5				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

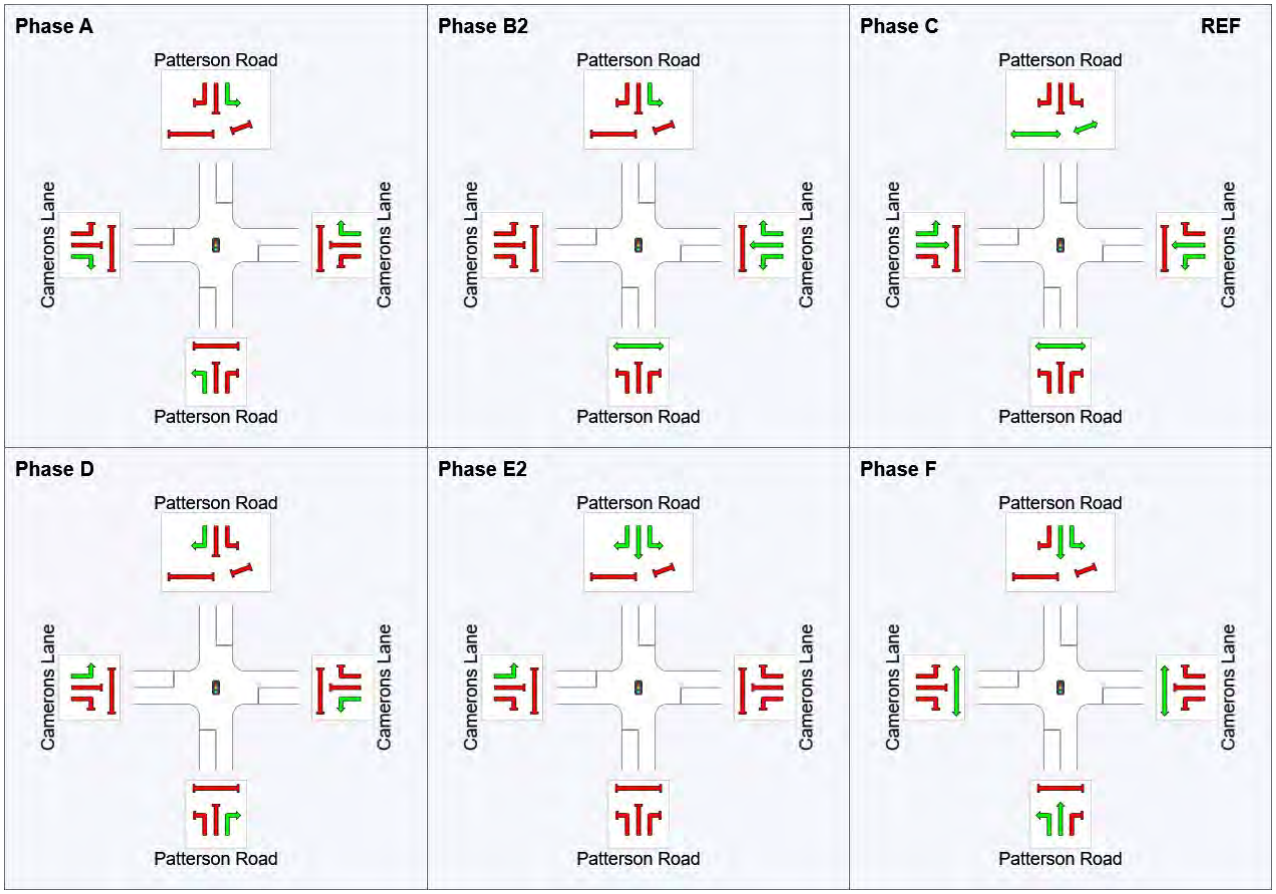
1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Phase Timing Summary

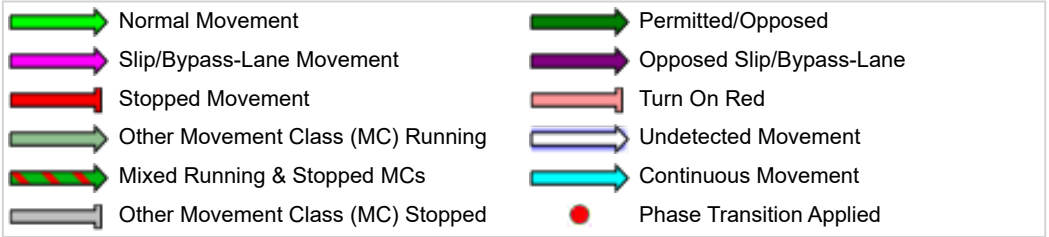
Phase	A	B2	C	D	E2	F
Phase Change Time (sec)	74	95	0	24	37	47
Green Time (sec)	15	9	18	7	4	21
Phase Time (sec)	21	15	24	13	10	27
Phase Split	19%	14%	22%	12%	9%	25%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

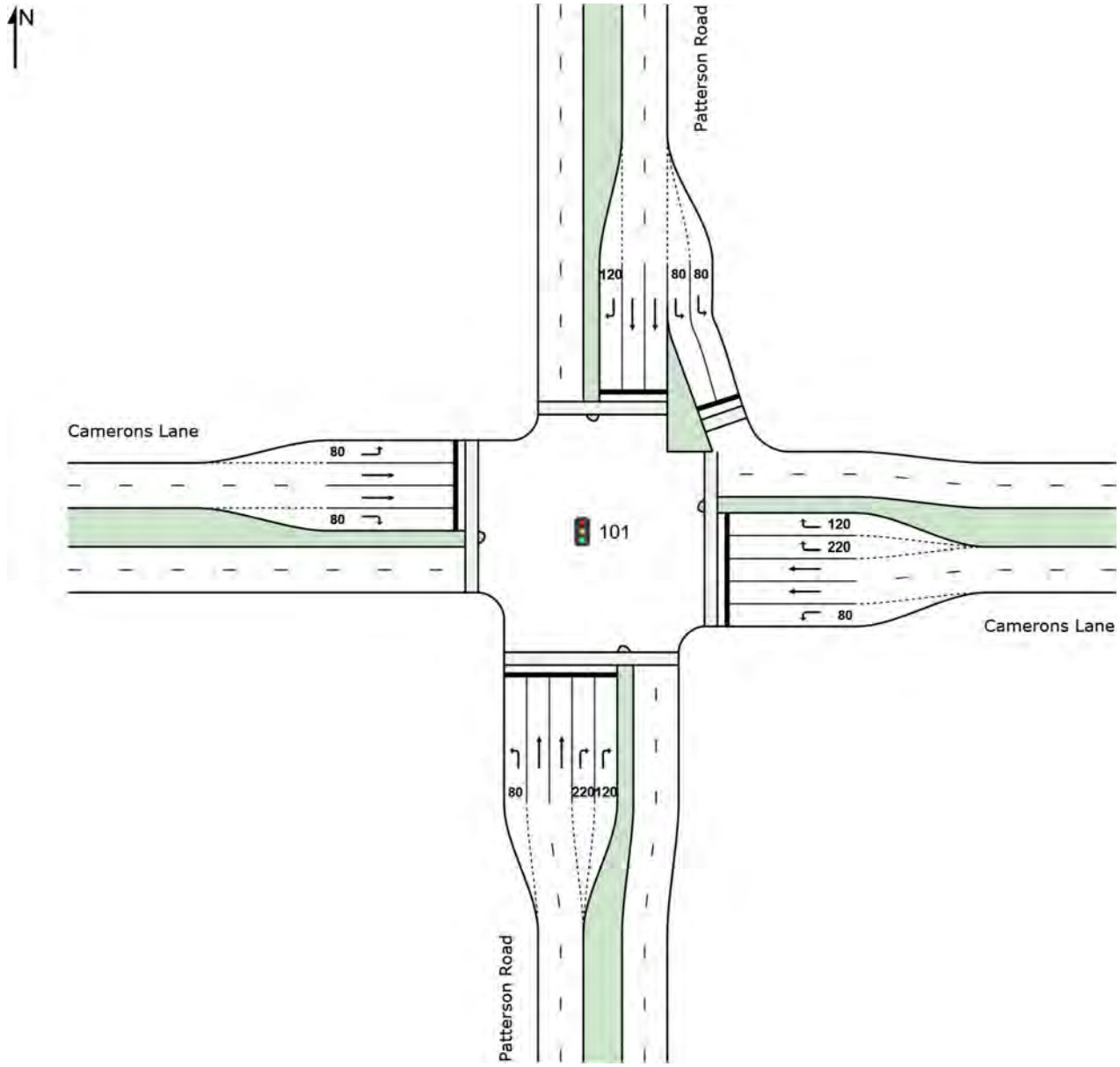


Site: 101 [50% - Ultimate - Patterson Rd / Camerons Lane - PM]

New Site
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 110 seconds (Site User-Given Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Variable Phasing - Copy
Reference Phase: Phase C
Input Phase Sequence: A, B2, C, D, E1, F
Output Phase Sequence: A, B2, C, D, E1, F

Site Layout



Lane Use and Performance

	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Patterson Road													
Lane 1	26	3.0	534	0.049	100	35.4	LOS D	1.0	7.2	Short	80	0.0	NA
Lane 2	249	3.0	351	0.710	100	47.5	LOS D	13.1	93.9	Full	500	0.0	0.0
Lane 3	249	3.0	351	0.710	100	47.5	LOS D	13.1	93.9	Full	500	0.0	0.0
Lane 4	183	3.0	251	0.729	100	58.1	LOS E	10.0	71.8	Short	220	0.0	NA
Lane 5	183	3.0	251	0.729	100	58.1	LOS E	10.0	71.8	Short	120	0.0	NA
Approach	891	3.0		0.729		51.5	LOS D	13.1	93.9				
East: Camerons Lane													
Lane 1	291	3.0	1219	0.238	100	13.4	LOS B	6.1	43.8	Short	80	0.0	NA
Lane 2	259	3.0	914	0.284	100	18.8	LOS B	8.4	60.1	Full	500	0.0	0.0
Lane 3	259	3.0	914	0.284	100	18.8	LOS B	8.4	60.1	Full	500	0.0	0.0
Lane 4	633	3.0	835	0.758	100	32.4	LOS C	28.1	202.1	Short	220	0.0	NA
Lane 5	633	3.0	835	0.758	100	32.4	LOS C	28.1	202.1	Short	120	0.0	NA
Approach	2076	3.0		0.758		26.3	LOS C	28.1	202.1				
North: Patterson Road													
Lane 1	233	3.0	835	0.279	100	25.6	LOS C	7.7	55.5	Short	80	0.0	NA
Lane 2	233	3.0	835	0.279	100	25.6	LOS C	7.7	55.5	Short	80	0.0	NA
Lane 3	166	3.0	228	0.726	100	53.9	LOS D	9.1	65.6	Full	500	0.0	0.0
Lane 4	166	3.0	228	0.726	100	53.9	LOS D	9.1	65.6	Full	500	0.0	0.0
Lane 5	99	3.0	134	0.741	100	64.9	LOS E	5.7	40.8	Short	120	0.0	NA
Approach	897	3.0		0.741		40.4	LOS D	9.1	65.6				
West: Camerons Lane													
Lane 1	147	3.0	367	0.401	100	47.4	LOS D	7.0	50.1	Short	80	0.0	NA
Lane 2	52	3.0	141	0.367	100	55.1	LOS E	2.8	20.0	Full	500	0.0	0.0
Lane 3	52	3.0	141	0.367	100	55.1	LOS E	2.8	20.0	Full	500	0.0	0.0
Lane 4	22	3.0	100	0.221	100	62.7	LOS E	1.2	8.7	Short	80	0.0	NA
Approach	273	3.0		0.401		51.6	LOS D	7.0	50.1				
Intersection	4136	3.0		0.758		36.5	LOS D	28.1	202.1				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

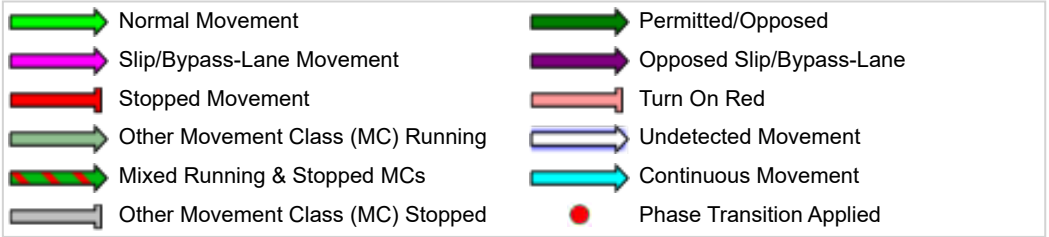
Phase Timing Summary

Phase	A	B2	C	D	E1	F
Phase Change Time (sec)	54	66	0	14	28	35
Green Time (sec)	6	38	8	8	1	13
Phase Time (sec)	12	44	14	14	7	19
Phase Split	11%	40%	13%	13%	6%	17%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence

REF: Reference Phase
VAR: Variable Phase



USER REPORT FOR SITE

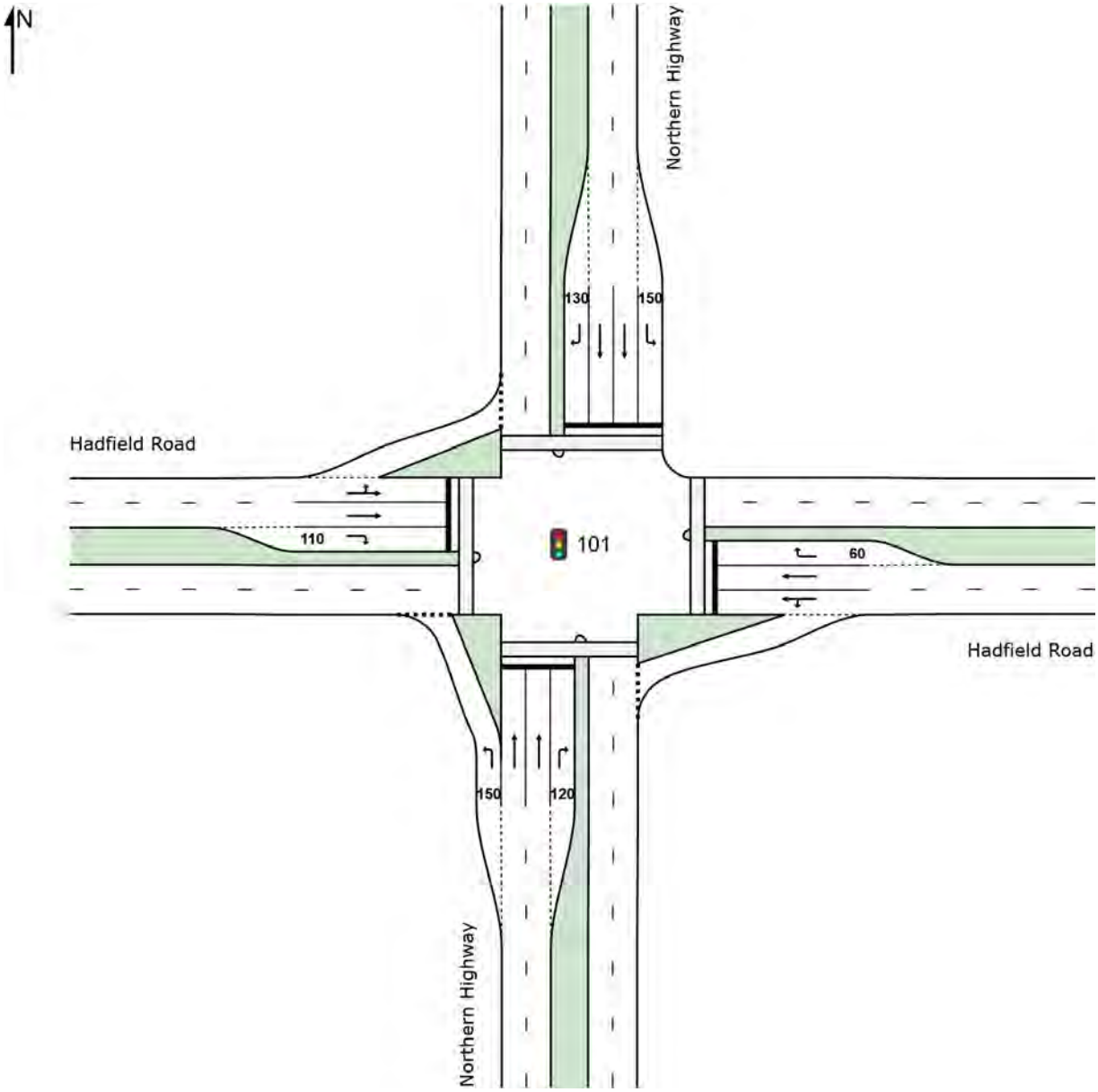
Project: 190900_SIDRA_Beveridge NW PSP_200701 **Template: Site User Report**

Site: 101 [Orig. - Ultimate - Northern Hwy / Hadfield Rd - AM]

New Site
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 125 seconds (Site User-Given Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Variable Phasing
Reference Phase: Phase C
Input Phase Sequence: A, B1*, B2*, C, D, E1*, E2*, F
Output Phase Sequence: A, C, D, E1*, F
(* Variable Phase)

Site Layout



Lane Use and Performance

	Demand Flows Total veh/h	Demand Flows HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Northern Highway													
Lane 1	26	3.0	1379	0.019	100	8.1	LOS A	0.3	2.2	Short	150	0.0	NA
Lane 2	491	8.0	719	0.682	100	34.4	LOS C	24.8	185.7	Full	500	0.0	0.0
Lane 3	491	8.0	719	0.682	100	34.4	LOS C	24.8	185.7	Full	500	0.0	0.0
Lane 4	318	3.0	279	1.138	100	202.8	LOS F	39.3	282.1	Short	120	0.0	NA
Approach	1325	6.7		1.138		74.3	LOS E	39.3	282.1				
East: Hadfield Road													
Lane 1	185	3.0	343	0.540	100	53.5	LOS D	9.2	66.4	Full	200	0.0	0.0
Lane 2	134	3.0	247	0.540	100	56.4	LOS E	7.8	56.3	Full	200	0.0	50.5[8]
Lane 3	359	3.0	313[1]	1.148	100	211.1	LOS F	45.7	328.2	Short	60	0.0	NA
Approach	678	3.0		1.148		137.5	LOS F	45.7	328.2				
North: Northern Highway													
Lane 1	518	3.0	632	0.819	100	49.6	LOS D	30.5	219.1	Short	150	0.0	NA
Lane 2	703	8.0	616[1]	1.141	100	194.9	LOS F	90.2	674.5	Full	500	0.0	32.3
Lane 3	707	8.0	619[1]	1.141	100	194.8	LOS F	90.7	678.4	Full	500	0.0	32.8
Lane 4	145	3.0	206	0.706	100	66.6	LOS E	9.0	64.7	Short	130	0.0	NA
Approach	2073	6.4		1.141		149.6	LOS F	90.7	678.4				
West: Hadfield Road													
Lane 1	437	3.0	403	1.087	100	129.9	LOS F	42.1	302.6	Full	500	0.0	0.0
Lane 2	269	3.0	247	1.087	100	157.2	LOS F	29.1	208.8	Full	500	0.0	0.0
Lane 3	69	3.0	338	0.206	100	52.5	LOS D	3.6	26.0	Short	110	0.0	NA
Approach	776	3.0		1.087		132.4	LOS F	42.1	302.6				
Intersection	4852	5.5		1.148		124.6	LOS F	90.7	678.4				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
8 Probability of Blockage has been set on the basis of a queue that overflows from a short lane.

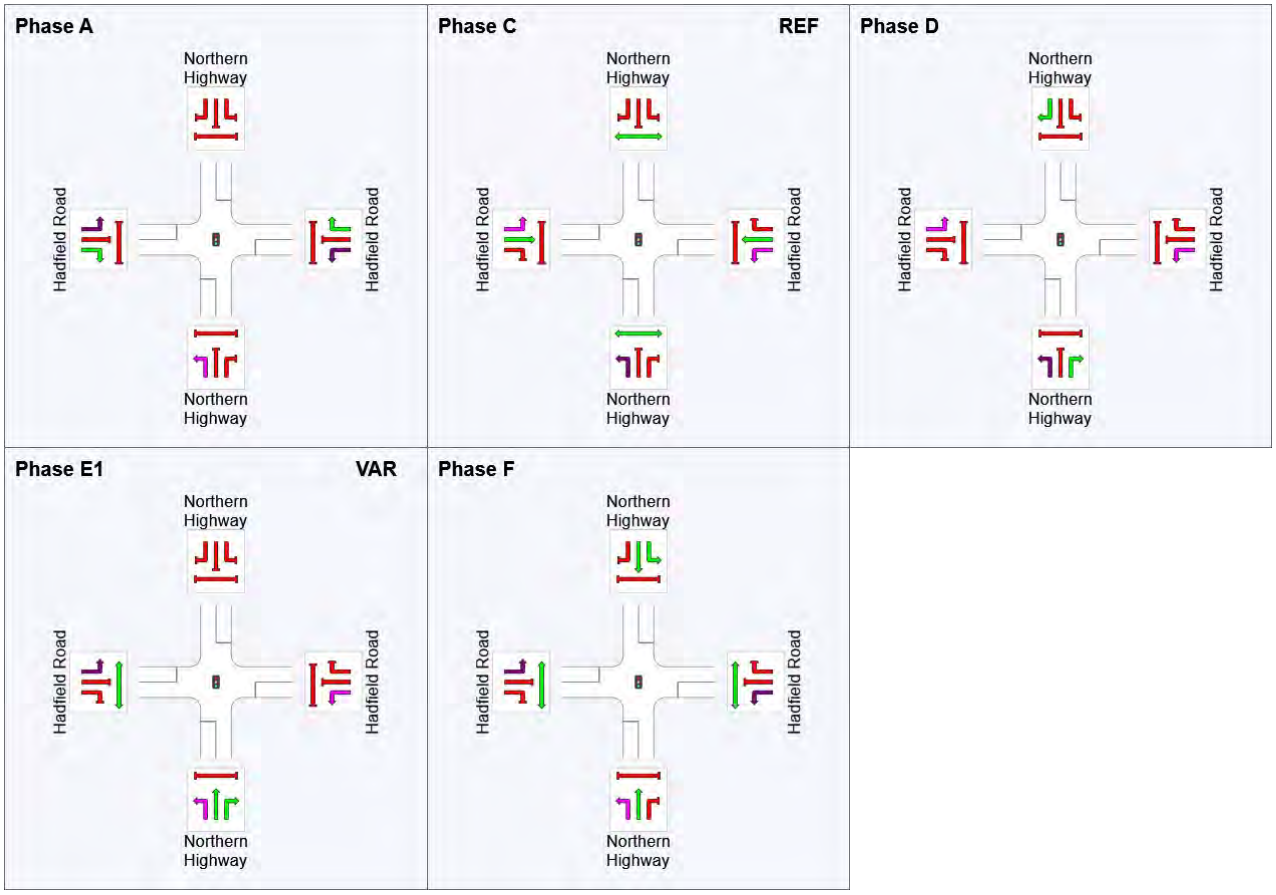
Phase Timing Summary

Phase	A	C	D	E1	F
Phase Change Time (sec)	96	0	22	42	47
Green Time (sec)	23	16	14	***	43
Phase Time (sec)	29	22	20	5	49
Phase Split	23%	18%	16%	4%	39%

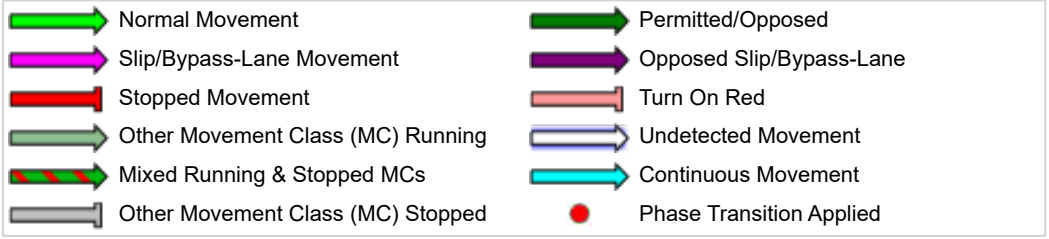
See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

*** No green time has been calculated for this phase because the next phase starts during its intergreen time. This occurs with overlap phasing where there is no single movement connecting this phase to the next, or where the only such movement is a dummy movement with zero minimum green time specified.
If a green time is required for this phase, specify a dummy movement with a non-zero minimum green time.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

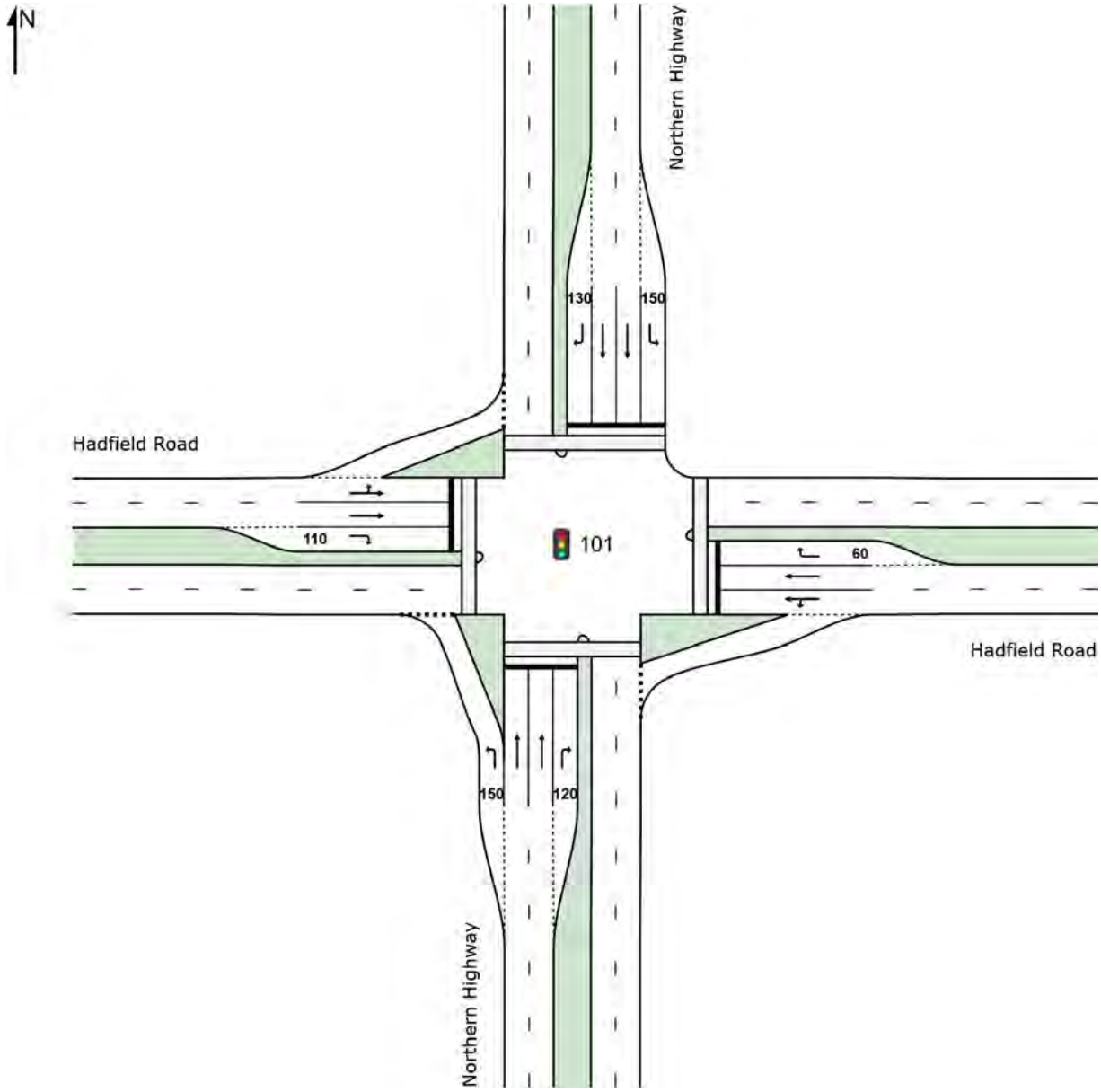


Site: 101 [Orig. - Ultimate - Northern Hwy / Hadfield Rd - PM]

New Site
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 125 seconds (Site User-Given Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Variable Phasing
Reference Phase: Phase C
Input Phase Sequence: A, B1*, B2*, C, D, E1*, E2*, F
Output Phase Sequence: A, B2*, C, D, E2*, F
(* Variable Phase)

Site Layout



Lane Use and Performance

	Demand Flows Total veh/h	Demand Flows HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Northern Highway													
Lane 1	94	3.0	1097	0.085	100	12.5	LOS B	1.9	13.5	Short	150	0.0	NA
Lane 2	670	8.0	609[1]	1.101	100	162.9	LOS F	78.2	584.6	Full	500	0.0	19.2
Lane 3	643	8.0	584[1]	1.101	100	163.6	LOS F	75.2	562.2	Full	500	0.0	15.6
Lane 4	157	3.0	176	0.889	100	78.2	LOS E	10.9	78.1	Short	120	0.0	NA
Approach	1563	7.2		1.101		145.7	LOS F	78.2	584.6				
East: Hadfield Road													
Lane 1	508	3.0	664	0.765	100	47.6	LOS D	26.3	189.0	Full	200	0.0	0.0
Lane 2	360	3.0	470[1]	0.765	100	39.5	LOS D	18.8	135.1	Full	200	0.0	59.7[8]
Lane 3	446	3.0	412[1]	1.083	100	160.6	LOS F	50.4	361.9	Short	60	0.0	NA
Approach	1314	3.0		1.083		83.8	LOS F	50.4	361.9				
North: Northern Highway													
Lane 1	428	3.0	617	0.694	100	44.2	LOS D	22.6	162.2	Short	150	0.0	NA
Lane 2	587	8.0	629	0.934	100	64.5	LOS E	43.3	324.2	Full	500	0.0	0.0
Lane 3	554	8.0	593[1]	0.934	100	64.4	LOS E	40.3	301.4	Full	500	0.0	0.0
Lane 4	214	3.0	191	1.118	100	187.5	LOS F	24.9	179.1	Short	130	0.0	NA
Approach	1783	6.2		1.118		74.3	LOS E	43.3	324.2				
West: Hadfield Road													
Lane 1	219	3.0	222	0.991	100	109.8	LOS F	18.2	130.5	Full	500	0.0	0.0
Lane 2	153	3.0	155	0.991	100	98.5	LOS F	12.5	89.9	Full	500	0.0	0.0
Lane 3	33	3.0	88	0.370	100	72.1	LOS E	2.1	14.8	Short	110	0.0	NA
Approach	405	3.0		0.991		102.5	LOS F	18.2	130.5				
Intersection	5065	5.4		1.118		101.1	LOS F	78.2	584.6				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
8 Probability of Blockage has been set on the basis of a queue that overflows from a short lane.

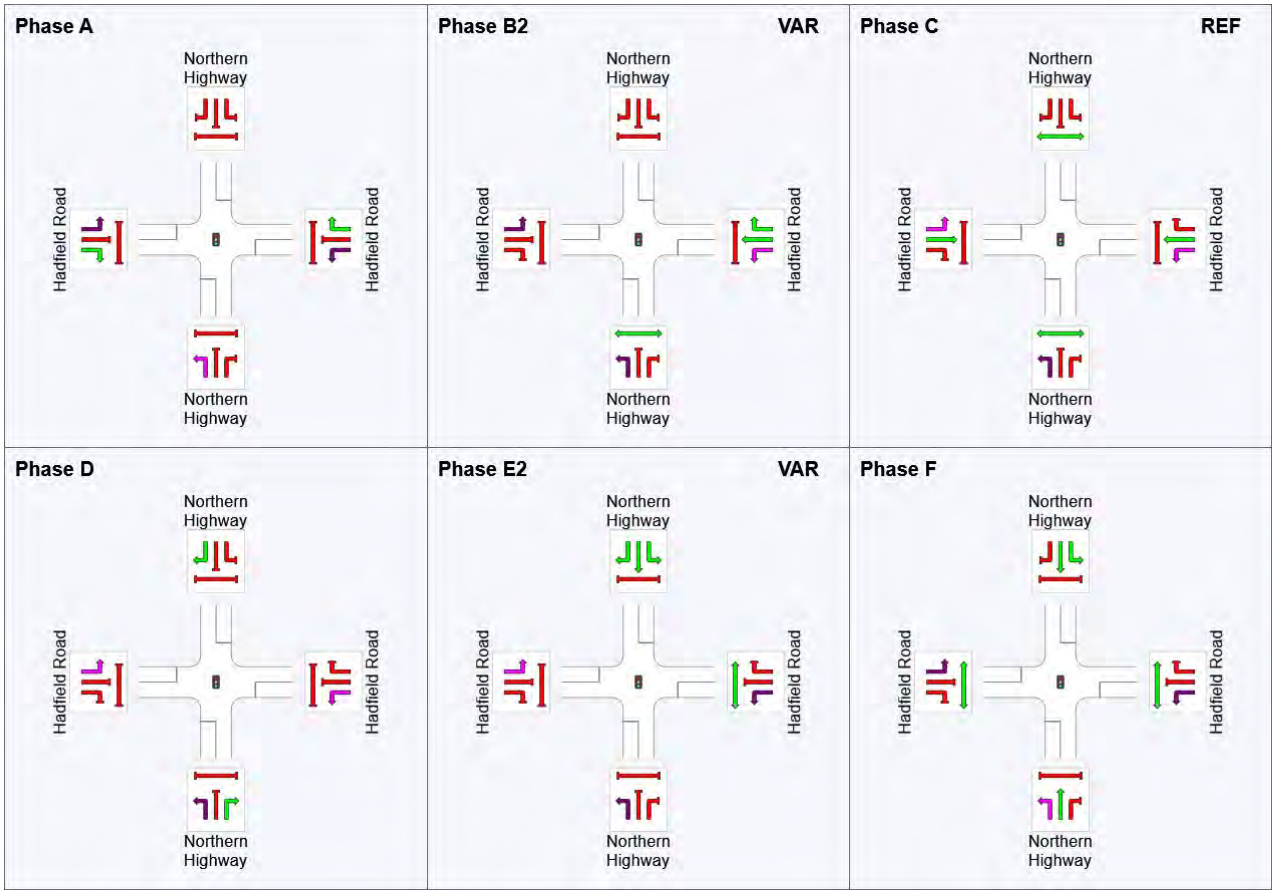
Phase Timing Summary

Phase	A	B2	C	D	E2	F
Phase Change Time (sec)	82	94	0	16	34	35
Green Time (sec)	6	25	10	12	***	41
Phase Time (sec)	12	31	16	18	1	47
Phase Split	10%	25%	13%	14%	1%	38%

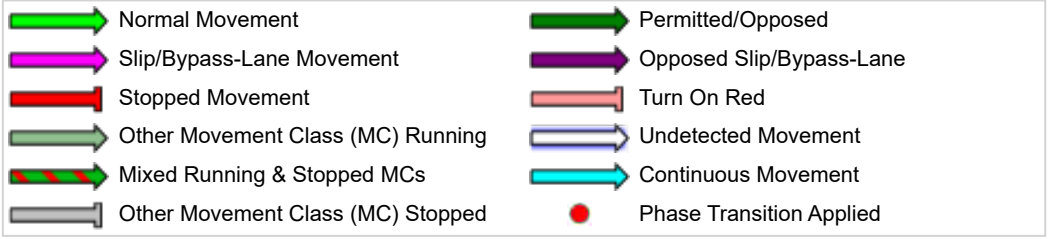
See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

*** No green time has been calculated for this phase because the next phase starts during its intergreen time. This occurs with overlap phasing where there is no single movement connecting this phase to the next, or where the only such movement is a dummy movement with zero minimum green time specified.
If a green time is required for this phase, specify a dummy movement with a non-zero minimum green time.

Output Phase Sequence



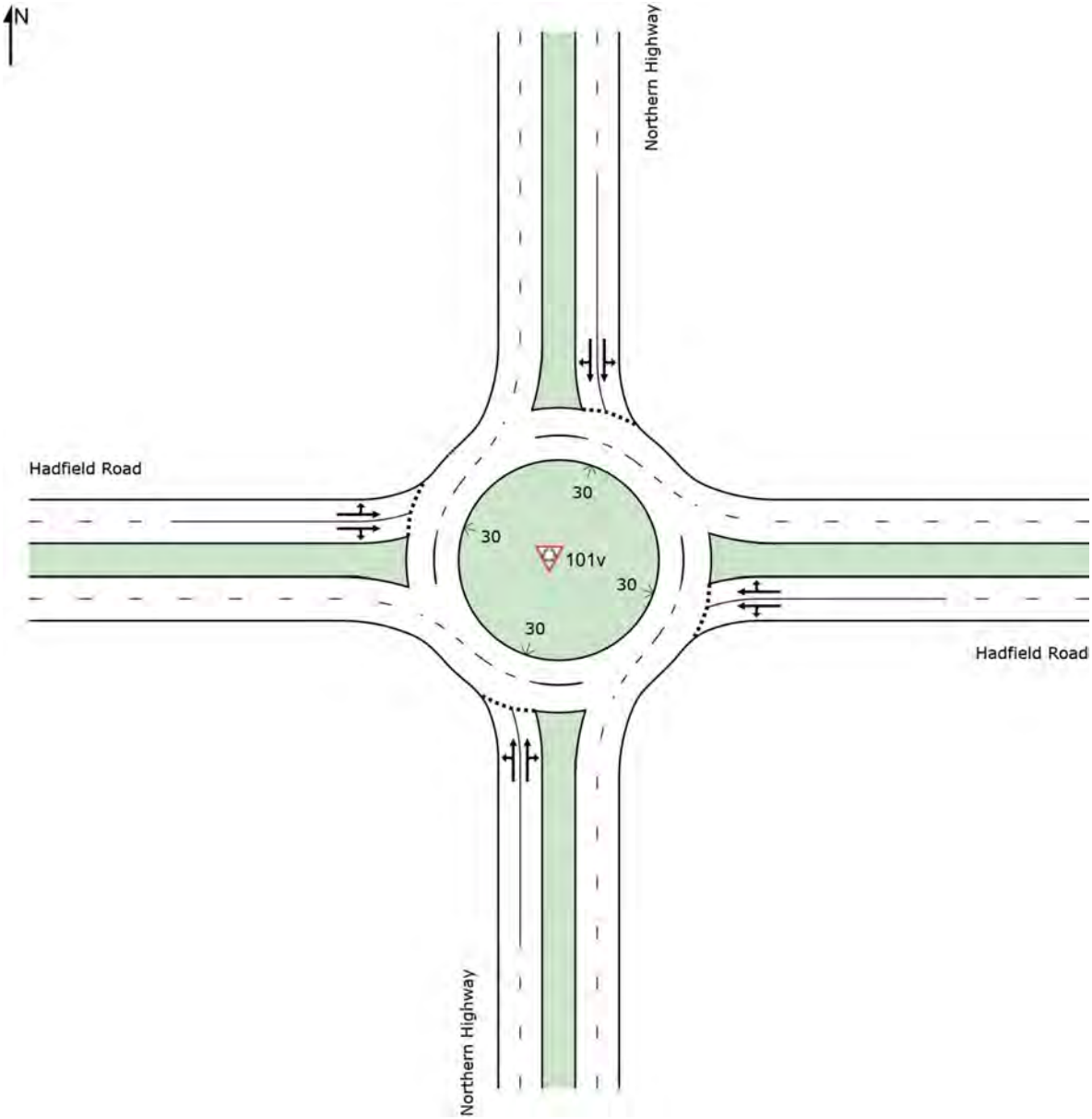
REF: Reference Phase
VAR: Variable Phase



Site: 101v [Orig. - Ultimate - Northern Hwy / Hadfield Rd - AM]

New Site
Site Category: (None)
Roundabout

Site Layout



Lane Use and Performance

	Demand Flows Total veh/h	Demand Flows HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Northern Highway													
Lane 1[d]	715	7.8	887	0.806	100	12.4	LOS B	10.1	75.6	Full	500	0.0	0.0
Lane 2	610	5.4	756	0.806	100	16.9	LOS B	9.6	70.2	Full	500	0.0	0.0
Approach	1325	6.7		0.806		14.5	LOS B	10.1	75.6				
East: Hadfield Road													
Lane 1	289	3.0	425	0.679	100	15.3	LOS B	4.9	35.5	Full	200	0.0	0.0
Lane 2[d]	389	3.0	573	0.679	100	18.2	LOS B	5.6	40.5	Full	200	0.0	0.0
Approach	678	3.0		0.679		16.9	LOS B	5.6	40.5				
North: Northern Highway													
Lane 1[d]	1143	5.7	864	1.323	100	304.3	LOS F	191.5	1406.1	Full	500	0.0	73.3
Lane 2	930	7.2	703	1.323	100	307.3	LOS F	157.6	1171.8	Full	500	0.0	43.9
Approach	2073	6.4		1.323		305.7	LOS F	191.5	1406.1				
West: Hadfield Road													
Lane 1[d]	459	3.0	501	0.915	100	35.8	LOS D	12.6	90.5	Full	500	0.0	0.0
Lane 2	317	3.0	347	0.915	100	44.8	LOS D	10.2	73.0	Full	500	0.0	0.0
Approach	776	3.0		0.915		39.5	LOS D	12.6	90.5				
Intersection	4852	5.5		1.323		143.2	LOS F	191.5	1406.1				

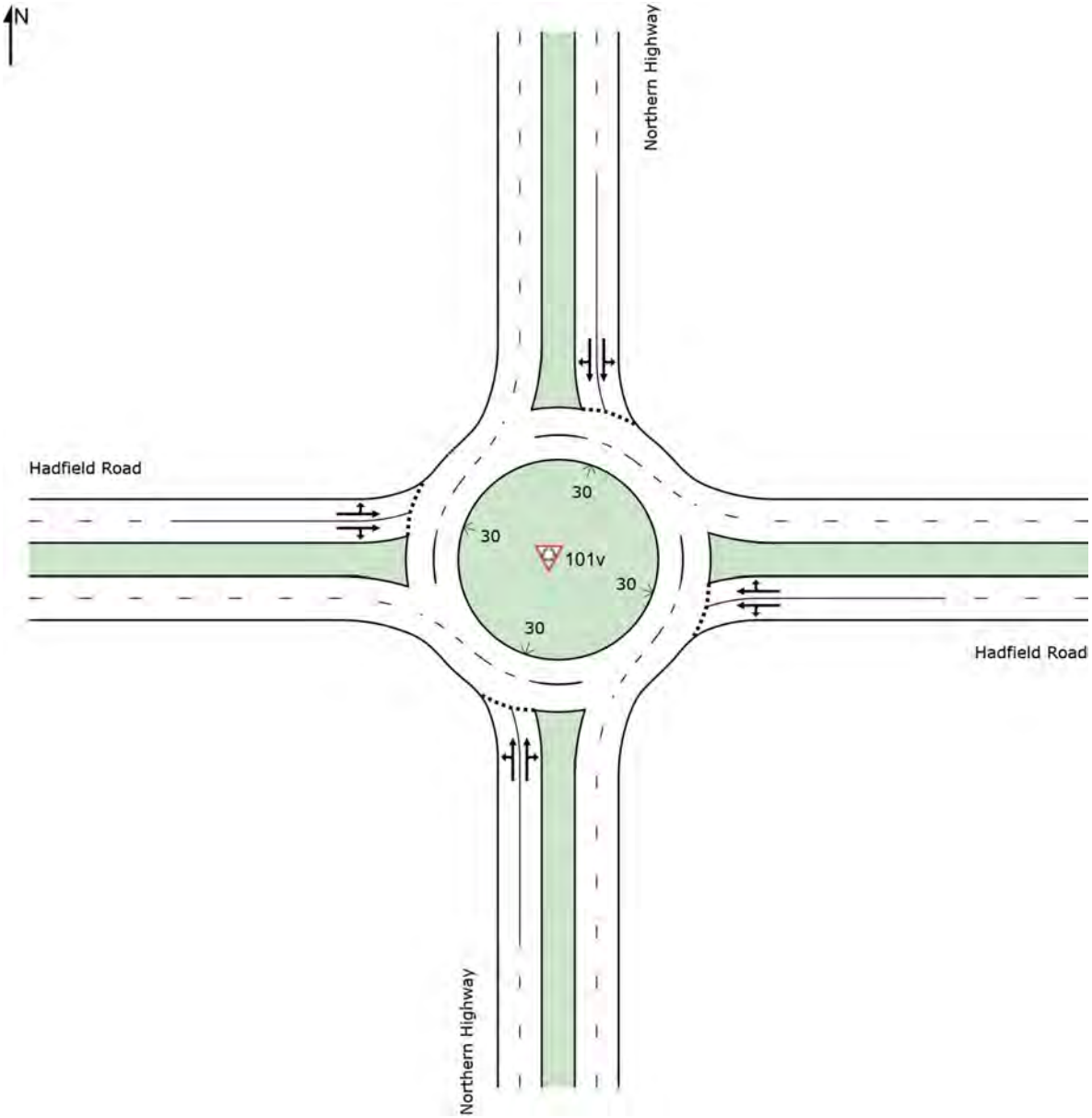
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Site: 101v [Orig. - Ultimate - Northern Hwy / Hadfield Rd - PM]

New Site
Site Category: (None)
Roundabout

Site Layout



Lane Use and Performance

	Demand Flows Total veh/h	Demand Flows HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Northern Highway													
Lane 1[d]	873	7.5	735	1.188	100	185.8	LOS F	101.1	753.0	Full	500	0.0	18.8
Lane 2	690	6.9	581	1.188	100	190.2	LOS F	81.6	605.0	Full	500	0.0	10.9
Approach	1563	7.2		1.188		187.7	LOS F	101.1	753.0				
East: Hadfield Road													
Lane 1[d]	761	3.0	520	1.464	100	433.8	LOS F	163.6	1174.8	Full	200	0.0	100.0
Lane 2	553	3.0	377	1.464	100	441.2	LOS F	120.6	865.9	Full	200	0.0	100.0
Approach	1314	3.0		1.464		436.9	LOS F	163.6	1174.8				
North: Northern Highway													
Lane 1[d]	960	5.8	1117	0.859	100	11.4	LOS B	14.1	103.5	Full	500	0.0	0.0
Lane 2	824	6.7	959	0.859	100	14.5	LOS B	13.8	101.8	Full	500	0.0	0.0
Approach	1783	6.2		0.859		12.8	LOS B	14.1	103.5				
West: Hadfield Road													
Lane 1[d]	237	3.0	524	0.453	100	10.4	LOS B	3.0	21.6	Full	500	0.0	0.0
Lane 2	168	3.0	370	0.453	100	13.7	LOS B	2.6	18.9	Full	500	0.0	0.0
Approach	405	3.0		0.453		11.8	LOS B	3.0	21.6				
Intersection	5065	5.4		1.464		176.7	LOS F	163.6	1174.8				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

ATTACHMENT E
SPRING HILL CONE – CONCEPT PLANS

Legend

- PSP - Property Boundary
- Quarry Site
- Open Space
- Proposed Road

Note: Plan has been prepared with the intention of the quarry proceeding

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FOR DISCUSSION

No.	Revision Description	Drawn	Checked	Date
1	Prepared for Panel Hearing	JG	SM	June 2020

Millar | Merrigan
Land Development Consultants

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Millar & Merrigan Pty Ltd ACN 005 541 668
Metro 2/126 Merrindale Drive, Croydon 3136
Regional 156 Commercial Road, Morwell 3840
Mail PO Box 247 Croydon, Victoria 3136

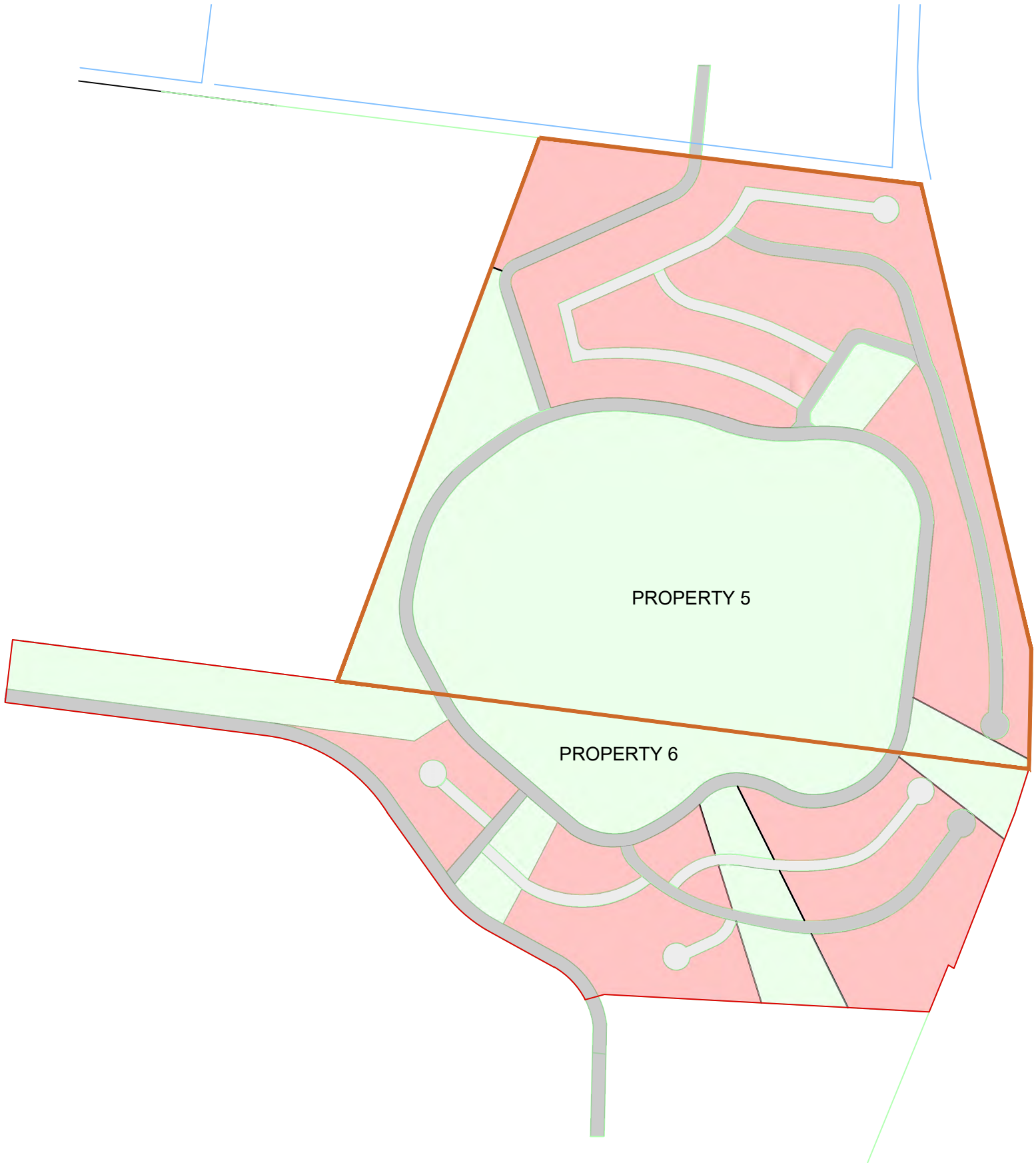
North

PROPOSED LAYOUT PLAN

SPRING HILL CONE

175 Northern Highway, Wallan
Mitchell Shire Council

11850 RL 01
VERSION 1
SHEET 1 OF 1



LAND ALLOCATION OF SITE AREA (PROPERTY 5)			
	SITE AREA	69.36ha	
	LAND USES		% NET DEV. AREA
	LOCAL ROADS	*8.79ha*	*12.7%*
	OPEN SPACE	*36.87ha*	*53.2%*
	RESIDENTIAL LAND	*23.70ha*	*34.2%*
	TOTAL AREA	69.36ha	100.0%

@15 Lots per hectare = Total number of lots = 356

@20 Lots per hectare = Total number of lots = 474

LAND ALLOCATION BELOW SITE AREA (PROPERTY 6)			
	SITE AREA	38.88ha	
	LAND USES		% NET DEV. AREA
	LOCAL ROADS	*7.07ha*	*18.2%*
	OPEN SPACE	*15.99ha*	*41.1%*
	RESIDENTIAL LAND	*15.82ha*	*40.7%*
	TOTAL AREA	38.88ha	100.0%

@15 Lots per hectare = Total number of lots = 237

@20 Lots per hectare = Total number of lots = 316

No.	Revision Description	Drawn	Checked	Date
2.	Amended areas and reserve	AHW		6/07/2020
1.	Prepared for discussion purposes	AHW	JG	3/07/2020

North

150 75 0 150

1:7500

Original sheet size A3

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FOR DISCUSSION

Millar | Merrigan

Land Development Consultants

Civil Engineering
Land Surveying
Landscape Architecture
Project Management
Town Planning
Urban Design

SAI GLOBAL Quality ISO 9001

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www.millarmerrigan.com.au
survey@millarmerrigan.com.au

LAND ALLOCATION PLAN

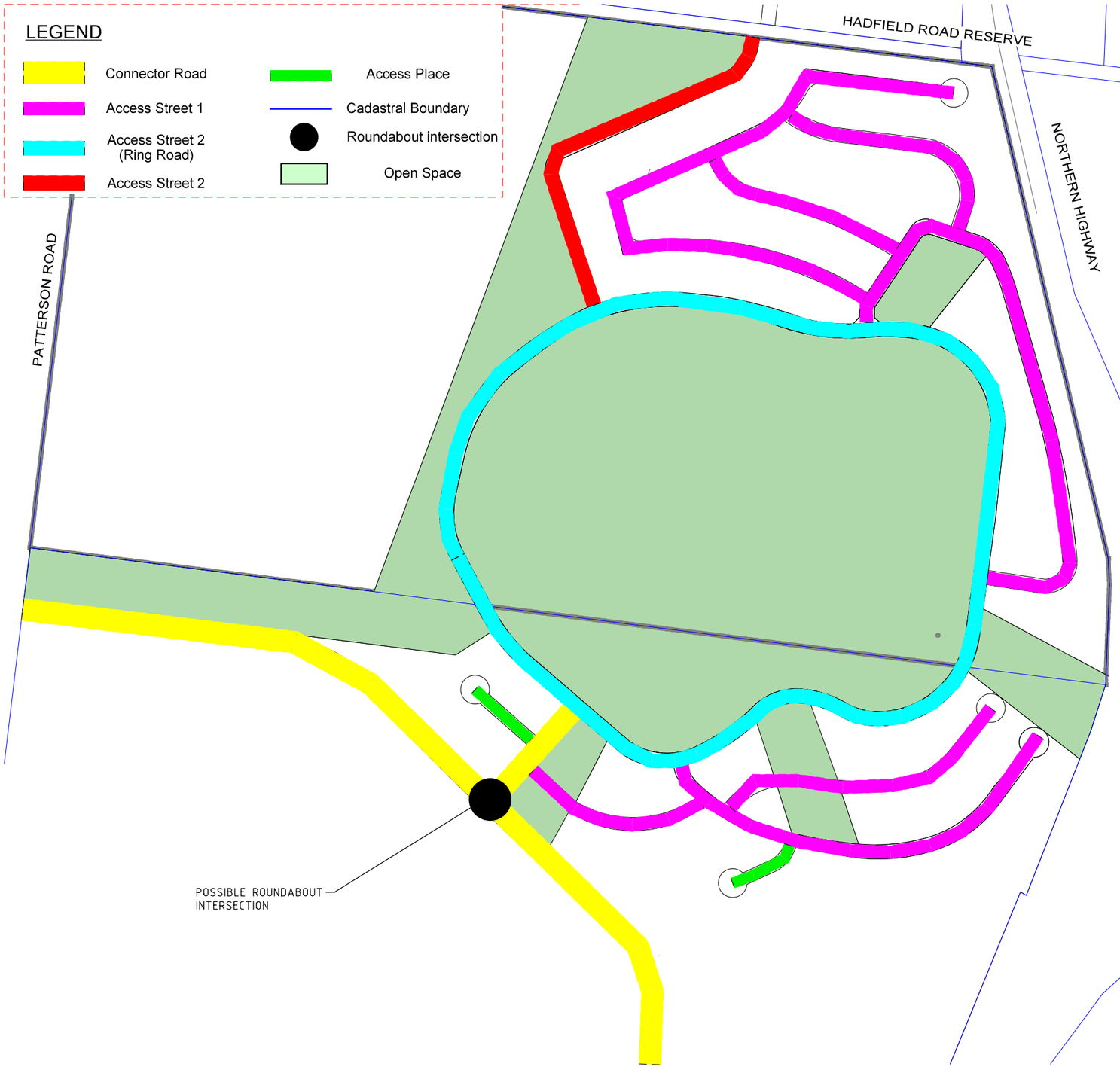
INVERLOCHY
MITCHELL SHIRE COUNCIL

11850M9
VERSION 2

ATTACHMENT F
SPRING HILL CONE – ROAD HIERARCHY PLAN

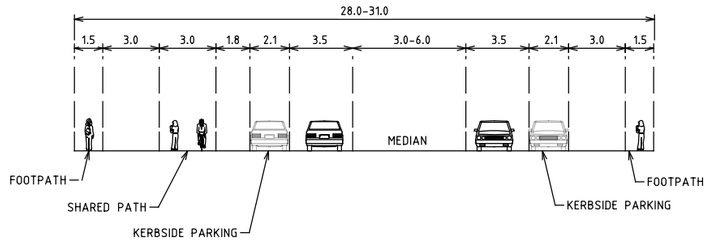
LEGEND

- Connector Road
- Access Street 1
- Access Street 2 (Ring Road)
- Access Street 2
- Access Place
- Cadastral Boundary
- Roundabout intersection
- Open Space

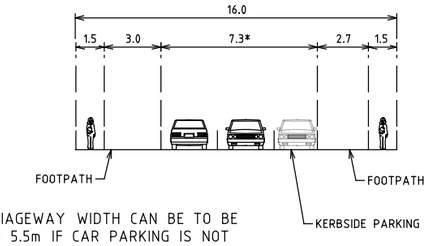


TYPICAL CROSS SECTIONS

Connector Street

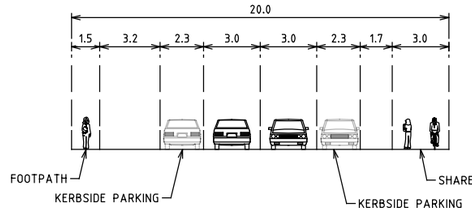


Access Street 1 / Access Place

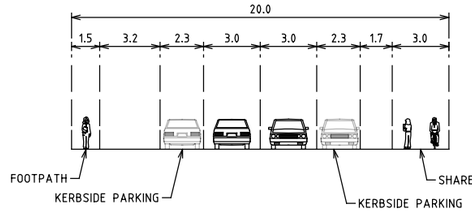


*NOTE: CARRIAGEWAY WIDTH CAN BE TO BE REDUCED TO 5.5m IF CAR PARKING IS NOT REQUIRED ON BOTH SIDES OTHERWISE PROVIDE 7.3m

Access Street 2



Access Street 2 (Ring Road)



Drawing Record

ISSUE	DRAWN	APP'D	DATE	AMENDMENT
P1	GL	AA	04.07.20	PRELIMINARY ISSUE FOR COMMENT

WARNING
BEWARE OF UNDERGROUND SERVICES
THE LOCATIONS OF UNDERGROUND SERVICES ARE APPROXIMATE ONLY AND THEIR EXACT POSITION SHOULD BE PROVEN ON SITE. NO GUARANTEE IS GIVEN THAT ALL EXISTING SERVICES ARE SHOWN.

PRELIMINARY PLAN
FOR DISCUSSION PURPOSES ONLY
SUBJECT TO CHANGE WITHOUT NOTIFICATION
DATE OF ISSUE: 04/07/20

Notes & Legend

1. AERIAL IMAGE FROM NEARMAP UNDER LICENSE AGREEMENT WITH TRAFFICWORKS PTY LTD.
2. ALL DIMENSIONS ARE TO FACE OF KERB UNLESS SHOWN OTHERWISE.

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CLIENT

Crystal Group

N W E S

MELWAY MAP 665 A7
BEVERIDGE NORTH WEST

SCALE OF METRES
NTS

Spring Hill Cone

Mitchell Shire

Road Hierarchy Plan

SHEET NO.	DRAWING NO.	ISSUE
1	190900-CTP-01	P1

4/07/2020 4:23:03 PM 190900-CTP-01 C:\CadDrive\1920 Projects\190900\Design\190900-CTP-01-P2.dgn

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