Outline Plan

Amended
April 2017

Associated Engineering
GLOBAL PERSPECTIVE. LOCAL FOCUS.
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THE PIERS

Approved by the Municipal Planning Commission July 11, 2017

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1 Purpose

1.1 PURPOSE

The purpose of The Piers Outline Plan is to establish a framework for the future subdivision and development of lands within the NE ¼ 28-8-22-4 east of Chinook Trail and south of Garry Drive. The West Lethbridge Phase II Area Structure Plan (ASP) was approved by City Council on May 16, 2005. Based upon the planning principles and objectives within the ASP, this Outline Plan provides more detailed information on land uses and their intensity, the location of the elementary school sites, parks, open spaces, pedestrian and vehicular circulation within The Piers Outline Plan Area.

The Piers Outline Plan was prepared to comply with requirements within the adopted West Lethbridge Phase II Area Structure Plan and is consistent with the City of Lethbridge Design Standards 2016 Edition.

1.2 LOCATION & AREA

As shown on Figure 1 – Location Plan and Figure 2 – Existing Site Topography, the area is located west of the proposed residential neighborhood of The Crossings and east of the proposed Chinook Trail. The Piers Outline Plan Area comprises approximately 58.66 ha (145.0 ac) of privately owned land. The land is currently under cultivation.

1.3 LAND OWNERSHIP

SEE APPENDIX A

1.4 PLANNING CONTEXT

Unchanged

1.4.1 Municipal Development Plan

Unchanged

1.4.2 Urbanization of West Lethbridge, 1969

Unchanged

1.4.3 West Lethbridge Phase II Area Structure Plan

The area structure plan for West Lethbridge Phase II will help guide the growth and development of two future neighbourhoods, to the north and south of Whoop-Up Drive, and the Community Core. The area structure plan provides the framework for the future detailed design and development of land uses (education facilities, retail and office space, recreation facilities, a library, seniors' housing, multi-unit housing and other community services), major roadways, utility services and amenities to accommodate approximately 20,000 people. The purpose of the West Lethbridge Phase II ASP is: "to develop planning, urban design and infrastructure solutions that will ensure the creation of a vibrant, liveable and diverse activity centre in West Lethbridge."

The ASP area encompasses a total area of 698 ha (1,724.8 ac) and will ultimately accommodate a population of approximately 21,750 at full build-out. A further breakdown of the ASP area is as follows:

- Community Core encompassing approximately 105 ha (260 ac)
- North Village, including The Piers encompassing approximately 228 ha (563 ac)
- South Village encompassing approximately 365 ha (902 ac)

City Council passed Bylaw No. 5321 adopting the West Lethbridge Phase II ASP, thereby establishing a conceptual land use and infrastructure plan to guide future development of lands located west of Metis Trail. The Piers Outline Plan complies with the approved West Lethbridge Phase II ASP. Major roadway accesses to The Piers Outline Plan area are consistent with the West Lethbridge Phase II ASP.

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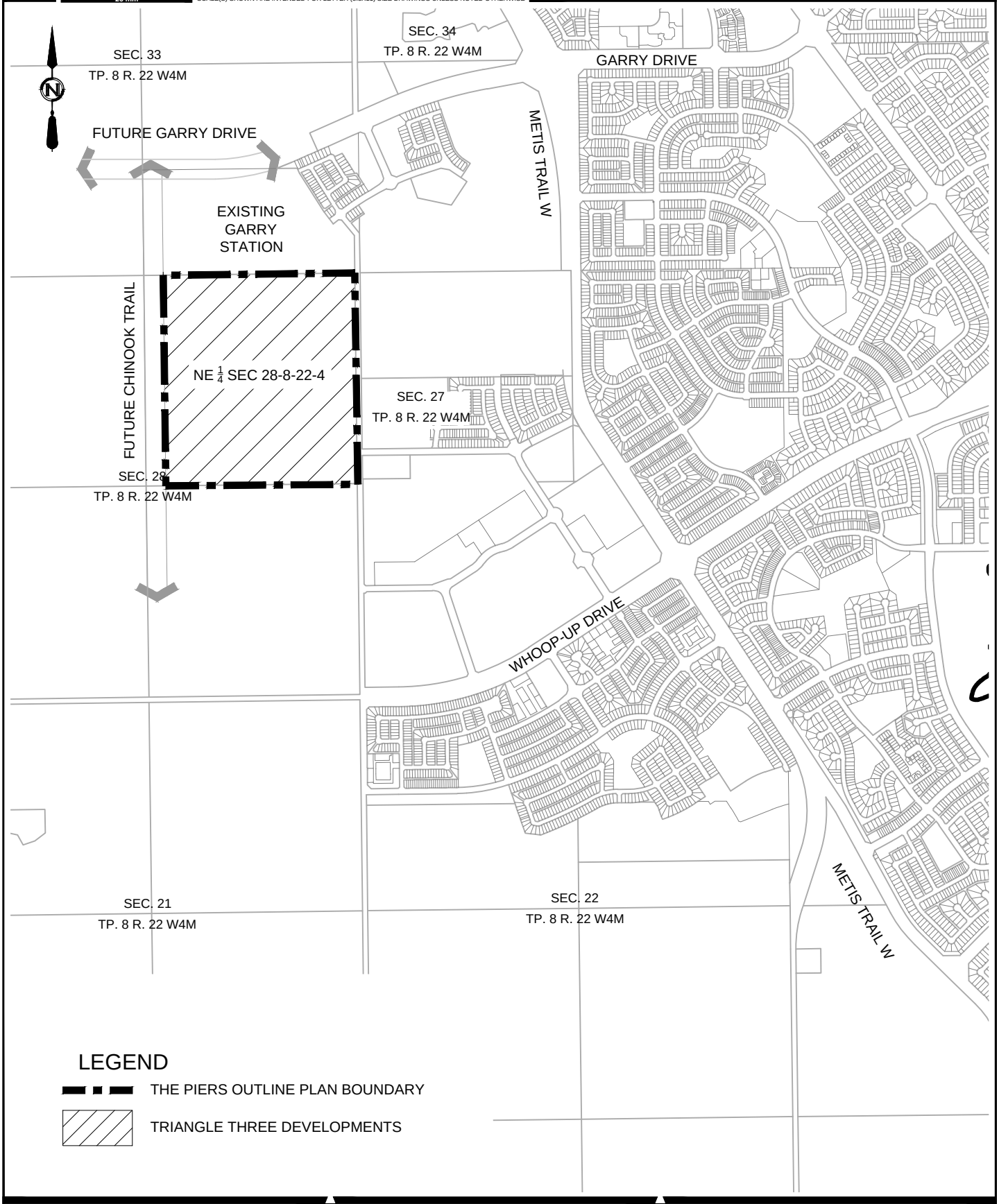

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AE PROJECT No.	20143124-01
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FIGURE 1

TRIANGLE THREE DEVELOPMENTS
THE PIERS OUTLINE PLAN

LOCATION PLAN

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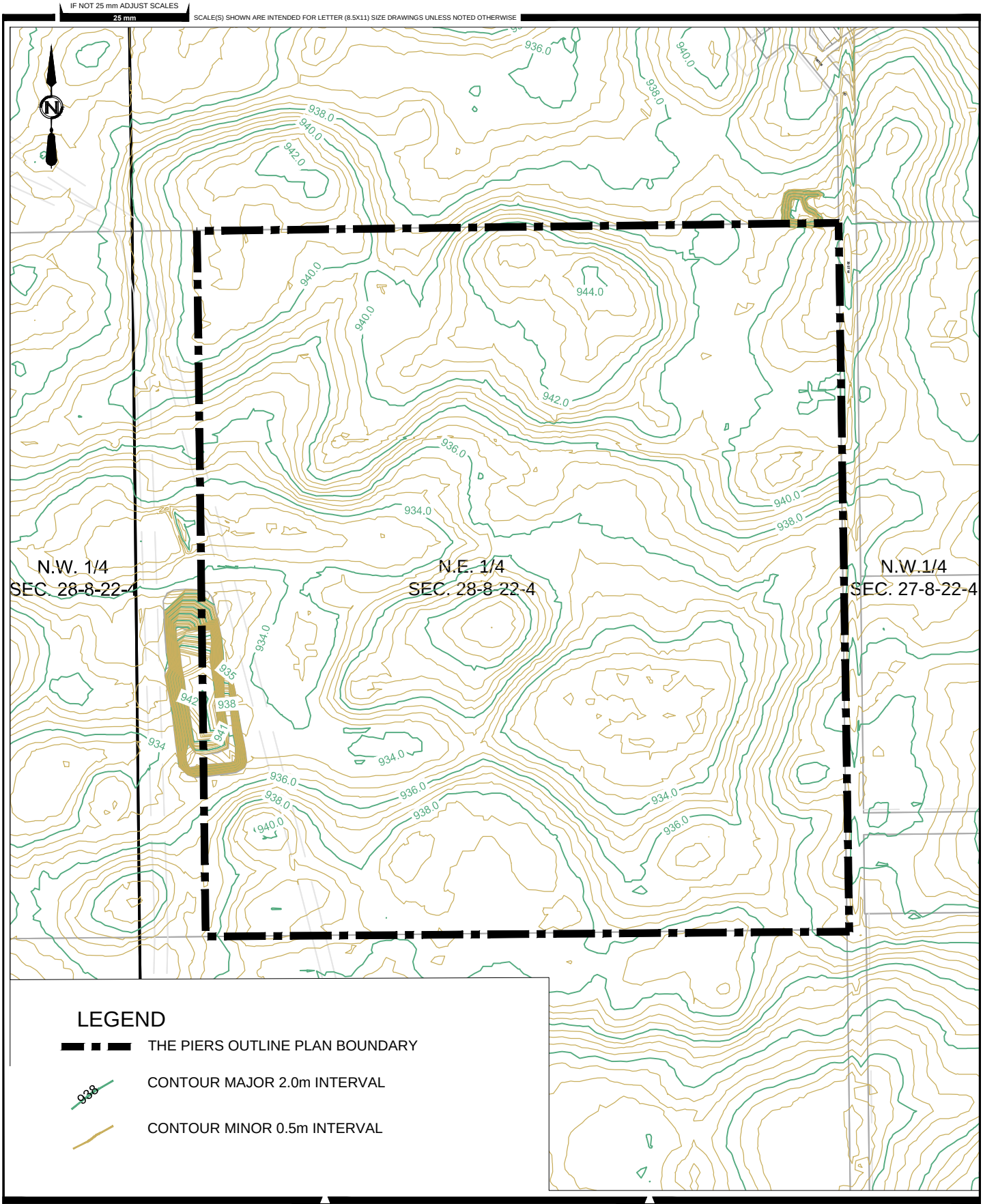

LEGEND

- THE PIERS OUTLINE PLAN BOUNDARY
- 938 CONTOUR MAJOR 2.0m INTERVAL
- CONTOUR MINOR 0.5m INTERVAL

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Alberta's Best Managed Companies

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FIGURE 2

TRIANGLE THREE DEVELOPMENTS
THE PIERS OUTLINE PLAN

EXISTING SITE TOPOGRAPHY

1.4.4 Adjacent Planning Areas

The Piers Outline Plan Area lies within the approved West Lethbridge Phase II Area Structure Plan (ASP) (see Section 2.1.3). The Mountain Heights / Riverstone / River Bend Area Structure Plan and Benton Crossing Outline Plan Area are in effect for neighborhoods located southeast of The Piers Outline Plan Area. The neighborhoods of Varsity Village and Indian Battle Heights are located to the east of The Piers Outline Plan Area. Varsity Village is bounded by Whoop-Up Drive to the north, University Drive to the east, McLeod Drive to the south and Metis Trail to the west. Indian Battle Heights is bounded by Garry Drive to the north, University Drive to the east, Whoop-Up Drive to the south and Metis Trail to the west. The West Highlands Area Structure Plan is in effect for the area to the northeast of The Piers Outline Plan Area.

1.4.5 Land Use Bylaw

Unchanged

1.5 ASP REQUIREMENTS

1.5.1 Principles and Objectives

1.5.1.1 Provide a framework that will facilitate financial viability of future development through the orderly economic extension of services and strategic allocation of land uses.

A. Orderly, economic and beneficial extension of roadways and municipal services

B. Construction of low density residential developments and elementary school sites in initial phases

1.5.1.2 Promote walkability by creating functional, safe and attractive pedestrian environments.

Unchanged

1.5.1.3 Foster integrated neighbourhoods that encourage a wider range of housing choices for different age and income groups.

Unchanged

1.5.1.4 Provide logical, safe and efficient hierarchy of transportation systems within the ASP area to address the public transit, private automobile, and truck movement, pedestrian and bicycle transportation needs of residents and business.

Unchanged

1.5.1.5 Create a sense of place that adds visual interest and fosters social interaction, where people want to spend time.

Unchanged

1.5.1.6 Design attractive and functional open spaces.

Unchanged

1.5.1.7 Foster the safety and comfort of residents to enhance liveability.

Unchanged

1.5.1.8 Accommodate needed community services and recreational opportunities.

Unchanged

2 Land Use

2.1 LOW DENSITY RESIDENTIAL

Low Density Residential is proposed to be the predominant Land Use within The Piers Outline Plan, comprising 27.56 ha or 46.98% of the gross developmental area. Low density residential uses will include single detached and semi-detached housing types.

Small lot developments are proposed for lots with rear lane access to provide off street parking and garage access.

Secondary suites would be appropriate for corner lots with lanes.

Walk out basements are proposed in locations primarily adjacent to the stormwater management facilities.

It is proposed that all lands designated for low density residential be redistricted from their current designation of F.U.D. prior to subdivision. The proposed land use concept is shown in Figure 3.

2.2 MEDIUM DENSITY RESIDENTIAL

Medium Density residential developments are proposed for 7.58 ha or 12.92% of the gross developmental area. This land use will include a range of attached housing types including triplex, fourplex, row housings and low-rise apartments.

All medium density developments will be located on or near the Collector road system to allow convenient access to the transit and trail systems proposed for the Community.

2.3 PARKS AND OPEN SPACE

The parks and open space areas in The Piers consist of an integrated pathway system, two elementary school sites, one pocket park, and one park associated with stormwater management facilities comprising 5.52 ha or 9.41% of the plan area. Cash in lieu will be paid for the portion of MR not provided as the required 10% of gross developable area.

The Piers contains portions of two elementary school sites that will serve the surrounding neighbourhoods. A separate school site of 4.08 ha (1.85 ha from The Piers) in the southeast of the plan area and a public school site of 4.80 ha (1.78 ha from The Piers) in the northeast of the plan area will be developed in conjunction with the neighbouring development to the east.

One Pocket Park (0.57 ha) is located in the west of the plan area

The stormwater management facility will provide functional and attractive open space to The Piers Neighbourhood.

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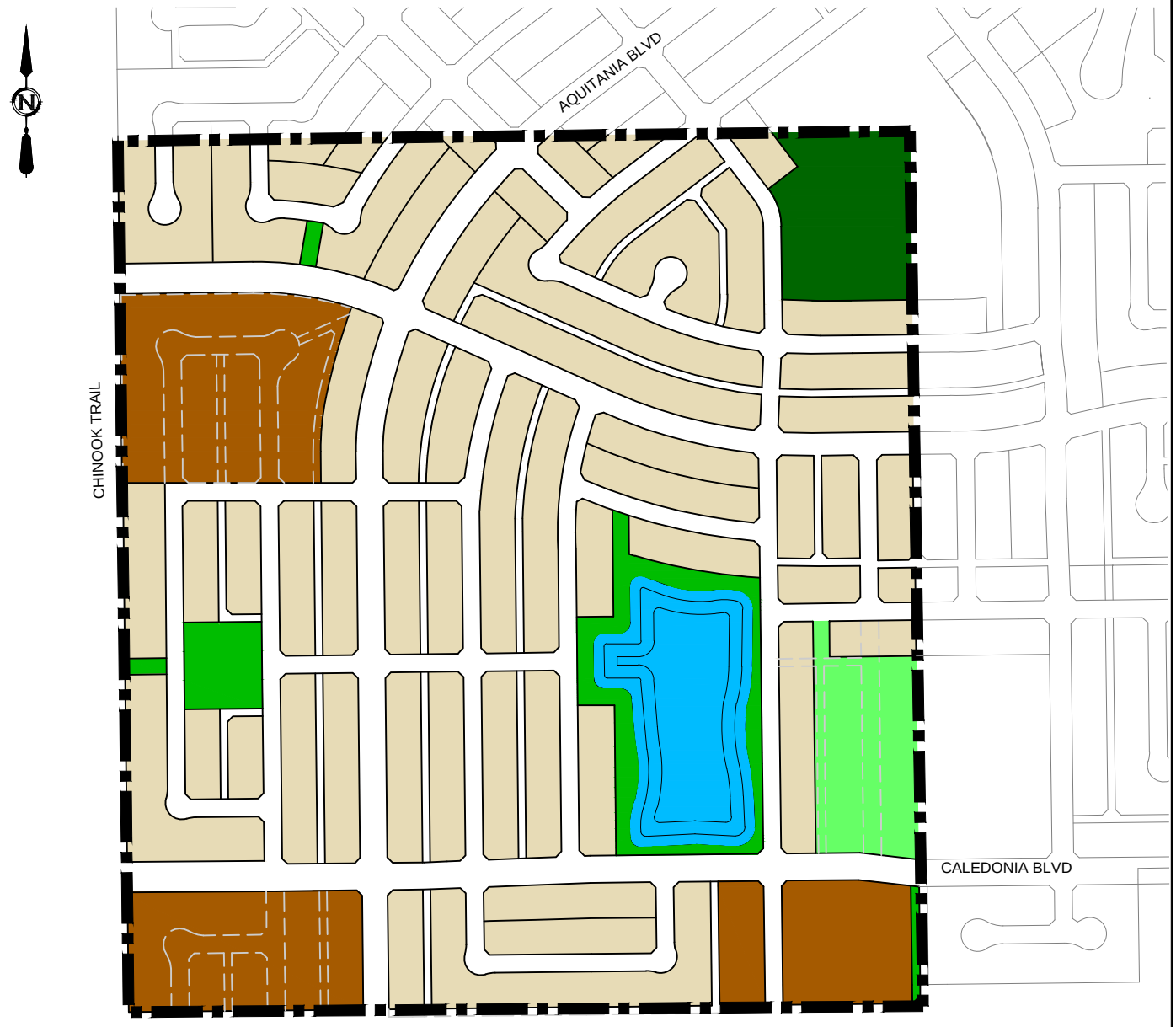

OUTLINE PLAN STATISTICS		
THE PIERS	HECTARE	% OF GDA
GROSS DEVELOPABLE AREA	58.66	
PARKS AND OPEN SPACE		
PARKS	1.89	3.22
SEPARATE ELEMENTARY SCHOOL SITE	1.78	3.03
PUBLIC ELEMENTARY SCHOOL SITE	1.85	3.15
SUM OF PARKS AND OPEN SPACE	5.52	9.41
STORM WATER MANAGEMENT	2.80	4.77
ROADWAYS	15.21	25.93
RESIDENTIAL		
LOW DENSITY	27.56	46.98
MEDIUM DENSITY	7.57	12.91
SUM OF RESIDENTIAL	35.13	59.89

LEGEND

The Piers Outline Plan Boundary

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FIGURE 3

TRIANGLE THREE DEVELOPMENTS
THE PIERS OUTLINE PLAN

PROPOSED ZONING AND LAND USE

2.4 ARCHITECTURAL CONTROLS

Unchanged

2.5 SUBDIVISION ENTRANCE FEATURES

Unchanged

2.6 TRANSPORTATION REQUIREMENTS

The plan area will be serviced on the north boundary by the westerly extension of Garry Drive and the future construction of Chinook Trail on the west boundary. These are major arterial roadways to be developed to a divided arterial standard in 75 m rights-of-way. The extension of Garry Drive ± 400 m west of Metis Trail to the neighborhood entrance road connecting the North Village of the West Lethbridge Phase II ASP to Garry Drive, is completed and in use.

2.6.1 Roadways

The roadway connections from The Piers Outline Plan area to other developments in the "North Village" will be provided by local streets, and major/minor collector roadways.

The internal road network, as shown on Figure 5, is made up of local streets and minor collectors, which connect to a major collector. In addition, two collector roadways extend east from the plan area to the Crossings and Garry Station Subdivisions.

The Piers has a combination of laned and laneless areas. Where applicable, 7.0m lanes have been included in the plan area.

Detailed design will address driveway locations and fire truck access.

The existing Traffic Impact Assessment (TIA) for the Piers OLP area was updated for The Piers Outline Plan Amendment to determine required roadway classifications and intersection controls. (Appendix I).

The detailed intersection capacity and critical road link analysis along with recommended traffic control for full build-out planning horizon is addressed in the TIA.

The Piers will require an additional south access for vehicles at full buildout, to ensure the existing roundabout at Aquitania Boulevard and Caledonia Boulevard continues to operate acceptably. The TIA outlines that when the medium density sites in Stage 5 are developed, this additional access to the south of The Piers will be required.

2.6.2 Pathway Network

The proposed pathway system will provide non-vehicular access (pedestrian and bicycle connectivity) from the residential areas to future arterials, regional pathway, neighbourhood parks, stormwater management facilities and the High schools/library complex to the south. (Figure 5)

All major collector pathway crossings are at roadway intersections to provide a safer crossing environment..

2.6.3 Sound Attenuation

Unchanged

2.6.4 Transit Routes

Unchanged.

2.7 NATURAL GAS PIPELINE

Unchanged.

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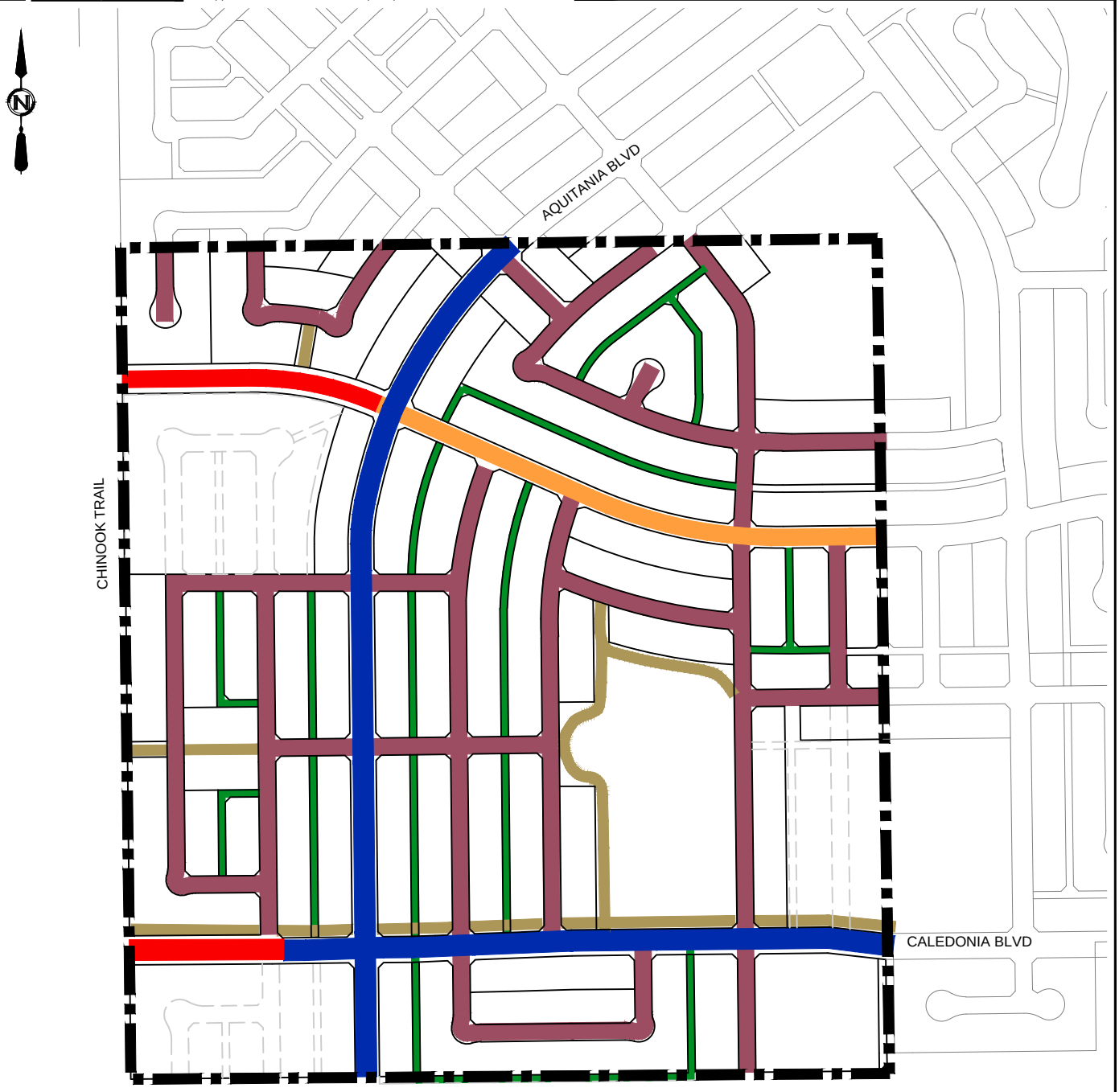

LEGEND

- The Piers Outline Plan Boundary
- Community Entrance
- Major Collector Roadway
- Minor Collector Roadway
- Local Roadway 16.5
- Local Roadway 19.5
- Lanes
- Walkways & Pathways

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FIGURE 5

TRIANGLE THREE DEVELOPMENTS
THE PIERS OUTLINE PLAN

CONCEPTUAL ROAD CLASSIFICATION

3 Staging and Implementation

3.1 TENTATIVE STAGING

In general, development will progress from east to west and from south to north.

The servicing of initial phases will require the extension of water, sanitary and storm piping to the east limit of The Piers at Caledonia Blvd. The servicing of latter phases will require water and sanitary piping from the north-east on Aquitania Blvd. The servicing of the final phases will require the implementation of one of the two proposed servicing strategies for the area.

1. Option 1 requires the extension of a trunk sewer from the existing sanitary sewer in Garry Drive to a connection point in the Chinook Trail ROW.
2. Option 2 requires a sanitary lift station that will pump to the existing system to the north.

All the servicing infrastructure will require the developers of adjacent lands to complete their underground installations.

The developer of The Piers will enter into a boundary condition agreement with The Crossings developers to ensure extension of services.

Tentative staging is shown on Figure 7 – Staging Plan.

3.2 REDISTRICTING AND SUBDIVISION

Unchanged

3.3 AMENDING THE PLAN

Unchanged

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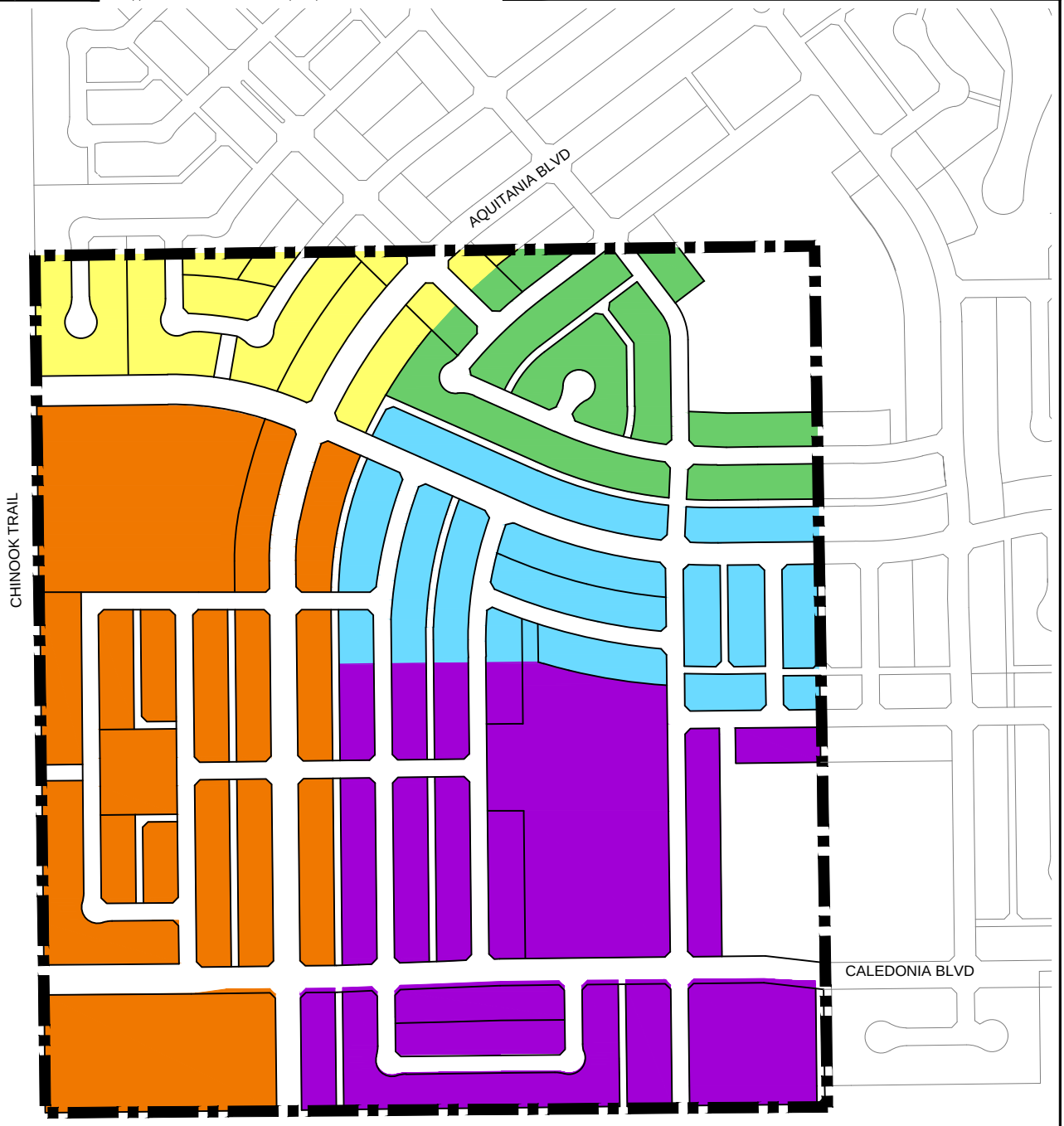

LEGEND

The Piers Outline Plan Boundary

STAGE 1
STAGE 2
STAGE 3
STAGE 4
STAGE 5

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FIGURE 7

TRIANGLE THREE DEVELOPMENTS
THE PIERS OUTLINE PLAN

STAGING PLAN

4 Water Distribution

The existing water distribution network adjacent to The Piers Outline Plan Area consists of a 300 mm diameter watermain along Caledonia Blvd W in The Crossings Subdivision and a 400 mm diameter watermain along Aquitania Blvd in the Garry Station Subdivision.

The proposed water distribution network in The Piers Outline Plan Area is shown on Figure 8 – Water Servicing Concept. The network will be sized to satisfy the following City of Lethbridge level of service objectives:

• Minimum acceptable pressures to be no less than 310 kPa during peak hour demand

• Minimum acceptable pressures to be no less than 345 kPa during maximum day demand

• Maximum delivered pressures to be no greater than 620 kPa

• An additional service objective is that the minimum fire flow be no less than 75 L/s in residential areas, with a minimum residual pressure of 150 kPa, during maximum day demand.

The majority of the watermains within The Piers Outline Plan Area will consist of 200 mm diameter pipe. In accordance with the West Lethbridge Phase II Area Structure Plan (Associated Engineering, 2005), a 400 mm diameter watermain will extend along the north-south major collector roadway. A 300 mm diameter pipe will be installed along the extension of Caledonia Blvd W to its intersection with the major collector roadway. A 250 mm diameter pipe will be installed along the east-west minor collector roadway into the Garry Station Development. Low density residential lots will be serviced from the 200 mm, 250 mm, 300 mm, and 400 mm watermains.

Ultimately, the water distribution network in The Piers Outline Plan Area will connect to the City's network at fourteen (14) locations as shown on Figure 8 – Water Servicing Concept. Initially, two (2) connections will be made to the existing network within The Crossings Subdivision. In the future, the water distribution network in The Piers Outline Plan Area will connect to water distribution networks of adjacent developments and arterial roads.

Table 4-1
Water Demands in The Piers Outline Plan Area

Demand Scenario	Full Development MLD (L/s)	
Average Day Demand (415L/cap/day)	1.05	(12.2)
Maximum Day Demand (2.2 x ADD)	2.31	(26.8)
Peak Hour Demand (3.5 x ADD)	3.68	(42.6)
Population Equivalent for Design	2533	

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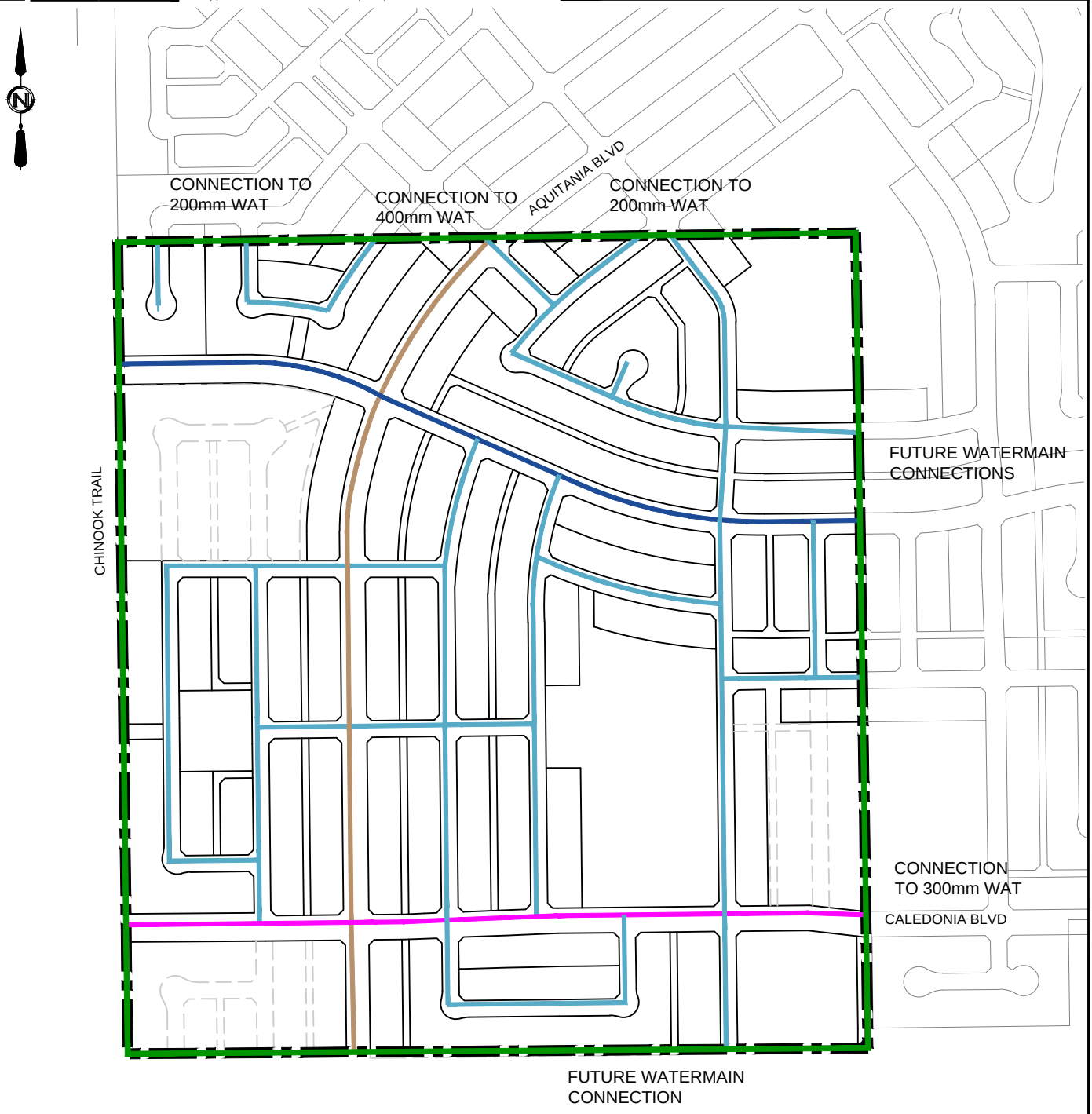

LEGEND

- The Piers Outline Plan Boundary
- Water Catchments
- Proposed 400Ø Watermain
- Proposed 300Ø Watermain
- Proposed 250Ø Watermain
- Proposed 200Ø Watermain

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FIGURE 8

TRIANGLE THREE DEVELOPMENTS
THE PIERS OUTLINE PLAN

WATER SERVICING CONCEPT

5 Sanitary Collection

The existing sanitary collection system near The Piers Outline Plan Area consists of:

- A 250 mm diameter sewer along Caledonia Blvd W in The Crossings Subdivision. This sewer conveys flows to the 450 mm diameter sewer along Aquitania Blvd West, then to the existing trunk sewer in Metis Trail
- A 200mm diameter sewer along Aquitania Blvd W in the Garry Station Subdivision.

The 2006 Outline Plan for the Crossings Subdivision identified that an off-site area of 76 ha to the west of the Crossings Subdivision would contribute a peak sanitary flow of 79 L/s into the sanitary sewer along Britannia Blvd. W. The 2006 Outline Plan for The Crossings Subdivision did not identify that any off-site area contributing sanitary flow to the sanitary sewer along Caledonia Blvd. W. In 2007, the sanitary sewer system in The Crossings was redesigned to convey an off-site area of 25 ha into the sanitary sewer along Caledonia Blvd. W.

The proposed sanitary sewer system in The Piers Outline Plan Area is shown on Figure 9 - Sanitary Servicing Concept 1 and Figure 10 – Sanitary Servicing Concept 2. The network will be sized to satisfy the following City of Lethbridge level of service objectives:

- Meet the dry weather demand with appropriate allowances made for wet weather inflows
- Provide sanitary sewer capacity so that surcharging does not occur for the design peak flows

The majority of the sanitary sewers within The Piers Outline Plan Area will consist of 200 mm diameter pipe. There will be three (3) sanitary catchment areas in The Piers Outline Plan Area

- Area A – will connect to the existing 200 mm diameter sewer along Caledonia Blvd W in the Crossings Subdivision
- Area B – will connect to the existing 200 mm diameter sewers along Aquitania Blvd W in the Garry Station Subdivision and as shown in Figures 9 and 10
- Area C (Option 1) –will connect via gravity to a future trunk sewer in the Chinook Trail ROW west of the Piers Subdivision.
- Area C (Option 2) – will alternatively connect via pump station and forcemain to the existing 250 mm diameter sewer along Aquitania Blvd W in the Garry Station Subdivision.

Area A: The south east catchment area will convey the sanitary flows from approximately 14.4 ha of residential development in the Piers Outline Plan Area. The 14.4 ha is comprised of 12.5 ha of low density residential and 1.8 ha of medium density residential development. The south school site will be serviced within Area A. Hence, the proposed area contributing sanitary flows into the Crossings Subdivision along Caledonia Blvd W is less than the maximum allowed (i.e. 25 ha).

Area B: The north catchment area will convey the sanitary flows from approximately 7.8 ha of low density residential development in the Piers Outline Plan Area. The north school site will be serviced by the existing Garry Station sanitary sewer system.

Area C: The west catchment area will convey the sanity flows from approximately 13.1 ha of residential development in the Piers Outline Plan Area. The 13.1 ha is comprised of 7.3 ha of low density residential and 5.7 ha of medium density residential development.

No off-site areas will contribute sanitary flows to The Piers Outline Plan Area.

Peak sanitary flows for The Piers Outline Plan Area are summarized in Table 5-1. These flows were developed using sewage generation rates presented in the City of Lethbridge Design Standards (2016).

Table 5-1
Sanitary Flows

	Area A m^3/d (L/s)	Area B m^3/d (L/s)	Area C m^3/d (L/s)	Total m^3/d (L/s)
Population	1,103	543	1,330	2,976
Dry Weather Flow	441 (5.7)	217 (2.5)	532 (6.2)	1,1913 (13.8)
Peaking Factor	3.77	3.96	3.72	3.45
Peak Dry Weather Flow	1,664 (19.3)	860 (9.9)	1,978 (22.9)	4,102 (47.5)
Wet Weather Flow	551 (6.4)	272 (3.1)	665 (7.7)	1,488 (17.2)
Infiltration	165 (1.9)	81 (0.9)	200 (2.3)	446 (5.2)
Peak Wet Weather Flow	2,380 (27.5)	1,213 (14.0)	2,843 (32.9)	6,036 (69.9)

The peak sanitary flow from The Piers Outline Plan Area into The Crossings Subdivision (Area A) is 27.5 L/s.

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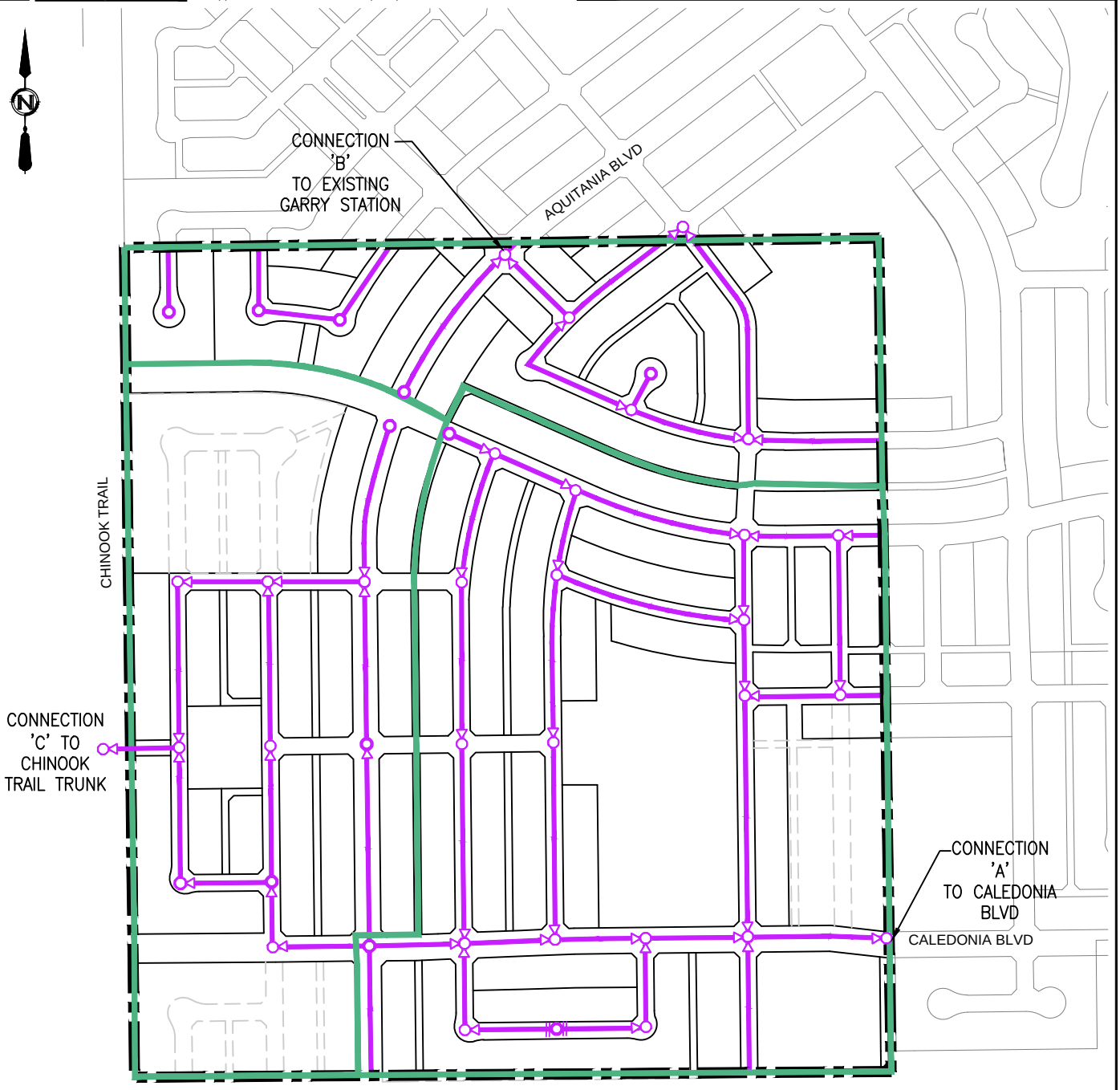

LEGEND

- The Piers Outline Plan Boundary
- Proposed Sanitary Manhole & Direction
- A–3 Sanitary Manhole Number
- Sanitary Catchment Boundary
- 250 Proposed Sanitary Sewer & Size

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FIGURE 9

TRIANGLE THREE DEVELOPMENTS
THE PIERS OUTLINE PLAN

SANITARY SERVICING CONCEPT 1

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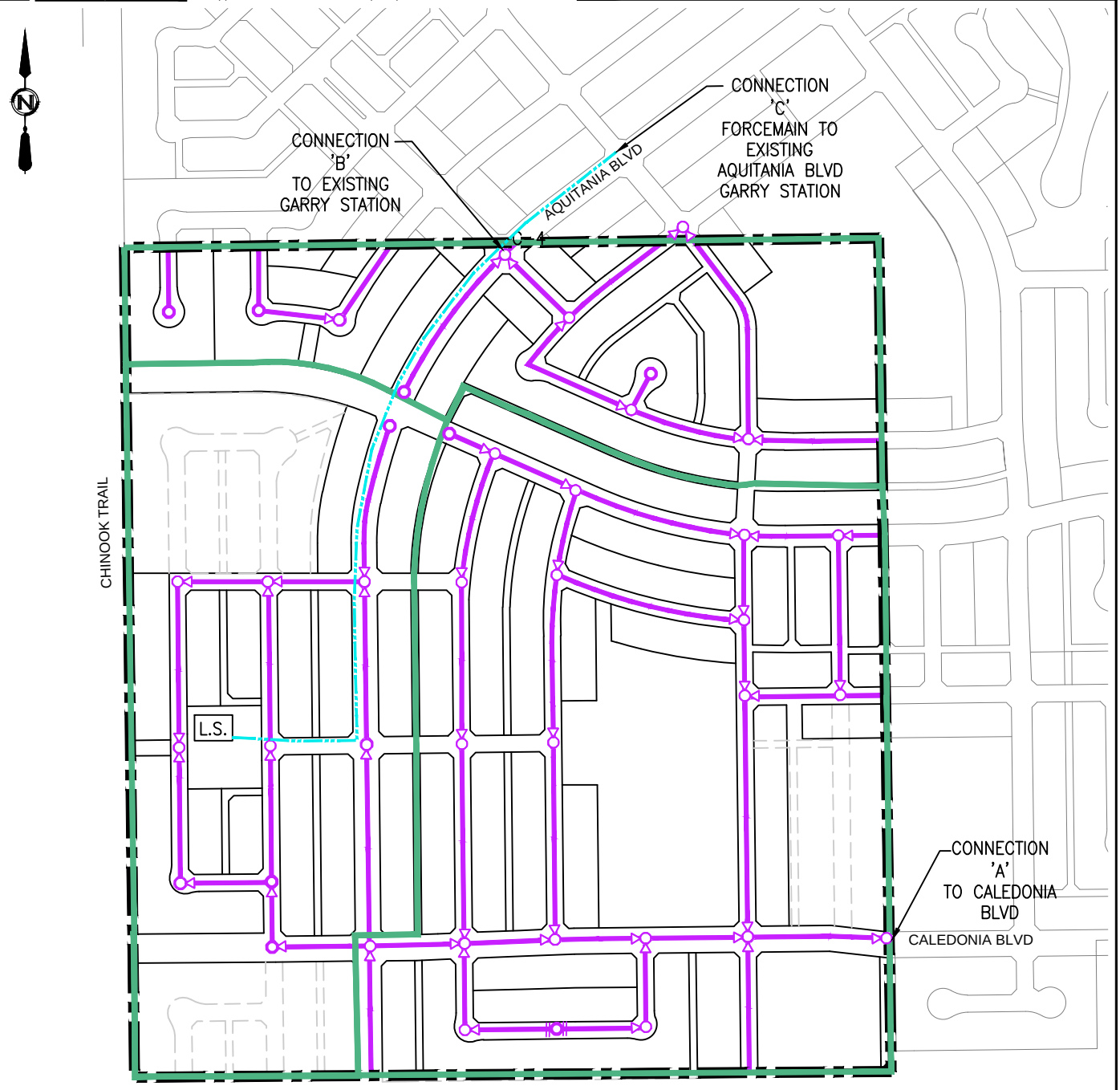

LEGEND

- The Piers Outline Plan Boundary
- Proposed Sanitary Manhole & Direction
- Sanitary Catchment Boundary
- Proposed Sanitary Sewer
- Proposed Sanitary Forcemain

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FIGURE 10

TRIANGLE THREE DEVELOPMENTS
THE PIERS OUTLINE PLAN

SANITARY SERVICING CONCEPT 2

6 Stormwater Management

Catchment boundaries have been defined by the proposed elevations of the Chinook Trail ROW to the east, the existing development boundaries to the North and East, as well as the south property boundary on the south side of the development area. The development catchment boundary includes approximately 3.0 ha from the future Chinook Trail arterial right of way.

The stormwater runoff boundary along the north boundary of the Piers development has been revised. An area of 10.3 ha along the north boundary of the Piers development has been added to the Garry Station development, and will now be accommodated in the existing pond 'D'.

The remainder of the site will drain to a stormwater management facility in the central portion of the planning area. Due to downstream constraints the stormwater management facility will operate as a "zero" release rate. The pond will connect to the existing Crossings stormwater management system.

Design criteria that will be used for the stormwater management system includes:

- 1000 m^3/ha active storage for stormwater management facilities
- Detention release rate of 1.6 l/s/ha (to allow for very small rainfall events, and irrigation makeup)
- 200 l/s/ha for major system flows
- 90 l/s/ha for minor system flows

The proposed stormwater management facility will generally be designed to meet he following criteria:

- Type: Wet Pond
- Upstream Drainage Area: 50.6 ha
- Permanent Pool, Volume: 12,700 m^3
  Depth: 2.0 m (minimum)
- Active Storage: Volume: 50,600 m^3
  Depth: 2.0 m (maximum)
- Approximate HWL: 934.5 m

Figure 11 provides an overall servicing strategy for the minor stormwater management system including the outlet main to the existing Crossings stormwater management system.

Figure 12 provides an overall servicing strategy for the major stormwater management system including the conceptual grading for the development.

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25 mm
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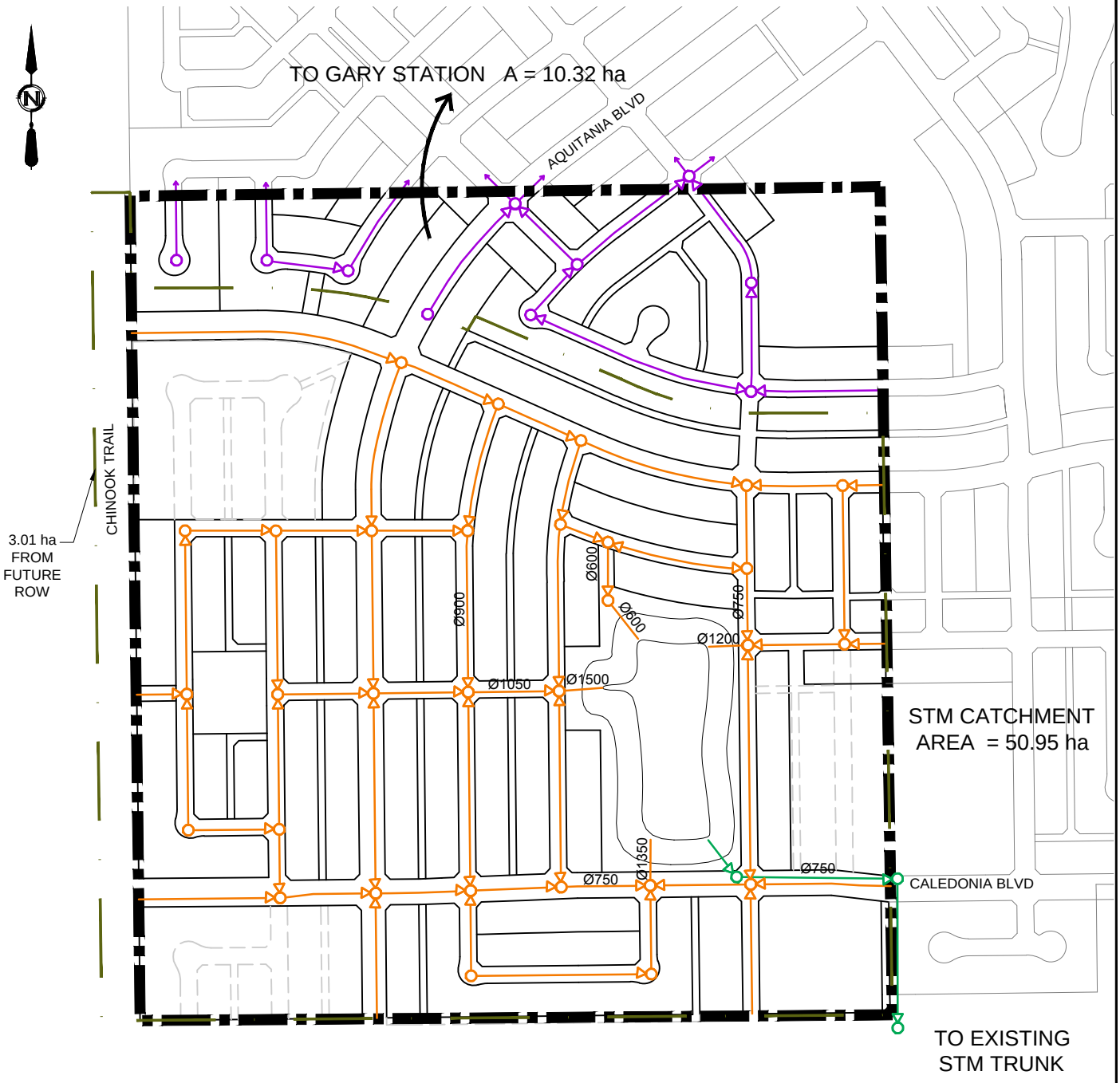


LEGEND

- The Piers Outline Plan Boundary
- Proposed Storm Catchment Bourndary
- Proposed Storm Sewer Collection System
- Proposed Storm Sewer Outlet
- Proposed Off Site Storm Sewer
- Proposed Storm Manhole & Direction

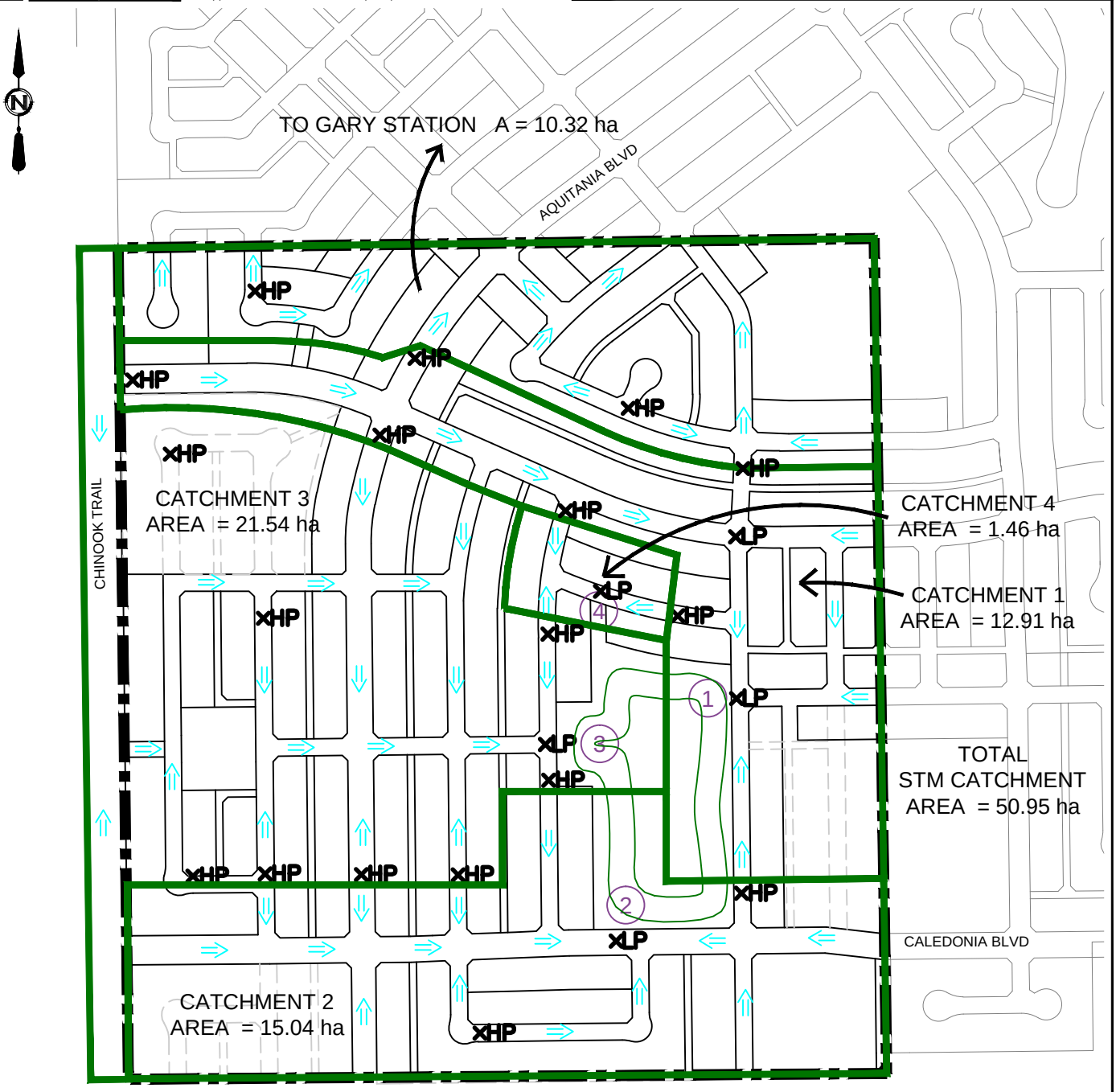
Associated Engineering

AE PROJECT No.	20143124-01
SCALE	NTS
APPROVED	A MCDONALD
DATE	2017JAN25
REV	1
DESCRIPTION	FIGURE 11

FIGURE 11

TRIANGLE THREE DEVELOPMENTS
THE PIERS OUTLINE PLAN

MINOR STORMWATER MANAGEMENT CONCEPT



LEGEND

- The Piers Outline Plan Boundary
- Stormwater Catchment Boundary
- Overland Flow Direction
- XHP × XLP Point of Vertical Intersection
- (#) Overland Flow Oulet to Wet Pond

Associated Engineering

AE PROJECT No.	20143124-01
SCALE	NTS
APPROVED	T JENSEN
DATE	2017JAN25
REV	1
DESCRIPTION	FIGURE 12

FIGURE 12

TRIANGLE THREE DEVELOPMENTS
THE PIERS OUTLINE PLAN

MAJOR STORMWATER MANAGEMENT CONCEPT

IF NOT 25 mm ADJUST SCALES
25 mm
SCALE(S) SHOWN ARE INTENDED FOR LETTER (8.5X11) SIZE DRAWINGS UNLESS NOTED OTHERWISE

LEGEND

- The Piers Outline Plan Boundary
- Existing High Pressure Pipeline
- Existing Sweet Gas Well
- Proposed Relocated High Pressure Pipeline Alignment

AE PROJECT No.	20143124-01
SCALE	NTS
APPROVED	T JENSEN
DATE	2017JAN25
REV	1
DESCRIPTION	FIGURE 13

FIGURE 13

TRIANGLE THREE DEVELOPMENTS
THE PIERS OUTLINE PLAN

PROPOSED GAS LINE RELOCATION

REPORT

Appendix A – Certificates of Title

LAND TITLE CERTIFICATE

S

LINC	SHORT LEGAL	TITLE NUMBER
0022 090 443	4;22;8;28;NE	121 054 634

LEGAL DESCRIPTION
MERIDIAN 4 RANGE 22 TOWNSHIP 8
SECTION 28
QUARTER NORTH EAST
EXCEPTING THEREOUT ALL MINES AND MINERALS
AREA: 64.7 HECTARES (160 ACRES) MORE OR LESS

ESTATE: FEE SIMPLE

MUNICIPALITY: LETHBRIDGE COUNTY / CITY OF LETHBRIDGE

REFERENCE NUMBER: 091 288 215

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
121 054 634	06/03/2012	TRANSFER OF LAND	$2,800,000	SEE INSTRUMENT

OWNERS

BRADLEY JAMES KIRK
OF 238 22 ST N
LETHBRIDGE
ALBERTA T1H 3R7
AS TO AN UNDIVIDED 90% INTEREST

KEVIN GUY KIRK
OF 238 22 ST N
LETHBRIDGE
ALBERTA T1H 3R7
AS TO AN UNDIVIDED 10% INTEREST
(DATA UPDATED BY: CHANGE OF NAME 161086325)

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
751 006 966	27/01/1975	UTILITY RIGHT OF WAY GRANTEE - CANADIAN WESTERN NATURAL GAS COMPANY

(CONTINUED)

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
		LIMITED. "DISCHARGED EXCEPT AS TO A 20 FOOT STRIP SEE INSTRUMENT 761072088" (DATA UPDATED BY: 131020588)
981 066 294	04/03/1998	CAVEAT RE : RIGHT OF WAY AGREEMENT CAVEATOR - TAMARACK ACQUISITION CORP. 600, 425-1 STREET SW CALGARY ALBERTA T2P3L8 (DATA UPDATED BY: TRANSFER OF CAVEAT 991026309) (DATA UPDATED BY: TRANSFER OF CAVEAT 011238126) (DATA UPDATED BY: TRANSFER OF CAVEAT 041187482) (DATA UPDATED BY: TRANSFER OF CAVEAT 161183232)
001 162 343	15/06/2000	CAVEAT RE : RIGHT OF WAY AGREEMENT CAVEATOR - TAMARACK ACQUISITION CORP. 600, 425-1 STREET SW CALGARY ALBERTA T2P3L8 (DATA UPDATED BY: TRANSFER OF CAVEAT 161181526)
161 119 124	24/05/2016	UTILITY RIGHT OF WAY GRANTEE - THE CITY OF LETHBRIDGE. AS TO PORTION OR PLAN:1611249 AS TO ACCESS R/W AREAS A,B,C & D

TOTAL INSTRUMENTS: 004

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 15 DAY OF FEBRUARY, 2017 AT 02:07 P.M.

ORDER NUMBER: 32317495

CUSTOMER FILE NUMBER: redo32315547

END OF CERTIFICATE

(CONTINUED)

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LAND TITLE CERTIFICATE

M

LINC	SHORT LEGAL	TITLE NUMBER
0020 696 358	4;22;8;28;NW	151 051 642
0022 090 443	4;22;8;28;NE	
0013 563 391	4;22;8;28;SW	
0022 090 451	4;22;8;28;SE	

LEGAL DESCRIPTION

FIRST

*ALL MINES AND MINERALS WITHIN, UPON OR UNDER:
MERIDIAN 4 RANGE 22 TOWNSHIP 8
SECTION 28
QUARTER NORTH WEST
AND THE RIGHT TO WORK THE SAME
AREA: 64.7 HECTARES (160 ACRES) MORE OR LESS

SECOND

*ALL MINES AND MINERALS, AND THE RIGHT TO WORK THE SAME
WITHIN, UPON OR UNDER:
MERIDIAN 4 RANGE 22 TOWNSHIP 8
SECTION 28
QUARTER NORTH EAST
AREA: 64.7 HECTARES (160 ACRES) MORE OR LESS

THIRD

*ALL MINES AND MINERALS WITHIN, UPON OR UNDER:
MERIDIAN 4 RANGE 22 TOWNSHIP 8
SECTION 28
QUARTER SOUTH WEST
AND THE RIGHT TO WORK THE SAME
AREA: 64.7 HECTARES (160 ACRES) MORE OR LESS

FOURTH

*ALL MINES AND MINERALS WITHIN, UPON OR UNDER:
MERIDIAN 4 RANGE 22 TOWNSHIP 8
SECTION 28
QUARTER SOUTH EAST
AND THE RIGHT TO WORK THE SAME

(CONTINUED)

AREA: 64.7 HECTARES (160 ACRES) MORE OR LESS

ESTATE: FEE SIMPLE

MUNICIPALITY: LETHBRIDGE COUNTY / CITY OF LETHBRIDGE

REFERENCE NUMBER: 111 020 111

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
151 051 642	20/02/2015	TRANSFER OF LAND	$14,400	NOMINAL

OWNERS

FREEHOLD ROYALTIES LTD.
OF 400 144 4 AVE SW
CALGARY
ALBERTA T2P 3N4

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
1692AE .	07/11/1910	INSTRUMENT AFFECTED LAND: 4;22;8;28;SE 4;22;8;28;NE "SUBJECT TO THE PAYMENT OF THE ROYALTY PROVIDED FOR IN THE GRANT FROM THE CROWN (NZ81)"
1697AE .	07/11/1910	INSTRUMENT AFFECTED LAND: 4;22;8;28;SW 4;22;8;28;NW "SUBJECT TO THE PAYMENT OF THE ROYALTY PROVIDED FOR IN THE GRANT FROM THE CROWN (NZ86)"
981 293 657	23/09/1998	CAVEAT RE : PETROLEUM AND NATURAL GAS LEASE CAVEATOR - TAMARACK ACQUISITION CORP. 600, 425-1 STREET SW CALGARY ALBERTA T2P3L8 AGENT - SEAL. AFFECTED LAND: 4;22;8;28;NW (DATA UPDATED BY: TRANSFER OF CAVEAT 011228035) (DATA UPDATED BY: TRANSFER OF CAVEAT 161184692)

(CONTINUED)

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
981 293 658	23/09/1998	CAVEAT RE : PETROLEUM AND NATURAL GAS LEASE CAVEATOR - TAMARACK ACQUISITION CORP. 600, 425-1 STREET SW CALGARY ALBERTA T2P3L8 AGENT - SEAL. AFFECTED LAND: 4;22;8;28;NE (DATA UPDATED BY: TRANSFER OF CAVEAT 011228036) (DATA UPDATED BY: TRANSFER OF CAVEAT 161184692)
981 294 874	24/09/1998	CAVEAT RE : PETROLEUM AND NATURAL GAS LEASE CAVEATOR - TAMARACK ACQUISITION CORP. 600, 425-1 STREET SW CALGARY ALBERTA T2P3L8 AGENT - SEAL. AFFECTED LAND: 4;22;8;28;SE (DATA UPDATED BY: TRANSFER OF CAVEAT 011228035) (DATA UPDATED BY: TRANSFER OF CAVEAT 161184692)
981 294 875	24/09/1998	CAVEAT RE : PETROLEUM AND NATURAL GAS LEASE CAVEATOR - TAMARACK ACQUISITION CORP. 600, 425-1 STREET SW CALGARY ALBERTA T2P3L8 AGENT - SEAL. AFFECTED LAND: 4;22;8;28;SW (DATA UPDATED BY: TRANSFER OF CAVEAT 011228035) (DATA UPDATED BY: TRANSFER OF CAVEAT 161184692)

TOTAL INSTRUMENTS: 006

(CONTINUED)

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 15 DAY OF FEBRUARY, 2017 AT 02:07 P.M.

ORDER NUMBER: 32317495

CUSTOMER FILE NUMBER: redo32315547

END OF CERTIFICATE

Appendix B - Geotechnical Investigation

Appendix C - Environmental Site Assessment

Appendix D - Letter from Alberta Community Development

Appendix E - Land Use Population Statistics

OVERALL LAND USE AND POPULATION STATISTICS
THE PIERS SUBDIVISION

	Ha	% of GDA
GROSS AREA	58.66	
Circulation		
Arterial Roadways	0.00	
GROSS DEVELOPABLE AREA	58.66	100.00%
Non-Residential Uses		
Circulation		
Collectors	5.80	9.89%
Local Roadways	7.54	12.85%
Lanes	1.87	3.19%
Subtotal	**15.21**	**25.93%**
Stormwater Management Facilities		
Wet Pond	2.80	4.77%
Subtotal	**2.80**	**4.77%**
Parks/School/Open Spaces		
Public School Site	1.85	3.15%
Separate School Site	1.78	3.03%
Neighborhood Parks	1.78	3.03%
Walkways	0.11	0.19%
Subtotal	**5.52**	**9.41%**
Total Non-Residential Uses	23.53	40.11%
Residential Uses		
Low Density Residential	27.56	46.98%
Medium Density Residential	7.57	12.91%
Subtotal Residential Uses	35.13	59.89%
TOTAL	58.66	100.00%

RESIDENTIAL LAND USE ANALYSIS

	Area (Ha)	Density (Units/Ha)	Units	Persons /Unit	Population
Low Density Residential	27.56	25	689	2.90	1998
Medium Density Residential	0.48	37	18	1.90	34
Medium Density Residential	7.09	75	532	1.90	1010
TOTAL	35.13		1239		3042

Note to Reader: The Land Use Statistics summary does not form part of the Outline Plan Bylaw and may be subject to change over time. (March, 2008)(Revised March 2017)

Appendix F - Water Distribution System - Water Demands Summary

Appendix G - Sanitary Flow in Outline Plan Area

Appendix H - Summary of Stormwater Management System

Appendix I - Transportation Impact Assessment

REPORT

The Piers
Traffic Impact Study
Lethbridge, AB

March 2017

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1 Introduction

1.1 BACKGROUND

The Piers is a proposed residential subdivision located in the west end of west Lethbridge, AB as part of the North Village (as stated in the West Lethbridge Area Structure Plan). The subdivision is located north of Whoop-up Drive, east of the future Chinook Trail, and west of The Crossings subdivision.

The purpose of this report is to assess the traffic impacts of the Piers development. The City of Lethbridge requires a Traffic Impact Study (TIS) that identifies internal roadway classification, as well as intersection configuration and traffic control. In addition to the roadway network internal to the Piers, there will be impact assessments conducted for existing intersections surrounding the Piers development. The study has been prepared in accordance with the City of Lethbridge Traffic Impact Study Guidelines.

1.2 STUDY OBJECTIVES

The specific objectives of this study are the following:

- Determine the AM and PM peak hour traffic volumes for intersections within The Piers development.
- Determine the AM and PM peak hour traffic volumes at select intersections in the surrounding developments and evaluate their impacts on relevant adjacent roadways and intersections for the full build-out horizon (20 years).
- Recommend appropriate intersection control requirements to accommodate the traffic volumes at full buildout.
- Identify roadway classifications based on daily volume estimates derived from peak hour volumes under full buildout.

2 Site Content

2.1 STUDY AREA

The proposed location for The Piers is shown in Figure 2-1. The current area is undeveloped. The Piers will be accessed from the north via Garry Station Port, and from the east via Caledonia Boulevard and the northeast connector to Métis Trail through The Crossings / Garry Station. Initially, for this analysis, it is assumed that future Chinook Trail will not exist at full buildout of The Piers so there will be no access from the south. Should these assumptions result in the over-burdening of existing infrastructure, access to and from the west or south will be considered.

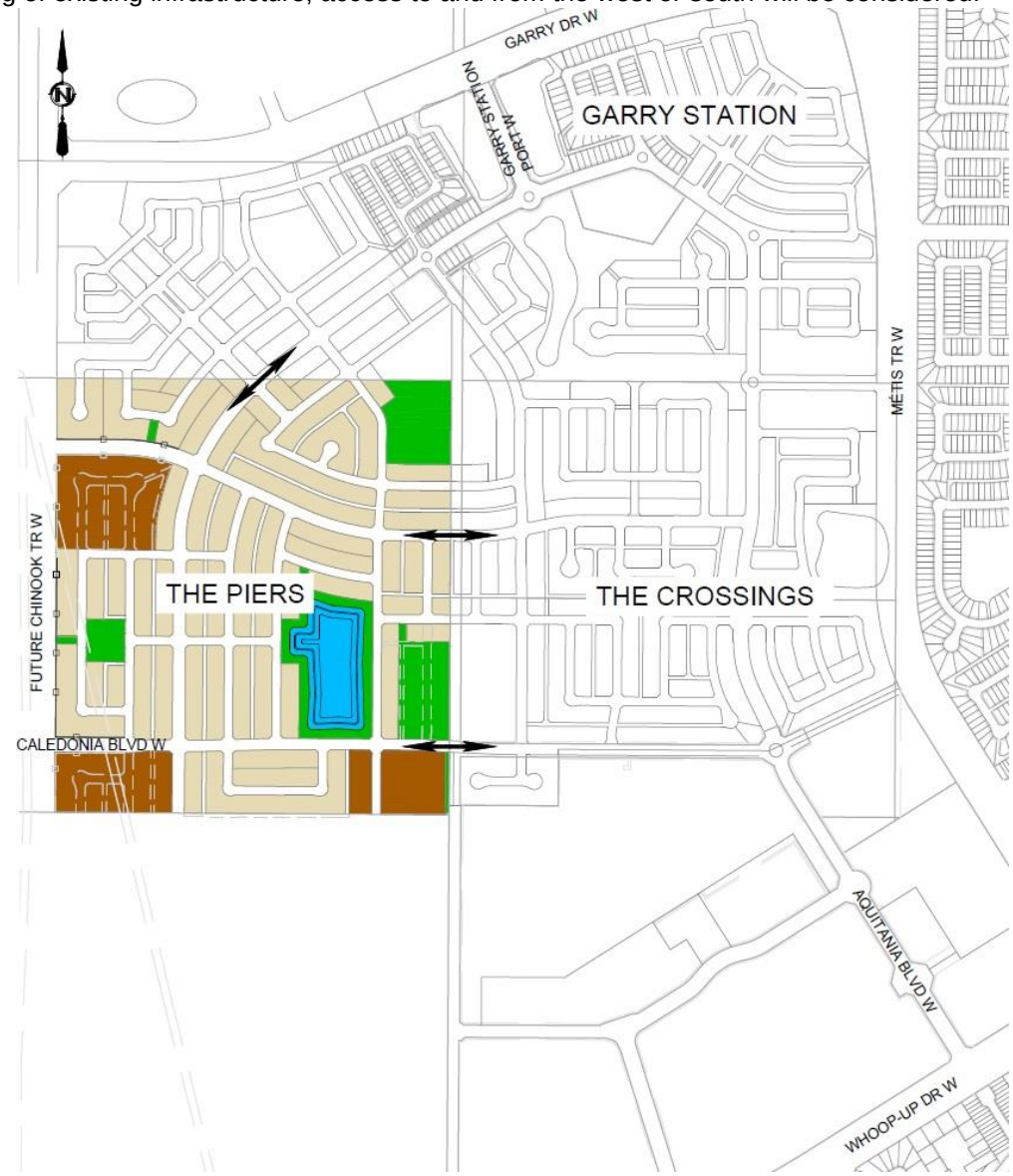


Figure 2-1 The Piers

2.2 SITE PLAN

The Piers development contains 27.71 ha of low density housing, 7.66 ha of medium density housing, and a middle-school site. The attached site plan (Figure 2-2) shows the land area assignment of the proposed The Piers development and each land use zone within the development.

Figure 2-2 The Piers Land Use Area

For the purpose of this TIS, there are four internal intersections to be analyzed, Intersections A, B, C and D, and three external intersections E, F, and G to be analysed (see Figure 2-3).

Figure 2-3 Intersections for Analysis

3 Background Traffic Conditions

Background traffic is traffic that will exist without the proposed development. This is made up of existing traffic and future traffic projected to the full buildout year. Currently, the area planned for The Piers is not developed and therefore contains no existing traffic. All traffic internal to the Piers will be site generated. Areas surrounding The Piers contain background traffic and will be included in analysis as the volumes will have an effect on gateway roadways into The Piers development.

Background traffic volumes for the full buildout AM and PM peak hour background volumes are obtained from the Crossings Traffic Impact Assessment (2007) and used the City's EMME model (Included in Appendix A) to determine a growth rate. They include traffic volumes for existing areas surrounding The Piers development in North Village. This background traffic will have an impact on the following roadways leading into the Piers:

- Aquitania Boulevard (via Garry Station Port)
- Caledonia Boulevard (via Métis Trail)
- Caledonia Boulevard (via Aquitania Boulevard)
- Caledonia Boulevard (via Crossings Branch Public Library/Catholic Central West Campus/Chinook High School site)

Upon comparison of the EMME model with the Crossings TIA, it was found that the volumes of the Crossings TIA were above the projections of the EMME model. Because the Crossings TIA has a full buildout year of 2031, these values were determined to be an accurate representation of the background traffic for the Piers at full buildout. Figures 3-1 and 3-2 show the background traffic volumes for the AM and PM peak respectively.

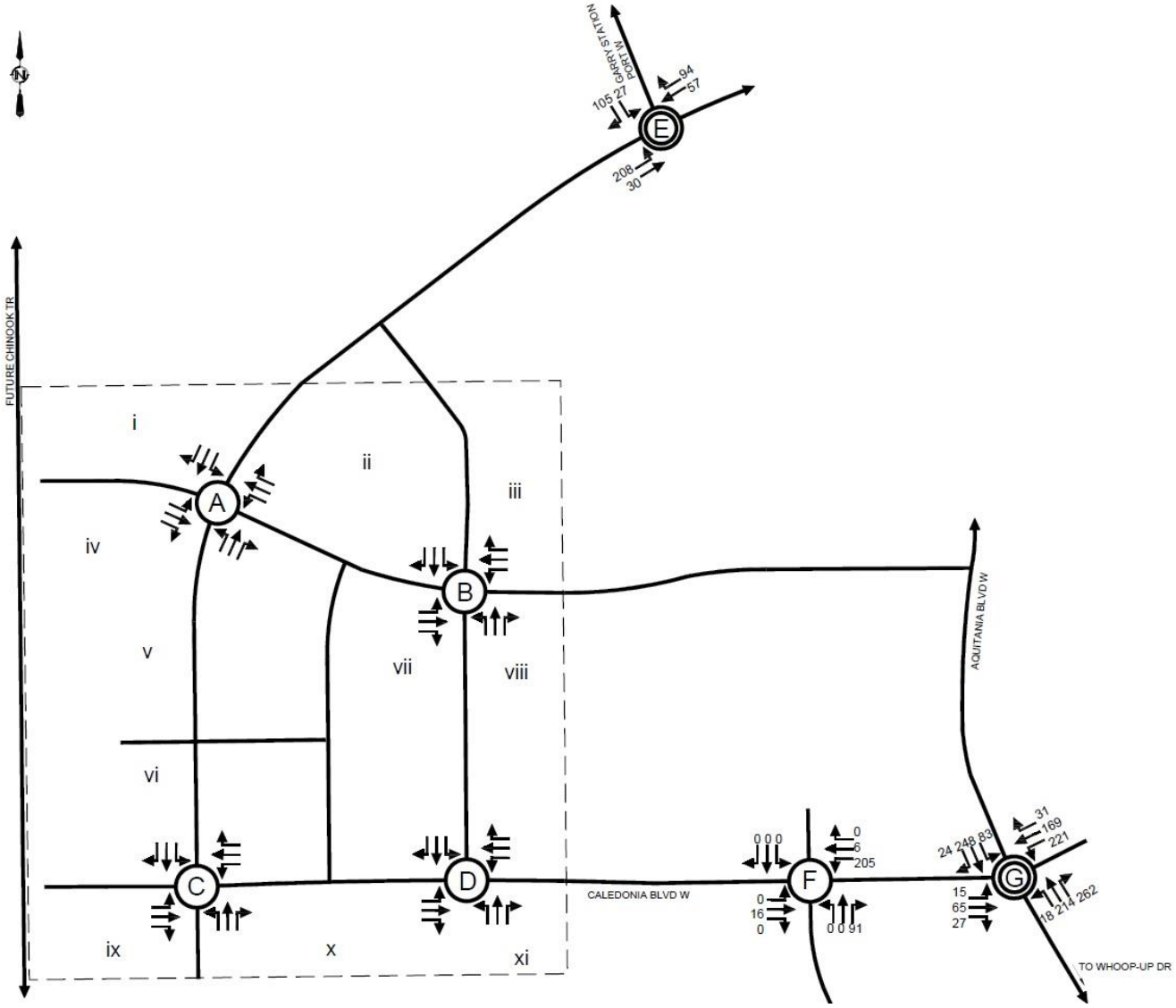


Figure 3-1 AM Peak Full Buildout Background Traffic Demand

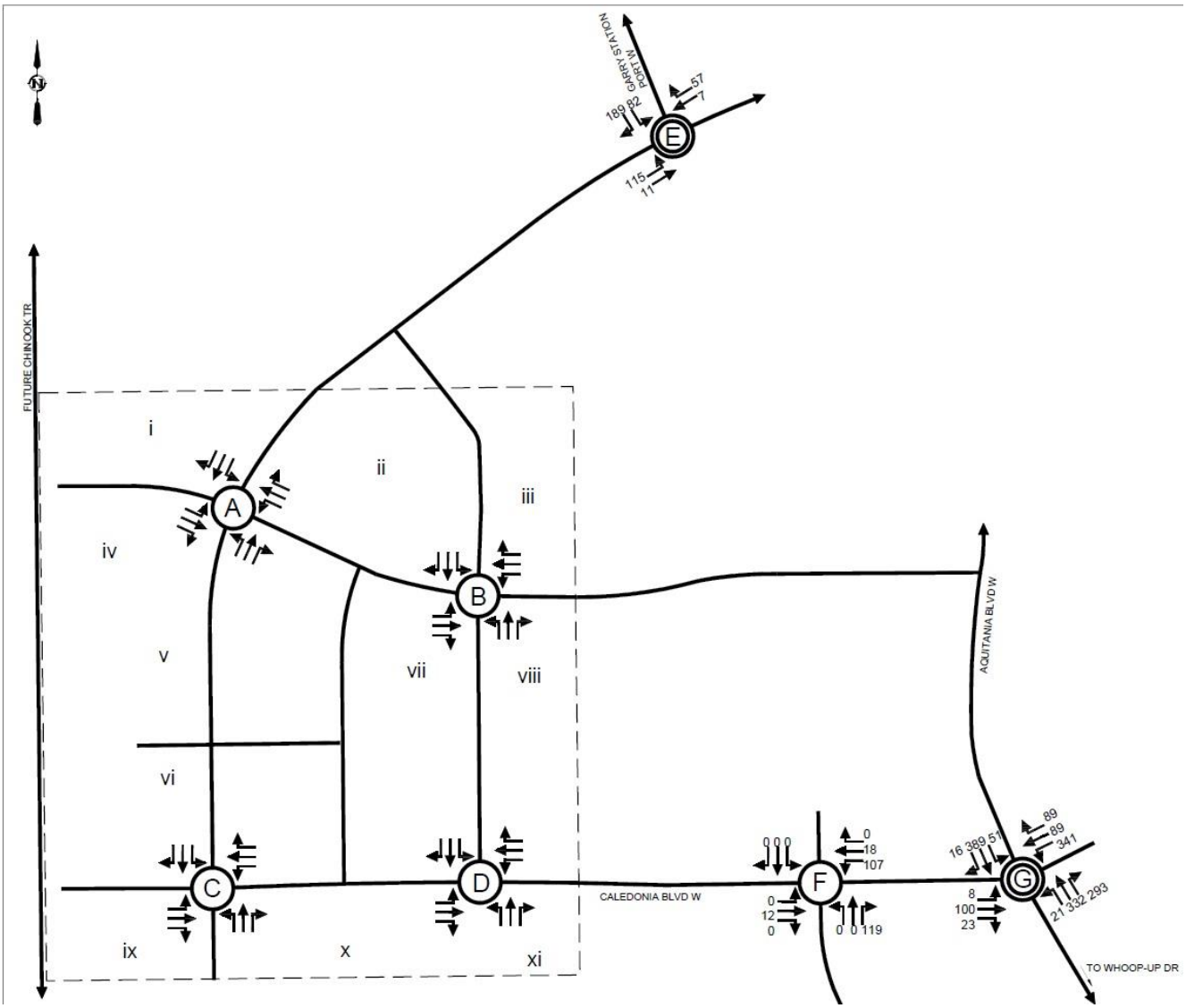


Figure 3-2 PM Peak Full Buildout Background Traffic Demand

4 Site Generated Traffic

In order to assess The Piers in detail, the site was divided by land-use into zones. Figure 4-1 shows an overview of the zones in The Piers.

Figure 4-1 The Piers Zones

4.1 TRIP GENERATION

Trip generation rates for residential units are based on the City of Lethbridge's Trip Generation Rates from the City of Lethbridge Traffic Impact Study Guidelines. The trip generation rate for the school site is derived from the Institute of Transportation Engineers' Trip Generation Manual – 9th Edition. Table 4-1 summarizes the trip rates and trip splits for the land use types in The Piers. The densities used are based on the City of Lethbridge maximum density bylaws.

Table 4-1 Trip Generation Rates

Land Use Type	Density	Classification	Trip Rates		% Trips (in/out)	
			AM	PM	AM	PM
Residential	25 Units/ha	Low Density	0.77	1.02	26/74	64/36
Residential	75 Units/ha	Medium Density	0.75	0.92	29/71	61/39
Residential	37 Units/ha	Medium Density	0.75	0.92	29/71	61/39
Middle School	-	ITE Code 522 (9th)	*245	**135	55/45	45/55
*	From Graph (AM peak hour), X=450					
**	From Graph (PM peak generator), X=450					

For the middle school, ITE Code 522 was used. Data based on student population for Code 522 does not include fitted curve equations, so data must be gathered via graphs. For the AM peak, there is one appropriate data set in code 522, and the number of trips is found by interpolating the graph data for a population of 450 students. The AM trip value is 245 trips. For the PM peak, there is a variation in the data for the peak generator and the adjacent trips, so these values are obtained separately from their respective graphs at 450 students, and the highest value was used to ensure a conservative analysis with a value of 135 trips. The % trips in and out are taken from the respective ITE Trip Generation data sets.

A note about the medium density zones which includes zones iv, ix, and xi. Zones iv and ix are 75 units per hectare density. Zone xi is made up of medium density residential with 37 units per hectare for the smaller west portion, and 75 units per hectare for the remainder of the zone. The smaller portion is 0.5 hectares and the larger portion is 1.4 hectares to equal a total zone area of 1.9 hectares.

Table 4-2 and Table 4-3 shows the trip generation for trips in and trips out per zone in The Piers for the AM and PM peaks respectively.

Table 4-2 Trip Generation AM Peak

Zone	Land Use	Area	Units	Trip Rate	Trips In	Trips Out	Total Trips
i	Low Density	3	75	0.77	15	43	58
ii	Low Density	4.73	118	0.77	24	67	91
iii	Low Density	1.37	34	0.77	7	19	26
iv	Med Density	3.33	250	0.75	55	133	188
v	Low Density	6.23	156	0.77	31	89	120
vi	Low Density	4.88	122	0.77	24	70	94
vii	Low Density	1.24	31	0.77	6	18	24
viii	Low Density	2.29	57	0.77	11	33	44
ix	Med Density	2.41	181	0.75	39	97	136
x	Low Density	2.85	71	0.77	14	41	55
xi	Med Density	1.9	124	0.75	27	66	93
xii	School	-	-		135	110	245

Table 4-3 Trip Generation PM Peak

Zone	Land Use	Area	Units	Trip Rate	Trips In	Trips Out	Total Trips
i	Low Density	3	75	1.02	49	27	76
ii	Low Density	4.73	118	1.02	77	43	120
iii	Low Density	1.37	34	1.02	22	13	35
iv	Med Density	3.33	250	0.92	140	90	230
v	Low Density	6.23	156	1.02	102	57	124
vi	Low Density	4.88	122	1.02	79	45	124
vii	Low Density	1.24	31	1.02	20	12	32

Zone	Land Use	Area	Units	Trip Rate	Trips In	Trips Out	Total Trips
viii	Low Density	2.29	57	1.02	37	21	58
ix	Med Density	2.41	181	0.92	102	65	167
x	Low Density	2.85	71	1.02	46	26	72
xi	Med Density	1.9	124	0.92	70	44	114
xii	School	-	-		61	74	135

4.2 TRIP DISTRIBUTION

The trip distribution percentages used are based on typical traffic trips during the AM and PM peak. It is assumed the distribution is the same for both the AM and PM peak. The analysis will not initially consider any traffic flowing south of The Piers development, or west to the future Chinook Trail. Should the initial distribution overload the existing accesses (Intersections E, F, or G), the analysis may have to consider opening Chinook Trail to Whoop-up Drive, or a south link through the parcel south of The Piers to Whoop-up Drive.

The distribution is based on usage of roads north, east, and internal to the development only and is summarized in Table 4-4 and Figure 4-2. The majority of traffic will be travelling to/from work during the AM / PM peaks, and accessing Whoop-up Drive via Aquitania Boulevard or Métis Trail. In the future, the north area of West Lethbridge will contain the West Lethbridge Employment Area, and traffic will access this area via Métis Trail and Garry Drive.

Table 4-4 Trip Distribution

TO / FROM		ZONE											
		i	ii	iii	iv	v	vi	vii	viii	ix	x	xi	xii
GARRY STATION		25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%
AQUITANIA BLVD		15%	15%	15%	15%	15%	20%	15%	15%	20%	20%	20%	20%
HIGH SCHOOL		5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	0%
MÉTIS TR		55%	55%	55%	55%	50%	50%	55%	55%	50%	50%	50%	55%
	North	*40%*	*40%*	*40%*	*40%*	*45%*	*40%*	*40%*	*40%*	*40%*	*40%*	*45%*	*45%*
	South	*15%*	*15%*	*15%*	*15%*	*10%*	*10%*	*15%*	*15%*	*10%*	*10%*	*5%*	*10%*

Figure 4-2 Full Buildout Trip Distribution

4.3 TRIP ASSIGNMENT

PTV Vistro software was used to complete a detailed trip assignment. Vistro trip assignment is based on allocating the share of trips to take specific paths between origins and destinations (zones and previously detailed to / from locations from Table 4-4). Trips were assigned to the road network by considering the zone access to Garry Station, Métis Trail, Whoop-up Drive, and the High School site (i.e. priority on most direct routes)

4.4 SITE GENERATED VOLUMES

Based on the trip generation, distribution, and assignment of the traffic for the AM and PM peaks, Vistro compiles traffic volumes at each intersection within the network at the full buildout horizon. Figures 4-3 and 4-4 below show a summary of the site generated volumes for the AM and PM peak, respectively.

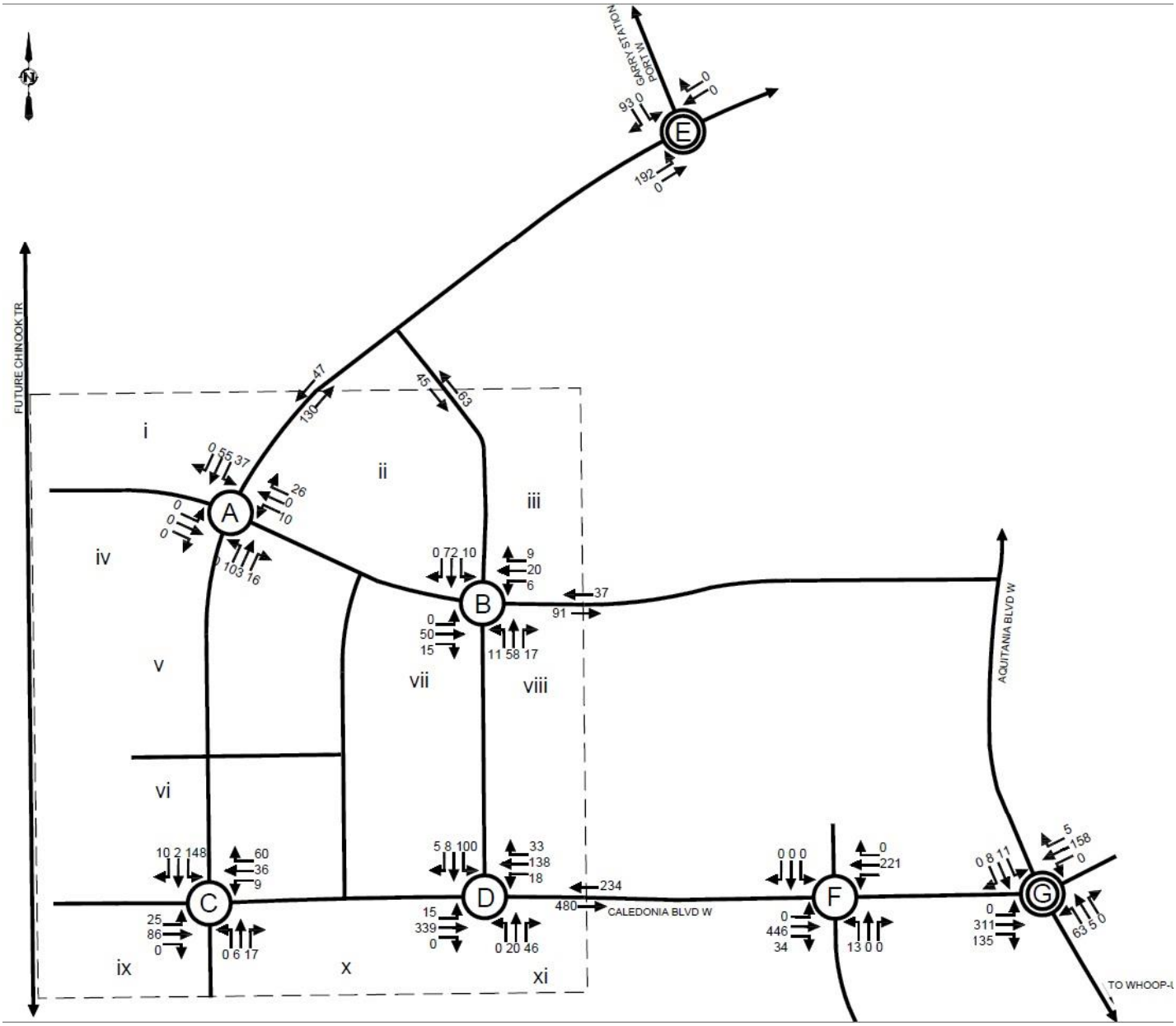


Figure 4-3 Site Generated Volumes AM Peak

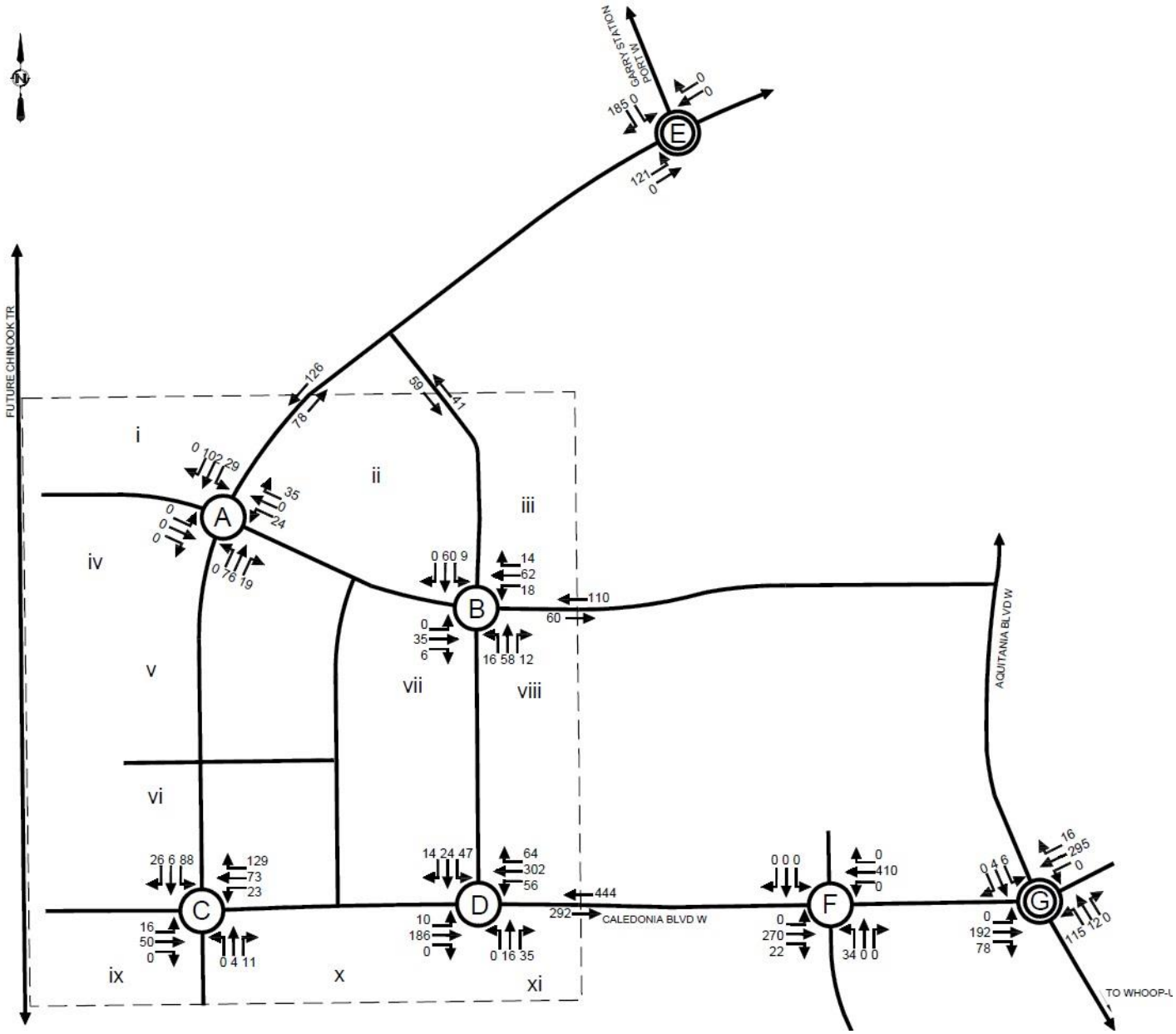


Figure 4-4 Site Generated Volumes PM Peak

5 Total Combined Traffic

The full buildout background volumes and the full buildout site generated traffic volumes are combined at each intersection to produce the total combined traffic at full buildout for The Piers. As there are no background volumes within The Piers development, these combined values are the same as the site generated volumes.

Figures 5-1 and 5-2 illustrate the AM and PM peak hour total combined traffic volumes at study intersections for full buildout of The Piers.

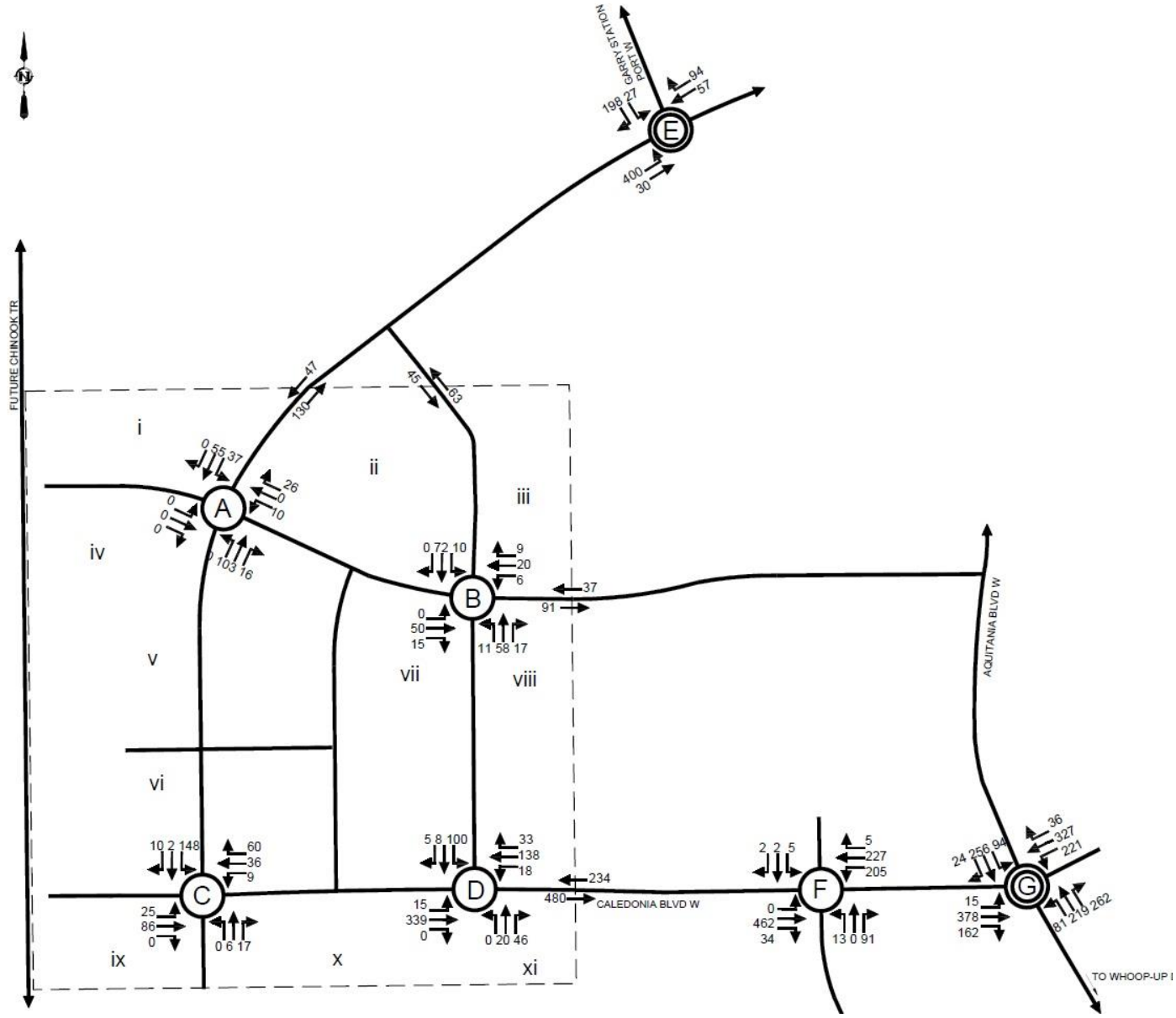


Figure 5-1 Total Full Buildout Volumes AM Peak

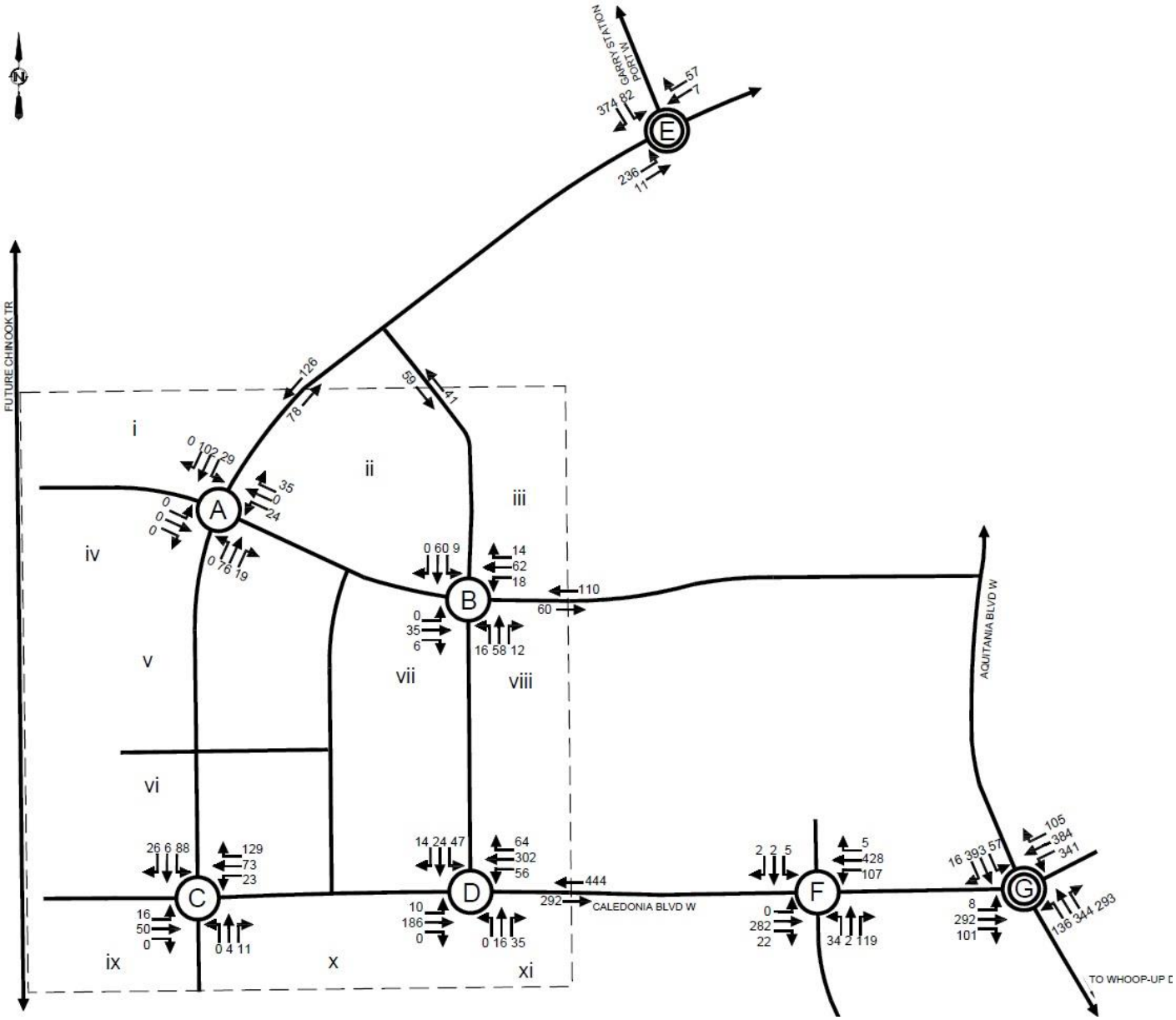


Figure 5-2 Total Full Buildout Volumes PM Peak

6 Intersection Capacity Analysis

Traffic analysis for the AM and PM peak hour conditions was conducted using Synchro/Sim Traffic 9 and SIDRA software.

Synchro / Sim Traffic 9 traffic analysis program is based on the Transportation Research Board Highway Capacity Manual 2010, 5th Ed. (HCM) and was used to analyze the capacity of the study intersections and determine the need for additional intersection and capacity improvements. This program applies the methodology established by the HCM to output a level of service for a study intersection, given the lane designations, vehicular volumes, signal timing, and heavy vehicle percentages.

SIDRA is an intersection analysis program that models intersection functionality and lane capacity also based on HCM 2010. It specializes in accurately modeling the performance and capacity of roundabouts.

For all analyses conducted, the parameters from the City of Lethbridge Traffic Analysis Parameters were used that include an ideal saturation flow of 1,750 vph and a peak hour factor of 0.88.

6.1 INTERSECTION ANALYSIS

The performance of an intersection depends on several different factors including level of service / vehicle delay and degree of saturation / volume-to-capacity ratio.

Level of service is based on the estimated average delay per vehicle for all traffic passing through an intersection. A high level of service is a result of a very low average delay; the highest level of service is identified as level of service A. A low level of service is a result of a large average delay; typically, the lowest level of service is identified as level of service F. The level of service categories vary depending on whether an intersection is signalized or stop or yield-controlled. The Highway Capacity Manual justifies this difference by noting that drivers stopped at a signal will have more tolerance for delays because they will perceive that eventually they will get their turn. Table 6-1 below identifies the level of service criteria for intersections.

Table 6-1 Level of Service Criteria

Level of Service	Average Signalized Control Delay per Vehicle (s)	Average Unsignalized Control Delay per Vehicle (s)
A	Less than 10	Less than 10
B	10 – 20	10 – 15
C	20 – 35	15 – 25
D	35 – 55	25 – 35
E	55 – 80	35 – 50
F	Greater than 80	Greater than 50

The degree of saturation, or volume-to-capacity ratio of an intersection describes the extent to which the traffic volumes can be accommodated by the theoretical capacity of the intersection. A volume-to-capacity ratio below 0.9 indicates that there is generally sufficient capacity to accommodate the traffic on the approach or at the intersection. A value between 0.9 and 1.0 suggests unstable operations and congestion may occur as volumes are nearing the theoretical capacity of the roadway. A calculated value over 1.0 indicates that volumes are theoretically exceeding capacity.

Based on Lethbridge standards, a minimum overall level of service D and a v/c ratio of 0.80 are required for the intersection and 0.9 for critical movements. Individual movements cannot exceed a LOS F.

The results of the capacity analysis are summarized in the following sections. Detailed Synchro and SIDRA analysis reports for the AM and PM peaks can be found in Appendix B.

6.2 LEVEL OF SERVICE RESULTS

Intersection performance was modeled using Synchro 9 software for un-signalized intersections and roundabouts were analysed in SIDRA. Traffic control decisions were made during the analysis in accordance with the City of Lethbridge Traffic Impact Study Guidelines in order to achieve acceptable intersection performance.

Tables 6-2 and 6-3 show a summary of the intersection analysis conducted for the AM peak and PM peak respectively. All intersections internal to The Piers have an acceptable overall and movement-specific LOS. While the existing intersections E and F at Garry Station Port and the School access also meet requirements, the existing roundabout at Aquitania Boulevard and Caledonia Boulevard does not. The following section will discuss solutions for Intersection G to meet capacity requirements.

Table 6-2 AM Peak LOS Summary

Intersection	Control	EB Delay / LOS	WB Delay / LOS	NB Delay / LOS	SB Delay / LOS	Intersection Delay	Intersection LOS	Max v/c Ratio
A	2-Way Stop	0.0 / A	2.0 / A	10.2 / B	10.4 / B	9.1	A	0.16
B	2-Way Stop	0.0 / A	1.3 / A	10.4 / B	10.6 / B	6.7	A	0.25
C	2-Way Stop	1.8 / A	0.7 / A	9.7 / A	13.2 / B	6.5	A	0.29
D	2-Way Stop	0.4 / A	0.9 / A	13.2 / B	26.0 / D	5.8	A	0.43
E	Roundabout	7.2 / A	6.6 / A	-	3.8 / A	6.1	A	0.33
F	2-Way Stop	0.0 / A	6.0 / A	20.5 / C	44.6 / E	4.9	A	0.34
G	Roundabout	26.3 / C	12.5 / B	31.2 / C	20.5 / C	12.0	C	0.89

Table 6-3 PM Peak LOS Summary

Intersection	Control	EB Delay / LOS	WB Delay / LOS	NB Delay / LOS	SB Delay / LOS	Intersection Delay	Intersection LOS	Max v/c Ratio
A	2-Way Stop	2.4 / A	3.0 / A	10.0 / B	10.7 / B	8.8	A	0.19
B	2-Way Stop	0.1 / A	1.9 / A	11.8 / B	12.5 / B	5.7	A	0.17
C	2-Way Stop	0.1 / A	0.2 / A	9.5 / A	12.0 / B	4.5	A	0.21
D	2-Way Stop	0.5 / A	1.5 / A	12.4 / B	21.3 / C	4.2	A	0.30
E	Roundabout	7.8 / A	4.6 / A	-	3.7 / A	5.1	A	0.30
F	2-Way Stop	0.0 / A	2.6 / A	19.4 / C	29.6 / D	4.6	A	0.42
G	Roundabout	36.6 / D	319.2 / F	79.0 / F	55.3 / E	74.7	F	1.16

6.3 INTERSECTION 'G' ANALYSIS

The current analysis results in a failed intersection LOS and v/c at the existing roundabout at Aquitania Boulevard and Caledonia Boulevard. Three possible solutions were considered to reduce the volume of traffic directed to the existing roundabout.

As the existing roundabout fails due to the large volume of traffic entering the circle from the east during the PM peak, creating a right turn bypass lane would relieve some pressure from the roundabout and improve the LOS. However, this option is dependant on available land to the NE of the roundabout. This land does not appear to be available for the bypass lane. While this solution was considered, it is both unfeasible and not preferred by the city.

Chinook Trail is a long-term future arterial road bordering the west portion of the study area that is planned to extend from Garry Drive to Whoop-up Drive. There will eventually be a north access and a south access from The Piers onto Chinook Trail. If a section of Chinook Trail is built by full buildout from Whoop-up Drive to the south Piers access, it would allow for approximately 20% of traffic currently being routed to Whoop-up Drive from Caledonia Boulevard and Aquitania Boulevard to instead access Whoop-up Drive via the section of Chinook Trail. This option provides acceptable operation intersections within The Piers as well as Intersection E. Some of Intersection G's accesses have high v/c ratios, but overall the LOS for each leg remains a C or better, and it operates at a LOS C overall. Performance reports for this option are included in Appendix C.

Another option to assist with traffic distribution is a south road which would run through the parcel of land immediately south of The Piers development. This would be the most direct connection to Whoop-up Drive for many vehicles in The Piers, as well as an alternate connection from Garry Station to Whoop-up Drive instead of Métis Trail. By distributing approximately 25% of vehicles through the south link to Whoop-up Drive, this relieves pressure on the Aquitania Boulevard – Caledonia Boulevard roundabout. See Table 6-4 for the updated distribution to / from each zone in The Piers. This updated distribution takes into account full buildout of the development, and the most natural access to / from other areas to / from each zone.

If the future Chinook Trail is not planned to be constructed by full buildout of The Piers, a preferred solution would be a south access road to divert traffic to / from the south side of The Piers to Whoop-up Drive. This is dependant on if a future TIA for the lands south of The Piers indicates that adequate capacity is available to divert 20-30% of traffic that would normally use the existing roundabout at Aquitania Boulevard and Caledonia Boulevard.

Table 6-4 Updated Trip Distribution

TO/FROM	ZONE											
	i	ii	iii	iv	v	vi	vii	viii	ix	x	xi	xii
GARRY STATION	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%
AQUITANIA BLVD	10%	10%	15%	10%	10%	10%	15%	20%	15%	15%	20%	15%
HIGH SCHOOL	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	0%
MÉTIS TR	30%	30%	35%	30%	35%	30%	30%	35%	15%	20%	25%	35%
SOUTH LINK	30%	30%	20%	30%	25%	30%	25%	15%	40%	35%	25%	25%

The following Figures 6-1 and 6-2 show the traffic volumes at all intersections for the AM and PM peak respectively under the condition that the south link road can route traffic to Whoop-up Drive. Tables 6-5 and 6-6 summarize the AM and PM performances at each intersection in the network. Full reports for this solution are available in Appendix D.

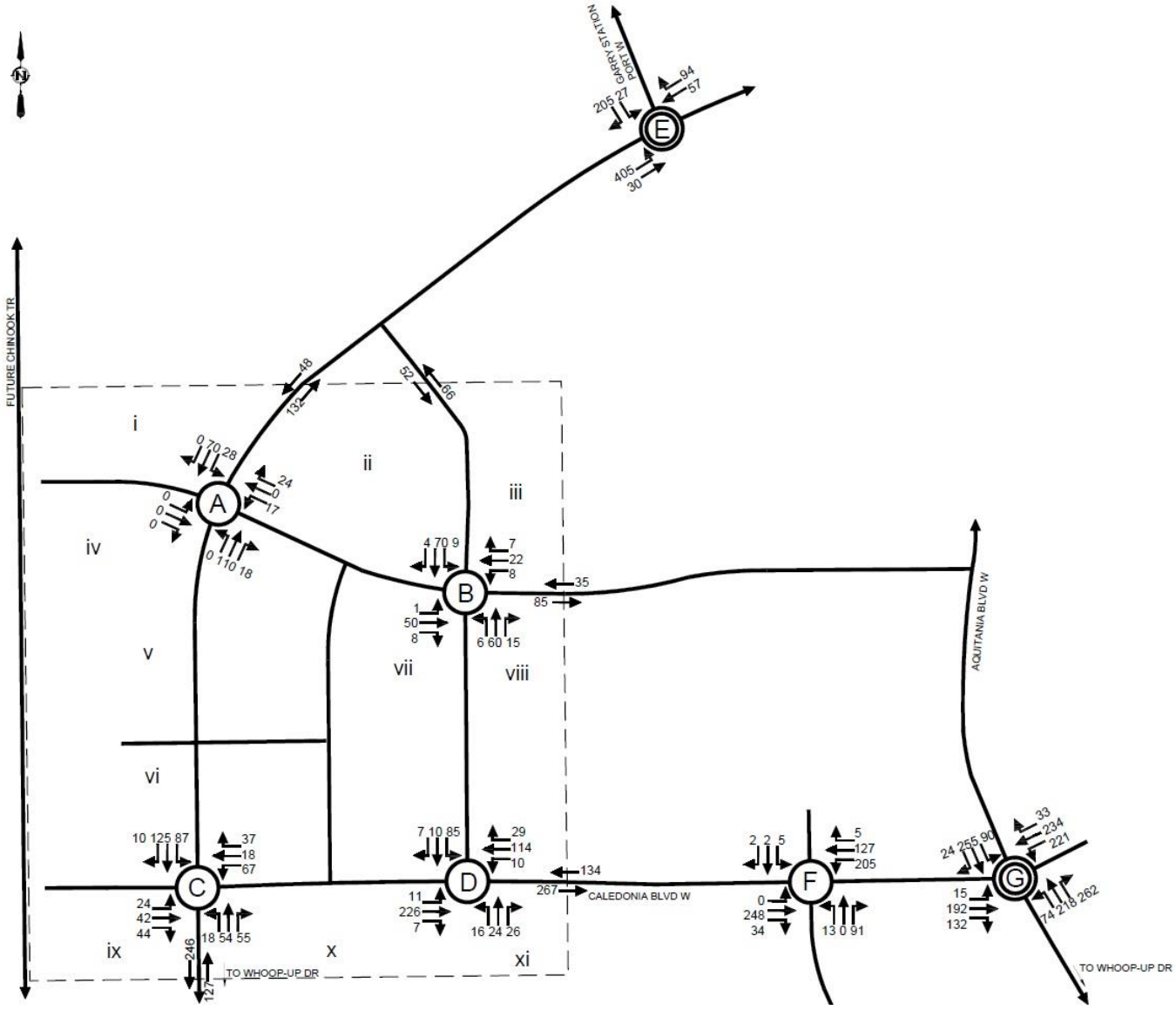


Figure 6-1 AM Peak volumes with South Link

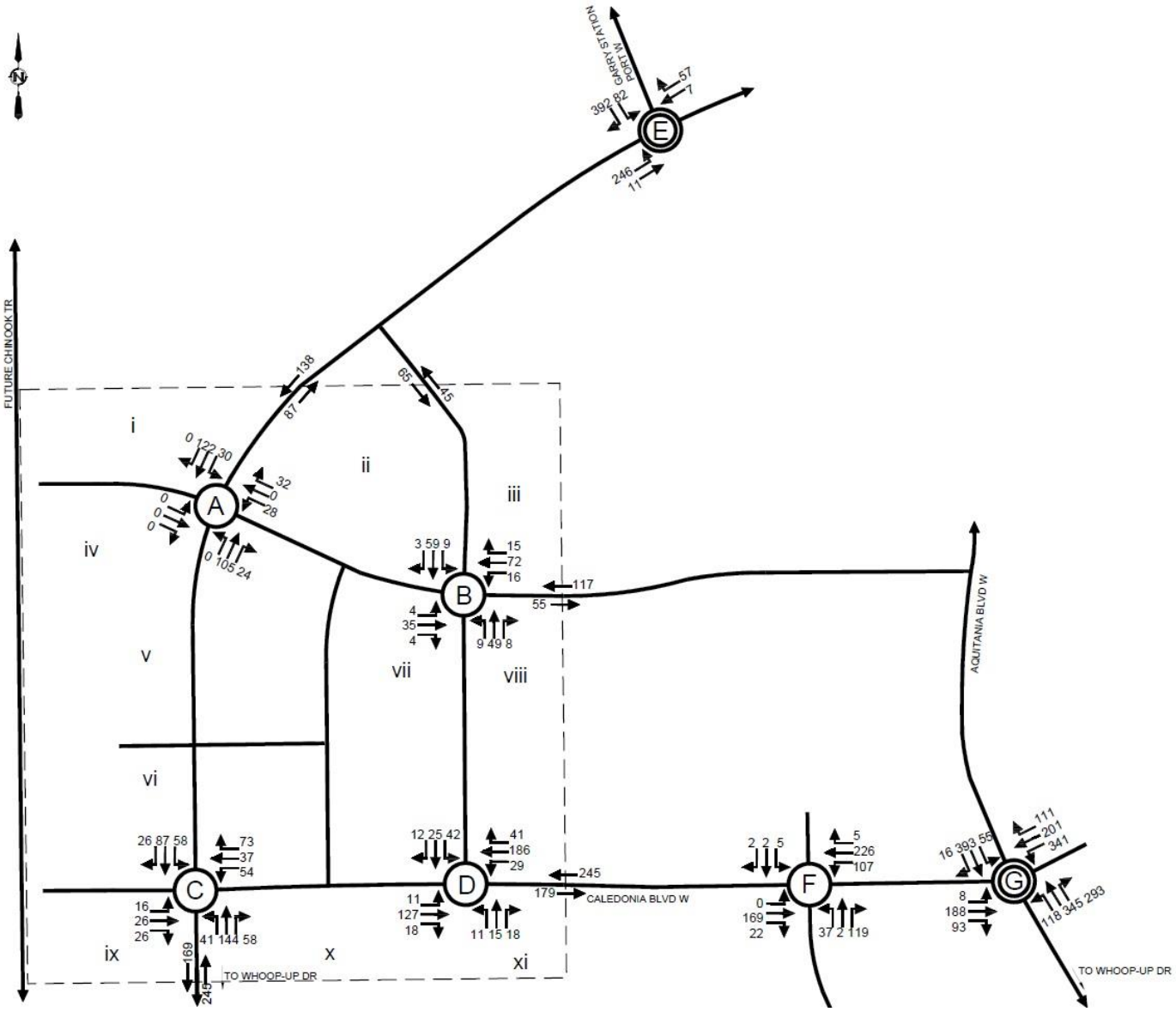


Figure 6-2 PM Peak volumes with South Link

Table 6-5 AM Peak LOS Summary (With South Link)

Intersection	Control	EB Delay / LOS	WB Delay / LOS	NB Delay / LOS	SB Delay / LOS	Intersection Delay	Intersection LOS	Max v/c Ratio
A	2-Way Stop	10.4 / B	10.2 / B	0.0 / A	2.3 / A	2.6	A	0.09
B	2-Way Stop	0.1 / A	1.5 / A	10.5 / B	10.9 / B	5.9	A	0.13
C	2-Way Stop	14.5 / B	17.2 / C	1.2 / A	3.4 / A	7.9	A	0.32
D	2-Way Stop	0.4 / A	0.6 / A	12.7 / B	16.4 / C	4.8	A	0.27
E	Roundabout	7.2 / A	6.7 / A	-	3.8 / A	6.1	A	0.34
F	2-Way Stop	0.0 / A	6.0 / A	13.6 / B	25.0 / C	5.0	A	0.22
G	Roundabout	12.6 / B	10.2 / B	9.1 / A	13.8 / B	11.1	B	0.67

Table 6-6 PM Peak LOS Summary (With South Link)

Intersection	Control	EB Delay / LOS	WB Delay / LOS	NB Delay / LOS	SB Delay / LOS	Intersection Delay	Intersection LOS	Max v/c Ratio
A	2-Way Stop	10.7 / B	10.4 / B	0.0 / A	0.2 / A	2.6	A	0.09
B	2-Way Stop	0.8 / A	1.3 / A	10.6 / B	10.8 / B	5.7	A	0.11
C	2-Way Stop	14.3 / B	16.3 / B	1.5 / A	2.9 / A	7.0	A	0.37
D	2-Way Stop	0.7 / A	1.0 / A	12.1 / B	14.2 / B	3.8	A	0.19
E	Roundabout	7.8 / A	4.7 / A	-	3.6 / A	5.1	A	0.31
F	2-Way Stop	0.1 / A	3.1 / A	13.5 / B	18.5 / C	4.8	A	0.30
G	Roundabout	16.3 / C	40.4 / D	9.9 / A	28.5 / C	24.0	C	0.94

Based on these adjusted results assuming the south road is open by full buildout, all intersections operate acceptably in both the AM and PM peaks. Figure 6-3 summarizes the level of services at all intersections.

The overall LOS at the PM peak has improved at intersection G to an acceptable LOS C. It should be noted that due to the movement-specific low LOS on the WB leg (LOS D), the v/c ratio is 0.94 which is above the acceptable level. However, all movement level of services and v/c ratios, however, are acceptable as the NB v/c = 0.78 (LOS B), SB v/c = 0.84 (LOS C), and EB v/c = 0.58 (LOS C). For this reason, the performance at Intersection G is considered permissible with the South Link open.

Figure 6-3

6.4 BUILDOUT FORECAST

These results are based on full buildout of The Piers in 2037. In order to gauge when in the development of The Piers a south link would be needed to prevent Intersection G from exceeding capacity, an estimate was undertaken of the anticipated phasing using a zone by zone buildout (as described in the OLP, approximately five stages progressing east to west and south to north over the 20 years). Table 6-7 shows an approximate LOS of the roundabout for each five-year increment.

Table 6-7 Intersection G LOS during buildout

Year	Approximate ha developed	Corresponding LOS
2022	9.2	A
2025	14.1	A
2028	19.6	C
2030	23.1	C
2035	27.98	C
2037	35.4	F

The row in red is the threshold where Intersection G will operate acceptably without opening the south road. All stages as shown in the OLP can be built except for Stage 5. Stage 5 low density units can be built and produce the LOS of C at Intersection G and maintain acceptable v/c ratios. Once either of the medium density lots are developed in Stage 5, Intersection G will not operate with an acceptable LOS or v/c ratios without the south road being available for alternative access. See Figure 6-4 for a visual of this buildout permitted.

The LOS for each of the five-year increments were achieved by combining the trip generations for the appropriate zones in the stages at each year and combining it with the background traffic for full buildout applied with a 1.1% annual growth rate to equate it to the phase year (1.1% based on the EMME model).

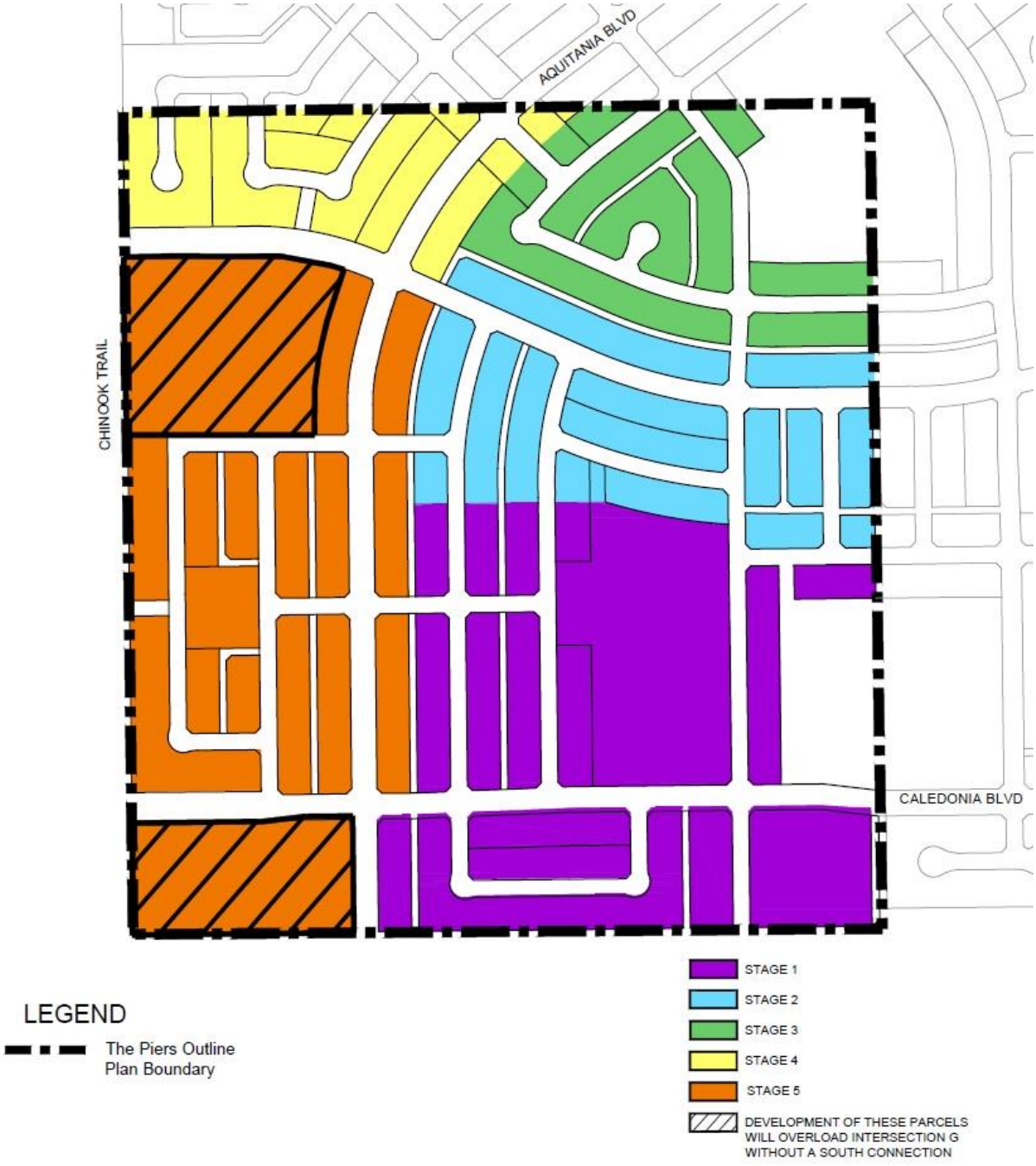


Figure 6-4 Staging Plan with permitted development without the South connection

6.5 INTERSECTION CONFIGURATION

Based on the completed analysis, Figure 6-5 summarizes the intersection configurations and traffic control requirements to accommodate traffic at full buildout with the south connection and no access to the future Chinook Trail.

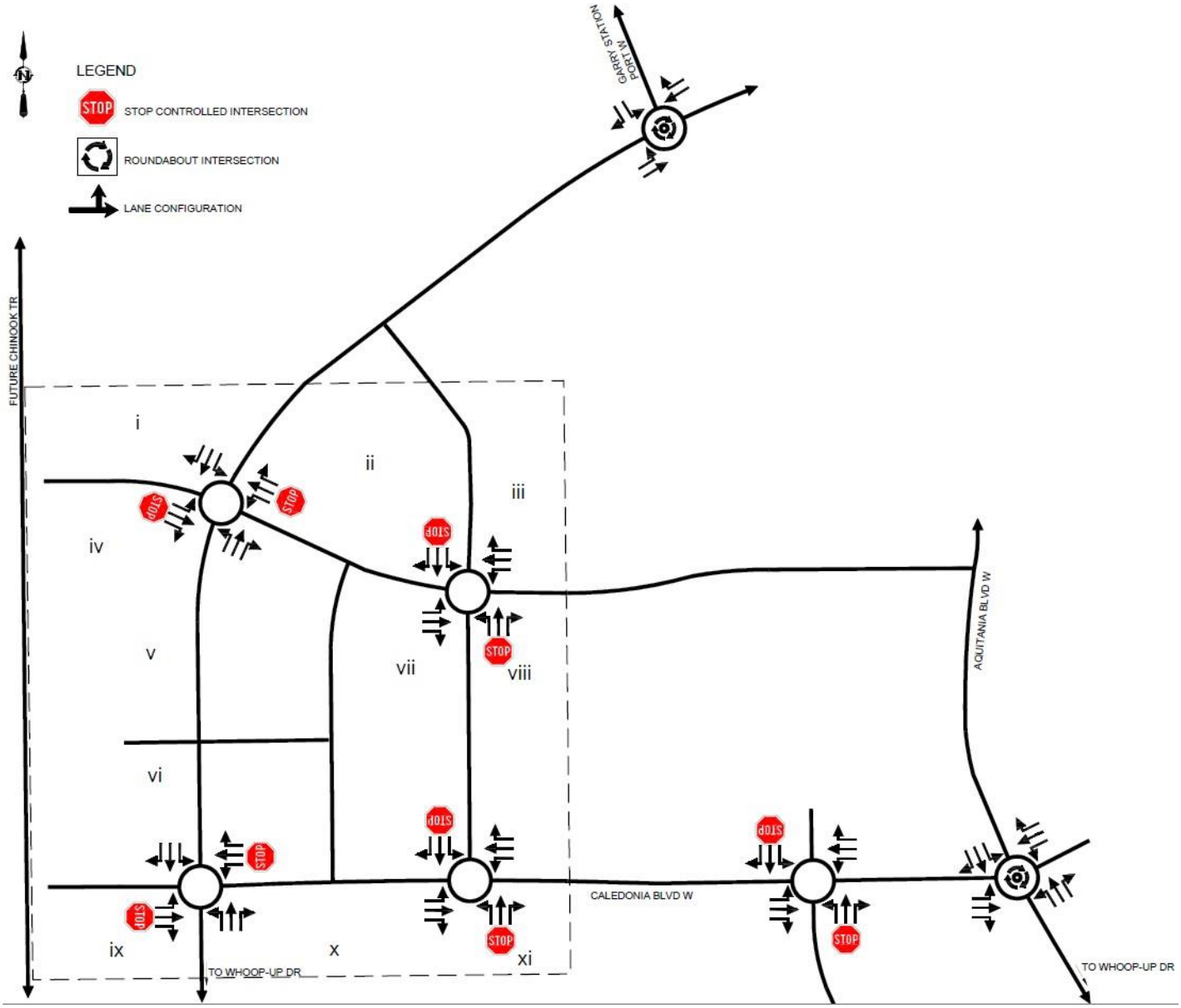


Figure 6-5 Intersection Configuration and Traffic Control at Full Buildout With South Link

7 Road Classification

The road classifications for the study area are based on the City of Lethbridge Design Standards – Section 6: Transportation (2016). Table 7-1 shows the full buildout volumes and daily traffic volume criteria generally guiding the road classification in the City.

Table 7-1 Road Classification

Road Classification	Daily Traffic Volume (veh/day)
Arterial	over 15,000
Super Collector	2,000 to 15,000
Community Entrance Road	2,000 to 8,000
Major Collector	2,000 to 8,000
Minor Collector	Up to 4,000
Local < 2,000	Local < 2,000

Source: City of Lethbridge Design Standards (2016)

Daily traffic volumes for The Piers were derived from the AM and PM peak full buildout volumes with the South Link open. It is assumed for this analysis that daily volumes correspond to approximately the AM peak plus the PM peak times 5.6. 5.6 is provided by the City as an daily volume calculation factor to use with the AM and PM peaks to find the daily traffic volume. It is based on data from permanent traffic counting stations.

Following discussion with the City, and due to the existing portions of Aquitania Boulevard that is build to Major Collector, Aquitania Boulevard in The Piers will be classified as a major collector.

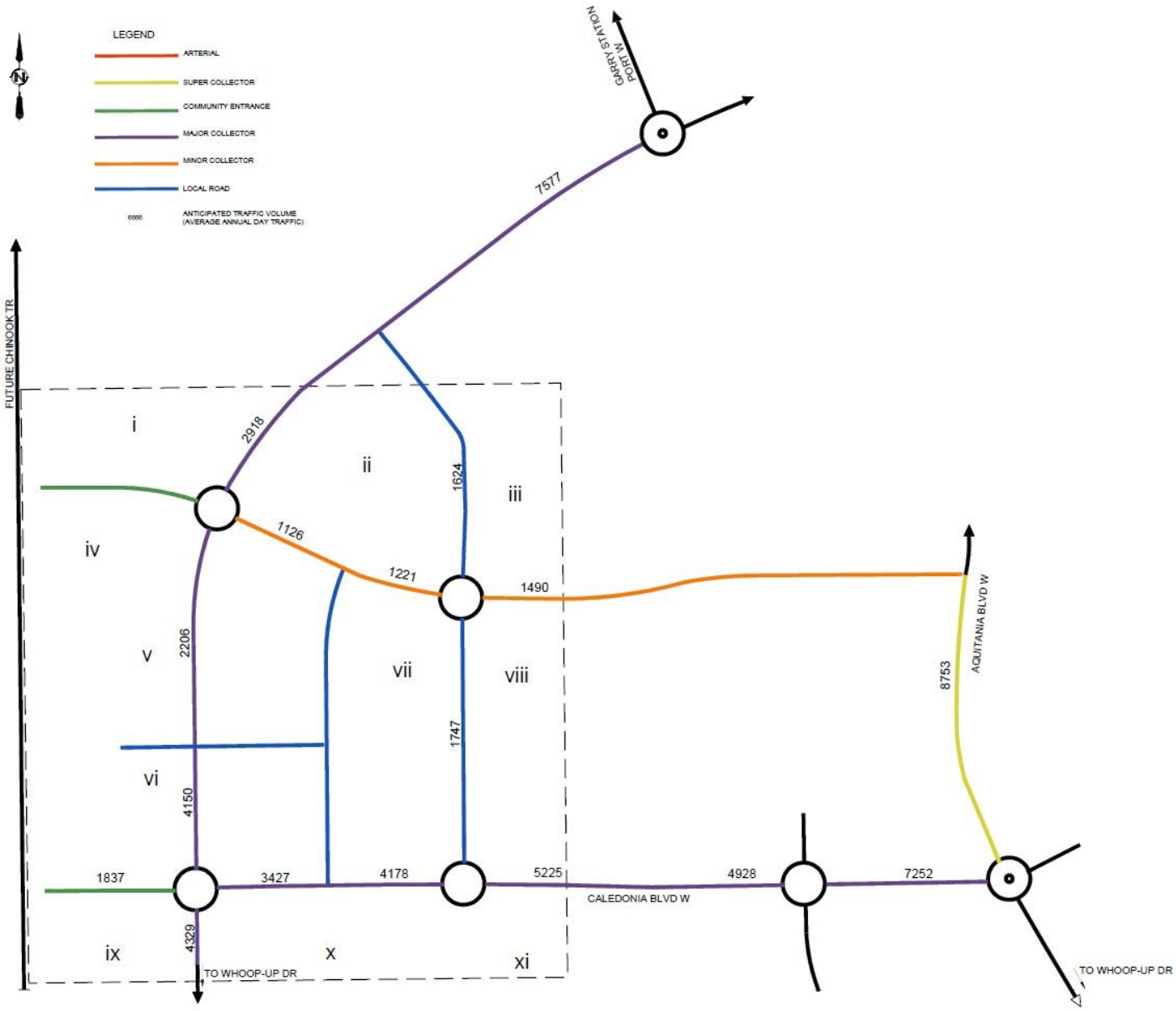


Figure 7-1 Daily Traffic Volumes with South Link

8 Transit Service

Transit service standards will correspond to the Transit Master Plan.

9 Cycling

The Piers will provide a regional pathway along the north side of Caledonia Boulevard that will link future Chinook Trail with the existing regional pathway along the south side of Caledonia Boulevard in The Crossing subdivision.

The street crossing from the north to the south side of Caledonia Boulevard is intended to happen in front of the proposed school building with a raised crosswalk.

10 Recommendations

Based on the analysis conducted, it is recommended that roadway classifications follow that laid out in Figure 7-1.

Results from analysis indicate Aquitania Boulevard will be required to extend south of The Piers development to provide a connection to Whoop-up Drive prior to full buildout to accommodate traffic accessing Whoop-up Drive. Without this connection, the capacity of the existing roundabout at Aquitania Boulevard and Caledonia Boulevard would be exceeded during the PM peak. As discussed in Section 6-4, and illustrated in Figure 6-4, this will be required when approximated 28 hectares of The Piers has been constructed in order for further development to occur.

With this south link open, all intersections internal to The Piers development will operate at acceptable levels as two way stop controlled intersections during the AM and PM peaks at full buildout. External to The Piers, the roundabout at Garry Station Port and Aquitania Boulevard will operate with an acceptable level of service and the roundabout at Aquitania Boulevard and Caledonia Boulevard will also operate acceptably. The intersection that provides access to the high school /library site at Caledonia Boulevard will have acceptable operation at full buildout as a two-way stop.

While the road connecting the south end of Aquitania Boulevard to Whoop-up Drive will be needed prior to full buildout but not at opening day of the network, the Level of Service should be revaluated at the roundabout at Aquitania Boulevard and Caledonia Boulevard throughout the development of The Piers to ensure the roundabout does not exceed capacity and the south link is not required.

Because The Piers uses analysis that does not consider the future Chinook Trail construction and connections it will provide, level of service and stop controls at intersections should be re-evaluated once Chinook Trail is planned to be constructed.

Closure

This report was prepared for the City of Lethbridge to assess the traffic impact of The Piers subdivision.

The services provided by Associated Engineering Alberta Ltd. In the preparation of this report were conducted in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions. No other warranty expressed or implied is made.

Respectfully submitted,

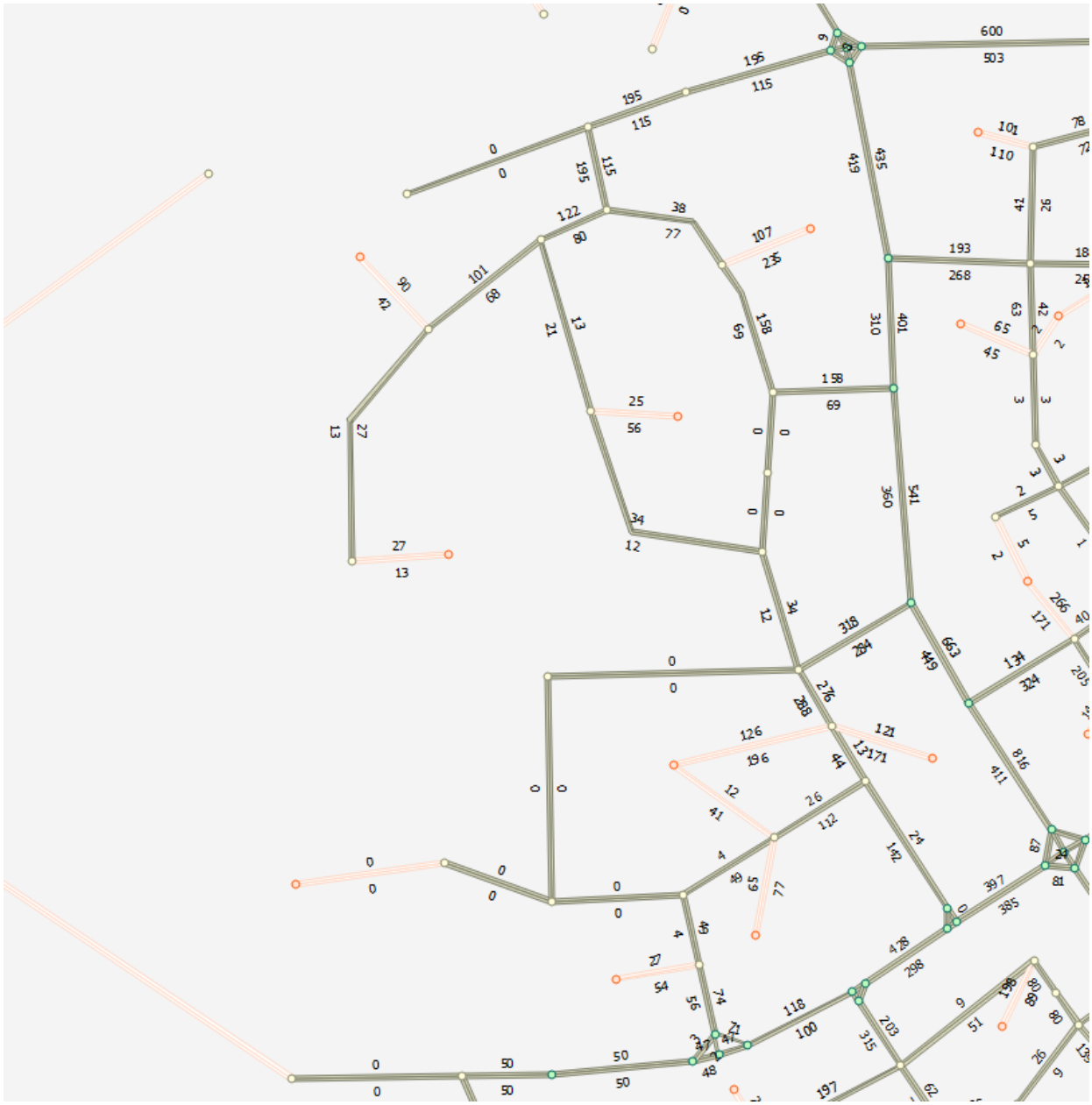
Associated Engineering Alberta Ltd.

Darryl Schalk, P.L. (Eng.), R.E.T. Manager, Transportation	Chris Poirier, C.E.T. Project Manager	Breanna Jackson, E.I.T. Junior Transportation Engineer

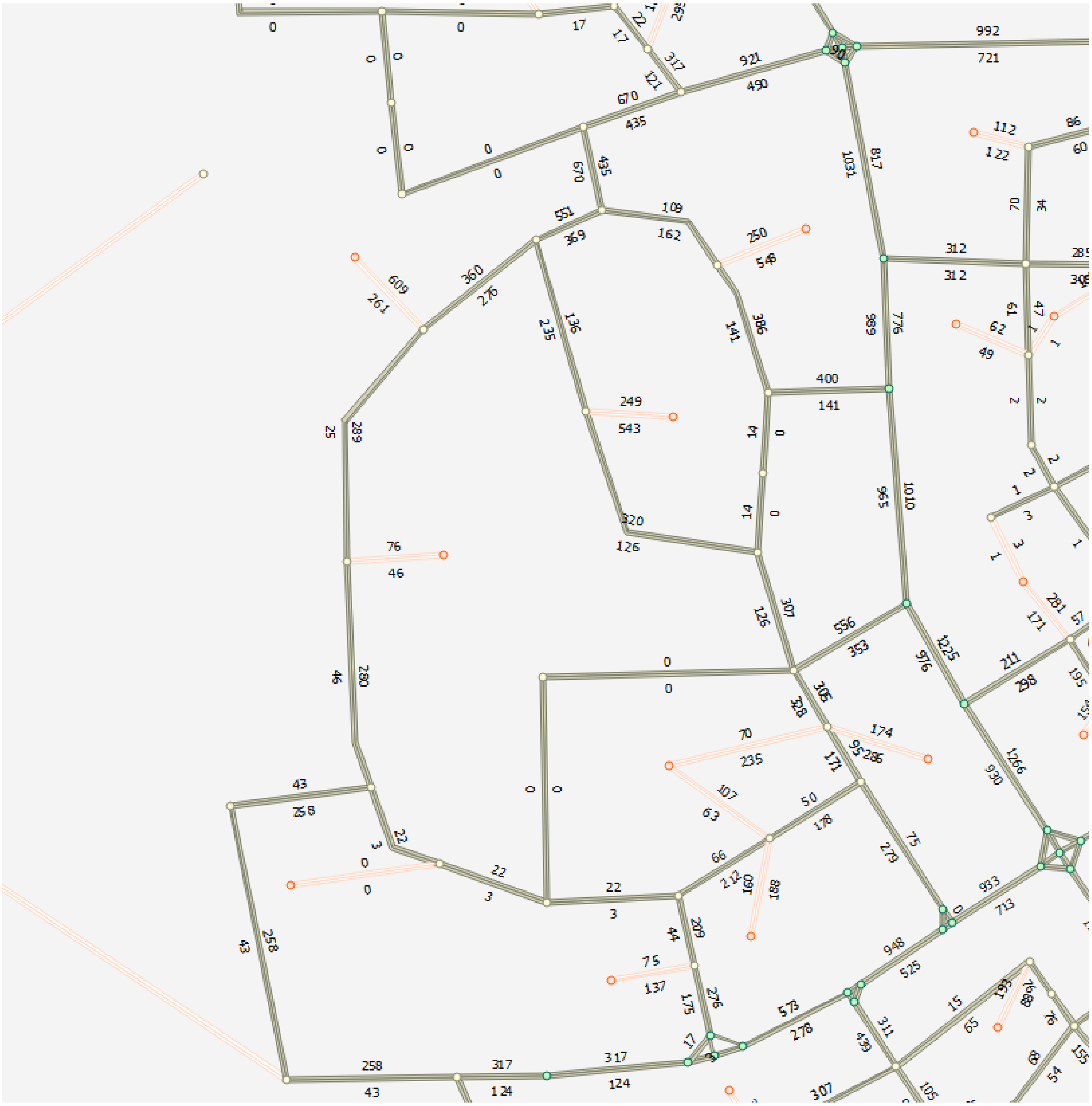
Appendix A – EMME Model

City of Lethbridge EMME Model was provided with background traffic projections for Short (106k), Interim (137k) and Full Buildout (197k). Using known population projection of 130k in 2040 and current population of 97k, the year of the projections translated to 2023, 2045, and 2089. Using a linear growth relationship, the growth rate between the interim and short term projects equated to a 1.1% growth rate.

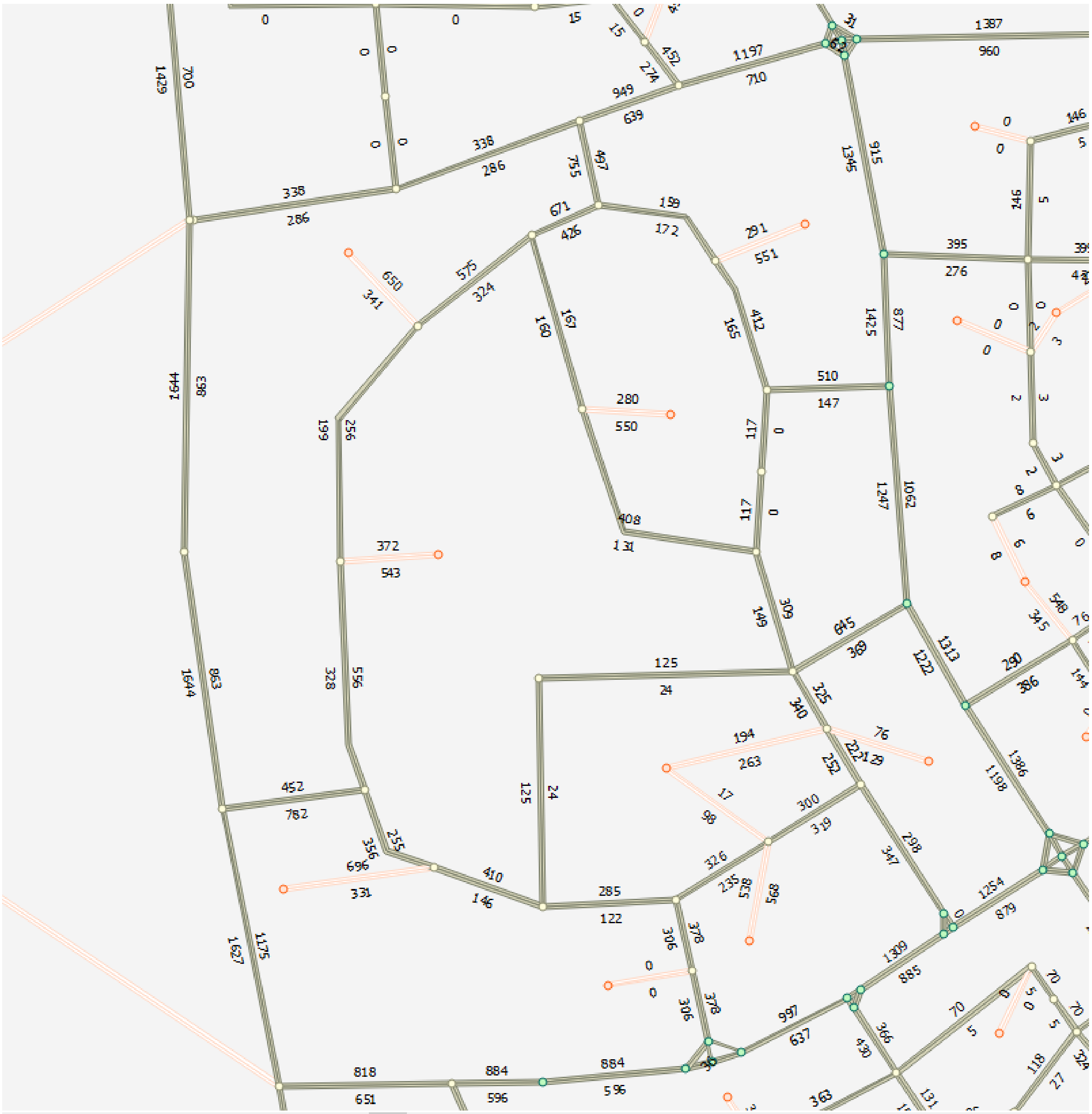
PM Short EMME Data



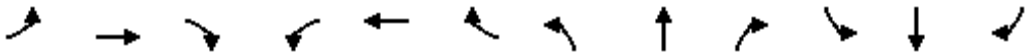
PM Interim EMME Data



PM Full Buildout EMME Data w/ Piers

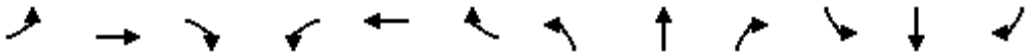


Appendix B – Synchro and SIDRA Reports



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	20	0	24	0	95	44	35	45	0
Future Volume (vph)	0	0	0	20	0	24	0	95	44	35	45	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt					0.927			0.957				
Flt Protected					0.978						0.978	
Satd. Flow (prot)	0	1735	0	0	1573	0	0	1660	0	0	1697	0
Flt Permitted					0.978						0.978	
Satd. Flow (perm)	0	1735	0	0	1573	0	0	1660	0	0	1697	0
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		305.3			396.7			589.4			375.3	
Travel Time (s)		22.9			29.8			44.2			28.1	
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	0	0	0	23	0	27	0	108	50	40	51	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	50	0	0	158	0	0	91	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 33.7%		ICU Level of Service A	
Analysis Period (min) 15			
Description: Int A			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	20	0	24	0	95	44	35	45	0
Future Volume (Veh/h)	0	0	0	20	0	24	0	95	44	35	45	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	0	0	0	23	0	27	0	108	50	40	51	0
Pedestrians		10			10			10			10	
Lane Width (m)		3.7			3.7			3.7			3.7	
Walking Speed (m/s)		1.1			1.1			1.1			1.1	
Percent Blockage		1			1			1			1	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	37			10			105	93	20	184	80	34
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	37			10			105	93	20	184	80	34
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			100	86	95	94	93	100
cM capacity (veh/h)	1559			1595			796	771	1038	632	784	1021

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	0	50	158	91
Volume Left	0	23	0	40
Volume Right	0	27	50	0
cSH	1700	1595	839	709
Volume to Capacity	0.00	0.01	0.19	0.13
Queue Length 95th (m)	0.0	0.3	5.2	3.3
Control Delay (s)	0.0	3.4	10.3	10.8
Lane LOS		A	B	B
Approach Delay (s)	0.0	3.4	10.3	10.8
Approach LOS			B	B

Intersection Summary			
Average Delay	9.3		
Intersection Capacity Utilization	33.7%	ICU Level of Service	A
Analysis Period (min)	15		
Description: Int A			

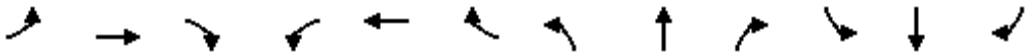
Intersection	
Int Delay, s/veh	9.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	0	0	0	20	0	24	0	95	44	35	45	0
Future Vol, veh/h	0	0	0	20	0	24	0	95	44	35	45	0
Conflicting Peds, #/hr	10	0	10	10	0	10	10	0	10	10	0	10
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	23	0	27	0	108	50	40	51	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	37	0	0	10	0	0	105	93	20	158	79	34
Stage 1	-	-	-	-	-	-	10	10	-	69	69	-
Stage 2	-	-	-	-	-	-	95	83	-	89	10	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1574	-	-	1610	-	-	875	797	1058	808	811	1039
Stage 1	-	-	-	-	-	-	1011	887	-	941	837	-
Stage 2	-	-	-	-	-	-	912	826	-	918	887	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1559	-	-	1595	-	-	807	771	1039	666	784	1020
Mov Cap-2 Maneuver	-	-	-	-	-	-	807	771	-	666	784	-
Stage 1	-	-	-	-	-	-	1002	879	-	932	817	-
Stage 2	-	-	-	-	-	-	834	806	-	759	879	-

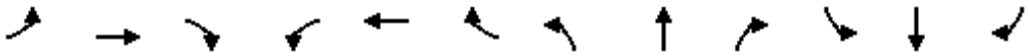
Approach	EB	WB	NB	SB
HCM Control Delay, s	0	3.3	10.3	10.6
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	840	1559	-	-	1595	-	-	728
HCM Lane V/C Ratio	0.188	-	-	-	0.014	-	-	0.125
HCM Control Delay (s)	10.3	0	-	-	7.3	0	-	10.6
HCM Lane LOS	B	A	-	-	A	A	-	B
HCM 95th %tile Q(veh)	0.7	0	-	-	0	-	-	0.4



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	99	5	15	39	9	8	51	36	15	57	0
Future Volume (vph)	0	99	5	15	39	9	8	51	36	15	57	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.993			0.981			0.949				
Flt Protected					0.988			0.996			0.990	
Satd. Flow (prot)	0	1723	0	0	1681	0	0	1640	0	0	1717	0
Flt Permitted					0.988			0.996			0.990	
Satd. Flow (perm)	0	1723	0	0	1681	0	0	1640	0	0	1717	0
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		396.7			778.9			439.8			453.2	
Travel Time (s)		29.8			58.4			33.0			34.0	
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	0	113	6	17	44	10	9	58	41	17	65	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	119	0	0	71	0	0	108	0	0	82	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 27.4%		ICU Level of Service A	
Analysis Period (min) 15			
Description: Int B			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	99	5	15	39	9	8	51	36	15	57	0
Future Volume (Veh/h)	0	99	5	15	39	9	8	51	36	15	57	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	0	113	6	17	44	10	9	58	41	17	65	0
Pedestrians		10			10			10			10	
Lane Width (m)		3.7			3.7			3.7			3.7	
Walking Speed (m/s)		1.1			1.1			1.1			1.1	
Percent Blockage		1			1			1			1	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	64			129			252	224	136	289	222	69
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	64			129			252	224	136	289	222	69
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			99	91	95	97	90	100
cM capacity (veh/h)	1524			1443			622	655	896	566	656	976

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	119	71	108	82
Volume Left	0	17	9	17
Volume Right	6	10	41	0
cSH	1524	1443	726	635
Volume to Capacity	0.00	0.01	0.15	0.13
Queue Length 95th (m)	0.0	0.3	4.0	3.4
Control Delay (s)	0.0	1.9	10.8	11.5
Lane LOS		A	B	B
Approach Delay (s)	0.0	1.9	10.8	11.5
Approach LOS			B	B

Intersection Summary			
Average Delay	5.9		
Intersection Capacity Utilization	27.4%	ICU Level of Service	A
Analysis Period (min)	15		
Description: Int B			

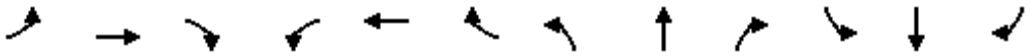
Intersection	
Int Delay, s/veh	5.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	0	99	5	15	39	9	8	51	36	15	57	0
Future Vol, veh/h	0	99	5	15	39	9	8	51	36	15	57	0
Conflicting Peds, #/hr	10	0	10	10	0	10	10	0	10	10	0	10
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	113	6	17	44	10	9	58	41	17	65	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	65	0	0	128	0	0	251	224	135	269	222	69
Stage 1	-	-	-	-	-	-	125	125	-	94	94	-
Stage 2	-	-	-	-	-	-	126	99	-	175	128	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1537	-	-	1458	-	-	702	675	914	684	677	994
Stage 1	-	-	-	-	-	-	879	792	-	913	817	-
Stage 2	-	-	-	-	-	-	878	813	-	827	790	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1523	-	-	1445	-	-	631	655	897	592	657	976
Mov Cap-2 Maneuver	-	-	-	-	-	-	631	655	-	592	657	-
Stage 1	-	-	-	-	-	-	871	785	-	905	800	-
Stage 2	-	-	-	-	-	-	790	796	-	724	783	-

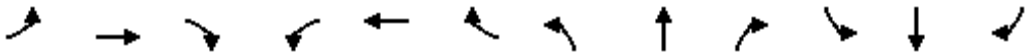
Approach	EB	WB	NB	SB
HCM Control Delay, s	0	1.8	10.8	11.4
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	727	1523	-	-	1445	-	-	642
HCM Lane V/C Ratio	0.148	-	-	-	0.012	-	-	0.127
HCM Control Delay (s)	10.8	0	-	-	7.5	0	-	11.4
HCM Lane LOS	B	A	-	-	A	A	-	B
HCM 95th %tile Q(veh)	0.5	0	-	-	0	-	-	0.4



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	25	69	0	10	27	42	0	7	18	96	3	10
Future Volume (vph)	25	69	0	10	27	42	0	7	18	96	3	10
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt					0.928			0.904			0.988	
Flt Protected		0.987			0.994						0.958	
Satd. Flow (prot)	0	1712	0	0	1600	0	0	1568	0	0	1642	0
Flt Permitted		0.987			0.994						0.958	
Satd. Flow (perm)	0	1712	0	0	1600	0	0	1568	0	0	1642	0
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		277.5			100.4			137.5			589.4	
Travel Time (s)		20.8			7.5			10.3			44.2	
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	28	78	0	11	31	48	0	8	20	109	3	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	106	0	0	90	0	0	28	0	0	123	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 30.9%		ICU Level of Service A	
Analysis Period (min) 15			
Description: Int C			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	25	69	0	10	27	42	0	7	18	96	3	10
Future Volume (Veh/h)	25	69	0	10	27	42	0	7	18	96	3	10
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	28	78	0	11	31	48	0	8	20	109	3	11
Pedestrians		10			10			10			10	
Lane Width (m)		3.7			3.7			3.7			3.7	
Walking Speed (m/s)		1.1			1.1			1.1			1.1	
Percent Blockage		1			1			1			1	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	89			88			244	255	98	255	231	75
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	89			88			244	255	98	255	231	75
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			99			100	99	98	83	100	99
cM capacity (veh/h)	1492			1494			664	620	940	642	639	968

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	106	90	28	123
Volume Left	28	11	0	109
Volume Right	0	48	20	11
cSH	1492	1494	819	662
Volume to Capacity	0.02	0.01	0.03	0.19
Queue Length 95th (m)	0.4	0.2	0.8	5.2
Control Delay (s)	2.1	1.0	9.5	11.7
Lane LOS	A	A	A	B
Approach Delay (s)	2.1	1.0	9.5	11.7
Approach LOS			A	B

Intersection Summary				
Average Delay	5.8			
Intersection Capacity Utilization	30.9%	ICU Level of Service	A	
Analysis Period (min)	15			
Description: Int C				

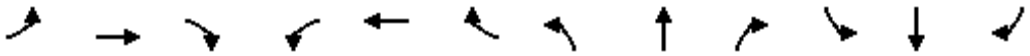
Intersection	
Int Delay, s/veh	5.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	25	69	0	10	27	42	0	7	18	96	3	10
Future Vol, veh/h	25	69	0	10	27	42	0	7	18	96	3	10
Conflicting Peds, #/hr	10	0	10	10	0	10	10	0	10	10	0	10
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	28	78	0	11	31	48	0	8	20	109	3	11

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	88	0	0	88	0	0	240	256	98	246	232	75
Stage 1	-	-	-	-	-	-	145	145	-	87	87	-
Stage 2	-	-	-	-	-	-	95	111	-	159	145	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1508	-	-	1508	-	-	714	648	958	708	668	986
Stage 1	-	-	-	-	-	-	858	777	-	921	823	-
Stage 2	-	-	-	-	-	-	912	804	-	843	777	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1494	-	-	1494	-	-	675	618	940	659	637	968
Mov Cap-2 Maneuver	-	-	-	-	-	-	675	618	-	659	637	-
Stage 1	-	-	-	-	-	-	833	754	-	894	809	-
Stage 2	-	-	-	-	-	-	882	790	-	792	754	-

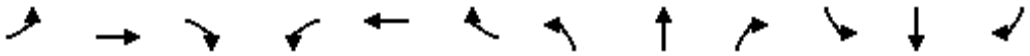
Approach	EB	WB	NB	SB
HCM Control Delay, s	2	0.9	9.5	11.5
HCM LOS			A	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	820	1494	-	-	1494	-	-	678
HCM Lane V/C Ratio	0.035	0.019	-	-	0.008	-	-	0.183
HCM Control Delay (s)	9.5	7.5	0	-	7.4	0	-	11.5
HCM Lane LOS	A	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.1	0.1	-	-	0	-	-	0.7



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	24	234	0	17	94	21	0	34	42	65	14	9
Future Volume (vph)	24	234	0	17	94	21	0	34	42	65	14	9
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt					0.978			0.926			0.986	
Flt Protected		0.995			0.994						0.964	
Satd. Flow (prot)	0	1726	0	0	1686	0	0	1606	0	0	1649	0
Flt Permitted		0.995			0.994						0.964	
Satd. Flow (perm)	0	1726	0	0	1686	0	0	1606	0	0	1649	0
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		112.5			489.9			139.9			439.8	
Travel Time (s)		8.4			36.7			10.5			33.0	
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	27	266	0	19	107	24	0	39	48	74	16	10
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	293	0	0	150	0	0	87	0	0	100	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 37.3%		ICU Level of Service A	
Analysis Period (min) 15			
Description: Int D			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	24	234	0	17	94	21	0	34	42	65	14	9
Future Volume (Veh/h)	24	234	0	17	94	21	0	34	42	65	14	9
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	27	266	0	19	107	24	0	39	48	74	16	10
Pedestrians		10			10			10			10	
Lane Width (m)		3.7			3.7			3.7			3.7	
Walking Speed (m/s)		1.1			1.1			1.1			1.1	
Percent Blockage		1			1			1			1	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	141			276			515	509	286	564	497	139
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	141			276			515	509	286	564	497	139
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			99			100	91	94	79	96	99
cM capacity (veh/h)	1429			1275			427	443	739	359	450	892

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	293	150	87	100
Volume Left	27	19	0	74
Volume Right	0	24	48	10
cSH	1429	1275	569	395
Volume to Capacity	0.02	0.01	0.15	0.25
Queue Length 95th (m)	0.4	0.3	4.1	7.5
Control Delay (s)	0.9	1.1	12.5	17.2
Lane LOS	A	A	B	C
Approach Delay (s)	0.9	1.1	12.5	17.2
Approach LOS			B	C

Intersection Summary			
Average Delay	5.1		
Intersection Capacity Utilization	37.3%	ICU Level of Service	A
Analysis Period (min)	15		
Description: Int D			

Intersection	
Int Delay, s/veh	4.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	24	234	0	17	94	21	0	34	42	65	14	9
Future Vol, veh/h	24	234	0	17	94	21	0	34	42	65	14	9
Conflicting Peds, #/hr	10	0	10	10	0	10	10	0	10	10	0	10
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	27	266	0	19	107	24	0	39	48	74	16	10

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	141	0	0	276	0	0	510	509	286	541	497	139
Stage 1	-	-	-	-	-	-	330	330	-	167	167	-
Stage 2	-	-	-	-	-	-	180	179	-	374	330	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1442	-	-	1287	-	-	474	467	753	452	475	909
Stage 1	-	-	-	-	-	-	683	646	-	835	760	-
Stage 2	-	-	-	-	-	-	822	751	-	647	646	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1429	-	-	1275	-	-	435	441	739	376	449	892
Mov Cap-2 Maneuver	-	-	-	-	-	-	435	441	-	376	449	-
Stage 1	-	-	-	-	-	-	662	626	-	809	741	-
Stage 2	-	-	-	-	-	-	775	732	-	550	626	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.7	1	12.5	16.6
HCM LOS			B	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	567	1429	-	-	1275	-	-	411
HCM Lane V/C Ratio	0.152	0.019	-	-	0.015	-	-	0.243
HCM Control Delay (s)	12.5	7.6	0	-	7.9	0	-	16.6
HCM Lane LOS	B	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	0.5	0.1	-	-	0	-	-	0.9

LANE LEVEL OF SERVICE

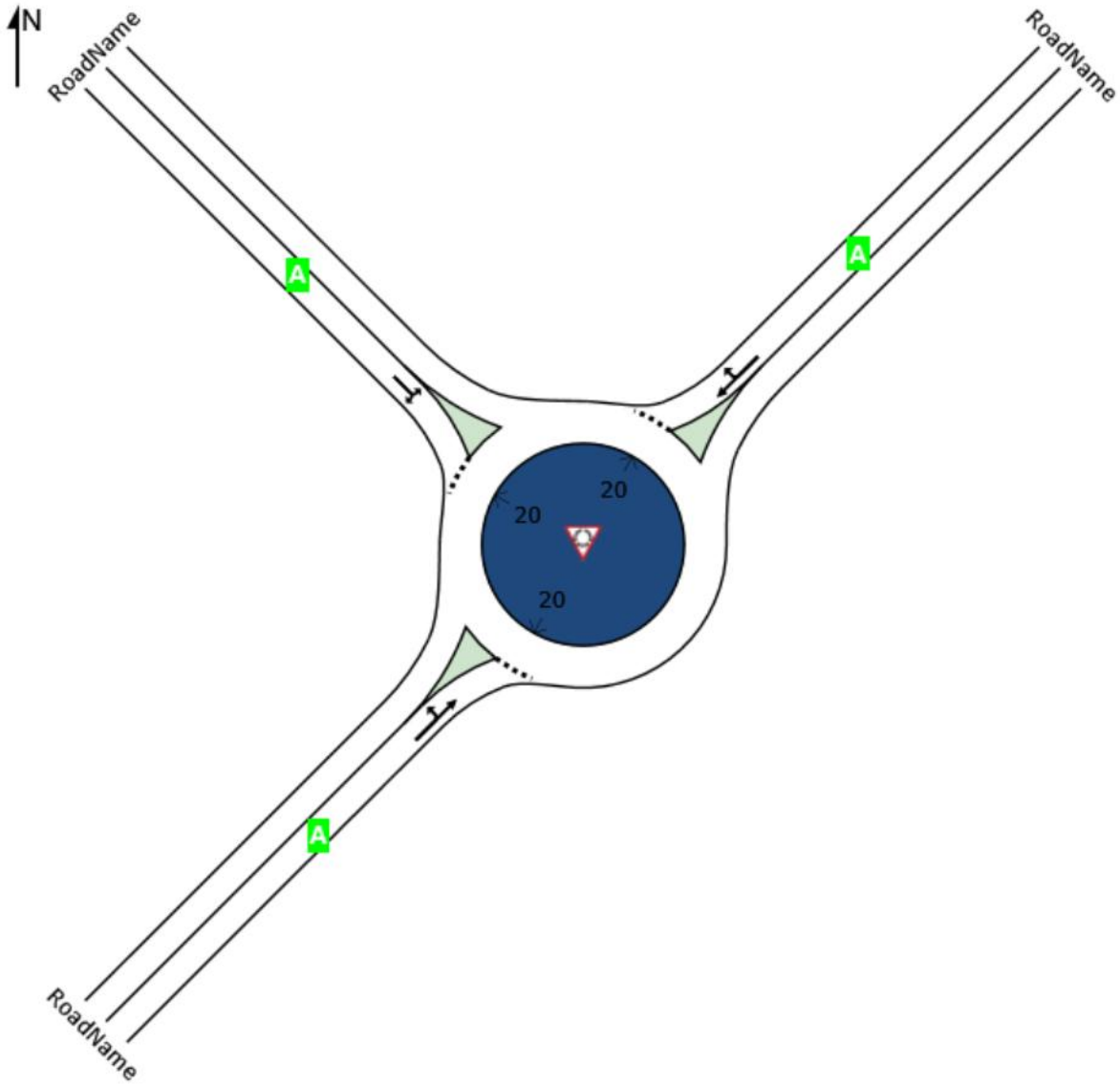
Lane Level of Service

Site: 1 [AMIntE]

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Roundabout

All Movement Classes

	Northeast	Northwest	Southwest	Intersection
LOS	A	A	A	A



Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). 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 and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

LANE SUMMARY

Site: 1 [AMIntE]

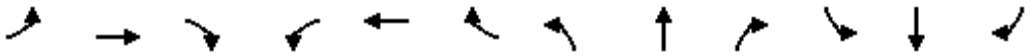
Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Roundabout

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. %
NorthEast: RoadName													
Lane 1[d]	159	2.0	737	0.216	100	6.5	LOS A	1.2	8.8	Full	200	0.0	0.0
Approach	159	2.0		0.216		6.5	LOS A	1.2	8.8				
NorthWest: RoadName													
Lane 1[d]	231	2.0	1159	0.199	100	3.8	LOS A	1.3	9.5	Full	225	0.0	0.0
Approach	231	2.0		0.199		3.8	LOS A	1.3	9.5				
SouthWest: RoadName													
Lane 1[d]	437	2.0	1352	0.323	100	7.2	LOS A	2.4	16.8	Full	200	0.0	0.0
Approach	437	2.0		0.323		7.2	LOS A	2.4	16.8				
Intersection	826	2.0		0.323		6.1	LOS A	2.4	16.8				

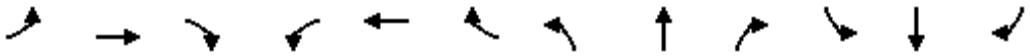
Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
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



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	336	33	205	171	5	12	0	91	5	2	2
Future Volume (vph)	0	336	33	205	171	5	12	0	91	5	2	2
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.988			0.998			0.881			0.973	
Flt Protected					0.974			0.994			0.971	
Satd. Flow (prot)	0	1714	0	0	1686	0	0	1519	0	0	1639	0
Flt Permitted					0.974			0.994			0.971	
Satd. Flow (perm)	0	1714	0	0	1686	0	0	1519	0	0	1639	0
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		489.9			345.4			55.7			56.4	
Travel Time (s)		36.7			25.9			4.2			4.2	
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	0	382	38	233	194	6	14	0	103	6	2	2
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	420	0	0	433	0	0	117	0	0	10	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 63.2%		ICU Level of Service B	
Analysis Period (min) 15			
Description: Int F			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	336	33	205	171	5	12	0	91	5	2	2
Future Volume (Veh/h)	0	336	33	205	171	5	12	0	91	5	2	2
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	0	382	38	233	194	6	14	0	103	6	2	2
Pedestrians		10			10			10			10	
Lane Width (m)		3.7			3.7			3.7			3.7	
Walking Speed (m/s)		1.1			1.1			1.1			1.1	
Percent Blockage		1			1			1			1	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	210			430			1087	1087	421	1187	1103	217
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	210			430			1087	1087	421	1187	1103	217
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			79			91	100	83	95	99	100
cM capacity (veh/h)	1348			1119			156	168	621	112	164	808

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	420	433	117	10
Volume Left	0	233	14	6
Volume Right	38	6	103	2
cSH	1348	1119	457	147
Volume to Capacity	0.00	0.21	0.26	0.07
Queue Length 95th (m)	0.0	6.0	7.7	1.6
Control Delay (s)	0.0	5.9	15.6	31.3
Lane LOS		A	C	D
Approach Delay (s)	0.0	5.9	15.6	31.3
Approach LOS			C	D

Intersection Summary			
Average Delay	4.8		
Intersection Capacity Utilization	63.2%	ICU Level of Service	B
Analysis Period (min)	15		
Description: Int F			

Intersection	
Int Delay, s/veh	4.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	0	336	33	205	171	5	12	0	91	5	2	2
Future Vol, veh/h	0	336	33	205	171	5	12	0	91	5	2	2
Conflicting Peds, #/hr	10	0	10	10	0	10	10	0	10	10	0	10
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	382	38	233	194	6	14	0	103	6	2	2

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	210	0	0	429	0	0	1086	1087	421	1135	1102	217
Stage 1	-	-	-	-	-	-	411	411	-	673	673	-
Stage 2	-	-	-	-	-	-	675	676	-	462	429	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1361	-	-	1130	-	-	194	216	632	179	212	823
Stage 1	-	-	-	-	-	-	618	595	-	445	454	-
Stage 2	-	-	-	-	-	-	444	453	-	580	584	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1348	-	-	1120	-	-	154	162	620	120	159	808
Mov Cap-2 Maneuver	-	-	-	-	-	-	154	162	-	120	159	-
Stage 1	-	-	-	-	-	-	612	590	-	441	345	-
Stage 2	-	-	-	-	-	-	334	344	-	479	579	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	4.9	15.5	29.2
HCM LOS			C	D

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	458	1348	-	-	1120	-	-	159
HCM Lane V/C Ratio	0.256	-	-	-	0.208	-	-	0.064
HCM Control Delay (s)	15.5	0	-	-	9.1	0	-	29.2
HCM Lane LOS	C	A	-	-	A	A	-	D
HCM 95th %tile Q(veh)	1	0	-	-	0.8	-	-	0.2

LANE LEVEL OF SERVICE

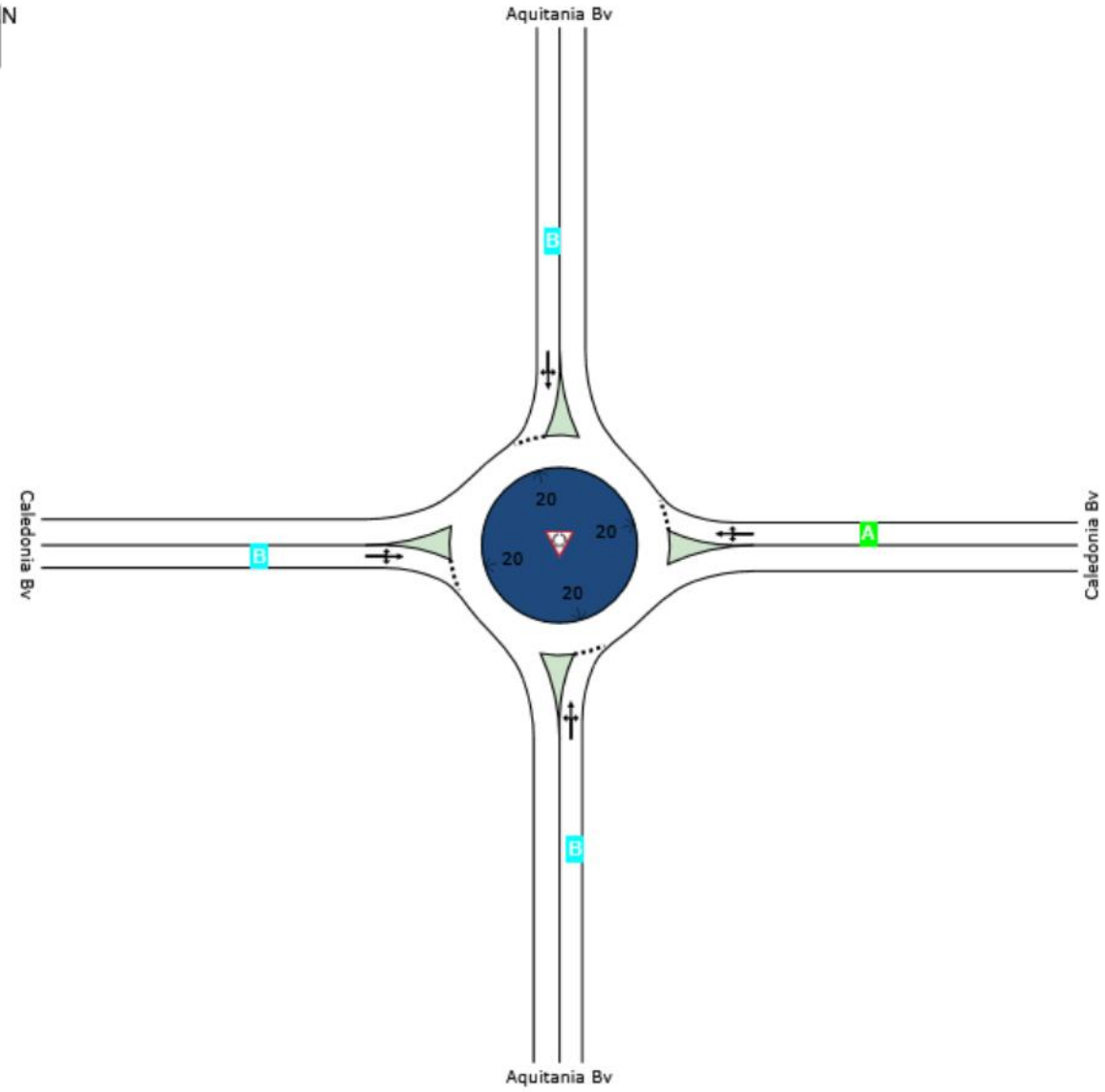
Lane Level of Service

Site: 1 [AMIntG]

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Roundabout

All Movement Classes

	South	East	North	West	Intersection
LOS	B	A	B	B	B



Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). 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 and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

LANE SUMMARY

Site: 1 [AMIntG]

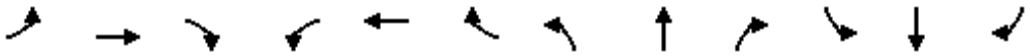
Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Roundabout

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: Aquitania Bv													
Lane 1[d]	583	2.0	813	0.718	100	11.2	LOS B	9.2	65.8	Full	50	0.0	13.8
Approach	583	2.0		0.718		11.2	LOS B	9.2	65.8				
East: Caledonia Bv													
Lane 1[d]	561	2.0	871	0.644	100	9.3	LOS A	7.2	51.0	Full	50	0.0	5.6
Approach	561	2.0		0.644		9.3	LOS A	7.2	51.0				
North: Aquitania Bv													
Lane 1[d]	385	2.0	625	0.616	100	13.8	LOS B	6.2	44.1	Full	200	0.0	0.0
Approach	385	2.0		0.616		13.8	LOS B	6.2	44.1				
West: Caledonia Bv													
Lane 1[d]	449	2.0	657	0.685	100	14.8	LOS B	7.8	55.5	Full	250	0.0	0.0
Approach	449	2.0		0.685		14.8	LOS B	7.8	55.5				
Intersection	1979	2.0		0.718		12.0	LOS B	9.2	65.8				

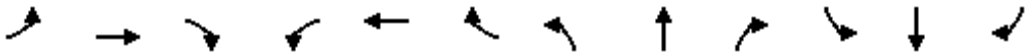
Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
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



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	1	1	47	0	45	0	73	31	35	100	0
Future Volume (vph)	1	1	1	47	0	45	0	73	31	35	100	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.955			0.934			0.960				
Flt Protected		0.984			0.975						0.987	
Satd. Flow (prot)	0	1630	0	0	1580	0	0	1665	0	0	1712	0
Flt Permitted		0.984			0.975						0.987	
Satd. Flow (perm)	0	1630	0	0	1580	0	0	1665	0	0	1712	0
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		305.3			396.7			589.4			375.3	
Travel Time (s)		22.9			29.8			44.2			28.1	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	1	1	1	53	0	51	0	83	35	40	114	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	3	0	0	104	0	0	118	0	0	154	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 30.4%		ICU Level of Service A	
Analysis Period (min) 15			
Description: Int A			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	1	1	47	0	45	0	73	31	35	100	0
Future Volume (Veh/h)	1	1	1	47	0	45	0	73	31	35	100	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	1	1	1	53	0	51	0	83	35	40	114	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	51			2			192	160	2	212	136	26
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	51			2			192	160	2	212	136	26
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			97			100	88	97	94	84	100
cM capacity (veh/h)	1555			1620			659	707	1083	640	730	1050

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	3	104	118	154
Volume Left	1	53	0	40
Volume Right	1	51	35	0
cSH	1555	1620	788	704
Volume to Capacity	0.00	0.03	0.15	0.22
Queue Length 95th (m)	0.0	0.8	4.0	6.3
Control Delay (s)	2.4	3.8	10.4	11.5
Lane LOS	A	A	B	B
Approach Delay (s)	2.4	3.8	10.4	11.5
Approach LOS			B	B

Intersection Summary				
Average Delay	9.0			
Intersection Capacity Utilization	30.4%	ICU Level of Service	A	
Analysis Period (min)	15			
Description: Int A				

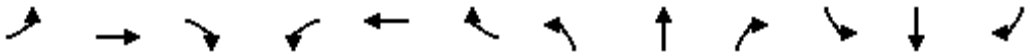
Intersection	
Int Delay, s/veh	8.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	1	1	1	47	0	45	0	73	31	35	100	0
Future Vol, veh/h	1	1	1	47	0	45	0	73	31	35	100	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	1	1	53	0	51	0	83	35	40	114	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	51	0	0	2	0	0	193	162	2	195	137	26
Stage 1	-	-	-	-	-	-	4	4	-	132	132	-
Stage 2	-	-	-	-	-	-	189	158	-	63	5	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1555	-	-	1620	-	-	767	730	1082	764	754	1050
Stage 1	-	-	-	-	-	-	1018	892	-	871	787	-
Stage 2	-	-	-	-	-	-	813	767	-	948	892	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1555	-	-	1620	-	-	658	704	1082	655	728	1050
Mov Cap-2 Maneuver	-	-	-	-	-	-	658	704	-	655	728	-
Stage 1	-	-	-	-	-	-	1017	891	-	870	760	-
Stage 2	-	-	-	-	-	-	668	741	-	831	891	-

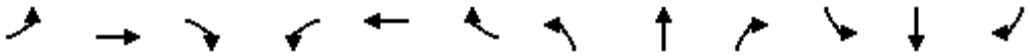
Approach	EB	WB	NB	SB
HCM Control Delay, s	2.4	3.7	10.4	11.5
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	786	1555	-	-	1620	-	-	708
HCM Lane V/C Ratio	0.15	0.001	-	-	0.033	-	-	0.217
HCM Control Delay (s)	10.4	7.3	0	-	7.3	0	-	11.5
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.5	0	-	-	0.1	-	-	0.8



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	68	4	41	117	21	13	56	26	13	61	1
Future Volume (vph)	1	68	4	41	117	21	13	56	26	13	61	1
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.992			0.984			0.963			0.998	
Flt Protected		0.999			0.989			0.993			0.991	
Satd. Flow (prot)	0	1719	0	0	1688	0	0	1659	0	0	1716	0
Flt Permitted		0.999			0.989			0.993			0.991	
Satd. Flow (perm)	0	1719	0	0	1688	0	0	1659	0	0	1716	0
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		396.7			778.9			439.8			453.2	
Travel Time (s)		29.8			58.4			33.0			34.0	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	1	77	5	47	133	24	15	64	30	15	69	1
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	83	0	0	204	0	0	109	0	0	85	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 31.0%		ICU Level of Service A	
Analysis Period (min) 15			
Description: Int B			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	68	4	41	117	21	13	56	26	13	61	1
Future Volume (Veh/h)	1	68	4	41	117	21	13	56	26	13	61	1
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	1	77	5	47	133	24	15	64	30	15	69	1
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	157			82			356	332	80	382	323	145
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	157			82			356	332	80	382	323	145
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			97			97	89	97	97	88	100
cM capacity (veh/h)	1423			1515			531	569	981	498	576	902

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	83	204	109	85
Volume Left	1	47	15	15
Volume Right	5	24	30	1
cSH	1423	1515	636	563
Volume to Capacity	0.00	0.03	0.17	0.15
Queue Length 95th (m)	0.0	0.7	4.7	4.0
Control Delay (s)	0.1	1.9	11.8	12.5
Lane LOS	A	A	B	B
Approach Delay (s)	0.1	1.9	11.8	12.5
Approach LOS			B	B

Intersection Summary				
Average Delay	5.7			
Intersection Capacity Utilization	31.0%	ICU Level of Service	A	
Analysis Period (min)	15			
Description: Int B				

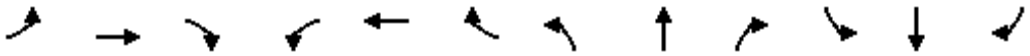
Intersection	
Int Delay, s/veh	5.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	1	68	4	41	117	21	13	56	26	13	61	1
Future Vol, veh/h	1	68	4	41	117	21	13	56	26	13	61	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	77	5	47	133	24	15	64	30	15	69	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	157	0	0	82	0	0	355	332	80	366	322	145
Stage 1	-	-	-	-	-	-	82	82	-	238	238	-
Stage 2	-	-	-	-	-	-	273	250	-	128	84	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1423	-	-	1515	-	-	600	588	980	590	595	902
Stage 1	-	-	-	-	-	-	926	827	-	765	708	-
Stage 2	-	-	-	-	-	-	733	700	-	876	825	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1423	-	-	1515	-	-	530	567	980	509	574	902
Mov Cap-2 Maneuver	-	-	-	-	-	-	530	567	-	509	574	-
Stage 1	-	-	-	-	-	-	925	826	-	764	684	-
Stage 2	-	-	-	-	-	-	636	676	-	783	824	-

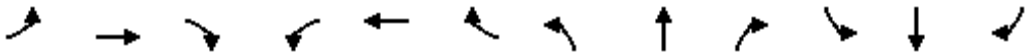
Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	1.7	11.8	12.5
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	634	1423	-	-	1515	-	-	564
HCM Lane V/C Ratio	0.17	0.001	-	-	0.031	-	-	0.151
HCM Control Delay (s)	11.8	7.5	0	-	7.5	0	-	12.5
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.6	0	-	-	0.1	-	-	0.5



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	17	48	0	25	69	98	0	5	12	71	7	27
Future Volume (vph)	17	48	0	25	69	98	0	5	12	71	7	27
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.931			0.905			0.965	
Flt Protected		0.987			0.994						0.967	
Satd. Flow (prot)	0	1712	0	0	1605	0	0	1570	0	0	1619	0
Flt Permitted		0.987			0.994						0.967	
Satd. Flow (perm)	0	1712	0	0	1605	0	0	1570	0	0	1619	0
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		277.5			100.4			137.5			589.4	
Travel Time (s)		20.8			7.5			10.3			44.2	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	19	55	0	28	78	111	0	6	14	81	8	31
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	74	0	0	217	0	0	20	0	0	120	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 33.3%		ICU Level of Service A	
Analysis Period (min) 15			
Description: Int C			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	17	48	0	25	69	98	0	5	12	71	7	27
Future Volume (Veh/h)	17	48	0	25	69	98	0	5	12	71	7	27
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	19	55	0	28	78	111	0	6	14	81	8	31
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	189			55			318	338	55	300	282	134
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	189			55			318	338	55	300	282	134
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			98			100	99	99	87	99	97
cM capacity (veh/h)	1385			1550			593	565	1012	623	607	916

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	74	217	20	120
Volume Left	19	28	0	81
Volume Right	0	111	14	31
cSH	1385	1550	818	678
Volume to Capacity	0.01	0.02	0.02	0.18
Queue Length 95th (m)	0.3	0.4	0.6	4.9
Control Delay (s)	2.0	1.1	9.5	11.4
Lane LOS	A	A	A	B
Approach Delay (s)	2.0	1.1	9.5	11.4
Approach LOS			A	B

Intersection Summary			
Average Delay	4.5		
Intersection Capacity Utilization	33.3%	ICU Level of Service	A
Analysis Period (min)	15		
Description: Int C			

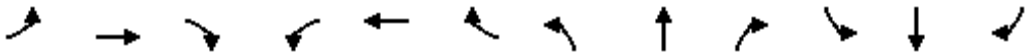
Intersection	
Int Delay, s/veh	4.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	17	48	0	25	69	98	0	5	12	71	7	27
Future Vol, veh/h	17	48	0	25	69	98	0	5	12	71	7	27
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	19	55	0	28	78	111	0	6	14	81	8	31

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	190	0	0	55	0	0	303	340	55	294	284	134
Stage 1	-	-	-	-	-	-	93	93	-	191	191	-
Stage 2	-	-	-	-	-	-	210	247	-	103	93	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1384	-	-	1550	-	-	649	582	1012	658	625	915
Stage 1	-	-	-	-	-	-	914	818	-	811	742	-
Stage 2	-	-	-	-	-	-	792	702	-	903	818	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1384	-	-	1550	-	-	605	562	1012	628	604	915
Mov Cap-2 Maneuver	-	-	-	-	-	-	605	562	-	628	604	-
Stage 1	-	-	-	-	-	-	901	807	-	800	727	-
Stage 2	-	-	-	-	-	-	742	688	-	872	807	-

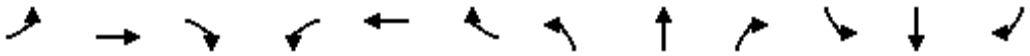
Approach	EB	WB	NB	SB
HCM Control Delay, s	2	1	9.5	11.4
HCM LOS			A	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	819	1384	-	-	1550	-	-	681
HCM Lane V/C Ratio	0.024	0.014	-	-	0.018	-	-	0.175
HCM Control Delay (s)	9.5	7.6	0	-	7.4	0	-	11.4
HCM Lane LOS	A	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.1	0	-	-	0.1	-	-	0.6



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	16	155	0	44	247	51	0	23	28	44	36	24
Future Volume (vph)	16	155	0	44	247	51	0	23	28	44	36	24
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.980			0.926			0.969	
Flt Protected		0.995			0.994						0.979	
Satd. Flow (prot)	0	1726	0	0	1690	0	0	1606	0	0	1646	0
Flt Permitted		0.995			0.994						0.979	
Satd. Flow (perm)	0	1726	0	0	1690	0	0	1606	0	0	1646	0
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		112.5			489.9			139.9			439.8	
Travel Time (s)		8.4			36.7			10.5			33.0	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	18	176	0	50	281	58	0	26	32	50	41	27
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	194	0	0	389	0	0	58	0	0	118	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 49.0%		ICU Level of Service A	
Analysis Period (min) 15			
Description: Int D			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	16	155	0	44	247	51	0	23	28	44	36	24
Future Volume (Veh/h)	16	155	0	44	247	51	0	23	28	44	36	24
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	18	176	0	50	281	58	0	26	32	50	41	27
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	339			176			670	651	176	667	622	310
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	339			176			670	651	176	667	622	310
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			96			100	93	96	85	89	96
cM capacity (veh/h)	1220			1400			316	368	867	326	383	730

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	194	389	58	118
Volume Left	18	50	0	50
Volume Right	0	58	32	27
cSH	1220	1400	540	397
Volume to Capacity	0.01	0.04	0.11	0.30
Queue Length 95th (m)	0.3	0.8	2.7	9.3
Control Delay (s)	0.9	1.3	12.5	17.9
Lane LOS	A	A	B	C
Approach Delay (s)	0.9	1.3	12.5	17.9
Approach LOS			B	C

Intersection Summary			
Average Delay	4.6		
Intersection Capacity Utilization	49.0%	ICU Level of Service	A
Analysis Period (min)	15		
Description: Int D			

Intersection	
Int Delay, s/veh	4.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	16	155	0	44	247	51	0	23	28	44	36	24
Future Vol, veh/h	16	155	0	44	247	51	0	23	28	44	36	24
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	18	176	0	50	281	58	0	26	32	50	41	27

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	339	0	0	176	0	0	657	652	176	651	623	310
Stage 1	-	-	-	-	-	-	213	213	-	410	410	-
Stage 2	-	-	-	-	-	-	444	439	-	241	213	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1220	-	-	1400	-	-	378	387	867	382	402	730
Stage 1	-	-	-	-	-	-	789	726	-	619	595	-
Stage 2	-	-	-	-	-	-	593	578	-	762	726	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1220	-	-	1400	-	-	319	364	867	332	378	730
Mov Cap-2 Maneuver	-	-	-	-	-	-	319	364	-	332	378	-
Stage 1	-	-	-	-	-	-	776	714	-	609	569	-
Stage 2	-	-	-	-	-	-	506	553	-	696	714	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.7	1	12.6	17.8
HCM LOS			B	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	534	1220	-	-	1400	-	-	399
HCM Lane V/C Ratio	0.109	0.015	-	-	0.036	-	-	0.296
HCM Control Delay (s)	12.6	8	0	-	7.7	0	-	17.8
HCM Lane LOS	B	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	0.4	0	-	-	0.1	-	-	1.2

LANE LEVEL OF SERVICE

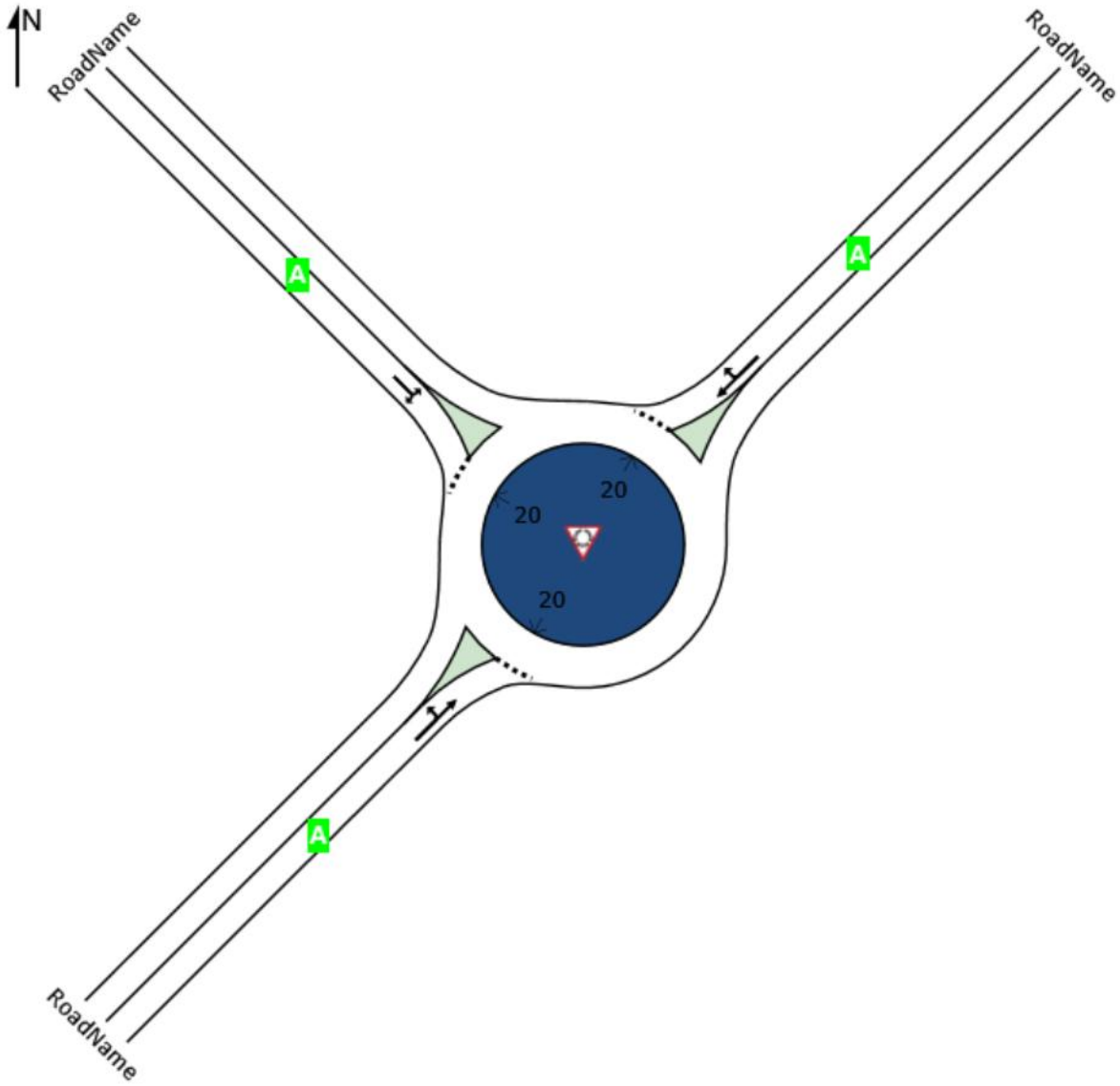
Lane Level of Service

Site: 1 [PMIntE]

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Roundabout

All Movement Classes

	Northeast	Northwest	Southwest	Intersection
LOS	A	A	A	A



Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). 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 and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

LANE SUMMARY

Site: 1 [PMIntE]

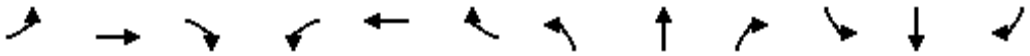
Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Roundabout

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. %
NorthEast: RoadName													
Lane 1[d]	159	2.0	737	0.216	100	6.5	LOS A	1.2	8.8	Full	200	0.0	0.0
Approach	159	2.0		0.216		6.5	LOS A	1.2	8.8				
NorthWest: RoadName													
Lane 1[d]	231	2.0	1159	0.199	100	3.8	LOS A	1.3	9.5	Full	225	0.0	0.0
Approach	231	2.0		0.199		3.8	LOS A	1.3	9.5				
SouthWest: RoadName													
Lane 1[d]	437	2.0	1352	0.323	100	7.2	LOS A	2.4	16.8	Full	200	0.0	0.0
Approach	437	2.0		0.323		7.2	LOS A	2.4	16.8				
Intersection	826	2.0		0.323		6.1	LOS A	2.4	16.8				

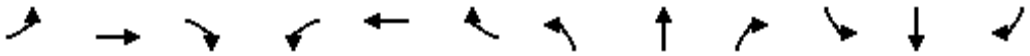
Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
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



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	241	22	107	248	5	33	2	119	5	2	2
Future Volume (vph)	1	241	22	107	248	5	33	2	119	5	2	2
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.989			0.998			0.896			0.973	
Flt Protected					0.985			0.989			0.971	
Satd. Flow (prot)	0	1716	0	0	1705	0	0	1537	0	0	1639	0
Flt Permitted					0.985			0.989			0.971	
Satd. Flow (perm)	0	1716	0	0	1705	0	0	1537	0	0	1639	0
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		489.9			345.4			113.5			56.4	
Travel Time (s)		36.7			25.9			8.5			4.2	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	1	274	25	122	282	6	38	2	135	6	2	2
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	300	0	0	410	0	0	175	0	0	10	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 56.5%		ICU Level of Service B	
Analysis Period (min) 15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	241	22	107	248	5	33	2	119	5	2	2
Future Volume (Veh/h)	1	241	22	107	248	5	33	2	119	5	2	2
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	1	274	25	122	282	6	38	2	135	6	2	2
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	288			299			820	820	286	954	830	285
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	288			299			820	820	286	954	830	285
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			90			86	99	82	97	99	100
cM capacity (veh/h)	1274			1262			270	279	753	180	276	754

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	300	410	175	10
Volume Left	1	122	38	6
Volume Right	25	6	135	2
cSH	1274	1262	534	232
Volume to Capacity	0.00	0.10	0.33	0.04
Queue Length 95th (m)	0.0	2.4	10.8	1.0
Control Delay (s)	0.0	3.1	15.0	21.2
Lane LOS	A	A	B	C
Approach Delay (s)	0.0	3.1	15.0	21.2
Approach LOS			B	C

Intersection Summary				
Average Delay	4.6			
Intersection Capacity Utilization	56.5%	ICU Level of Service	B	
Analysis Period (min)	15			

Intersection	
Int Delay, s/veh	4.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	1	241	22	107	248	5	33	2	119	5	2	2
Future Vol, veh/h	1	241	22	107	248	5	33	2	119	5	2	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	274	25	122	282	6	38	2	135	6	2	2

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	288	0	0	299	0	0	819	820	286	885	829	285
Stage 1	-	-	-	-	-	-	289	289	-	528	528	-
Stage 2	-	-	-	-	-	-	530	531	-	357	301	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1274	-	-	1262	-	-	294	310	753	266	306	754
Stage 1	-	-	-	-	-	-	719	673	-	534	528	-
Stage 2	-	-	-	-	-	-	533	526	-	661	665	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1274	-	-	1262	-	-	265	274	753	198	271	754
Mov Cap-2 Maneuver	-	-	-	-	-	-	265	274	-	198	271	-
Stage 1	-	-	-	-	-	-	718	672	-	533	467	-
Stage 2	-	-	-	-	-	-	468	466	-	540	664	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	2.4	15.1	19.7
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	531	1274	-	-	1262	-	-	255
HCM Lane V/C Ratio	0.33	0.001	-	-	0.096	-	-	0.04
HCM Control Delay (s)	15.1	7.8	0	-	8.2	0	-	19.7
HCM Lane LOS	C	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	1.4	0	-	-	0.3	-	-	0.1

LANE LEVEL OF SERVICE

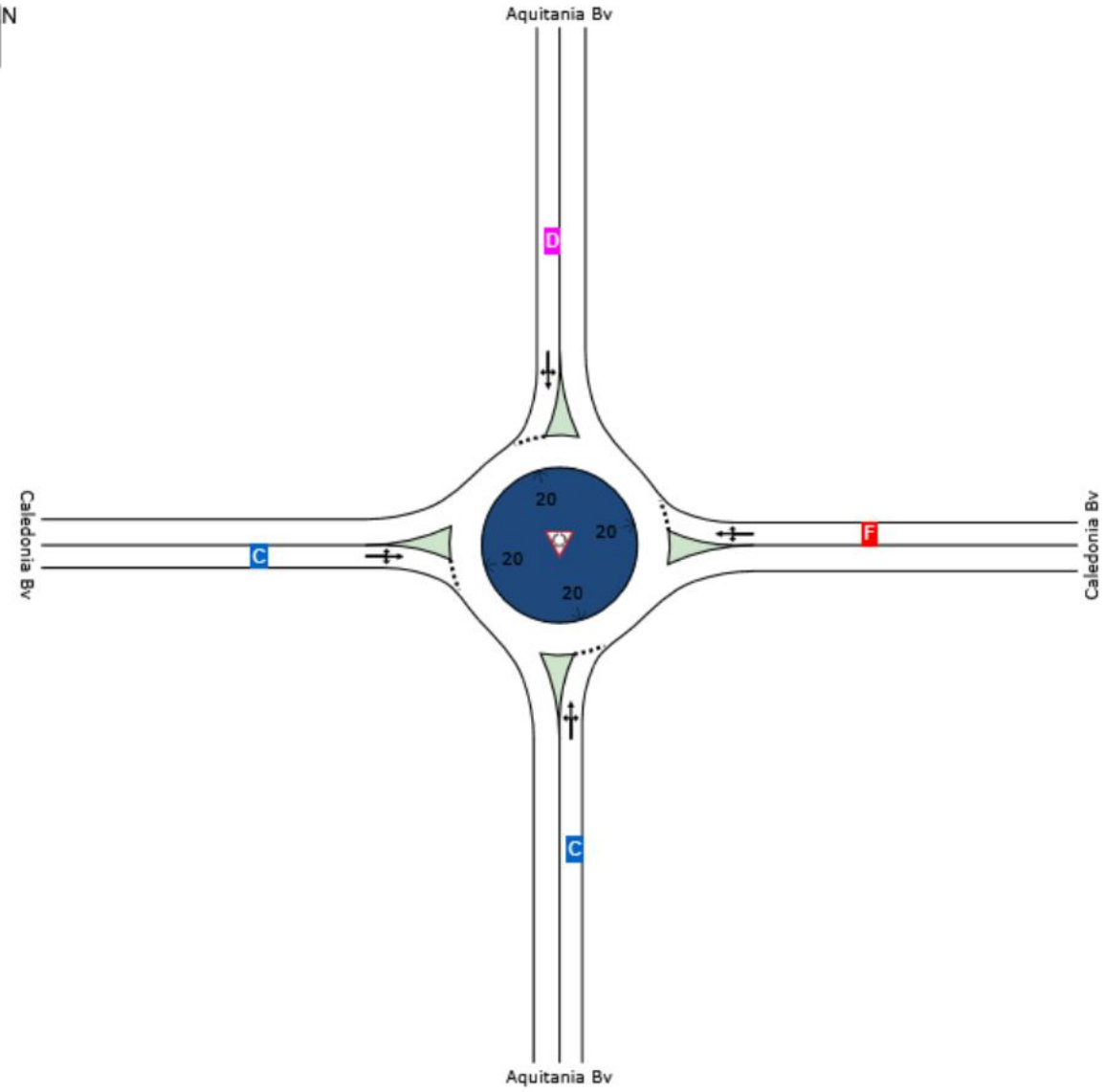
Lane Level of Service

Site: 1 [PMIntG]

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Roundabout

All Movement Classes

	South	East	North	West	Intersection
LOS	C	F	D	C	F



Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). 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 and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

LANE SUMMARY

Site: 1 [PMIntG]

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Roundabout

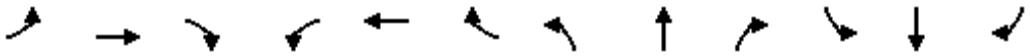
Lane Use and Performance

	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: Aquitania Bv													
Lane 1[d]	818	2.0	864	0.947	100	29.2	LOS C	29.3	208.3	Full	50	0.0	100.0
Approach	818	2.0		0.947		29.2	LOS C	29.3	208.3				
East: Caledonia Bv													
Lane 1[d]	778	2.0	677	1.150	100	163.8	LOS F	87.1	620.2	Full	50	0.0	100.0
Approach	778	2.0		1.150		163.8	LOS F	87.1	620.2				
North: Aquitania Bv													
Lane 1[d]	488	2.0	520	0.939	100	49.4	LOS D	21.5	152.8	Full	200	0.0	0.0
Approach	488	2.0		0.939		49.4	LOS D	21.5	152.8				
West: Caledonia Bv													
Lane 1[d]	408	2.0	518	0.788	100	26.5	LOS C	10.8	76.7	Full	250	0.0	0.0
Approach	408	2.0		0.788		26.5	LOS C	10.8	76.7				
Intersection	2493	2.0		1.150		74.7	LOS F	87.1	620.2				

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). 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 and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
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.

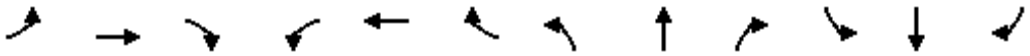
d Dominant lane on roundabout approach

Appendix C – Chinook Trail Reports



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	20	0	23	0	96	44	31	49	0
Future Volume (vph)	0	0	0	20	0	23	0	96	44	31	49	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.928			0.958				
Flt Protected					0.977						0.981	
Satd. Flow (prot)	0	1735	0	0	1573	0	0	1662	0	0	1702	0
Flt Permitted					0.977						0.981	
Satd. Flow (perm)	0	1735	0	0	1573	0	0	1662	0	0	1702	0
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		343.2			396.7			589.4			375.3	
Travel Time (s)		25.7			29.8			44.2			28.1	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	0	0	0	23	0	26	0	109	50	35	56	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	49	0	0	159	0	0	91	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 26.4%		ICU Level of Service A	
Analysis Period (min) 15			
Description: Int A			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	20	0	23	0	96	44	31	49	0
Future Volume (Veh/h)	0	0	0	20	0	23	0	96	44	31	49	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	0	0	0	23	0	26	0	109	50	35	56	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	26			0			87	72	0	164	59	13
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	26			0			87	72	0	164	59	13
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			100	86	95	95	93	100
cM capacity (veh/h)	1588			1623			843	807	1085	678	820	1067

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	0	49	159	91
Volume Left	0	23	0	35
Volume Right	0	26	50	0
cSH	1700	1623	878	759
Volume to Capacity	0.00	0.01	0.18	0.12
Queue Length 95th (m)	0.0	0.3	5.0	3.1
Control Delay (s)	0.0	3.5	10.0	10.4
Lane LOS		A	B	B
Approach Delay (s)	0.0	3.5	10.0	10.4
Approach LOS			B	B

Intersection Summary			
Average Delay	9.1		
Intersection Capacity Utilization	26.4%	ICU Level of Service	A
Analysis Period (min)	15		
Description: Int A			

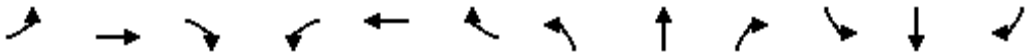
Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	0	0	0	20	0	23	0	96	44	31	49	0
Future Vol, veh/h	0	0	0	20	0	23	0	96	44	31	49	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	23	0	26	0	109	50	35	56	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	26	0	0	0	0	0	86	72	0	139	59	13
Stage 1	-	-	-	-	-	-	0	0	-	59	59	-
Stage 2	-	-	-	-	-	-	86	72	-	80	0	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1588	-	-	-	-	-	900	818	-	831	832	1067
Stage 1	-	-	-	-	-	-	-	-	-	953	846	-
Stage 2	-	-	-	-	-	-	922	835	-	929	-	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1588	-	-	-	-	-	854	818	-	-	832	1067
Mov Cap-2 Maneuver	-	-	-	-	-	-	854	818	-	-	832	-
Stage 1	-	-	-	-	-	-	-	-	-	953	846	-
Stage 2	-	-	-	-	-	-	861	835	-	929	-	-

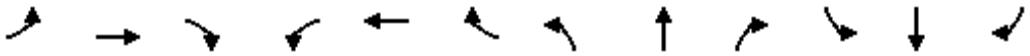
Approach	EB	WB	NB	SB
HCM Control Delay, s	0			
HCM LOS			-	-

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	1588	-	-	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-	-	-	-
HCM Control Delay (s)	-	0	-	-	-	-	-	-
HCM Lane LOS	-	A	-	-	-	-	-	-
HCM 95th %tile Q(veh)	-	0	-	-	-	-	-	-



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	98	6	16	39	8	9	57	38	12	65	0
Future Volume (vph)	0	98	6	16	39	8	9	57	38	12	65	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.992			0.983			0.951				
Flt Protected					0.987			0.996			0.992	
Satd. Flow (prot)	0	1721	0	0	1683	0	0	1643	0	0	1721	0
Flt Permitted					0.987			0.996			0.992	
Satd. Flow (perm)	0	1721	0	0	1683	0	0	1643	0	0	1721	0
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		396.7			778.9			439.8			453.2	
Travel Time (s)		29.8			58.4			33.0			34.0	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	0	111	7	18	44	9	10	65	43	14	74	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	118	0	0	71	0	0	118	0	0	88	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 24.4%		ICU Level of Service A	
Analysis Period (min) 15			
Description: Int B			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	98	6	16	39	8	9	57	38	12	65	0
Future Volume (Veh/h)	0	98	6	16	39	8	9	57	38	12	65	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	0	111	7	18	44	9	10	65	43	14	74	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	53			118			236	204	114	274	202	48
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	53			118			236	204	114	274	202	48
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			98	91	95	98	89	100
cM capacity (veh/h)	1553			1470			653	684	938	594	685	1020

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	118	71	118	88
Volume Left	0	18	10	14
Volume Right	7	9	43	0
cSH	1553	1470	756	669
Volume to Capacity	0.00	0.01	0.16	0.13
Queue Length 95th (m)	0.0	0.3	4.2	3.4
Control Delay (s)	0.0	2.0	10.6	11.2
Lane LOS		A	B	B
Approach Delay (s)	0.0	2.0	10.6	11.2
Approach LOS			B	B

Intersection Summary				
Average Delay	6.0			
Intersection Capacity Utilization	24.4%	ICU Level of Service	A	
Analysis Period (min)	15			
Description: Int B				

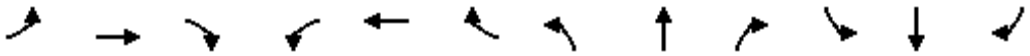
Intersection	
Int Delay, s/veh	6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	0	98	6	16	39	8	9	57	38	12	65	0
Future Vol, veh/h	0	98	6	16	39	8	9	57	38	12	65	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	111	7	18	44	9	10	65	43	14	74	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	53	0	0	118	0	0	237	205	115	254	203	49
Stage 1	-	-	-	-	-	-	115	115	-	85	85	-
Stage 2	-	-	-	-	-	-	122	90	-	169	118	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1553	-	-	1470	-	-	717	691	937	699	693	1020
Stage 1	-	-	-	-	-	-	890	800	-	923	824	-
Stage 2	-	-	-	-	-	-	882	820	-	833	798	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1553	-	-	1470	-	-	651	682	937	612	684	1020
Mov Cap-2 Maneuver	-	-	-	-	-	-	651	682	-	612	684	-
Stage 1	-	-	-	-	-	-	890	800	-	923	813	-
Stage 2	-	-	-	-	-	-	791	809	-	730	798	-

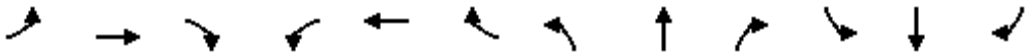
Approach	EB	WB	NB	SB
HCM Control Delay, s	0	1.9	10.7	11.2
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	754	1553	-	-	1470	-	-	672
HCM Lane V/C Ratio	0.157	-	-	-	0.012	-	-	0.13
HCM Control Delay (s)	10.7	0	-	-	7.5	0	-	11.2
HCM Lane LOS	B	A	-	-	A	A	-	B
HCM 95th %tile Q(veh)	0.6	0	-	-	0	-	-	0.4



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	31	59	2	8	40	38	0	7	15	88	3	26
Future Volume (vph)	31	59	2	8	40	38	0	7	15	88	3	26
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.997			0.940			0.908			0.970	
Flt Protected		0.983			0.995						0.964	
Satd. Flow (prot)	0	1700	0	0	1623	0	0	1575	0	0	1622	0
Flt Permitted		0.983			0.995						0.964	
Satd. Flow (perm)	0	1700	0	0	1623	0	0	1575	0	0	1622	0
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		277.5			100.4			137.5			589.4	
Travel Time (s)		20.8			7.5			10.3			44.2	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	35	67	2	9	45	43	0	8	17	100	3	30
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	104	0	0	97	0	0	25	0	0	133	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 32.6%		ICU Level of Service A	
Analysis Period (min) 15			
Description: Int C			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	31	59	2	8	40	38	0	7	15	88	3	26
Future Volume (Veh/h)	31	59	2	8	40	38	0	7	15	88	3	26
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	35	67	2	9	45	43	0	8	17	100	3	30
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	88			69			254	244	68	244	224	66
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	88			69			254	244	68	244	224	66
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			99			100	99	98	85	100	97
cM capacity (veh/h)	1508			1532			661	639	995	676	656	997

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	104	97	25	133
Volume Left	35	9	0	100
Volume Right	2	43	17	30
cSH	1508	1532	845	729
Volume to Capacity	0.02	0.01	0.03	0.18
Queue Length 95th (m)	0.5	0.1	0.7	5.0
Control Delay (s)	2.6	0.7	9.4	11.0
Lane LOS	A	A	A	B
Approach Delay (s)	2.6	0.7	9.4	11.0
Approach LOS			A	B

Intersection Summary				
Average Delay	5.7			
Intersection Capacity Utilization	32.6%	ICU Level of Service	A	
Analysis Period (min)	15			
Description: Int C				

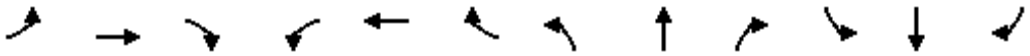
Intersection	
Int Delay, s/veh	5.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	31	59	2	8	40	38	0	7	15	88	3	26
Future Vol, veh/h	31	59	2	8	40	38	0	7	15	88	3	26
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	35	67	2	9	45	43	0	8	17	100	3	30

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	89	0	0	69	0	0	241	246	68	236	225	67
Stage 1	-	-	-	-	-	-	139	139	-	85	85	-
Stage 2	-	-	-	-	-	-	102	107	-	151	140	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1506	-	-	1532	-	-	713	656	995	718	674	997
Stage 1	-	-	-	-	-	-	864	782	-	923	824	-
Stage 2	-	-	-	-	-	-	904	807	-	851	781	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1506	-	-	1532	-	-	673	636	995	683	654	997
Mov Cap-2 Maneuver	-	-	-	-	-	-	673	636	-	683	654	-
Stage 1	-	-	-	-	-	-	843	763	-	901	819	-
Stage 2	-	-	-	-	-	-	868	802	-	808	762	-

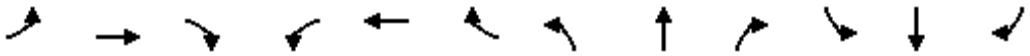
Approach	EB	WB	NB	SB
HCM Control Delay, s	2.5	0.7	9.4	11
HCM LOS			A	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	844	1506	-	-	1532	-	-	734
HCM Lane V/C Ratio	0.03	0.023	-	-	0.006	-	-	0.181
HCM Control Delay (s)	9.4	7.4	0	-	7.4	0	-	11
HCM Lane LOS	A	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.1	0.1	-	-	0	-	-	0.7



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	24	194	4	14	79	23	9	34	33	73	14	11
Future Volume (vph)	24	194	4	14	79	23	9	34	33	73	14	11
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.997			0.973			0.941			0.984	
Flt Protected		0.995			0.994			0.994			0.964	
Satd. Flow (prot)	0	1721	0	0	1678	0	0	1623	0	0	1646	0
Flt Permitted		0.995			0.994			0.994			0.964	
Satd. Flow (perm)	0	1721	0	0	1678	0	0	1623	0	0	1646	0
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		112.5			489.9			139.9			439.8	
Travel Time (s)		8.4			36.7			10.5			33.0	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	27	220	5	16	90	26	10	39	38	83	16	13
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	252	0	0	132	0	0	87	0	0	112	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 35.8%		ICU Level of Service A	
Analysis Period (min) 15			
Description: Int D			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	24	194	4	14	79	23	9	34	33	73	14	11
Future Volume (Veh/h)	24	194	4	14	79	23	9	34	33	73	14	11
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	27	220	5	16	90	26	10	39	38	83	16	13
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	116			225			432	424	222	469	414	103
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	116			225			432	424	222	469	414	103
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			99			98	92	95	81	97	99
cM capacity (veh/h)	1473			1344			502	506	817	442	513	952

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	252	132	87	112
Volume Left	27	16	10	83
Volume Right	5	26	38	13
cSH	1473	1344	606	482
Volume to Capacity	0.02	0.01	0.14	0.23
Queue Length 95th (m)	0.4	0.3	3.8	6.8
Control Delay (s)	0.9	1.0	11.9	14.7
Lane LOS	A	A	B	B
Approach Delay (s)	0.9	1.0	11.9	14.7
Approach LOS			B	B

Intersection Summary			
Average Delay	5.2		
Intersection Capacity Utilization	35.8%	ICU Level of Service	A
Analysis Period (min)	15		
Description: Int D			

Intersection	
Int Delay, s/veh	5.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	24	194	4	14	79	23	9	34	33	73	14	11
Future Vol, veh/h	24	194	4	14	79	23	9	34	33	73	14	11
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	27	220	5	16	90	26	10	39	38	83	16	13

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	116	0	0	225	0	0	426	425	223	450	415	103
Stage 1	-	-	-	-	-	-	277	277	-	135	135	-
Stage 2	-	-	-	-	-	-	149	148	-	315	280	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1473	-	-	1344	-	-	539	521	817	519	528	952
Stage 1	-	-	-	-	-	-	729	681	-	868	785	-
Stage 2	-	-	-	-	-	-	854	775	-	696	679	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1473	-	-	1344	-	-	506	503	817	454	510	952
Mov Cap-2 Maneuver	-	-	-	-	-	-	506	503	-	454	510	-
Stage 1	-	-	-	-	-	-	714	667	-	850	775	-
Stage 2	-	-	-	-	-	-	815	765	-	612	665	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.8	0.9	12	14.5
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	604	1473	-	-	1344	-	-	490
HCM Lane V/C Ratio	0.143	0.019	-	-	0.012	-	-	0.227
HCM Control Delay (s)	12	7.5	0	-	7.7	0	-	14.5
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.5	0.1	-	-	0	-	-	0.9

LANE LEVEL OF SERVICE

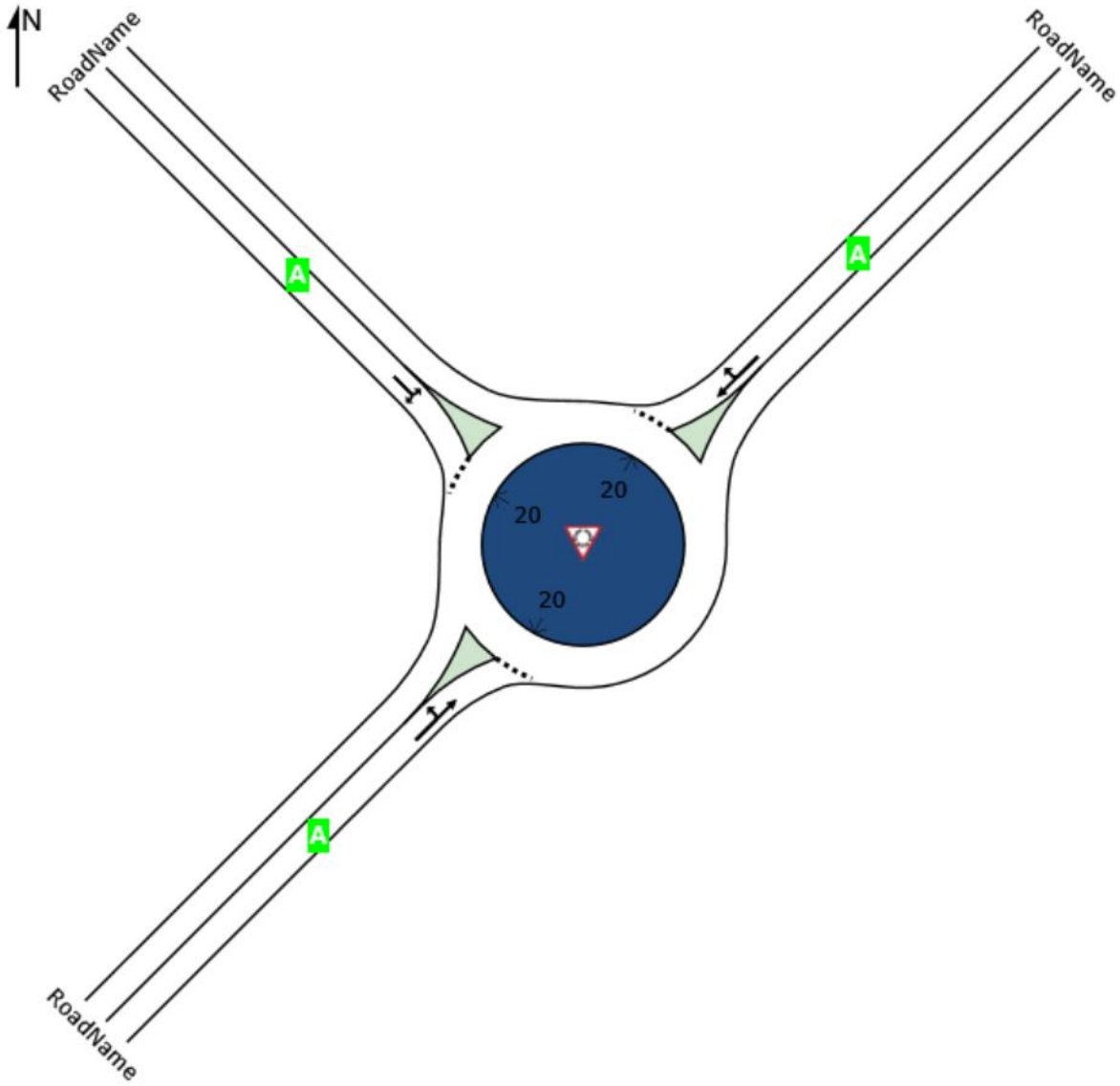
Lane Level of Service

Site: 1 [AMIntE-With Chinook Tr]

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Roundabout

All Movement Classes

	Northeast	Northwest	Southwest	Intersection
LOS	A	A	A	A



Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). 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 and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

LANE SUMMARY

Site: 1 [AMIntE-With Chinook Tr]

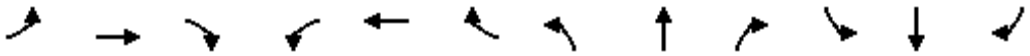
Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Roundabout

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. %
NorthEast: RoadName													
Lane 1[d]	67	2.0	848	0.079	100	4.8	LOS A	0.4	3.0	Full	200	0.0	0.0
Approach	67	2.0		0.079		4.8	LOS A	0.4	3.0				
NorthWest: RoadName													
Lane 1[d]	486	2.0	1517	0.321	100	3.7	LOS A	2.5	18.1	Full	225	0.0	0.0
Approach	486	2.0		0.321		3.7	LOS A	2.5	18.1				
SouthWest: RoadName													
Lane 1[d]	267	2.0	1118	0.239	100	7.8	LOS A	1.5	10.4	Full	200	0.0	0.0
Approach	267	2.0		0.239		7.8	LOS A	1.5	10.4				
Intersection	821	2.0		0.321		5.1	LOS A	2.5	18.1				

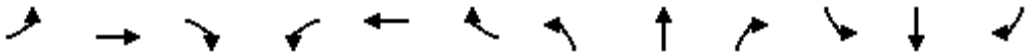
Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
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



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	260	45	107	152	5	12	2	119	5	2	2
Future Volume (vph)	0	260	45	107	152	5	12	2	119	5	2	2
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.980			0.997			0.879			0.973	
Flt Protected					0.980			0.995			0.971	
Satd. Flow (prot)	0	1700	0	0	1695	0	0	1517	0	0	1639	0
Flt Permitted					0.980			0.995			0.971	
Satd. Flow (perm)	0	1700	0	0	1695	0	0	1517	0	0	1639	0
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		489.9			345.4			113.5			56.4	
Travel Time (s)		36.7			25.9			8.5			4.2	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	0	295	51	122	173	6	14	2	135	6	2	2
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	346	0	0	301	0	0	151	0	0	10	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 52.1%		ICU Level of Service A	
Analysis Period (min) 15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	260	45	107	152	5	12	2	119	5	2	2
Future Volume (Veh/h)	0	260	45	107	152	5	12	2	119	5	2	2
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	0	295	51	122	173	6	14	2	135	6	2	2
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	179			346			744	744	320	876	766	176
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	179			346			744	744	320	876	766	176
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			90			95	99	81	97	99	100
cM capacity (veh/h)	1397			1213			303	308	720	201	299	867

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	346	301	151	10
Volume Left	0	122	14	6
Volume Right	51	6	135	2
cSH	1397	1213	629	257
Volume to Capacity	0.00	0.10	0.24	0.04
Queue Length 95th (m)	0.0	2.5	7.1	0.9
Control Delay (s)	0.0	3.9	12.5	19.6
Lane LOS		A	B	C
Approach Delay (s)	0.0	3.9	12.5	19.6
Approach LOS			B	C

Intersection Summary				
Average Delay	4.0			
Intersection Capacity Utilization	52.1%	ICU Level of Service	A	
Analysis Period (min)	15			

Intersection	
Int Delay, s/veh	3.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	0	260	45	107	152	5	12	2	119	5	2	2
Future Vol, veh/h	0	260	45	107	152	5	12	2	119	5	2	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	295	51	122	173	6	14	2	135	6	2	2

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	178	0	0	347	0	0	742	743	321	809	766	176
Stage 1	-	-	-	-	-	-	321	321	-	419	419	-
Stage 2	-	-	-	-	-	-	421	422	-	390	347	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1398	-	-	1212	-	-	332	343	720	299	333	867
Stage 1	-	-	-	-	-	-	691	652	-	612	590	-
Stage 2	-	-	-	-	-	-	610	588	-	634	635	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1398	-	-	1212	-	-	301	305	720	221	296	867
Mov Cap-2 Maneuver	-	-	-	-	-	-	301	305	-	221	296	-
Stage 1	-	-	-	-	-	-	691	652	-	612	524	-
Stage 2	-	-	-	-	-	-	538	522	-	513	635	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	3.4	12.5	18.1
HCM LOS			B	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	628	1398	-	-	1212	-	-	284
HCM Lane V/C Ratio	0.241	-	-	-	0.1	-	-	0.036
HCM Control Delay (s)	12.5	0	-	-	8.3	0	-	18.1
HCM Lane LOS	B	A	-	-	A	A	-	C
HCM 95th %tile Q(veh)	0.9	0	-	-	0.3	-	-	0.1

LANE LEVEL OF SERVICE

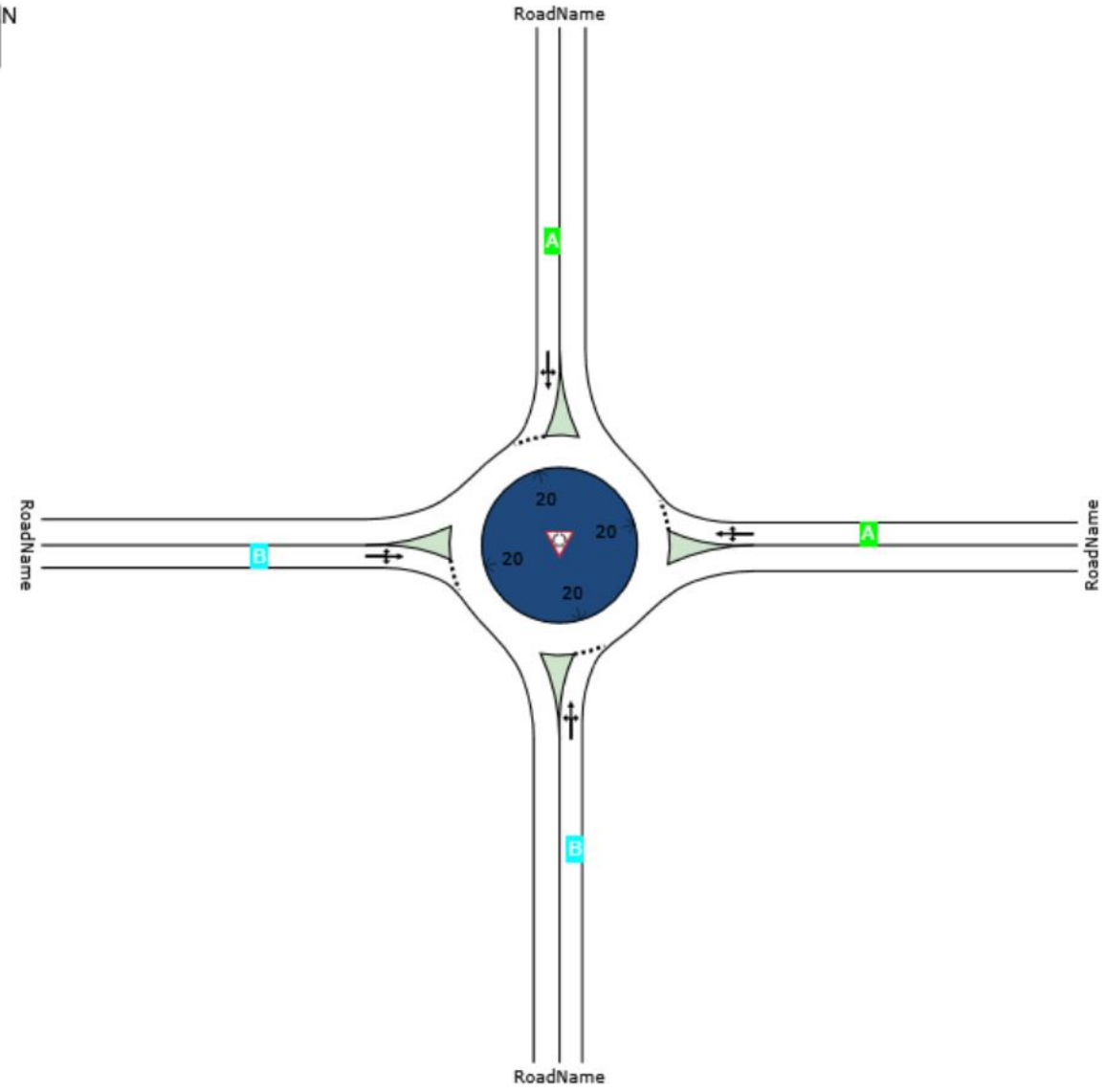
Lane Level of Service

Site: 1 [AMIntG-With Chinook Tr]

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Roundabout

All Movement Classes

	South	East	North	West	Intersection
LOS	B	A	A	B	B



Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). 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 and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

LANE SUMMARY

Site: 1 [AMIntG-With Chinook Tr]

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Roundabout

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: RoadName													
Lane 1[d]	580	2.0	780	0.743	100	12.0	LOS B	10.1	72.2	Full	50	0.0	17.2
Approach	580	2.0		0.743		12.0	LOS B	10.1	72.2				
East: RoadName													
Lane 1[d]	529	2.0	985	0.538	100	7.0	LOS A	4.8	34.1	Full	50	0.0	0.0
Approach	529	2.0		0.538		7.0	LOS A	4.8	34.1				
North: RoadName													
Lane 1[d]	385	2.0	769	0.501	100	9.5	LOS A	4.3	30.8	Full	200	0.0	0.0
Approach	385	2.0		0.501		9.5	LOS A	4.3	30.8				
West: RoadName													
Lane 1[d]	394	2.0	577	0.683	100	16.5	LOS B	7.4	52.6	Full	250	0.0	0.0
Approach	394	2.0		0.683		16.5	LOS B	7.4	52.6				
Intersection	1888	2.0		0.743		11.0	LOS B	10.1	72.2				

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). 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 and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
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

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	59	0	0	22	0	0
Future Volume (vph)	59	0	0	22	0	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.865			
Flt Protected	0.950					
Satd. Flow (prot)	1648	0	1501	0	0	1735
Flt Permitted	0.950					
Satd. Flow (perm)	1648	0	1501	0	0	1735
Link Speed (k/h)	48		48			48
Link Distance (m)	277.5		214.2			632.2
Travel Time (s)	20.8		16.1			47.4
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	67	0	0	25	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	67	0	25	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	3.7		0.0			0.0
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	1.6		1.6			1.6
Two way Left Turn Lane						
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	24	14		14	24	
Sign Control	Stop		Free			Free

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 13.5%		ICU Level of Service A	
Analysis Period (min) 15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	59	0	0	22	0	0
Future Volume (Veh/h)	59	0	0	22	0	0
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	67	0	0	25	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	12	12			25	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	12	12			25	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	93	100			100	
cM capacity (veh/h)	1007	1068			1589	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	67	25	0
Volume Left	67	0	0
Volume Right	0	25	0
cSH	1007	1700	1700
Volume to Capacity	0.07	0.01	0.00
Queue Length 95th (m)	1.6	0.0	0.0
Control Delay (s)	8.8	0.0	0.0
Lane LOS	A		
Approach Delay (s)	8.8	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	6.4		
Intersection Capacity Utilization	13.5%	ICU Level of Service	A
Analysis Period (min)	15		

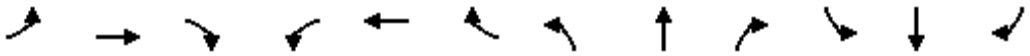
Intersection	
Int Delay, s/veh	6.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Traffic Vol, veh/h	59	0	0	22	0	0
Future Vol, veh/h	59	0	0	22	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	67	0	0	25	0	0

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	13	13	0	0	25	0
Stage 1	13	-	-	-	-	-
Stage 2	0	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	1006	1067	-	-	1589	-
Stage 1	1010	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	1006	1067	-	-	1589	-
Mov Cap-2 Maneuver	1006	-	-	-	-	-
Stage 1	1010	-	-	-	-	-
Stage 2	-	-	-	-	-	-

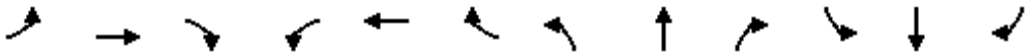
Approach	WB	NB	SB
HCM Control Delay, s	8.8	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	1006	1589	-
HCM Lane V/C Ratio	-	-	0.067	-	-
HCM Control Delay (s)	-	-	8.8	0	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	0.2	0	-



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	41	0	39	0	77	32	32	102	0
Future Volume (vph)	0	0	0	41	0	39	0	77	32	32	102	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.935			0.961				
Flt Protected					0.975						0.988	
Satd. Flow (prot)	0	1735	0	0	1581	0	0	1667	0	0	1714	0
Flt Permitted					0.975						0.988	
Satd. Flow (perm)	0	1735	0	0	1581	0	0	1667	0	0	1714	0
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		343.2			396.7			589.4			375.3	
Travel Time (s)		25.7			29.8			44.2			28.1	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	0	0	0	47	0	44	0	88	36	36	116	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	91	0	0	124	0	0	152	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 26.1%		ICU Level of Service A	
Analysis Period (min) 15			
Description: Int A			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	41	0	39	0	77	32	32	102	0
Future Volume (Veh/h)	0	0	0	41	0	39	0	77	32	32	102	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	0	0	0	47	0	44	0	88	36	36	116	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	44			0			174	138	0	196	116	22
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	44			0			174	138	0	196	116	22
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			97			100	88	97	95	85	100
cM capacity (veh/h)	1564			1623			680	731	1085	655	752	1055

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	0	91	124	152
Volume Left	0	47	0	36
Volume Right	0	44	36	0
cSH	1700	1623	808	726
Volume to Capacity	0.00	0.03	0.15	0.21
Queue Length 95th (m)	0.0	0.7	4.1	6.0
Control Delay (s)	0.0	3.9	10.3	11.3
Lane LOS		A	B	B
Approach Delay (s)	0.0	3.9	10.3	11.3
Approach LOS			B	B

Intersection Summary			
Average Delay	9.1		
Intersection Capacity Utilization	26.1%	ICU Level of Service	A
Analysis Period (min)	15		
Description: Int A			

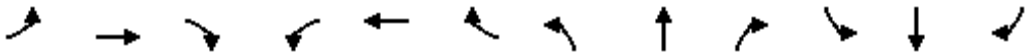
Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	0	0	0	41	0	39	0	77	32	32	102	0
Future Vol, veh/h	0	0	0	41	0	39	0	77	32	32	102	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	47	0	44	0	88	36	36	116	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	44	0	0	0	0	0	173	138	0	177	115	22
Stage 1	-	-	-	-	-	-	0	0	-	115	115	-
Stage 2	-	-	-	-	-	-	173	138	-	62	0	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1564	-	-	-	-	-	790	753	-	785	775	1055
Stage 1	-	-	-	-	-	-	-	-	-	890	800	-
Stage 2	-	-	-	-	-	-	829	782	-	949	-	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1564	-	-	-	-	-	699	753	-	-	775	1055
Mov Cap-2 Maneuver	-	-	-	-	-	-	699	753	-	-	775	-
Stage 1	-	-	-	-	-	-	-	-	-	890	800	-
Stage 2	-	-	-	-	-	-	709	782	-	949	-	-

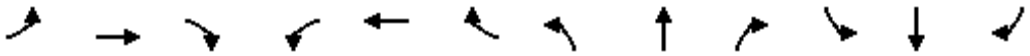
Approach	EB	WB	NB	SB
HCM Control Delay, s	0			
HCM LOS			-	-

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	1564	-	-	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-	-	-	-
HCM Control Delay (s)	-	0	-	-	-	-	-	-
HCM Lane LOS	-	A	-	-	-	-	-	-
HCM 95th %tile Q(veh)	-	0	-	-	-	-	-	-



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	65	4	42	111	17	15	61	24	11	68	0
Future Volume (vph)	0	65	4	42	111	17	15	61	24	11	68	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.991			0.987			0.968				
Flt Protected					0.988			0.993			0.993	
Satd. Flow (prot)	0	1719	0	0	1692	0	0	1667	0	0	1723	0
Flt Permitted					0.988			0.993			0.993	
Satd. Flow (perm)	0	1719	0	0	1692	0	0	1667	0	0	1723	0
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		396.7			778.9			439.8			453.2	
Travel Time (s)		29.8			58.4			33.0			34.0	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	0	74	5	48	126	19	17	69	27	13	77	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	79	0	0	193	0	0	113	0	0	90	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 31.5%		ICU Level of Service A	
Analysis Period (min) 15			
Description: Int B			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	65	4	42	111	17	15	61	24	11	68	0
Future Volume (Veh/h)	0	65	4	42	111	17	15	61	24	11	68	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	0	74	5	48	126	19	17	69	27	13	77	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	145			79			346	318	76	370	310	136
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	145			79			346	318	76	370	310	136
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			97			97	88	97	97	87	100
cM capacity (veh/h)	1437			1519			534	580	985	507	585	913

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	79	193	113	90
Volume Left	0	48	17	13
Volume Right	5	19	27	0
cSH	1437	1519	634	572
Volume to Capacity	0.00	0.03	0.18	0.16
Queue Length 95th (m)	0.0	0.7	4.9	4.2
Control Delay (s)	0.0	2.0	11.9	12.5
Lane LOS		A	B	B
Approach Delay (s)	0.0	2.0	11.9	12.5
Approach LOS			B	B

Intersection Summary				
Average Delay	6.0			
Intersection Capacity Utilization	31.5%	ICU Level of Service	A	
Analysis Period (min)	15			
Description: Int B				

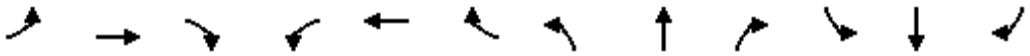
Intersection	
Int Delay, s/veh	5.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	0	65	4	42	111	17	15	61	24	11	68	0
Future Vol, veh/h	0	65	4	42	111	17	15	61	24	11	68	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	74	5	48	126	19	17	69	27	13	77	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	145	0	0	78	0	0	346	317	76	355	309	136
Stage 1	-	-	-	-	-	-	76	76	-	231	231	-
Stage 2	-	-	-	-	-	-	270	241	-	124	78	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1437	-	-	1520	-	-	608	599	985	600	605	913
Stage 1	-	-	-	-	-	-	933	832	-	772	713	-
Stage 2	-	-	-	-	-	-	736	706	-	880	830	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1437	-	-	1520	-	-	532	579	985	516	584	913
Mov Cap-2 Maneuver	-	-	-	-	-	-	532	579	-	516	584	-
Stage 1	-	-	-	-	-	-	933	832	-	772	689	-
Stage 2	-	-	-	-	-	-	631	682	-	784	830	-

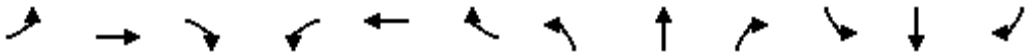
Approach	EB	WB	NB	SB
HCM Control Delay, s	0	1.8	11.9	12.4
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	633	1437	-	-	1520	-	-	573
HCM Lane V/C Ratio	0.18	-	-	-	0.031	-	-	0.157
HCM Control Delay (s)	11.9	0	-	-	7.4	0	-	12.4
HCM Lane LOS	B	A	-	-	A	A	-	B
HCM 95th %tile Q(veh)	0.7	0	-	-	0.1	-	-	0.6



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	33	57	2	20	64	89	0	5	10	65	7	37
Future Volume (vph)	33	57	2	20	64	89	0	5	10	65	7	37
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.997			0.931			0.913			0.954	
Flt Protected		0.982			0.994						0.971	
Satd. Flow (prot)	0	1698	0	0	1605	0	0	1584	0	0	1607	0
Flt Permitted		0.982			0.994						0.971	
Satd. Flow (perm)	0	1698	0	0	1605	0	0	1584	0	0	1607	0
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		277.5			100.4			137.5			589.4	
Travel Time (s)		20.8			7.5			10.3			44.2	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	38	65	2	23	73	101	0	6	11	74	8	42
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	105	0	0	197	0	0	17	0	0	124	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 32.5%		ICU Level of Service A	
Analysis Period (min) 15			
Description: Int C			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	33	57	2	20	64	89	0	5	10	65	7	37
Future Volume (Veh/h)	33	57	2	20	64	89	0	5	10	65	7	37
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	38	65	2	23	73	101	0	6	11	74	8	42
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	174			67			358	362	66	326	312	124
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	174			67			358	362	66	326	312	124
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	97			99			100	99	99	88	99	95
cM capacity (veh/h)	1403			1535			547	542	998	596	577	927

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	105	197	17	124
Volume Left	38	23	0	74
Volume Right	2	101	11	42
cSH	1403	1535	769	676
Volume to Capacity	0.03	0.01	0.02	0.18
Queue Length 95th (m)	0.6	0.3	0.5	5.1
Control Delay (s)	2.9	1.0	9.8	11.5
Lane LOS	A	A	A	B
Approach Delay (s)	2.9	1.0	9.8	11.5
Approach LOS			A	B

Intersection Summary				
Average Delay	4.7			
Intersection Capacity Utilization	32.5%	ICU Level of Service	A	
Analysis Period (min)	15			
Description: Int C				

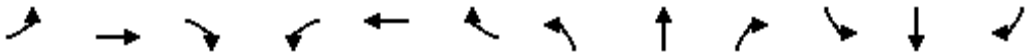
Intersection	
Int Delay, s/veh	4.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	33	57	2	20	64	89	0	5	10	65	7	37
Future Vol, veh/h	33	57	2	20	64	89	0	5	10	65	7	37
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	38	65	2	23	73	101	0	6	11	74	8	42

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	174	0	0	67	0	0	335	360	66	318	311	123
Stage 1	-	-	-	-	-	-	141	141	-	169	169	-
Stage 2	-	-	-	-	-	-	194	219	-	149	142	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1403	-	-	1535	-	-	619	567	998	635	604	928
Stage 1	-	-	-	-	-	-	862	780	-	833	759	-
Stage 2	-	-	-	-	-	-	808	722	-	854	779	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1403	-	-	1535	-	-	565	542	998	602	577	928
Mov Cap-2 Maneuver	-	-	-	-	-	-	565	542	-	602	577	-
Stage 1	-	-	-	-	-	-	838	758	-	810	746	-
Stage 2	-	-	-	-	-	-	750	710	-	814	757	-

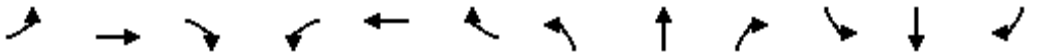
Approach	EB	WB	NB	SB
HCM Control Delay, s	2.7	0.9	9.7	11.5
HCM LOS			A	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	779	1403	-	-	1535	-	-	681
HCM Lane V/C Ratio	0.022	0.027	-	-	0.015	-	-	0.182
HCM Control Delay (s)	9.7	7.6	0	-	7.4	0	-	11.5
HCM Lane LOS	A	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.1	0.1	-	-	0	-	-	0.7



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	18	128	9	35	203	50	6	23	22	50	36	26
Future Volume (vph)	18	128	9	35	203	50	6	23	22	50	36	26
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.992			0.977			0.942			0.968	
Flt Protected		0.994			0.994			0.994			0.978	
Satd. Flow (prot)	0	1711	0	0	1685	0	0	1624	0	0	1642	0
Flt Permitted		0.994			0.994			0.994			0.978	
Satd. Flow (perm)	0	1711	0	0	1685	0	0	1624	0	0	1642	0
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		112.5			489.9			139.9			439.8	
Travel Time (s)		8.4			36.7			10.5			33.0	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	20	145	10	40	231	57	7	26	25	57	41	30
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	175	0	0	328	0	0	58	0	0	128	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 43.0%		ICU Level of Service A	
Analysis Period (min) 15			
Description: Int D			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	18	128	9	35	203	50	6	23	22	50	36	26
Future Volume (Veh/h)	18	128	9	35	203	50	6	23	22	50	36	26
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	20	145	10	40	231	57	7	26	25	57	41	30
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	288			155			580	558	150	568	534	260
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	288			155			580	558	150	568	534	260
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			97			98	94	97	85	91	96
cM capacity (veh/h)	1274			1425			367	419	896	389	432	779

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	175	328	58	128
Volume Left	20	40	7	57
Volume Right	10	57	25	30
cSH	1274	1425	532	457
Volume to Capacity	0.02	0.03	0.11	0.28
Queue Length 95th (m)	0.4	0.7	2.8	8.6
Control Delay (s)	1.0	1.2	12.6	15.9
Lane LOS	A	A	B	C
Approach Delay (s)	1.0	1.2	12.6	15.9
Approach LOS			B	C

Intersection Summary				
Average Delay	4.8			
Intersection Capacity Utilization	43.0%	ICU Level of Service	A	
Analysis Period (min)	15			
Description: Int D				

Intersection	
Int Delay, s/veh	4.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	18	128	9	35	203	50	6	23	22	50	36	26
Future Vol, veh/h	18	128	9	35	203	50	6	23	22	50	36	26
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	20	145	10	40	231	57	7	26	25	57	41	30

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	288	0	0	156	0	0	565	558	151	556	536	259
Stage 1	-	-	-	-	-	-	191	191	-	339	339	-
Stage 2	-	-	-	-	-	-	374	367	-	217	197	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1274	-	-	1424	-	-	436	438	895	442	451	780
Stage 1	-	-	-	-	-	-	811	742	-	676	640	-
Stage 2	-	-	-	-	-	-	647	622	-	785	738	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1274	-	-	1424	-	-	374	416	895	393	428	780
Mov Cap-2 Maneuver	-	-	-	-	-	-	374	416	-	393	428	-
Stage 1	-	-	-	-	-	-	797	729	-	665	618	-
Stage 2	-	-	-	-	-	-	562	601	-	723	725	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.9	0.9	12.6	15.9
HCM LOS			B	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	532	1274	-	-	1424	-	-	458
HCM Lane V/C Ratio	0.109	0.016	-	-	0.028	-	-	0.278
HCM Control Delay (s)	12.6	7.9	0	-	7.6	0	-	15.9
HCM Lane LOS	B	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	0.4	0	-	-	0.1	-	-	1.1

LANE LEVEL OF SERVICE

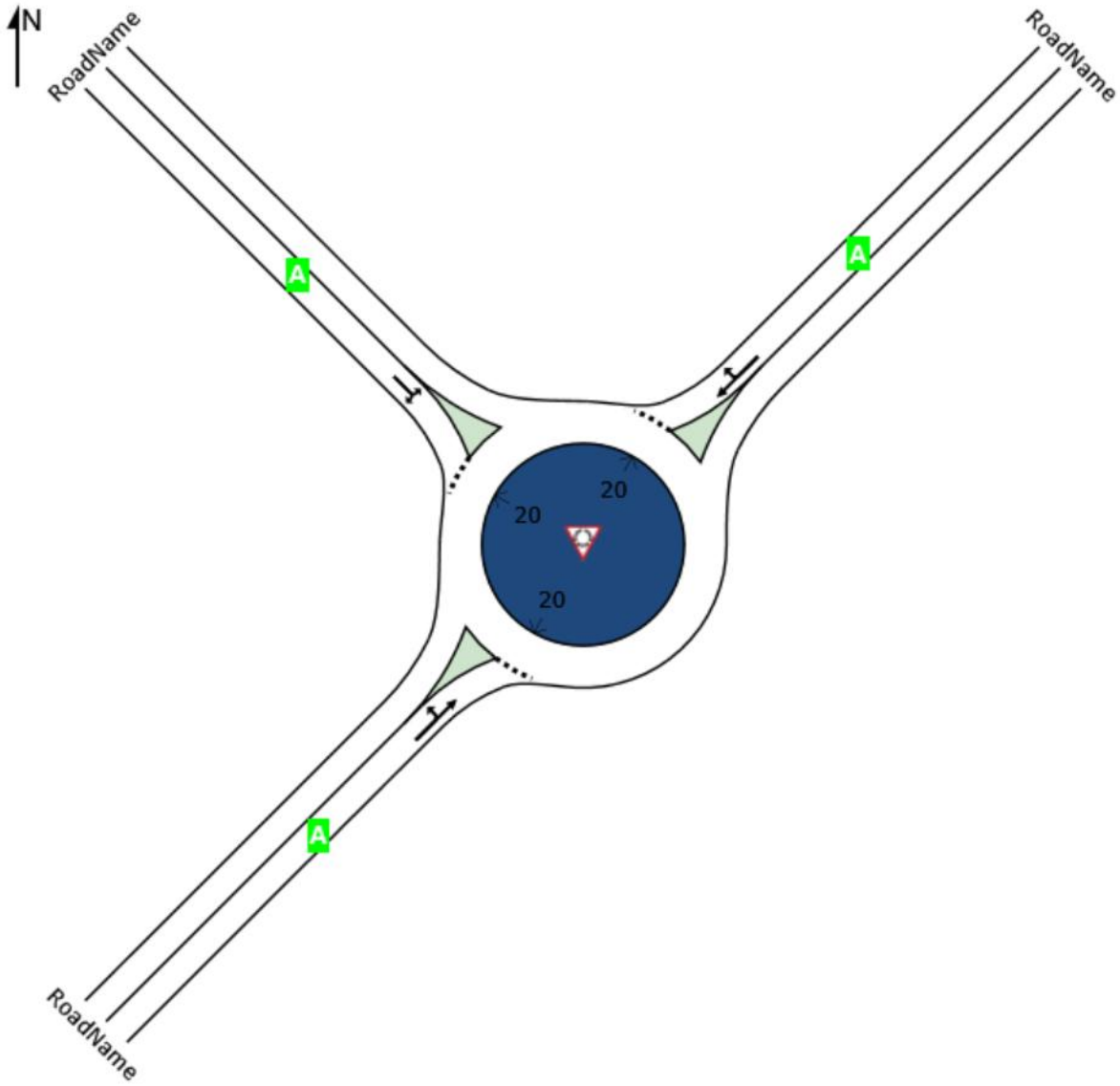
Lane Level of Service

Site: 1 [PMIntE-With Chinook Tr]

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Roundabout

All Movement Classes

	Northeast	Northwest	Southwest	Intersection
LOS	A	A	A	A



Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). 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 and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

LANE SUMMARY

Site: 1 [PMIntE-With Chinook Tr]

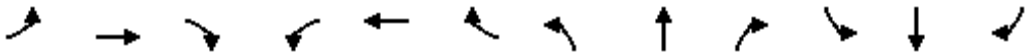
Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Roundabout

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. %
NorthEast: RoadName													
Lane 1[d]	67	2.0	842	0.080	100	4.9	LOS A	0.4	3.1	Full	200	0.0	0.0
Approach	67	2.0		0.080		4.9	LOS A	0.4	3.1				
NorthWest: RoadName													
Lane 1[d]	492	2.0	1518	0.324	100	3.6	LOS A	2.6	18.4	Full	225	0.0	0.0
Approach	492	2.0		0.324		3.6	LOS A	2.6	18.4				
SouthWest: RoadName													
Lane 1[d]	274	2.0	1120	0.244	100	7.8	LOS A	1.5	10.7	Full	200	0.0	0.0
Approach	274	2.0		0.244		7.8	LOS A	1.5	10.7				
Intersection	833	2.0		0.324		5.1	LOS A	2.6	18.4				

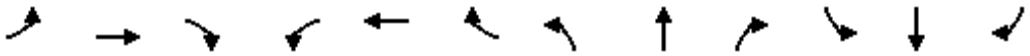
Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
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



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	188	34	107	286	5	33	2	119	5	2	2
Future Volume (vph)	0	188	34	107	286	5	33	2	119	5	2	2
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.979			0.998			0.896			0.973	
Flt Protected					0.987			0.989			0.971	
Satd. Flow (prot)	0	1698	0	0	1709	0	0	1537	0	0	1639	0
Flt Permitted					0.987			0.989			0.971	
Satd. Flow (perm)	0	1698	0	0	1709	0	0	1537	0	0	1639	0
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		489.9			345.4			113.5			56.4	
Travel Time (s)		36.7			25.9			8.5			4.2	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	0	214	39	122	325	6	38	2	135	6	2	2
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	253	0	0	453	0	0	175	0	0	10	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 56.4%		ICU Level of Service B	
Analysis Period (min) 15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	188	34	107	286	5	33	2	119	5	2	2
Future Volume (Veh/h)	0	188	34	107	286	5	33	2	119	5	2	2
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	0	214	39	122	325	6	38	2	135	6	2	2
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	331			253			808	808	234	942	825	328
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	331			253			808	808	234	942	825	328
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			91			86	99	83	97	99	100
cM capacity (veh/h)	1228			1312			276	285	806	187	279	713

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	253	453	175	10
Volume Left	0	122	38	6
Volume Right	39	6	135	2
cSH	1228	1312	560	238
Volume to Capacity	0.00	0.09	0.31	0.04
Queue Length 95th (m)	0.0	2.3	10.1	1.0
Control Delay (s)	0.0	2.8	14.3	20.8
Lane LOS		A	B	C
Approach Delay (s)	0.0	2.8	14.3	20.8
Approach LOS			B	C

Intersection Summary			
Average Delay	4.5		
Intersection Capacity Utilization	56.4%	ICU Level of Service	B
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	4.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	0	188	34	107	286	5	33	2	119	5	2	2
Future Vol, veh/h	0	188	34	107	286	5	33	2	119	5	2	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	214	39	122	325	6	38	2	135	6	2	2

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	331	0	0	252	0	0	806	807	233	873	823	328
Stage 1	-	-	-	-	-	-	233	233	-	571	571	-
Stage 2	-	-	-	-	-	-	573	574	-	302	252	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1228	-	-	1313	-	-	300	315	806	271	309	713
Stage 1	-	-	-	-	-	-	770	712	-	506	505	-
Stage 2	-	-	-	-	-	-	505	503	-	707	698	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1228	-	-	1313	-	-	271	279	806	205	274	713
Mov Cap-2 Maneuver	-	-	-	-	-	-	271	279	-	205	274	-
Stage 1	-	-	-	-	-	-	770	712	-	506	447	-
Stage 2	-	-	-	-	-	-	444	446	-	587	698	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	2.2	14.4	19.4
HCM LOS			B	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	557	1228	-	-	1313	-	-	261
HCM Lane V/C Ratio	0.314	-	-	-	0.093	-	-	0.039
HCM Control Delay (s)	14.4	0	-	-	8	0	-	19.4
HCM Lane LOS	B	A	-	-	A	A	-	C
HCM 95th %tile Q(veh)	1.3	0	-	-	0.3	-	-	0.1

LANE LEVEL OF SERVICE

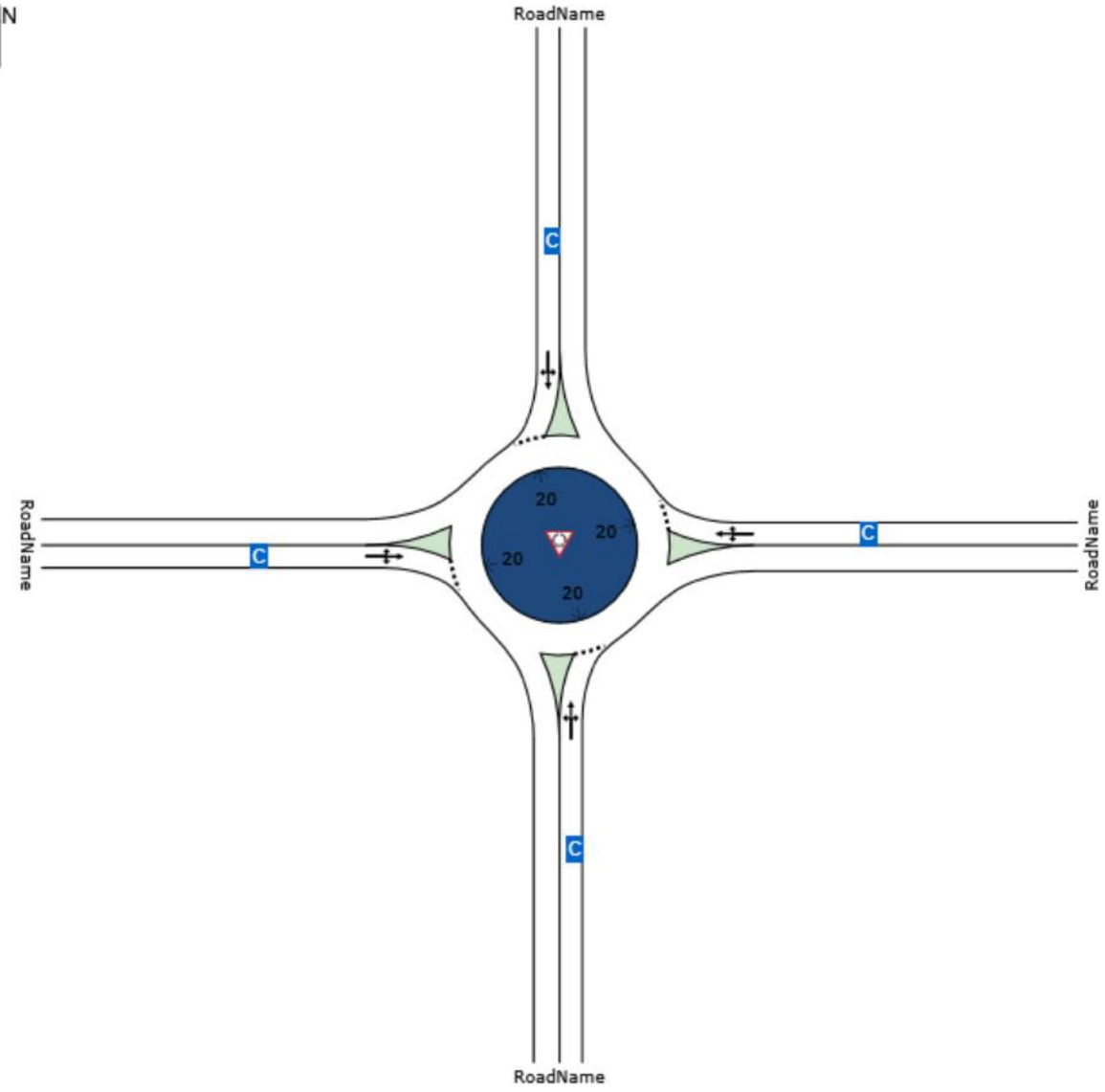
Lane Level of Service

Site: 1 [PM - Full Buildout with Chinook]

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Roundabout

All Movement Classes

	South	East	North	West	Intersection
LOS	C	C	C	C	C



Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). 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 and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

LANE SUMMARY

Site: 1 [PM - Full Buildout with Chinook]

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Roundabout

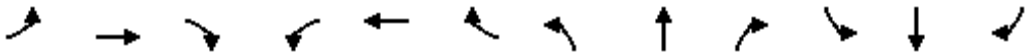
Lane Use and Performance

	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	95% Back of Queue Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: RoadName													
Lane 1[d]	768	2.0	852	0.902	100	20.0	LOS C	22.3	158.4	Full	50	0.0	100.0
Approach	768	2.0		0.902		20.0	LOS C	22.3	158.4				
East: RoadName													
Lane 1[d]	719	2.0	827	0.870	100	21.2	LOS C	17.9	127.2	Full	50	0.0	52.9
Approach	719	2.0		0.870		21.2	LOS C	17.9	127.2				
North: RoadName													
Lane 1[d]	487	2.0	615	0.793	100	22.2	LOS C	11.8	83.9	Full	200	0.0	0.0
Approach	487	2.0		0.793		22.2	LOS C	11.8	83.9				
West: RoadName													
Lane 1[d]	312	2.0	424	0.734	100	27.0	LOS C	8.2	58.5	Full	250	0.0	0.0
Approach	312	2.0		0.734		27.0	LOS C	8.2	58.5				
Intersection	2286	2.0		0.902		21.8	LOS C	22.3	158.4				

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). 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 and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
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.

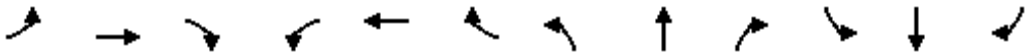
d Dominant lane on roundabout approach

Appendix D – South Link Reports



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	1	1	21	0	21	0	98	38	27	56	0
Future Volume (vph)	1	1	1	21	0	21	0	98	38	27	56	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.955			0.932			0.962				
Flt Protected		0.984			0.976						0.984	
Satd. Flow (prot)	0	1630	0	0	1578	0	0	1669	0	0	1707	0
Flt Permitted		0.984			0.976						0.984	
Satd. Flow (perm)	0	1630	0	0	1578	0	0	1669	0	0	1707	0
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		305.3			396.7			589.4			375.3	
Travel Time (s)		22.9			29.8			44.2			28.1	
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	1	1	1	24	0	24	0	111	43	31	64	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	3	0	0	48	0	0	154	0	0	95	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 34.2%		ICU Level of Service A	
Analysis Period (min) 15			
Description: Int A			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	1	1	21	0	21	0	98	38	27	56	0
Future Volume (Veh/h)	1	1	1	21	0	21	0	98	38	27	56	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	1	1	1	24	0	24	0	111	43	31	64	0
Pedestrians		10			10			10			10	
Lane Width (m)		3.7			3.7			3.7			3.7	
Walking Speed (m/s)		1.1			1.1			1.1			1.1	
Percent Blockage		1			1			1			1	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	302	300	84	280	278	152	74			164		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	302	300	84	280	278	152	74			164		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	96	100	97	100			98		
cM capacity (veh/h)	601	588	957	638	604	877	1511			1401		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	3	48	154	95
Volume Left	1	24	0	31
Volume Right	1	24	43	0
cSH	680	739	1511	1401
Volume to Capacity	0.00	0.06	0.00	0.02
Queue Length 95th (m)	0.1	1.6	0.0	0.5
Control Delay (s)	10.3	10.2	0.0	2.6
Lane LOS	B	B		A
Approach Delay (s)	10.3	10.2	0.0	2.6
Approach LOS	B	B		

Intersection Summary				
Average Delay	2.6			
Intersection Capacity Utilization	34.2%	ICU Level of Service	A	
Analysis Period (min)	15			
Description: Int A				

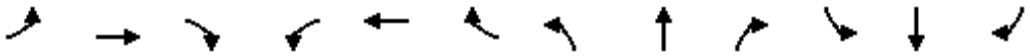
Intersection	
Int Delay, s/veh	2.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	1	1	1	21	0	21	0	98	38	27	56	0
Future Vol, veh/h	1	1	1	21	0	21	0	98	38	27	56	0
Conflicting Peds, #/hr	10	0	10	10	0	10	10	0	10	10	0	10
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	1	1	24	0	24	0	111	43	31	64	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	290	300	84	279	278	153	74	0	0	165	0	0
Stage 1	135	135	-	143	143	-	-	-	-	-	-	-
Stage 2	155	165	-	136	135	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	662	612	975	673	630	893	1526	-	-	1413	-	-
Stage 1	868	785	-	860	779	-	-	-	-	-	-	-
Stage 2	847	762	-	867	785	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	621	587	957	647	604	877	1512	-	-	1400	-	-
Mov Cap-2 Maneuver	621	587	-	647	604	-	-	-	-	-	-	-
Stage 1	860	760	-	852	772	-	-	-	-	-	-	-
Stage 2	816	755	-	837	760	-	-	-	-	-	-	-

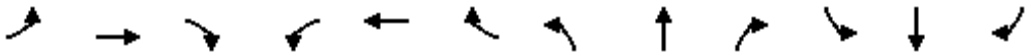
Approach	EB	WB	NB	SB
HCM Control Delay, s	10.3	10.2	0	2.5
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1512	-	-	688	745	1400	-	-
HCM Lane V/C Ratio	-	-	-	0.005	0.064	0.022	-	-
HCM Control Delay (s)	0	-	-	10.3	10.2	7.6	0	-
HCM Lane LOS	A	-	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0.2	0.1	-	-



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	80	3	10	33	7	6	52	25	12	52	2
Future Volume (vph)	1	80	3	10	33	7	6	52	25	12	52	2
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.996			0.981			0.960			0.996	
Flt Protected		0.999			0.990			0.996			0.991	
Satd. Flow (prot)	0	1726	0	0	1685	0	0	1659	0	0	1712	0
Flt Permitted		0.999			0.990			0.996			0.991	
Satd. Flow (perm)	0	1726	0	0	1685	0	0	1659	0	0	1712	0
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		396.7			778.9			439.8			453.2	
Travel Time (s)		29.8			58.4			33.0			34.0	
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	1	91	3	11	38	8	7	59	28	14	59	2
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	95	0	0	57	0	0	94	0	0	75	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 26.3%		ICU Level of Service A	
Analysis Period (min) 15			
Description: Int B			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	80	3	10	33	7	6	52	25	12	52	2
Future Volume (Veh/h)	1	80	3	10	33	7	6	52	25	12	52	2
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	1	91	3	11	38	8	7	59	28	14	59	2
Pedestrians		10			10			10			10	
Lane Width (m)		3.7			3.7			3.7			3.7	
Walking Speed (m/s)		1.1			1.1			1.1			1.1	
Percent Blockage		1			1			1			1	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	56			104			210	182	112	236	180	62
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	56			104			210	182	112	236	180	62
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			99	91	97	98	92	100
cM capacity (veh/h)	1534			1474			671	693	923	626	695	984

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	95	57	94	75
Volume Left	1	11	7	14
Volume Right	3	8	28	2
cSH	1534	1474	746	686
Volume to Capacity	0.00	0.01	0.13	0.11
Queue Length 95th (m)	0.0	0.2	3.3	2.8
Control Delay (s)	0.1	1.5	10.5	10.9
Lane LOS	A	A	B	B
Approach Delay (s)	0.1	1.5	10.5	10.9
Approach LOS			B	B

Intersection Summary			
Average Delay	5.9		
Intersection Capacity Utilization	26.3%	ICU Level of Service	A
Analysis Period (min)	15		
Description: Int B			

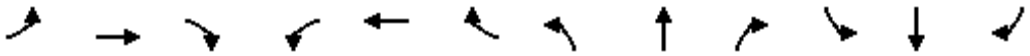
Intersection	
Int Delay, s/veh	5.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	1	80	3	10	33	7	6	52	25	12	52	2
Future Vol, veh/h	1	80	3	10	33	7	6	52	25	12	52	2
Conflicting Peds, #/hr	10	0	10	10	0	10	10	0	10	10	0	10
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	91	3	11	38	8	7	59	28	14	59	2

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	55	0	0	104	0	0	210	183	113	223	181	61
Stage 1	-	-	-	-	-	-	105	105	-	74	74	-
Stage 2	-	-	-	-	-	-	105	78	-	149	107	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1550	-	-	1488	-	-	747	711	940	733	713	1004
Stage 1	-	-	-	-	-	-	901	808	-	935	833	-
Stage 2	-	-	-	-	-	-	901	830	-	854	807	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1536	-	-	1474	-	-	679	692	923	647	694	986
Mov Cap-2 Maneuver	-	-	-	-	-	-	679	692	-	647	694	-
Stage 1	-	-	-	-	-	-	892	800	-	925	819	-
Stage 2	-	-	-	-	-	-	820	816	-	759	799	-

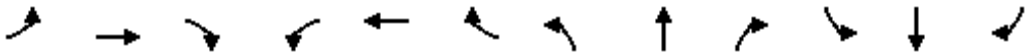
Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	1.5	10.5	10.8
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	747	1536	-	-	1474	-	-	691
HCM Lane V/C Ratio	0.126	0.001	-	-	0.008	-	-	0.109
HCM Control Delay (s)	10.5	7.3	0	-	7.5	0	-	10.8
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.4	0	-	-	0	-	-	0.4



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	24	46	24	54	19	31	10	35	47	63	81	10
Future Volume (vph)	24	46	24	54	19	31	10	35	47	63	81	10
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.966			0.960			0.931			0.992	
Flt Protected		0.987			0.975			0.995			0.980	
Satd. Flow (prot)	0	1654	0	0	1624	0	0	1607	0	0	1686	0
Flt Permitted		0.987			0.975			0.995			0.980	
Satd. Flow (perm)	0	1654	0	0	1624	0	0	1607	0	0	1686	0
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		277.5			100.4			282.2			589.4	
Travel Time (s)		20.8			7.5			21.2			44.2	
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	27	52	27	61	22	35	11	40	53	72	92	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	106	0	0	118	0	0	104	0	0	175	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 35.2%		ICU Level of Service A	
Analysis Period (min) 15			
Description: Int C			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	24	46	24	54	19	31	10	35	47	63	81	10
Future Volume (Veh/h)	24	46	24	54	19	31	10	35	47	63	81	10
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	27	52	27	61	22	35	11	40	53	72	92	11
Pedestrians		10			10			10			10	
Lane Width (m)		3.7			3.7			3.7			3.7	
Walking Speed (m/s)		1.1			1.1			1.1			1.1	
Percent Blockage		1			1			1			1	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	396	376	118	403	356	86	113			103		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	396	376	118	403	356	86	113			103		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	94	90	97	87	96	96	99			95		
cM capacity (veh/h)	487	514	917	463	528	954	1463			1475		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	106	118	104	175
Volume Left	27	61	11	72
Volume Right	27	35	53	11
cSH	570	562	1463	1475
Volume to Capacity	0.19	0.21	0.01	0.05
Queue Length 95th (m)	5.1	6.0	0.2	1.2
Control Delay (s)	12.8	13.1	0.8	3.3
Lane LOS	B	B	A	A
Approach Delay (s)	12.8	13.1	0.8	3.3
Approach LOS	B	B		

Intersection Summary				
Average Delay	7.1			
Intersection Capacity Utilization	35.2%	ICU Level of Service	A	
Analysis Period (min)	15			
Description: Int C				

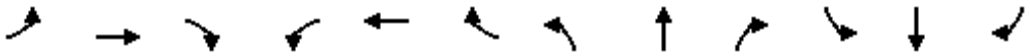
Intersection	
Int Delay, s/veh	7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	24	46	24	54	19	31	10	35	47	63	81	10
Future Vol, veh/h	24	46	24	54	19	31	10	35	47	63	81	10
Conflicting Peds, #/hr	10	0	10	10	0	10	10	0	10	10	0	10
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	27	52	27	61	22	35	11	40	53	72	92	11

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	379	377	118	390	356	86	113	0	0	103	0	0
Stage 1	251	251	-	99	99	-	-	-	-	-	-	-
Stage 2	128	126	-	291	257	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	579	555	934	569	570	973	1476	-	-	1489	-	-
Stage 1	753	699	-	907	813	-	-	-	-	-	-	-
Stage 2	876	792	-	717	695	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	506	512	917	477	526	955	1462	-	-	1475	-	-
Mov Cap-2 Maneuver	506	512	-	477	526	-	-	-	-	-	-	-
Stage 1	740	657	-	891	799	-	-	-	-	-	-	-
Stage 2	807	778	-	601	653	-	-	-	-	-	-	-

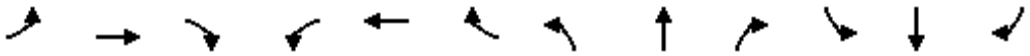
Approach	EB	WB	NB	SB
HCM Control Delay, s	12.7	12.9	0.8	3.1
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1462	-	-	575	572	1475	-	-
HCM Lane V/C Ratio	0.008	-	-	0.186	0.207	0.049	-	-
HCM Control Delay (s)	7.5	0	-	12.7	12.9	7.6	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.7	0.8	0.2	-	-



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	16	181	6	13	87	18	15	31	30	56	13	8
Future Volume (vph)	16	181	6	13	87	18	15	31	30	56	13	8
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.996			0.980			0.947			0.986	
Flt Protected		0.996			0.994			0.990			0.965	
Satd. Flow (prot)	0	1721	0	0	1690	0	0	1626	0	0	1651	0
Flt Permitted		0.996			0.994			0.990			0.965	
Satd. Flow (perm)	0	1721	0	0	1690	0	0	1626	0	0	1651	0
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		112.5			489.9			139.9			439.8	
Travel Time (s)		8.4			36.7			10.5			33.0	
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	18	206	7	15	99	20	17	35	34	64	15	9
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	231	0	0	134	0	0	86	0	0	88	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 33.0%		ICU Level of Service A	
Analysis Period (min) 15			
Description: Int D			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	16	181	6	13	87	18	15	31	30	56	13	8
Future Volume (Veh/h)	16	181	6	13	87	18	15	31	30	56	13	8
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	18	206	7	15	99	20	17	35	34	64	15	9
Pedestrians		10			10			10			10	
Lane Width (m)		3.7			3.7			3.7			3.7	
Walking Speed (m/s)		1.1			1.1			1.1			1.1	
Percent Blockage		1			1			1			1	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	129			223			421	414	230	456	408	129
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	129			223			421	414	230	456	408	129
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			99			97	93	96	86	97	99
cM capacity (veh/h)	1443			1333			499	506	795	443	511	904

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	231	134	86	88
Volume Left	18	15	17	64
Volume Right	7	20	34	9
cSH	1443	1333	589	479
Volume to Capacity	0.01	0.01	0.15	0.18
Queue Length 95th (m)	0.3	0.3	3.9	5.1
Control Delay (s)	0.7	0.9	12.2	14.2
Lane LOS	A	A	B	B
Approach Delay (s)	0.7	0.9	12.2	14.2
Approach LOS			B	B

Intersection Summary				
Average Delay	4.8			
Intersection Capacity Utilization	33.0%	ICU Level of Service	A	
Analysis Period (min)	15			
Description: Int D				

Intersection	
Int Delay, s/veh	4.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	16	181	6	13	87	18	15	31	30	56	13	8
Future Vol, veh/h	16	181	6	13	87	18	15	31	30	56	13	8
Conflicting Peds, #/hr	10	0	10	10	0	10	10	0	10	10	0	10
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	18	206	7	15	99	20	17	35	34	64	15	9

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	129	0	0	223	0	0	416	414	229	439	408	129
Stage 1	-	-	-	-	-	-	255	255	-	149	149	-
Stage 2	-	-	-	-	-	-	161	159	-	290	259	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1457	-	-	1346	-	-	547	529	810	528	533	921
Stage 1	-	-	-	-	-	-	749	696	-	854	774	-
Stage 2	-	-	-	-	-	-	841	766	-	718	694	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1444	-	-	1334	-	-	510	506	795	461	510	904
Mov Cap-2 Maneuver	-	-	-	-	-	-	510	506	-	461	510	-
Stage 1	-	-	-	-	-	-	732	680	-	834	758	-
Stage 2	-	-	-	-	-	-	799	750	-	637	678	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.6	0.9	12.1	13.8
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	592	1444	-	-	1334	-	-	494
HCM Lane V/C Ratio	0.146	0.013	-	-	0.011	-	-	0.177
HCM Control Delay (s)	12.1	7.5	0	-	7.7	0	-	13.8
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.5	0	-	-	0	-	-	0.6

LANE LEVEL OF SERVICE

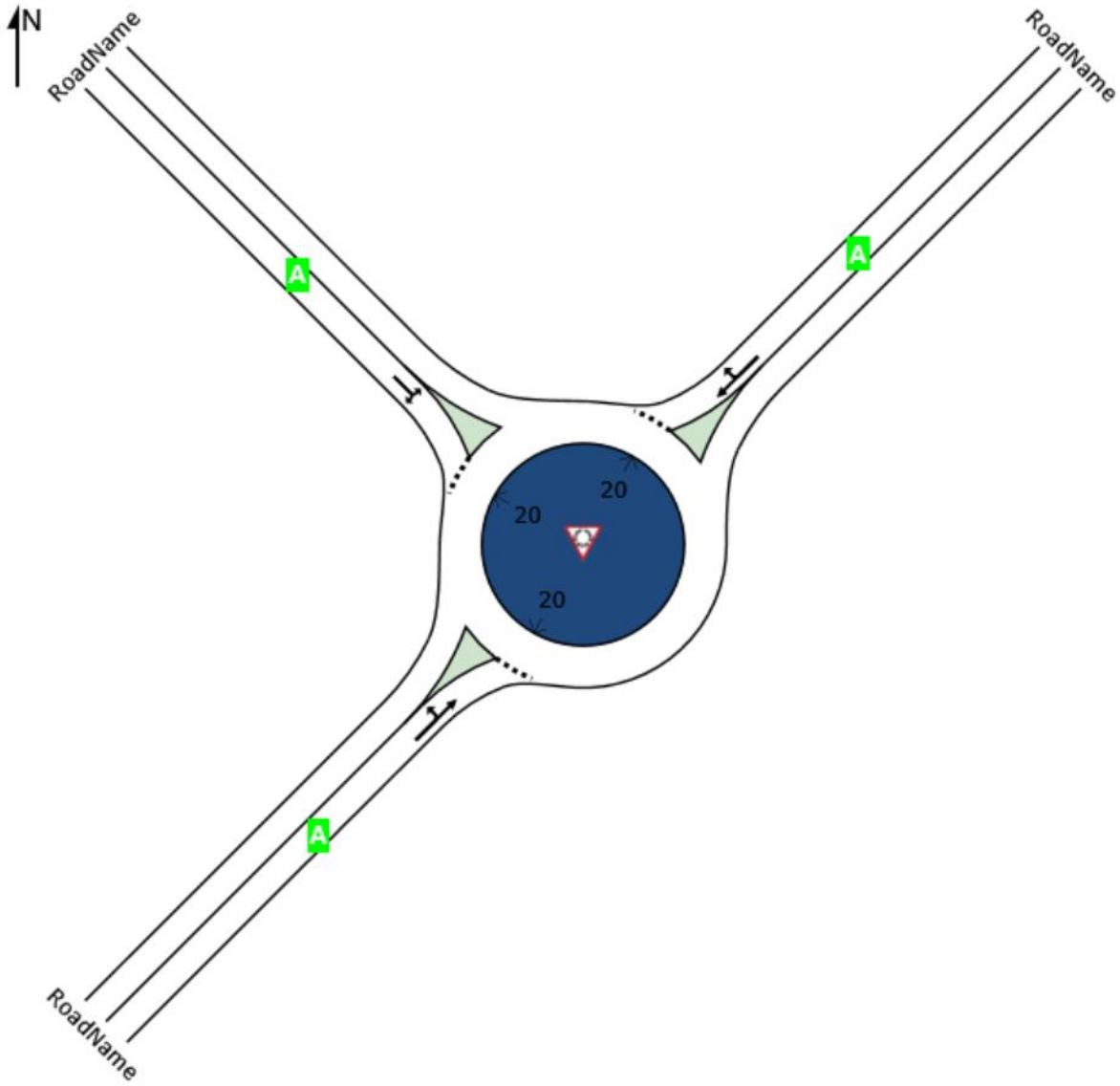
Lane Level of Service

Site: 1 [AMIntE-With South Link]

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Roundabout

All Movement Classes

	Northeast	Northwest	Southwest	Intersection
LOS	A	A	A	A



Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). 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 and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

LANE SUMMARY

Site: 1 [AMIntE-With South Link]

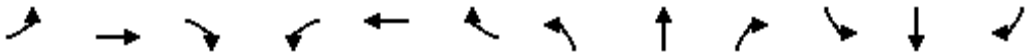
Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Roundabout

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. %
NorthEast: RoadName													
Lane 1[d]	67	2.0	848	0.079	100	4.8	LOS A	0.4	3.0	Full	200	0.0	0.0
Approach	67	2.0		0.079		4.8	LOS A	0.4	3.0				
NorthWest: RoadName													
Lane 1[d]	486	2.0	1517	0.321	100	3.7	LOS A	2.5	18.1	Full	225	0.0	0.0
Approach	486	2.0		0.321		3.7	LOS A	2.5	18.1				
SouthWest: RoadName													
Lane 1[d]	267	2.0	1118	0.239	100	7.8	LOS A	1.5	10.4	Full	200	0.0	0.0
Approach	267	2.0		0.239		7.8	LOS A	1.5	10.4				
Intersection	821	2.0		0.321		5.1	LOS A	2.5	18.1				

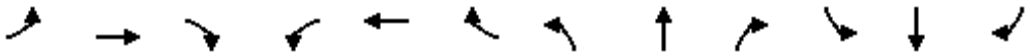
Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
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



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	230	33	205	124	5	12	0	91	5	2	2
Future Volume (vph)	0	230	33	205	124	5	12	0	91	5	2	2
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.983			0.998			0.881			0.973	
Flt Protected					0.970			0.994			0.971	
Satd. Flow (prot)	0	1705	0	0	1679	0	0	1519	0	0	1639	0
Flt Permitted					0.970			0.994			0.971	
Satd. Flow (perm)	0	1705	0	0	1679	0	0	1519	0	0	1639	0
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		489.9			345.4			55.7			56.4	
Travel Time (s)		36.7			25.9			4.2			4.2	
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	0	261	38	233	141	6	14	0	103	6	2	2
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	299	0	0	380	0	0	117	0	0	10	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 54.5%		ICU Level of Service A	
Analysis Period (min) 15			
Description: Int F			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	230	33	205	124	5	12	0	91	5	2	2
Future Volume (Veh/h)	0	230	33	205	124	5	12	0	91	5	2	2
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	0	261	38	233	141	6	14	0	103	6	2	2
Pedestrians		10			10			10			10	
Lane Width (m)		3.7			3.7			3.7			3.7	
Walking Speed (m/s)		1.1			1.1			1.1			1.1	
Percent Blockage		1			1			1			1	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	157			309			913	913	300	1013	929	164
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	157			309			913	913	300	1013	929	164
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			81			93	100	86	96	99	100
cM capacity (veh/h)	1410			1240			209	218	726	154	213	864

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	299	380	117	10
Volume Left	0	233	14	6
Volume Right	38	6	103	2
cSH	1410	1240	560	198
Volume to Capacity	0.00	0.19	0.21	0.05
Queue Length 95th (m)	0.0	5.2	5.9	1.2
Control Delay (s)	0.0	5.9	13.1	24.2
Lane LOS		A	B	C
Approach Delay (s)	0.0	5.9	13.1	24.2
Approach LOS			B	C

Intersection Summary			
Average Delay	5.0		
Intersection Capacity Utilization	54.5%	ICU Level of Service	A
Analysis Period (min)	15		
Description: Int F			

Intersection	
Int Delay, s/veh	4.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	0	230	33	205	124	5	12	0	91	5	2	2
Future Vol, veh/h	0	230	33	205	124	5	12	0	91	5	2	2
Conflicting Peds, #/hr	10	0	10	10	0	10	10	0	10	10	0	10
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	261	38	233	141	6	14	0	103	6	2	2

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	157	0	0	309	0	0	912	913	300	962	929	164
Stage 1	-	-	-	-	-	-	290	290	-	620	620	-
Stage 2	-	-	-	-	-	-	622	623	-	342	309	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1423	-	-	1252	-	-	255	273	740	235	268	881
Stage 1	-	-	-	-	-	-	718	672	-	476	480	-
Stage 2	-	-	-	-	-	-	474	478	-	673	660	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1410	-	-	1240	-	-	209	213	726	167	209	865
Mov Cap-2 Maneuver	-	-	-	-	-	-	209	213	-	167	209	-
Stage 1	-	-	-	-	-	-	711	666	-	472	378	-
Stage 2	-	-	-	-	-	-	370	377	-	572	654	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	5.3	13	22.6
HCM LOS			B	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	564	1410	-	-	1240	-	-	215
HCM Lane V/C Ratio	0.208	-	-	-	0.188	-	-	0.048
HCM Control Delay (s)	13	0	-	-	8.6	0	-	22.6
HCM Lane LOS	B	A	-	-	A	A	-	C
HCM 95th %tile Q(veh)	0.8	0	-	-	0.7	-	-	0.1

LANE LEVEL OF SERVICE

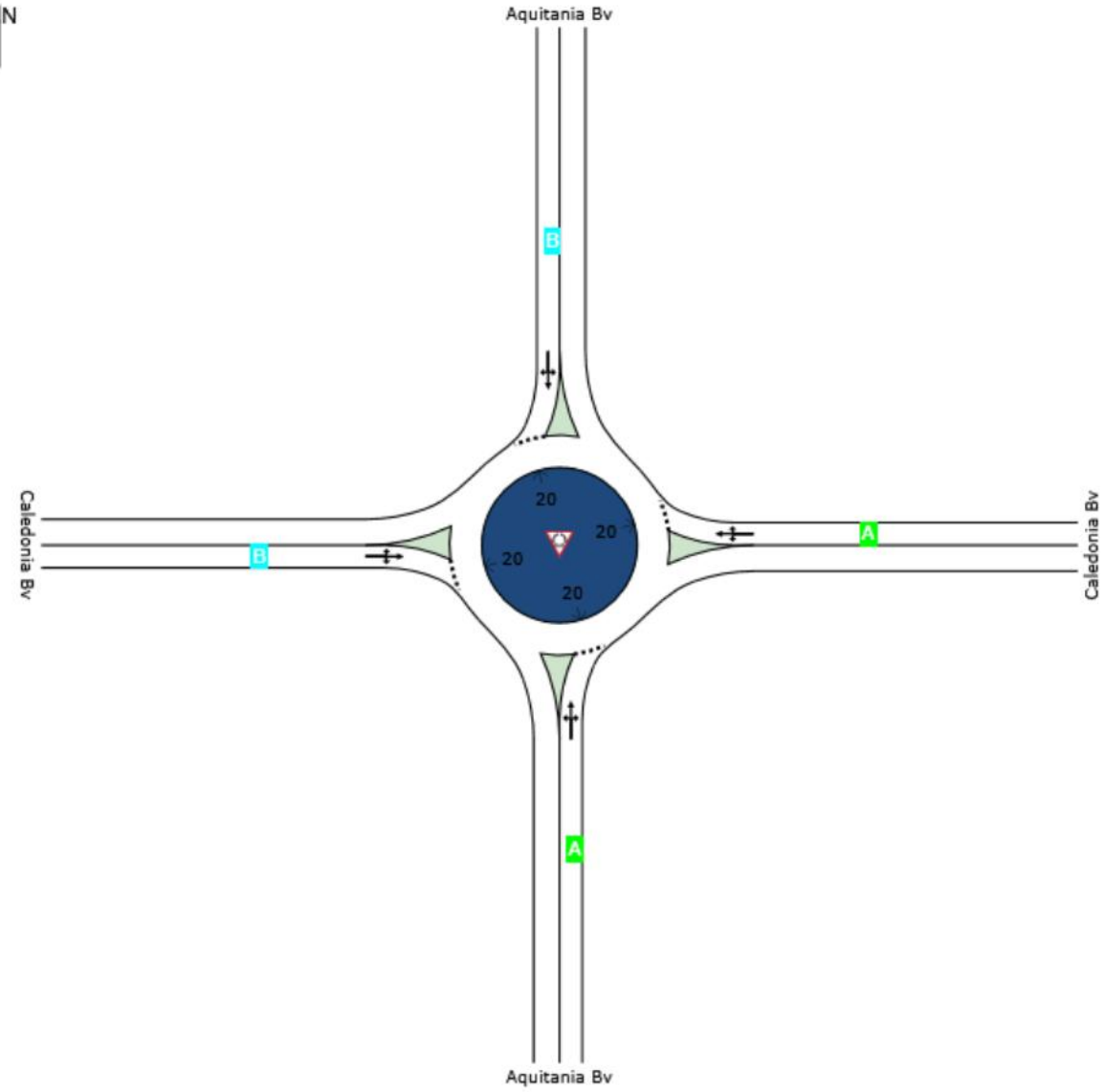
Lane Level of Service

Site: 1 [AMIntG-With South Link]

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Roundabout

All Movement Classes

	South	East	North	West	Intersection
LOS	A	A	B	B	A



Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). 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 and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

LANE SUMMARY

Site: 1 [AMIntG-With South Link]

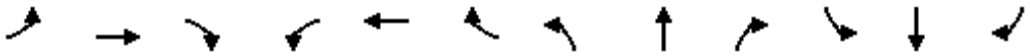
Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Roundabout

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: Aquitania Bv													
Lane 1[d]	575	2.0	917	0.627	100	7.4	LOS A	6.6	46.7	Full	50	0.0	3.0
Approach	575	2.0		0.627		7.4	LOS A	6.6	46.7				
East: Caledonia Bv													
Lane 1[d]	519	2.0	886	0.586	100	9.0	LOS A	5.7	40.4	Full	200	0.0	0.0
Approach	519	2.0		0.586		9.0	LOS A	5.7	40.4				
North: Aquitania Bv													
Lane 1[d]	383	2.0	670	0.572	100	11.8	LOS B	5.3	38.1	Full	200	0.0	0.0
Approach	383	2.0		0.572		11.8	LOS B	5.3	38.1				
West: Caledonia Bv													
Lane 1[d]	338	2.0	662	0.511	100	10.3	LOS B	4.3	30.4	Full	250	0.0	0.0
Approach	338	2.0		0.511		10.3	LOS B	4.3	30.4				
Intersection	1815	2.0		0.627		9.3	LOS A	6.6	46.7				

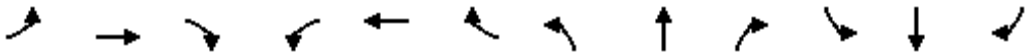
Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
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



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	1	1	42	0	35	0	90	37	0	110	0
Future Volume (vph)	1	1	1	42	0	35	0	90	37	0	110	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.955			0.939			0.961				
Flt Protected		0.984			0.973							
Satd. Flow (prot)	0	1630	0	0	1585	0	0	1667	0	0	1735	0
Flt Permitted		0.984			0.973							
Satd. Flow (perm)	0	1630	0	0	1585	0	0	1667	0	0	1735	0
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		305.3			396.7			589.4			375.3	
Travel Time (s)		22.9			29.8			44.2			28.1	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	1	1	1	48	0	40	0	102	42	0	125	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	3	0	0	88	0	0	144	0	0	125	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 22.3%		ICU Level of Service A	
Analysis Period (min) 15			
Description: Int A			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	1	1	42	0	35	0	90	37	0	110	0
Future Volume (Veh/h)	1	1	1	42	0	35	0	90	37	0	110	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	1	1	1	48	0	40	0	102	42	0	125	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	288	269	125	250	248	123	125			144		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	288	269	125	250	248	123	125			144		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	93	100	96	100			100		
cM capacity (veh/h)	636	637	926	702	655	928	1462			1438		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	3	88	144	125
Volume Left	1	48	0	0
Volume Right	1	40	42	0
cSH	710	790	1462	1438
Volume to Capacity	0.00	0.11	0.00	0.00
Queue Length 95th (m)	0.1	2.8	0.0	0.0
Control Delay (s)	10.1	10.1	0.0	0.0
Lane LOS	B	B		
Approach Delay (s)	10.1	10.1	0.0	0.0
Approach LOS	B	B		

Intersection Summary				
Average Delay	2.6			
Intersection Capacity Utilization	22.3%	ICU Level of Service	A	
Analysis Period (min)	15			
Description: Int A				

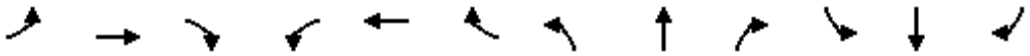
Intersection	
Int Delay, s/veh	2.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	1	1	1	42	0	35	0	90	37	0	110	0
Future Vol, veh/h	1	1	1	42	0	35	0	90	37	0	110	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	1	1	48	0	40	0	102	42	0	125	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	268	269	125	249	248	123	125	0	0	144	0	0
Stage 1	125	125	-	123	123	-	-	-	-	-	-	-
Stage 2	143	144	-	126	125	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	685	637	926	705	655	928	1462	-	-	1438	-	-
Stage 1	879	792	-	881	794	-	-	-	-	-	-	-
Stage 2	860	778	-	878	792	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	656	637	926	703	655	928	1462	-	-	1438	-	-
Mov Cap-2 Maneuver	656	637	-	703	655	-	-	-	-	-	-	-
Stage 1	879	792	-	881	794	-	-	-	-	-	-	-
Stage 2	823	778	-	876	792	-	-	-	-	-	-	-

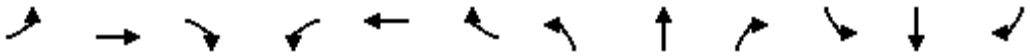
Approach	EB	WB	NB	SB
HCM Control Delay, s	10	10.1	0	0
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1462	-	-	719	790	1438	-	-
HCM Lane V/C Ratio	-	-	-	0.005	0.111	-	-	-
HCM Control Delay (s)	0	-	-	10	10.1	0	-	-
HCM Lane LOS	A	-	-	B	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0	0.4	0	-	-



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	4	56	2	22	90	15	9	54	14	10	59	2
Future Volume (vph)	4	56	2	22	90	15	9	54	14	10	59	2
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.996			0.984			0.975			0.997	
Flt Protected		0.996			0.991			0.994			0.993	
Satd. Flow (prot)	0	1721	0	0	1692	0	0	1681	0	0	1717	0
Flt Permitted		0.996			0.991			0.994			0.993	
Satd. Flow (perm)	0	1721	0	0	1692	0	0	1681	0	0	1717	0
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		396.7			778.9			439.8			453.2	
Travel Time (s)		29.8			58.4			33.0			34.0	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	5	64	2	25	102	17	10	61	16	11	67	2
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	71	0	0	144	0	0	87	0	0	80	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 26.5%		ICU Level of Service A	
Analysis Period (min) 15			
Description: Int B			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	4	56	2	22	90	15	9	54	14	10	59	2
Future Volume (Veh/h)	4	56	2	22	90	15	9	54	14	10	59	2
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	5	64	2	25	102	17	10	61	16	11	67	2
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	119			66			271	244	65	282	236	110
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	119			66			271	244	65	282	236	110
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			98			98	91	98	98	90	100
cM capacity (veh/h)	1469			1536			617	645	999	603	651	943

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	71	144	87	80
Volume Left	5	25	10	11
Volume Right	2	17	16	2
cSH	1469	1536	686	649
Volume to Capacity	0.00	0.02	0.13	0.12
Queue Length 95th (m)	0.1	0.4	3.3	3.2
Control Delay (s)	0.5	1.4	11.0	11.3
Lane LOS	A	A	B	B
Approach Delay (s)	0.5	1.4	11.0	11.3
Approach LOS			B	B

Intersection Summary			
Average Delay	5.5		
Intersection Capacity Utilization	26.5%	ICU Level of Service	A
Analysis Period (min)	15		
Description: Int B			

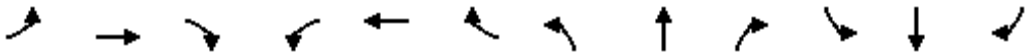
Intersection	
Int Delay, s/veh	5.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	4	56	2	22	90	15	9	54	14	10	59	2
Future Vol, veh/h	4	56	2	22	90	15	9	54	14	10	59	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	64	2	25	102	17	10	61	16	11	67	2

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	119	0	0	66	0	0	269	243	65	274	236	111
Stage 1	-	-	-	-	-	-	74	74	-	161	161	-
Stage 2	-	-	-	-	-	-	195	169	-	113	75	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1469	-	-	1536	-	-	684	659	999	678	665	942
Stage 1	-	-	-	-	-	-	935	833	-	841	765	-
Stage 2	-	-	-	-	-	-	807	759	-	892	833	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1469	-	-	1536	-	-	619	645	999	609	651	942
Mov Cap-2 Maneuver	-	-	-	-	-	-	619	645	-	609	651	-
Stage 1	-	-	-	-	-	-	931	830	-	838	752	-
Stage 2	-	-	-	-	-	-	721	746	-	810	830	-

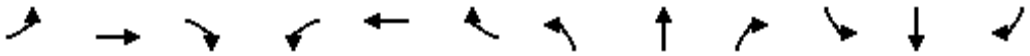
Approach	EB	WB	NB	SB
HCM Control Delay, s	0.5	1.3	11	11.3
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	686	1469	-	-	1536	-	-	650
HCM Lane V/C Ratio	0.128	0.003	-	-	0.016	-	-	0.124
HCM Control Delay (s)	11	7.5	0	-	7.4	0	-	11.3
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.4	0	-	-	0.1	-	-	0.4



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	16	31	20	58	45	59	31	113	62	43	71	26
Future Volume (vph)	16	31	20	58	45	59	31	113	62	43	71	26
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.959			0.951			0.959			0.975	
Flt Protected		0.988			0.982			0.993			0.985	
Satd. Flow (prot)	0	1644	0	0	1620	0	0	1652	0	0	1666	0
Flt Permitted		0.988			0.982			0.993			0.985	
Satd. Flow (perm)	0	1644	0	0	1620	0	0	1652	0	0	1666	0
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		277.5			100.4			314.3			589.4	
Travel Time (s)		20.8			7.5			23.6			44.2	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	18	35	23	66	51	67	35	128	70	49	81	30
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	76	0	0	184	0	0	233	0	0	160	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 37.7%		ICU Level of Service A	
Analysis Period (min) 15			
Description: Int C			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	16	31	20	58	45	59	31	113	62	43	71	26
Future Volume (Veh/h)	16	31	20	58	45	59	31	113	62	43	71	26
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	18	35	23	66	51	67	35	128	70	49	81	30
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	520	462	96	468	442	163	111			198		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	520	462	96	468	442	163	111			198		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	95	93	98	85	89	92	98			96		
cM capacity (veh/h)	379	468	960	445	480	882	1479			1375		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	76	184	233	160
Volume Left	18	66	35	49
Volume Right	23	67	70	30
cSH	520	557	1479	1375
Volume to Capacity	0.15	0.33	0.02	0.04
Queue Length 95th (m)	3.9	10.9	0.6	0.8
Control Delay (s)	13.1	14.6	1.3	2.6
Lane LOS	B	B	A	A
Approach Delay (s)	13.1	14.6	1.3	2.6
Approach LOS	B	B		

Intersection Summary				
Average Delay	6.7			
Intersection Capacity Utilization	37.7%	ICU Level of Service	A	
Analysis Period (min)	15			
Description: Int C				

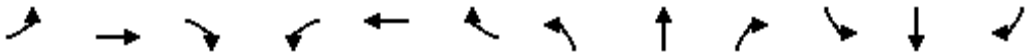
Intersection	
Int Delay, s/veh	6.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	16	31	20	58	45	59	31	113	62	43	71	26
Future Vol, veh/h	16	31	20	58	45	59	31	113	62	43	71	26
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	18	35	23	66	51	67	35	128	70	49	81	30

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	486	462	95	456	442	164	110	0	0	199	0	0
Stage 1	193	193	-	234	234	-	-	-	-	-	-	-
Stage 2	293	269	-	222	208	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	492	497	962	515	510	881	1480	-	-	1373	-	-
Stage 1	809	741	-	769	711	-	-	-	-	-	-	-
Stage 2	715	687	-	780	730	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	397	465	962	451	477	881	1480	-	-	1373	-	-
Mov Cap-2 Maneuver	397	465	-	451	477	-	-	-	-	-	-	-
Stage 1	787	713	-	748	692	-	-	-	-	-	-	-
Stage 2	595	668	-	696	702	-	-	-	-	-	-	-

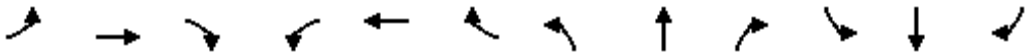
Approach	EB	WB	NB	SB
HCM Control Delay, s	13	14.6	1.1	2.4
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1480	-	-	524	559	1373	-	-
HCM Lane V/C Ratio	0.024	-	-	0.145	0.329	0.036	-	-
HCM Control Delay (s)	7.5	0	-	13	14.6	7.7	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.5	1.4	0.1	-	-



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	13	114	20	32	175	35	12	18	21	43	28	16
Future Volume (vph)	13	114	20	32	175	35	12	18	21	43	28	16
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.982			0.980			0.944			0.975	
Flt Protected		0.996			0.993			0.988			0.976	
Satd. Flow (prot)	0	1697	0	0	1688	0	0	1618	0	0	1651	0
Flt Permitted		0.996			0.993			0.988			0.976	
Satd. Flow (perm)	0	1697	0	0	1688	0	0	1618	0	0	1651	0
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		112.5			489.9			139.9			439.8	
Travel Time (s)		8.4			36.7			10.5			33.0	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	15	130	23	36	199	40	14	20	24	49	32	18
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	168	0	0	275	0	0	58	0	0	99	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 38.1%		ICU Level of Service A	
Analysis Period (min) 15			
Description: Int D			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	13	114	20	32	175	35	12	18	21	43	28	16
Future Volume (Veh/h)	13	114	20	32	175	35	12	18	21	43	28	16
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	15	130	23	36	199	40	14	20	24	49	32	18
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	239			153			496	482	142	496	474	219
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	239			153			496	482	142	496	474	219
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			97			97	96	97	89	93	98
cM capacity (veh/h)	1328			1428			436	466	906	443	471	821

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	168	275	58	99
Volume Left	15	36	14	49
Volume Right	23	40	24	18
cSH	1328	1428	572	494
Volume to Capacity	0.01	0.03	0.10	0.20
Queue Length 95th (m)	0.3	0.6	2.6	5.6
Control Delay (s)	0.8	1.2	12.0	14.1
Lane LOS	A	A	B	B
Approach Delay (s)	0.8	1.2	12.0	14.1
Approach LOS			B	B

Intersection Summary				
Average Delay	4.3			
Intersection Capacity Utilization	38.1%	ICU Level of Service	A	
Analysis Period (min)	15			
Description: Int D				

Intersection	
Int Delay, s/veh	4.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	13	114	20	32	175	35	12	18	21	43	28	16
Future Vol, veh/h	13	114	20	32	175	35	12	18	21	43	28	16
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	15	130	23	36	199	40	14	20	24	49	32	18

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	239	0	0	152	0	0	486	481	141	484	473	219
Stage 1	-	-	-	-	-	-	170	170	-	291	291	-
Stage 2	-	-	-	-	-	-	316	311	-	193	182	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1328	-	-	1429	-	-	492	485	907	493	490	821
Stage 1	-	-	-	-	-	-	832	758	-	717	672	-
Stage 2	-	-	-	-	-	-	695	658	-	809	749	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1328	-	-	1429	-	-	442	465	907	450	470	821
Mov Cap-2 Maneuver	-	-	-	-	-	-	442	465	-	450	470	-
Stage 1	-	-	-	-	-	-	822	749	-	708	653	-
Stage 2	-	-	-	-	-	-	628	639	-	757	740	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.7	1	12	14
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	573	1328	-	-	1429	-	-	498
HCM Lane V/C Ratio	0.101	0.011	-	-	0.025	-	-	0.199
HCM Control Delay (s)	12	7.7	0	-	7.6	0	-	14
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.3	0	-	-	0.1	-	-	0.7

LANE LEVEL OF SERVICE

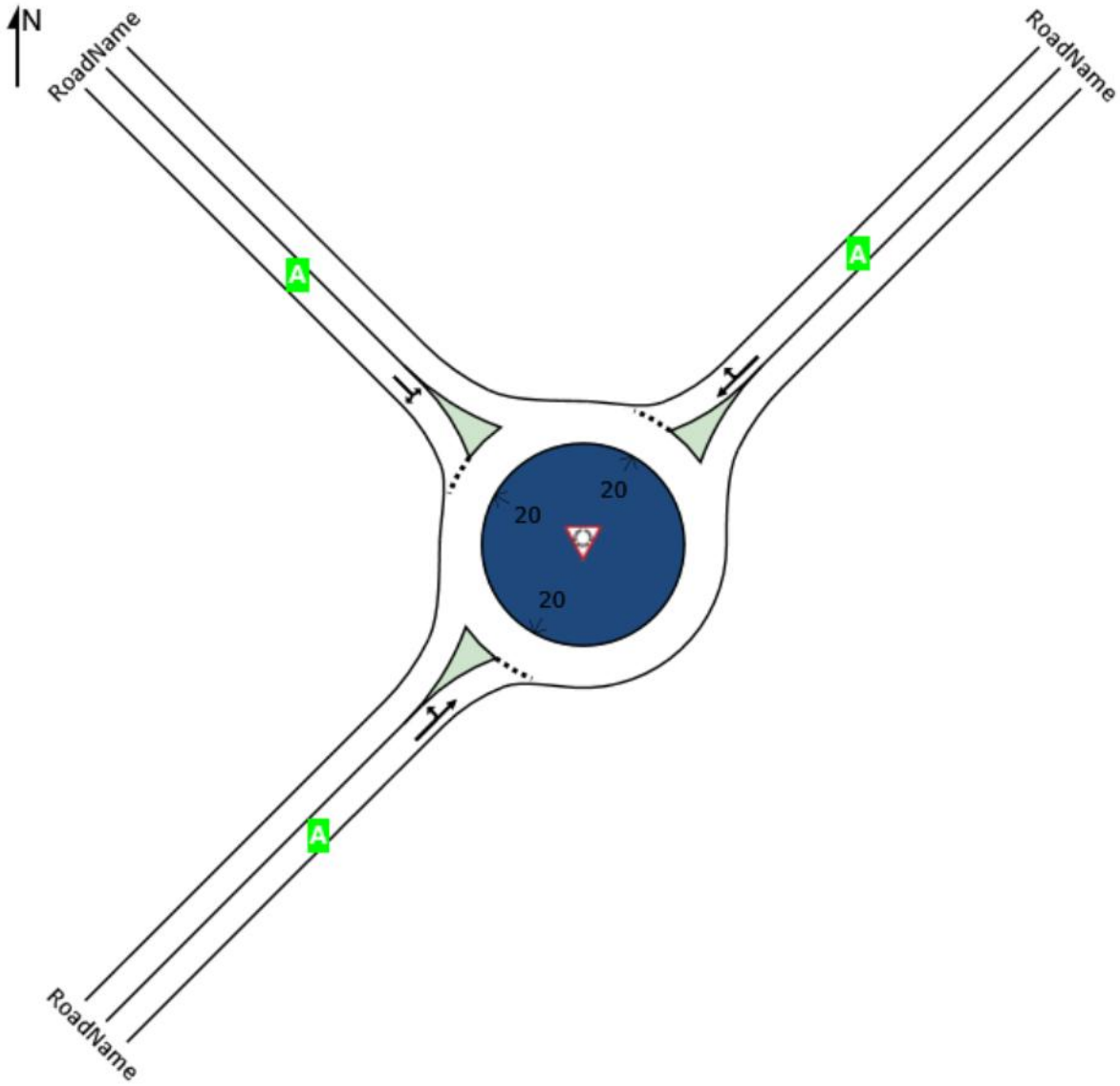
Lane Level of Service

Site: 1 [PMIntE-With South Link]

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Roundabout

All Movement Classes

	Northeast	Northwest	Southwest	Intersection
LOS	A	A	A	A



Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). 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 and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

LANE SUMMARY

Site: 1 [PMIntE-With South Link]

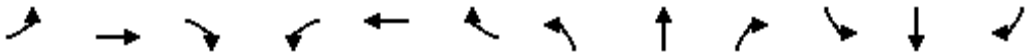
Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Roundabout

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	95% Back of Queue Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
NorthEast: RoadName													
Lane 1[d]	67	2.0	844	0.080	100	4.8	LOS A	0.4	3.0	Full	200	0.0	0.0
Approach	67	2.0		0.080		4.8	LOS A	0.4	3.0				
NorthWest: RoadName													
Lane 1[d]	492	2.0	1518	0.324	100	3.6	LOS A	2.6	18.3	Full	225	0.0	0.0
Approach	492	2.0		0.324		3.6	LOS A	2.6	18.3				
SouthWest: RoadName													
Lane 1[d]	272	2.0	1120	0.243	100	7.8	LOS A	1.5	10.6	Full	200	0.0	0.0
Approach	272	2.0		0.243		7.8	LOS A	1.5	10.6				
Intersection	831	2.0		0.324		5.1	LOS A	2.6	18.3				

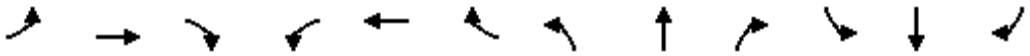
Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
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



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	156	22	107	217	5	33	2	119	5	2	2
Future Volume (vph)	0	156	22	107	217	5	33	2	119	5	2	2
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.983			0.998			0.896			0.973	
Flt Protected					0.984			0.989			0.971	
Satd. Flow (prot)	0	1705	0	0	1704	0	0	1537	0	0	1639	0
Flt Permitted					0.984			0.989			0.971	
Satd. Flow (perm)	0	1705	0	0	1704	0	0	1537	0	0	1639	0
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		489.9			345.4			113.5			56.4	
Travel Time (s)		36.7			25.9			8.5			4.2	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	0	177	25	122	247	6	38	2	135	6	2	2
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	202	0	0	375	0	0	175	0	0	10	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		1.6			1.6			1.6			1.6	
Two way Left Turn Lane												
Headway Factor	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 49.8%		ICU Level of Service A	
Analysis Period (min) 15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	156	22	107	217	5	33	2	119	5	2	2
Future Volume (Veh/h)	0	156	22	107	217	5	33	2	119	5	2	2
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	0	177	25	122	247	6	38	2	135	6	2	2
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	253			202			686	686	190	820	696	250
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	253			202			686	686	190	820	696	250
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			91			89	99	84	97	99	100
cM capacity (veh/h)	1312			1370			334	337	852	230	333	789

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	202	375	175	10
Volume Left	0	122	38	6
Volume Right	25	6	135	2
cSH	1312	1370	630	288
Volume to Capacity	0.00	0.09	0.28	0.03
Queue Length 95th (m)	0.0	2.2	8.6	0.8
Control Delay (s)	0.0	3.1	12.9	17.9
Lane LOS		A	B	C
Approach Delay (s)	0.0	3.1	12.9	17.9
Approach LOS			B	C

Intersection Summary				
Average Delay	4.7			
Intersection Capacity Utilization	49.8%	ICU Level of Service	A	
Analysis Period (min)	15			

Intersection	
Int Delay, s/veh	4.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	0	156	22	107	217	5	33	2	119	5	2	2
Future Vol, veh/h	0	156	22	107	217	5	33	2	119	5	2	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	177	25	122	247	6	38	2	135	6	2	2

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	252	0	0	202	0	0	685	685	190	752	695	249
Stage 1	-	-	-	-	-	-	190	190	-	493	493	-
Stage 2	-	-	-	-	-	-	495	495	-	259	202	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1313	-	-	1370	-	-	362	371	852	327	366	790
Stage 1	-	-	-	-	-	-	812	743	-	558	547	-
Stage 2	-	-	-	-	-	-	556	546	-	746	734	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1313	-	-	1370	-	-	330	332	852	252	328	790
Mov Cap-2 Maneuver	-	-	-	-	-	-	330	332	-	252	328	-
Stage 1	-	-	-	-	-	-	812	743	-	558	490	-
Stage 2	-	-	-	-	-	-	494	489	-	626	734	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	2.6	13	16.8
HCM LOS			B	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	627	1313	-	-	1370	-	-	316
HCM Lane V/C Ratio	0.279	-	-	-	0.089	-	-	0.032
HCM Control Delay (s)	13	0	-	-	7.9	0	-	16.8
HCM Lane LOS	B	A	-	-	A	A	-	C
HCM 95th %tile Q(veh)	1.1	0	-	-	0.3	-	-	0.1

LANE LEVEL OF SERVICE

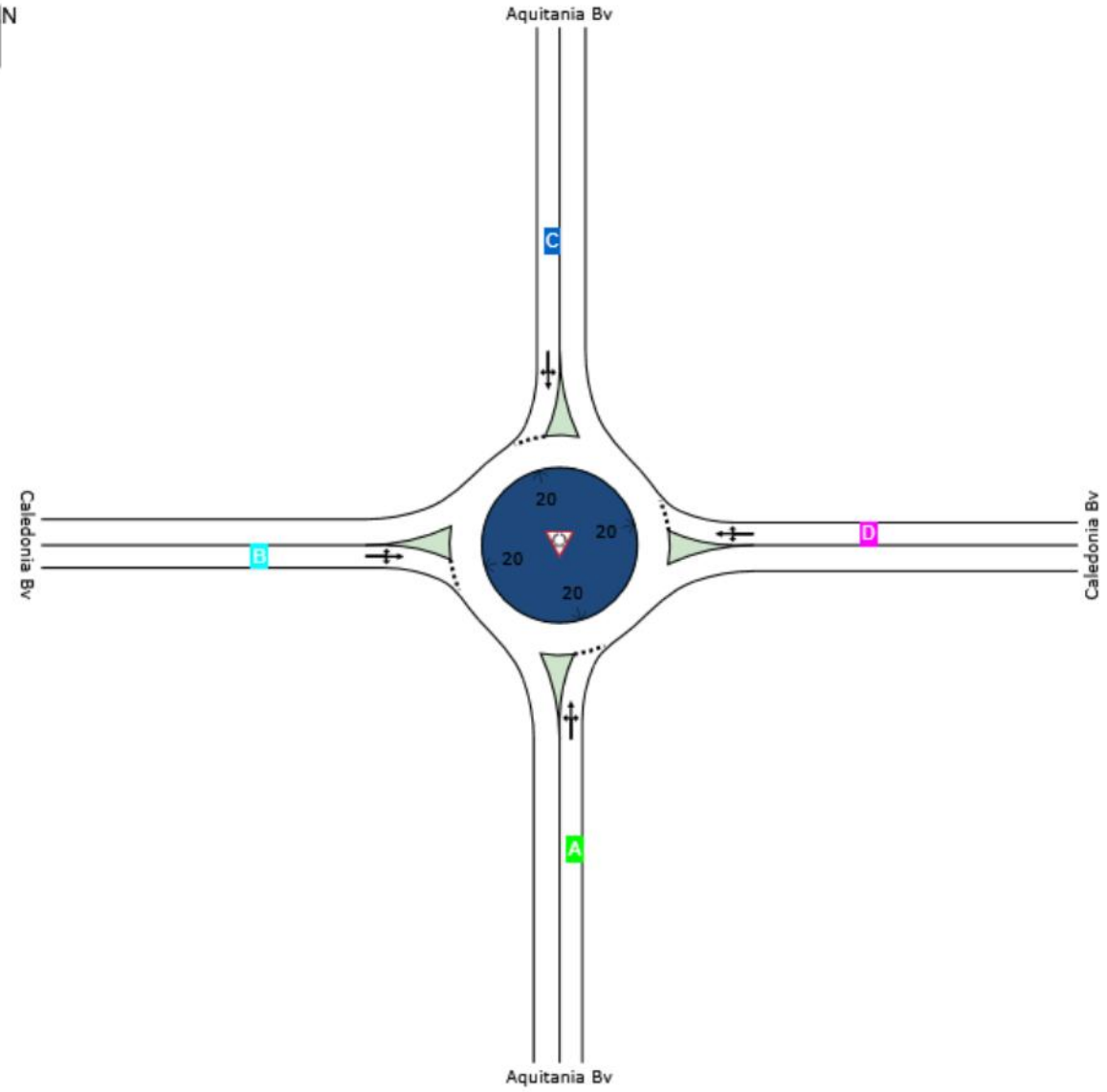
Lane Level of Service

Site: 1 [PMIntG-With South Link]

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Roundabout

All Movement Classes

	South	East	North	West	Intersection
LOS	A	D	C	B	C



Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). 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 and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

LANE SUMMARY

Site: 1 [PMIntG-With South Link]

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Roundabout

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	95% Back of Queue Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Aquitania Bv													
Lane 1[d]	781	2.0	989	0.790	100	9.9	LOS A	13.0	92.3	Full	50	0.0	27.9
Approach	781	2.0		0.790		9.9	LOS A	13.0	92.3				
East: Caledonia Bv													
Lane 1[d]	669	2.0	709	0.944	100	37.7	LOS D	25.7	182.9	Full	200	0.0	2.4
Approach	669	2.0		0.944		37.7	LOS D	25.7	182.9				
North: Aquitania Bv													
Lane 1[d]	486	2.0	552	0.881	100	33.5	LOS C	16.1	114.7	Full	200	0.0	0.0
Approach	486	2.0		0.881		33.5	LOS C	16.1	114.7				
West: Caledonia Bv													
Lane 1[d]	288	2.0	495	0.582	100	17.0	LOS B	5.4	38.6	Full	250	0.0	0.0
Approach	288	2.0		0.582		17.0	LOS B	5.4	38.6				
Intersection	2225	2.0		0.944		24.3	LOS C	25.7	182.9				

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). 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 and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
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

Appendix E - City of Lethbridge Correspondence

From: Adam St. Amant <Adam.St.Amant@lethbridge.ca>
Sent: Wednesday, December 21, 2016 9:39 AM
To: Chris Poirier
Subject: RE: Piers TIA Update - Initial Sign-off Sheet

Hi Chris,

Here's a quick summary of the updates from our discussion:

- Bus Routes: Use the typical paragraph noting that transit will determine routes.
- Bike Routes: Provide a sketch of the cycling network in the report.
- City will provide Emme traffic data.
- There are currently no plans for the area south of The Piers. Traffic from this area will be addressed in a future TIA.
- Add the intersection of Garry Station Port W at Aquitania Blvd W to the analysis intersections.
- Complete an analysis with and without Chinook Trail. The purpose of this analysis is to determine whether Chinook Trail is required for the full build out of The Piers to provide adequate traffic operations. If the road network can handle The Piers full-build-out, then all is good. Otherwise, the phase at which Chinook Trail becomes necessary needs to be identified.

Regards,

Adam St. Amant, P.Eng., PTOE
Transportation Engineer
City of Lethbridge – Infrastructure Services
304 Stafford Dr N, Lethbridge, AB, T1H 2A6
O: 403-320-3845

From: Chris Poirier [mailto:poirierc@ae.ca]
Sent: December 16, 2016 4:55 PM
To: Adam St. Amant
Cc: Breanna Jackson
Subject: Piers TIA Update - Initial Sign-off Sheet

Adam:

As discussed, here's the initial sign-off sheet and accompanying graphic for your review. Let me know if you have any questions, comments or concerns.

Have a great weekend.

Chris Poirier, C.E.T.
Project Manager, Transportation
Associated Engineering Alberta Ltd.
Suite 1001 - 400 - 4th Avenue South, Lethbridge, AB T1J 4E1
Tel: 403.329.1404 | Cel: 403.308.3878

From: Adam St. Amant <Adam.St.Amant@lethbridge.ca>
Sent: Wednesday, January 11, 2017 10:14 AM
To: Chris Poirier
Cc: Breanna Jackson
Subject: RE: Piers TIA - Trip Generation & Distribution for Review
Attachments: The Crossings Traffic Impact Assessment.pdf; 20110525 The Crossings Update Analysis Letter.pdf

Hi Chris,

The model does not provide enough granularity to say for sure with the collector road network. More than likely what you are proposing should work. The model is more intended to develop growth rates and apply these to known conditions and plans to extrapolate future traffic volumes.

I've attached the old Crossings TIA in case it is helpful in generating the background traffic along Caledonia.

Adam St. Amant, P.Eng., PTOE
Transportation Engineer
City of Lethbridge – Infrastructure Services
304 Stafford Dr N, Lethbridge, AB, T1H 2A6
O: 403-320-3845

From: Chris Poirier [mailto:poirierc@ae.ca]
Sent: January 10, 2017 4:59 PM
To: Adam St. Amant
Cc: Breanna Jackson
Subject: RE: Piers TIA - Trip Generation & Distribution for Review

Adam:

We have a question about the EMME data.

In the attachment you'll see where I've circled two zeros on Caledonia west of the roundabout. Below these numbers there's two internal links. One that connects to Aquitania (126 & 96) and the other connects to Britannia (12 & 41). I'm assuming this was where the modeller at the time assumed he/she needed to assign the internal parcel traffic to the network.

With the access to the library's as well as one schools' parking lots now actually being off of Caledonia, would it be reasonable for us to take the link with 126 and 196 on it and assume it can be redirected to connect with Caledonia as I've shown in the sketch - or maybe a portion of those volumes?

Chris

From: Adam St. Amant [mailto:Adam.St.Amant@lethbridge.ca]
Sent: Monday, January 09, 2017 4:02 PM
To: Chris Poirier <poirierc@ae.ca>
Subject: RE: Piers TIA - Trip Generation & Distribution for Review

Hi Chris,

Please find attached the model info from Emme to help estimate background traffic growth rates. Only the Full Build Out scenarios in the model have traffic from The Piers (The Piers is not developed in the Short and Interim models). Let me know if this is what you were looking for from the model. Here are the City populations for each horizon in case they are useful:

- Short: 106k
- Interim: 137k
- Full Build Out: 197k

Note that the current city population for any 'existing' traffic counts would be about 97k.

With regard to the trip generation and distribution:

- Provide/clarify details about the school and how the trip rate was calculated
- For the distribution on Figure 3: By the time The Piers is built out, the West Lethbridge Employment area will (hopefully) be up and running. Would it make sense to re-route some of the traffic away from Métis and up to Garry Station Port? (I was thinking 20-25% at Garry Station Port and 50% Métis instead of the 10-15% and 60% shown. Would this make sense?)

If you have any questions or concerns, please let me know.

Adam St. Amant, P.Eng., PTOE
Transportation Engineer
City of Lethbridge – Infrastructure Services
304 Stafford Dr N, Lethbridge, AB, T1H 2A6
O: 403-320-3845

From: Chris Poirier [mailto:poirierc@ae.ca]
Sent: January 5, 2017 11:38 AM
To: Adam St. Amant
Subject: Piers TIA - Trip Generation & Distribution for Review

Adam:

As discussed, while you're getting the EMME data prepared for our use as background traffic, we're proceeding with development-generated traffic analysis. Attached is a memo describing our suggested trip generation and distribution approach. Please review at your earliest and provide your feedback.

Thanks,

Chris Poirier, C.E.T.
Project Manager, Transportation
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You may unsubscribe from Associated's electronic communications at any time.

From: Adam St. Amant <Adam.St.Amant@lethbridge.ca>
Sent: Monday, January 23, 2017 2:44 PM
To: Chris Poirier
Subject: RE: Piers TIA - Communication Summary

Hi Chris,

See below in green.

Adam St. Amant, P.Eng., PTOE
Transportation Engineer
City of Lethbridge – Infrastructure Services
304 Stafford Dr N, Lethbridge, AB, T1H 2A6
O: 403-320-3845

From: Chris Poirier [mailto:poirierc@ae.ca]
Sent: January 23, 2017 2:26 PM
To: Adam St. Amant
Subject: Piers TIA - Communication Summary

Please correct me if I'm wrong. Our chat confirmed the following:

- No alterations to the existing roundabout at Caledonia / Aquitania are anticipated based on the analysis I think the analysis indicated a possible modification, but it's not going to happen due to restricted right of way.
- The N-S roadway east of Chinook, even though the analysis would make it appear to only need to be a minor collector, needs to be a major collector to match the context of the rest of the existing portion of Aquitania Correct
- Caledonia, even though current analysis would appear to make it appear to need to be a major collector, needs to be a minor collector to match the context of the existing portion of it to the east Correct
- We will identify which phase triggers the need for an outlet to the south. This will likely be either when Caledonia exceeds minor collector design standard capacity or the roundabout of Caledonia at Aquitania reaches LOS E or a v/c > 0.8. We currently show an option where 5% could go down to Whoop-Up via Chinook Trail. An alternate possibility (discussed after the call) is to have up to 10% diverted south thereby resulting in Caledonia no longer needing to be a major collector. Please provide a bit of text on your understanding of the potential south accesses so I have a crystal clear understanding. Something along the lines of: *If a future TIA for the lands south of The Piers indicates that adequate capacity is available, a south access road may be considered to divert XX% of traffic to Whoop Up Drive. A minimum capacity of XX vehicles in the AM peak hour and XX vehicles in the PM peak hour is required to be diverted along the south access road to preclude the need for the Chinook Trail connection while maintaining adequate levels of service at nearby intersections and traffic levels within design standards on minor collector roadways.* Reword as necessary to best fit the document. I'm pretty much looking to best define what would be required to the south to not need to have Chinook Trail built or whether it will be required even with the south road. I'm thinking back/ahead to Indian battle heights and the fact that Métis Trail wasn't built until after there was development to the west.

Thanks,

Chris Poirier, C.E.T.
Project Manager, Transportation
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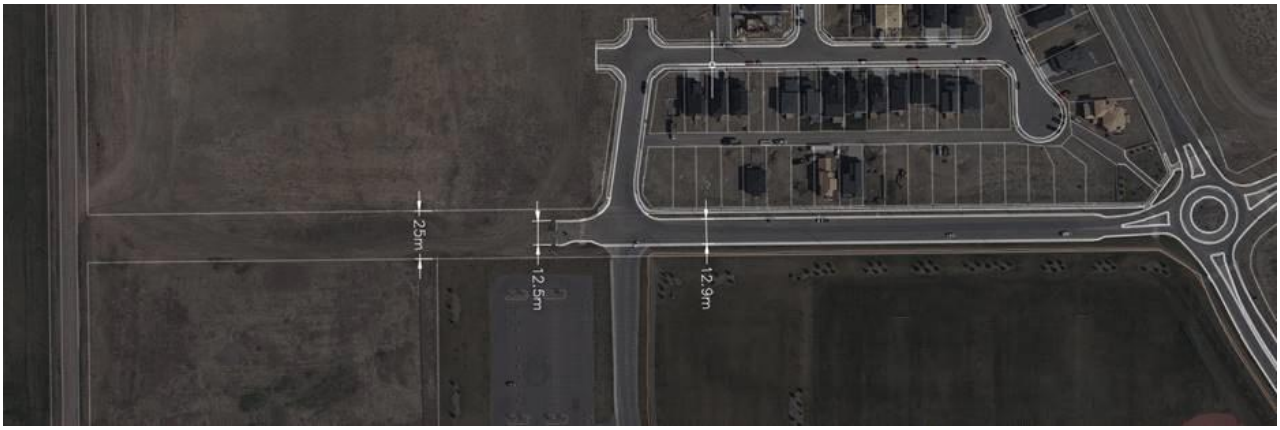
Tel: 403.329.1404 | Cel: 403.308.3878

From: Adam St. Amant <Adam.St.Amant@lethbridge.ca>
Sent: Thursday, January 26, 2017 9:39 AM
To: Chris Poirier
Cc: Breanna Jackson
Subject: RE: Piers TIA - A Couple Issues

Hi Chris,

I think The Crossings may have already taken care of your issue in the real-world. While their TIA identified a minor collector, Caledonia is built as a major collector, so continuing as a major collector through The Piers would work. It also makes sense to have the major collector here as the road now links two arterials and has an additional school.



If you still want to look into the 5.6 factor applicability to the school site, there are the sports fields and library that will have extracurricular activities and a different trip generation rate from the schools. If you are looking to refine the trip generations further, we would require supporting documentation. If your traffic projections were over 7000vpd, it may be worth exploring changes to the trip generation for front driveway access but, even with refinement, the city may still require the major collector roadway to continue along Caledonia due to the new link between arterials, existing built cross section through The Crossings, and the addition of a school site to this road.

If you have any questions or concerns, please let me know.

Regards,

Adam St. Amant, P.Eng., PTOE
Transportation Engineer
City of Lethbridge – Infrastructure Services
304 Stafford Dr N, Lethbridge, AB, T1H 2A6
O: 403-320-3845

From: Chris Poirier [mailto:poirierc@ae.ca]
Sent: January 24, 2017 2:10 PM
To: Adam St. Amant
Cc: Breanna Jackson
Subject: Piers TIA - A Couple Issues

Adam:

A couple more things that have come up that we'd like your thoughts on:

1. We can't get the Caledonia volumes down into the minor collector range that he (and maybe that's ok?).
2. We're wondering if the 5.6 factor may be the culprit for the school / library access high volume contribution to Caledonia.

Breanna's summary of the issues below…

Using the background traffic for The Piers TIA (The Crossings Full Buildout Volumes), it is confirmed that Caledonia Blvd was classified as a minor collector with 3220 daily trips on the road section west of the Caledonia Blvd – Aquitania Blvd roundabout in the Crossings TIA. (See PiersSketch 1) The Crossings TIA only contains volumes from the High school site and no developments to the west. As this 3220 is nearing the 4000 ADT trip limit for a minor collector this presents a potential problem when the site generated traffic from The Piers is applied to the roundabout.

Upon initial results following analysis of traffic volumes along Caledonia Blvd without a south link or Chinook Trail open, it was found that the ADT value for Caledonia Blvd West of the Caledonia Blvd-Aquitania Blvd roundabout classified a failing roundabout and a major collector road classification.

The analysis was again conducted with the South link open, and accepting ~25% of site generated traffic. Metis Trail VIA Caledonia Blvd, and Whoop-up Dr VIA Aquitania Blvd/Caledonia Blvd, accept ~10-15% each, of the site generated distribution. While the roundabout now successfully operates, the daily traffic still classifies the roadway (from school access to Aquitania) as a major collector with an ADT value of 6978.

All ADT calculations are conducted using (AM+PM)*5.6

A potential cause of this classification issue might be the school / library site access (at Caledonia Blvd). The volume in/out on the south portion of this intersection is contributing to ADT in the same manner of other roadways. Essentially the 5.6 ADT factor is being applied to the school trip volumes, which may be over estimating the amount of traffic activity that occurs at a school site (taking the AM & PM peaks x 5.6 currently translates into 3427 AADT – seems kinda high, don't you think?). Because this site will experience almost no traffic flow except for the AM and PM school peaks (and maybe a midday peak), is the 5.6 factor necessarily accurate? Is there a better ADT calculation that can be used given the specific nature of this road?

If the daily traffic volumes are adjusted for the school site, there is still a chance that Caledonia Blvd west of the roundabout will still classify as a major collector

because in order to classify Caledonia Blvd as a minor collector as it has been built, there can only be an increase in ~100 vehicles (both directions) per peak hour which is unrealistic given the total trip generation for the PM peak of 1304 trips, and the AM peak of 1102 trips.

Looking forward to your feedback.

Sincerely,

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