



AMEC Earth and Environmental

Bovaird Drive Environmental  
Assessment

Traffic Study  
Final Report

August 2012

Excellence in  
Transportation  
Planning



# AMEC Earth and Environmental

## Bovaird Drive Class EA

### Traffic Study

### Final Report

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# AMEC Earth and Environmental

## Bovaird Drive Class EA

### Traffic Study

### Final Report

## 1. Introduction

ENTRA Consultants (now GENIVAR) was retained by AMEC Earth and Environmental to complete a traffic assessment for the Bovaird Drive Class Environmental Assessment for the Region of Peel. The purpose of this study is to review current and future level of service on Bovaird Drive and crossing intersections from Worthington Avenue/Lake Louise Drive to the Halton Region boundary just past Caseley Street for the existing AM, midday and PM peak periods, and for the AM and PM peak periods for the 2021 and 2031 horizon years.

The existing roadways connecting with Bovaird Drive in the study area are as follows:

- Bovaird Drive at Worthington Avenue/Lake Louise Drive
- Bovaird Drive at Ashby Field Road
- Bovaird Drive at Mississauga Road
- Bovaird Drive at Heritage Road
- Bovaird Drive at Caseley Street

This assessment identifies potential current and future traffic deficiencies on the roadway through a comprehensive and environmentally sound planning process and recommends road improvements.

This report includes:

- A description of Bovaird Drive and the existing crossing roadways within the study area.
- A traffic capacity assessment of existing roadway and intersection operations for AM, midday and PM peak periods.
- A description of the planned future road network for Bovaird Drive for the 2021 and 2031 horizon years.
- A traffic capacity assessment for 2021 and 2031 future roadway and intersection operations for the AM and PM peak periods. The 2031 horizon includes an assessment with and without the North-South Transportation Corridor (NSTC).

- A roundabout capacity assessment for 2021 and 2031 future intersection operations for the PM peak period.
- Recommendations on lane configurations, tapers and storage lengths for the intersections within the study area for the future conditions.

The study area and crossing intersections can be found in Exhibit 1.

## **1.1 Study Area Context**

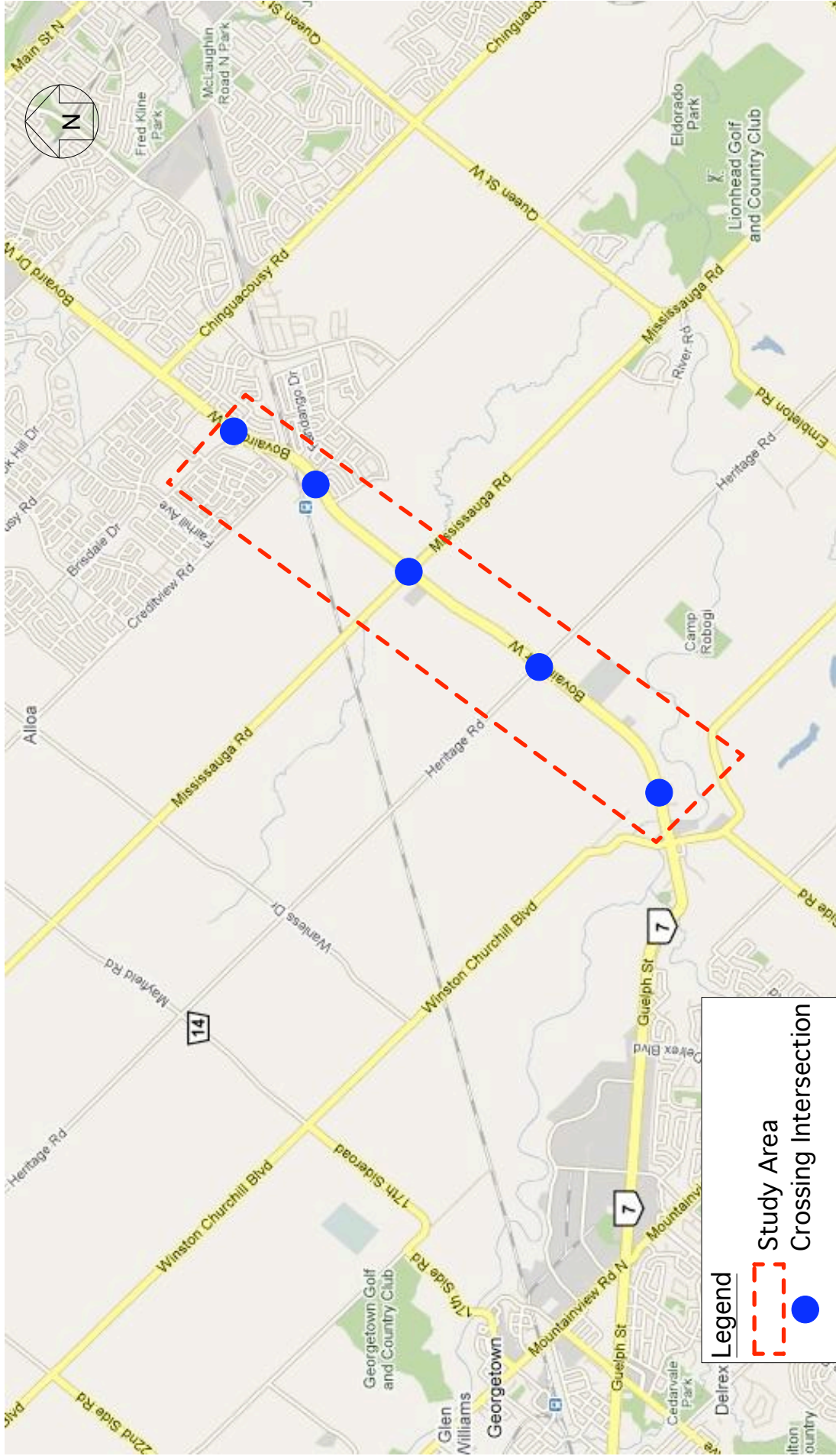
Brampton is continually growing at a rapid rate and has large areas of soon to be developed land in the west. According to the Brampton Transportation and Transit Master Plan, the city is expected to grow substantially over the next 20 years with the population increasing by 68 percent or 307,000 residents between 2006 and 2031, 41,000 of which is in the Bram West area. Given the growth in population and employment in Brampton, traffic is increasing accordingly.

The Halton–Peel Boundary Area Transportation Study, a joint study between the Region of Peel, Halton Region, City of Brampton, Town of Caledon and Town of Halton Hills, identified the long-term (2021 and 2031) transportation network required to accommodate future traffic demands. The study covered an area from Trafalgar Road in the west to Chinguacousy Road in the east and from King Street in the north to just south of Highway 401 in the south. The study determined the following:

- Congestion is occurring on Bovaird Drive (formerly Highway 7) through Norval. A Georgetown-Norval By-pass will be required.
- There is a lack of east-west connections and continuity. East-west capacity improvements will be required between Bovaird Drive and Highway 401.
- There are north-south capacity deficiencies in Halton Hills and west Brampton. A North-South Transportation Corridor (NSTC) will be needed to support development in the study area.
- Suitable corridors for truck routes are required.
- More connections to freeways are needed.

The Peel Long Range Transportation Plan, Peel Region Capital Road Improvements Program, and Brampton Transportation and Transit Master Plan all identify the need to improve Bovaird Drive.





Source: Google Maps

**Exhibit 1**  
**Study Area**  
**Bovaird Drive Class EA**

Schematic





## 2. Document Review

ENTRA staff completed an extensive document review for this study. Documents that were reviewed to complete this study included:

- Halton-Peel Boundary Area Transportation Study, September 24, 2009 PowerPoint Presentation for Public Information Centre No.1
- Region of Peel Long Range Transportation Plan, Final Report, September 2005 and Draft Report Update, June 2011
- City of Brampton Transportation and Transit Master Plan, Sustainable Update, 2009 Draft Final Report, July 2009
- Region of Peel Official Plan, Office Consolidation, November 2008
- Halton-Peel Boundary Area Transportation Study (HP BATS) EMME model with 2031 PM peak hour link volumes with and without the NSTC
- Region of Peel EMME model with 2021 and 2031 PM peak hour link volumes with and without the NSTC
- Halton-Peel Boundary Area Transportation Study – Transportation Master Plan, Technical Agencies Committee Meeting #1 PowerPoint presentation prepared by iTRANS
- Signal timings, ATR/Classification counts and AM, midday and PM turning movements counts for the following intersections:
  - Bovaird Drive and Lake Louise Drive/Worthington Avenue
  - Bovaird Drive and Ashby Field Road
  - Bovaird Drive and Mississauga Road
  - Bovaird Drive and Heritage Road
  - Bovaird Drive and Caseley Street
- Region of Peel Guidelines for Using Synchro Software v5.0, March 2003
- Geometric Design Guide for Canadian Roads, 1999 Edition, Transportation Association of Canada (TAC)
- Municipal Class Environmental Assessment Study, Mississauga Road Improvements from North of Bovaird Drive to Mayfield Road, November 3, 2008, PowerPoint presentation for the Public Information Centre No.1
- Three-year (2005-2007) collision summary on Bovaird Drive from Lake Louise Drive/Worthington Avenue to west of Heritage Road
- Peel Long Range Transportation Plan, 2005
- Mount Pleasant Secondary Plan Area Transportation Master Plan, July 2009

- GTA West Corridor Study (ongoing)
- The Hamlet of Norval Secondary Plan
- Creditview Road Widening From Realigned Creditview Road to (Approximately 1,500m North of Bovaird Drive) Mayfield Road, Class Environmental Assessment – Environmental Study Draft Report, ENTRA Consultants, April 2010

The roadway improvements described in this report for future conditions are consistent with the previous area studies reviewed, including the Municipal Class Environmental Assessment Study, Mississauga Road Improvements from North of Bovaird Drive to Mayfield Road, which outlines roadway improvements at the intersection of Mississauga Road and Bovaird Drive.

## **2.1 Inventory**

An inventory of Bovaird Drive and all crossing roads from Worthington Avenue/Lake Louise Drive from the east to Caseley Street to the west was completed using information provided by the Region of Peel and field studies completed by ENTRA staff.

ENTRA Consultants completed a field survey on November 5, 2009. Information collected by ENTRA included documentation of storage and taper lengths, lane configuration, posted speed limits, roadway alignments, surrounding land uses and other details of the existing roadways.

## **3. Existing Conditions**

### **3.1 Road Network**

Crossing streets on Bovaird Drive within the study area include Worthington Avenue/Lake Louise Drive, Ashby Field Road, Mississauga Road, Heritage Road and Caseley Street. The characteristics of Bovaird Drive and the crossing intersections are described below and illustrated in Exhibit 2.

#### **Bovaird Drive**

Bovaird Drive (formerly Highway 7) is designated as an arterial road under the jurisdiction of the Region of Peel. Bovaird Drive at Worthington Avenue/Lake Louise Drive has a six-lane cross-section. Bovaird Drive, just west of Worthington Avenue/Lake Louise Drive, has a four-lane cross-section, which extends to the west side of Ashby Field Road where it becomes a two-lane cross-section. The two-lane cross-section of Bovaird Drive carries west through the remainder of the study area past Caseley Street. Currently, the speed limit on Bovaird Drive within the study area is 70km/h from Worthington Drive/Lake Louise Drive to west of Heritage Road. The speed limit then drops to 60km/h through Caseley Street. The CN Rail line does not cross any of the streets in the study area. Bovaird Drive crosses over the railway tracks.

#### **Worthington Avenue/Lake Louise Drive**

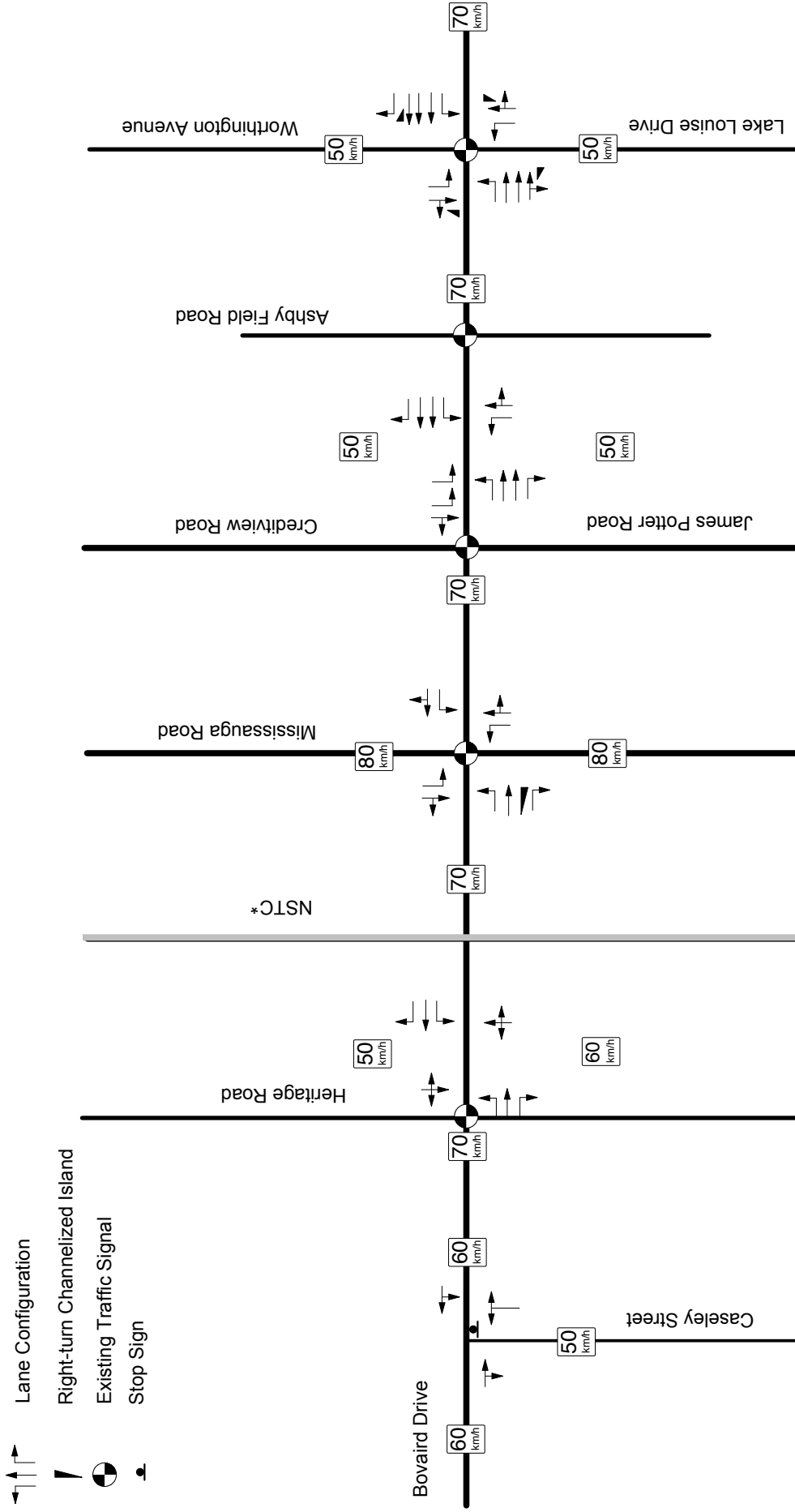
Worthington Avenue/Lake Louise Drive is a north-south roadway under the jurisdiction of the City of Brampton. The intersection of Worthington Avenue/Lake Louise Drive with Bovaird Drive is signalized. Commercial properties are present on both the northwest and northeast quadrants of the intersection. The south leg of the intersection leads into a residential subdivision. The speed limit on Worthington Avenue/Lake Louise Drive is 50km/h.

#### **Ashby Field Road**

Ashby Field Road is a local street leading into the Mount Pleasant GO Station to the north and a residential area to the south. The intersection of Ashby Field Road with Bovaird Drive is signalized with a double southbound left-turn lane. The speed limit on Ashby Field Road is 50km/h.

#### **Mississauga Road**

Mississauga Road is a major roadway under the jurisdiction of the Region of Peel. Mississauga Road, on the intersection approaches with Bovaird Drive, has a two-lane cross-section with left-turn lanes on the north-south approaches to the signalized intersection. The speed limit on Mississauga Road is 80km/h.



\* The location of NSTC is assumed and subject to further study. If future studies conclude that the crossing location be west of Heritage Road, an addendum to this report will be completed.

Schematic



## Exhibit 2 Existing Roadway Characteristics Bovaird Drive Class EA

## Heritage Road

Heritage Road has a two-lane cross-section on both the north and south approaches. The intersection of Heritage Road with Bovaird Drive is signalized. The speed limit on Heritage Road is 60km/h south of Bovaird Drive and 50km/h north of Bovaird Drive.

## Caseley Street

Caseley Street is a local roadway under jurisdiction of the City of Brampton. The intersection of Caseley Street with Bovaird Drive is unsignalized with a stop sign on Caseley Street. The speed limit on Caseley Street is 50km/h.

The existing storage and taper lengths for the left-turn and right-turn lanes at the intersections are shown in Exhibit 3.

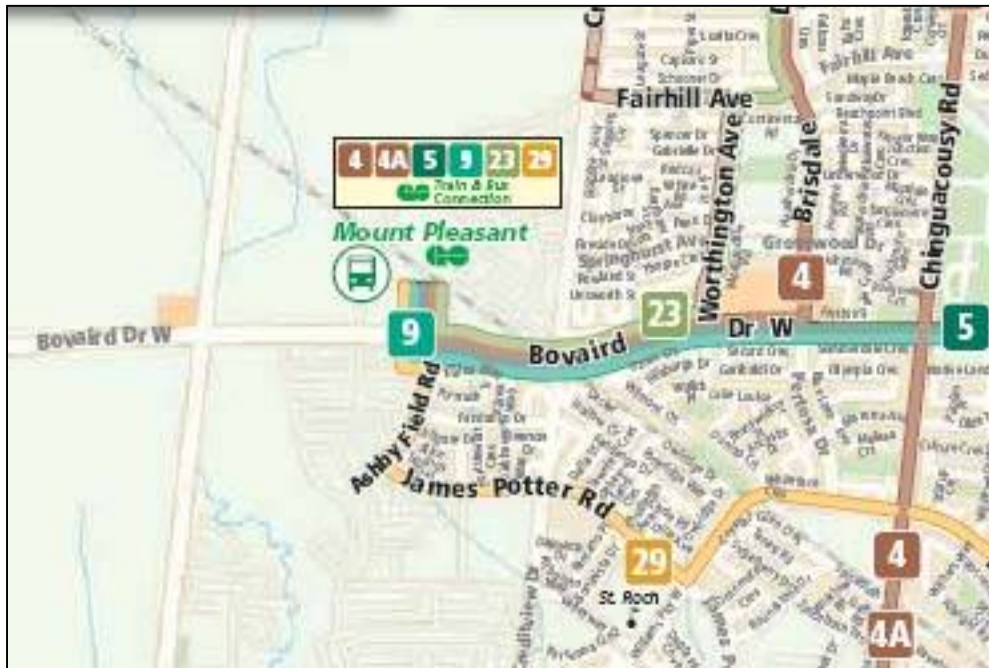
### Exhibit 3 – Existing Storage and Taper Lengths

Intersection Movement	Existing Storage (m)	Existing Taper (m)
<b>Bovaird Drive at Worthington Avenue/Lake Louise Drive</b>		
Northbound Left	50	30
Northbound Right	10	N/A - Channelized
Southbound Left	50	22
Southbound Right	10	N/A - Channelized
Westbound Left	90	100
Westbound Right	90	28
Eastbound Left	230	76
Eastbound Right	10	N/A - Channelized
<b>Bovaird Drive at Ashby Field Road</b>		
Northbound Left	75	17
Southbound Left	100	N/A
Southbound Through/Right	31	30
Westbound Left	110	91
Westbound Right	110	39
Eastbound Left	148	100
Eastbound Right	90	60
<b>Bovaird Drive at Mississauga Road</b>		
Northbound Left	36	100
Southbound Left	18	71
Westbound Left	60	100
Eastbound Left	20	45
Eastbound Right	100	88
<b>Bovaird Drive at Heritage Road</b>		
Westbound Left	55	100
Westbound Right	15	40
Eastbound Left	50	72
Eastbound Right	10	72

### 3.1.1 Transit

Currently, Brampton Transit routes 4, 4A, 5, 9, 23 and 29 arrive at the Mount Pleasant GO station located at the intersection of Bovaird Drive and Ashby Field Road. Route 29 operates along Williams Parkway to James Potter Road to Ashby Field Road. Route 4 and 4A operate northbound on Chinguacousy Road. Route 4 then travels on Bridsdale Drive and 4A travels along Worthington Avenue. Route 23 operates on Sandalwood Parkway to Bridsdale Drive and on to Bovaird Drive. Route 5 operates east-west along Bovaird Drive. The transit routes are shown in Exhibit 4.

Exhibit 4 – Existing Transit on Bovaird Drive



Source: Brampton Transit Website System Map

### 3.1.2 Pedestrians and Cyclists

Currently, based on the traffic counts, there are few pedestrians in the Bovaird Drive corridor from Worthington Avenue/Lake Louise Drive to Caseley Street. Sidewalks are present at the following locations:

- all sides of the intersection at Bovaird Drive and Worthington Avenue/Lake Louise Drive
- southeast side of Bovaird Drive at Bovaird Drive and Ashby Field Road
- south side of Bovaird Drive at Caseley Street



Pedestrians who are present with or without a sidewalk can cross Bovaird Drive at any one of the intersections within the study area.

Cyclists are present but not prominent on Bovaird Drive. There are no dedicated bike lanes on Bovaird Drive.

## **3.2 Traffic Volumes**

Recent vehicle turning movement counts for the study area intersections were obtained from the Region of Peel. The turning movement counts are illustrated for AM, midday and PM peak hours in Exhibit 5. The dates of the counts are given below:

- Bovaird Drive at Worthington Avenue/Lake Louise Drive – September 29, 2009
- Bovaird Drive at Ashby Field Road – December 1, 2009
- Bovaird Drive at Mississauga Road – December 1, 2009
- Bovaird Drive at Heritage Road – December 1, 2009
- Yonge Street at Caseley Street – December 1, 2009



The summary of the existing traffic volumes on the boundary roads during the roadway AM and PM peak hours are shown in Exhibit 5 and detailed summaries are provided in Appendix A – Existing Traffic Data.

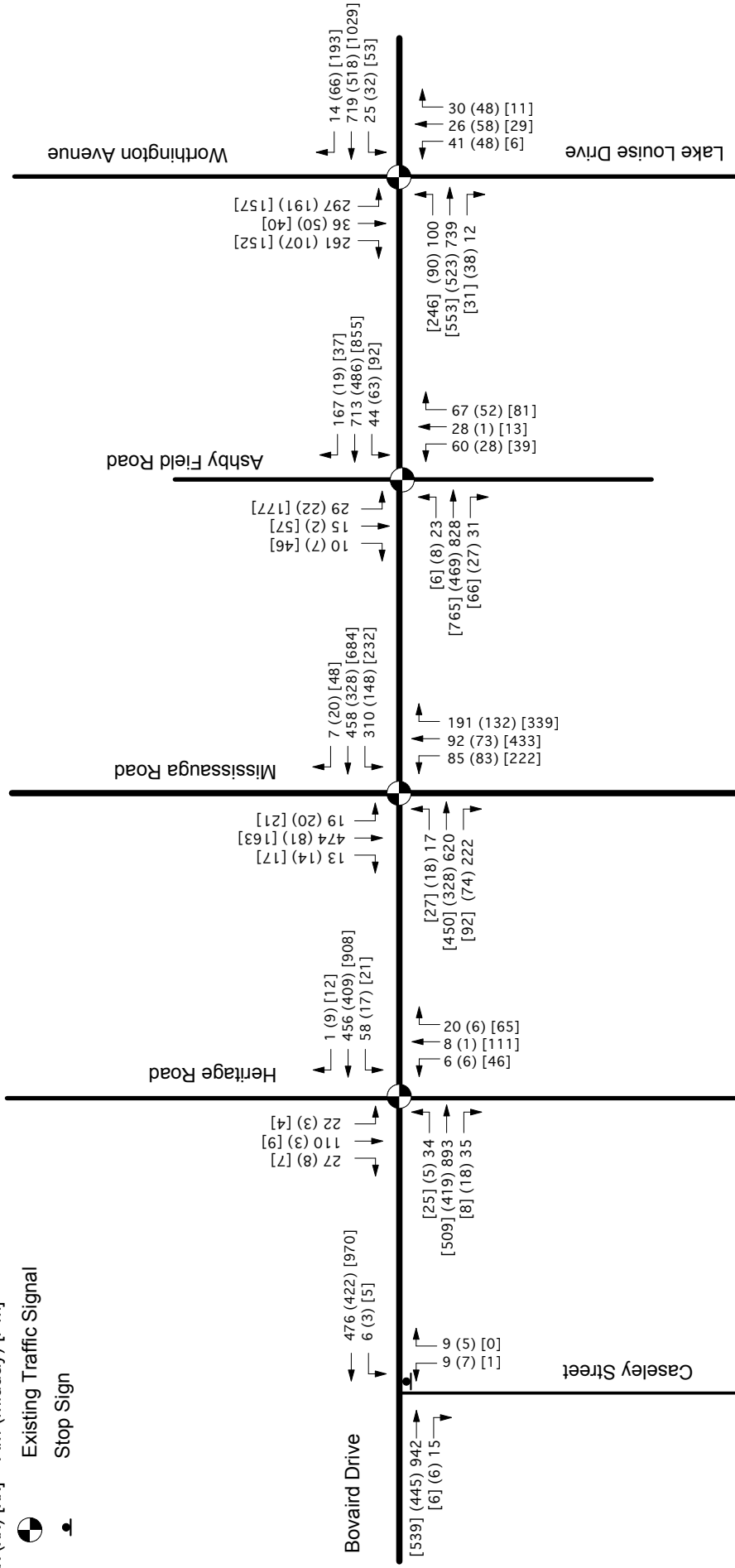
### **3.2.1 Intersection Level of Service**

Intersection capacity analyses were completed for each of the intersections on Bovaird Drive in the study area to determine the existing level of service (LOS) during the roadway AM, midday and PM peak hours. Intersection capacity analyses were completed using the Highway Capacity Manual (HCM) methodology and Synchro 7 software and the Region of Peel Guidelines for Using Synchro Software v5.0, March 2003.

The results of the signalized and unsignalized existing capacity analyses can be found in Exhibit 6 and Exhibit 7, respectively. Details of the capacity analyses are presented in Appendix B – Synchro Intersection Capacity Analysis. Definitions of the intersection level of service for signalized and unsignalized intersections can be found in Appendix C – Level of Service Definitions.



- xx (xx) [xx] AM (Midday) [PM]
-  Existing Traffic Signal
-  Stop Sign



Schematic



## Exhibit 5 Existing Traffic Volumes, Roadway Peak Hours Bovaird Drive Class EA

Exhibit 6 – Signalized Intersection Capacity Analysis, Existing Conditions, Roadway Peak Hours

Intersection	AM Peak Hour			Midday Peak Hour			PM Peak Hour		
	V/C	Delay (sec.)	LOS	V/C	Delay (sec.)	LOS	V/C	Delay (sec.)	LOS
<b>Bovaird Drive and Ashby Field Road</b>	<b>0.38</b>	<b>14</b>	<b>B</b>	<b>0.23</b>	<b>9</b>	<b>A</b>	<b>0.42</b>	<b>16</b>	<b>B</b>
Eastbound Left	0.06	7	A	0.02	6	A	0.02	9	A
Eastbound Through	0.39	10	A	0.22	7	A	0.39	12	B
Eastbound Right	0.02	7	A	0.02	6	A	0.04	9	A
Westbound Left	0.13	11	B	0.11	6	A	0.26	12	B
Westbound Through	0.38	13	B	0.24	7	A	0.43	12	B
Westbound Right	0.10	10	B	0.01	6	A	0.02	9	A
Northbound Left	0.37	42	D	0.25	38	D	0.35	45	D
Northbound Through/Right	0.19	39	D	0.04	36	D	0.14	41	D
Southbound Left	0.16	44	D	0.17	41	D	0.40	40	D
Southbound Through/Right	0.04	28	C	0.01	27	C	0.14	26	C
<b>Bovaird Drive and Heritage Road</b>	<b>0.69</b>	<b>13</b>	<b>B</b>	<b>0.30</b>	<b>4</b>	<b>A</b>	<b>0.73</b>	<b>16</b>	<b>B</b>
Eastbound Left	0.06	5	A	0.01	1	A	0.11	7	A
Eastbound Through	0.73	13	B	0.30	2	A	0.44	9	A
Eastbound Right	0.03	5	A	0.01	1	A	0.01	5	A
Westbound Left	0.21	7	A	0.02	1	A	0.04	6	A
Westbound Through	0.38	7	A	0.30	2	A	0.75	15	B
Westbound Right	0.00	5	A	0.01	1	A	0.01	5	A
Northbound Approach	0.07	31	C	0.20	47	D	0.64	39	D
Southbound Approach	0.52	36	D	0.20	48	D	0.05	29	C
<b>Bovaird Drive and Mississauga Road</b>	<b>0.94</b>	<b>52</b>	<b>D</b>	<b>0.40</b>	<b>22</b>	<b>C</b>	<b>0.95</b>	<b>48</b>	<b>D</b>
Eastbound Left	0.06	25	C	0.06	19	B	0.29	37	D
Eastbound Through	0.95	60	E	0.48	25	C	0.75	44	D
Eastbound Right	0.14	26	C	0.05	19	B	0.06	27	C
Westbound Left	1.02	92	F	0.35	16	B	0.72	33	C
Westbound Through/Right	0.5	20	B	0.41	18	B	0.87	41	D
Northbound Left	0.61	41	D	0.22	24	C	0.45	24	C

Intersection	AM Peak Hour			Midday Peak Hour			PM Peak Hour		
	V/C	Delay (sec.)	LOS	V/C	Delay (sec.)	LOS	V/C	Delay (sec.)	LOS
Northbound Through/Right	0.39	30	C	0.26	25	C	1.03	76	E
Southbound Left	0.07	32	C	0.06	28	C	0.33	49	D
Southbound Through/Right	0.96	73	E	0.19	30	C	0.37	38	D
<b>Worthington Avenue and Bovaird Drive</b>	<b>0.42</b>	<b>22</b>	<b>C</b>	<b>0.36</b>	<b>12</b>	<b>B</b>	<b>0.73</b>	<b>14</b>	<b>B</b>
Eastbound Left	0.24	11	B	0.21	9	A	0.75	25	C
Eastbound Through/Right	0.24	9	A	0.24	9	A	0.18	6	A
Westbound Left	0.06	8	A	0.08	8	A	0.10	6	A
Westbound Through	0.23	9	A	0.22	9	A	0.31	7	A
Westbound Right	0.01	8	A	0.05	8	A	0.14	6	A
Northbound Left	0.24	37	D	0.15	18	B	0.03	37	D
Northbound Through/Right	0.08	34	C	0.16	18	B	0.09	37	D
Southbound Left	0.89	69	E	0.59	24	C	0.65	49	D
Southbound Through/Right	0.29	37	D	0.23	18	B	0.40	42	D

Based on the capacity analyses for the existing signalized intersections, all intersections currently operate at satisfactory levels of service. The westbound left-turn movement at the intersection of Bovaird Drive and Mississauga Road is over capacity with a 92 second delay in the AM peak hour. This is due in large part to the left-turning volume of 310 vehicles opposing 620 vehicles per hour travelling in the eastbound through lane.

### Exhibit 7 – Unsignalized Intersection Capacity Analysis, Existing Conditions, Roadway Peak Hours

Intersection	AM Peak Hour		Midday Peak Hour		PM Peak Hour	
	Delay (sec.)	LOS	Delay (sec.)	LOS	Delay (sec.)	LOS
<b>Bovaird Drive and Caseley Street</b>	<b>0</b>	<b>A</b>	<b>0</b>	<b>A</b>	<b>0</b>	<b>C</b>
Eastbound Through/Right	0	A	0	A	0	A
Westbound Left/Through	0	A	0	A	0	A
Northbound Left/Through	27	D	15	B	34	D

Based on the capacity analysis, the existing unsignalized intersection of Bovaird Drive and Caseley Street has no capacity problems and operates at an acceptable level of service during all peak hours.

### **3.2.2 Queuing Analysis**

SimTraffic was used to determine the queues at the signalized Bovaird Drive intersections. The results of the analysis are shown in Exhibit 8 and summarized below.

The queue report indicates the following queues are over the storage capacity based on the 95th percentile:

1. Bovaird Drive and Heritage Road
  - eastbound right-turn storage is 10m, queue is 4m in the midday peak period
2. Bovaird Drive and Mississauga Road
  - eastbound left-turn storage is 20m, queue is 26m in the AM peak period and 29m in the PM peak period
  - westbound left-turn storage is 60m, queue is 134m in the AM peak period and 122m in the PM peak period
  - northbound left-turn storage is 36m, queue is 147m in the PM peak period
  - southbound left-turn storage is 18m, queue is 36m in the AM peak period
3. Bovaird Drive and Worthington Avenue/Lake Louise Drive
  - southbound left-turn has a 50m storage, queue is 81m in the AM peak period
  - southbound through/right-turn has a 90m storage (distance to nearest upstream intersection), queue is 173m in the AM peak period

Although the queue lengths are over capacity for the northbound and southbound right-turn movements on Worthington Avenue/Lake Louise Drive, these movements are channelized and cannot be accessed if there is more than one vehicle queued in the through lanes.

Exhibit 8 – Intersection Queuing Analysis, SimTraffic, Existing Conditions, Roadway Peak Hours

Intersection  Movement	Available Storage (m)	95th Percentile Queues		
		AM Peak Hour	Midday Peak Hour	PM Peak Hour
<b>Bovaird Drive and Ashby Field Road</b>				
Eastbound Left	148	15	7	0
Eastbound Through	185	72	31	59
Eastbound Through	185	71	39	63
Eastbound Right	90	9	10	13
Westbound Left	110	14	15	33
Westbound Through	246	77	56	122
Westbound Through	246	49	37	87
Westbound Right	110	18	6	8
Northbound Left	75	25	15	20
Northbound Through/Right	90	27	14	15
Southbound Left	100	7	6	20
Southbound Left	100	11	6	24
Southbound Through/Right	31	15	8	22
<b>Bovaird Drive and Caseley Street</b>				
Eastbound Through/Right	120	7	11	0
Westbound Left/Through	119	17	0	6
Northbound Left/Right	30	15	10	3
<b>Bovaird Drive and Heritage Road</b>				
Eastbound Left	50	12	4	9
Eastbound Through	925	150	38	69
Eastbound Right	10	8	4	3
Westbound Left	55	22	8	5
Westbound Through	438	68	33	107
Westbound Right	15	0	7	5
Northbound Left/Through/Right	522	14	12	58
Southbound Left/Through/Right	437	36	12	11
<b>Bovaird Drive and Mississauga Road</b>				
Eastbound Left	20	26	15	29
Eastbound Through	464	194	100	154
Eastbound Right	100	111	17	21
Westbound Left	60	134	42	122
Westbound Through/Right	697	106	72	214
Northbound Left	36	31	30	147
Northbound Through/Right	500+	62	35	501
Southbound Left	18	36	18	14
Southbound Through/Right	500+	196	42	65

Intersection	Available Storage (m)	95th Percentile Queues		
		AM Peak Hour	Midday Peak Hour	PM Peak Hour
<b>Bovaird Drive and Worthington Avenue</b>				
Eastbound Left	230	25	29	167
Eastbound Through	292	40	23	76
Eastbound Through	292	41	32	22
Eastbound Through/Right	292	44	30	36
Westbound Left	90	10	19	21
Westbound Through	330	46	38	56
Westbound Through	330	52	45	64
Westbound Through	330	22	0	40
Westbound Right	90	0	0	23
Northbound Left	50	20	23	6
Northbound Through/Right	90	44	15	21
Southbound Left	50	80	44	56
Southbound Through/Right	90	173	19	85

### 3.2.3 Region of Peel Queuing Methodology

The left-turn storage required at the study area intersections are governed by standards set out by Peel Region and will take precedence over Synchro requirements. If the requirement obtained by the Region's standards is less than Synchro, then priority will be given to the largest storage requirement obtained by either method.

Peel Region's standard practice is to utilize a seven-metre vehicle length in all storage length calculations and to employ the use of the TAC Guidelines to determine the taper lengths.

The following formula and attached table is utilized:

Formula:  $m = (V_e \times C) / (n \times 3600)$

Where:

- Ve: equivalent hourly volume
- C: cycle length in seconds (assume 120 cycle length)
- n: number of lanes used by the equivalent volume
- 3,600: number of seconds in one hour

The 'm' value represents the average number of cars or trucks per lane arriving at an intersection approach in one cycle. As such, LOS C column in the table shown in Appendix D – Region of Peel Queuing Methodology is utilized to find the value in the "X" Vehicles column. The value found in the "X" Vehicles column is multiplied by 7m for cars, 2.4 factor for trucks and 1.74 for buses. The value obtained represents the storage length required. It is important to note that the Region's methodology is appropriate for left-turn movements only.

The results are summarized in Exhibit 9. The calculation table for the Region's methodology can be found in Appendix D – Region of Peel Queuing Methodology.

Overall, the intersection queuing using the Region's methodology is better than that produced by SimTraffic. The movements where the queue exceeds storage are as follows:

1. Bovaird Drive and Mississauga Road
  - westbound left-turn storage is 60m, queue is 94m in the AM peak period and 80m in the PM peak period
  - northbound left-turn storage is 36m, queue is 73m in the PM peak period
  - southbound left-turn storage is 18m, queue is 7m in the PM peak period
2. Bovaird Drive and Worthington Avenue/Lake Louise Drive
  - southbound left-turn storage is 50m, queue is 84m in the AM peak period and 66m in the midday peak period

### Exhibit 9 – Intersection Queuing Analysis, Region Methodology, Existing Conditions, Roadway Peak Hours

Approach	Existing Storage (m)	Region Queues (m)		
		AM	Midday	PM
<b>Bovaird Drive at Worthington Avenue/Lake Louise Drive</b>				
Northbound Left	50	14	14	0
Southbound Left	50	84	66	49
Westbound Left	90	7	14	21
Eastbound Left	230	84	28	70
<b>Bovaird Drive at Ashby Field Road</b>				
Northbound Left	75	21	0	14
Southbound Left	100	14	38	49
Westbound Left	110	14	52	80
Eastbound Left	148	7	7	7
<b>Bovaird Drive at Mississauga Road</b>				
Northbound Left	36	28	0	73
Southbound Left	18	7	38	7
Westbound Left	60	94	52	80
Eastbound Left	20	7	7	7
<b>Bovaird Drive at Heritage Road</b>				
Westbound Left	55	14	7	7
Eastbound Left	50	7	0	7



### **3.2.4 Collisions in the Study Area**

A collision summary of Bovaird Drive within the study area was provided by the Region of Peel. The main details in the collision summary provided for the study area from 2005 to 2007 are that there were 38 collisions at the intersection of Bovaird Drive and Mississauga Road and 13 collisions at the intersection of Bovaird Drive and Heritage Road. Most the collisions were property damage only. It should be noted that the direction of the collisions or specific location was not included in the summary.

The collision summary provided by the Region can be found in Appendix A – Existing Traffic Data.



## **4. Future Conditions**

This section describes and assesses the future road network for the 2021 and 2031 horizons. An assessment of the Bovaird Drive corridor was completed with and without the North-South Transportation Corridor (NSTC) for the 2031 horizon. This section also assesses the existing intersections along Bovaird Drive for roundabouts.

### **4.1 North-South Transportation Corridor**

The need for a NSTC has been identified due to the significant growth expected in west Brampton and Halton in the Milton and Georgetown areas. The location for the NSTC is unknown at this time. In order to allow the Class EA to proceed, the location of the NSTC is assumed to cross Bovaird Drive east of Heritage Road. However, if future Environmental Assessments conclude that the crossing location be west of Heritage Road, an addendum to the Bovaird Drive Class EA will be undertaken.

The Halton-Peel Boundary Study identified the need for the Corridor due to the north-south capacity deficiencies in Halton Hills and west Brampton as well as east-west link deficiencies, the need for more suitable truck routes and the need for more connections to freeways (Highway 401, Highway 407).

HP BATS also identified the Halton-Peel Freeway Option as the preferred NSTC. The corridor will connect to Highway 401/407 to the south and extend north past Bovaird Drive and Wanless Drive by the 2031 horizon year. The approximate location of the NSTC is shown in Exhibit 10.

The Halton-Peel Boundary Area Transportation Study Report was adopted by the Councils of participating municipalities including the Region of Peel, the City of Brampton, the Town of Caledon, Halton Region and the Town of Halton Hills in April and May 2010.

### **4.2 Long Range Transportation Plan**

The Peel Region Long Range Transportation Plan (LRTP) was initiated in late 2002 as part of the Regional Official Plan Strategic Update (ROPSU). This study identified and addressed transportation challenges anticipated by the Region over the next 20 to 30 years, and developed appropriate policies, strategies and a road improvement plan to address these challenges. In 2010, the Region of Peel initiated an update to the Long Range Transportation Plan 2005 and completed a Draft Report, dated June 2011.

The LRTP covers the first two phases of the EA process for the identified roadway improvements. The LRTP identifies the need to widen Bovaird Drive to six lanes by 2031.

### **4.3 Region of Peel Road Capital Program**

The Region of Peel Road Capital Program (2010 to 2031) identifies that by 2016 Bovaird Drive should be widened from two to four lanes from Winston Churchill Boulevard to Mississauga Road and from four to six lanes from Mississauga Road to Worthington Avenue, and that by 2023 Bovaird Drive should be widened from four to six lanes from Winston Churchill Boulevard to Mississauga Road.

### **4.4 GTA West Corridor**

The Ontario Ministry of Transportation (MTO) has commenced the formal Environmental Assessment (EA) process to examine long-term transportation problems and opportunities to the year 2031 and consider alternative solutions to provide better linkages between Urban Growth Centres in the GTA West Corridor Preliminary Study Area, including Downtown Guelph, Downtown Milton, Brampton City Centre and Vaughan Corporate Centre, as identified in the Growth Plan. The GTA West Study is at the stage where a Draft Transportation Development Strategy Report was released. The report includes a Preliminary Route Planning Study Area, which is a geographic area within which a reasonable range of route alternatives can be generated and will be applied in Stage 2 of the EA process.

While there may not be firm commitments for the location of the GTA West Corridor at this time, the need for this Corridor has been established and the facility is planned to be in place by 2031.

### **4.5 Future Truck Traffic**

Additional roadways to by-pass Norval from Bovaird Drive, such as the Georgetown-Norval By-pass, would provide an alternative to commuter truck traffic passing through the communities in Georgetown and Norval. As a result of future truck traffic travelling to and from the NSTC, aggregate sites and future development of commercial areas, truck traffic is expected to increase from 10 percent to 15 percent by 2031. In addition, Bovaird Drive is one of the few east-west arterial corridors, and the planned widening of Bovaird Drive would support the projected increase in truck movements. The widening of Bovaird Drive will help to accommodate truck traffic.

### **4.6 Future Transit**

According to the 2009 Brampton Transportation and Transit Master Plan, in conjunction with development, Brampton Transit is expected to expand substantially and includes:

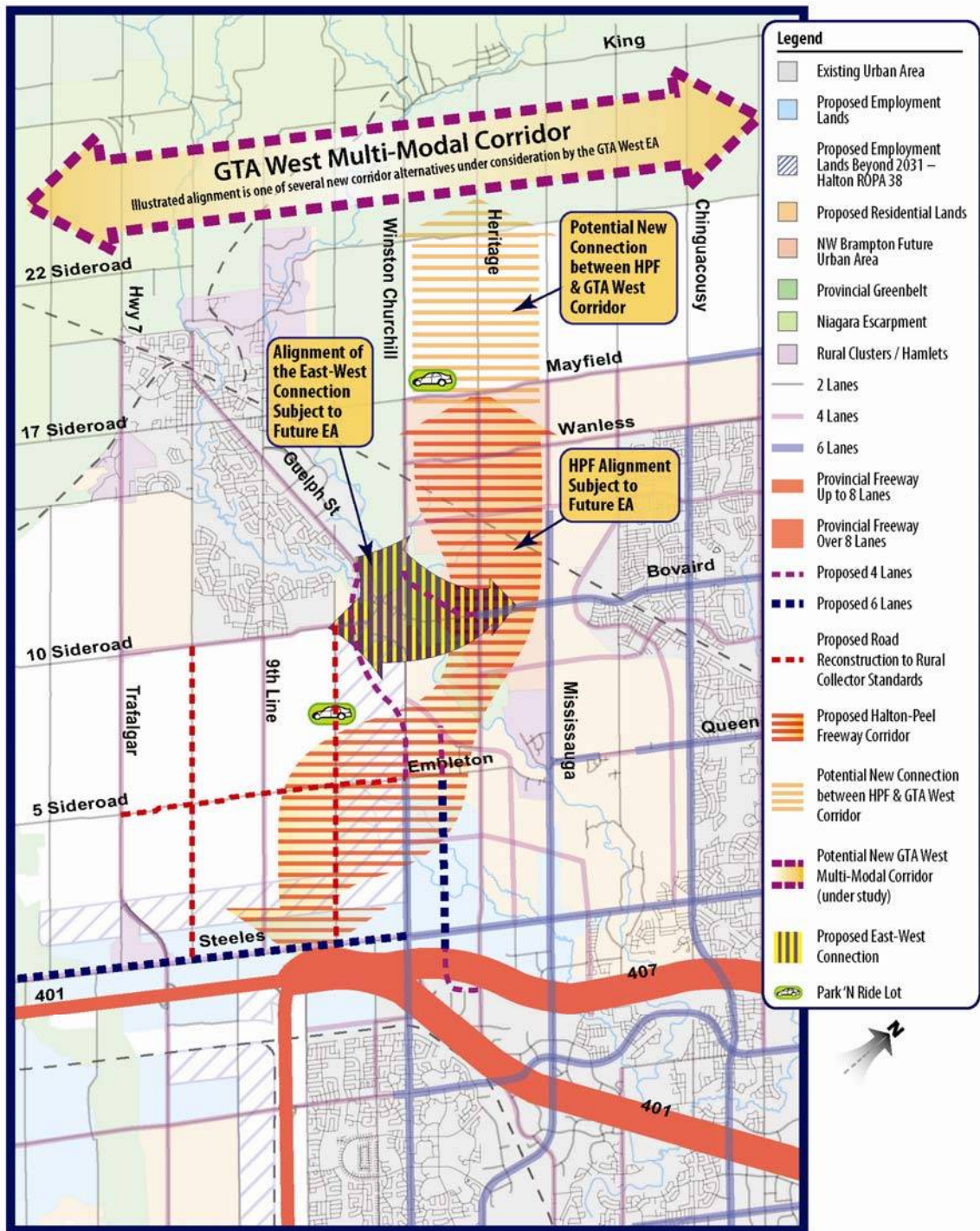
- Mississauga Road Bus Rapid Transit (BRT)
- Bovaird Drive BRT to the Mount Pleasant GO station and Mississauga Road
- additional north-south and east-west transit corridors

The ultimate (2031) Brampton Transit network can be found in Exhibit 11.

Detailed intersection drawings should include transit connections on Bovaird Drive at the Mississauga Road intersection.

GO Transit is expected to expand as well. The 2020 GO Transit Service Plan can be found in Exhibit 12.

# Exhibit 10 – Approximate NSTC Location – Halton-Peel Freeway Option



Subject to future Environmental Assessment studies

Source: AMEC, Environment and Infrastructure Group, August 20, 2012





Source: Brampton Transportation and Transit Master Plan

Exhibit 11  
Brampton Ultimate Transit Network  
Bovaird Drive Class EA





**Legend**

**CORE SERVICE:**  
 All-day 2-Way Rail Service, every 15-20 minutes or better during the peak and every 30 minutes or better

**COMMUTER SERVICE:**  
 Peak-period, peak direction rail service every 30 minutes or better, with counter-peak and off-peak bus service hourly or better.

**BRT Service:**  
 All-day 2-way bus service, every 5 minutes or better during the peak, and every 10 minutes or better off-peak

**Services Extensions:**  
 Services will be considered to urban growth centres currently beyond GO's service area.

**BLOOR**

**EXISTING RAIL STATIONS:**  
 Number and location of future stations will be determined during project planning.

**URBAN GROWTH CENTRES:**  
 Downtown areas identified in "The Growth Plan" to encourage intensification and

**BUILT-UP AREAS:**  
 Urban areas where development will be directed in accordance with "Places to Grow". (Approximate)

**GREENBELT AREAS:**  
 Greenbelt, protected per Ontario regulation 59/05. (Approximate)

Source: Brampton Transportation and Transit Master Plan

**Exhibit 12**  
**GO Transit 2020 Service Plan**  
**Bovaird Drive Class EA**

Schematic





## 4.7 Road Network Alternatives

Future alternative networks were developed to incorporate the long-term widening plans for Bovaird Drive and other committed improvements by the City of Brampton and Region of Peel.

The future alternative roadway networks contained in this report are the following:

1. **Do Nothing Roadway Network Alternative:** Maintain Bovaird Drive in its present configuration west of Mississauga Road. Proceed with currently approved improvements only, east of Mississauga Road.
2. **Improve other Roads:** Improve adjacent parallel arterial roadways to accommodate the projected future traffic demand for Bovaird Drive.
3. **Transit Service Improvements:** Improve existing public transit service within the City of Brampton, and connect to the major activity areas of the Greater Toronto Area (GTA), to encourage a shift in modal choice from automobile to public transit modes.
4. **Travel Demand Management (TDM):** TDM measures are aimed at shifting travel behaviour to reduce peak hour vehicular traffic demand. Such measures may include increasing the number of carpool parking facilities, creating high occupancy vehicle (HOV) lanes, introduction of flexible work hours by major employers and facilitating active modes of transportation such as walking and cycling.
5. **Widen Bovaird Drive with Intersection Improvements:** Addition of through traffic lanes (six lanes from Lake Louise Drive to the Halton-Peel Freeway and four lanes from the Halton Peel Freeway to the access to the Northwest Brampton Secondary Plan Area), including intersection improvements to increase traffic capacity of the corridor.
6. **Combination:** Combine alternatives 3 to 5 as mentioned above to increase the overall effectiveness of individual alternatives and reduce environmental impacts.

The alternatives were assessed in the First Public Consultation Centre and detailed documentation of the assessment is provided in the Class EA, Progress Report 1, June 2010, by AMEC.

Based on the evaluation of alternative solutions as per the EA process, the Combination Alternative (3 to 5) was carried forward and further assessed in this study. Although this report discusses transportation impacts only, the evaluation criteria for alternatives was based on natural environment, social, cultural and economic environment, cost, and compatibility with plans and policies.

Alternative 1 for 2021, the “Do Nothing” option, is evaluated in this report and is not considered feasible as a transportation solution. Alternative 6, which is the preliminary recommended solution, is analyzed with signalized intersections and with roundabouts for 2021 conditions.

## 4.8 2021 Horizon Year

### 4.8.1 Planned Road Improvements, Brampton TTMP

By the 2021 horizon year, development along Bovaird Drive is expected to increase substantially. Therefore, many road and network improvements will be necessary. Based on the 2031 HP BATS EMME model output provided by the Region<sup>1</sup>, the Municipal Class Environmental Assessment Study for Mississauga Road, and the 2009 Brampton Transportation and Transit Master Plan north of Bovaird Drive to Mayfield Road, the base road improvements required for the 2021 horizon year are as follows:

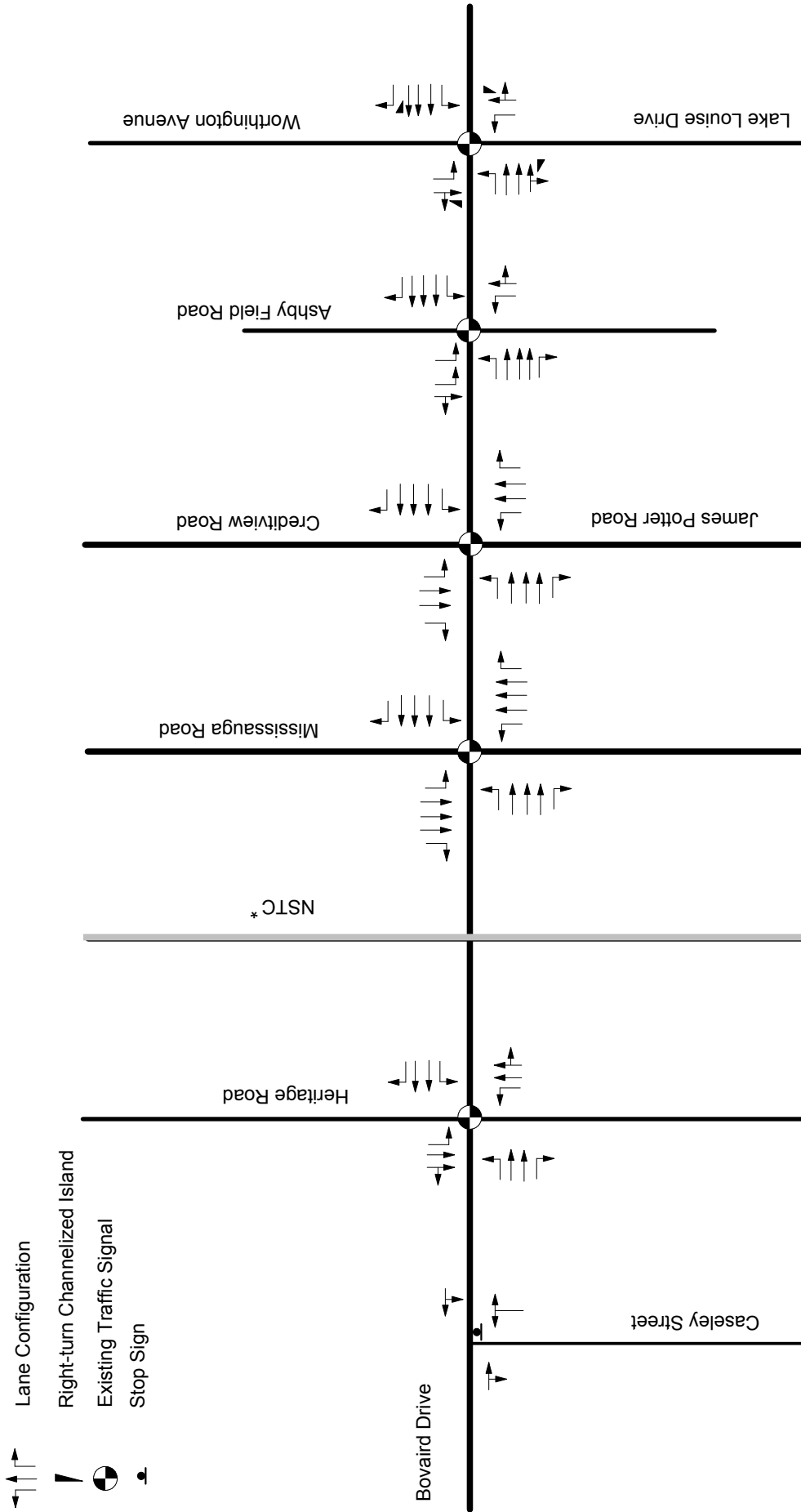
1. Bovaird Drive is expected to widen to a six-lane cross-section (three lanes in each direction) from Worthington Avenue to west of Mississauga Road.
2. Bovaird Drive is expected to widen to a four-lane cross-section (two lanes in each direction) from west of Mississauga Road to west of Heritage Road.
3. Mississauga Road is expected to widen to a four-lane cross section, however, depending on the traffic volumes, Mississauga Road may need a six-lane cross section in 2021.
4. Heritage Road is expected to widen to a four-lane cross-section both north and south of Bovaird Drive.
5. Additional roadways to by-pass Norval from Bovaird Drive, such as the Georgetown-Norval By-pass, which would provide an alternative to commuter truck traffic passing through the communities in Georgetown and Norval and support development in Georgetown and Brampton. The Georgetown-Norval By-pass is currently being examined for routing options by the Region of Halton, City of Brampton, Ministry of Transportation and Region of Peel and may significantly reduce truck and passenger car traffic on Bovaird Drive (Highway 7) in Norval and Georgetown. The additional roadways to by-pass Norval are expected to be in place for the 2021 horizon year.
6. The future James Potter Road will connect with Bovaird Drive opposite the realigned Creditview Road. The Region has indicated that the south leg of this intersection is expected to be constructed by the end of 2012, while the north leg is expected to be constructed by 2016.

The 2031 HP BATS model output can be found in Appendix E – HP BATS EMME Model.

The lane configuration for the 2021 preferred road network is shown in Exhibit 13.

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<sup>1</sup> The 2021 HP BATS model was not provided by Peel Region. Therefore, using the 2031 HP BATS model, an annual reduction in traffic of 1 percent was applied on Bovaird Drive from Worthington Avenue/Lake Louise Drive to Mississauga Road and an annual 2 percent reduction was used from Mississauga Road to the Halton Boundary to derive 2021 traffic.



\* The location of NSTC is assumed and subject to further study. If future studies conclude that the crossing location be west of Heritage Road, an addendum to this report will be completed.

Schematic

**Exhibit 13**  
**2021 Lane Configuration**  
**Bovaird Drive Class EA**



## 4.8.2 Projected Traffic Volumes

The ongoing HP BATS was used as the source for the future travel demand. Population and employment forecasts used in this study are practical, current and appropriate, and travel demand forecasts have been prepared for the 2021 and 2031 planning horizons. Population and employment levels were obtained from the land use framework concept in the Mount Pleasant Secondary Plan Transportation Master Plan, as endorsed by the City of Brampton.

HP BATS is at a point where the need for the Georgetown-Norval By-pass has been established, therefore, the traffic forecasts in the HP BATS model would reflect the Georgetown-Norval By-pass. The north-south transportation corridor is not likely to be built by 2021, however, the traffic analysis is included.

The projected traffic volumes were taken from the afternoon (PM) 2031 HP BATS EMME model provided by the Region of Peel, which provided link volumes along Bovaird Drive. Current distribution of traffic was used from the provided link volumes to get turning movement counts at each intersection. With the NSTC connection with Bovaird Drive, it is expected that some of the westbound left-turning vehicles at the Bovaird Drive and Mississauga Road intersection that were headed towards Highway 401 and Highway 407 will instead now travel through the intersection to the Halton-Peel Freeway and, therefore, 40 percent of traffic in the westbound left-turn lane at the intersection was relocated to the westbound through movement at the intersection for this scenario.

Furthermore, the 2021 HP BATS model was not provided, therefore, an annual reduction in traffic of 1 percent was applied on Bovaird Drive from Worthington Avenue/Lake Louise Drive to Mississauga Road and an annual 2 percent reduction was used from Mississauga Road to the Halton Boundary to derive 2021 traffic.

While HP BATS provided traffic projections along Bovaird Drive, Mississauga Road and Heritage Road, the other crossing streets did not have projected traffic. Therefore, due to the current level of development already occurring on Worthington/Lake Louise Drive and the GO station, a 1 percent annual growth was applied to these roadways. No growth was applied to Caseley Street.

The Region has indicated that the NSTC is not expected to be in place for the 2021 horizon year.

The estimated 2021 AM and PM traffic volumes can be found in Exhibit 14. At the Region's request, the weekday AM traffic volumes are derived by reversing the weekday PM volumes, except for the Bovaird Drive and James Potter Road/Creditview Road intersection.

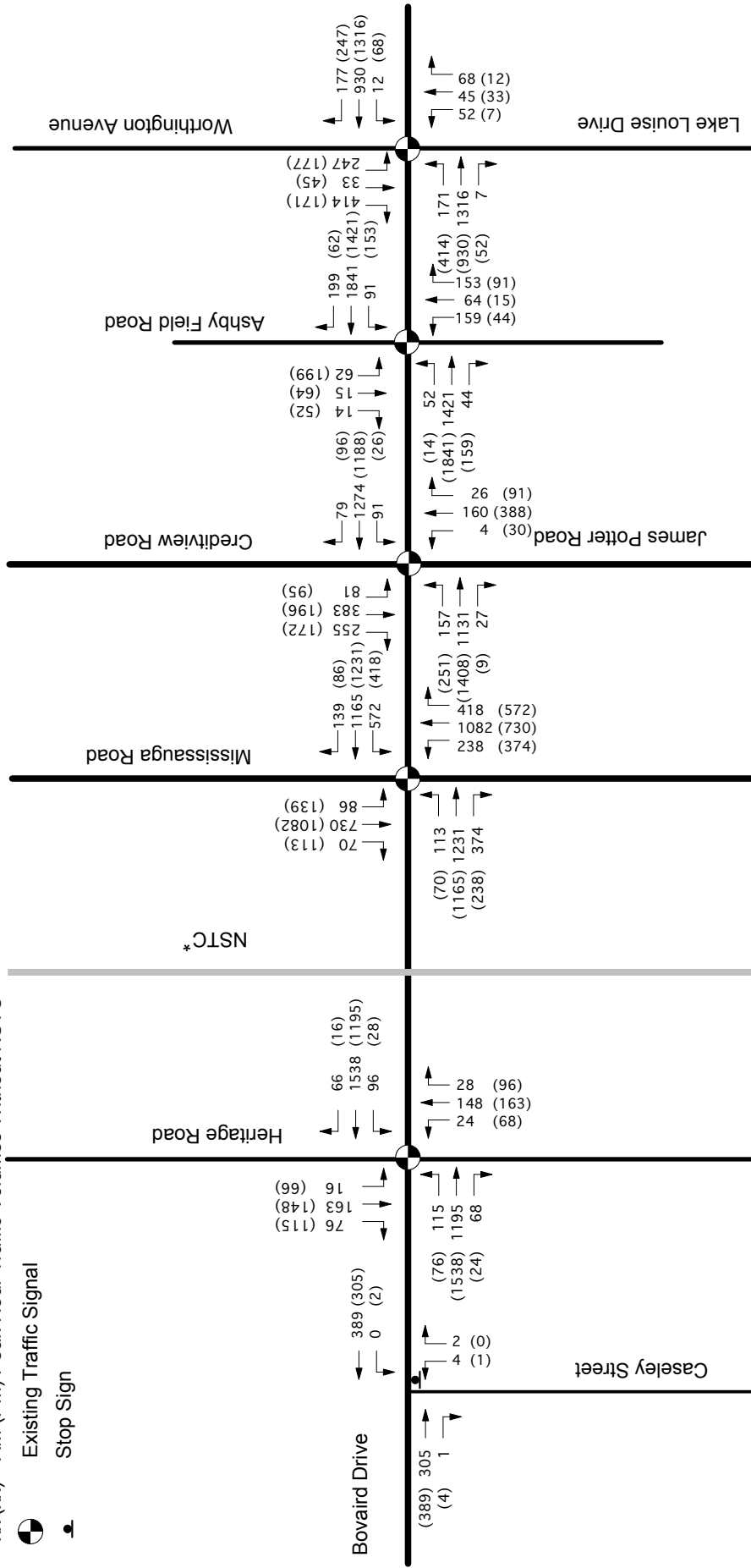
As directed by the Region, 2021 peak hour traffic volumes for the Bovaird Drive and James Potter Road/Creditview Road intersection were obtained by interpolating between 2016 and 2031 traffic volumes provided in the Mount Pleasant Block 51-1 Transportation Study and Collector Road EA Study, Final Report, January 14, 2011.



xx (xx) AM (PM) Peak Hour Traffic Volumes Without NSTC

Existing Traffic Signal

Stop Sign



\* The location of NSTC is assumed and subject to further study. If future studies conclude that the crossing location be west of Heritage Road, an addendum to this report will be completed.

Schematic

## Exhibit 14 2021 Projected Traffic Volumes, AM and PM Peak Hours Bovaird Drive Class EA



### 4.8.3 2021 Do Nothing Alternative

The do nothing alternative measures the traffic impacts on Bovaird Drive if the existing lane configurations are maintained (no roadway improvements) for 2021 traffic conditions.

Intersection capacity analyses were completed for each of the intersections on Bovaird Drive in the study area for the do nothing alternative to determine the 2021 level of service (LOS) for the roadway AM and PM peak hours. Intersection capacity analyses were completed using the Highway Capacity Manual (HCM) methodology, Synchro 7 software and the Region of Peel Guidelines for Using Synchro Software v5.0, March 2003.

The results of the signalized capacity analyses can be found in Exhibit 15. Details of the capacity analyses are presented in Appendix B – Synchro Intersection Capacity Analysis. Definitions of the intersection LOS for signalized and unsignalized intersections can be found in Appendix C – Level of Service Definitions.

#### Exhibit 15 – Signalized Intersection Capacity Analysis, 2021 Conditions, AM and PM Peak Hours, Do Nothing Alternative

Intersection  Movement	AM Peak Hour			PM Peak Hour		
	V/C	Delay (sec.)	LOS	V/C	Delay (sec.)	LOS
<b>Ashby Field Road and Bovaird Drive</b>	<b>0.95</b>	<b>50</b>	<b>D</b>	<b>1.74</b>	<b>43</b>	<b>D</b>
Eastbound Left	0.35	27	C	0.10	10	B
Westbound Left	0.77	60	E	2.12	570	F
Westbound Through	1.09	80	E	0.68	16	B
<b>Heritage Road and Bovaird Drive</b>	<b>1.63</b>	<b>105</b>	<b>F</b>	<b>1.30</b>	<b>146</b>	<b>F</b>
Eastbound Left	1.89	472	F	0.88	84	F
Eastbound Through	0.96	34	C	1.49	243	F
Westbound Left	1.43	280	F	0.33	19	B
Westbound Through	1.27	145	F	1.11	82	F
<b>Worthington Avenue and Bovaird Drive</b>	<b>0.65</b>	<b>21</b>	<b>C</b>	<b>0.74</b>	<b>26</b>	<b>C</b>
Eastbound Left	0.57	21	C	0.92	47	D
<b>Mississauga Road and Bovaird Drive</b>	<b>2.27</b>	<b>419</b>	<b>F</b>	<b>2.08</b>	<b>409</b>	<b>F</b>
Eastbound Left	2.31	689	F	1.40	310	F
Eastbound Through	1.97	484	F	2.04	520	F
Westbound Left	2.12	557	F	1.99	500	F
Westbound Through	1.53	278	F	1.67	343	F
Northbound Left	1.29	201	F	1.95	483	F
Northbound Through	2.27	616	F	1.62	322	F
Southbound Left	1.65	411	F	2.40	720	F
Southbound Through	1.52	289	F	1.91	458	F

Results of the capacity analysis clearly show that if no improvements are made along Bovaird Drive, there will not be sufficient capacity to accommodate traffic demand and vehicles will experience long delays.

If no improvements are made, the operational characteristics of the intersections would further worsen for 2031 conditions.

Based on this analysis, the following input to the problem statement can be provided:

**As presently configured, Bovaird Drive will not have sufficient capacity to accommodate the anticipated traffic demand by 2021 and 2031.**

#### 4.8.4 Intersection Level of Service with Planned Improvements

Intersection capacity analyses were completed for each of the intersections on Bovaird Drive in the study area with the planned roadway improvements to determine the 2021 LOS for the roadway AM and PM peak hours. Intersection capacity analyses were completed using the Highway Capacity Manual (HCM) methodology, Synchro 7 software and the Region of Peel Guidelines for Using Synchro Software v5.0, March 2003.

The results of the signalized and unsignalized capacity analyses can be found in Exhibit 16 and Exhibit 17. Details of the capacity analyses are presented in Appendix B – Synchro Intersection Capacity Analysis. Definitions of the intersection LOS for signalized and unsignalized intersections can be found in Appendix C – Level of Service Definitions.

To complete the analysis for the 2021 horizon year, changes in signal timings were made including an additional eastbound left-turn phase at the Mississauga Road and Worthington Avenue/Lake Louise Drive intersections and other minor green split changes at all intersections.

#### Exhibit 16 – Signalized Intersection Capacity Analysis, 2021 Conditions, AM and PM Peak Hours

Intersection Movement	AM Peak Hour			PM Peak Hour		
	V/C	Delay (sec.)	LOS	V/C	Delay (sec.)	LOS
<b>Bovaird Drive and Ashby Field Road</b>	<b>0.62</b>	<b>22</b>	<b>C</b>	<b>0.67</b>	<b>21</b>	<b>C</b>
Eastbound Left	0.66	56	E	0.08	14	B
Eastbound Through	0.58	21	C	0.74	22	C
Eastbound Right	0.03	14	B	0.1	13	B
Westbound Left	0.45	14	B	0.78	37	D
Westbound Through	0.65	17	B	0.48	12	B
Westbound Right	0.12	11	B	0.04	8	A
Northbound Left	0.66	50	D	0.33	45	D
Northbound Through/Right	0.46	42	D	0.14	42	D
Southbound Left	0.28	51	D	0.62	50	D
Southbound Through/Right	0.04	27	C	0.21	29	C

Intersection  Movement	AM Peak Hour			PM Peak Hour		
	V/C	Delay (sec.)	LOS	V/C	Delay (sec.)	LOS
<b>Bovaird Drive and Heritage Road</b>	<b>0.67</b>	<b>12</b>	<b>B</b>	<b>0.63</b>	<b>13</b>	<b>B</b>
Eastbound Left	0.73	33	C	0.30	8	A
Eastbound Through	0.53	7	A	0.68	10	A
Eastbound Right	0.05	4	A	0.02	5	A
Westbound Left	0.37	9	A	0.18	8	A
Westbound Through	0.65	9	A	0.51	8	A
Westbound Right	0.05	4	A	0.01	5	A
Northbound Left	0.14	30	C	0.38	33	C
Northbound Through/Right	0.29	30	C	0.42	31	C
Southbound Left	0.09	29	C	0.36	32	C
Southbound Through/Right	0.41	31	C	0.37	31	C
<b>Bovaird Drive and Mississauga Road</b>	<b>0.99</b>	<b>53</b>	<b>D</b>	<b>1.33</b>	<b>64</b>	<b>E</b>
Eastbound Left	0.55	33	C	0.37	24	C
Eastbound Through	1.03	79	E	0.68	36	D
Eastbound Right	0.61	48	D	0.16	28	C
Westbound Left	1.13	115	F	1.36	213	F
Westbound Through	0.53	26	C	0.57	27	C
Westbound Right	0.15	21	C	0.06	20	C
Northbound Left	0.98	87	F	1.51	284	F
Northbound Through	0.61	33	C	0.38	27	C
Northbound Right	0.27	28	C	0.69	36	D
Southbound Left	0.80	88	F	0.85	83	F
Southbound Through	0.60	42	D	0.91	57	E
Southbound Right	0.10	36	D	0.12	37	D
<b>Bovaird Drive and Creditview Road</b>	<b>0.54</b>	<b>24</b>	<b>C</b>	<b>0.54</b>	<b>21</b>	<b>C</b>
Eastbound Left	0.59	20	B	0.68	18	B
Eastbound Right	0.02	17	B	0.01	11	B
Westbound Left	0.39	19	B	0.16	16	B
Westbound Right	0.05	20	C	0.06	18	B
Northbound Left	0.01	19	B	0.09	22	C
Northbound Right	0.02	19	B	0.06	22	C
Southbound Left	0.19	21	C	0.35	27	C
Southbound Right	0.30	23	C	0.16	23	C
<b>Lake Louise Drive/Worthington Avenue and Bovaird Drive</b>	<b>0.62</b>	<b>23</b>	<b>C</b>	<b>0.81</b>	<b>24</b>	<b>C</b>
Eastbound Left	0.33	11	B	0.88	42	D
Eastbound Through/Right	0.47	13	B	0.30	7	A
Westbound Left	0.10	25	C	0.28	22	C
Westbound Through	0.57	30	C	0.60	24	C
Westbound Right	0.13	25	C	0.18	19	B



Intersection  Movement	AM Peak Hour			PM Peak Hour		
	V/C	Delay (sec.)	LOS	V/C	Delay (sec.)	LOS
Northbound Left	0.49	38	D	0.04	37	D
Northbound Through/Right	0.19	29	C	0.10	38	D
Southbound Left	0.71	41	D	0.70	53	D
Southbound Through/Right	0.45	33	C	0.39	42	D

Based on the capacity analysis for the 2021 signalized intersections, all intersections are expected to operate at satisfactory levels of service with the exception of Bovaird Drive and Mississauga Road, where turning movements expected to operate over-capacity include westbound left turns and northbound left turns. This is likely due to more traffic using Mississauga Road and Bovaird Drive as a connection to Highway 401 and Highway 407 and travelling along Bovaird Drive westbound towards Halton Region.

### Exhibit 17 – Unsignalized Intersection Capacity Analysis, 2021 Conditions, AM and PM Peak Hours

Intersection  Movement	AM Peak Hour		PM Peak Hour	
	Delay (sec.)	LOS	Delay (sec.)	LOS
<b>Bovaird Drive and Caseley Street</b>	<b>0</b>	<b>A</b>	<b>0</b>	<b>A</b>
Eastbound Through/Right	0	A	0	A
Westbound Left	0	A	0	A
Northbound Left/Through	13	B	14	B

The intersection capacity analysis for the unsignalized intersection of Bovaird Drive and Caseley Street indicates that the intersection will operate at a good LOS in the 2021 horizon year. In fact, due to the Georgetown-Norval By-pass, the intersection actually performs better than in the current condition.

#### 4.8.5 SimTraffic Queuing Analysis

SimTraffic was used to determine the queues at the Bovaird Drive intersections. The results of the analysis are shown in Exhibit 18 along with the existing storage lengths and predicted storage lengths. It should be noted that these storage lengths are not recommendations.

Exhibit 18 – Intersection Queuing Analysis, SimTraffic, 2021  
Conditions, AM and PM Peak Hours

Intersection Movement	Available Storage (m)	95th Percentile Queues	
		AM Peak Hour	PM Peak Hour
<b>Bovaird Drive and Ashby Field Road</b>			
Eastbound Left	148	20	9
Eastbound Right	90	8	19
Westbound Left	110	20	51
Westbound Right	110	190	11
Northbound Left	75	40	21
Northbound Through/Right	90	66	24
Southbound Left	100	15	43
Southbound Left	100	13	50
Southbound Through/Right	31	6	25
<b>Bovaird Drive and Heritage Road</b>			
Eastbound Left	50	36	21
Eastbound Right	30	12	9
Westbound Left	55	35	9
Westbound Right	15	12	6
Northbound Left	30	14	27
Northbound Through/Right	518	28	40
Southbound Left	30	8	27
Southbound Through/Right	432	31	38
<b>Bovaird Drive and Mississauga Road</b>			
Eastbound Left	50	112	49
Eastbound Right	100	218	47
Westbound Left	60	247	189
Westbound Right	60	34	17
Northbound Left	80	223	202
Northbound Right	150	59	71
Southbound Left	18	72	86
Southbound Right	60	21	24
<b>Bovaird Drive and Creditview Road</b>			
Eastbound Left	180	49	64
Eastbound Right	80	11	4
Westbound Left	85	27	12
Westbound Right	70	48	20
Northbound Left	40	5	18
Northbound Right	70	8	21
Southbound Left	110	25	30
Southbound Right	100	94	40

Intersection Movement	Available Storage (m)	95th Percentile Queues	
		AM Peak Hour	PM Peak Hour
<b>Bovaird Drive and Worthington Avenue</b>			
Eastbound Left	230	48	80
Westbound Left	90	10	28
Westbound Right	90	10	44
Northbound Left	50	21	5
Southbound Left	50	84	64
Southbound Though/Right	90	255	60

From the SimTraffic queuing analysis, the following movements are expected to be problematic:

1. Bovaird Drive at Ashby Field Road
  - westbound right-turn queues
2. Bovaird Drive at Mississauga Road
  - eastbound, westbound, southbound and northbound left-turn queues and eastbound right-turn queues
3. Bovaird Drive at Worthington Avenue/Lake Louise Drive
  - southbound left-turn and southbound right-turn queues

As stated for existing conditions, although the queue exceeds available storage for the southbound right-turn movement on Worthington Avenue/Lake Louise Drive, these movements are channelized and the storage is in the channelized lane.

#### 4.8.6 Region of Peel Queuing Methodology

The Region of Peel's queue methodology was also reviewed for the 2021 traffic. The results are shown in Exhibit 19.

#### Exhibit 19 – Intersection Queuing Analysis, Region Methodology, 2021 Conditions, AM and PM Peak Hours

Intersection Movement	Existing/ Predicted Storage (m)	Region Queues (m)	
		AM Peak Hour	PM Peak Hour
<b>Bovaird Drive and Worthington Avenue</b>			
Northbound Left	50	14	0
Southbound Left	50	70	49
Eastbound Left	230	49	129
Westbound Left	60	7	21

Intersection Movement	Existing/ Predicted Storage (m)	Region Queues (m)	
		AM Peak Hour	PM Peak Hour
<b>Bovaird Drive and Ashby Field Road</b>			
Northbound Left	75	49	14
Southbound Left	100	14	28
Eastbound Left	148	14	7
Westbound Left	110	28	49
<b>Bovaird Drive and Mississauga Road</b>			
Northbound Left	80	94	146
Southbound Left	18	45	49
Eastbound Left	50	52	38
Westbound Left	60	195	160
<b>Bovaird Drive and Heritage Road</b>			
Northbound Left	30	7	14
Southbound Left	30	7	14
Eastbound Left	50	28	21
Westbound Left	55	21	7
<b>Bovaird Drive and Creditview Road</b>			
Northbound Left	40	0	7
Southbound Left	110	21	21
Eastbound Left	180	35	56
Westbound Left	85	21	7

Similar to the SimTraffic queues, the Region's methodology finds that the following movements are expected to be problematic:

1. Bovaird Drive at Mississauga Road
  - eastbound, westbound, southbound and northbound left-turn queues, and northbound and eastbound right-turn queues
2. Bovaird Drive at Worthington Avenue/Lake Louise Drive
  - southbound left-turn and northbound, southbound and westbound right-turn queues

#### 4.8.7 Roundabout Evaluation

The intersections of Worthington Avenue/Lake Louise Drive, Ashby Field Road, Mississauga Road, Heritage Road and Caseley Street with Bovaird Drive were analyzed to see if roundabouts were feasible in the 2021 horizon year. The analysis investigated the feasibility of roundabouts based on the following criteria:

- intersection delay and level of service
- compatibility with adjacent land use
- performance

## 2021 Intersection Operations Assessment

The 2021 intersection operations analysis included determining the expected capacity and delay for each approach of the roundabouts using RODEL roundabout capacity software. A 50th percentile confidence level was used in the RODEL analysis to represent the most probable capacity of each roundabout approach. Similarly, average delay, as opposed to maximum delay, was used to be consistent with the Synchro analysis. The RODEL output can be found in Appendix F – RODEL Capacity Output.

Based on the intersection analysis, the roundabout option for the intersection of Bovaird Drive and Mississauga Road fails with a level of service F, as shown in Exhibit 20.

### Exhibit 20 – Roundabout Level of Service, 2021 Conditions, PM Peak Hour

Intersection Movement	Delay (sec)	V/C	Overall LOS
<b>Bovaird Drive at Worthington Avenue/Lake Louise Drive</b>			
Northbound	9	0.11	A
Southbound	9	0.48	
Westbound	3	0.57	
Eastbound	2	0.47	
<b>Bovaird Drive at Ashby Field Road</b>			
Northbound	7	0.21	A
Southbound	4	0.26	
Westbound	2	0.51	
Eastbound	4	0.69	
<b>Bovaird Drive at Mississauga Road</b>			
Northbound	7	0.72	F
Southbound	405	1.26	
Westbound	5	0.71	
Eastbound	4	0.64	
<b>Bovaird Drive at Heritage Road</b>			
Northbound	5	0.32	A
Southbound	5	0.29	
Westbound	8	0.74	
Eastbound	9	0.78	
<b>Bovaird Drive at Caseley Street</b>			
Northbound	4	0.001	A
Westbound	4	0.27	
Eastbound	5	0.35	

## Geometric Requirements and Performance Evaluation

The intersection operation analysis determined that in order to function with an acceptable level of service as described, the roundabouts would require the following geometry:

### 1. Bovaird Drive at Worthington Avenue/Lake Louise Drive

- three entering lanes on Bovaird Drive in both directions – one entering lane on the south leg and two entering lanes on the north leg
- because of the left-turn volume, the eastbound approach should have a dedicated left-turn lane as one of the entering lanes
- a 65m Inscribed Circle Diameter (ICD)

Based on the capacity analysis, a roundabout at this location is technically feasible, however, due the grade from the west leg, the surrounding commercial properties and the good functionality of a traffic signal with the current geometry, a roundabout is not recommended at this location.

### 2. Bovaird Drive at Ashby Field Road

- three entering lanes on Bovaird Drive in both directions – two entering lanes on both the north and south legs of the intersection
- a 65m ICD

Again, a roundabout at this location is technically feasible, however, the intersection is currently operating well under signal control. Implementation of a roundabout is not recommended in this location.

### 3. Bovaird Drive at Mississauga Road

- three entering lanes on all but the north leg (southbound) where two entering lanes are necessary
- because of the left-turn volume, one of the three lanes should be a dedicated left-turn lane on the north and west approaches
- a 70m ICD

The functionality of a traffic signal with the NSTC and the proposed traffic signal geometry will serve the intersection well instead of a roundabout. Also, due to its proximity with the proposed NSTC, high speeds on Bovaird Drive and future surrounding development, a roundabout in this location is not recommended.

### 4. Bovaird Drive at Heritage Road

- two entering lanes on all approaches
- a 50m ICD

A roundabout at this location is feasible based on the capacity analysis, however, a traffic signal can handle the level of traffic expected for the 2021 horizon year. Also, to

be consistent with other area controls along Bovaird Drive a roundabout is not recommended in this location.

#### 5. Bovaird Drive at Caseley Street

- a single entering lane on all approaches
- a 40m ICD

A roundabout at this location is feasible based on the capacity analysis, however, due to space limitations on the roadway and the level of traffic on Caseley Street, a roundabout in this location is not recommended or preferred.

Because the results of the operations assessment for the PM peak hour indicate that the roundabout option is infeasible, the AM peak hour analysis is not provided.

## 4.9 2031 Horizon Year

### 4.9.1 Planned Road Improvements, Brampton TTMP

Similar to 2021 traffic volumes, by the 2031 horizon year, development along Bovaird Drive is expected to increase substantially. Therefore, many road and network improvements would be necessary. Based on the 2031 HP BATS EMME model output provided by the Region, the Municipal Class Environmental Assessment Study for Mississauga Road, and the 2009 Brampton Transportation and Transit Master Plan north of Bovaird Drive to Mayfield Road, the base road improvements required for the 2031 horizon year is as follows:

1. Bovaird Drive is expected to be a six-lane cross-section (three lanes in each direction) from Worthington Avenue to west of Mississauga Road.
2. Bovaird Drive is expected to widen to a four-lane cross-section (two lanes in each direction) from west of Mississauga Road to west of Heritage Road.
3. Mississauga Road is expected to widen to a six-lane cross section.
4. Heritage Road is expected to widen to a four-lane cross-section both north and south of Bovaird Drive.
5. The Georgetown-Norval By-pass as 2021 traffic is expected to be in place for the 2031 horizon year.
6. The future James Potter Road connects with Bovaird Drive opposite the realigned Creditview Road (as previously noted in 2021 conditions).
7. Elbern Markell Drive is planned to be extended to Bovaird Drive between 2021 and 2031, located equal distance from Mississauga Road and James Potter Road. However, projected volumes do not warrant analysis of signalized intersection capacity.

## 4.9.2 Projected Traffic Volumes

As stated in Section 4.8.2, the projected traffic volumes were taken from the afternoon (PM) 2031 HP BATS EMME model provided by the Region of Peel, which provided link volumes along Bovaird Drive. Current distribution of traffic was used from the provided link volumes to get turning movement counts at each intersection. With the NSTC connection to Bovaird Drive, it is expected that some of the westbound left-turning vehicles at the Bovaird Drive and Mississauga Road intersection that were headed towards Highway 401 and Highway 407 will instead now travel through the intersection to the Halton-Peel Freeway and, therefore, 40 percent of traffic in the westbound left-turn lane at the intersection was relocated to the westbound through movement at the intersection for this scenario.

As stated previously, while HP BATS provided traffic projections along Bovaird Drive, Mississauga Road and Heritage Road, the other crossing streets did not have projected traffic. Therefore, due to the current level of development already occurring on Worthington/Lake Louise Drive and the GO station, a 1 percent annual growth was applied to these roadways. No growth was applied to Caseley Street.

Also, traffic volumes for the future James Potter Road/Creditview Road realignment where it connects with Bovaird Drive were taken from the Creditview Road Realignment Class Environmental Assessment prepared by ENTRA Consultants. The 2031 traffic volumes from this study were slightly modified along Bovaird Drive to match the traffic volumes with the NSTC.

Lane configurations for the 2031 preferred road network is shown in Exhibit 21. The 2031 traffic volumes with and without the NSTC can be found in Exhibit 22 and Exhibit 23 for the AM and PM peak hours, respectively.

## 4.9.3 Intersection Level of Service

Intersection capacity analyses were completed for each of the intersections on Bovaird Drive in the study area to determine the 2031 LOS for the roadway AM and PM peak hours. Intersection capacity analyses were completed using the Highway Capacity Manual (HCM) methodology and Synchro 7 software and the Region of Peel Guidelines for Using Synchro Software v5.0, March 2003.

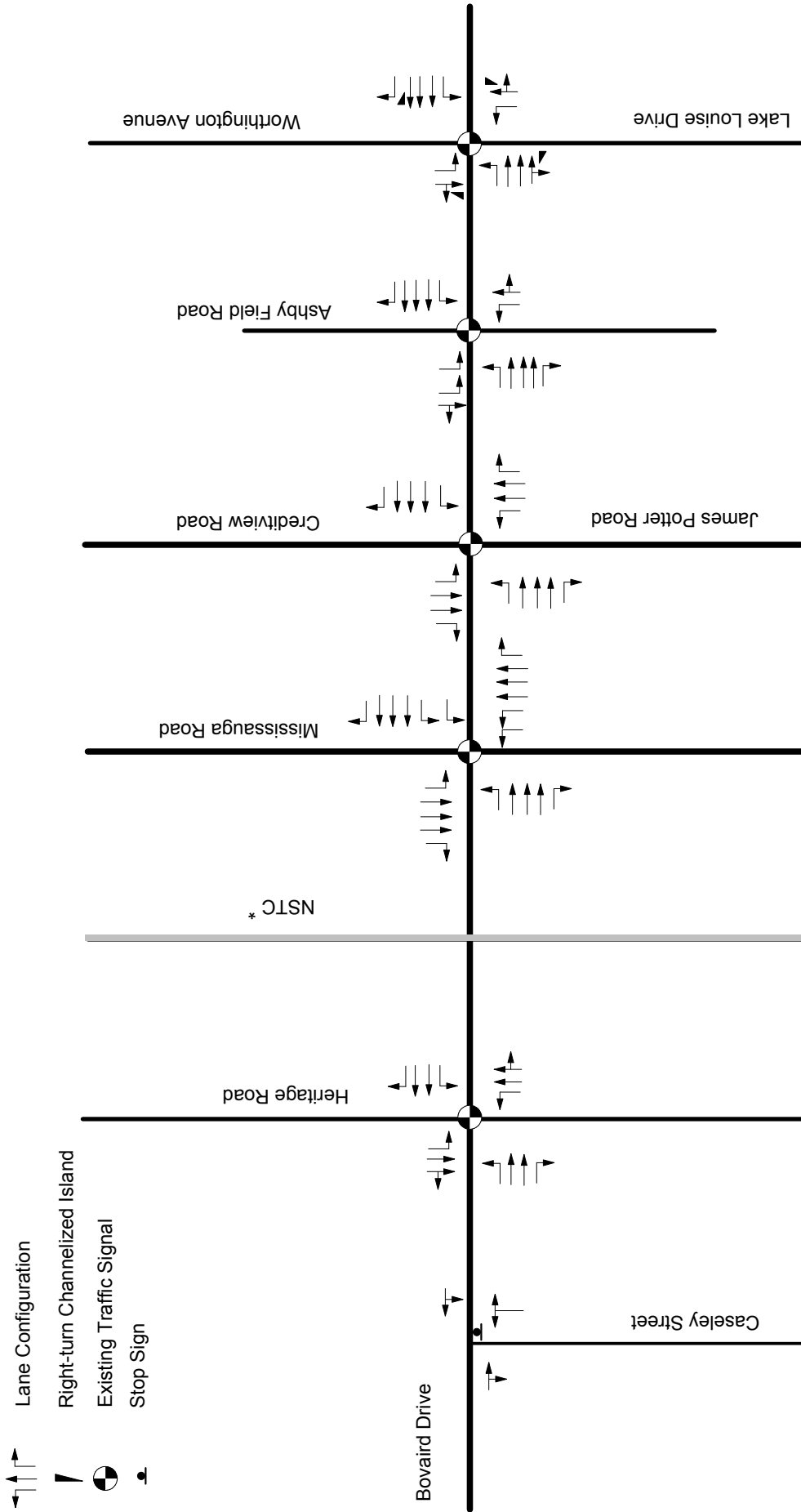
To complete the analysis for the 2031 horizon year, changes in the lane configuration and signal timing were made from existing and 2021 conditions. Lane configuration changes included the addition of a double northbound left-turn lane at the intersection of Bovaird Drive and Mississauga Road.

Modifications to the signal timings for the 2031 horizon year include:

- addition of a protected phase for the northbound left-turn lane at the Bovaird Drive and Mississauga Road intersection
- cycle length increase from 120 to 140 seconds to coincide with the protected phase at the intersection of Bovaird Drive and Mississauga Road
- green split modifications at all intersections



The results of the signalized and unsignalized existing capacity analysis can be found in Exhibit 24, Exhibit 25, Exhibit 26 and Exhibit 27, respectively. Details of the capacity analyses are presented in Appendix B – Synchro Intersection Capacity Analysis. Definitions of the intersection level of service for signalized and unsignalized intersections can be found in Appendix C – Level of Service Definitions.

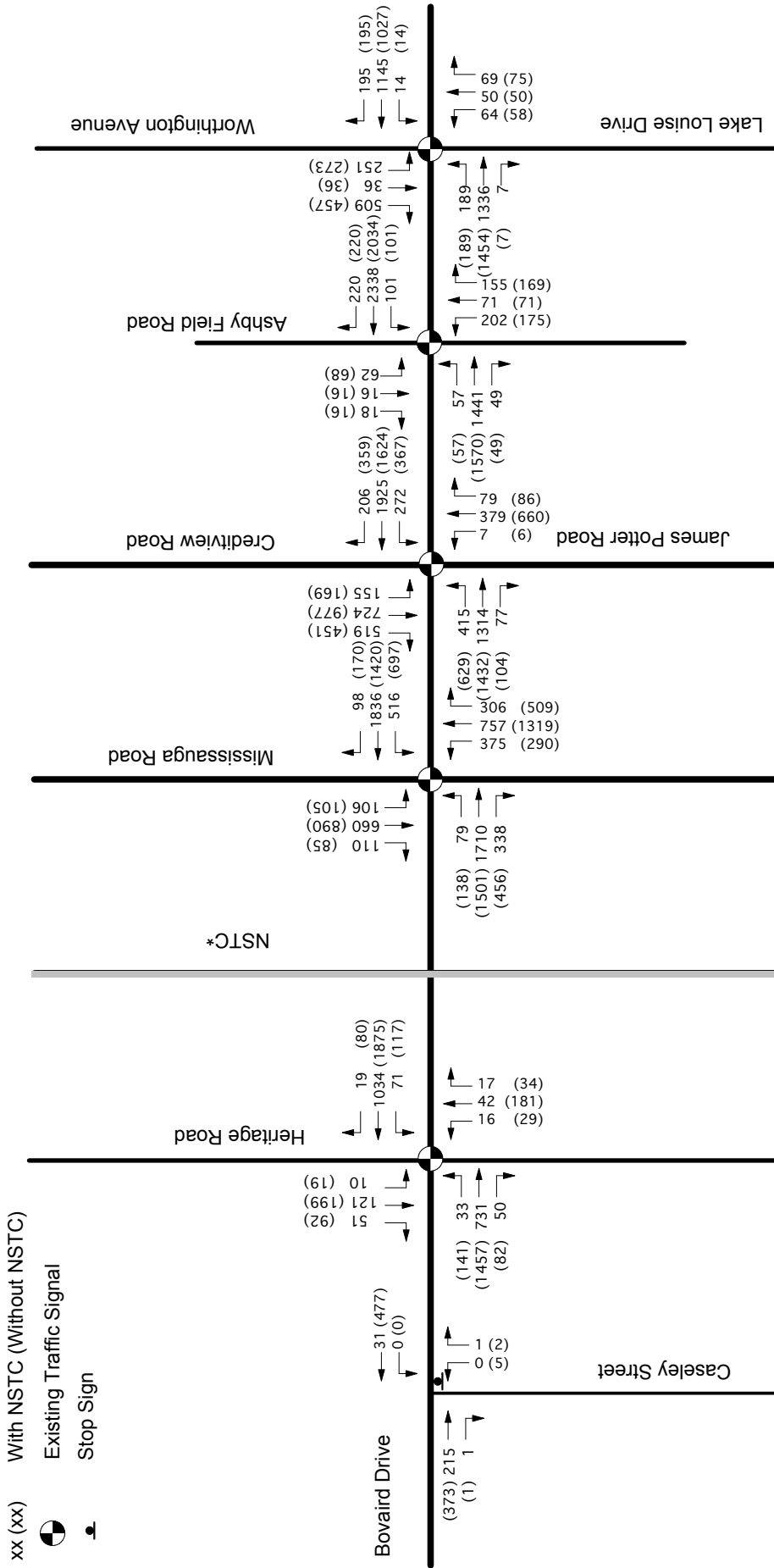


\* The location of NSTC is assumed and subject to further study. If future studies conclude that the crossing location be west of Heritage Road, an addendum to this report will be completed.

Schematic



**Exhibit 21**  
**2031 Lane Configuration**  
**Bovaird Drive Class EA**

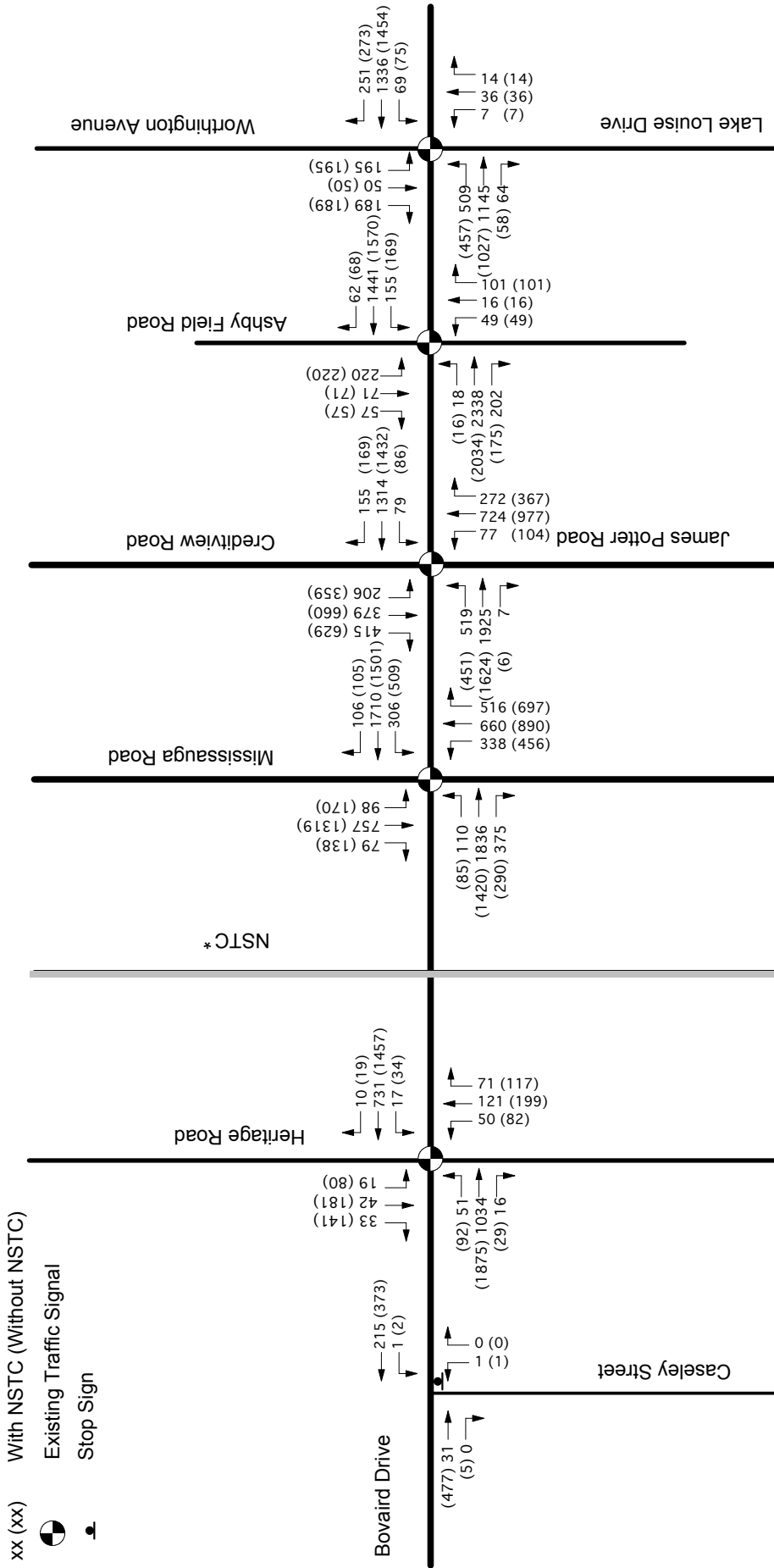
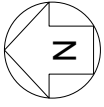


\* The location of NSTC is assumed and subject to further study. If future studies conclude that the crossing location be west of Heritage Road, an addendum to this report will be completed.

Schematic



## Exhibit 22 2031 Projected Traffic Volumes, AM Peak Hour Bovaird Drive Class EA



\* The location of NSTC is assumed and subject to further study. If future studies conclude that the crossing location be west of Heritage Road, an addendum to this report will be completed.

Schematic



**Exhibit 23**  
**2031 Projected Traffic Volumes, PM Peak Hour**  
**Bovaird Drive Class EA**

Exhibit 24 – Signalized Intersection Capacity Analysis, 2031  
Conditions, AM Peak Hour

Intersection  Movement	With NSTC			Without NSTC		
	V/C	Delay (sec.)	LOS	V/C	Delay (sec.)	LOS
<b>Bovaird Drive and Ashby Field Road</b>	<b>0.78</b>	<b>27</b>	<b>C</b>	<b>0.79</b>	<b>24</b>	<b>C</b>
Eastbound Left	0.85	100	F	0.84	95	F
Eastbound Through	0.63	24	C	0.67	24	C
Eastbound Right	0.03	16	B	0.03	15	B
Westbound Left	0.49	17	B	0.53	18	B
Westbound Through	0.85	25	C	0.73	19	B
Westbound Right	0.14	12	B	0.14	12	B
Northbound Left	0.75	55	E	0.69	52	D
Northbound Through/Right	0.46	41	D	0.52	43	D
Southbound Left	0.29	52	D	0.31	51	D
Southbound Through/Right	0.06	26	C	0.05	26	C
<b>Bovaird Drive and Creditview Road/ James Potter Road</b>	<b>0.88</b>	<b>45</b>	<b>D</b>	<b>1.07</b>	<b>64</b>	<b>E</b>
Eastbound Left	0.98	81	F	1.16	122	F
Eastbound Through	0.55	25	C	0.74	30	C
Eastbound Right	0.07	19	B	0.09	22	C
Westbound Left	0.79	31	C	0.90	51	D
Westbound Through	0.98	56	E	1.06	80	F
Westbound Right	0.16	26	C	0.49	32	C
Northbound Left	0.08	46	D	0.09	40	D
Northbound Through	0.66	53	D	1.02	84	F
Northbound Right	0.05	46	D	0.05	37	D
Southbound Left	0.59	41	D	0.95	88	F
Southbound Through	0.75	46	D	1.01	71	E
Southbound Right	0.61	43	D	0.29	33	C
<b>Bovaird Drive and Heritage Road</b>	<b>0.40</b>	<b>8</b>	<b>A</b>	<b>0.87</b>	<b>20</b>	<b>C</b>
Eastbound Left	0.10	4	A	0.61	21	C
Eastbound Through	0.31	5	A	0.63	9	A
Eastbound Right	0.03	4	A	0.06	4	A
Westbound Left	0.14	5	A	0.63	27	C
Westbound Through	0.42	6	A	0.94	26	C
Westbound Right	0.01	4	A	0.08	8	A
Northbound Left	0.10	31	C	0.18	33	C
Northbound Through/Right	0.10	31	C	0.37	33	C
Southbound Left	0.06	31	C	0.11	32	C
Southbound Through/Right	0.29	32	C	0.44	34	C

Intersection Movement	With NSTC			Without NSTC		
	V/C	Delay (sec.)	LOS	V/C	Delay (sec.)	LOS
<b>Bovaird Drive and Mississauga Road</b>	<b>0.94</b>	<b>59</b>	<b>E</b>	<b>1.05</b>	<b>63</b>	<b>E</b>
Eastbound Left	0.64	41	D	0.66	36	D
Eastbound Through	1.04	79	E	0.99	69	E
Eastbound Right	0.36	37	D	0.74	53	D
Westbound Left	1.03	109	F	1.09	119	F
Westbound Through	0.78	34	C	0.63	31	C
Westbound Right	0.12	21	C	0.20	24	C
Northbound Left	1.04	120	F	0.95	103	F
Northbound Through	0.51	42	D	0.98	72	E
Northbound Right	0.20	37	D	0.56	47	D
Southbound Left	0.47	43	D	0.64	49	D
Southbound Through	0.65	54	D	0.86	63	E
Southbound Right	0.20	48	D	0.19	47	D
<b>Bovaird Drive and Worthington</b>	<b>0.76</b>	<b>32</b>	<b>C</b>	<b>0.73</b>	<b>26</b>	<b>C</b>
Eastbound Left	0.39	16	B	0.35	12	B
Eastbound Through/Right	0.52	16	B	0.53	13	B
Westbound Left	0.14	33	C	0.16	29	C
Westbound Through	0.88	46	D	0.74	35	C
Westbound Right	0.14	30	C	0.14	26	C
Northbound Left	0.43	30	C	0.74	68	E
Northbound Through/Right	0.17	26	C	0.22	27	C
Southbound Left	0.82	56	E	0.79	45	D
Southbound Through/Right	0.56	39	D	0.50	31	C

Exhibit 25 – Signalized Intersection Capacity Analysis, 2031  
Conditions, PM Peak Hour

Intersection Movement	With NSTC			Without NSTC		
	V/C	Delay (sec.)	LOS	V/C	Delay (sec.)	LOS
<b>Bovaird Drive and Ashby Field Road</b>	<b>0.82</b>	<b>27</b>	<b>C</b>	<b>0.74</b>	<b>23</b>	<b>C</b>
Eastbound Left	0.11	15	B	0.12	15	B
Eastbound Through	0.95	33	C	0.82	25	C
Eastbound Right	0.16	14	B	0.12	14	B
Westbound Left	0.79	43	D	0.86	53	D
Westbound Through	0.48	12	B	0.53	12	B
Westbound Right	0.04	8	A	0.04	8	A
Northbound Left	0.36	46	D	0.36	46	D
Northbound Through/Right	0.15	42	D	0.15	42	D

Intersection Movement	With NSTC			Without NSTC		
	V/C	Delay (sec.)	LOS	V/C	Delay (sec.)	LOS
Southbound Left	0.69	53	D	0.69	53	D
Southbound Through/Right	0.24	30	C	0.25	30	C
<b>Bovaird Drive and Heritage Road</b>	0.42	10	A	0.78	17	B
Eastbound Left	0.10	4	A	0.56	21	C
Eastbound Through	0.44	6	A	0.86	16	B
Eastbound Right	0.01	4	A	0.02	5	A
Westbound Left	0.05	4	A	0.37	18	B
Westbound Through	0.30	5	A	0.64	10	B
Westbound Right	0.01	4	A	0.01	5	A
Northbound Left	0.29	33	C	0.45	33	C
Northbound Through/Right	0.29	32	C	0.49	31	C
Southbound Left	0.12	32	C	0.43	33	C
Southbound Through/Right	0.11	31	C	0.47	31	C
<b>Bovaird Drive and Mississauga Road</b>	0.91	49	D	1.09	102	F
Eastbound Left	0.71	41	D	0.51	26	C
Eastbound Through	0.96	55	E	0.75	39	D
Eastbound Right	0.32	31	C	0.20	29	C
Westbound Left	0.93	95	F	1.55	324	F
Westbound Through	0.76	35	D	0.66	31	C
Westbound Right	0.10	23	C	0.09	22	C
Northbound Left	0.94	93	F	1.26	201	F
Northbound Through	0.36	33	C	0.49	35	C
Northbound Right	0.71	43	D	1.02	88	F
Southbound Left	0.64	70	E	1.42	285	F
Southbound Through	0.74	57	E	1.29	194	F
Southbound Right	0.06	45	D	0.27	49	D
<b>Bovaird Drive and Worthington Avenue</b>	0.79	28	C	0.83	29	C
Eastbound Left	0.89	39	D	0.90	52	D
Eastbound Through/Right	0.41	9	A	0.34	8	A
Westbound Left	0.53	41	D	0.40	31	C
Westbound Through	0.88	38	D	0.75	32	C
Westbound Right	0.18	24	C	0.19	23	C
Northbound Left	0.03	28	C	0.04	37	D
Northbound Through/Right	0.10	29	C	0.11	37	D
Southbound Left	0.67	40	D	0.74	55	D
Southbound Through/Right	0.33	31	C	0.47	43	D
<b>Bovaird Drive and Creditview</b>	0.92	54	D	1.16	65	E
Eastbound Left	0.97	74	E	1.24	161	F

Intersection Movement	With NSTC			Without NSTC		
	V/C	Delay (sec.)	LOS	V/C	Delay (sec.)	LOS
Eastbound Through	0.75	29	C	0.85	36	D
Eastbound Right	0.01	17	B	0.01	22	C
Westbound Left	0.54	38	D	0.67	42	D
Westbound Through	0.99	75	E	1.07	86	F
Westbound Right	0.10	39	D	0.11	31	C
Northbound Left	0.38	53	D	0.50	42	D
Northbound Through	0.98	84	F	0.99	66	E
Northbound Right	0.53	55	D	0.64	42	D
Southbound Left	0.99	98	F	1.26	172	F
Southbound Through	0.34	37	D	0.45	24	C
Southbound Right	0.27	37	D	0.66	31	C

Based on the capacity analysis for the 2031 signalized intersections, the intersections of Worthington Avenue/Lake Louise Drive, Ashby Field Road, and Heritage Road are expected to operate at a satisfactory LO with and without the NSTC and the connection to Bovaird Drive.

The intersection of Bovaird Drive with the future James Potter Road/Creditview Road is expected to operate at a satisfactory LOS with the NSTC, but over capacity without the NSTC.

To improve the operation of the Bovaird Drive and Mississauga Road intersection, a dual westbound left-turn lane was introduced. For the scenario with the NSTC and with the improvements, the intersection is expected to operate at an overall LOS below 1.0 in the PM peak hour. In the AM peak hour with the NSTC, the westbound left-turn, eastbound through and northbound left-turn are expected to operate above capacity.

For the scenario without the NSTC, the intersection fails overall with the westbound left-turn, northbound left-turn, northbound right-turn southbound left-turn, and southbound through movements all over capacity in the PM peak hour.

## Exhibit 26 – Unsignalized Intersection Capacity Analysis, 2031 Conditions, AM Peak Hour

Intersection Movement	With NSTC		Without NSTC	
	Delay (sec.)	LOS	Delay (sec.)	LOS
<b>Bovaird Drive and Caseley Street</b>	0.1	A	0.1	A
Westbound Left/Through	0	A	0	A
Northbound Left/Through	10	A	15	B



## Exhibit 27 – Unsignalized Intersection Capacity Analysis, 2031 Conditions, PM Peak Hour

Intersection Movement	With NSTC		Without NSTC	
	Delay (sec.)	LOS	Delay (sec.)	LOS
<b>Bovaird Drive and Caseley Street</b>	0.1	A	0.1	A
Westbound Left/Through	0	A	0	A
Northbound Left/Through	10	A	0	A

The intersection capacity analysis for the unsignalized intersection of Bovaird Drive and Caseley Street indicates that the intersection will operate at a good LOS in the 2031 horizon year. In fact, due to the Georgetown-Norval By-pass and the NSTC, the intersection actually performs better than current conditions.

It should be noted that although not recommended due to potential safety concerns because of the speed on Mississauga Road and number of vehicles in the through lanes, the southbound right-turn lane traffic can be accommodated in the first southbound through lane, which would make it a through/right.

### 4.9.4 SimTraffic Queuing Analysis

SimTraffic was used to determine the queues at the Bovaird Drive intersections. The results of the analysis are shown in Exhibit 28 and Exhibit 29. The existing storage along with predicted storage for the longer and new movements are also shown. It should be noted that these storage lengths are not recommendations.

## Exhibit 28 – Intersection Queuing Analysis, SimTraffic, 2031 Conditions, AM Peak Hour

Intersection Movement	Available/ Predicted Storage (m)	SimTraffic 95th Percentile Queues	
		With NSTC	Without NSTC
<b>Bovaird Drive and Ashby Field Road</b>			
Eastbound Left	148	24	28
Eastbound Right	90	11	10
Westbound Left	110	28	69
Westbound Right	110	13	190
Northbound Left	75	77	44
Northbound Through/Right	90	71	70
Southbound Left	70	12	15
Southbound Left	70	14	11
Southbound Through/Right	31	9	5

Intersection  Movement	Available/ Predicted Storage (m)	SimTraffic 95th Percentile Queues	
		With NSTC	Without NSTC
<b>Bovaird Drive and Creditview Road</b>			
Eastbound Left	180	175	170
Eastbound Right	80	14	24
Westbound Left	85	68	213
Westbound Right	110	21	232
Northbound Left	40	6	4
Northbound Right	80	13	75
Southbound Left	80	48	165
Southbound Right	115	82	231
<b>Bovaird Drive and Heritage Road</b>			
Eastbound Left	50	11	22
Eastbound Right	30	12	14
Westbound Left	55	17	32
Westbound Right	30	6	40
Northbound Left	30	11	13
Northbound Through/Right	518	17	24
Southbound Left	30	8	11
Southbound Through/Right	432	23	43
<b>Bovaird Drive and Mississauga Road</b>			
Eastbound Left	50	64	101
Eastbound Right	100	61	76
Westbound Left	150	147	173
Westbound Right	150	152	177
Westbound Right	60	24	76
Northbound Left	80	113	87
Northbound Left	190	115	85
Northbound Right	150	55	131
Southbound Left	50	47	41
Southbound Right	60	30	53
<b>Bovaird Drive and Worthington Avenue</b>			
Eastbound Left	230	45	41
Westbound Left	90	10	9
Westbound Right	110	21	23
Northbound Left	40	24	22
Southbound Left	80	91	77

From the SimTraffic queuing analysis, the following movements are said to be problematic in the AM peak hour:

1. Bovaird Drive at Mississauga Road
  - eastbound, westbound, southbound and northbound left-turn queues for both scenarios are high
2. Bovaird Drive at Ashby Field Road
  - westbound right-turn lane in the scenario without the NSTC
  - northbound left-turn lane in the scenario with the NSTC

### Exhibit 29 – Intersection Queuing Analysis, SimTraffic, 2031 Conditions, PM Peak Hour

Intersection  Movement	Available/ Predicted  Storage (m)	SimTraffic 95th Percentile Queues	
		With NSTC	Without NSTC
<b>Bovaird Drive and Ashby Field Road</b>			
Eastbound Left	148	9	9
Eastbound Right	90	103	60
Westbound Left	110	36	50
Westbound Right	110	12	14
Northbound Left	75	30	21
Northbound Through/Right	90	27	24
Southbound Left	100	41	41
Southbound Left	100	48	41
Southbound Through/Right	31	38	34
<b>Bovaird Drive and Heritage Road</b>			
Eastbound Left	50	15	27
Eastbound Right	30	8	36
Westbound Left	55	7	14
Westbound Right	30	3	7
Northbound Left	30	24	28
Northbound Through/Right	522	29	42
Southbound Left	30	11	28
Southbound Through/Right	437	18	43
<b>Bovaird Drive and Mississauga Road</b>			
Eastbound Left	50	46	46
Eastbound Right	100	56	61
Westbound Left	150	62	132
Westbound Right	150	65	178
Northbound Left	80	55	72
Northbound Left	190	60	75
Northbound Right	150	95	93
Southbound Left	50	43	102
Southbound Right	60	23	99

Intersection	Available/ Predicted	SimTraffic 95th Percentile Queues	
		With NSTC	Without NSTC
Movement	Storage (m)		
<b>Bovaird Drive and Worthington Avenue</b>			
Eastbound Left	230	132	112
Westbound Left	90	36	26
Westbound Right	90	56	48
Northbound Left	50	0	4
Southbound Left	50	73	79
<b>Bovaird Drive and Creditview Road</b>			
Eastbound Left	180	148	281
Eastbound Right	80	0	0
Westbound Left	85	34	143
Westbound Right	110	75	124
Northbound Left	40	81	56
Northbound Right	80	68	113
Southbound Left	80	84	175
Southbound Right	115	80	153

From the SimTraffic queuing analysis, the following movements are said to be problematic in the PM peak hour:

1. Bovaird Drive at Mississauga Road
  - eastbound, westbound, southbound and northbound left-turn queues for both scenarios are high
  - eastbound right-turn lane at the intersection has a long queue
2. Bovaird Drive at Ashby Field Road
  - eastbound right-turn lane in the scenario with the NSTC
  - southbound through/right-turn lane is past the storage

Similar to existing conditions, although the queue is over capacity for the northbound and southbound right-turn movements on Worthington Avenue/Lake Louise Drive, these movements are channelized and the storage is in the channelized lane.

#### 4.9.5 Region of Peel Queuing Methodology

The Region of Peel's queuing methodology was also reviewed for the 2031 traffic. The results are shown in Exhibit 30 and Exhibit 31.

Similar to the SimTraffic queues, the Region's methodology finds the following movements problematic in the PM peak hour:

1. Bovaird Drive at Mississauga Road
  - southbound, westbound, eastbound and northbound left-turn queues for both scenarios are high

2. Bovaird Drive at Worthington Avenue/Lake Louise Drive

- southbound left-turn queue is slightly (6m) over the storage, however, this is measured to the commercial driveway and vehicles can queue longer if necessary

Again, the Region's methodology has fewer movements that are problematic compared to the SimTraffic queues.

**Exhibit 30 – Intersection Queuing Analysis, Region Methodology, 2031 Conditions, AM Peak Hour**

Intersection Movement	Available/ Predicted Storage (m)	Region Queues (m)	
		With NSTC (m)	Without NSTC (m)
<b>Bovaird Drive and Worthington Avenue</b>			
Northbound Left	50	21	21
Southbound Left	50	70	77
Eastbound Left	230	56	56
Westbound Left	90	7	7
<b>Bovaird Drive and Ashby Field Road</b>			
Northbound Left	75	56	49
Southbound Left x2	100	14	14
Eastbound Left	148	14	14
Westbound Left	110	28	28
<b>Bovaird Drive and Mississauga Road</b>			
Northbound Left x2	190	73	66
Southbound Left	50	52	52
Eastbound Left	50	38	59
Westbound Left x2	150	94	21
<b>Bovaird Drive and Heritage Road</b>			
Northbound Left	30	7	7
Southbound Left	30	0	7
Eastbound Left	55	7	28
Westbound Left	50	14	28
<b>Bovaird Drive and Creditview Road</b>			
Northbound Left	40	0	0
Southbound Left	80	49	56
Eastbound Left	180	70	206
Westbound Left	105	84	112

Exhibit 31 – Intersection Queuing Analysis, Region Methodology, 2031 Conditions, PM Peak Hour

Intersection Movement	Available/ Predicted Storage (m)	Region Queues (m)	
		With NSTC (m)	Without NSTC (m)
<b>Bovaird Drive and Worthington Avenue</b>			
Northbound Left	50	0	0
Southbound Left	50	56	56
Eastbound Left	230	150	136
Westbound Left	90	21	21
<b>Bovaird Drive and Ashby Field Road</b>			
Northbound Left	75	14	14
Southbound Left x2	100	35	35
Eastbound Left	148	7	7
Westbound Left	110	42	49
<b>Bovaird Drive and Mississauga Road</b>			
Northbound Left x2	190	73	87
Southbound Left	50	52	66
Eastbound Left	50	52	45
Westbound Left x2	150	66	94
<b>Bovaird Drive and Heritage Road</b>			
Northbound Left	30	14	21
Southbound Left	30	7	21
Eastbound Left	55	14	21
Westbound Left	50	7	7
<b>Bovaird Drive and Creditview Road</b>			
Northbound Left	40	28	35
Southbound Left	80	70	112
Eastbound Left	180	84	157
Westbound Left	105	28	28

#### 4.9.6 Roundabout Evaluation

Similar to 2021 traffic, the intersections of Worthington Avenue/Lake Louise Drive, Ashby Field Road, Mississauga Road, Heritage Road and Caseley Street with Bovaird Drive were analyzed with and without the NSTC connection to see if roundabouts were feasible in the 2031 horizon year. The analysis investigated the feasibility of roundabouts based on the following criteria:

- intersection delay and level of service
- compatibility with adjacent land use
- performance

## **2031 Intersection Operations Assessment**

The 2031 intersection operation analysis included determining the expected capacity and delay for each approach of the roundabouts using RODEL roundabout capacity software, similar to the 2021 traffic analysis. A summary of the RODEL analysis can be found in Exhibit 32. The RODEL output can be found in Appendix F – RODEL Capacity Output.

Based on the intersection analysis, roundabouts will operate at an acceptable delay and LOS at all intersections in the 2031 horizon year for the option with the NSTC connection. The roundabout scenario without the NSTC connection fails for the intersection of Bovaird Drive and Mississauga Road with an LOS F. It should be noted that for comparison analysis, the same geometry was used for both scenarios.

## **Geometric Requirements and Performance Evaluation**

The intersection operation analysis determined that in order to function with an acceptable LOS as described, the roundabouts would require the following geometry in the 2031 horizon year:

- Bovaird Drive at Worthington Avenue/Lake Louise Drive
  - No modifications would be required from the 2021 roundabout geometry for this intersection. The 2021 evaluation and 2031 evaluation is identical, which is as follows:
    - three entering lanes on Bovaird Drive in both directions – one entering lane on the south leg and two entering lanes on the north leg
    - because of the left-turn volume, the eastbound approach should have a dedicated left-turn lane as one of the entering lanes
    - a 65m ICD
  - A roundabout at this location is technically feasible, however, due the grade from the west leg, the surrounding commercial properties and the functionality of a traffic signal with the current geometry, a roundabout is not recommended at this location.
- Bovaird Drive at Ashby Field Road
  - The geometry required for this roundabout is also identical to the 2021 roundabout. The evaluation is also similar, which is as follows:
    - three entering lanes on Bovaird Drive in both directions – two entering lanes on both the north and south legs of the intersection
    - a 65m ICD
  - A roundabout at this location is technically feasible, however, the intersection is currently operating well under signal control. Implementation of a roundabout is not recommended in this location.

- Bovaird Drive at James Potter Road/Creditview Road
  - The geometry required for this roundabout is as follows:
    - three entering lanes on Bovaird Drive in the westbound direction and four entering lanes on Bovaird Drive in the eastbound direction
    - two entering lanes for the northbound direction and three entering lanes in the southbound direction
    - a 70m ICD
  - A roundabout at this location is technically feasible, however, the intersection will operate well under signal control. Implementation of a roundabout is not recommended in this location.

### Exhibit 32 – Roundabout Level of Service, 2031 Conditions, PM Peak Hour

	Delay (sec)		V/C		Overall LOS	
	with NSTC	without NSTC	with NSTC	without NSTC	with NSTC	without NSTC
<b>Bovaird Drive at Worthington Avenue/Lake Louise Drive</b>						
Northbound	16	11	0.18	0.15		
Southbound	10	13	0.53	0.57	A	A
Westbound	4	4	0.64	0.60		
Eastbound	3	2	0.58	0.52		
<b>Bovaird Drive at Ashby Field Road</b>						
Northbound	23	10	0.41	0.28		
Southbound	4	5	0.29	0.31	B	A
Westbound	2	2	0.52	0.56		
Eastbound	18	6	0.88	0.77		
<b>Bovaird Drive at James Potter Road/Creditview Road</b>						
Northbound	37		0.84			
Southbound	29		0.76			
Westbound	4	N/A	0.64	N/A	C	N/A
Eastbound	13		0.85			
<b>Bovaird Drive at Mississauga Road</b>						
Northbound	4	121	0.86	0.99		
Southbound	8	277	0.62	1.14	C	F
Westbound	13	35	0.84	0.92		
Eastbound	15	9	0.84	0.81		



	Delay (sec)		V/C		Overall LOS	
	with NSTC	without NSTC	with NSTC	without NSTC	with NSTC	without NSTC
<b>Bovaird Drive at Heritage Road</b>						
Northbound	3	10	0.17	0.52		
Southbound	2	5	0.06	0.36	A	E
Westbound	2	8	0.36	0.76		
Eastbound	3	77	0.50	0.97		
<b>Bovaird Drive at Caseley Street</b>						
Northbound	3	4	0.01	0.01		
Westbound	4	5	0.19	0.33	A	A
Eastbound	3	5	0.03	0.43		

- Bovaird Drive at Mississauga Road
  - Modifications to this roundabout would be necessary for the 2021 horizon year. The southbound approach would need three lanes entering instead of two and the eastbound approach would require a fourth entering lane to accommodate the high level of right-turn movements from Bovaird Drive to southbound on Mississauga Road. The proposed geometry would be as follows:
    - three entering lanes on all but the east leg where four entering lanes would be needed. If the eastbound right-turn movements at this intersection were put in a by-pass to the roundabout, then three lanes could enter on the east approach as well
    - because of the left-turn volume, one of the three lanes should be a dedicated left-turn on the north and west approaches
    - a 70m ICD
  - The complications of having a fourth lane entering for drivers and the possibility of a necessary right-turn lane by-passing the roundabout make it more difficult for motorists to navigate. Also, additional right-of-way would be needed to accommodate the geometry.
- Bovaird Drive at Heritage Road
  - two entering lanes on all approaches
  - a 50m ICD
  - A roundabout at this location is feasible based on the capacity analysis for the scenario with the NSTC, however, a traffic signal can handle the level of expected for the 2031 horizon year. Also, to be consistent with other area controls along Bovaird Drive, a roundabout is not recommended in this location. In addition, the collision history on Bovaird Drive does not indicate any problematic movements at this intersection.

- Bovaird Drive at Caseley Street
  - The design of this roundabout is identical to the 2021 design and, therefore, the evaluation is the same.
  - a single entering lane on all approaches
  - a 40m ICD
  - A roundabout at this location is feasible based on the capacity analysis, however, due to space limitations on the roadway and the level of traffic on Caseley Street, a roundabout in this location is not recommended or preferred.

## 4.10 Summary

Based on the traffic analysis, the road network with the NSTC connections is the preferred scenario as traffic delay and LOS for the Bovaird Drive corridor improves significantly on Bovaird Drive and the surrounding intersections.

Roundabouts are not recommended because of the size and impact on surrounding land, speed on the roadway, entry and exit width of the Bovaird Drive and Mississauga Road roundabout in the 2031 horizon year, grades, intersection control, continuity and the ability of signals to handle the expected traffic. Since the PM peak hour assessment indicates that roundabouts are infeasible, an AM peak hour assessment is not required.

Overall, the intersection of Bovaird Drive and Mississauga Road operates at a satisfactory level of service with the double westbound left-turn lanes in the 2031 horizon year. It is recommended that the intersection be constructed with a single left-turn lane on all approaches for the 2021 horizon year and protect for a double westbound left-turn lane and northbound left-turn lane for future conditions. (However, this proposed staging is subject to environmental, political and social factors.) This finding is consistent with the Mount Pleasant Block 51-1 Collector Road EA and Transportation Study, which notes that the intersection, while busy, would operate with an appropriate LOS with single left-turn lanes.

All other intersections operate with acceptable LOS with the preferred road network in the 2031 PM conditions.

## 5. Recommendations

The recommended solution is a multi-modal approach to improving Bovaird Drive to accommodate traffic in the 2021 and 2031 horizon years.

Recommended TDM measures include encouraging increased carpooling, cycling and walking, to shift travel away from single-occupant vehicles. To facilitate the movement of pedestrians, cyclists and other non-motorized forms of propulsion, the preferred alternative will include a sidewalk on the south side and a multi-use path on the north side of Bovaird Drive.

Recommended transit measures for Bovaird Drive include those provided in the Brampton TTMP, which recommend BRT service from Mississauga Road to Airport Road. Bovaird Drive is planned as a primary transit corridor by 2021 (with transit vehicle headways of five minutes or less). To improve transit efficiency throughout the Bovaird Drive corridor, transit queue jump lanes are included in the preferred alternative at all approaches with Mississauga Road and at the east and west approaches with Heritage Road, Creditview Road/James Potter Drive and Ashby Field Road.

To accommodate projected auto and truck volumes, based on the traffic analysis, the recommended road network for 2021 and 2031 is described below and was previously shown in Exhibit 13 and Exhibit 21.

The study assumes that the NRTC will be in place by 2031 and recommendations are consistent with findings in the Peel Long Range Transportation Study and the Brampton Transportation and Transit Master Plan.

### 1. Bovaird Drive and Worthington Avenue/Lake Louise Drive

The current road network configuration at this intersection is not expected to change from current conditions.

### 2. Bovaird Drive and Ashby Field Road

Bovaird Drive is expected to widen to three lanes in each direction for 2021 and 2031 east and west of Ashby Field Road. Some modifications are recommended to the storage lanes and tapers for both Bovaird Drive and Ashby Field Road, as shown in Exhibit 33.

### 3. Bovaird Drive and Creditview Road/James Potter Road

The 2031 lane configuration for the intersection is as follows:

- Bovaird Drive is expected to have three through lanes and exclusive right-turn and left-turn lanes at the intersection.
- There are two through lanes expected northbound and southbound with left-turn and right-turn lanes on the north and south approaches.

Regarding the eastbound left-turn lane at the intersection, note that subsequent to the traffic analyses completed for this Bovaird EA study, the Mount Pleasant Block 51-1 Transportation Study and Collector Road EA was completed by BA Group in

January 14, 2011, with an updated traffic analyses submitted to the Region of Peel on April 6, 2011.

Based on the 2031 model outputs provided by the Region, our work completed for the Mount Pleasant Secondary Plan Area Transportation Master Plan, and the balancing of volumes throughout the Bovaird Drive corridor, weekday PM peak hour eastbound left-turn volumes at the future Bovaird Drive and Creditview Road intersection are estimated to be approximately 519 vehicles.

Comments provided by the Region on the Block 51-1 Transportation Study and Collector Road EA, dated February 22, 2011, indicate that the estimated 2031 total traffic weekday PM peak hour eastbound left-turn volumes of 606 vehicles shown in the study is overstated by about 50 percent due differences in modelling results between Brampton's model and the Region's model. If this is the case, ENTRA expects that the eastbound left-turn movement could be accommodated by a single left-turn lane.

#### 4. Bovaird Drive and Mississauga Road

Bovaird Drive is expected to widen on the east and west sides of Mississauga Road in both the 2021 and 2031 horizon years. Mississauga Road is expected to widen to three lanes north and south of the intersection of Bovaird Drive with Mississauga Road tapering to a four-lane cross-section further north.

The intersection configuration for the 2021 horizon year is as follows:

- Three through lanes on Mississauga Road on both the north and south approaches.
- Three through lanes on Bovaird Drive in both the east and west approaches.
- Single left-turn and right-turn lanes on all approaches with storage lanes and taper widths as shown in Exhibit 33.
- Protection for future double left-turn lanes on the east leg (westbound) and the south leg (northbound). However, the opportunity for staging is subject to social, political and environmental factors.

The intersection additions for the 2031 horizon year are as follows:

- An additional left-turn lane on the south leg (northbound).

The analysis indicates that an additional left-turn lane on the east leg (westbound) will be required in the 2031 horizon year. The storage and taper lengths in Exhibit 32 show what is required for the double left-turn lane for the westbound left-turn movement.

#### 5. Bovaird Cross-section Transitioning

- From Mississauga Road heading west, Bovaird Drive will turn from a six-lane cross-section to a four-lane cross-section and then to a two-lane cross section further west past Heritage Road.

## 6. Bovaird Drive and Heritage Road

- Heritage Road will widen to a four-lane cross-section north and south of Bovaird Road in the 2021 and 2031 horizon years. Bovaird Drive will have a four-lane cross-section north and south of Heritage Road, however, the cross-section between Heritage Road and Mississauga Road could change depending on the final location of the NSTC.
- Modifications to the geometry include left-turn lanes on Heritage Road and modifications to the storage and taper lengths, as shown in Exhibit 33.

## 7. Bovaird Drive and Caseley Street

- This intersection is expected to operate well in both 2021 and 2031 and no modifications are expected to be needed.

Proposed storage and taper lengths for the 2021 and 2031 horizon years are taken from the SimTraffic and Region methodology for calculating queues.

While reviewing right-turn vehicle queues during the SimTraffic simulations, we noted that if the right turn-lane was temporarily blocked by through lane queues, then the 95th percentile queue was recorded at the point where a right-turning vehicle waits in the through lane to enter the exclusive right-turn lane. This occurred only in a few cases (at Bovaird Drive and Ashby Field Road for westbound right-turn movements and at Bovaird Drive and Mississauga Road for eastbound and westbound right-turn movements). Since this is not an appropriate measure of right-turn lane storage requirements, for these cases, the Synchro queues (and Peel Region methodology queues) were compared to the SimTraffic results.

Transportation Association of Canada (TAC) methodology was used for the calculation of taper lengths. The recommended storage and taper lengths are shown in Exhibit 33.



## Exhibit 33 - Recommended Storage and Taper Lengths

Approach	Intersection Movement	No. of Lanes	Existing Storage (m)	2021		2031		Existing Taper (m)	Required Taper Ratio <sup>d</sup> (m)	Required Taper Length (m)	Proposed Taper 2021 (m)	Proposed Taper 2031 (m)	Design Speed (km/h)
				Required Storage (m)	Proposed Storage (m)	Required Storage (m)	Proposed Storage (m)						
<b>Bovaird Drive @ Worthington Avenue</b>													
North (SB)	Left Turn	1	90	84	90	91	90 <sup>a</sup>	22	14:1 - 17:1	49 - 59.5	22 <sup>a</sup>	22 <sup>a</sup>	60
South (NB)	Left Turn	1	50	21	50 <sup>a</sup>	24	50 <sup>a</sup>	30	14:1 - 17:1	49 - 59.5	30 <sup>a</sup>	30 <sup>a</sup>	60
West (EB)	Left Turn	1	230	129	230 <sup>a</sup>	150	230 <sup>a</sup>	75	17:1 - 23:1	59.5 - 80.5	75 <sup>a</sup>	75 <sup>a</sup>	80
East (WB)	Left Turn	1	90	28	90 <sup>a</sup>	36	90 <sup>a</sup>	100	17:1 - 23:1	59.5 - 80.5	100 <sup>a</sup>	100 <sup>a</sup>	80
	Right Turn	1	90	44	90 <sup>a</sup>	56	90 <sup>a</sup>	28	17:1 - 24:1	59.5 - 84	28 <sup>a</sup>	28 <sup>a</sup>	80
<b>Bovaird Drive @ Ashby Field Road</b>													
North (SB)	Double Left Turn	2	100+100	43+50	100+100 <sup>a</sup>	41+48	100+100 <sup>a</sup>	30					60
South (NB)	Left Turn	1	75	49	80	77	80	17	14:1 - 17:1	49 - 59.5	17 <sup>a</sup>	17 <sup>a</sup>	60
West (EB)	Left Turn	1	148	20	130 <sup>c</sup>	24	130 <sup>c</sup>	100	17:1 - 23:1	59.5 - 80.5	80	80	80
	Right Turn	1	90	19	110	103	110	60	17:1 - 24:1	59.5 - 84	60	60	80
East (WB)	Left Turn	1	110	51	95 <sup>c</sup>	42	95 <sup>c</sup>	91	17:1 - 23:1	59.5 - 80.5	80	80	80
	Right Turn	1	110	11	110 <sup>a</sup>	13	110 <sup>a</sup>	39	17:1 - 24:1	59.5 - 84	39 <sup>a</sup>	39 <sup>a</sup>	80
<b>Bovaird Drive @ Mississauga Road</b>													
North (SB)	Left Turn	1	18	86	90	52	90	71	17:1 - 23:1	59.5 - 80.5	60	60	90
	Right Turn	1		24	35	30	35		17:1 - 24:1	59.5 - 84	60	60	90
South (NB)	Left Turn	1	36	223	225	115	225	100	17:1 - 23:1	59.5 - 80.5	60	60	90
	Double Left Turn	2				113	115		17:1 - 23:1	59.5 - 80.5	60	60	90
	Right Turn	1		71	100	95	100		17:1 - 24:1	59.5 - 84	60	60	90
West (EB)	Left Turn	1	20	112	115	64	115	45	17:1 - 23:1	59.5 - 80.5	60	60	80
	Right Turn	1	100	74	75	61	75	88	17:1 - 24:1	59.5 - 84	60	60	80
East (WB)	Left Turn	1	60	247	250	152	250	100	17:1 - 23:1	59.5 - 80.5	60	60	80
	Double Left Turn	2				147	150		17:1 - 23:1	59.5 - 80.5	60	60	80
	Right Turn	1		34	35	24	35		17:1 - 24:1	59.5 - 84	60	60	80
<b>Bovaird Drive @ Heritage Road</b>													
North (SB)	Left Turn	1		27	30	11	30		17:1 - 20:1	59.5 - 70	60	60	70
South (NB)	Left Turn	1		27	30	24	30		17:1 - 20:1	59.5 - 70	60	60	70
West (EB)	Left Turn	1	50	36	50 <sup>a</sup>	15	50 <sup>a</sup>	72	17:1 - 23:1	59.5 - 80.5	70	70	80
	Right Turn	1	10	12	30	12	30	72	17:1 - 24:1	59.5 - 84	70	70	80
East (WB)	Left Turn	1	55	35	55 <sup>a</sup>	17	55 <sup>a</sup>	100	17:1 - 23:1	59.5 - 80.5	100	100	80
	Right Turn	1	15	12	30	6	30	40	17:1 - 24:1	59.5 - 84	70	70	80
<b>Bovaird Drive @ Creditview Road</b>													
North (SB)	Left Turn	1		25	110	81	85		17:1 - 23:1	59.5 - 80.5	60	60	80
	Right Turn	1		93	95	82	95		17:1 - 24:1	59.5 - 84	60	60	80
South (NB)	Left Turn	1		18	40	81	85		17:1 - 23:1	59.5 - 80.5	60	60	80
	Right Turn	1		22	70	68	70		17:1 - 24:1	59.5 - 84	60	60	80
West (EB)	Left Turn	1		62	180	178	180		17:1 - 23:1	59.5 - 80.5	60	60	80
	Right Turn	1		11	80	14	80		17:1 - 24:1	59.5 - 84	60	60	80
East (WB)	Left Turn	1		27	85	84	85		17:1 - 23:1	59.5 - 80.5	60	60	80
	Right Turn	1		48	70	75	110		17:1 - 24:1	59.5 - 84	60	60	80

a = no change from existing storage/taper lengths

b = storage is provided within right-turn channelized island

c = proposed storage length is less than existing due to proposed intersection spacing on Bovaird Drive between Creditview Road and Ashby Field Road

d = Taper ratios are based on Table 2.3.5.2 and Table 2.3.8.3 in TAC's Geometric Design Guide for Canadian Roads





## 6. Summary

The findings of the traffic analysis of Bovaird Drive can be summarized as follows:

### 6.1 Existing Conditions

- Based on the capacity analysis for the existing signalized intersections, all intersections currently operate at satisfactory LOS. The westbound left-turn movement at the intersection of Bovaird Drive with Mississauga Road is over capacity in the AM peak hour. This is due in large part to the left-turning volume at this intersection of 310 vehicles as opposed to 620 vehicles per hour travelling in one eastbound through lane.
- Based on the capacity analysis, the existing unsignalized intersection of Bovaird Drive and Caseley Street has no capacity problems and operates at an acceptable level of service during all peak hours.

### 6.2 Future Roadway and Intersection Improvements

- Bovaird Drive is expected to widen to three lanes in each direction from west of Worthington Avenue to west of Mississauga Road.
- Mississauga Road is expected to widen to a four-lane cross-section further north.
- Heritage Road will widen to a four-lane cross-section north and south of Bovaird Drive in the 2021 and 2031 horizon years. Bovaird Drive will have four a lane cross-section north and south of Heritage Road, however, the cross-section between Heritage Road and Mississauga Road could change depending on the final location of the NSTC.
- The intersection configuration for Bovaird Drive and Mississauga Road for the 2021 horizon year is as follows:
  - Three through lanes on Mississauga Road on both the north and south approaches.
  - Three through lanes on Bovaird Drive in both the east and west directions.
  - Single left-turn and right-turn lanes on all approaches.
  - Protection for future double left-turn lanes on the east leg (westbound) and the south leg (northbound). However, the opportunity for staging is subject to social, political and environmental factors.
- The intersection additions for the 2031 horizon year are as follows:
  - An additional left-turn lane on the south leg (northbound).
  - An additional left-turn lane on the east leg (westbound). The Region should monitor this movement to determine when the second left-turn lane is needed prior to the 2031 horizon year.

- Modifications to the geometry include left-turn lanes on Heritage Drive.

### **6.3 2021 Conditions**

- Overall, all intersections will operate at a satisfactory LOS with the NSTC and the connection to Bovaird Drive. However, the option without the NSTC fails at the intersection with Mississauga Road with the westbound left-turn and northbound left-turn lanes operating over capacity.
- Roundabouts are not recommended because of the size and impact on surrounding land, speed on the roadway, grades, intersection control, continuity and the ability of signals to handle the expected traffic.
- The intersection capacity analysis for the unsignalized intersection of Bovaird Drive and Caseley Street indicates that the intersection will operate at a good LOS in the 2021 horizon year.

### **6.4 2031 Conditions**

- Based on the traffic analysis, the road network with the NSTC connections is the preferred scenario as traffic delay and LOS for the Bovaird Drive corridor improves significantly on Bovaird Drive and the surrounding intersections.
- Roundabouts are not recommended because of the size and impact on surrounding land, speed on the roadway, entry and width of the Bovaird Drive and Mississauga Road roundabout in the 2031 horizon year, grades, intersection control, continuity and the ability of signals to handle the expected traffic.
- Overall, the intersection of Bovaird Drive and Mississauga Road operates at a satisfactory LOS with or without the double westbound left-turn lanes in the 2031 horizon year. It is recommended that the intersection be constructed with a single left-turn lane on all approaches for the 2021 horizon year and protect for a double westbound left-turn lane and northbound left-turn lane for future conditions. (However, the staging is subject to environmental, political and social considerations.) With the inclusion of the northbound and westbound double left-turn lanes, the movements are expected to operate at a LOS F, but below a volume-to-capacity ratio of 1.0 during the weekday PM peak hour. The eastbound through, southbound left-turn and southbound through movements are expected to operate at a LOS E. Although these results are typical of heavily utilized urban arterial roadways, these individual movements may improve through the reassignment of background traffic throughout the overall road network in the future.
- Overall, all other intersections operate with acceptable LOS with the preferred road network in 2031 conditions for the AM and PM peak hours.

## **Appendices**

- A. Existing Traffic Data**
- B. Synchro Intersection Capacity Analysis**
- C. Level of Service Definitions**
- D. Region of Peel Queuing Methodology**
- E. HP BATS EMME Model**
- F. RODEL Capacity Output**





## Appendix A

### Existing Traffic Data





## Traffic Counts





# MG8 ENG

## Morning Peak Diagram

### Specified Period

**From:** 7:00:00

**To:** 9:00:00

### One Hour Peak

**From:** 7:00:00

**To:** 8:00:00

**Municipality:** Region of Peel  
**Site #:** 10716989  
**Intersection:** Bovaird Drive & Worthington Avenue  
**TFR File #:** 1  
**Count date:** 29-Sep-2009

**Weather conditions:**  
Sunny  
**Person(s) who counted:**  
ZORAN

### \*\* Signalized Intersection \*\*

**Major Road:** Bovaird Drive runs W/E

North Leg Total: 734  
 North Entering: 594  
 North Peds: 3  
 Peds Cross:  $\times$

Cyclists	0	0	0	0
Trucks	5	0	0	5
Cars	256	36	297	589
<b>Totals</b>	<b>261</b>	<b>36</b>	<b>297</b>	



Cyclists	0
Trucks	7
Cars	133
<b>Totals</b>	<b>140</b>

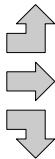
East Leg Total: 1824  
 East Entering: 758  
 East Peds: 12  
 Peds Cross:  $\times$

Cyclists	Trucks	Cars	Totals
0	37	984	1021

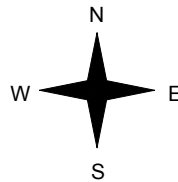


Bovaird Dr

Cyclists	Trucks	Cars	Totals
0	4	96	100
3	39	697	739
0	0	12	12
<b>3</b>	<b>43</b>	<b>805</b>	



Lake Louise Dr



Cars	Trucks	Cyclists	Totals
13	1	0	14
687	32	0	719
25	0	0	25
<b>725</b>	<b>33</b>	<b>0</b>	

Bovaird Dr



Cars	Trucks	Cyclists	Totals
1024	39	3	1066

Peds Cross:  $\times$   
 West Peds: 6  
 West Entering: 851  
 West Leg Total: 1872

Cars	73	Cars	41	24	30	95
Trucks	0	Trucks	0	2	0	2
Cyclists	0	Cyclists	0	0	0	0
<b>Totals</b>	<b>73</b>	<b>Totals</b>	<b>41</b>	<b>26</b>	<b>30</b>	



Peds Cross:  $\times$   
 South Peds: 3  
 South Entering: 97  
 South Leg Total: 170

## Comments

# MG8 ENG

## Mid-day Peak Diagram

### Specified Period

**From:** 11:00:00

**To:** 14:00:00

### One Hour Peak

**From:** 13:00:00

**To:** 14:00:00

**Municipality:** Region of Peel  
**Site #:** 10716989  
**Intersection:** Bovaird Drive & Worthington Avenue  
**TFR File #:** 1  
**Count date:** 29-Sep-2009

**Weather conditions:**  
Sunny  
**Person(s) who counted:**  
ZORAN

### \*\* Signalized Intersection \*\*

**Major Road:** Bovaird Drive runs W/E

North Leg Total: 562  
 North Entering: 348  
 North Peds: 5  
 Peds Cross:  $\bowtie$

Cyclists	1	0	0	1
Trucks	28	1	14	43
Cars	78	49	177	304
<b>Totals</b>	<b>107</b>	<b>50</b>	<b>191</b>	



Cyclists 0  
 Trucks 9  
 Cars 205  
 Totals 214

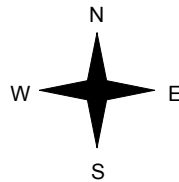
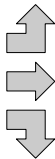
East Leg Total: 1378  
 East Entering: 616  
 East Peds: 15  
 Peds Cross:  $\bowtie$

Cyclists	8	Trucks	89	Cars	576	Totals	673
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Bovaird Dr

Cyclists	0	Trucks	2	Cars	88	Totals	90
	9		72		442		523
	0		1		37		38
	9		75		567		



Worthington Ave



Cars	62	Trucks	4	Cyclists	0	Totals	66
	451		60		7		518
	31		1		0		32
	544		65		7		



Bovaird Dr



Cars	664	Trucks	89	Cyclists	9	Totals	762
------	-----	--------	----	----------	---	--------	-----

Peds Cross:  $\bowtie$   
 West Peds: 8  
 West Entering: 651  
 West Leg Total: 1324

Cars	117
Trucks	3
Cyclists	0
<b>Totals</b>	<b>120</b>



Lake Louise Dr

Cars	47	55	45	147
Trucks	1	3	3	7
Cyclists	0	0	0	0
<b>Totals</b>	<b>48</b>	<b>58</b>	<b>48</b>	

Peds Cross:  $\bowtie$   
 South Peds: 2  
 South Entering: 154  
 South Leg Total: 274

## Comments

# MG8 ENG

## Afternoon Peak Diagram

### Specified Period

**From:** 15:00:00

**To:** 18:00:00

### One Hour Peak

**From:** 16:45:00

**To:** 17:45:00

**Municipality:** Region of Peel  
**Site #:** 10716989  
**Intersection:** Bovaird Drive & Worthington Avenue  
**TFR File #:** 1  
**Count date:** 29-Sep-2009

**Weather conditions:**  
Sunny  
**Person(s) who counted:**  
ZORAN

### \*\* Signalized Intersection \*\*

**Major Road:** Bovaird Drive runs W/E

North Leg Total: 817

North Entering: 349

North Peds: 3

Peds Cross:  $\times$

Cyclists	6	0	0	6
Trucks	58	1	5	64
Cars	88	39	152	279
<b>Totals</b>	<b>152</b>	<b>40</b>	<b>157</b>	



Cyclists 0

Trucks 27

Cars 441

Totals 468

East Leg Total: 1996

East Entering: 1275

East Peds: 17

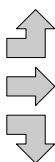
Peds Cross:  $\times$

Cyclists	13	Trucks	118	Cars	1056	Totals	1187
----------	----	--------	-----	------	------	--------	------

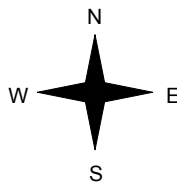


Bovaird Dr

Cyclists	0	Trucks	5	Cars	241	Totals	246
	3		43		507		553
	0		1		30		31
	3		49		778		



Lake Louise Dr



Worthington Ave



Cars	171	Trucks	22	Cyclists	0	Totals	193
	962		60		7		1029
	53		0		0		53
	1186		82		7		

Bovaird Dr



Cars	670	Trucks	48	Cyclists	3	Totals	721
------	-----	--------	----	----------	---	--------	-----

Peds Cross:  $\times$   
 West Peds: 30  
 West Entering: 830  
 West Leg Total: 2017

Cars	122
Trucks	2
Cyclists	0
<b>Totals</b>	<b>124</b>



Cars	6	29	11	46
Trucks	0	0	0	0
Cyclists	0	0	0	0
<b>Totals</b>	<b>6</b>	<b>29</b>	<b>11</b>	

Peds Cross:  $\times$   
 South Peds: 0  
 South Entering: 46  
 South Leg Total: 170

### Comments

# MG8 ENG

## Total Count Diagram

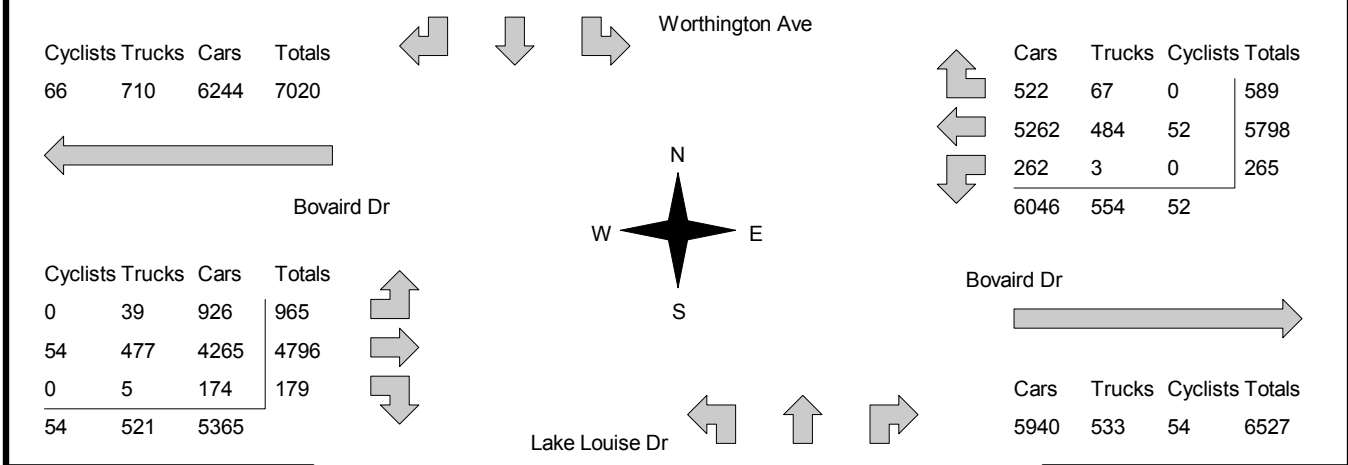
**Municipality:** Region of Peel  
**Site #:** 10716989  
**Intersection:** Bovaird Drive & Worthington Avenue  
**TFR File #:** 1  
**Count date:** 29-Sep-2009

**Weather conditions:**  
 Sunny  
**Person(s) who counted:**  
 ZORAN

**\*\* Signalized Intersection \*\***

**Major Road:** Bovaird Drive runs W/E

North Leg Total: 4816 North Entering: 2985 North Peds: 27 Peds Cross: ⚡	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>Cyclists</td><td>14</td><td>0</td><td>0</td><td>14</td></tr> <tr> <td>Trucks</td><td>225</td><td>17</td><td>51</td><td>293</td></tr> <tr> <td>Cars</td><td>823</td><td>391</td><td>1464</td><td>2678</td></tr> <tr> <td><b>Totals</b></td><td><b>1062</b></td><td><b>408</b></td><td><b>1515</b></td><td></td></tr> </table>	Cyclists	14	0	0	14	Trucks	225	17	51	293	Cars	823	391	1464	2678	<b>Totals</b>	<b>1062</b>	<b>408</b>	<b>1515</b>			<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>Cyclists</td><td>0</td></tr> <tr> <td>Trucks</td><td>116</td></tr> <tr> <td>Cars</td><td>1715</td></tr> <tr> <td><b>Totals</b></td><td><b>1831</b></td></tr> </table>	Cyclists	0	Trucks	116	Cars	1715	<b>Totals</b>	<b>1831</b>	East Leg Total: 13179 East Entering: 6652 East Peds: 179 Peds Cross: ⚡
Cyclists	14	0	0	14																												
Trucks	225	17	51	293																												
Cars	823	391	1464	2678																												
<b>Totals</b>	<b>1062</b>	<b>408</b>	<b>1515</b>																													
Cyclists	0																															
Trucks	116																															
Cars	1715																															
<b>Totals</b>	<b>1831</b>																															



Peds Cross: ⚡ West Peds: 86 West Entering: 5940 West Leg Total: 12960	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>Cars</td><td>827</td></tr> <tr> <td>Trucks</td><td>25</td></tr> <tr> <td>Cyclists</td><td>0</td></tr> <tr> <td><b>Totals</b></td><td><b>852</b></td></tr> </table>	Cars	827	Trucks	25	Cyclists	0	<b>Totals</b>	<b>852</b>		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>Cars</td><td>159</td><td>267</td><td>211</td><td>637</td></tr> <tr> <td>Trucks</td><td>1</td><td>10</td><td>5</td><td>16</td></tr> <tr> <td>Cyclists</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr> <td><b>Totals</b></td><td><b>160</b></td><td><b>277</b></td><td><b>216</b></td><td></td></tr> </table>	Cars	159	267	211	637	Trucks	1	10	5	16	Cyclists	0	0	0	0	<b>Totals</b>	<b>160</b>	<b>277</b>	<b>216</b>		Peds Cross: ⚡ South Peds: 10 South Entering: 653 South Leg Total: 1505
Cars	827																															
Trucks	25																															
Cyclists	0																															
<b>Totals</b>	<b>852</b>																															
Cars	159	267	211	637																												
Trucks	1	10	5	16																												
Cyclists	0	0	0	0																												
<b>Totals</b>	<b>160</b>	<b>277</b>	<b>216</b>																													

### Comments

# MG8 ENG

## Traffic Count Summary

Intersection: Bovaird Drive & Worthington Aven Count Date: 29-Sep-2009 Municipality: Region of Peel

North Approach Totals						North/South Total Approaches	South Approach Totals					
Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds		Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds
	Left	Thru	Right	Grand Total				Left	Thru	Right	Grand Total	
7:00:00	22	2	32	56	0	58	7:00:00	2	0	0	2	0
8:00:00	297	36	261	594	3	691	8:00:00	41	26	30	97	3
9:00:00	262	54	110	426	1	502	9:00:00	15	32	29	76	1
11:00:00	16	1	7	24	0	25	11:00:00	0	1	0	1	0
12:00:00	105	29	57	191	4	263	12:00:00	10	32	30	72	1
13:00:00	161	38	87	286	4	390	13:00:00	24	44	36	104	1
14:00:00	191	50	107	348	5	502	14:00:00	48	58	48	154	2
15:00:00	7	1	7	15	0	15	15:00:00	0	0	0	0	0
16:00:00	155	114	138	407	4	438	16:00:00	5	16	10	31	1
17:00:00	122	25	117	264	3	318	17:00:00	6	25	23	54	0
18:00:00	163	57	139	359	3	413	18:00:00	7	38	9	54	1
Totals:	1501	407	1062	2970	27	3615		158	272	215	645	10

East Approach Totals						East/West Total Approaches	West Approach Totals					
Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds		Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds
	Left	Thru	Right	Grand Total				Left	Thru	Right	Grand Total	
7:00:00	5	110	0	115	0	205	7:00:00	6	84	0	90	0
8:00:00	25	719	14	758	12	1609	8:00:00	100	739	12	851	6
9:00:00	19	597	14	630	20	1522	9:00:00	94	790	8	892	6
11:00:00	0	28	0	28	0	60	11:00:00	5	27	0	32	0
12:00:00	23	527	62	612	17	1237	12:00:00	68	536	21	625	6
13:00:00	25	476	55	556	24	1164	13:00:00	88	481	39	608	10
14:00:00	32	518	66	616	15	1267	14:00:00	90	523	38	651	8
15:00:00	0	20	2	22	0	38	15:00:00	4	12	0	16	1
16:00:00	36	843	63	942	58	1586	16:00:00	92	535	17	644	2
17:00:00	48	912	151	1111	16	1842	17:00:00	152	566	13	731	14
18:00:00	52	1035	156	1243	17	2027	18:00:00	259	498	27	784	32
Totals:	265	5785	583	6633	179	12557		958	4791	175	5924	85

### Calculated Values for Traffic Crossing Major Street

Hours Ending:	8:00	9:00	12:00	13:00		14:00	16:00	17:00	18:00
Crossing Values:	392	357	170	263		320	334	183	276

# MG8 ENG

## Morning Peak Diagram

### Specified Period

**From:** 7:00:00

**To:** 9:00:00

### One Hour Peak

**From:** 7:30:00

**To:** 8:30:00

**Municipality:** Region of Peel  
**Site #:** na  
**Intersection:** Bovaird Drive & Ashby Field  
**TFR File #:** 1  
**Count date:** 1-Dec-2009

**Weather conditions:**  
 Cold, light snow in the morning  
**Person(s) who counted:**  
 MIRELA

**\*\* Signalized Intersection \*\***

**Major Road:** Bovaird Drive runs W/E

North Leg Total: 272

North Entering: 54

North Peds: 0

Peds Cross:  $\times$

Cyclists	0	0	0	0
Trucks	1	0	0	1
Cars	9	15	29	53
<b>Totals</b>	<b>10</b>	<b>15</b>	<b>29</b>	



Cyclists 0

Trucks 3

Cars 215

**Totals 218**

East Leg Total: 1848

East Entering: 924

East Peds: 8

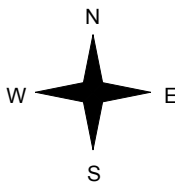
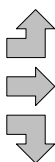
Peds Cross:  $\times$

Cyclists	0	Trucks	49	Cars	734	Totals	783
----------	---	--------	----	------	-----	--------	-----



Bovaird Dr

Cyclists	0	Trucks	3	Cars	20	Totals	23
	0		47		781		828
	0		1		30		31
	0		51		831		



GO Transit Access

Cars	167	Trucks	0	Cyclists	0	Totals	167
	666		47		0		713
	42		2		0		44
	875		49		0		



Bovaird Dr



Peds Cross:  $\times$   
 West Peds: 0  
 West Entering: 882  
 West Leg Total: 1665

Cars	87	Cars	59	28	66	153
Trucks	3	Trucks	1	0	1	2
Cyclists	0	Cyclists	0	0	0	0
<b>Totals</b>	<b>90</b>	<b>Totals</b>	<b>60</b>	<b>28</b>	<b>67</b>	



Ashby Field



Peds Cross:  $\times$   
 South Peds: 1  
 South Entering: 155  
 South Leg Total: 245

## Comments

# MG8 ENG

## Mid-day Peak Diagram

### Specified Period

**From:** 11:00:00

**To:** 14:00:00

### One Hour Peak

**From:** 12:00:00

**To:** 13:00:00

**Municipality:** Region of Peel  
**Site #:** na  
**Intersection:** Bovaird Drive & Ashby Field  
**TFR File #:** 1  
**Count date:** 1-Dec-2009

**Weather conditions:**  
 Cold, light snow in the morning  
**Person(s) who counted:**  
 MIRELA

**\*\* Signalized Intersection \*\***

**Major Road:** Bovaird Drive runs W/E

North Leg Total: 59  
 North Entering: 31  
 North Peds: 1  
 Peds Cross:  $\bowtie$

Cyclists	0	0	0	0
Trucks	2	0	0	2
Cars	5	2	22	29
<b>Totals</b>	<b>7</b>	<b>2</b>	<b>22</b>	

Cyclists	0
Trucks	2
Cars	26
<b>Totals</b>	<b>28</b>

East Leg Total: 1111  
 East Entering: 568  
 East Peds: 10  
 Peds Cross:  $\bowtie$

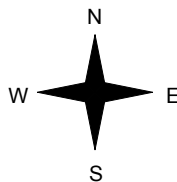
Cyclists	Trucks	Cars	Totals
0	59	462	521



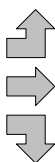
Cars	Trucks	Cyclists	Totals
19	0	0	19
432	54	0	486
63	0	0	63
<b>514</b>	<b>54</b>	<b>0</b>	



Bovaird Dr



Cyclists	Trucks	Cars	Totals
0	2	6	8
0	48	421	469
0	5	22	27
<b>0</b>	<b>55</b>	<b>449</b>	



Ashby Field

Bovaird Dr



Cars	Trucks	Cyclists	Totals
493	50	0	543

Peds Cross:  $\bowtie$   
 West Peds: 0  
 West Entering: 504  
 West Leg Total: 1025

Cars	87	Cars	25	1	50	76
Trucks	5	Trucks	3	0	2	5
Cyclists	0	Cyclists	0	0	0	0
<b>Totals</b>	<b>92</b>	<b>Totals</b>	<b>28</b>	<b>1</b>	<b>52</b>	



Peds Cross:  $\bowtie$   
 South Peds: 2  
 South Entering: 81  
 South Leg Total: 173

## Comments

# MG8 ENG

## Afternoon Peak Diagram

### Specified Period

**From:** 15:00:00

**To:** 18:00:00

### One Hour Peak

**From:** 16:45:00

**To:** 17:45:00

**Municipality:** Region of Peel  
**Site #:** na  
**Intersection:** Bovaird Drive & Ashby Field  
**TFR File #:** 1  
**Count date:** 1-Dec-2009

**Weather conditions:**  
 Cold, light snow in the morning  
**Person(s) who counted:**  
 MIRELA

**\*\* Signalized Intersection \*\***

**Major Road:** Bovaird Drive runs W/E

North Leg Total: 336  
 North Entering: 280  
 North Peds: 0  
 Peds Cross:  $\bowtie$

Cyclists	0	0	0	0
Trucks	0	0	0	0
Cars	46	57	177	280
Totals	46	57	177	

Cyclists	0
Trucks	0
Cars	56
Totals	56

East Leg Total: 2007  
 East Entering: 984  
 East Peds: 11  
 Peds Cross:  $\bowtie$

Cyclists	0
Trucks	35
Cars	905
Totals	940

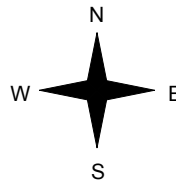


GO Transit Access

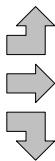
Cars	37	0	0	37
Trucks	822	33	0	855
Cyclists	92	0	0	92
Totals	951	33	0	



Bovaird Dr



Cyclists	0
Trucks	0
Cars	6
Totals	6
Cyclists	0
Trucks	43
Cars	722
Totals	765
Cyclists	0
Trucks	1
Cars	65
Totals	66
Cyclists	0
Trucks	44
Cars	793
Totals	

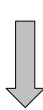


Bovaird Dr



Peds Cross:  $\bowtie$   
 West Peds: 5  
 West Entering: 837  
 West Leg Total: 1777

Cars	214	37	13	81	131
Trucks	1	2	0	0	2
Cyclists	0	0	0	0	0
Totals	215	39	13	81	



Ashby Field



Peds Cross:  $\bowtie$   
 South Peds: 1  
 South Entering: 133  
 South Leg Total: 348

## Comments



# MG8 ENG

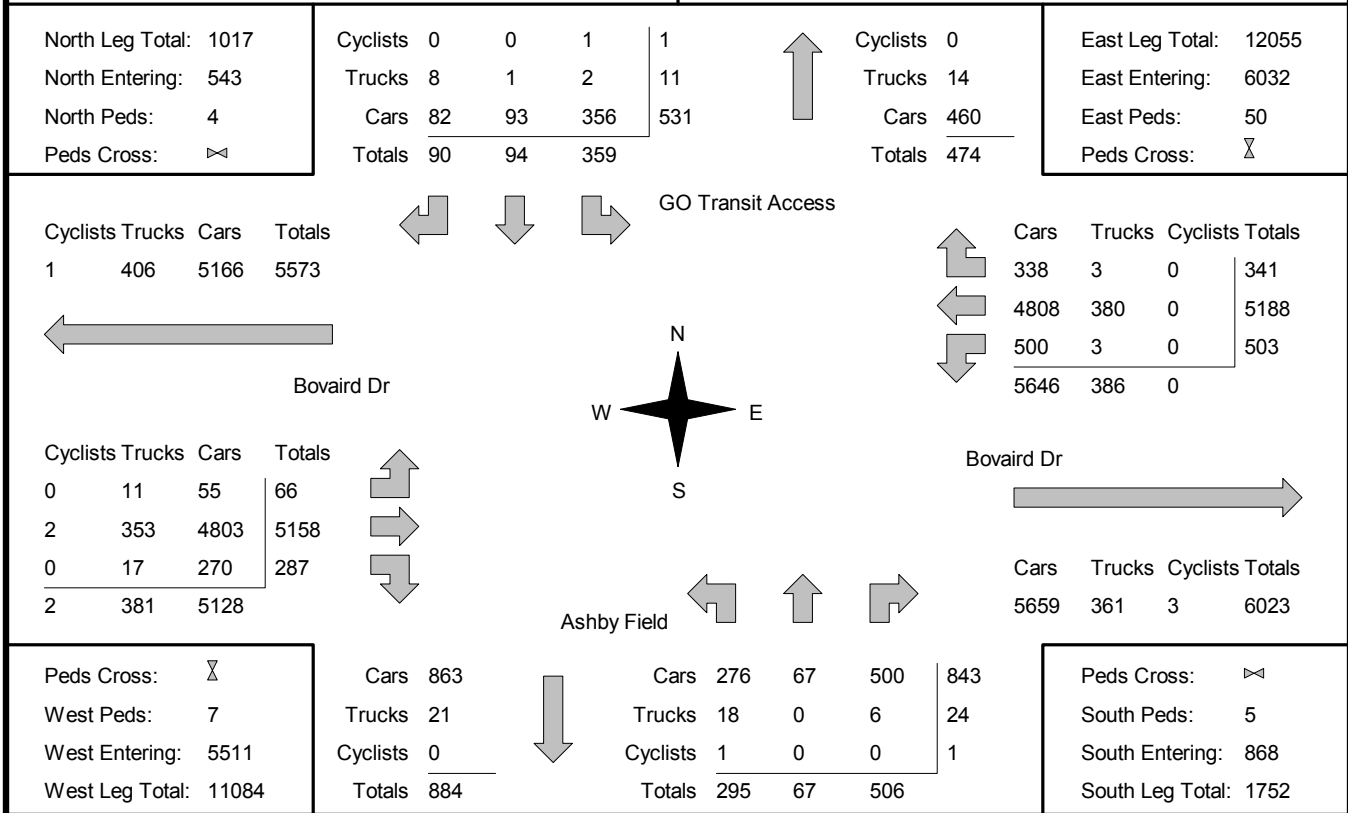
## Total Count Diagram

**Municipality:** Region of Peel  
**Site #:** na  
**Intersection:** Bovaird Drive & Ashby Field  
**TFR File #:** 1  
**Count date:** 1-Dec-2009

**Weather conditions:**  
 Cold, light snow in the morning  
**Person(s) who counted:**  
 MIRELA

**\*\* Signalized Intersection \*\***

**Major Road:** Bovaird Drive runs W/E



### Comments

# MG8 ENG

## Traffic Count Summary

Intersection: Bovaird Drive & Ashby Field						Count Date: 1-Dec-2009		Municipality: Region of Peel					
North Approach Totals						North/South Total Approaches	South Approach Totals						
Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds		Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds	
	Left	Thru	Right	Grand Total				Left	Thru	Right	Grand Total		
7:00:00	0	0	0	0	0	0	7:00:00	0	0	0	0	0	
8:00:00	38	17	10	65	0	211	8:00:00	53	33	60	146	0	
9:00:00	22	5	5	32	0	172	9:00:00	56	3	81	140	1	
11:00:00	1	1	1	3	0	6	11:00:00	1	0	2	3	0	
12:00:00	13	3	7	23	1	108	12:00:00	18	8	59	85	0	
13:00:00	22	2	7	31	1	112	13:00:00	28	1	52	81	2	
14:00:00	16	2	2	20	1	94	14:00:00	29	1	44	74	1	
15:00:00	0	0	0	0	0	0	15:00:00	0	0	0	0	0	
16:00:00	24	3	5	32	0	136	16:00:00	32	4	68	104	0	
17:00:00	26	3	5	34	1	144	17:00:00	43	6	61	110	0	
18:00:00	197	58	48	303	0	428	18:00:00	35	11	79	125	1	
<b>Totals:</b>	<b>359</b>	<b>94</b>	<b>90</b>	<b>543</b>	<b>4</b>	<b>1411</b>		<b>295</b>	<b>67</b>	<b>506</b>	<b>868</b>	<b>5</b>	
East Approach Totals						East/West Total Approaches	West Approach Totals						
Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds		Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds	
	Left	Thru	Right	Grand Total				Left	Thru	Right	Grand Total		
7:00:00	0	0	0	0	0	0	7:00:00	0	0	0	0	0	
8:00:00	27	674	192	893	7	1714	8:00:00	27	764	30	821	0	
9:00:00	50	662	21	733	2	1553	9:00:00	8	782	30	820	0	
11:00:00	1	21	2	24	0	46	11:00:00	0	20	2	22	0	
12:00:00	34	451	15	500	4	990	12:00:00	5	472	13	490	1	
13:00:00	63	486	19	568	10	1072	13:00:00	8	469	27	504	0	
14:00:00	51	458	16	525	5	994	14:00:00	4	446	19	469	1	
15:00:00	0	0	0	0	0	1	15:00:00	0	1	0	1	0	
16:00:00	88	751	17	856	10	1608	16:00:00	5	702	45	752	0	
17:00:00	89	883	21	993	2	1791	17:00:00	4	738	56	798	0	
18:00:00	100	802	38	940	10	1774	18:00:00	5	764	65	834	5	
<b>Totals:</b>	<b>503</b>	<b>5188</b>	<b>341</b>	<b>6032</b>	<b>50</b>	<b>11543</b>		<b>66</b>	<b>5158</b>	<b>287</b>	<b>5511</b>	<b>7</b>	
Calculated Values for Traffic Crossing Major Street													
Hours Ending:	8:00	9:00	12:00	13:00		14:00	16:00	17:00	18:00				
Crossing Values:	131	85	44	62		53	70	77	305				

# MG8 ENG

## Morning Peak Diagram

### Specified Period

**From:** 7:00:00

**To:** 9:00:00

### One Hour Peak

**From:** 7:45:00

**To:** 8:45:00

**Municipality:** Region of Peel  
**Site #:** na  
**Intersection:** Bovaird Drive & Mississauga Road  
**TFR File #:** 1  
**Count date:** 1-Dec-2009

**Weather conditions:**  
 Clear weather, light snow in the morning  
**Person(s) who counted:**  
 MOMO  
 MIROSLAV

**\*\* Signalized Intersection \*\***

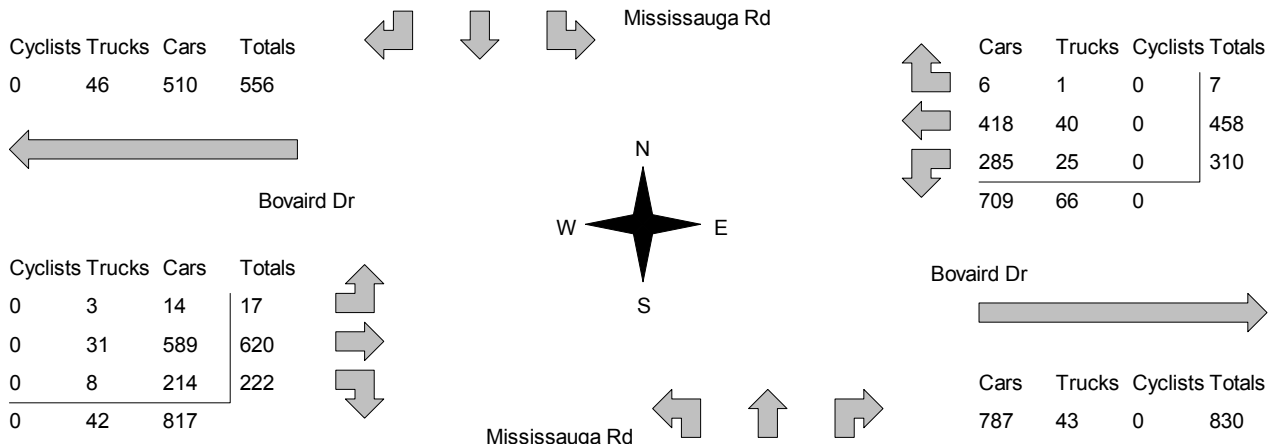
**Major Road:** Bovaird Drive runs W/E

North Leg Total: 622  
 North Entering: 506  
 North Peds: 0  
 Peds Cross:  $\times$

Cyclists	0	0	0	0
Trucks	1	17	2	20
Cars	12	457	17	486
<b>Totals</b>	<b>13</b>	<b>474</b>	<b>19</b>	

Cyclists	0
Trucks	13
Cars	103
<b>Totals</b>	<b>116</b>

East Leg Total: 1605  
 East Entering: 775  
 East Peds: 0  
 Peds Cross:  $\times$



Peds Cross:  $\times$   
 West Peds: 0  
 West Entering: 859  
 West Leg Total: 1415

Cars	956	Cars	80	83	181	344
Trucks	50	Trucks	5	9	10	24
Cyclists	0	Cyclists	0	0	0	0
<b>Totals</b>	<b>1006</b>	<b>Totals</b>	<b>85</b>	<b>92</b>	<b>191</b>	

Peds Cross:  $\times$   
 South Peds: 0  
 South Entering: 368  
 South Leg Total: 1374

### Comments

# MG8 ENG

## Mid-day Peak Diagram

### Specified Period

**From:** 11:00:00

**To:** 14:00:00

### One Hour Peak

**From:** 12:45:00

**To:** 13:45:00

**Municipality:** Region of Peel  
**Site #:** na  
**Intersection:** Bovaird Drive & Mississauga Road  
**TFR File #:** 1  
**Count date:** 1-Dec-2009

**Weather conditions:**  
 Clear weather, light snow in the morning  
**Person(s) who counted:**  
 MOMO  
 MIROSLAV

**\*\* Signalized Intersection \*\***

**Major Road:** Bovaird Drive runs W/E

North Leg Total: 226  
 North Entering: 115  
 North Peds: 0  
 Peds Cross:  $\bowtie$

Cyclists	0	0	0	0
Trucks	2	13	2	17
Cars	12	68	18	98
<b>Totals</b>	<b>14</b>	<b>81</b>	<b>20</b>	



Cyclists	0
Trucks	18
Cars	93
<b>Totals</b>	<b>111</b>

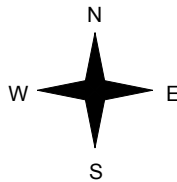
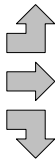
East Leg Total: 976  
 East Entering: 496  
 East Peds: 0  
 Peds Cross:  $\bowtie$

Cyclists	Trucks	Cars	Totals
0	63	362	425



Bovaird Dr

Cyclists	Trucks	Cars	Totals
0	7	11	18
0	46	282	328
0	12	62	74
0	65	355	



Mississauga Rd

Mississauga Rd

Cars	Trucks	Cyclists	Totals
17	3	0	20
285	43	0	328
124	24	0	148
426	70	0	



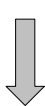
Bovaird Dr



Cars	Trucks	Cyclists	Totals
415	65	0	480

Peds Cross:  $\bowtie$   
 West Peds: 0  
 West Entering: 420  
 West Leg Total: 845

Cars	254
Trucks	49
Cyclists	0
<b>Totals</b>	<b>303</b>



Cars	65	65	115	245
Trucks	18	8	17	43
Cyclists	0	0	0	0
<b>Totals</b>	<b>83</b>	<b>73</b>	<b>132</b>	

Peds Cross:  $\bowtie$   
 South Peds: 0  
 South Entering: 288  
 South Leg Total: 591

## Comments

# MG8 ENG

## Afternoon Peak Diagram

### Specified Period

**From:** 15:00:00

**To:** 18:00:00

### One Hour Peak

**From:** 16:15:00

**To:** 17:15:00

**Municipality:** Region of Peel  
**Site #:** na  
**Intersection:** Bovaird Drive & Mississauga Road  
**TFR File #:** 1  
**Count date:** 1-Dec-2009

**Weather conditions:**  
 Clear weather, light snow in the morning  
**Person(s) who counted:**  
 MOMO  
 MIROSLAV

**\*\* Signalized Intersection \*\***

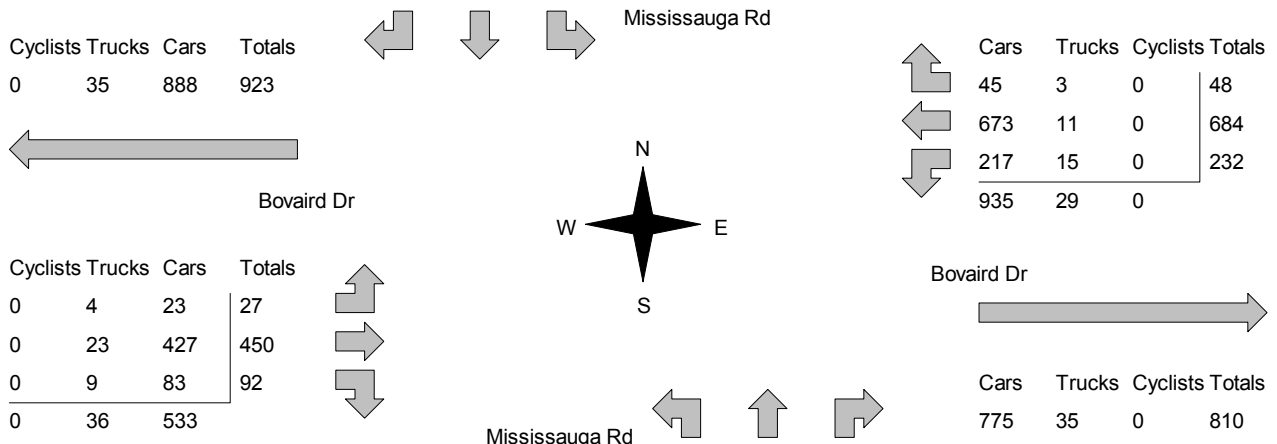
**Major Road:** Bovaird Drive runs W/E

North Leg Total: 709  
 North Entering: 201  
 North Peds: 0  
 Peds Cross:  $\times$

Cyclists	0	0	0	0
Trucks	4	7	0	11
Cars	13	156	21	190
<b>Totals</b>	<b>17</b>	<b>163</b>	<b>21</b>	

Cyclists	0
Trucks	21
Cars	487
<b>Totals</b>	<b>508</b>

East Leg Total: 1774  
 East Entering: 964  
 East Peds: 0  
 Peds Cross:  $\times$



Peds Cross:  $\times$   
 West Peds: 0  
 West Entering: 569  
 West Leg Total: 1492

Cars	456	Cars	202	419	327	948
Trucks	31	Trucks	20	14	12	46
Cyclists	0	Cyclists	0	0	0	0
<b>Totals</b>	<b>487</b>	<b>Totals</b>	<b>222</b>	<b>433</b>	<b>339</b>	

Peds Cross:  $\times$   
 South Peds: 0  
 South Entering: 994  
 South Leg Total: 1481

## Comments

# MG8 ENG

## Total Count Diagram

**Municipality:** Region of Peel  
**Site #:** na  
**Intersection:** Bovaird Drive & Mississauga Road  
**TFR File #:** 1  
**Count date:** 1-Dec-2009

**Weather conditions:**  
 Clear weather, light snow in the morning  
**Person(s) who counted:**  
 MOMO  
 MIROSLAV

**\*\* Signalized Intersection \*\***

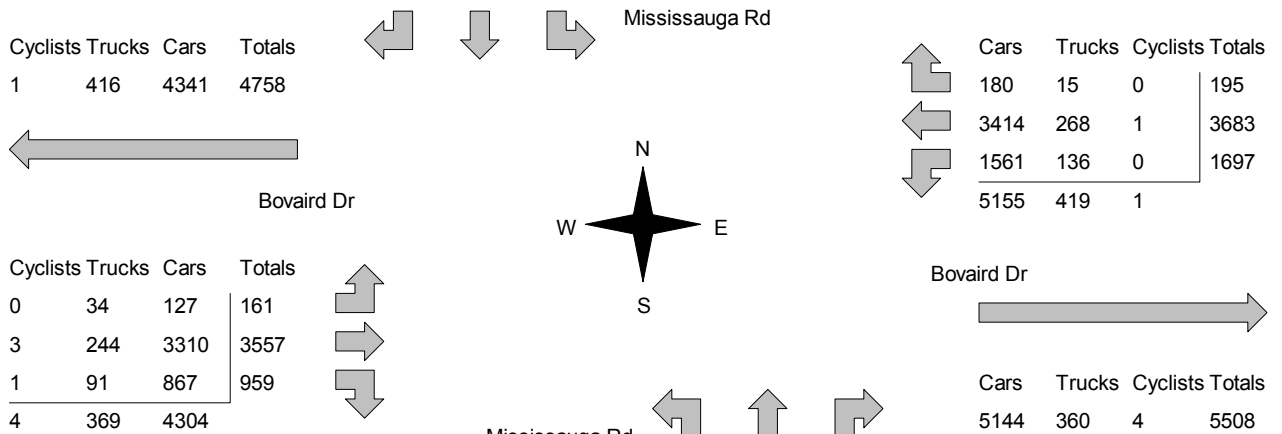
**Major Road:** Bovaird Drive runs W/E

North Leg Total: 3675  
 North Entering: 1858  
 North Peds: 2  
 Peds Cross:  $\times$

Cyclists	0	0	0	0
Trucks	36	102	14	152
Cars	93	1467	146	1706
Totals	129	1569	160	

Cyclists	0
Trucks	133
Cars	1684
Totals	1817

East Leg Total: 11083  
 East Entering: 5575  
 East Peds: 2  
 Peds Cross:  $\times$



Peds Cross:  $\times$   
 West Peds: 0  
 West Entering: 4677  
 West Leg Total: 9435

Cars	3895	Cars	834	1377	1688	3899
Trucks	329	Trucks	112	84	102	298
Cyclists	1	Cyclists	0	0	1	1
Totals	4225	Totals	946	1461	1791	

Peds Cross:  $\times$   
 South Peds: 2  
 South Entering: 4198  
 South Leg Total: 8423

### Comments

# MG8 ENG

## Traffic Count Summary

Intersection: Bovaird Drive & Mississauga Road    Count Date: 1-Dec-2009    Municipality: Region of Peel

North Approach Totals						North/South Total Approaches	South Approach Totals					
Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds		Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds
	Left	Thru	Right	Grand Total				Left	Thru	Right	Grand Total	
7:00:00	0	0	0	0	0	0	7:00:00	0	0	0	0	0
8:00:00	15	412	10	437	0	796	8:00:00	70	95	194	359	0
9:00:00	15	459	17	491	0	855	9:00:00	80	93	191	364	0
11:00:00	5	37	0	42	0	90	11:00:00	17	10	21	48	0
12:00:00	21	104	18	143	0	400	12:00:00	64	67	126	257	0
13:00:00	19	94	16	129	0	436	13:00:00	88	83	136	307	0
14:00:00	11	82	18	111	0	395	14:00:00	88	84	112	284	0
15:00:00	0	5	1	6	0	8	15:00:00	0	0	2	2	0
16:00:00	33	96	14	143	0	779	16:00:00	149	235	252	636	0
17:00:00	25	161	17	203	0	1180	17:00:00	204	429	344	977	2
18:00:00	16	119	18	153	2	1117	18:00:00	186	365	413	964	0
Totals:	160	1569	129	1858	2	6056		946	1461	1791	4198	2

East Approach Totals						East/West Total Approaches	West Approach Totals					
Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds		Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds
	Left	Thru	Right	Grand Total				Left	Thru	Right	Grand Total	
7:00:00	0	0	0	0	0	0	7:00:00	0	0	0	0	0
8:00:00	256	379	6	641	1	1517	8:00:00	11	622	243	876	0
9:00:00	331	469	10	810	0	1632	9:00:00	20	602	200	822	0
11:00:00	35	66	1	102	0	187	11:00:00	2	64	19	85	0
12:00:00	143	277	27	447	0	850	12:00:00	13	310	80	403	0
13:00:00	141	297	19	457	0	867	13:00:00	26	311	73	410	0
14:00:00	154	351	18	523	0	915	14:00:00	16	312	64	392	0
15:00:00	7	13	3	23	0	26	15:00:00	1	2	0	3	0
16:00:00	189	571	15	775	0	1330	16:00:00	20	429	106	555	0
17:00:00	230	653	23	906	0	1469	17:00:00	28	443	92	563	0
18:00:00	211	607	73	891	1	1459	18:00:00	24	462	82	568	0
Totals:	1697	3683	195	5575	2	10252		161	3557	959	4677	0

### Calculated Values for Traffic Crossing Major Street

Hours Ending:	8:00	9:00	12:00	13:00	14:00	16:00	17:00	18:00
Crossing Values:	498	554	189	201	183	417	658	568

# MG8 ENG

## Morning Peak Diagram

### Specified Period

**From:** 7:00:00

**To:** 9:00:00

### One Hour Peak

**From:** 7:30:00

**To:** 8:30:00

**Municipality:** Region of Peel  
**Site #:** 10720341  
**Intersection:** Bovaird Drive & Heritage Rd  
**TFR File #:** 2  
**Count date:** 1-Dec-2009

**Weather conditions:**  
 Clear and cold, light snow  
**Person(s) who counted:**  
 VELE

**\*\* Signalized Intersection \*\***

**Major Road:** Bovaird Drive runs W/E

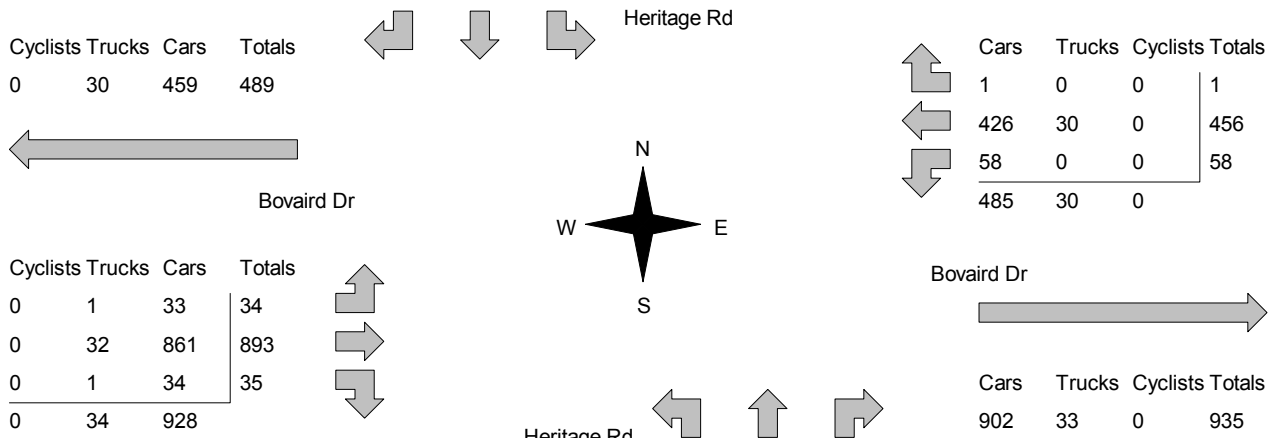
North Leg Total: 202  
 North Entering: 159  
 North Peds: 0  
 Peds Cross:  $\bowtie$

Cyclists	0	0	0	0
Trucks	0	1	0	1
Cars	27	109	22	158
<b>Totals</b>	<b>27</b>	<b>110</b>	<b>22</b>	



Cyclists	0
Trucks	2
Cars	41
<b>Totals</b>	<b>43</b>

East Leg Total: 1450  
 East Entering: 515  
 East Peds: 0  
 Peds Cross:  $\bowtie$



Peds Cross:  $\bowtie$   
 West Peds: 0  
 West Entering: 962  
 West Leg Total: 1451

Cars	201
Trucks	2
Cyclists	0
<b>Totals</b>	<b>203</b>



Cars	6	7	19	32
Trucks	0	1	1	2
Cyclists	0	0	0	0
<b>Totals</b>	<b>6</b>	<b>8</b>	<b>20</b>	

Peds Cross:  $\bowtie$   
 South Peds: 0  
 South Entering: 34  
 South Leg Total: 237

## Comments



# MG8 ENG

## Mid-day Peak Diagram

### Specified Period

**From:** 11:00:00

**To:** 14:00:00

### One Hour Peak

**From:** 12:30:00

**To:** 13:30:00

**Municipality:** Region of Peel  
**Site #:** 10720341  
**Intersection:** Bovaird Drive & Heritage Rd  
**TFR File #:** 2  
**Count date:** 1-Dec-2009

**Weather conditions:**  
 Clear and cold, light snow  
**Person(s) who counted:**  
 VELE

**\*\* Signalized Intersection \*\***

**Major Road:** Bovaird Drive runs W/E

North Leg Total: 29  
 North Entering: 14  
 North Peds: 0  
 Peds Cross:  $\bowtie$

Cyclists	0	0	0	0
Trucks	0	1	0	1
Cars	8	2	3	13
<b>Totals</b>	<b>8</b>	<b>3</b>	<b>3</b>	



Cyclists	0
Trucks	1
Cars	14
<b>Totals</b>	<b>15</b>

East Leg Total: 863  
 East Entering: 435  
 East Peds: 0  
 Peds Cross:  $\bowtie$

Cyclists	Trucks	Cars	Totals
0	59	364	423

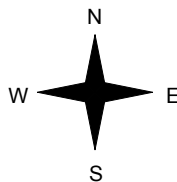


Heritage Rd

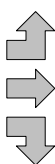
Cars	Trucks	Cyclists	Totals
8	1	0	9
350	59	0	409
17	0	0	17
<b>375</b>	<b>60</b>	<b>0</b>	



Bovaird Dr



Cyclists	Trucks	Cars	Totals
0	0	5	5
0	51	368	419
0	0	18	18
<b>0</b>	<b>51</b>	<b>391</b>	



Bovaird Dr



Peds Cross:  $\bowtie$   
 West Peds: 0  
 West Entering: 442  
 West Leg Total: 865

Cars	37	Cars	6	1	6	13
Trucks	1	Trucks	0	0	0	0
Cyclists	0	Cyclists	0	0	0	0
<b>Totals</b>	<b>38</b>	<b>Totals</b>	<b>6</b>	<b>1</b>	<b>6</b>	



Heritage Rd



Peds Cross:  $\bowtie$   
 South Peds: 0  
 South Entering: 13  
 South Leg Total: 51

## Comments

# MG8 ENG

## Afternoon Peak Diagram

### Specified Period

**From:** 15:00:00

**To:** 18:00:00

### One Hour Peak

**From:** 16:30:00

**To:** 17:30:00

**Municipality:** Region of Peel  
**Site #:** 10720341  
**Intersection:** Bovaird Drive & Heritage Rd  
**TFR File #:** 2  
**Count date:** 1-Dec-2009

**Weather conditions:**  
 Clear and cold, light snow  
**Person(s) who counted:**  
 VELE

**\*\* Signalized Intersection \*\***

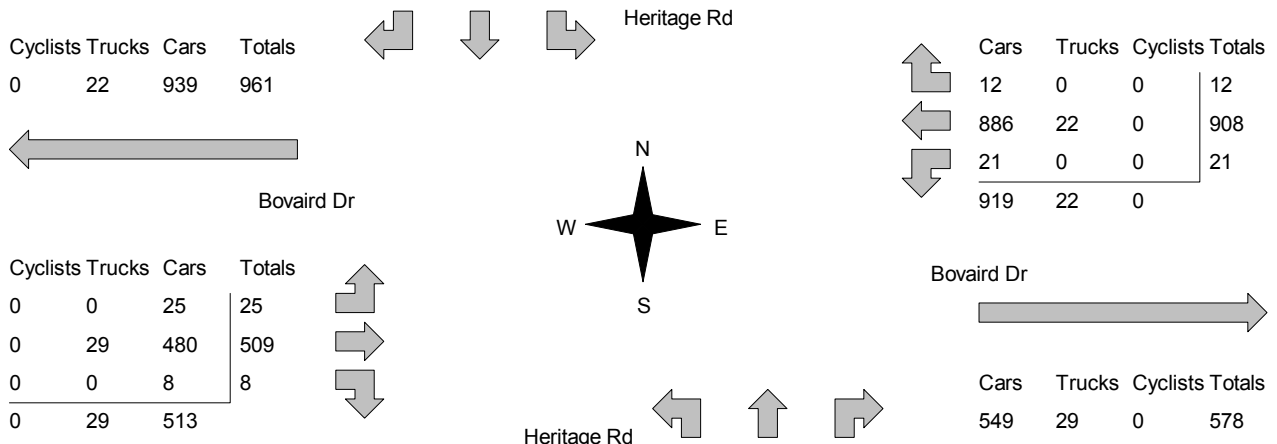
**Major Road:** Bovaird Drive runs W/E

North Leg Total: 168  
 North Entering: 20  
 North Peds: 0  
 Peds Cross:  $\bowtie$

Cyclists	0	0	0	0
Trucks	0	0	0	0
Cars	7	9	4	20
<b>Totals</b>	<b>7</b>	<b>9</b>	<b>4</b>	

Cyclists	0
Trucks	0
Cars	148
<b>Totals</b>	<b>148</b>

East Leg Total: 1519  
 East Entering: 941  
 East Peds: 0  
 Peds Cross:  $\bowtie$



Peds Cross:  $\bowtie$   
 West Peds: 0  
 West Entering: 542  
 West Leg Total: 1503

Cars	38	Cars	46	111	65	222
Trucks	0	Trucks	0	0	0	0
Cyclists	0	Cyclists	0	0	0	0
<b>Totals</b>	<b>38</b>	<b>Totals</b>	<b>46</b>	<b>111</b>	<b>65</b>	

Peds Cross:  $\bowtie$   
 South Peds: 0  
 South Entering: 222  
 South Leg Total: 260

## Comments

# MG8 ENG

## Total Count Diagram

**Municipality:** Region of Peel  
**Site #:** 10720341  
**Intersection:** Bovaird Drive & Heritage Rd  
**TFR File #:** 2  
**Count date:** 1-Dec-2009

**Weather conditions:**  
 Clear and cold, light snow  
**Person(s) who counted:**  
 VELE

**\*\* Signalized Intersection \*\***

**Major Road:** Bovaird Drive runs W/E

North Leg Total: 784  
 North Entering: 380  
 North Peds: 1  
 Peds Cross:  $\bowtie$

Cyclists	0	0	0	0
Trucks	0	3	2	5
Cars	90	227	58	375
<b>Totals</b>	<b>90</b>	<b>230</b>	<b>60</b>	



Cyclists	0
Trucks	5
Cars	399
<b>Totals</b>	<b>404</b>

East Leg Total: 9445  
 East Entering: 4729  
 East Peds: 0  
 Peds Cross:  $\bowtie$

Cyclists	Trucks	Cars	Totals
1	326	4336	4663

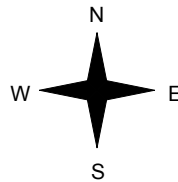


Heritage Rd

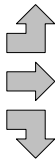
Cars	Trucks	Cyclists	Totals
55	3	0	58
4129	326	1	4456
212	3	0	215
<b>4396</b>	<b>332</b>	<b>1</b>	



Bovaird Dr



Cyclists	Trucks	Cars	Totals
0	1	124	125
0	323	4148	4471
1	3	124	128
<b>1</b>	<b>327</b>	<b>4396</b>	



Bovaird Dr



Cars	Trucks	Cyclists	Totals
4384	331	1	4716

Heritage Rd



Peds Cross:  $\bowtie$   
 West Peds: 0  
 West Entering: 4724  
 West Leg Total: 9387

Cars	563	Cars	117	220	178	515
Trucks	9	Trucks	0	1	6	7
Cyclists	1	Cyclists	0	0	1	1
<b>Totals</b>	<b>573</b>	<b>Totals</b>	<b>117</b>	<b>221</b>	<b>185</b>	



Peds Cross:  $\bowtie$   
 South Peds: 2  
 South Entering: 523  
 South Leg Total: 1096

### Comments

# MG8 ENG

## Traffic Count Summary

Intersection: Bovaird Drive & Heritage Rd      Count Date: 1-Dec-2009      Municipality: Region of Peel

North Approach Totals						North/South Total Approaches	South Approach Totals					
Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds		Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds
	Left	Thru	Right	Grand Total				Left	Thru	Right	Grand Total	
7:00:00	0	0	0	0	0	0	7:00:00	0	0	0	0	0
8:00:00	19	116	12	147	0	167	8:00:00	3	6	11	20	0
9:00:00	17	75	27	119	0	154	9:00:00	9	9	17	35	0
11:00:00	1	1	2	4	0	13	11:00:00	7	2	0	9	0
12:00:00	3	8	15	26	0	52	12:00:00	9	6	11	26	0
13:00:00	0	1	4	5	0	16	13:00:00	4	3	4	11	0
14:00:00	6	5	7	18	0	34	14:00:00	6	1	9	16	2
15:00:00	0	0	0	0	0	0	15:00:00	0	0	0	0	0
16:00:00	4	8	7	19	1	64	16:00:00	8	21	16	45	0
17:00:00	7	9	8	24	0	157	17:00:00	23	68	42	133	0
18:00:00	3	7	8	18	0	246	18:00:00	48	105	75	228	0
Totals:	60	230	90	380	1	903		117	221	185	523	2

East Approach Totals						East/West Total Approaches	West Approach Totals					
Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds		Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds
	Left	Thru	Right	Grand Total				Left	Thru	Right	Grand Total	
7:00:00	0	0	0	0	0	0	7:00:00	0	0	0	0	0
8:00:00	57	406	4	467	0	1417	8:00:00	13	922	15	950	0
9:00:00	59	504	1	564	0	1426	9:00:00	34	786	42	862	0
11:00:00	1	23	1	25	0	57	11:00:00	0	30	2	32	0
12:00:00	9	342	1	352	0	800	12:00:00	14	415	19	448	0
13:00:00	15	396	5	416	0	844	13:00:00	4	415	9	428	0
14:00:00	15	440	8	463	0	866	14:00:00	7	380	16	403	0
15:00:00	0	0	0	0	0	0	15:00:00	0	0	0	0	0
16:00:00	20	685	7	712	0	1251	16:00:00	7	522	10	539	0
17:00:00	25	869	15	909	0	1450	17:00:00	24	511	6	541	0
18:00:00	14	786	16	816	0	1337	18:00:00	22	490	9	521	0
Totals:	215	4451	58	4724	0	9448		125	4471	128	4724	0

### Calculated Values for Traffic Crossing Major Street

Hours Ending:	8:00	9:00	12:00	13:00		14:00	16:00	17:00	18:00
Crossing Values:	138	101	20	7		17	33	98	156

# MG8 ENG

## Morning Peak Diagram

### Specified Period

**From:** 7:00:00

**To:** 9:00:00

### One Hour Peak

**From:** 7:30:00

**To:** 8:30:00

**Municipality:** Region of Peel  
**Site #:** na  
**Intersection:** Bovaird Drive & Caseley Street  
**TFR File #:** 1  
**Count date:** 1-Dec-2009

**Weather conditions:**  
 Cold with light snow in the morning  
**Person(s) who counted:**  
 ZORAN

**\*\* Non-Signalized Intersection \*\***

**Major Road:** Bovaird Drive runs W/E

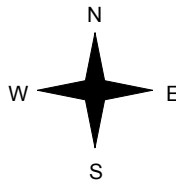
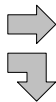
East Leg Total: 1433  
 East Entering: 482  
 East Peds: 4  
 Peds Cross: X

Cyclists	Trucks	Cars	Totals
12	35	438	485



Bovaird Dr

Cyclists	Trucks	Cars	Totals
11	34	897	942
7	4	4	15
18	38	901	



Caseley St

Cars	Trucks	Cyclists	Totals
------	--------	----------	--------

432	33	11	476
3	1	2	6
435	34	13	



Bovaird Dr

Cars	Trucks	Cyclists	Totals
903	36	12	951



Peds Cross: X  
 West Peds: 5  
 West Entering: 957  
 West Leg Total: 1442

Cars	7
Trucks	5
Cyclists	9
Totals	21



Cars	6	6	12
Trucks	2	2	4
Cyclists	1	1	2
Totals	9	9	

Peds Cross: X  
 South Peds: 1  
 South Entering: 18  
 South Leg Total: 39

## Comments

# MG8 ENG

## Mid-day Peak Diagram

### Specified Period

**From:** 11:00:00

**To:** 14:00:00

### One Hour Peak

**From:** 12:30:00

**To:** 13:30:00

**Municipality:** Region of Peel  
**Site #:** na  
**Intersection:** Bovaird Drive & Caseley Street  
**TFR File #:** 1  
**Count date:** 1-Dec-2009

**Weather conditions:**  
Cold with light snow in the morning

**Person(s) who counted:**  
ZORAN

**\*\* Non-Signalized Intersection \*\***

**Major Road:** Bovaird Drive runs W/E

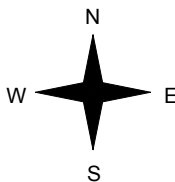
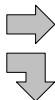
East Leg Total: 875  
 East Entering: 425  
 East Peds: 5  
 Peds Cross: ∞

Cyclists	Trucks	Cars	Totals
4	58	367	429



Bovaird Dr

Cyclists	Trucks	Cars	Totals
6	58	381	445
3	0	3	6
9	58	384	



Caseley St

Cars	Trucks	Cyclists	Totals
362	57	3	422
2	0	1	3
364	57	4	



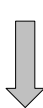
Bovaird Dr

Cars	Trucks	Cyclists	Totals
386	58	6	450

Peds Cross: ∞  
 South Peds: 0  
 South Entering: 12  
 South Leg Total: 21

Peds Cross: ∞  
 West Peds: 18  
 West Entering: 451  
 West Leg Total: 880

Cars	5		
Trucks	0		
Cyclists	4		
Totals	9		



Cars	5	5	10
Trucks	1	0	1
Cyclists	1	0	1
Totals	7	5	

## Comments

# MG8 ENG

## Afternoon Peak Diagram

### Specified Period

**From:** 15:00:00

**To:** 18:00:00

### One Hour Peak

**From:** 16:30:00

**To:** 17:30:00

**Municipality:** Region of Peel  
**Site #:** na  
**Intersection:** Bovaird Drive & Caseley Street  
**TFR File #:** 1  
**Count date:** 1-Dec-2009

**Weather conditions:**  
Cold with light snow in the morning

**Person(s) who counted:**  
ZORAN

**\*\* Non-Signalized Intersection \*\***

**Major Road:** Bovaird Drive runs W/E

East Leg Total: 1514  
 East Entering: 975  
 East Peds: 3  
 Peds Cross: X

Cyclists	Trucks	Cars	Totals
22	36	913	971

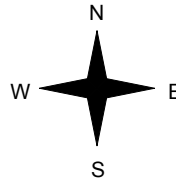


Bovaird Dr

Cars	Trucks	Cyclists	Totals
913	36	21	970
4	0	1	5
917	36	22	



913 36 21 970  
 4 0 1 5  
 917 36 22



Cyclists	Trucks	Cars	Totals
2	39	498	539
0	0	6	6
2	39	504	



Caseley St

Bovaird Dr



Cars	Trucks	Cyclists	Totals
498	39	2	539

Peds Cross: X  
 West Peds: 1  
 West Entering: 545  
 West Leg Total: 1516

Cars	10
Trucks	0
Cyclists	1
Totals	11



Cars	0	0	0
Trucks	0	0	0
Cyclists	1	0	1
Totals	1	0	

Peds Cross: X  
 South Peds: 1  
 South Entering: 1  
 South Leg Total: 12

## Comments

# MG8 ENG

## Total Count Diagram

**Municipality:** Region of Peel  
**Site #:** na  
**Intersection:** Bovaird Drive & Caseley Street  
**TFR File #:** 1  
**Count date:** 1-Dec-2009

**Weather conditions:**  
 Cold with light snow in the morning  
**Person(s) who counted:**  
 ZORAN

**\*\* Non-Signalized Intersection \*\***

**Major Road:** Bovaird Drive runs W/E

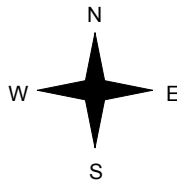
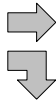
East Leg Total: 9437  
 East Entering: 4703  
 East Peds: 33  
 Peds Cross: ∞

Cyclists	Trucks	Cars	Totals
88	347	4272	4707



Bovaird Dr

Cyclists	Trucks	Cars	Totals
44	362	4300	4706
14	7	22	43
58	369	4322	



Caseley St

Cars	Trucks	Cyclists	Totals
------	--------	----------	--------

4248	337	84	4669
25	2	7	34
4273	339	91	



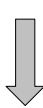
Bovaird Dr

Cars	Trucks	Cyclists	Totals
4321	364	49	4734

Peds Cross: ∞  
 South Peds: 5  
 South Entering: 66  
 South Leg Total: 143

Peds Cross: ∞  
 West Peds: 36  
 West Entering: 4749  
 West Leg Total: 9456

Cars	47
Trucks	9
Cyclists	21
Totals	77



Cars	24	21	45
Trucks	10	2	12
Cyclists	4	5	9
Totals	38	28	

### Comments



# MG8 ENG

## Traffic Count Summary

Intersection: Bovaird Drive & Caseley Street

Count Date: 1-Dec-2009

Municipality: Region of Peel

North Approach Totals						North/South Total Approaches	South Approach Totals					
Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds		Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds
	Left	Thru	Right	Grand Total				Left	Thru	Right	Grand Total	
7:00:00	0	0	0	0	0	0	7:00:00	0	0	0	0	0
8:00:00	0	0	0	0	0	4	8:00:00	2	0	2	4	2
9:00:00	0	0	0	0	0	17	9:00:00	9	0	8	17	1
11:00:00	0	0	0	0	0	1	11:00:00	1	0	0	1	0
12:00:00	0	0	0	0	0	3	12:00:00	2	0	1	3	0
13:00:00	0	0	0	0	0	7	13:00:00	3	0	4	7	0
14:00:00	0	0	0	0	0	6	14:00:00	5	0	1	6	0
15:00:00	0	0	0	0	0	0	15:00:00	0	0	0	0	0
16:00:00	0	0	0	0	0	10	16:00:00	3	0	7	10	1
17:00:00	0	0	0	0	0	1	17:00:00	1	0	0	1	0
18:00:00	0	0	0	0	0	17	18:00:00	12	0	5	17	1
Totals:	0	0	0	0	0	66		38	0	28	66	5

East Approach Totals						East/West Total Approaches	West Approach Totals					
Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds		Hour Ending	Includes Cars, Trucks, & Cyclists				Total Peds
	Left	Thru	Right	Grand Total				Left	Thru	Right	Grand Total	
7:00:00	0	0	0	0	0	0	7:00:00	0	0	0	0	0
8:00:00	0	418	0	418	0	1303	8:00:00	0	882	3	885	0
9:00:00	9	493	0	502	8	1423	9:00:00	0	908	13	921	5
11:00:00	0	81	0	81	0	96	11:00:00	0	15	0	15	0
12:00:00	0	299	0	299	0	675	12:00:00	0	375	1	376	0
13:00:00	2	394	0	396	2	818	13:00:00	0	419	3	422	17
14:00:00	3	410	0	413	3	853	14:00:00	0	437	3	440	1
15:00:00	0	42	0	42	0	73	15:00:00	0	31	0	31	0
16:00:00	7	751	0	758	13	1323	16:00:00	0	556	9	565	11
17:00:00	4	935	0	939	0	1451	17:00:00	0	510	2	512	0
18:00:00	7	839	0	846	5	1395	18:00:00	0	540	9	549	2
Totals:	32	4662	0	4694	31	9410		0	4673	43	4716	36

### Calculated Values for Traffic Crossing Major Street

Hours Ending:	8:00	9:00	12:00	13:00	14:00	16:00	17:00	18:00
Crossing Values:	2	22	2	22	9	27	1	19





## Signal Timings



## REGIONAL MUNICIPALITY OF PEEL

### Traffic Signal Timing Parameters

<b>DATE:</b> Jan. 11, 2010		<b>Completed By:</b> IT						
		<b>Approved By:</b>						
<b>Location:</b> Bovaird @ Lake Louise/Worthington								
						<b>PEAK PERIOD (Mon. - Fri.) (Green + Amber + All Red) (sec.)</b>		
Phase #	Direction	Vehicle Minimum (sec.)	Pedestrian Minimum (sec.)	Amber (sec.)	All Red (sec.)	Split AM	Split OP	Split PM
1	WB P.P. LT	5		3		0	0	10
2	EB	25	21	4.6	2	82	62	72
3								
4	NB	8	29	4	2.9	38	38	38
5								
6	WB	25	21	4.6	2	82	62	82
7								
8	SB	8	29	4	2.9	38	38	38
<b>System Control</b>		Yes						
<b>Local Control</b>		No						
<b>Semi-Actuated Mode</b>		Yes						
						<b>PEAK</b>		<b>CYCLE LENGTH (sec.)</b>
						AM (06:00 - 9:00)		120
						OP (09:00 - 15:00)		110
						PM (15:00 - 19:00)		120

<b>DATE:</b> Jan. 11, 2010		<b>Completed By:</b> IT						
		<b>Approved By:</b>						
<b>Location:</b> Bovaird @ Go Station								
						<b>PEAK PERIOD (Mon. - Fri.) (Green + Amber + All Red) (sec.)</b>		
Phase #	Direction	Vehicle Minimum (sec.)	Pedestrian Minimum (sec.)	Amber (sec.)	All Red (sec.)	Split AM	Split OP	Split PM1/PM2
1								
2	EB	12	26	4.2	2	60	53	60/50
3	SB Prot. LT	8		4	2.7	23	20	23/33
4	NB	8	29	4	2.7	37	37	37/37
5	EB P.P. LT	5		3	0	18	0	0/0
6	WB	12	26	4.2	2	42	53	60/50
7								
8	SB	8	29	4	2.7	60	57	60/70
<b>System Control</b>		Yes						
<b>Local Control</b>		No						
<b>Semi-Actuated Mode</b>		Yes						
						<b>PEAK</b>		<b>CYCLE LENGTH</b>
						AM (06:00 - 9:00)		120
						OP (09:00 - 15:00)		110
						PM1 (15:00 - 17:00)		120
						PM2 (17:00 - 19:00)		120

<b>DATE:</b> Jan. 11, 2010		<b>Completed By:</b> IT						
		<b>Approved By:</b>						
<b>Location:</b> Mississauga @ Bovaird						<b>PEAK PERIOD (Mon. - Fri.) (Green + Amber + All Red) (sec.)</b>		
Phase #	Direction	Vehicle Minimum (sec.)	Pedestrian Minimum (sec.)	Amber (sec.)	All Red (sec.)	Split		
						AM	OP	PM
1	WB P.P. LT	5		3		20	10	15
2	EB	20	20	4.6	2	50	52	47
3								
4	NB	12	20	4.6	2	50	48	58
5								
6	WB	20	20	4.6	2	70	62	62
7	N.B. P.P. LT	5		3		10	10	20
8	SB	12	20	4.6	2	40	38	38
<b>System Control</b>		Yes						
<b>Local Control</b>		No						
<b>Semi-Actuated Mode</b>		No						
						<b>PEAK</b>		<b>CYCLE LENGTH (sec.)</b>
						AM (06:00 - 9:00)		120
						OP (09:00 - 15:00)		110
						PM (15:00 - 19:00)		120

<b>DATE:</b> Jan. 18, 2010		<b>Completed By:</b> IT						
		<b>Approved By:</b>						
<b>Location:</b> Bovaird @ Heritage						<b>PEAK PERIOD (Mon. - Fri.) (Green + Amber + All Red) (sec.)</b>		
Phase #	Direction	Vehicle Minimum (sec.)	Pedestrian Minimum (sec.)	Amber (sec.)	All Red (sec.)	Max.		
						All day/Every day		
1								
2	EB	16	16	5.4	2	62.4		
3								
4	NB	8	19	4.2	2	26.2		
5								
6	WB	16	16	5.4	2	62.4		
7								
8	SB	8	19	4.2	2	26.2		
<b>System Control</b>		No						
<b>Local Control</b>		No						
<b>Semi-Actuated Mode</b>		Yes						
						<b>PEAK</b>		<b>CYCLE LENGTH (sec.)</b>
						All day/Every day		Local



## Collision History





Location ID	Total 3-year	Year	Total#	Accident	Rd1 Sur Cond	Impact Type	Accident Class	Date	Time	Environmental Cond	Light		
10716989S Bovaird Dr W @ Lake Louise Dr	8	2005	2	5113571	Dry	Sideswipe	P.D.only	17-Jun-05	2324	Clear			
				5144358	Dry	Rear end	Non-reportable	27-Jul-05	2254	Clear			
		2006	2	6156505	Dry	Turning movement	P.D.only	12-Aug-06	1415	Clear	Daylight		
				6220464	Dry	Rear end	P.D.only	10-Nov-06	2100	Clear	Dark		
		2007	4	7029645	Dry	Turning movement	P.D.only	16-Feb-07	2150	Clear	Dark		
				7218477	Wet	Turning movement	P.D.only	09-Nov-07	1652	Rain	Dusk		
				7229267	Loose snow	Turning movement	P.D.only	26-Nov-07	517	Snow	Dusk		
				7245333	Dry	Rear end	P.D.only	21-Dec-07	1123	Clear	Daylight		
		10716989L Bovaird Dr W west of the Lake Louis Dr	4	2006	3	6052392	Wet	Sideswipe	P.D.only	25-Mar-06	1048	Rain	Daylight
						6067558	Dry	Rear end	P.D.only	17-Apr-06	1332	Clear	Daylight
6075233	Dry					Rear end	P.D.only	28-Apr-06	1018	Clear	Daylight		
2007	1			7027737	Packed snow	Approaching	P.D.only	14-Feb-07	849	Snow	Daylight		
10717934L Bovaird Dr W @ Creditview Rd W	2	2006	2	6046854	Dry	Rear end	Non-fatal injury	16-Mar-06	1618	Clear	Daylight		
				6182693	Dry	Rear end	P.D.only	17-Sep-06	2055	Clear	Dark		
10718002L Bovaird Dr W west of the Go Station Entrance	2	2006	2	6083980	Dry	Rear end	P.D.only	10-May-06	1037	Clear	Daylight		
				6156902	Dry	Other	P.D.only	12-Aug-06	1145	Clear	Dark		
00121018S Bovaird Dr W @ Mississauga Rd	38	2005	8	5070549	Dry	Angle	P.D.only	19-Apr-05	1522	Clear	Daylight		
				5080910	Dry	Sideswipe	P.D.only	05-May-05	820	Clear	Daylight		
				5160539	Dry	Angle	P.D.only	18-Aug-05	2000	Clear	Daylight		
				5160818	Wet	Turning movement	P.D.only	19-Aug-05	650	Rain	Dark		
				5176639	Dry	SMV other	P.D.only	09-Sep-05	212	Clear	Dark		
				5219220	Dry	Rear end	Non-fatal injury	08-Nov-05	840	Clear	Daylight		
				5243275	Dry	Rear end	P.D.only	13-Dec-05	1130	Clear	Daylight		
				5250364	Wet	Approaching	P.D.only	23-Dec-05	1306	Clear	Daylight		
		2006	5	6012799	Ice	Rear end	P.D.only	02-Aug-05	930	Clear	Daylight		
				6014529	Wet	Approaching	P.D.only	24-Oct-05	601	Rain	Dawn		
				6193709	Dry	Sideswipe	P.D.only	03-Oct-06	304	Clear	Daylight		
				6197432	Dry	Angle	P.D.only	08-Oct-06	1520	Clear	Daylight		
				06197525S	Dry	Angle	P.D.only		1645	Clear	Daylight		
				7022854	Dry	Turning movement	P.D.only	06-Feb-07	1243	Clear	Daylight		
				7028613	Dry	Angle	P.D.only	15-Feb-07	1514	Clear	Daylight		
		2007	25	7030842	Dry	Rear end	P.D.only	19-Feb-07	730	Clear	Daylight		
				7039116	Wet	Angle	P.D.only	03-Mar-07	854	Clear	Daylight		
				7042560	Dry	Sideswipe	P.D.only	08-Mar-07	1150	Clear	Daylight		
				7043865	Ice	Approaching	Non-fatal injury	10-Mar-07	731	Freezing rain	Daylight		
				7050472	Dry	Angle	Non-fatal injury	20-Mar-07	1653	Clear	Daylight		
				7068779	Dry	Sideswipe	P.D.only	18-Apr-07	1530	Clear	Daylight		
				07077982S	Dry	Turning movement	P.D.only	01-May-07	448	Clear	Daylight		
				7088537	Wet	Rear end	P.D.only	16-May-07	1534	Rain	Daylight		
				7088662	Wet	Rear end	P.D.only	16-May-07	1650	Rain	Daylight		
				07101696S	Dry	Angle	P.D.only	03-Jun-07	1030	Clear	Daylight		
				7101724	Dry	Rear end	P.D.only	03-Jun-07	1218	Clear	Daylight		
				7102231	Wet	Rear end	P.D.only	04-Jun-07	741	Rain	Daylight		
				7124808	Dry	Sideswipe	P.D.only	03-Jul-07	1104	Clear	Daylight		
		7133244	Dry	Angle	Non-fatal injury	14-Jul-07	1221	Clear	Daylight				
		7150054	Dry	Rear end	P.D.only	05-Aug-07	1830	Clear	Daylight				
		7157788	Dry	Other	P.D.only	16-Aug-07	907	Clear	Daylight				
		7166679	Dry	Approaching	P.D.only	27-Aug-07	1126	Clear	Dark				
		7167818	Dry	Angle	P.D.only	29-Aug-07	1456	Clear	Daylight				
		07221517S	Dry	Rear end	P.D.only	13-Nov-07	1800	Clear	Dark				
		7235569	Dry	Angle	P.D.only	06-Dec-07	1020	Clear	Daylight				
		7240766	Ice	Rear end	P.D.only	14-Dec-07	730	Snow	Daylight				
		7244564	Wet	Angle	P.D.only	20-Dec-07	820	Clear	Daylight				
		7248302	Dry	Approaching	P.D.only	26-Dec-07	1047	Clear	Daylight				
10718956L Bovaird Dr W West of the Mississauga Rd	4	2005	3	5015629	Slush	Sideswipe	P.D.only	26-Jan-05	1127	Snow	Dark		
				5146298	Dry	Rear end	P.D.only	30-Jul-05	1250	Clear	Daylight		
				5182849	Dry	Rear end	P.D.only	17-Sep-05	1655	Clear	Daylight		
		2006	1	6094013	Dry	Rear end	P.D.only	24-May-06	900	Clear	Daylight		

Location ID	Total 3-year	Year	Total#	Accident	Rd1 Sur Cond	Impact Type	Accident Class	Date	Time	Environmental Cond	Light		
10720341S Bovaird Dr W @ Heritage Rd	13	2005	2	5186753	Wet	Sideswipe	Non-fatal injury	14-Sep-05	931	Rain	Dark		
				052414645	Dry	Other	P.D.only	10-Dec-05	1230	Clear	Dark		
		2006	6	60180495	Dry	Approaching	P.D.only	30-Jan-06	1430	Clear	Daylight		
				6029405	Dry	Angle	Non-fatal injury	17-Feb-06	1535	Clear	Daylight		
				6038822	Dry	Approaching	P.D.only	04-Mar-06	1351	Clear	Daylight		
				6065056	Dry	Approaching	Non-fatal injury	13-Apr-06	1614	Clear	Daylight		
				6130183	Dry	Angle	P.D.only	09-Jul-06	1359	Clear	Daylight		
		2007	5	6192239	Dry	Rear end	P.D.only	01-Oct-06	1200	Clear	Daylight		
				7049801	Wet	Sideswipe	P.D.only	19-Mar-07	1600	Clear	Daylight		
				7101687	Dry	Angle	P.D.only	03-Jun-07	1049	Clear	Daylight		
		10720341L Bovaird Dr W West of the Heritage Rd	4	2007	2	7121605	Dry	Turning movement	P.D.only	12-Jul-07	1115	Clear	Daylight
						7204369	Dry	Approaching	P.D.only	19-Oct-07	1915	Strong Wind	Dark
						072185145	Wet	Approaching	P.D.only	09-Nov-07	1740	Rain	Dark
5003202	Packed snow					Angle	P.D.only	06-Jan-05	1412	Snow	Dawn		
Grand Total	75	2005	2	5085363	Dry	Turning movement	P.D.only	11-May-05	1510	Clear	Daylight		
				7114320	Dry	Rear end	P.D.only	19-Jun-07	1715	Clear	Daylight		
				7114336	Dry	Rear end	P.D.only	19-Jun-07	1740	Clear	Daylight		



## Appendix B

### Synchro Intersection Capacity Analysis






























Existing Traffic



HCM Signalized Intersection Capacity Analysis  
 1: Lake Lousie Drive/Worthington Avenue & Bovaird Drive

<Existing> AM Peak Hour

3/22/2012
























												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		  			  							
Volume (vph)	100	739	12	25	719	14	41	26	30	297	36	261
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6		6.6	6.6	6.6	6.9	6.9		6.9	6.9	
Lane Util. Factor	1.00	0.91		1.00	0.91	1.00	1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	1.00		1.00	1.00	0.97	1.00	0.99		1.00	0.98	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		0.99	1.00	
Frft	1.00	1.00		1.00	1.00	0.85	1.00	0.92		1.00	0.87	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1711	4875		1780	4932	1450	1778	1642		1761	1576	
Flt Permitted	0.36	1.00		0.35	1.00	1.00	0.37	1.00		0.72	1.00	
Satd. Flow (perm)	654	4875		655	4932	1450	693	1642		1335	1576	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	100	739	12	25	719	14	41	26	30	297	36	261
RTOR Reduction (vph)	0	1	0	0	0	5	0	23	0	0	182	0
Lane Group Flow (vph)	100	750	0	25	719	9	41	33	0	297	115	0
Confl. Peds. (#/hr)	3		3	3		3	6		12	12		6
Heavy Vehicles (%)	4%	5%	0%	0%	4%	7%	0%	8%	0%	0%	0%	2%
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6		6	4			8		
Actuated Green, G (s)	75.4	75.4		75.4	75.4	75.4	29.6	29.6		29.6	29.6	
Effective Green, g (s)	75.4	75.4		75.4	75.4	75.4	29.6	29.6		29.6	29.6	
Actuated g/C Ratio	0.64	0.64		0.64	0.64	0.64	0.25	0.25		0.25	0.25	
Clearance Time (s)	6.6	6.6		6.6	6.6	6.6	6.9	6.9		6.9	6.9	
Vehicle Extension (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	416	3102		417	3138	923	173	410		333	394	
v/s Ratio Prot		c0.15			0.15			0.02			0.07	
v/s Ratio Perm	0.15			0.04		0.01	0.06			c0.22		
v/c Ratio	0.24	0.24		0.06	0.23	0.01	0.24	0.08		0.89	0.29	
Uniform Delay, d1	9.3	9.3		8.1	9.2	7.9	35.4	34.0		42.9	36.0	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.4	0.2		0.3	0.2	0.0	1.5	0.2		25.9	0.9	
Delay (s)	10.6	9.4		8.4	9.3	7.9	36.9	34.2		68.8	36.8	
Level of Service	B	A		A	A	A	D	C		E	D	
Approach Delay (s)		9.6			9.3			35.4			52.8	
Approach LOS		A			A			D			D	
<b>Intersection Summary</b>												
HCM Average Control Delay			21.7				HCM Level of Service			C		
HCM Volume to Capacity ratio			0.42									
Actuated Cycle Length (s)			118.5				Sum of lost time (s)			13.5		
Intersection Capacity Utilization			92.5%				ICU Level of Service			F		
Analysis Period (min)			15									
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 2: Bovaird Drive & Ashby Field Road

<Existing> AM Peak Hour

2/4/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	23	828	31	44	713	167	60	28	67	29	15	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.2	6.2	6.2	6.2	6.2	6.7	6.7		6.7	6.7	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00		0.97	1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	1.00	1.00	0.99		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.89		1.00	0.94	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1580	3368	1517	1699	3336	1597	1750	1634		3463	1698	
Flt Permitted	0.33	1.00	1.00	0.34	1.00	1.00	0.74	1.00		0.95	1.00	
Satd. Flow (perm)	544	3368	1517	608	3336	1597	1365	1634		3463	1698	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	23	828	31	44	713	167	60	28	67	29	15	10
RTOR Reduction (vph)	0	0	12	0	0	74	0	59	0	0	8	0
Lane Group Flow (vph)	23	828	19	44	713	93	60	36	0	29	17	0
Confl. Peds. (#/hr)			1	1					8	8		
Heavy Vehicles (%)	13%	6%	3%	5%	7%	0%	2%	0%	2%	0%	0%	10%
Turn Type	pm+pt		Perm	Perm		Perm	Perm			Prot		
Protected Phases	5	2			6			4		3	8	
Permitted Phases	2		2	6		6	4					
Actuated Green, G (s)	59.5	59.5	59.5	53.2	53.2	53.2	11.3	11.3		5.0	23.0	
Effective Green, g (s)	59.5	59.5	59.5	53.2	53.2	53.2	11.3	11.3		5.0	23.0	
Actuated g/C Ratio	0.62	0.62	0.62	0.56	0.56	0.56	0.12	0.12		0.05	0.24	
Clearance Time (s)	3.0	6.2	6.2	6.2	6.2	6.2	6.7	6.7		6.7	6.7	
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	375	2101	946	339	1860	891	162	194		181	409	
v/s Ratio Prot	0.00	c0.25			0.21			0.02		c0.01	0.01	
v/s Ratio Perm	0.04		0.01	0.07		0.06	c0.04					
v/c Ratio	0.06	0.39	0.02	0.13	0.38	0.10	0.37	0.19		0.16	0.04	
Uniform Delay, d1	7.2	9.0	6.8	10.1	11.9	9.9	38.8	37.9		43.2	27.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.1	0.6	0.0	0.8	0.6	0.2	3.0	1.0		0.9	0.1	
Delay (s)	7.3	9.5	6.9	10.9	12.5	10.1	41.7	38.9		44.1	27.8	
Level of Service	A	A	A	B	B	B	D	D		D	C	
Approach Delay (s)		9.4			12.0			40.0			36.6	
Approach LOS		A			B			D			D	
<b>Intersection Summary</b>												
HCM Average Control Delay			13.6				HCM Level of Service			B		
HCM Volume to Capacity ratio			0.38									
Actuated Cycle Length (s)			95.4				Sum of lost time (s)		19.6			
Intersection Capacity Utilization			60.6%				ICU Level of Service			B		
Analysis Period (min)			15									
c Critical Lane Group												
























# HCM Signalized Intersection Capacity Analysis

## 3: Bovaird Drive & Mississauga Road

<Existing> AM Peak Hour

2/4/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	17	620	222	310	458	7	85	92	191	19	474	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6	6.6	3.0	6.6		3.0	6.6		6.6	6.6	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	0.90		1.00	1.00	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1513	1789	1536	1653	1719		1684	1584		1608	1798	
Flt Permitted	0.50	1.00	1.00	0.10	1.00		0.11	1.00		0.59	1.00	
Satd. Flow (perm)	790	1789	1536	171	1719		199	1584		992	1798	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	17	620	222	310	458	7	85	92	191	19	474	13
RTOR Reduction (vph)	0	0	141	0	0	0	0	63	0	0	1	0
Lane Group Flow (vph)	17	620	81	310	465	0	85	220	0	19	486	0
Heavy Vehicles (%)	18%	5%	4%	8%	9%	14%	6%	10%	5%	11%	4%	8%
Turn Type	Perm		Perm	pm+pt			pm+pt			Perm		
Protected Phases		2		1	6		7	4			8	
Permitted Phases	2		2	6			4			8		
Actuated Green, G (s)	43.5	43.5	43.5	63.5	63.5		41.9	41.9		33.4	33.4	
Effective Green, g (s)	43.5	43.5	43.5	63.5	63.5		41.9	41.9		33.4	33.4	
Actuated g/C Ratio	0.37	0.37	0.37	0.54	0.54		0.35	0.35		0.28	0.28	
Clearance Time (s)	6.6	6.6	6.6	3.0	6.6		3.0	6.6		6.6	6.6	
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	290	656	563	304	920		139	560		279	506	
v/s Ratio Prot		0.35		c0.15	0.27		c0.03	0.14			c0.27	
v/s Ratio Perm	0.02		0.05	c0.40			0.19			0.02		
v/c Ratio	0.06	0.95	0.14	1.02	0.50		0.61	0.39		0.07	0.96	
Uniform Delay, d1	24.3	36.4	25.1	35.6	17.5		29.8	28.8		31.2	42.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	24.0	0.5	56.8	2.0		11.0	1.0		0.5	31.4	
Delay (s)	24.7	60.4	25.6	92.3	19.5		40.8	29.7		31.7	73.4	
Level of Service	C	E	C	F	B		D	C		C	E	
Approach Delay (s)		50.7			48.7			32.3			71.8	
Approach LOS		D			D			C			E	
<b>Intersection Summary</b>												
HCM Average Control Delay			51.6			HCM Level of Service				D		
HCM Volume to Capacity ratio			0.94									
Actuated Cycle Length (s)			118.6			Sum of lost time (s)			12.6			
Intersection Capacity Utilization			97.9%			ICU Level of Service				F		
Analysis Period (min)			15									






















c Critical Lane Group

# HCM Signalized Intersection Capacity Analysis

<Existing> AM Peak Hour

## 4: Bovaird Drive & Heritage Road

2/4/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	34	893	35	58	456	1	6	8	20	22	110	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.4	7.4	7.4	7.4	7.4	7.4		6.2			6.2	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00			1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85		0.92			0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.99			0.99	
Satd. Flow (prot)	1733	1807	1551	1785	1756	1597		1618			1811	
Flt Permitted	0.48	1.00	1.00	0.22	1.00	1.00		0.94			0.95	
Satd. Flow (perm)	880	1807	1551	411	1756	1597		1531			1735	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	34	893	35	58	456	1	6	8	20	22	110	27
RTOR Reduction (vph)	0	0	3	0	0	0	0	17	0	0	9	0
Lane Group Flow (vph)	34	893	32	58	456	1	0	17	0	0	150	0
Heavy Vehicles (%)	3%	4%	3%	0%	7%	0%	0%	13%	5%	0%	1%	0%
Turn Type	Perm		Perm	Perm		Perm	Perm			Perm		
Protected Phases		2			6			4			8	
Permitted Phases	2		2	6		6	4			8		
Actuated Green, G (s)	58.7	58.7	58.7	58.7	58.7	58.7		14.4			14.4	
Effective Green, g (s)	58.7	58.7	58.7	58.7	58.7	58.7		14.4			14.4	
Actuated g/C Ratio	0.68	0.68	0.68	0.68	0.68	0.68		0.17			0.17	
Clearance Time (s)	7.4	7.4	7.4	7.4	7.4	7.4		6.2			6.2	
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0		5.0			5.0	
Lane Grp Cap (vph)	596	1223	1050	278	1189	1081		254			288	
v/s Ratio Prot		c0.49			0.26							
v/s Ratio Perm	0.04		0.02	0.14		0.00		0.01			c0.09	
v/c Ratio	0.06	0.73	0.03	0.21	0.38	0.00		0.07			0.52	
Uniform Delay, d1	4.7	8.9	4.6	5.3	6.1	4.5		30.5			33.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00			1.00	
Incremental Delay, d2	0.2	3.9	0.1	1.7	0.9	0.0		0.2			3.2	
Delay (s)	4.9	12.8	4.7	7.0	7.0	4.5		30.7			36.2	
Level of Service	A	B	A	A	A	A		C			D	
Approach Delay (s)		12.2			7.0			30.7			36.2	
Approach LOS		B			A			C			D	
<b>Intersection Summary</b>												
HCM Average Control Delay			13.3				HCM Level of Service				B	
HCM Volume to Capacity ratio			0.69									
Actuated Cycle Length (s)			86.7				Sum of lost time (s)			13.6		
Intersection Capacity Utilization			70.4%				ICU Level of Service			C		
Analysis Period (min)			15									

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis  
 5: Bovaird Drive & Caseley Street

<Existing> AM Peak Hour  
 2/4/2010



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↗		
Volume (veh/h)	942	15	6	476	9	9
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	942	15	6	476	9	9
Pedestrians	5			4	1	
Lane Width (m)	3.5			3.5	3.5	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	0			0	0	
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			958		1444	954
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			958		1444	954
tC, single (s)			4.3		6.6	6.4
tC, 2 stage (s)						
tF (s)			2.4		3.7	3.5
p0 queue free %			99		93	97
cM capacity (veh/h)			660		130	287

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	957	482	18
Volume Left	0	6	9
Volume Right	15	0	9
cSH	1700	660	178
Volume to Capacity	0.56	0.01	0.10
Queue Length 95th (m)	0.0	0.2	2.5
Control Delay (s)	0.0	0.3	27.4
Lane LOS		A	D
Approach Delay (s)	0.0	0.3	27.4
Approach LOS			D

Intersection Summary			
Average Delay		0.4	
Intersection Capacity Utilization	61.7%		ICU Level of Service B
Analysis Period (min)		15	

HCM Signalized Intersection Capacity Analysis  
 1: Lake Lousie Drive/Worthington Avenue & Bovaird Drive

<Existing> Midday Peak Hour

3/22/2012



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↙	↑↑↑		↙	↑↑↑	↗	↙	↗		↙	↗	
Volume (vph)	90	523	38	32	518	66	48	58	48	191	50	107
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6		6.6	6.6	6.6	6.9	6.9		6.9	6.9	
Lane Util. Factor	1.00	0.91		1.00	0.91	1.00	1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	1.00		1.00	1.00	0.97	1.00	0.99		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		0.99	1.00	
Frt	1.00	0.99		1.00	1.00	0.85	1.00	0.93		1.00	0.90	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1744	4476		1731	4580	1466	1743	1645		1654	1409	
Flt Permitted	0.45	1.00		0.43	1.00	1.00	0.66	1.00		0.69	1.00	
Satd. Flow (perm)	827	4476		785	4580	1466	1206	1645		1199	1409	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	90	523	38	32	518	66	48	58	48	191	50	107
RTOR Reduction (vph)	0	5	0	0	0	32	0	35	0	0	69	0
Lane Group Flow (vph)	90	556	0	32	518	34	48	71	0	191	88	0
Confl. Peds. (#/hr)	5		2	2		5	8		15	15		8
Heavy Vehicles (%)	2%	14%	3%	3%	12%	6%	2%	5%	6%	7%	2%	26%
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6		6	4			8		
Actuated Green, G (s)	31.5	31.5		31.5	31.5	31.5	16.7	16.7		16.7	16.7	
Effective Green, g (s)	31.5	31.5		31.5	31.5	31.5	16.7	16.7		16.7	16.7	
Actuated g/C Ratio	0.51	0.51		0.51	0.51	0.51	0.27	0.27		0.27	0.27	
Clearance Time (s)	6.6	6.6		6.6	6.6	6.6	6.9	6.9		6.9	6.9	
Vehicle Extension (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	422	2285		401	2338	748	326	445		325	381	
v/s Ratio Prot		c0.12			0.11			0.04			0.06	
v/s Ratio Perm	0.11			0.04		0.02	0.04			c0.16		
v/c Ratio	0.21	0.24		0.08	0.22	0.05	0.15	0.16		0.59	0.23	
Uniform Delay, d1	8.3	8.4		7.7	8.3	7.6	17.1	17.2		19.5	17.5	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.2	0.3		0.4	0.2	0.1	0.4	0.4		4.2	0.7	
Delay (s)	9.4	8.7		8.1	8.6	7.7	17.5	17.5		23.7	18.2	
Level of Service	A	A		A	A	A	B	B		C	B	
Approach Delay (s)		8.8			8.4			17.5			21.2	
Approach LOS		A			A			B			C	























Intersection Summary		
HCM Average Control Delay	11.9	HCM Level of Service B
HCM Volume to Capacity ratio	0.36	
Actuated Cycle Length (s)	61.7	Sum of lost time (s) 13.5
Intersection Capacity Utilization	88.3%	ICU Level of Service E
Analysis Period (min)	15	
c Critical Lane Group		

# HCM Signalized Intersection Capacity Analysis

## 2: Bovaird Drive & Ashby Field Road

<Existing> Midday Peak Hour






















2/4/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	8	469	27	63	486	19	28	1	52	22	2	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.2	6.2	6.2	6.2	6.2	6.2	6.7	6.7		6.7	6.7	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00		0.97	1.00	
Frbp, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.98	1.00	0.98		1.00	0.98	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.85		1.00	0.88	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1427	3245	1311	1782	3216	1563	1608	1511		3463	1334	
Flt Permitted	0.48	1.00	1.00	0.48	1.00	1.00	0.75	1.00		0.95	1.00	
Satd. Flow (perm)	713	3245	1311	906	3216	1563	1272	1511		3463	1334	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	8	469	27	63	486	19	28	1	52	22	2	7
RTOR Reduction (vph)	0	0	10	0	0	7	0	47	0	0	6	0
Lane Group Flow (vph)	8	469	17	63	486	12	28	6	0	22	3	0
Confl. Peds. (#/hr)	1		2	2		1			10	10		
Confl. Bikes (#/hr)												7
Heavy Vehicles (%)	25%	10%	19%	0%	11%	0%	11%	0%	4%	0%	0%	29%
Turn Type	Perm		Perm	Perm		Perm	Perm			Prot		
Protected Phases		2			6			4		3	8	
Permitted Phases	2		2	6		6	4					
Actuated Green, G (s)	54.7	54.7	54.7	54.7	54.7	54.7	7.6	7.6		3.2	17.5	
Effective Green, g (s)	54.7	54.7	54.7	54.7	54.7	54.7	7.6	7.6		3.2	17.5	
Actuated g/C Ratio	0.64	0.64	0.64	0.64	0.64	0.64	0.09	0.09		0.04	0.21	
Clearance Time (s)	6.2	6.2	6.2	6.2	6.2	6.2	6.7	6.7		6.7	6.7	
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	458	2086	843	582	2067	1005	114	135		130	274	
v/s Ratio Prot		0.14			c0.15			0.00		c0.01	0.00	
v/s Ratio Perm	0.01		0.01	0.07		0.01	c0.02					
v/c Ratio	0.02	0.22	0.02	0.11	0.24	0.01	0.25	0.04		0.17	0.01	
Uniform Delay, d1	5.5	6.3	5.5	5.8	6.4	5.5	36.1	35.4		39.7	26.9	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.1	0.3	0.0	0.4	0.3	0.0	2.3	0.3		1.3	0.0	
Delay (s)	5.6	6.6	5.5	6.2	6.7	5.5	38.4	35.7		41.0	27.0	
Level of Service	A	A	A	A	A	A	D	D		D	C	
Approach Delay (s)		6.5			6.6			36.6			36.9	
Approach LOS		A			A			D			D	
<b>Intersection Summary</b>												
HCM Average Control Delay			9.4				HCM Level of Service			A		
HCM Volume to Capacity ratio			0.23									
Actuated Cycle Length (s)			85.1				Sum of lost time (s)			19.6		
Intersection Capacity Utilization			60.3%				ICU Level of Service			B		
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis  
3: Bovaird Drive & Mississauga Road






















<Existing> Midday Peak Hour  
2/4/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	18	328	74	148	328	20	83	73	132	20	81	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6	6.6	3.0	6.6		3.0	6.6		6.6	6.6	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.90		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1284	1648	1377	1539	1647		1463	1512		1623	1588	
Flt Permitted	0.55	1.00	1.00	0.44	1.00		0.63	1.00		0.63	1.00	
Satd. Flow (perm)	746	1648	1377	715	1647		978	1512		1075	1588	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	18	328	74	148	328	20	83	73	132	20	81	14
RTOR Reduction (vph)	0	0	43	0	2	0	0	60	0	0	6	0
Lane Group Flow (vph)	18	328	31	148	346	0	83	145	0	20	89	0
Heavy Vehicles (%)	39%	14%	16%	16%	13%	15%	22%	11%	13%	10%	16%	14%
Turn Type	Perm		Perm	pm+pt			pm+pt			Perm		
Protected Phases		2		1	6		7	4			8	
Permitted Phases	2		2	6			4			8		
Actuated Green, G (s)	45.5	45.5	45.5	55.5	55.5		39.9	39.9		31.4	31.4	
Effective Green, g (s)	45.5	45.5	45.5	55.5	55.5		39.9	39.9		31.4	31.4	
Actuated g/C Ratio	0.42	0.42	0.42	0.51	0.51		0.37	0.37		0.29	0.29	
Clearance Time (s)	6.6	6.6	6.6	3.0	6.6		3.0	6.6		6.6	6.6	
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	313	690	577	419	842		384	556		311	459	
v/s Ratio Prot		c0.20		0.02	c0.21		0.01	c0.10			0.06	
v/s Ratio Perm	0.02		0.02	0.16			0.07			0.02		
v/c Ratio	0.06	0.48	0.05	0.35	0.41		0.22	0.26		0.06	0.19	
Uniform Delay, d1	18.8	22.9	18.8	15.0	16.4		23.1	24.0		28.0	29.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	2.3	0.2	1.1	1.5		0.6	0.5		0.4	0.9	
Delay (s)	19.1	25.2	18.9	16.0	17.9		23.7	24.6		28.4	30.0	
Level of Service	B	C	B	B	B		C	C		C	C	
Approach Delay (s)		23.9			17.4			24.3			29.7	
Approach LOS		C			B			C			C	
<b>Intersection Summary</b>												
HCM Average Control Delay			22.0			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.40									
Actuated Cycle Length (s)			108.6			Sum of lost time (s)			19.8			
Intersection Capacity Utilization			68.3%			ICU Level of Service				C		
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis  
4: Bovaird Drive & Heritage Road

<Existing> Midday Peak Hour  
2/4/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	5	419	18	17	409	9	6	1	6	3	3	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.4	7.4	7.4	7.4	7.4	7.4		6.2			6.2	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00			1.00	
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00		1.00			0.97	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00		1.00			1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85		0.94			0.92	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.98			0.99	
Satd. Flow (prot)	1785	1678	1597	1785	1648	1439		1722			1550	
Flt Permitted	0.52	1.00	1.00	0.52	1.00	1.00		1.00			1.00	
Satd. Flow (perm)	981	1678	1597	972	1648	1439		1762			1567	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	5	419	18	17	409	9	6	1	6	3	3	8
RTOR Reduction (vph)	0	0	2	0	0	1	0	6	0	0	8	0
Lane Group Flow (vph)	5	419	16	17	409	8	0	7	0	0	6	0
Confl. Peds. (#/hr)												7
Heavy Vehicles (%)	0%	12%	0%	0%	14%	11%	0%	0%	0%	0%	33%	0%
Turn Type	Perm		Perm	Perm		Perm	Perm			Perm		
Protected Phases		2			6			4			8	
Permitted Phases	2		2	6		6	4			8		
Actuated Green, G (s)	70.1	70.1	70.1	70.1	70.1	70.1		1.7			1.7	
Effective Green, g (s)	70.1	70.1	70.1	70.1	70.1	70.1		1.7			1.7	
Actuated g/C Ratio	0.82	0.82	0.82	0.82	0.82	0.82		0.02			0.02	
Clearance Time (s)	7.4	7.4	7.4	7.4	7.4	7.4		6.2			6.2	
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0		5.0			5.0	
Lane Grp Cap (vph)	805	1377	1311	798	1353	1181		35			31	
v/s Ratio Prot		c0.25			0.25							
v/s Ratio Perm	0.01		0.01	0.02		0.01		c0.00			0.00	
v/c Ratio	0.01	0.30	0.01	0.02	0.30	0.01		0.20			0.20	
Uniform Delay, d1	1.4	1.8	1.4	1.4	1.8	1.4		41.2			41.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00			1.00	
Incremental Delay, d2	0.0	0.6	0.0	0.0	0.6	0.0		5.9			6.5	
Delay (s)	1.4	2.4	1.4	1.4	2.4	1.4		47.1			47.7	
Level of Service	A	A	A	A	A	A		D			D	
Approach Delay (s)		2.3			2.3			47.1			47.7	
Approach LOS		A			A			D			D	
<b>Intersection Summary</b>												
HCM Average Control Delay			3.7				HCM Level of Service				A	
HCM Volume to Capacity ratio			0.30									
Actuated Cycle Length (s)			85.4				Sum of lost time (s)			13.6		
Intersection Capacity Utilization			50.8%				ICU Level of Service			A		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis  
5: Bovaird Drive & Caseley Street

<Existing> Midday Peak Hour  
2/4/2010































Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↔	↔	
Volume (veh/h)	445	6	3	422	7	5
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	445	6	3	422	7	5
Pedestrians	18			5		
Lane Width (m)	3.5			3.5		
Walking Speed (m/s)	1.2			1.2		
Percent Blockage	1			0		
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			451		894	453
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			451		894	453
tC, single (s)			4.1		6.5	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.6	3.3
p0 queue free %			100		98	99
cM capacity (veh/h)			1120		292	608
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>WB 1</b>	<b>NB 1</b>			
Volume Total	451	425	12			
Volume Left	0	3	7			
Volume Right	6	0	5			
cSH	1700	1120	373			
Volume to Capacity	0.27	0.00	0.03			
Queue Length 95th (m)	0.0	0.1	0.8			
Control Delay (s)	0.0	0.1	15.0			
Lane LOS	A		B			
Approach Delay (s)	0.0	0.1	15.0			
Approach LOS	A		B			
<b>Intersection Summary</b>						
Average Delay			0.2			
Intersection Capacity Utilization			36.1%	ICU Level of Service	A	
Analysis Period (min)			15			



HCM Signalized Intersection Capacity Analysis  
 1: Lake Lousie Drive/Worthington Avenue & Bovaird Drive





























<Existing> PM Peak Hour

3/22/2012

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		  			  			 			 		
Volume (vph)	246	553	31	53	1029	193	6	29	11	157	40	152	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	6.6	6.6		6.6	6.6	6.6	6.9	6.9		6.9	6.9		
Lane Util. Factor	1.00	0.91		1.00	0.91	1.00	1.00	1.00		1.00	1.00		
Frbp, ped/bikes	1.00	1.00		1.00	1.00	0.97	1.00	0.99		1.00	0.96		
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	0.98	1.00		0.98	1.00		
Frft	1.00	0.99		1.00	1.00	0.85	1.00	0.96		1.00	0.88		
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (prot)	1747	4723		1785	4839	1399	1742	1786		1701	1221		
Flt Permitted	0.26	1.00		0.42	1.00	1.00	0.52	1.00		0.73	1.00		
Satd. Flow (perm)	474	4723		791	4839	1399	951	1786		1309	1221		
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Adj. Flow (vph)	246	553	31	53	1029	193	6	29	11	157	40	152	
RTOR Reduction (vph)	0	4	0	0	0	60	0	9	0	0	101	0	
Lane Group Flow (vph)	246	580	0	53	1029	133	6	31	0	157	91	0	
Confl. Peds. (#/hr)	3					3	30		17	17		30	
Heavy Vehicles (%)	2%	8%	3%	0%	6%	11%	0%	0%	0%	3%	3%	38%	
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA		
Protected Phases		2			6			4			8		
Permitted Phases	2			6		6	4			8			
Actuated Green, G (s)	75.6	75.6		75.6	75.6	75.6	20.2	20.2		20.2	20.2		
Effective Green, g (s)	75.6	75.6		75.6	75.6	75.6	20.2	20.2		20.2	20.2		
Actuated g/C Ratio	0.69	0.69		0.69	0.69	0.69	0.18	0.18		0.18	0.18		
Clearance Time (s)	6.6	6.6		6.6	6.6	6.6	6.9	6.9		6.9	6.9		
Vehicle Extension (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0		
Lane Grp Cap (vph)	328	3267		547	3347	968	176	330		242	226		
v/s Ratio Prot		0.12			0.21			0.02			0.07		
v/s Ratio Perm	c0.52			0.07		0.10	0.01			c0.12			
v/c Ratio	0.75	0.18		0.10	0.31	0.14	0.03	0.09		0.65	0.40		
Uniform Delay, d1	10.8	5.9		5.6	6.6	5.7	36.5	37.0		41.3	39.2		
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00		
Incremental Delay, d2	14.6	0.1		0.4	0.2	0.3	0.2	0.3		8.0	2.4		
Delay (s)	25.4	6.0		5.9	6.8	6.0	36.7	37.2		49.2	41.7		
Level of Service	C	A		A	A	A	D	D		D	D		
Approach Delay (s)		11.8			6.7			37.2			45.1		
Approach LOS		B			A			D			D		
<b>Intersection Summary</b>													
HCM Average Control Delay			14.3									HCM Level of Service	B
HCM Volume to Capacity ratio			0.73										
Actuated Cycle Length (s)			109.3									Sum of lost time (s)	13.5
Intersection Capacity Utilization			79.3%									ICU Level of Service	D
Analysis Period (min)			15										
c	Critical Lane Group												

























HCM Signalized Intersection Capacity Analysis  
2: Bovaird Drive & Ashby Field Road

<Existing> PM Peak Hour  
2/4/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			 			 		 	 	
Volume (vph)	6	765	66	92	855	37	39	13	81	177	57	46
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.2	6.2	6.2	6.2	6.2	6.2	6.7	6.7		6.7	6.7	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00		0.97	1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	1.00	1.00	0.98		1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.87		1.00	0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1785	3400	1532	1784	3433	1597	1693	1604		3463	1740	
Flt Permitted	0.29	1.00	1.00	0.33	1.00	1.00	0.69	1.00		0.95	1.00	
Satd. Flow (perm)	540	3400	1532	612	3433	1597	1230	1604		3463	1740	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	6	765	66	92	855	37	39	13	81	177	57	46
RTOR Reduction (vph)	0	0	28	0	0	16	0	74	0	0	31	0
Lane Group Flow (vph)	6	765	38	92	855	21	39	20	0	177	72	0
Confl. Peds. (#/hr)			1	1			5		11	11		5
Heavy Vehicles (%)	0%	5%	2%	0%	4%	0%	5%	0%	0%	0%	0%	0%
Turn Type	Perm		Perm	Perm		Perm	Perm			Prot		
Protected Phases		2			6			4		3	8	
Permitted Phases	2		2	6		6	4					
Actuated Green, G (s)	55.0	55.0	55.0	55.0	55.0	55.0	8.7	8.7		12.1	27.5	
Effective Green, g (s)	55.0	55.0	55.0	55.0	55.0	55.0	8.7	8.7		12.1	27.5	
Actuated g/C Ratio	0.58	0.58	0.58	0.58	0.58	0.58	0.09	0.09		0.13	0.29	
Clearance Time (s)	6.2	6.2	6.2	6.2	6.2	6.2	6.7	6.7		6.7	6.7	
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	311	1960	883	353	1979	921	112	146		439	502	
v/s Ratio Prot		0.23			c0.25			0.01		c0.05	0.04	
v/s Ratio Perm	0.01		0.02	0.15		0.01	c0.03					
v/c Ratio	0.02	0.39	0.04	0.26	0.43	0.02	0.35	0.14		0.40	0.14	
Uniform Delay, d1	8.7	11.0	8.8	10.1	11.4	8.7	40.7	39.9		38.3	25.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.1	0.6	0.1	1.8	0.7	0.0	3.9	0.9		1.3	0.3	
Delay (s)	8.8	11.6	8.9	11.9	12.1	8.7	44.6	40.8		39.6	25.5	
Level of Service	A	B	A	B	B	A	D	D		D	C	
Approach Delay (s)		11.4			11.9			41.9			34.4	
Approach LOS		B			B			D			C	
<b>Intersection Summary</b>												
HCM Average Control Delay			16.3				HCM Level of Service				B	
HCM Volume to Capacity ratio			0.42									
Actuated Cycle Length (s)			95.4				Sum of lost time (s)			19.6		
Intersection Capacity Utilization			63.2%				ICU Level of Service			B		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis  
3: Bovaird Drive & Mississauga Road

<Existing> PM Peak Hour  
2/4/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	27	450	92	232	684	48	222	433	339	21	163	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6	6.6	3.0	6.6		3.0	6.6		6.6	6.6	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.93		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1552	1789	1452	1684	1819		1638	1697		1785	1749	
Flt Permitted	0.17	1.00	1.00	0.24	1.00		0.53	1.00		0.12	1.00	
Satd. Flow (perm)	278	1789	1452	420	1819		919	1697		231	1749	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	27	450	92	232	684	48	222	433	339	21	163	17
RTOR Reduction (vph)	0	0	61	0	2	0	0	23	0	0	3	0
Lane Group Flow (vph)	27	450	31	232	730	0	222	749	0	21	177	0
Heavy Vehicles (%)	15%	5%	10%	6%	2%	6%	9%	3%	4%	0%	4%	24%
Turn Type	Perm		Perm	pm+pt			pm+pt			Perm		
Protected Phases		2		1	6		7	4			8	
Permitted Phases	2		2	6			4			8		
Actuated Green, G (s)	40.4	40.4	40.4	55.4	55.4		51.4	51.4		32.6	32.6	
Effective Green, g (s)	40.4	40.4	40.4	55.4	55.4		51.4	51.4		32.6	32.6	
Actuated g/C Ratio	0.34	0.34	0.34	0.46	0.46		0.43	0.43		0.27	0.27	
Clearance Time (s)	6.6	6.6	6.6	3.0	6.6		3.0	6.6		6.6	6.6	
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	94	602	489	320	840		488	727		63	475	
v/s Ratio Prot		0.25		0.07	c0.40		0.06	c0.44			0.10	
v/s Ratio Perm	0.10		0.02	0.26			0.13			0.09		
v/c Ratio	0.29	0.75	0.06	0.72	0.87		0.45	1.03		0.33	0.37	
Uniform Delay, d1	29.2	35.3	27.0	23.1	29.0		22.9	34.3		35.0	35.4	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	7.5	8.3	0.2	9.6	11.8		1.4	41.2		13.7	2.2	
Delay (s)	36.8	43.5	27.2	32.8	40.9		24.3	75.5		48.7	37.6	
Level of Service	D	D	C	C	D		C	E		D	D	
Approach Delay (s)		40.6			38.9			64.1			38.8	
Approach LOS		D			D			E			D	
<b>Intersection Summary</b>												
HCM Average Control Delay			48.4			HCM Level of Service				D		
HCM Volume to Capacity ratio			0.95									
Actuated Cycle Length (s)			120.0			Sum of lost time (s)			13.2			
Intersection Capacity Utilization			131.1%			ICU Level of Service				H		
Analysis Period (min)			15									






















c Critical Lane Group

# HCM Signalized Intersection Capacity Analysis

<Existing> PM Peak Hour

## 4: Bovaird Drive & Heritage Road

2/4/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	25	509	8	21	908	12	46	111	65	4	9	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.4	7.4	7.4	7.4	7.4	7.4		6.2			6.2	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00			1.00	
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00		1.00			0.98	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00		1.00			1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85		0.96			0.95	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.99			0.99	
Satd. Flow (prot)	1785	1773	1597	1785	1842	1597		1786			1737	
Flt Permitted	0.19	1.00	1.00	0.44	1.00	1.00		0.92			0.94	
Satd. Flow (perm)	364	1773	1597	824	1842	1597		1668			1648	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	25	509	8	21	908	12	46	111	65	4	9	7
RTOR Reduction (vph)	0	0	1	0	0	1	0	18	0	0	6	0
Lane Group Flow (vph)	25	509	7	21	908	11	0	204	0	0	14	0
Confl. Peds. (#/hr)												7
Heavy Vehicles (%)	0%	6%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm		Perm	Perm		Perm	Perm				Perm	
Protected Phases		2			6			4				8
Permitted Phases	2		2	6		6	4			8		
Actuated Green, G (s)	57.0	57.0	57.0	57.0	57.0	57.0		16.6			16.6	
Effective Green, g (s)	57.0	57.0	57.0	57.0	57.0	57.0		16.6			16.6	
Actuated g/C Ratio	0.65	0.65	0.65	0.65	0.65	0.65		0.19			0.19	
Clearance Time (s)	7.4	7.4	7.4	7.4	7.4	7.4		6.2			6.2	
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0		5.0			5.0	
Lane Grp Cap (vph)	238	1159	1044	539	1204	1044		318			314	
v/s Ratio Prot		0.29			c0.49							
v/s Ratio Perm	0.07		0.00	0.03		0.01		c0.12			0.01	
v/c Ratio	0.11	0.44	0.01	0.04	0.75	0.01		0.64			0.05	
Uniform Delay, d1	5.6	7.3	5.3	5.4	10.3	5.3		32.6			28.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00			1.00	
Incremental Delay, d2	0.9	1.2	0.0	0.1	4.4	0.0		6.0			0.1	
Delay (s)	6.5	8.5	5.3	5.5	14.7	5.3		38.5			29.0	
Level of Service	A	A	A	A	B	A		D			C	
Approach Delay (s)		8.4			14.4			38.5			29.0	
Approach LOS		A			B			D			C	
<b>Intersection Summary</b>												
HCM Average Control Delay			15.8				HCM Level of Service				B	
HCM Volume to Capacity ratio			0.73									
Actuated Cycle Length (s)			87.2				Sum of lost time (s)		13.6			
Intersection Capacity Utilization			75.9%				ICU Level of Service				D	
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis  
 5: Bovaird Drive & Caseley Street

<Existing> PM Peak Hour  
 2/4/2010



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↶			↷		
Volume (veh/h)	539	6	5	970	1	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	539	6	5	970	1	0
Pedestrians	1			3	12	
Lane Width (m)	3.5			3.5	3.5	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	0			0	1	
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			557		1535	557
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			557		1535	557
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		99	100
cM capacity (veh/h)			1014		127	527

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	545	975	1
Volume Left	0	5	1
Volume Right	6	0	0
cSH	1700	1014	127
Volume to Capacity	0.32	0.00	0.01
Queue Length 95th (m)	0.0	0.1	0.2
Control Delay (s)	0.0	0.1	33.5
Lane LOS		A	D
Approach Delay (s)	0.0	0.1	33.5
Approach LOS			D

Intersection Summary			
Average Delay		0.1	
Intersection Capacity Utilization		66.0%	ICU Level of Service C
Analysis Period (min)		15	



## Do Nothing Scenario































HCM Signalized Intersection Capacity Analysis  
 1: Lake Lousie Drive/Worthington Avenue & Bovaird Drive

<Do Nothing> AM Peak Hour























3/22/2012

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		  			  							
Volume (vph)	171	1316	7	12	930	177	52	45	68	247	33	414
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6		6.6	6.6	6.6	6.9	6.9		6.9	6.9	
Lane Util. Factor	1.00	0.91		1.00	0.91	1.00	1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	1.00		1.00	1.00	0.97	1.00	0.98		1.00	0.98	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		0.99	1.00	
Frft	1.00	1.00		1.00	1.00	0.85	1.00	0.91		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1713	4882		1783	4932	1451	1781	1631		1764	1561	
Flt Permitted	0.28	1.00		0.17	1.00	1.00	0.19	1.00		0.68	1.00	
Satd. Flow (perm)	501	4882		312	4932	1451	353	1631		1270	1561	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	171	1316	7	12	930	177	52	45	68	247	33	414
RTOR Reduction (vph)	0	0	0	0	0	71	0	33	0	0	87	0
Lane Group Flow (vph)	171	1323	0	12	930	106	52	80	0	247	360	0
Confl. Peds. (#/hr)	3		3	3		3	6		12	12		6
Heavy Vehicles (%)	4%	5%	0%	0%	4%	7%	0%	8%	0%	0%	0%	2%
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6		6	4			8		
Actuated Green, G (s)	67.7	67.7		67.7	67.7	67.7	31.8	31.8		31.8	31.8	
Effective Green, g (s)	67.7	67.7		67.7	67.7	67.7	31.8	31.8		31.8	31.8	
Actuated g/C Ratio	0.60	0.60		0.60	0.60	0.60	0.28	0.28		0.28	0.28	
Clearance Time (s)	6.6	6.6		6.6	6.6	6.6	6.9	6.9		6.9	6.9	
Vehicle Extension (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	300	2925		187	2955	869	99	459		357	439	
v/s Ratio Prot		0.27			0.19			0.05			c0.23	
v/s Ratio Perm	c0.34			0.04		0.07	0.15			0.19		
v/c Ratio	0.57	0.45		0.06	0.31	0.12	0.53	0.17		0.69	0.82	
Uniform Delay, d1	13.8	12.5		9.4	11.2	9.8	34.2	30.7		36.2	37.9	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	7.7	0.5		0.7	0.3	0.3	9.3	0.4		7.2	13.0	
Delay (s)	21.4	13.0		10.1	11.5	10.1	43.5	31.1		43.4	50.9	
Level of Service	C	B		B	B	B	D	C		D	D	
Approach Delay (s)		13.9			11.2			35.0			48.2	
Approach LOS		B			B			C			D	
<b>Intersection Summary</b>												
HCM Average Control Delay			20.9				HCM Level of Service			C		
HCM Volume to Capacity ratio			0.65									
Actuated Cycle Length (s)			113.0				Sum of lost time (s)			13.5		
Intersection Capacity Utilization			103.5%				ICU Level of Service			G		
Analysis Period (min)			15									
c	Critical Lane Group											

HCM Signalized Intersection Capacity Analysis  
2: Ashby Field Road & Bovaird Drive

<Do Nothing> AM Peak Hour

2/14/2012

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Volume (vph)	52	1421	44	91	1841	199	159	64	153	62	15	14	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	3.0	6.2	6.2	6.2	6.2	6.2	6.7	6.7		6.7	6.7		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00		0.97	1.00		
Frbp, ped/bikes	1.00	1.00	0.98	1.00	1.00	1.00	1.00	0.99		1.00	1.00		
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00		
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.89		1.00	0.93		
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (prot)	1580	3368	1516	1700	3336	1597	1750	1632		3463	1663		
Flt Permitted	0.07	1.00	1.00	0.13	1.00	1.00	0.74	1.00		0.95	1.00		
Satd. Flow (perm)	113	3368	1516	233	3336	1597	1360	1632		3463	1663		
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Adj. Flow (vph)	52	1421	44	91	1841	199	159	64	153	62	15	14	
RTOR Reduction (vph)	0	0	18	0	0	84	0	52	0	0	10	0	
Lane Group Flow (vph)	52	1421	26	91	1841	115	159	165	0	62	19	0	
Confl. Peds. (#/hr)			1	1					8	8			
Heavy Vehicles (%)	13%	6%	3%	5%	7%	0%	2%	0%	2%	0%	0%	10%	
Turn Type	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA		Prot	NA		
Protected Phases	5	2			6			4		3	8		
Permitted Phases	2		2	6		6	4						
Actuated Green, G (s)	64.8	64.8	64.8	55.7	55.7	55.7	19.9	19.9		6.1	32.7		
Effective Green, g (s)	64.8	64.8	64.8	55.7	55.7	55.7	19.9	19.9		6.1	32.7		
Actuated g/C Ratio	0.59	0.59	0.59	0.50	0.50	0.50	0.18	0.18		0.06	0.30		
Clearance Time (s)	3.0	6.2	6.2	6.2	6.2	6.2	6.7	6.7		6.7	6.7		
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0		
Lane Grp Cap (vph)	147	1977	890	118	1683	806	245	294		191	493		
v/s Ratio Prot	0.02	c0.42			c0.55			0.10		c0.02	0.01		
v/s Ratio Perm	0.19		0.02	0.39		0.07	c0.12						
v/c Ratio	0.35	0.72	0.03	0.77	1.09	0.14	0.65	0.56		0.32	0.04		
Uniform Delay, d1	23.7	16.3	9.6	22.2	27.4	14.6	42.0	41.3		50.2	27.7		
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00		
Incremental Delay, d2	3.1	2.3	0.1	37.6	52.3	0.4	7.9	4.0		2.1	0.1		
Delay (s)	26.8	18.6	9.6	59.8	79.7	15.0	49.9	45.3		52.2	27.7		
Level of Service	C	B	A	E	E	B	D	D		D	C		
Approach Delay (s)		18.6			72.8			47.2			44.4		
Approach LOS		B			E			D			D		
<b>Intersection Summary</b>													
HCM Average Control Delay			49.8		HCM Level of Service						D		
HCM Volume to Capacity ratio			0.95										
Actuated Cycle Length (s)			110.4		Sum of lost time (s)					25.8			
Intersection Capacity Utilization			95.7%		ICU Level of Service					F			
Analysis Period (min)			15										
c Critical Lane Group													

HCM Signalized Intersection Capacity Analysis  
 3: Mississauga Road & Bovaird Drive

<Do Nothing> AM Peak Hour

2/14/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	113	1231	374	572	1165	139	238	1082	418	86	730	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6	6.6	3.0	6.6		3.0	6.6		6.6	6.6	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.96		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1513	1789	1536	1653	1688		1684	1658		1608	1777	
Flt Permitted	0.09	1.00	1.00	0.08	1.00		0.10	1.00		0.10	1.00	
Satd. Flow (perm)	140	1789	1536	144	1688		171	1658		176	1777	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	113	1231	374	572	1165	139	238	1082	418	86	730	70
RTOR Reduction (vph)	0	0	119	0	3	0	0	11	0	0	3	0
Lane Group Flow (vph)	113	1231	255	572	1301	0	238	1489	0	86	797	0
Heavy Vehicles (%)	18%	5%	4%	8%	9%	14%	6%	10%	5%	11%	4%	8%
Turn Type	Perm	NA	Perm	pm+pt	NA		pm+pt	NA		Perm	NA	
Protected Phases		2		1	6		7	4			8	
Permitted Phases	2		2	6			4			8		
Actuated Green, G (s)	45.4	45.4	45.4	65.4	65.4		51.4	51.4		38.4	38.4	
Effective Green, g (s)	45.4	45.4	45.4	65.4	65.4		51.4	51.4		38.4	38.4	
Actuated g/C Ratio	0.35	0.35	0.35	0.50	0.50		0.40	0.40		0.30	0.30	
Clearance Time (s)	6.6	6.6	6.6	3.0	6.6		3.0	6.6		6.6	6.6	
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	49	625	536	270	849		184	656		52	525	
v/s Ratio Prot		0.69		c0.28	0.77		0.10	c0.90			0.45	
v/s Ratio Perm	c0.81		0.17	0.79			0.41			0.49		
v/c Ratio	2.31	1.97	0.48	2.12	1.53		1.29	2.27		1.65	1.52	
Uniform Delay, d1	42.3	42.3	33.0	41.6	32.3		34.6	39.3		45.8	45.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	646.7	442.1	3.0	515.7	245.3		166.3	576.4		364.8	242.9	
Delay (s)	689.0	484.4	36.0	557.3	277.6		200.9	615.7		410.6	288.7	
Level of Service	F	F	D	F	F		F	F		F	F	
Approach Delay (s)		400.2			362.9			558.9			300.6	
Approach LOS		F			F			F			F	

Intersection Summary






















HCM Average Control Delay	419.1	HCM Level of Service	F
HCM Volume to Capacity ratio	2.27		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	16.2
Intersection Capacity Utilization	208.7%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis  
4: Heritage Road & Bovaird Drive

<Do Nothing> AM Peak Hour

2/14/2012

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	115	1195	68	96	1538	66	24	148	28	16	163	76
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.4	7.4	7.4	7.4	7.4	7.4		6.2			6.2	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00			1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85		0.98			0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.99			1.00	
Satd. Flow (prot)	1733	1807	1551	1785	1756	1597		1661			1786	
Flt Permitted	0.05	1.00	1.00	0.05	1.00	1.00		0.86			0.97	
Satd. Flow (perm)	88	1807	1551	97	1756	1597		1442			1739	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	115	1195	68	96	1538	66	24	148	28	16	163	76
RTOR Reduction (vph)	0	0	3	0	0	3	0	5	0	0	13	0
Lane Group Flow (vph)	115	1195	65	96	1538	63	0	195	0	0	242	0
Heavy Vehicles (%)	3%	4%	3%	0%	7%	0%	0%	13%	5%	0%	1%	0%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2		2	6		6	4			8		
Actuated Green, G (s)	82.8	82.8	82.8	82.8	82.8	82.8		23.4			23.4	
Effective Green, g (s)	82.8	82.8	82.8	82.8	82.8	82.8		23.4			23.4	
Actuated g/C Ratio	0.69	0.69	0.69	0.69	0.69	0.69		0.20			0.20	
Clearance Time (s)	7.4	7.4	7.4	7.4	7.4	7.4		6.2			6.2	
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0		5.0			5.0	
Lane Grp Cap (vph)	61	1249	1072	67	1214	1104		282			340	
v/s Ratio Prot		0.66			0.88							
v/s Ratio Perm	c1.30		0.04	0.99		0.04		0.14			c0.14	
v/c Ratio	1.89	0.96	0.06	1.43	1.27	0.06		0.69			0.71	
Uniform Delay, d1	18.5	16.9	6.0	18.5	18.5	5.9		44.8			45.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00			1.00	
Incremental Delay, d2	453.6	17.0	0.1	261.1	126.8	0.1		9.0			8.5	
Delay (s)	472.1	33.9	6.1	279.6	145.3	6.0		53.8			53.5	
Level of Service	F	C	A	F	F	A		D			D	
Approach Delay (s)		69.1			147.4			53.8			53.5	
Approach LOS		E			F			D			D	











Intersection Summary

HCM Average Control Delay	104.8	HCM Level of Service	F
HCM Volume to Capacity ratio	1.63		
Actuated Cycle Length (s)	119.8	Sum of lost time (s)	13.6
Intersection Capacity Utilization	124.1%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis  
5: Caseley Street & Bovaird Drive

<Do Nothing> AM Peak Hour  
2/14/2012

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	305	1	0	389	4	2
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	305	1	0	389	4	2
Pedestrians	5			4	1	
Lane Width (m)	3.5			3.5	3.5	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	0			0	0	
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			307		700	310
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			307		700	310
tC, single (s)			4.3		6.6	6.4
tC, 2 stage (s)						
tF (s)			2.4		3.7	3.5
p0 queue free %			100		99	100
cM capacity (veh/h)			1172		375	683
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>WB 1</b>	<b>NB 1</b>			
Volume Total	306	389	6			
Volume Left	0	0	4			
Volume Right	1	0	2			
cSH	1700	1172	441			
Volume to Capacity	0.18	0.00	0.01			
Queue Length 95th (m)	0.0	0.0	0.3			
Control Delay (s)	0.0	0.0	13.3			
Lane LOS			B			
Approach Delay (s)	0.0	0.0	13.3			
Approach LOS			B			
<b>Intersection Summary</b>						
Average Delay			0.1			
Intersection Capacity Utilization			31.7%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis  
 1: Lake Lousie Drive/Worthington Avenue & Bovaird Drive
























<Do Nothing> PM Peak Hour

3/22/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	414	930	52	68	1316	247	7	33	12	177	45	171
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.6		6.6	6.6	6.6	6.9	6.9		4.0	6.9	
Lane Util. Factor	1.00	0.91		1.00	0.91	1.00	1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	1.00		1.00	1.00	0.97	1.00	0.99		1.00	0.97	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	0.98	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	1.00	0.85	1.00	0.96		1.00	0.88	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1750	4723		1785	4839	1401	1749	1791		1733	1228	
Flt Permitted	0.11	1.00		0.28	1.00	1.00	0.71	1.00		0.95	1.00	
Satd. Flow (perm)	212	4723		525	4839	1401	1315	1791		1733	1228	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	414	930	52	68	1316	247	7	33	12	177	45	171
RTOR Reduction (vph)	0	4	0	0	0	160	0	11	0	0	130	0
Lane Group Flow (vph)	414	978	0	68	1316	87	7	34	0	177	86	0
Confl. Peds. (#/hr)	3					3	30		17	17		30
Heavy Vehicles (%)	2%	8%	3%	0%	6%	11%	0%	0%	0%	3%	3%	38%
Turn Type	pm+pt	NA		Perm	NA	Perm	Perm	NA		Prot	NA	
Protected Phases	5	2			6			4		3	8	
Permitted Phases	2			6		6	4					
Actuated Green, G (s)	53.0	53.0		30.8	30.8	30.8	5.6	5.6		11.1	20.7	
Effective Green, g (s)	53.0	53.0		30.8	30.8	30.8	5.6	5.6		11.1	20.7	
Actuated g/C Ratio	0.61	0.61		0.35	0.35	0.35	0.06	0.06		0.13	0.24	
Clearance Time (s)	4.0	6.6		6.6	6.6	6.6	6.9	6.9		4.0	6.9	
Vehicle Extension (s)	3.0	5.0		5.0	5.0	5.0	5.0	5.0		3.0	5.0	
Lane Grp Cap (vph)	450	2871		185	1709	495	84	115		221	292	
v/s Ratio Prot	c0.19	0.21			0.27			0.02		c0.10	c0.07	
v/s Ratio Perm	c0.37			0.13		0.06	0.01					
v/c Ratio	0.92	0.34		0.37	0.77	0.18	0.08	0.29		0.80	0.29	
Uniform Delay, d1	23.3	8.5		21.0	25.1	19.5	38.4	38.9		37.0	27.3	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	24.0	0.3		5.5	3.4	0.8	0.9	3.0		18.5	1.2	
Delay (s)	47.3	8.8		26.5	28.5	20.2	39.3	41.9		55.4	28.4	
Level of Service	D	A		C	C	C	D	D		E	C	
Approach Delay (s)		20.2			27.1			41.5			40.6	
Approach LOS		C			C			D			D	
<b>Intersection Summary</b>												
HCM Average Control Delay			26.1		HCM Level of Service					C		
HCM Volume to Capacity ratio			0.74									
Actuated Cycle Length (s)			87.2		Sum of lost time (s)				8.0			
Intersection Capacity Utilization			84.3%		ICU Level of Service					E		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis  
2: Ashby Field Road & Bovaird Drive

<Do Nothing> PM Peak Hour  
2/14/2012






















												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	14	1841	159	153	1421	62	44	15	91	199	64	52
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.2	6.2	6.2	6.2	6.2	6.2	6.7	6.7		6.7	6.7	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00		0.97	1.00	
Frbp, ped/bikes	1.00	1.00	0.98	1.00	1.00	1.00	1.00	0.98		1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.87		1.00	0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1785	3400	1531	1785	3433	1597	1692	1604		3463	1739	
Flt Permitted	0.12	1.00	1.00	0.06	1.00	1.00	0.68	1.00		0.95	1.00	
Satd. Flow (perm)	225	3400	1531	118	3433	1597	1215	1604		3463	1739	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	14	1841	159	153	1421	62	44	15	91	199	64	52
RTOR Reduction (vph)	0	0	53	0	0	24	0	9	0	0	21	0
Lane Group Flow (vph)	14	1841	106	153	1421	38	44	97	0	199	95	0
Confl. Peds. (#/hr)			1	1			5		11	11		5
Heavy Vehicles (%)	0%	5%	2%	0%	4%	0%	5%	0%	0%	0%	0%	0%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		Prot	NA	
Protected Phases		2			6			4		3		8
Permitted Phases	2		2	6		6	4					
Actuated Green, G (s)	63.5	63.5	63.5	63.5	63.5	63.5	13.5	13.5		8.0	28.2	
Effective Green, g (s)	63.5	63.5	63.5	63.5	63.5	63.5	13.5	13.5		8.0	28.2	
Actuated g/C Ratio	0.61	0.61	0.61	0.61	0.61	0.61	0.13	0.13		0.08	0.27	
Clearance Time (s)	6.2	6.2	6.2	6.2	6.2	6.2	6.7	6.7		6.7	6.7	
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	137	2064	929	72	2084	969	157	207		265	469	
v/s Ratio Prot		0.54			0.41			c0.06		c0.06	0.05	
v/s Ratio Perm	0.06		0.07	c1.29		0.02	0.04					
v/c Ratio	0.10	0.89	0.11	2.12	0.68	0.04	0.28	0.47		0.75	0.20	
Uniform Delay, d1	8.6	17.6	8.7	20.5	13.8	8.3	41.2	42.2		47.3	29.5	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.5	6.4	0.3	549.7	1.8	0.1	2.0	3.5		13.4	0.4	
Delay (s)	10.1	24.0	8.9	570.3	15.6	8.3	43.2	45.7		60.7	30.0	
Level of Service	B	C	A	F	B	A	D	D		E	C	
Approach Delay (s)		22.7			67.2			45.0			49.4	
Approach LOS		C			E			D			D	

Intersection Summary

HCM Average Control Delay	43.2	HCM Level of Service	D
HCM Volume to Capacity ratio	1.74		
Actuated Cycle Length (s)	104.6	Sum of lost time (s)	19.6
Intersection Capacity Utilization	91.0%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis  
3: Mississauga Road & Bovaird Drive

<Do Nothing> PM Peak Hour  
2/14/2012

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	70	1165	238	418	1231	86	374	730	572	139	1082	113
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6	6.6	3.0	6.6		3.0	6.6		6.6	6.6	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.93		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1552	1789	1452	1684	1819		1638	1697		1785	1749	
Flt Permitted	0.10	1.00	1.00	0.09	1.00		0.08	1.00		0.09	1.00	
Satd. Flow (perm)	158	1789	1452	160	1819		140	1697		162	1749	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	70	1165	238	418	1231	86	374	730	572	139	1082	113
RTOR Reduction (vph)	0	0	80	0	2	0	0	22	0	0	3	0
Lane Group Flow (vph)	70	1165	158	418	1315	0	374	1280	0	139	1192	0
Heavy Vehicles (%)	15%	5%	10%	6%	2%	6%	9%	3%	4%	0%	4%	24%
Turn Type	Perm	NA	Perm	pm+pt	NA		pm+pt	NA		Perm	NA	
Protected Phases		2		1	6		7	4			8	
Permitted Phases	2		2	6			4			8		
Actuated Green, G (s)	41.4	41.4	41.4	56.4	56.4		60.4	60.4		46.4	46.4	
Effective Green, g (s)	41.4	41.4	41.4	56.4	56.4		60.4	60.4		46.4	46.4	
Actuated g/C Ratio	0.32	0.32	0.32	0.43	0.43		0.46	0.46		0.36	0.36	
Clearance Time (s)	6.6	6.6	6.6	3.0	6.6		3.0	6.6		6.6	6.6	
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	50	570	462	210	789		192	788		58	624	
v/s Ratio Prot		0.65		c0.18	0.72		c0.17	0.75			0.68	
v/s Ratio Perm	0.44		0.11	c0.68			0.74			c0.86		
v/c Ratio	1.40	2.04	0.34	1.99	1.67		1.95	1.62		2.40	1.91	
Uniform Delay, d1	44.3	44.3	33.9	37.8	36.8		38.2	34.8		41.8	41.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	265.4	475.8	2.0	462.3	305.8		445.0	286.8		677.8	415.9	
Delay (s)	309.7	520.1	35.9	500.1	342.6		483.2	321.6		719.6	457.7	
Level of Service	F	F	D	F	F		F	F		F	F	
Approach Delay (s)		431.9			380.5			357.7			485.0	
Approach LOS		F			F			F			F	

Intersection Summary

HCM Average Control Delay	408.9	HCM Level of Service	F
HCM Volume to Capacity ratio	2.08		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	12.6
Intersection Capacity Utilization	192.0%	ICU Level of Service	H
Analysis Period (min)	15		






















c Critical Lane Group



HCM Signalized Intersection Capacity Analysis  
4: Heritage Road & Bovaird Drive

<Do Nothing> PM Peak Hour

2/14/2012

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	76	1538	24	28	1195	16	68	163	96	66	148	115
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.4	7.4	6.2	7.4	7.4	6.2		6.2			6.2	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00			1.00	
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00		1.00			0.98	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00		1.00			1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85		0.96			0.95	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.99			0.99	
Satd. Flow (prot)	1785	1773	1597	1785	1842	1597		1786			1737	
Flt Permitted	0.08	1.00	1.00	0.08	1.00	1.00		0.76			0.78	
Satd. Flow (perm)	148	1773	1597	148	1842	1597		1378			1362	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	76	1538	24	28	1195	16	68	163	96	66	148	115
RTOR Reduction (vph)	0	0	1	0	0	1	0	17	0	0	22	0
Lane Group Flow (vph)	76	1538	23	28	1195	15	0	310	0	0	307	0
Confl. Peds. (#/hr)												7
Heavy Vehicles (%)	0%	6%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA	custom	Perm	NA	custom	Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2		4	6		8	4			8		
Actuated Green, G (s)	50.7	50.7	22.7	50.7	50.7	22.7		22.7			22.7	
Effective Green, g (s)	50.7	50.7	22.7	50.7	50.7	22.7		22.7			22.7	
Actuated g/C Ratio	0.58	0.58	0.26	0.58	0.58	0.26		0.26			0.26	
Clearance Time (s)	7.4	7.4	6.2	7.4	7.4	6.2		6.2			6.2	
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0		5.0			5.0	
Lane Grp Cap (vph)	86	1033	417	86	1073	417		360			355	
v/s Ratio Prot		c0.87			0.65							
v/s Ratio Perm	0.51		0.01	0.19		0.01		0.22			c0.23	
v/c Ratio	0.88	1.49	0.05	0.33	1.11	0.03		0.86			0.86	
Uniform Delay, d1	15.6	18.1	24.1	9.3	18.1	24.0		30.6			30.7	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00			1.00	
Incremental Delay, d2	68.7	225.2	0.1	9.8	64.3	0.1		20.0			20.6	
Delay (s)	84.4	243.3	24.2	19.1	82.4	24.1		50.7			51.3	
Level of Service	F	F	C	B	F	C		D			D	
Approach Delay (s)		232.7			80.2			50.7			51.3	
Approach LOS		F			F			D			D	
<b>Intersection Summary</b>												
HCM Average Control Delay			145.5				HCM Level of Service				F	
HCM Volume to Capacity ratio			1.30									
Actuated Cycle Length (s)			87.0				Sum of lost time (s)			13.6		
Intersection Capacity Utilization			117.0%				ICU Level of Service			H		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis  
5: Caseley Street & Bovaird Drive

<Do Nothing> PM Peak Hour  
2/14/2012



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↔	↔	
Volume (veh/h)	389	4	2	305	1	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	389	4	2	305	1	0
Pedestrians	1			3	12	
Lane Width (m)	3.5			3.5	3.5	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	0			0	1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			405		713	406
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			405		713	406
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1153		397	641
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>WB 1</b>	<b>NB 1</b>			
Volume Total	393	307	1			
Volume Left	0	2	1			
Volume Right	4	0	0			
cSH	1700	1153	397			
Volume to Capacity	0.23	0.00	0.00			
Queue Length 95th (m)	0.0	0.0	0.1			
Control Delay (s)	0.0	0.1	14.1			
Lane LOS	A		B			
Approach Delay (s)	0.0	0.1	14.1			
Approach LOS	B					
<b>Intersection Summary</b>						
Average Delay			0.1			
Intersection Capacity Utilization			31.7%	ICU Level of Service	A	
Analysis Period (min)			15			



2021 Traffic



HCM Signalized Intersection Capacity Analysis  
 1: Lake Lousie Drive/Worthington Avenue & Bovaird Drive

<2021> AM Peak Hour  
 3/22/2012




























Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	171	1316	7	12	930	177	52	45	68	247	33	414
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.6		6.6	6.6	6.6	6.9	6.9		6.9	6.9	
Lane Util. Factor	1.00	0.91		1.00	0.91	1.00	1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	1.00		1.00	1.00	0.97	1.00	0.99		1.00	0.98	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		0.99	1.00	
Frft	1.00	1.00		1.00	1.00	0.85	1.00	0.91		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1750	4746		1783	4839	1400	1781	1684		1714	1174	
Flt Permitted	0.20	1.00		0.20	1.00	1.00	0.20	1.00		0.68	1.00	
Satd. Flow (perm)	363	4746		367	4839	1400	374	1684		1234	1174	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	171	1316	7	12	930	177	52	45	68	247	33	414
RTOR Reduction (vph)	0	0	0	0	0	118	0	22	0	0	297	0
Lane Group Flow (vph)	171	1323	0	12	930	59	52	91	0	247	150	0
Confl. Peds. (#/hr)	3		3	3		3	6		12	12		6
Heavy Vehicles (%)	2%	8%	3%	0%	6%	11%	0%	0%	0%	3%	3%	38%
Turn Type	pm+pt	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2			6			4				8
Permitted Phases	2			6		6	4			8		
Actuated Green, G (s)	60.8	60.8		34.6	34.6	34.6	29.2	29.2		29.2	29.2	
Effective Green, g (s)	60.8	60.8		34.6	34.6	34.6	29.2	29.2		29.2	29.2	
Actuated g/C Ratio	0.59	0.59		0.33	0.33	0.33	0.28	0.28		0.28	0.28	
Clearance Time (s)	3.0	6.6		6.6	6.6	6.6	6.9	6.9		6.9	6.9	
Vehicle Extension (s)	3.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	524	2788		123	1618	468	106	475		348	331	
v/s Ratio Prot	0.07	c0.28			c0.19			0.05				0.13
v/s Ratio Perm	0.12			0.03		0.04	0.14			c0.20		
v/c Ratio	0.33	0.47		0.10	0.57	0.13	0.49	0.19		0.71	0.45	
Uniform Delay, d1	10.9	12.2		23.7	28.4	23.9	31.0	28.2		33.3	30.6	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	0.6		1.6	1.5	0.6	7.3	0.4		8.1	2.1	
Delay (s)	11.2	12.8		25.3	29.9	24.5	38.2	28.6		41.4	32.6	
Level of Service	B	B		C	C	C	D	C		D	C	
Approach Delay (s)		12.6			29.0			31.6			35.8	
Approach LOS		B			C			C			D	

Intersection Summary

HCM Average Control Delay	23.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	103.5	Sum of lost time (s)	20.1
Intersection Capacity Utilization	103.5%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis  
2: Bovaird Drive & Ashby Field Road

<2021> AM Peak Hour  
4/26/2011

























												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		  			  					 		
Volume (vph)	52	1421	44	91	1841	199	159	64	153	62	15	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.2	6.2	6.2	3.0	6.2	6.2	6.7	6.7		6.7	6.7	
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91	1.00	1.00	1.00		0.97	1.00	
Frbp, ped/bikes	1.00	1.00	0.98	1.00	1.00	1.00	1.00	0.98		1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.89		1.00	0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1785	4885	1531	1785	4932	1597	1691	1651		3463	1728	
Flt Permitted	0.08	1.00	1.00	0.12	1.00	1.00	0.74	1.00		0.95	1.00	
Satd. Flow (perm)	159	4885	1531	222	4932	1597	1314	1651		3463	1728	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	52	1421	44	91	1841	199	159	64	153	62	15	14
RTOR Reduction (vph)	0	0	22	0	0	85	0	78	0	0	6	0
Lane Group Flow (vph)	52	1421	22	91	1841	114	159	139	0	62	23	0
Confl. Peds. (#/hr)			1	1			5		11	11		5
Heavy Vehicles (%)	0%	5%	2%	0%	4%	0%	5%	0%	0%	0%	0%	0%
Turn Type	Perm		Perm	pm+pt		Perm	Perm			Prot		
Protected Phases		2		1	6			4		3	8	
Permitted Phases	2		2	6		6	4					
Actuated Green, G (s)	55.0	55.0	55.0	63.3	63.3	63.3	20.2	20.2		7.0	33.9	
Effective Green, g (s)	55.0	55.0	55.0	63.3	63.3	63.3	20.2	20.2		7.0	33.9	
Actuated g/C Ratio	0.50	0.50	0.50	0.57	0.57	0.57	0.18	0.18		0.06	0.31	
Clearance Time (s)	6.2	6.2	6.2	3.0	6.2	6.2	6.7	6.7		6.7	6.7	
Vehicle Extension (s)	5.0	5.0	5.0	3.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	79	2440	765	203	2836	918	241	303		220	532	
v/s Ratio Prot		0.29		0.02	c0.37			0.08		c0.02	0.01	
v/s Ratio Perm	0.33		0.01	0.24		0.07	c0.12					
v/c Ratio	0.66	0.58	0.03	0.45	0.65	0.12	0.66	0.46		0.28	0.04	
Uniform Delay, d1	20.5	19.4	14.0	12.8	15.9	10.7	41.8	40.1		49.2	26.7	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	35.6	1.0	0.1	1.6	1.2	0.3	8.5	2.3		1.5	0.1	
Delay (s)	56.2	20.5	14.1	14.4	17.0	11.0	50.3	42.4		50.6	26.8	
Level of Service	E	C	B	B	B	B	D	D		D	C	
Approach Delay (s)		21.5			16.4			45.7			43.0	
Approach LOS		C			B			D			D	

Intersection Summary

HCM Average Control Delay	21.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	110.1	Sum of lost time (s)	19.6
Intersection Capacity Utilization	88.0%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis  
3: Bovaird Drive & Mississauga Road

<2021> AM Peak Hour  
4/26/2011

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	113	1231	374	572	1165	139	238	1082	418	86	730	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.6	6.6	3.0	6.6	6.6	3.0	6.6	6.6	6.6	6.6	6.6
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91	1.00	1.00	0.91	1.00	1.00	0.91	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1552	4885	1452	1684	5029	1507	1638	4980	1536	1785	4932	1288
Flt Permitted	0.23	1.00	1.00	0.12	1.00	1.00	0.23	1.00	1.00	0.23	1.00	1.00
Satd. Flow (perm)	377	4885	1452	219	5029	1507	390	4980	1536	436	4932	1288
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	113	1231	374	572	1165	139	238	1082	418	86	730	70
RTOR Reduction (vph)	0	0	156	0	0	41	0	0	270	0	0	39
Lane Group Flow (vph)	113	1231	218	572	1165	98	238	1082	148	86	730	31
Heavy Vehicles (%)	15%	5%	10%	6%	2%	6%	9%	3%	4%	0%	4%	24%
Turn Type	pm+pt		Perm	pm+pt		Perm	pm+pt		Perm	Perm		Perm
Protected Phases	5	2		1	6		7	4			8	
Permitted Phases	2		2	6		6	4		4	8		8
Actuated Green, G (s)	38.3	29.4	29.4	64.4	52.5	52.5	42.4	42.4	42.4	29.4	29.4	29.4
Effective Green, g (s)	38.3	29.4	29.4	64.4	52.5	52.5	42.4	42.4	42.4	29.4	29.4	29.4
Actuated g/C Ratio	0.32	0.24	0.24	0.54	0.44	0.44	0.35	0.35	0.35	0.24	0.24	0.24
Clearance Time (s)	3.0	6.6	6.6	3.0	6.6	6.6	3.0	6.6	6.6	6.6	6.6	6.6
Vehicle Extension (s)	3.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Grp Cap (vph)	207	1197	356	508	2200	659	242	1760	543	107	1208	316
v/s Ratio Prot	0.04	0.25		c0.30	0.23		c0.08	0.22			0.15	
v/s Ratio Perm	0.13		0.15	c0.30		0.07	c0.27		0.10	0.20		0.02
v/c Ratio	0.55	1.03	0.61	1.13	0.53	0.15	0.98	0.61	0.27	0.80	0.60	0.10
Uniform Delay, d1	30.0	45.3	40.3	35.3	24.7	20.3	34.1	32.1	27.8	42.6	40.1	35.0
Progression 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
Incremental Delay, d2	2.9	33.5	7.7	79.3	0.9	0.5	53.2	0.9	0.6	45.5	2.2	0.6
Delay (s)	32.9	78.8	47.9	114.7	25.6	20.8	87.3	33.0	28.3	88.1	42.4	35.6
Level of Service	C	E	D	F	C	C	F	C	C	F	D	D
Approach Delay (s)		69.1			52.4			39.3			46.3	
Approach LOS		E			D			D			D	




























Intersection Summary

HCM Average Control Delay	52.5	HCM Level of Service	D
HCM Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	106.2%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis  
4: Bovaird Drive & Heritage Road

<2021> AM Peak Hour  
4/26/2011

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			 			 			 	
Volume (vph)	115	1195	68	96	1538	66	24	148	28	16	163	76
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.4	7.4	7.4	7.4	7.4	7.4	6.2	6.2		6.2	6.2	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Fr t	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	0.95	
Fl t Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1785	3368	1597	1785	3500	1597	1785	3485		1785	3376	
Fl t Permitted	0.12	1.00	1.00	0.21	1.00	1.00	0.60	1.00		0.64	1.00	
Satd. Flow (perm)	234	3368	1597	390	3500	1597	1133	3485		1204	3376	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	115	1195	68	96	1538	66	24	148	28	16	163	76
RTOR Reduction (vph)	0	0	18	0	0	8	0	19	0	0	29	0
Lane Group Flow (vph)	115	1195	50	96	1538	58	24	157	0	16	210	0
Confl. Peds. (#/hr)												7
Heavy Vehicles (%)	0%	6%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm		Perm	Perm		Perm	Perm			Perm		
Protected Phases		2			6			4			8	
Permitted Phases	2		2	6		6	4			8		
Actuated Green, G (s)	53.2	53.2	53.2	53.2	53.2	53.2	12.0	12.0		12.0	12.0	
Effective Green, g (s)	53.2	53.2	53.2	53.2	53.2	53.2	12.0	12.0		12.0	12.0	
Actuated g/C Ratio	0.68	0.68	0.68	0.68	0.68	0.68	0.15	0.15		0.15	0.15	
Clearance Time (s)	7.4	7.4	7.4	7.4	7.4	7.4	6.2	6.2		6.2	6.2	
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	158	2274	1078	263	2363	1078	173	531		183	514	
v/s Ratio Prot		0.35			0.44			0.04			c0.06	
v/s Ratio Perm	c0.49		0.03	0.25		0.04	0.02			0.01		
v/c Ratio	0.73	0.53	0.05	0.37	0.65	0.05	0.14	0.29		0.09	0.41	
Uniform Delay, d1	8.2	6.4	4.3	5.5	7.4	4.3	28.9	29.6		28.7	30.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	25.3	0.9	0.1	3.9	1.4	0.1	0.8	0.7		0.4	1.1	
Delay (s)	33.4	7.3	4.4	9.4	8.8	4.4	29.7	30.3		29.1	31.3	
Level of Service	C	A	A	A	A	A	C	C		C	C	
Approach Delay (s)		9.4			8.7			30.2			31.2	
Approach LOS		A			A			C			C	

Intersection Summary

HCM Average Control Delay	11.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	78.8	Sum of lost time (s)	13.6
Intersection Capacity Utilization	93.3%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			



HCM Unsignalized Intersection Capacity Analysis  
 5: Bovaird Drive & Caseley Street

<2021> AM Peak Hour  
 4/26/2011



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↩			↩	↩	
Volume (veh/h)	305	1	0	389	4	2
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	305	1	0	389	4	2
Pedestrians	1			3	12	
Lane Width (m)	3.5			3.5	3.5	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	0			0	1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			318		708	320
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			318		708	320
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		99	100
cM capacity (veh/h)			1241		400	716

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	306	389	6
Volume Left	0	0	4
Volume Right	1	0	2
cSH	1700	1241	469
Volume to Capacity	0.18	0.00	0.01
Queue Length 95th (m)	0.0	0.0	0.3
Control Delay (s)	0.0	0.0	12.8
Lane LOS			B
Approach Delay (s)	0.0	0.0	12.8
Approach LOS			B

Intersection Summary			
Average Delay		0.1	
Intersection Capacity Utilization		31.4%	ICU Level of Service A
Analysis Period (min)		15	

HCM Signalized Intersection Capacity Analysis  
 22: James Potter Road/Creditview Road & Bovaird Drive

<2021> AM Peak Hour  
 2/14/2012



























Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	157	1131	27	91	1274	79	4	160	26	81	383	255
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.6	6.6	3.0	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frbp, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.97	1.00	1.00	0.97	1.00	1.00	0.68
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	0.99	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1750	4663	1520	1749	4663	1520	1732	3500	1520	1725	3500	1066
Flt Permitted	0.11	1.00	1.00	0.20	1.00	1.00	0.51	1.00	1.00	0.65	1.00	1.00
Satd. Flow (perm)	201	4663	1520	368	4663	1520	930	3500	1520	1181	3500	1066
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	157	1131	27	91	1274	79	4	160	26	81	383	255
RTOR Reduction (vph)	0	0	16	0	0	51	0	0	16	0	0	139
Lane Group Flow (vph)	157	1131	11	91	1274	28	4	160	10	81	383	116
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		207
Heavy Vehicles (%)	2%	10%	2%	2%	10%	2%	2%	2%	2%	2%	2%	2%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)	46.8	38.3	38.3	39.1	33.6	33.6	34.6	34.6	34.6	34.6	34.6	34.6
Effective Green, g (s)	46.8	38.3	38.3	39.1	33.6	33.6	34.6	34.6	34.6	34.6	34.6	34.6
Actuated g/C Ratio	0.49	0.40	0.40	0.41	0.36	0.36	0.37	0.37	0.37	0.37	0.37	0.37
Clearance Time (s)	3.0	6.6	6.6	3.0	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	266	1888	615	232	1656	540	340	1280	556	432	1280	390
v/s Ratio Prot	c0.06	0.24		0.02	c0.27			0.05			c0.11	
v/s Ratio Perm	0.23		0.01	0.14		0.02	0.00		0.01	0.07		0.11
v/c Ratio	0.59	0.60	0.02	0.39	0.77	0.05	0.01	0.12	0.02	0.19	0.30	0.30
Uniform Delay, d1	16.0	22.1	16.9	17.4	27.1	20.0	19.1	19.9	19.1	20.4	21.4	21.4
Progression 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
Incremental Delay, d2	3.5	0.5	0.0	1.1	2.2	0.0	0.1	0.2	0.1	1.0	0.6	1.9
Delay (s)	19.5	22.6	16.9	18.5	29.3	20.1	19.2	20.1	19.2	21.4	22.0	23.3
Level of Service	B	C	B	B	C	C	B	C	B	C	C	C
Approach Delay (s)		22.1			28.1			20.0			22.4	
Approach LOS		C			C			B			C	

Intersection Summary		
HCM Average Control Delay	24.4	HCM Level of Service C
HCM Volume to Capacity ratio	0.54	
Actuated Cycle Length (s)	94.6	Sum of lost time (s) 16.2
Intersection Capacity Utilization	71.0%	ICU Level of Service C
Analysis Period (min)	15	
c Critical Lane Group		

HCM Signalized Intersection Capacity Analysis  
 1: Lake Lousie Drive/Worthington Avenue & Bovaird Drive





























<2021> PM Peak Hour

3/23/2012

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		  			  							
Volume (vph)	414	930	52	68	1316	247	7	33	12	177	45	171
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.6		6.6	6.6	6.6	6.9	6.9		6.9	6.9	
Lane Util. Factor	1.00	0.91		1.00	0.91	1.00	1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	1.00		1.00	1.00	0.97	1.00	0.99		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		0.99	1.00	
Frft	1.00	0.99		1.00	1.00	0.85	1.00	0.96		1.00	0.88	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1750	4716		1781	4839	1399	1777	1791		1710	1248	
Flt Permitted	0.13	1.00		0.28	1.00	1.00	0.47	1.00		0.73	1.00	
Satd. Flow (perm)	237	4716		524	4839	1399	871	1791		1310	1248	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	414	930	52	68	1316	247	7	33	12	177	45	171
RTOR Reduction (vph)	0	4	0	0	0	134	0	10	0	0	121	0
Lane Group Flow (vph)	414	978	0	68	1316	113	7	35	0	177	95	0
Confl. Peds. (#/hr)	3		3	3		3	6		12	12		6
Heavy Vehicles (%)	2%	8%	3%	0%	6%	11%	0%	0%	0%	3%	3%	38%
Turn Type	pm+pt	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2			6			4				8
Permitted Phases	2			6		6	4			8		
Actuated Green, G (s)	77.7	77.7		51.6	51.6	51.6	21.9	21.9		21.9	21.9	
Effective Green, g (s)	77.7	77.7		51.6	51.6	51.6	21.9	21.9		21.9	21.9	
Actuated g/C Ratio	0.69	0.69		0.46	0.46	0.46	0.19	0.19		0.19	0.19	
Clearance Time (s)	3.0	6.6		6.6	6.6	6.6	6.9	6.9		6.9	6.9	
Vehicle Extension (s)	3.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	472	3240		239	2208	638	169	347		254	242	
v/s Ratio Prot	c0.18	0.21			0.27			0.02				0.08
v/s Ratio Perm	c0.42			0.13		0.08	0.01			c0.14		
v/c Ratio	0.88	0.30		0.28	0.60	0.18	0.04	0.10		0.70	0.39	
Uniform Delay, d1	25.8	7.0		19.2	23.0	18.2	37.1	37.5		42.5	39.8	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	16.6	0.2		3.0	1.2	0.6	0.2	0.3		10.1	2.2	
Delay (s)	42.4	7.2		22.2	24.2	18.8	37.3	37.8		52.6	42.0	
Level of Service	D	A		C	C	B	D	D		D	D	
Approach Delay (s)		17.7			23.3			37.7			46.8	
Approach LOS		B			C			D			D	
<b>Intersection Summary</b>												
HCM Average Control Delay			23.9									HCM Level of Service C
HCM Volume to Capacity ratio			0.81									
Actuated Cycle Length (s)			113.1									Sum of lost time (s) 9.9
Intersection Capacity Utilization			80.8%									ICU Level of Service D
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis  
2: Bovaird Drive & Ashby Field Road

<2021> PM Peak Hour without NSTC  
2/4/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		  			  			 		 		
Volume (vph)	14	1841	159	153	1421	62	44	15	91	199	64	52
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.2	6.2	6.2	3.0	6.2	6.2	6.7	6.7		6.7	6.7	
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91	1.00	1.00	1.00		0.97	1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	1.00	1.00	0.98		1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.87		1.00	0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1785	4885	1531	1785	4932	1597	1692	1604		3463	1739	
Flt Permitted	0.18	1.00	1.00	0.07	1.00	1.00	0.68	1.00		0.95	1.00	
Satd. Flow (perm)	330	4885	1531	137	4932	1597	1216	1604		3463	1739	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	14	1841	159	153	1421	62	44	15	91	199	64	52
RTOR Reduction (vph)	0	0	78	0	0	24	0	81	0	0	19	0
Lane Group Flow (vph)	14	1841	81	153	1421	38	44	25	0	199	97	0
Confl. Peds. (#/hr)			1	1			5		11	11		5
Heavy Vehicles (%)	0%	5%	2%	0%	4%	0%	5%	0%	0%	0%	0%	0%
Turn Type	Perm		Perm	pm+pt		Perm	Perm			Prot		
Protected Phases		2		1	6			4		3	8	
Permitted Phases	2		2	6		6	4					
Actuated Green, G (s)	51.8	51.8	51.8	61.8	61.8	61.8	11.2	11.2		9.4	27.3	
Effective Green, g (s)	51.8	51.8	51.8	61.8	61.8	61.8	11.2	11.2		9.4	27.3	
Actuated g/C Ratio	0.51	0.51	0.51	0.61	0.61	0.61	0.11	0.11		0.09	0.27	
Clearance Time (s)	6.2	6.2	6.2	3.0	6.2	6.2	6.7	6.7		6.7	6.7	
Vehicle Extension (s)	5.0	5.0	5.0	3.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	168	2481	778	196	2988	968	134	176		319	465	
v/s Ratio Prot		0.38		c0.05	0.29			0.02		c0.06	0.06	
v/s Ratio Perm	0.04		0.05	c0.42		0.02	c0.04					
v/c Ratio	0.08	0.74	0.10	0.78	0.48	0.04	0.33	0.14		0.62	0.21	
Uniform Delay, d1	12.9	19.8	13.0	19.1	11.1	8.1	41.9	41.1		44.6	29.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.0	2.1	0.3	18.0	0.5	0.1	3.0	0.8		5.3	0.5	
Delay (s)	13.9	21.9	13.3	37.1	11.7	8.2	44.9	41.8		49.9	29.4	
Level of Service	B	C	B	D	B	A	D	D		D	C	
Approach Delay (s)		21.1			13.9			42.7			42.4	
Approach LOS		C			B			D			D	

Intersection Summary		
HCM Average Control Delay	20.7	HCM Level of Service C
HCM Volume to Capacity ratio	0.67	
Actuated Cycle Length (s)	102.0	Sum of lost time (s) 16.4
Intersection Capacity Utilization	72.3%	ICU Level of Service C
Analysis Period (min)	15	
c Critical Lane Group		

HCM Signalized Intersection Capacity Analysis  
3: Bovaird Drive & Mississauga Road

<2021> PM Peak Hour without NSTC  
2/4/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	70	1165	238	418	1231	86	374	730	572	139	1082	113
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.6	6.6	3.0	6.6	6.6	3.0	6.6	6.6	6.6	6.6	6.6
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91	1.00	1.00	0.91	1.00	1.00	0.91	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1552	4885	1452	1684	5029	1507	1638	4980	1536	1785	4932	1288
Flt Permitted	0.18	1.00	1.00	0.13	1.00	1.00	0.12	1.00	1.00	0.36	1.00	1.00
Satd. Flow (perm)	294	4885	1452	223	5029	1507	215	4980	1536	681	4932	1288
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	70	1165	238	418	1231	86	374	730	572	139	1082	113
RTOR Reduction (vph)	0	0	154	0	0	49	0	0	165	0	0	76
Lane Group Flow (vph)	70	1165	84	418	1231	37	374	730	407	139	1082	37
Heavy Vehicles (%)	15%	5%	10%	6%	2%	6%	9%	3%	4%	0%	4%	24%
Turn Type	pm+pt		Perm	pm+pt		Perm	pm+pt		Perm	Perm		Perm
Protected Phases	5	2		1	6		7	4			8	
Permitted Phases	2		2	6		6	4		4	8		8
Actuated Green, G (s)	49.0	42.4	42.4	61.4	51.8	51.8	46.0	46.0	46.0	29.0	29.0	29.0
Effective Green, g (s)	49.0	42.4	42.4	61.4	51.8	51.8	46.0	46.0	46.0	29.0	29.0	29.0
Actuated g/C Ratio	0.41	0.35	0.35	0.51	0.43	0.43	0.38	0.38	0.38	0.24	0.24	0.24
Clearance Time (s)	3.0	6.6	6.6	3.0	6.6	6.6	3.0	6.6	6.6	6.6	6.6	6.6
Vehicle Extension (s)	3.0	5.0	5.0	5.0	5.0	5.0	3.0	5.0	5.0	5.0	5.0	5.0
Lane Grp Cap (vph)	188	1717	510	307	2160	647	247	1900	586	164	1186	310
v/s Ratio Prot	0.02	0.24		c0.18	0.24		c0.18	0.15			0.22	
v/s Ratio Perm	0.13		0.06	c0.51		0.02	c0.40		0.26	0.20		0.03
v/c Ratio	0.37	0.68	0.16	1.36	0.57	0.06	1.51	0.38	0.69	0.85	0.91	0.12
Uniform Delay, d1	22.5	33.3	26.9	30.6	26.0	20.1	33.3	27.0	31.4	43.7	44.6	35.8
Progression 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
Incremental Delay, d2	1.2	2.2	0.7	182.4	1.1	0.2	251.1	0.3	4.5	38.9	12.1	0.8
Delay (s)	23.8	35.5	27.6	213.0	27.1	20.3	284.4	27.3	35.9	82.6	56.7	36.6
Level of Service	C	D	C	F	C	C	F	C	D	F	E	D
Approach Delay (s)		33.6			71.5			87.6			57.7	
Approach LOS		C			E			F			E	
<b>Intersection Summary</b>												
HCM Average Control Delay			63.9		HCM Level of Service			E				
HCM Volume to Capacity ratio			1.33									
Actuated Cycle Length (s)			120.6		Sum of lost time (s)			6.0				
Intersection Capacity Utilization			105.0%		ICU Level of Service			G				
Analysis Period (min)			15									
























c Critical Lane Group

# HCM Signalized Intersection Capacity Analysis

<2021> PM Peak Hour without NSTC

## 4: Bovaird Drive & Heritage Road

2/4/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	76	1538	24	28	1195	16	68	163	96	66	148	115
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.4	7.4	7.4	7.4	7.4	7.4	6.2	6.2		6.2	6.2	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95		1.00	0.95	
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.94		1.00	0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1785	3368	1597	1785	3500	1597	1785	3371		1785	3304	
Flt Permitted	0.21	1.00	1.00	0.12	1.00	1.00	0.59	1.00		0.59	1.00	
Satd. Flow (perm)	386	3368	1597	229	3500	1597	1107	3371		1112	3304	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	76	1538	24	28	1195	16	68	163	96	66	148	115
RTOR Reduction (vph)	0	0	5	0	0	4	0	28	0	0	64	0
Lane Group Flow (vph)	76	1538	19	28	1195	12	68	231	0	66	199	0
Confl. Peds. (#/hr)												7
Heavy Vehicles (%)	0%	6%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm		Perm	Perm		Perm	Perm			Perm		
Protected Phases		2			6			4			8	
Permitted Phases	2		2	6		6	4			8		
Actuated Green, G (s)	53.3	53.3	53.3	53.3	53.3	53.3	13.0	13.0		13.0	13.0	
Effective Green, g (s)	53.3	53.3	53.3	53.3	53.3	53.3	13.0	13.0		13.0	13.0	
Actuated g/C Ratio	0.67	0.67	0.67	0.67	0.67	0.67	0.16	0.16		0.16	0.16	
Clearance Time (s)	7.4	7.4	7.4	7.4	7.4	7.4	6.2	6.2		6.2	6.2	
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	257	2247	1065	153	2335	1065	180	548		181	538	
v/s Ratio Prot		c0.46			0.34			c0.07			0.06	
v/s Ratio Perm	0.20		0.01	0.12		0.01	0.06			0.06		
v/c Ratio	0.30	0.68	0.02	0.18	0.51	0.01	0.38	0.42		0.36	0.37	
Uniform Delay, d1	5.5	8.1	4.5	5.0	6.7	4.5	29.8	30.1		29.8	29.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.9	1.7	0.0	2.6	0.8	0.0	2.8	1.1		2.6	0.9	
Delay (s)	8.4	9.9	4.5	7.7	7.5	4.5	32.6	31.2		32.4	30.7	
Level of Service	A	A	A	A	A	A	C	C		C	C	
Approach Delay (s)		9.7			7.5			31.5			31.0	
Approach LOS		A			A			C			C	
<b>Intersection Summary</b>												
HCM Average Control Delay			12.9				HCM Level of Service				B	
HCM Volume to Capacity ratio			0.63									
Actuated Cycle Length (s)			79.9				Sum of lost time (s)			13.6		
Intersection Capacity Utilization			94.5%				ICU Level of Service			F		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis  
5: Bovaird Drive & Caseley Street

<2021> PM Peak Hour without NSTC  
2/4/2010



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↔	↔	
Volume (veh/h)	389	4	2	305	1	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	389	4	2	305	1	0
Pedestrians	1			3	12	
Lane Width (m)	3.5			3.5	3.5	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	0			0	1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			405		713	406
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			405		713	406
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1153		397	641

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	393	307	1
Volume Left	0	2	1
Volume Right	4	0	0
cSH	1700	1153	397
Volume to Capacity	0.23	0.00	0.00
Queue Length 95th (m)	0.0	0.0	0.1
Control Delay (s)	0.0	0.1	14.1
Lane LOS		A	B
Approach Delay (s)	0.0	0.1	14.1
Approach LOS			B

Intersection Summary			
Average Delay		0.1	
Intersection Capacity Utilization		31.7%	ICU Level of Service A
Analysis Period (min)		15	

HCM Signalized Intersection Capacity Analysis  
 14: James Potter Road/Creditview Road & Bovaird Drive

<20221> PM Peak Hour with NSTC

2/14/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	251	1408	9	26	1188	96	30	388	91	95	196	172
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.6	6.6	3.0	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frbp, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.97	1.00	1.00	0.97	1.00	1.00	0.69
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	0.99	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1750	4663	1523	1749	4663	1523	1729	3500	1523	1734	3500	1073
Flt Permitted	0.13	1.00	1.00	0.18	1.00	1.00	0.63	1.00	1.00	0.50	1.00	1.00
Satd. Flow (perm)	244	4663	1523	329	4663	1523	1144	3500	1523	916	3500	1073
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	251	1408	9	26	1188	96	30	388	91	95	196	172
RTOR Reduction (vph)	0	0	5	0	0	62	0	0	64	0	0	122
Lane Group Flow (vph)	251	1408	4	26	1188	34	30	388	27	95	196	50
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		220
Heavy Vehicles (%)	2%	10%	2%	2%	10%	2%	2%	2%	2%	2%	2%	2%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)	46.0	40.6	40.6	32.3	29.9	29.9	24.6	24.6	24.6	24.6	24.6	24.6
Effective Green, g (s)	46.0	40.6	40.6	32.3	29.9	29.9	24.6	24.6	24.6	24.6	24.6	24.6
Actuated g/C Ratio	0.55	0.48	0.48	0.39	0.36	0.36	0.29	0.29	0.29	0.29	0.29	0.29
Clearance Time (s)	3.0	6.6	6.6	3.0	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	369	2259	738	167	1664	543	336	1027	447	269	1027	315
v/s Ratio Prot	c0.11	0.30		0.00	0.25			c0.11			0.06	
v/s Ratio Perm	c0.27		0.00	0.06		0.02	0.03		0.02	0.10		0.05
v/c Ratio	0.68	0.62	0.01	0.16	0.71	0.06	0.09	0.38	0.06	0.35	0.19	0.16
Uniform Delay, d1	13.2	16.0	11.2	16.1	23.3	17.7	21.5	23.5	21.3	23.3	22.2	21.9
Progression 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
Incremental Delay, d2	5.1	0.5	0.0	0.4	1.5	0.0	0.5	1.1	0.3	3.6	0.4	1.1
Delay (s)	18.3	16.5	11.2	16.5	24.7	17.8	22.0	24.6	21.5	26.9	22.6	23.0
Level of Service	B	B	B	B	C	B	C	C	C	C	C	C
Approach Delay (s)		16.7			24.1			23.9			23.6	
Approach LOS		B			C			C			C	

Intersection Summary		
HCM Average Control Delay	20.9	HCM Level of Service C
HCM Volume to Capacity ratio	0.54	
Actuated Cycle Length (s)	83.8	Sum of lost time (s) 9.6
Intersection Capacity Utilization	75.3%	ICU Level of Service D
Analysis Period (min)	15	
c Critical Lane Group		





2031 Traffic



HCM Signalized Intersection Capacity Analysis

<2031 with NSTC> AM Peak Hour

1: Lake Lousie Drive/Worthington Avenue & Bovaird Drive

3/22/2012






























Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↙	↑↑↑		↙	↑↑↑	↗	↙	↗		↙	↗	
Volume (vph)	189	1336	7	14	1145	195	64	50	69	251	36	509
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.6		6.6	6.6	6.6	4.0	6.9		6.9	6.9	
Lane Util. Factor	1.00	0.91		1.00	0.91	1.00	1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	1.00		1.00	1.00	0.97	1.00	0.99		1.00	0.98	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		0.99	1.00	
Frft	1.00	1.00		1.00	1.00	0.85	1.00	0.91		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1750	4746		1783	4839	1399	1785	1691		1714	1170	
Flt Permitted	0.12	1.00		0.19	1.00	1.00	0.13	1.00		0.68	1.00	
Satd. Flow (perm)	226	4746		359	4839	1399	247	1691		1227	1170	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	189	1336	7	14	1145	195	64	50	69	251	36	509
RTOR Reduction (vph)	0	0	0	0	0	143	0	23	0	0	383	0
Lane Group Flow (vph)	189	1343	0	14	1145	52	64	96	0	251	162	0
Confl. Peds. (#/hr)	3		3	3		3	6		12	12		6
Heavy Vehicles (%)	2%	8%	3%	0%	6%	11%	0%	0%	0%	3%	3%	38%
Turn Type	pm+pt	NA		Perm	NA	Perm	pm+pt	NA		Perm	NA	
Protected Phases	5	2			6		7	4				8
Permitted Phases	2			6		6	4			8		
Actuated Green, G (s)	57.8	57.8		28.6	28.6	28.6	35.0	35.0		26.4	26.4	
Effective Green, g (s)	57.8	57.8		28.6	28.6	28.6	35.0	35.0		26.4	26.4	
Actuated g/C Ratio	0.54	0.54		0.27	0.27	0.27	0.33	0.33		0.25	0.25	
Clearance Time (s)	4.0	6.6		6.6	6.6	6.6	4.0	6.9		6.9	6.9	
Vehicle Extension (s)	3.0	5.0		5.0	5.0	5.0	3.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	484	2581		97	1302	376	148	557		305	291	
v/s Ratio Prot	0.09	c0.28			c0.24		c0.02	0.06				0.14
v/s Ratio Perm	0.12			0.04		0.04	0.12			c0.20		
v/c Ratio	0.39	0.52		0.14	0.88	0.14	0.43	0.17		0.82	0.56	
Uniform Delay, d1	15.4	15.4		29.5	37.2	29.5	28.2	25.4		37.7	34.9	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.5	0.8		3.1	8.7	0.8	2.0	0.3		18.0	3.9	
Delay (s)	15.9	16.2		32.6	45.9	30.3	30.2	25.7		55.7	38.8	
Level of Service	B	B		C	D	C	C	C		E	D	
Approach Delay (s)		16.1			43.5			27.3			44.1	
Approach LOS		B			D			C			D	

Intersection Summary

HCM Average Control Delay	32.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	106.3	Sum of lost time (s)	24.1
Intersection Capacity Utilization	104.4%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis  
2: Bovaird Drive & Ashby Field Road

<2031 with NSTC> AM Peak Hour  
4/27/2011



































												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		  			  					 		
Volume (vph)	57	1441	49	101	2338	220	202	71	155	62	16	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.2	6.2	6.2	3.0	6.2	6.2	6.7	6.7		6.7	6.7	
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91	1.00	1.00	1.00		0.97	1.00	
Frbp, ped/bikes	1.00	1.00	0.98	1.00	1.00	1.00	1.00	0.98		1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.90		1.00	0.92	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1785	4885	1531	1785	4932	1597	1691	1657		3463	1713	
Flt Permitted	0.08	1.00	1.00	0.11	1.00	1.00	0.73	1.00		0.95	1.00	
Satd. Flow (perm)	142	4885	1531	199	4932	1597	1308	1657		3463	1713	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	57	1441	49	101	2338	220	202	71	155	62	16	18
RTOR Reduction (vph)	0	0	26	0	0	97	0	69	0	0	1	0
Lane Group Flow (vph)	57	1441	23	101	2338	123	202	157	0	62	33	0
Confl. Peds. (#/hr)			1	1			5		11	11		5
Heavy Vehicles (%)	0%	5%	2%	0%	4%	0%	5%	0%	0%	0%	0%	0%
Turn Type	Perm		Perm	pm+pt		Perm	Perm			Prot		
Protected Phases		2		1	6			4		3	8	
Permitted Phases	2		2	6		6	4					
Actuated Green, G (s)	52.8	52.8	52.8	62.6	62.6	62.6	23.1	23.1		7.0	36.8	
Effective Green, g (s)	52.8	52.8	52.8	62.6	62.6	62.6	23.1	23.1		7.0	36.8	
Actuated g/C Ratio	0.47	0.47	0.47	0.56	0.56	0.56	0.21	0.21		0.06	0.33	
Clearance Time (s)	6.2	6.2	6.2	3.0	6.2	6.2	6.7	6.7		6.7	6.7	
Vehicle Extension (s)	5.0	5.0	5.0	3.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	67	2297	720	207	2749	890	269	341		216	561	
v/s Ratio Prot		0.29		0.03	c0.47			0.09		c0.02	0.02	
v/s Ratio Perm	0.40		0.02	0.24		0.08	c0.15					
v/c Ratio	0.85	0.63	0.03	0.49	0.85	0.14	0.75	0.46		0.29	0.06	
Uniform Delay, d1	26.3	22.4	16.0	14.6	20.9	11.9	41.9	39.1		50.3	25.9	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	73.2	1.3	0.1	1.8	3.5	0.3	13.2	2.1		1.5	0.1	
Delay (s)	99.5	23.7	16.1	16.5	24.5	12.2	55.1	41.2		51.8	26.0	
Level of Service	F	C	B	B	C	B	E	D		D	C	
Approach Delay (s)		26.2			23.1			47.7			42.7	
Approach LOS		C			C			D			D	

Intersection Summary

HCM Average Control Delay	26.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	112.3	Sum of lost time (s)	19.6
Intersection Capacity Utilization	97.6%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis  
3: Bovaird Drive & Mississauga Road

<2031 with NSTC> AM Peak Hour  
4/27/2011

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		  		 	  		 	  			  	
Volume (vph)	79	1710	338	516	1836	98	375	757	306	106	660	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	3.0	6.6	6.6
Lane Util. Factor	1.00	0.91	1.00	0.97	0.91	1.00	0.97	0.91	1.00	1.00	0.91	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1552	4885	1452	3267	5029	1507	3177	4980	1536	1785	4932	1288
Flt Permitted	0.08	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.35	1.00	1.00
Satd. Flow (perm)	138	4885	1452	3267	5029	1507	3177	4980	1536	663	4932	1288
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	79	1710	338	516	1836	98	375	757	306	106	660	110
RTOR Reduction (vph)	0	0	161	0	0	16	0	0	215	0	0	58
Lane Group Flow (vph)	79	1710	177	516	1836	82	375	757	91	106	660	52
Heavy Vehicles (%)	15%	5%	10%	6%	2%	6%	9%	3%	4%	0%	4%	24%
Turn Type	pm+pt		Perm	Prot		Perm	Prot		Perm	pm+pt		Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2		2			6			4	8		8
Actuated Green, G (s)	54.2	47.3	47.3	21.4	65.4	65.4	15.9	41.5	41.5	36.0	29.0	29.0
Effective Green, g (s)	54.2	47.3	47.3	21.4	65.4	65.4	15.9	41.5	41.5	36.0	29.0	29.0
Actuated g/C Ratio	0.39	0.34	0.34	0.15	0.47	0.47	0.11	0.30	0.30	0.26	0.21	0.21
Clearance Time (s)	3.0	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	3.0	6.6	6.6
Vehicle Extension (s)	3.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	3.0	5.0	5.0
Lane Grp Cap (vph)	123	1650	491	499	2349	704	361	1476	455	227	1022	267
v/s Ratio Prot	0.03	c0.35		c0.16	0.37		c0.12	0.15		0.02	c0.13	
v/s Ratio Perm	0.22		0.12			0.05			0.06	0.10		0.04
v/c Ratio	0.64	1.04	0.36	1.03	0.78	0.12	1.04	0.51	0.20	0.47	0.65	0.20
Uniform Delay, d1	29.8	46.4	34.9	59.3	31.3	21.0	62.0	40.9	36.8	41.1	50.8	45.9
Progression 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
Incremental Delay, d2	10.9	32.2	2.1	49.3	2.7	0.3	57.8	0.6	0.5	1.5	3.1	1.6
Delay (s)	40.7	78.5	37.0	108.6	34.0	21.4	119.8	41.5	37.3	42.6	53.9	47.5
Level of Service	D	E	D	F	C	C	F	D	D	D	D	D
Approach Delay (s)		70.5			49.2			61.0			51.8	
Approach LOS		E			D			E			D	




























Intersection Summary

HCM Average Control Delay	58.6	HCM Level of Service	E
HCM Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	26.4
Intersection Capacity Utilization	93.2%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis  
4: Bovaird Drive & Heritage Road

<2031 with NSTC> AM Peak Hour  
4/27/2011

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			 			 			 	
Volume (vph)	33	731	50	71	1034	19	16	42	17	10	121	51
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.4	7.4	7.4	7.4	7.4	7.4	6.2	6.2		6.2	6.2	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96		1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1785	3368	1597	1785	3500	1597	1785	3416		1785	3389	
Flt Permitted	0.26	1.00	1.00	0.37	1.00	1.00	0.64	1.00		0.72	1.00	
Satd. Flow (perm)	494	3368	1597	703	3500	1597	1208	3416		1346	3389	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	33	731	50	71	1034	19	16	42	17	10	121	51
RTOR Reduction (vph)	0	0	15	0	0	3	0	15	0	0	44	0
Lane Group Flow (vph)	33	731	35	71	1034	16	16	44	0	10	128	0
Confl. Peds. (#/hr)												7
Heavy Vehicles (%)	0%	6%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm		Perm	Perm		Perm	Perm			Perm		
Protected Phases		2			6			4			8	
Permitted Phases	2		2	6		6	4			8		
Actuated Green, G (s)	56.1	56.1	56.1	56.1	56.1	56.1	10.2	10.2		10.2	10.2	
Effective Green, g (s)	56.1	56.1	56.1	56.1	56.1	56.1	10.2	10.2		10.2	10.2	
Actuated g/C Ratio	0.70	0.70	0.70	0.70	0.70	0.70	0.13	0.13		0.13	0.13	
Clearance Time (s)	7.4	7.4	7.4	7.4	7.4	7.4	6.2	6.2		6.2	6.2	
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	347	2365	1121	494	2457	1121	154	436		172	433	
v/s Ratio Prot		0.22			c0.30			0.01			c0.04	
v/s Ratio Perm	0.07		0.02	0.10		0.01	0.01			0.01		
v/c Ratio	0.10	0.31	0.03	0.14	0.42	0.01	0.10	0.10		0.06	0.29	
Uniform Delay, d1	3.8	4.5	3.6	3.9	5.0	3.6	30.8	30.8		30.6	31.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.5	0.3	0.1	0.6	0.5	0.0	0.6	0.2		0.3	0.8	
Delay (s)	4.3	4.9	3.7	4.6	5.6	3.6	31.4	31.0		30.9	32.4	
Level of Service	A	A	A	A	A	A	C	C		C	C	
Approach Delay (s)		4.8			5.5			31.1			32.3	
Approach LOS		A			A			C			C	
<b>Intersection Summary</b>												
HCM Average Control Delay			8.3				HCM Level of Service				A	
HCM Volume to Capacity ratio			0.40									
Actuated Cycle Length (s)			79.9				Sum of lost time (s)			13.6		
Intersection Capacity Utilization			72.7%				ICU Level of Service			C		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis  
 5: Bovaird Drive & Caseley Street

<2031 with NSTC> AM Peak Hour  
 4/27/2011



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↔	↔	
Volume (veh/h)	215	1	0	31	0	1
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	215	1	0	31	0	1
Pedestrians	1			3	12	
Lane Width (m)	3.5			3.5	3.5	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	0			0	1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			228		260	230
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			228		260	230
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1339		726	804































Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	216	31	1
Volume Left	0	0	0
Volume Right	1	0	1
cSH	1700	1339	804
Volume to Capacity	0.13	0.00	0.00
Queue Length 95th (m)	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	9.5
Lane LOS	A		
Approach Delay (s)	0.0	0.0	9.5
Approach LOS	A		

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	23.0%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis  
 6: James Potter Road/Creditview Road & Bovaird Drive

<2031 with NSTC> AM Peak Hour

3/22/2012

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		  			  			 			 	
Volume (vph)	415	1314	77	272	1925	206	7	379	79	155	724	519
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.0	6.0	3.0	6.6	6.6	6.6	6.6	6.6	3.0	6.6	6.6
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1750	5029	1566	1750	5029	1566	1750	3500	1566	1750	3500	1566
Flt Permitted	0.07	1.00	1.00	0.16	1.00	1.00	0.30	1.00	1.00	0.31	1.00	1.00
Satd. Flow (perm)	136	5029	1566	303	5029	1566	561	3500	1566	577	3500	1566
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	415	1314	77	272	1925	206	7	379	79	155	724	519
RTOR Reduction (vph)	0	0	28	0	0	111	0	0	66	0	0	255
Lane Group Flow (vph)	415	1314	49	272	1925	95	7	379	13	155	724	264
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8			2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)	81.2	61.5	61.5	67.2	50.5	50.5	21.4	21.4	21.4	35.9	35.9	35.9
Effective Green, g (s)	81.2	61.5	61.5	67.2	50.5	50.5	21.4	21.4	21.4	35.9	35.9	35.9
Actuated g/C Ratio	0.63	0.47	0.47	0.52	0.39	0.39	0.16	0.16	0.16	0.28	0.28	0.28
Clearance Time (s)	3.0	6.0	6.0	3.0	6.6	6.6	6.6	6.6	6.6	3.0	6.6	6.6
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	422	2385	743	343	1958	610	93	577	258	264	969	433
v/s Ratio Prot	c0.21	0.26		0.10	0.38			0.11		0.05	c0.21	
v/s Ratio Perm	c0.41		0.03	0.31		0.06	0.01		0.01	0.11		0.17
v/c Ratio	0.98	0.55	0.07	0.79	0.98	0.16	0.08	0.66	0.05	0.59	0.75	0.61
Uniform Delay, d1	42.1	24.3	18.5	18.9	39.2	25.7	45.8	50.7	45.6	37.7	42.8	40.8
Progression 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
Incremental Delay, d2	39.2	0.3	0.0	11.9	16.4	0.1	0.3	2.7	0.1	3.3	3.2	2.5
Delay (s)	81.3	24.5	18.5	30.8	55.6	25.9	46.1	53.4	45.7	41.0	45.9	43.4
Level of Service	F	C	B	C	E	C	D	D	D	D	D	D
Approach Delay (s)		37.3			50.2			52.0			44.4	
Approach LOS		D			D			D			D	

Intersection Summary		
HCM Average Control Delay	45.2	HCM Level of Service D
HCM Volume to Capacity ratio	0.88	
Actuated Cycle Length (s)	129.7	Sum of lost time (s) 9.6
Intersection Capacity Utilization	103.4%	ICU Level of Service G
Analysis Period (min)	15	
c Critical Lane Group		



HCM Signalized Intersection Capacity Analysis

<2031> PM Peak Hour with NSTC

1: Lake Lousie Drive/Worthington Avenue & Bovaird Drive

3/22/2012



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↑↑↑		↖	↑↑↑	↗	↖	↗		↖	↗	
Volume (vph)	509	1145	64	69	1336	251	7	36	14	195	50	189
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.6		6.6	6.6	6.6	6.9	6.9		6.9	6.9	
Lane Util. Factor	1.00	0.91		1.00	0.91	1.00	1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	1.00		1.00	1.00	0.97	1.00	0.99		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		0.99	1.00	
Frt	1.00	0.99		1.00	1.00	0.85	1.00	0.96		1.00	0.88	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1750	4717		1783	4839	1401	1778	1788		1715	1250	
Flt Permitted	0.13	1.00		0.22	1.00	1.00	0.49	1.00		0.72	1.00	
Satd. Flow (perm)	232	4717		414	4839	1401	920	1788		1307	1250	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	509	1145	64	69	1336	251	7	36	14	195	50	189
RTOR Reduction (vph)	0	5	0	0	0	172	0	11	0	0	147	0
Lane Group Flow (vph)	509	1204	0	69	1336	79	7	39	0	195	92	0
Confl. Peds. (#/hr)	3		3	3		3	6		12	12		6
Heavy Vehicles (%)	2%	8%	3%	0%	6%	11%	0%	0%	0%	3%	3%	38%
Turn Type	pm+pt	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2			6			4				8
Permitted Phases	2			6		6	4			8		
Actuated Green, G (s)	57.7	57.7		28.8	28.8	28.8	20.6	20.6		20.6	20.6	
Effective Green, g (s)	57.7	57.7		28.8	28.8	28.8	20.6	20.6		20.6	20.6	
Actuated g/C Ratio	0.63	0.63		0.31	0.31	0.31	0.22	0.22		0.22	0.22	
Clearance Time (s)	3.0	6.6		6.6	6.6	6.6	6.9	6.9		6.9	6.9	
Vehicle Extension (s)	3.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	574	2965		130	1518	440	206	401		293	281	
v/s Ratio Prot	c0.25	0.26			0.28			0.02				0.07
v/s Ratio Perm	c0.31			0.17		0.06	0.01			c0.15		
v/c Ratio	0.89	0.41		0.53	0.88	0.18	0.03	0.10		0.67	0.33	
Uniform Delay, d1	23.2	8.5		25.9	29.9	22.9	27.8	28.2		32.5	29.8	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	15.3	0.4		14.6	7.6	0.9	0.1	0.2		7.4	1.4	
Delay (s)	38.5	8.9		40.6	37.5	23.8	28.0	28.5		39.8	31.2	
Level of Service	D	A		D	D	C	C	C		D	C	
Approach Delay (s)		17.7			35.5			28.4			35.1	
Approach LOS		B			D			C			D	

Intersection Summary

HCM Average Control Delay	27.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	91.8	Sum of lost time (s)	9.9
Intersection Capacity Utilization	87.3%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis <2031> PM Peak with NSTC (Single WB Left)  
 2: Bovaird Drive & Ashby Field Road

2/4/2010



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↙	↑↑↑	↗	↙	↑↑↑	↗	↙	↑		↙↗	↑	
Volume (vph)	18	2338	202	155	1441	62	49	16	101	220	71	57
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.2	6.2	6.2	3.0	6.2	6.2	6.7	6.7		6.7	6.7	
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91	1.00	1.00	1.00		0.97	1.00	
Frbp, ped/bikes	1.00	1.00	0.98	1.00	1.00	1.00	1.00	0.98		1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.87		1.00	0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1785	4885	1531	1785	4932	1597	1692	1603		3463	1740	
Flt Permitted	0.17	1.00	1.00	0.07	1.00	1.00	0.67	1.00		0.95	1.00	
Satd. Flow (perm)	321	4885	1531	137	4932	1597	1202	1603		3463	1740	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	18	2338	202	155	1441	62	49	16	101	220	71	57
RTOR Reduction (vph)	0	0	79	0	0	25	0	90	0	0	18	0
Lane Group Flow (vph)	18	2338	123	155	1441	37	49	27	0	220	110	0
Confl. Peds. (#/hr)			1	1			5		11	11		5
Heavy Vehicles (%)	0%	5%	2%	0%	4%	0%	5%	0%	0%	0%	0%	0%
Turn Type	Perm		Perm	pm+pt		Perm	Perm			Prot		
Protected Phases		2		1	6			4		3	8	
Permitted Phases	2		2	6		6	4					
Actuated Green, G (s)	51.8	51.8	51.8	61.8	61.8	61.8	11.5	11.5		9.4	27.6	
Effective Green, g (s)	51.8	51.8	51.8	61.8	61.8	61.8	11.5	11.5		9.4	27.6	
Actuated g/C Ratio	0.51	0.51	0.51	0.60	0.60	0.60	0.11	0.11		0.09	0.27	
Clearance Time (s)	6.2	6.2	6.2	3.0	6.2	6.2	6.7	6.7		6.7	6.7	
Vehicle Extension (s)	5.0	5.0	5.0	3.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	163	2474	775	196	2979	965	135	180		318	469	
v/s Ratio Prot		c0.48		c0.05	0.29			0.02		c0.06	0.06	
v/s Ratio Perm	0.06		0.08	0.42		0.02	c0.04					
v/c Ratio	0.11	0.95	0.16	0.79	0.48	0.04	0.36	0.15		0.69	0.24	
Uniform Delay, d1	13.2	23.9	13.6	23.3	11.3	8.2	42.0	41.0		45.0	29.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.4	9.1	0.4	19.2	0.6	0.1	3.5	0.8		8.0	0.5	
Delay (s)	14.6	33.0	14.0	42.5	11.9	8.3	45.5	41.8		53.1	29.7	
Level of Service	B	C	B	D	B	A	D	D		D	C	
Approach Delay (s)		31.4			14.6			42.9			44.5	
Approach LOS		C			B			D			D	

Intersection Summary		
HCM Average Control Delay	26.9	HCM Level of Service C
HCM Volume to Capacity ratio	0.82	
Actuated Cycle Length (s)	102.3	Sum of lost time (s) 22.6
Intersection Capacity Utilization	93.1%	ICU Level of Service F
Analysis Period (min)	15	
c Critical Lane Group		

HCM Signalized Intersection Capacity Analysis <2031> PM Peak with NSTC (Single WB Left)  
 3: Bovaird Drive & Mississauga Road 2/4/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	110	1836	375	306	1710	106	338	660	516	98	757	79
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.6	6.6	3.0	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91	1.00	0.97	0.91	1.00	1.00	0.91	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1552	4885	1452	1684	5029	1507	3177	4980	1536	1785	4932	1288
Flt Permitted	0.08	1.00	1.00	0.07	1.00	1.00	0.95	1.00	1.00	0.39	1.00	1.00
Satd. Flow (perm)	124	4885	1452	128	5029	1507	3177	4980	1536	732	4932	1288
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	110	1836	375	306	1710	106	338	660	516	98	757	79
RTOR Reduction (vph)	0	0	183	0	0	37	0	0	179	0	0	62
Lane Group Flow (vph)	110	1836	192	306	1710	69	338	660	337	98	757	17
Heavy Vehicles (%)	15%	5%	10%	6%	2%	6%	9%	3%	4%	0%	4%	24%
Turn Type	pm+pt		Perm	pm+pt		Perm	Prot		Perm	Perm		Perm
Protected Phases	5	2		1	6		7	4			8	
Permitted Phases	2		2	6		6			4	8		8
Actuated Green, G (s)	63.0	52.5	52.5	76.5	63.0	63.0	14.4	50.3	50.3	29.3	29.3	29.3
Effective Green, g (s)	63.0	52.5	52.5	76.5	63.0	63.0	14.4	50.3	50.3	29.3	29.3	29.3
Actuated g/C Ratio	0.45	0.38	0.38	0.55	0.45	0.45	0.10	0.36	0.36	0.21	0.21	0.21
Clearance Time (s)	3.0	6.6	6.6	3.0	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Vehicle Extension (s)	3.0	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0	5.0	5.0	5.0
Lane Grp Cap (vph)	163	1832	545	303	2263	678	327	1789	552	153	1032	270
v/s Ratio Prot	0.05	0.38		c0.15	0.34		c0.11	0.13			c0.15	
v/s Ratio Perm	0.25		0.13	c0.40		0.05			0.22	0.13		0.01
v/c Ratio	0.67	1.00	0.35	1.01	0.76	0.10	1.03	0.37	0.61	0.64	0.73	0.06
Uniform Delay, d1	26.7	43.8	31.5	46.5	32.1	22.2	62.8	33.1	36.8	50.5	51.7	44.3
Progression 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
Incremental Delay, d2	10.5	21.5	1.8	54.2	2.4	0.3	58.7	0.3	2.9	18.8	4.6	0.4
Delay (s)	37.3	65.3	33.3	100.8	34.5	22.5	121.5	33.4	39.7	69.3	56.3	44.8
Level of Service	D	E	C	F	C	C	F	C	D	E	E	D
Approach Delay (s)		58.8			43.5			55.2			56.7	
Approach LOS		E			D			E			E	
<b>Intersection Summary</b>												
HCM Average Control Delay			53.0				HCM Level of Service			D		
HCM Volume to Capacity ratio			0.91									
Actuated Cycle Length (s)			140.0				Sum of lost time (s)		16.2			
Intersection Capacity Utilization			96.5%				ICU Level of Service		F			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis <2031> PM Peak with NSTC (WB Double Left)  
 3: Bovaird Drive & Mississauga Road 2/4/2010

























Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	110	1836	375	306	1710	106	338	660	516	98	757	79
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Lane Util. Factor	1.00	0.91	1.00	0.97	0.91	1.00	0.97	0.91	1.00	1.00	0.91	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1552	4885	1452	3267	5029	1507	3177	4980	1536	1785	4932	1288
Flt Permitted	0.07	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.39	1.00	1.00
Satd. Flow (perm)	120	4885	1452	3267	5029	1507	3177	4980	1536	732	4932	1288
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	110	1836	375	306	1710	106	338	660	516	98	757	79
RTOR Reduction (vph)	0	0	193	0	0	38	0	0	118	0	0	63
Lane Group Flow (vph)	110	1836	182	306	1710	68	338	660	398	98	757	16
Heavy Vehicles (%)	15%	5%	10%	6%	2%	6%	9%	3%	4%	0%	4%	24%
Turn Type	pm+pt		Perm	Prot		Perm	Prot		Perm	Perm		Perm
Protected Phases	5	2		1	6		7	4			8	
Permitted Phases	2		2			6			4	8		8
Actuated Green, G (s)	64.4	54.6	54.6	14.1	62.5	62.5	15.9	51.5	51.5	29.0	29.0	29.0
Effective Green, g (s)	64.4	54.6	54.6	14.1	62.5	62.5	15.9	51.5	51.5	29.0	29.0	29.0
Actuated g/C Ratio	0.46	0.39	0.39	0.10	0.45	0.45	0.11	0.37	0.37	0.21	0.21	0.21
Clearance Time (s)	3.0	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Vehicle Extension (s)	3.0	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0	5.0	5.0	5.0
Lane Grp Cap (vph)	155	1905	566	329	2245	673	361	1832	565	152	1022	267
v/s Ratio Prot	0.05	c0.38		c0.09	c0.34		c0.11	0.13			0.15	
v/s Ratio Perm	0.28		0.13			0.05			c0.26	0.13		0.01
v/c Ratio	0.71	0.96	0.32	0.93	0.76	0.10	0.94	0.36	0.71	0.64	0.74	0.06
Uniform Delay, d1	26.8	41.7	29.8	62.5	32.5	22.5	61.5	32.2	37.8	50.8	52.0	44.6
Progression 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
Incremental Delay, d2	13.9	13.7	1.5	32.0	2.5	0.3	31.2	0.3	5.0	19.2	4.8	0.4
Delay (s)	40.7	55.4	31.3	94.5	35.0	22.8	92.7	32.5	42.8	70.0	56.8	45.0
Level of Service	D	E	C	F	D	C	F	C	D	E	E	D
Approach Delay (s)		50.8			43.0			49.4			57.2	
Approach LOS		D			D			D			E	
<b>Intersection Summary</b>												
HCM Average Control Delay			49.0				HCM Level of Service			D		
HCM Volume to Capacity ratio			0.91									
Actuated Cycle Length (s)			140.0				Sum of lost time (s)		26.4			
Intersection Capacity Utilization			93.9%				ICU Level of Service		F			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis <2031> PM Peak with NSTC (Single WB Left)

4: Bovaird Drive & Heritage Road

2/4/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	51	1034	16	17	731	10	50	121	71	19	42	33
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.4	7.4	7.4	7.4	7.4	7.4	6.2	6.2		6.2	6.2	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95		1.00	0.95	
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.94		1.00	0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1785	3368	1597	1785	3500	1597	1785	3372		1785	3302	
Flt Permitted	0.37	1.00	1.00	0.26	1.00	1.00	0.71	1.00		0.63	1.00	
Satd. Flow (perm)	703	3368	1597	492	3500	1597	1326	3372		1186	3302	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	51	1034	16	17	731	10	50	121	71	19	42	33
RTOR Reduction (vph)	0	0	5	0	0	3	0	62	0	0	29	0
Lane Group Flow (vph)	51	1034	11	17	731	7	50	130	0	19	46	0
Confl. Peds. (#/hr)												7
Heavy Vehicles (%)	0%	6%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm		Perm	Perm		Perm	Perm			Perm		
Protected Phases		2			6			4			8	
Permitted Phases	2		2	6		6	4			8		
Actuated Green, G (s)	56.1	56.1	56.1	56.1	56.1	56.1	10.6	10.6		10.6	10.6	
Effective Green, g (s)	56.1	56.1	56.1	56.1	56.1	56.1	10.6	10.6		10.6	10.6	
Actuated g/C Ratio	0.70	0.70	0.70	0.70	0.70	0.70	0.13	0.13		0.13	0.13	
Clearance Time (s)	7.4	7.4	7.4	7.4	7.4	7.4	6.2	6.2		6.2	6.2	
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	491	2353	1116	344	2445	1116	175	445		157	436	
v/s Ratio Prot		c0.31			0.21			c0.04			0.01	
v/s Ratio Perm	0.07		0.01	0.03		0.00	0.04			0.02		
v/c Ratio	0.10	0.44	0.01	0.05	0.30	0.01	0.29	0.29		0.12	0.11	
Uniform Delay, d1	3.9	5.3	3.7	3.8	4.6	3.7	31.4	31.5		30.7	30.7	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	0.6	0.0	0.3	0.3	0.0	1.9	0.8		0.7	0.2	
Delay (s)	4.4	5.9	3.7	4.0	4.9	3.7	33.3	32.2		31.5	30.9	
Level of Service	A	A	A	A	A	A	C	C		C	C	
Approach Delay (s)		5.8			4.9			32.5			31.0	
Approach LOS		A			A			C			C	
<b>Intersection Summary</b>												
HCM Average Control Delay			9.5				HCM Level of Service				A	
HCM Volume to Capacity ratio			0.42									
Actuated Cycle Length (s)			80.3				Sum of lost time (s)			13.6		
Intersection Capacity Utilization			69.5%				ICU Level of Service			C		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis <2031> PM Peak with NSTC (Single WB Left)  
 5: Bovaird Drive & Caseley Street 2/4/2010



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑	↑	
Volume (veh/h)	31	0	1	215	1	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	31	0	1	215	1	0
Pedestrians	1			3	12	
Lane Width (m)	3.5			3.5	3.5	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	0			0	1	
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			43		261	46
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			43		261	46
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1563		724	1017

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	31	216	1
Volume Left	0	1	1
Volume Right	0	0	0
cSH	1700	1563	724
Volume to Capacity	0.02	0.00	0.00
Queue Length 95th (m)	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	10.0
Lane LOS		A	A
Approach Delay (s)	0.0	0.0	10.0
Approach LOS			A

Intersection Summary			
Average Delay		0.1	
Intersection Capacity Utilization		23.1%	ICU Level of Service A
Analysis Period (min)		15	

HCM Signalized Intersection Capacity Analysis  
 22: James Potter Road/Creditview Road & Bovaird Drive

<2031> PM Peak Hour with NSTC  
 3/22/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	519	1925	7	79	1314	155	77	724	272	206	379	415
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6	6.6	3.0	6.6	6.6	6.6	6.6	6.6	3.0	6.6	6.6
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1750	5029	1566	1750	5029	1566	1750	3500	1566	1750	3500	1566
Flt Permitted	0.09	1.00	1.00	0.11	1.00	1.00	0.53	1.00	1.00	0.12	1.00	1.00
Satd. Flow (perm)	170	5029	1566	200	5029	1566	971	3500	1566	227	3500	1566
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	519	1925	7	79	1314	155	77	724	272	206	379	415
RTOR Reduction (vph)	0	0	2	0	0	114	0	0	99	0	0	282
Lane Group Flow (vph)	519	1925	5	79	1314	41	77	724	173	206	379	133
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8			2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)	81.8	71.3	71.3	44.3	36.8	36.8	29.5	29.5	29.5	45.0	45.0	45.0
Effective Green, g (s)	81.8	71.3	71.3	44.3	36.8	36.8	29.5	29.5	29.5	45.0	45.0	45.0
Actuated g/C Ratio	0.58	0.51	0.51	0.32	0.26	0.26	0.21	0.21	0.21	0.32	0.32	0.32
Clearance Time (s)	6.6	6.6	6.6	3.0	6.6	6.6	6.6	6.6	6.6	3.0	6.6	6.6
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	533	2561	798	146	1322	412	205	738	330	209	1125	503
v/s Ratio Prot	c0.27	0.38		0.03	0.26			0.21		c0.09	0.11	
v/s Ratio Perm	c0.30		0.00	0.14		0.03	0.08		0.11	c0.23		0.09
v/c Ratio	0.97	0.75	0.01	0.54	0.99	0.10	0.38	0.98	0.53	0.99	0.34	0.27
Uniform Delay, d1	42.2	27.3	16.9	34.3	51.5	39.1	47.4	55.0	49.0	39.8	36.1	35.2
Progression 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
Incremental Delay, d2	32.1	1.3	0.0	4.0	23.2	0.1	5.2	28.8	5.9	57.7	0.8	1.3
Delay (s)	74.3	28.6	16.9	38.4	74.6	39.2	52.5	83.8	54.9	97.5	37.0	36.5
Level of Service	E	C	B	D	E	D	D	F	D	F	D	D
Approach Delay (s)		38.2			69.2			74.2			49.2	
Approach LOS		D			E			E			D	

Intersection Summary

HCM Average Control Delay	54.3	HCM Level of Service	D
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	9.6
Intersection Capacity Utilization	105.4%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

<2031 without NSTC> AM Peak Hour

1: Lake Lousie Drive/Worthington Avenue & Bovaird Drive

3/22/2012






























Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↑↑↑		↘	↑↑↑	↗	↘	↗		↘	↗	
Volume (vph)	189	1454	7	14	1027	195	58	50	75	273	36	457
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.6		6.6	6.6	6.6	6.9	6.9		6.9	6.9	
Lane Util. Factor	1.00	0.91		1.00	0.91	1.00	1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	1.00		1.00	1.00	0.97	1.00	0.99		1.00	0.98	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		0.99	1.00	
Frft	1.00	1.00		1.00	1.00	0.85	1.00	0.91		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1750	4746		1783	4839	1400	1781	1685		1716	1175	
Flt Permitted	0.14	1.00		0.17	1.00	1.00	0.15	1.00		0.68	1.00	
Satd. Flow (perm)	256	4746		317	4839	1400	275	1685		1222	1175	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	189	1454	7	14	1027	195	58	50	75	273	36	457
RTOR Reduction (vph)	0	0	0	0	0	139	0	22	0	0	328	0
Lane Group Flow (vph)	189	1461	0	14	1027	56	58	103	0	273	165	0
Confl. Peds. (#/hr)	3		3	3		3	6		12	12		6
Heavy Vehicles (%)	2%	8%	3%	0%	6%	11%	0%	0%	0%	3%	3%	38%
Turn Type	pm+pt	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2			6			4				8
Permitted Phases	2			6		6	4			8		
Actuated Green, G (s)	55.6	55.6		27.5	27.5	27.5	27.3	27.3		27.3	27.3	
Effective Green, g (s)	55.6	55.6		27.5	27.5	27.5	27.3	27.3		27.3	27.3	
Actuated g/C Ratio	0.58	0.58		0.29	0.29	0.29	0.28	0.28		0.28	0.28	
Clearance Time (s)	3.0	6.6		6.6	6.6	6.6	6.9	6.9		6.9	6.9	
Vehicle Extension (s)	3.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	537	2737		90	1380	399	78	477		346	333	
v/s Ratio Prot	0.09	c0.31			c0.21			0.06				0.14
v/s Ratio Perm	0.11			0.04		0.04	0.21			c0.22		
v/c Ratio	0.35	0.53		0.16	0.74	0.14	0.74	0.22		0.79	0.50	
Uniform Delay, d1	11.5	12.5		25.8	31.3	25.6	31.4	26.4		31.9	28.8	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	0.7		3.6	3.7	0.7	36.6	0.5		13.0	2.4	
Delay (s)	11.9	13.2		29.4	34.9	26.4	68.0	26.9		44.9	31.2	
Level of Service	B	B		C	C	C	E	C		D	C	
Approach Delay (s)		13.1			33.5			39.9			36.1	
Approach LOS		B			C			D			D	

Intersection Summary		
HCM Average Control Delay	25.5	HCM Level of Service C
HCM Volume to Capacity ratio	0.73	
Actuated Cycle Length (s)	96.4	Sum of lost time (s) 20.1
Intersection Capacity Utilization	109.0%	ICU Level of Service G
Analysis Period (min)	15	
c Critical Lane Group		



HCM Signalized Intersection Capacity Analysis  
2: Bovaird Drive & Ashby Field Road

<2031 without NSTC> AM Peak Hour  
4/27/2011



































												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		  			  					 		
Volume (vph)	57	1570	49	101	2034	220	175	71	169	68	16	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.2	6.2	6.2	3.0	6.2	6.2	6.7	6.7		6.7	6.7	
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91	1.00	1.00	1.00		0.97	1.00	
Frbp, ped/bikes	1.00	1.00	0.98	1.00	1.00	1.00	1.00	0.98		1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.89		1.00	0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1785	4885	1531	1785	4932	1597	1691	1652		3463	1723	
Flt Permitted	0.08	1.00	1.00	0.09	1.00	1.00	0.74	1.00		0.95	1.00	
Satd. Flow (perm)	142	4885	1531	161	4932	1597	1310	1652		3463	1723	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	57	1570	49	101	2034	220	175	71	169	68	16	16
RTOR Reduction (vph)	0	0	26	0	0	95	0	76	0	0	3	0
Lane Group Flow (vph)	57	1570	23	101	2034	125	175	164	0	68	29	0
Confl. Peds. (#/hr)			1	1			5		11	11		5
Heavy Vehicles (%)	0%	5%	2%	0%	4%	0%	5%	0%	0%	0%	0%	0%
Turn Type	Perm		Perm	pm+pt		Perm	Perm			Prot		
Protected Phases		2		1	6			4		3	8	
Permitted Phases	2		2	6		6	4					
Actuated Green, G (s)	52.8	52.8	52.8	62.6	62.6	62.6	21.3	21.3		7.1	35.1	
Effective Green, g (s)	52.8	52.8	52.8	62.6	62.6	62.6	21.3	21.3		7.1	35.1	
Actuated g/C Ratio	0.48	0.48	0.48	0.57	0.57	0.57	0.19	0.19		0.06	0.32	
Clearance Time (s)	6.2	6.2	6.2	3.0	6.2	6.2	6.7	6.7		6.7	6.7	
Vehicle Extension (s)	5.0	5.0	5.0	3.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	68	2332	731	191	2792	904	252	318		222	547	
v/s Ratio Prot		0.32		0.03	c0.41			0.10		c0.02	0.02	
v/s Ratio Perm	c0.40		0.02	0.27		0.08	c0.13					
v/c Ratio	0.84	0.67	0.03	0.53	0.73	0.14	0.69	0.52		0.31	0.05	
Uniform Delay, d1	25.2	22.3	15.3	15.1	17.7	11.3	41.6	40.0		49.4	26.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	69.9	1.6	0.1	2.6	1.7	0.3	10.1	2.8		1.6	0.1	
Delay (s)	95.1	23.8	15.4	17.7	19.4	11.6	51.7	42.8		51.0	26.3	
Level of Service	F	C	B	B	B	B	D	D		D	C	
Approach Delay (s)		26.0			18.6			46.6			43.1	
Approach LOS		C			B			D			D	

Intersection Summary

HCM Average Control Delay	24.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	110.6	Sum of lost time (s)	25.8
Intersection Capacity Utilization	94.3%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis  
3: Bovaird Drive & Mississauga Road

<2031 without NSTC> AM Peak Hour  
4/27/2011

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		  		 	  		 	  			  	
Volume (vph)	138	1501	456	697	1420	170	290	1319	509	105	890	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	3.0	6.6	6.6
Lane Util. Factor	1.00	0.91	1.00	0.97	0.91	1.00	0.97	0.91	1.00	1.00	0.91	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1552	4885	1452	3267	5029	1507	3177	4980	1536	1785	4932	1288
Flt Permitted	0.15	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.14	1.00	1.00
Satd. Flow (perm)	251	4885	1452	3267	5029	1507	3177	4980	1536	256	4932	1288
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	138	1501	456	697	1420	170	290	1319	509	105	890	85
RTOR Reduction (vph)	0	0	125	0	0	34	0	0	277	0	0	33
Lane Group Flow (vph)	138	1501	331	697	1420	136	290	1319	232	105	890	52
Heavy Vehicles (%)	15%	5%	10%	6%	2%	6%	9%	3%	4%	0%	4%	24%
Turn Type	pm+pt		Perm	Prot		Perm	Prot		Perm	pm+pt		Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2		2			6			4	8		8
Actuated Green, G (s)	55.2	43.4	43.4	27.4	62.6	62.6	13.4	37.7	37.7	38.1	29.4	29.4
Effective Green, g (s)	55.2	43.4	43.4	27.4	62.6	62.6	13.4	37.7	37.7	38.1	29.4	29.4
Actuated g/C Ratio	0.39	0.31	0.31	0.20	0.45	0.45	0.10	0.27	0.27	0.27	0.21	0.21
Clearance Time (s)	3.0	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	3.0	6.6	6.6
Vehicle Extension (s)	3.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	3.0	5.0	5.0
Lane Grp Cap (vph)	209	1514	450	639	2249	674	304	1341	414	165	1036	270
v/s Ratio Prot	0.06	c0.31		c0.21	0.28		c0.09	c0.26		0.04	0.18	
v/s Ratio Perm	0.21		0.23			0.09			0.15	0.13		0.04
v/c Ratio	0.66	0.99	0.74	1.09	0.63	0.20	0.95	0.98	0.56	0.64	0.86	0.19
Uniform Delay, d1	28.4	48.1	43.2	56.3	29.8	23.5	63.0	50.8	44.0	41.4	53.3	45.5
Progression 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
Incremental Delay, d2	7.6	21.2	10.3	62.8	1.4	0.7	39.9	20.7	2.8	7.8	9.2	1.6
Delay (s)	36.0	69.3	53.4	119.1	31.2	24.2	102.9	71.6	46.9	49.2	62.5	47.1
Level of Service	D	E	D	F	C	C	F	E	D	D	E	D
Approach Delay (s)		63.6			57.5			69.9			60.0	
Approach LOS		E			E			E			E	

Intersection Summary





























HCM Average Control Delay	63.0	HCM Level of Service	E
HCM Volume to Capacity ratio	1.05		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	26.4
Intersection Capacity Utilization	100.0%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis  
4: Bovaird Drive & Heritage Road

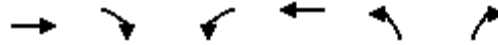
<2031 without NSTC> AM Peak Hour

4/27/2011

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			 			 			 	
Volume (vph)	141	1457	82	117	1875	80	29	181	34	19	199	92
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	7.4	7.4	7.4	7.4	7.4	6.2	6.2		6.2	6.2	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95		1.00	0.95	
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	0.95	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1785	3368	1597	1785	3500	1597	1785	3485		1785	3377	
Flt Permitted	0.08	1.00	1.00	0.17	1.00	1.00	0.55	1.00		0.62	1.00	
Satd. Flow (perm)	146	3368	1597	323	3500	1597	1039	3485		1160	3377	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	141	1457	82	117	1875	80	29	181	34	19	199	92
RTOR Reduction (vph)	0	0	19	0	0	9	0	19	0	0	64	0
Lane Group Flow (vph)	141	1457	63	117	1875	71	29	196	0	19	227	0
Confl. Peds. (#/hr)												7
Heavy Vehicles (%)	0%	6%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%
Turn Type	pm+pt		Perm	Perm		Perm	Perm			Perm		
Protected Phases	5	2			6			4			8	
Permitted Phases	2		2	6		6	4			8		
Actuated Green, G (s)	58.1	58.1	58.1	48.4	48.4	48.4	12.8	12.8		12.8	12.8	
Effective Green, g (s)	58.1	58.1	58.1	48.4	48.4	48.4	12.8	12.8		12.8	12.8	
Actuated g/C Ratio	0.69	0.69	0.69	0.57	0.57	0.57	0.15	0.15		0.15	0.15	
Clearance Time (s)	3.0	7.4	7.4	7.4	7.4	7.4	6.2	6.2		6.2	6.2	
Vehicle Extension (s)	3.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	230	2316	1098	185	2005	915	157	528		176	512	
v/s Ratio Prot	0.05	c0.43			c0.54			0.06			c0.07	
v/s Ratio Perm	0.37		0.04	0.36		0.04	0.03			0.02		
v/c Ratio	0.61	0.63	0.06	0.63	0.94	0.08	0.18	0.37		0.11	0.44	
Uniform Delay, d1	16.3	7.3	4.3	12.1	16.6	8.1	31.3	32.2		30.9	32.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	4.8	1.3	0.1	15.3	9.7	0.2	1.2	0.9		0.6	1.3	
Delay (s)	21.1	8.6	4.4	27.4	26.3	8.2	32.5	33.2		31.5	33.9	
Level of Service	C	A	A	C	C	A	C	C		C	C	
Approach Delay (s)		9.4			25.7			33.1			33.7	
Approach LOS		A			C			C			C	
<b>Intersection Summary</b>												
HCM Average Control Delay			20.3			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.87									
Actuated Cycle Length (s)			84.5			Sum of lost time (s)		21.0				
Intersection Capacity Utilization			96.0%			ICU Level of Service				F		
Analysis Period (min)			15									
c	Critical Lane Group											

HCM Unsignalized Intersection Capacity Analysis  
 5: Bovaird Drive & Caseley Street

<2031 without NSTC> AM Peak Hour  
 4/27/2011



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↔	↔	
Volume (veh/h)	373	1	0	477	5	2
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	373	1	0	477	5	2
Pedestrians	1			3	12	
Lane Width (m)	3.5			3.5	3.5	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	0			0	1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			386		864	388
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			386		864	388
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		98	100
cM capacity (veh/h)			1172		324	656

























Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	374	477	7
Volume Left	0	0	5
Volume Right	1	0	2
cSH	1700	1172	379
Volume to Capacity	0.22	0.00	0.02
Queue Length 95th (m)	0.0	0.0	0.4
Control Delay (s)	0.0	0.0	14.7
Lane LOS	B		
Approach Delay (s)	0.0	0.0	14.7
Approach LOS	B		

Intersection Summary			
Average Delay			0.1
Intersection Capacity Utilization	36.1%		ICU Level of Service
Analysis Period (min)	15		A

HCM Signalized Intersection Capacity Analysis  
 22: James Potter Road/Creditview Road & Bovaird Drive

<2031 without NSTC> AM Peak Hour

3/22/2012

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	629	1432	104	367	1624	359	6	660	86	169	977	451
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.0	6.0	3.0	6.6	6.6	6.6	6.6	6.6	3.0	6.6	6.6
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1750	5029	1566	1750	5029	1566	1750	3500	1566	1750	3500	1566
Flt Permitted	0.11	1.00	1.00	0.12	1.00	1.00	0.20	1.00	1.00	0.17	1.00	1.00
Satd. Flow (perm)	199	5029	1566	221	5029	1566	361	3500	1566	315	3500	1566
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	629	1432	104	367	1624	359	6	660	86	169	977	451
RTOR Reduction (vph)	0	0	48	0	0	126	0	0	70	0	0	326
Lane Group Flow (vph)	629	1432	56	367	1624	233	6	660	16	169	977	125
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8			2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)	67.0	42.6	42.6	54.8	33.4	33.4	20.4	20.4	20.4	30.4	30.4	30.4
Effective Green, g (s)	67.0	42.6	42.6	54.8	33.4	33.4	20.4	20.4	20.4	30.4	30.4	30.4
Actuated g/C Ratio	0.61	0.39	0.39	0.50	0.30	0.30	0.19	0.19	0.19	0.28	0.28	0.28
Clearance Time (s)	3.0	6.0	6.0	3.0	6.6	6.6	6.6	6.6	6.6	3.0	6.6	6.6
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	544	1948	606	408	1527	475	67	649	290	178	967	433
v/s Ratio Prot	c0.32	0.28		0.18	0.32			0.19		0.06	c0.28	
v/s Ratio Perm	c0.39		0.04	0.27		0.15	0.02		0.01	0.20		0.08
v/c Ratio	1.16	0.74	0.09	0.90	1.06	0.49	0.09	1.02	0.05	0.95	1.01	0.29
Uniform Delay, d1	32.6	28.9	21.4	29.4	38.3	31.3	37.1	44.8	36.9	36.2	39.8	31.3
Progression 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
Incremental Delay, d2	89.5	1.5	0.1	21.9	42.0	0.8	2.6	39.6	0.4	52.1	31.5	1.7
Delay (s)	122.1	30.3	21.5	51.3	80.3	32.1	39.7	84.4	37.2	88.3	71.3	33.0
Level of Service	F	C	C	D	F	C	D	F	D	F	E	C
Approach Delay (s)		56.6			68.4			78.7			62.3	
Approach LOS		E			E			E			E	

Intersection Summary

HCM Average Control Delay	64.4	HCM Level of Service	E
HCM Volume to Capacity ratio	1.07		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	9.6
Intersection Capacity Utilization	116.4%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			























HCM Signalized Intersection Capacity Analysis - PM Peak Hour without NSTC (Single WB Left)  
 1: Lake Lousie Drive/Worthington Avenue & Bovaird Drive 3/22/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	457	1027	58	75	1454	273	7	36	14	195	50	189
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.6		6.6	6.6	6.6	6.9	6.9		6.9	6.9	
Lane Util. Factor	1.00	0.91		1.00	0.91	1.00	1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	1.00		1.00	1.00	0.97	1.00	0.99		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		0.99	1.00	
Frt	1.00	0.99		1.00	1.00	0.85	1.00	0.96		1.00	0.88	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1750	4716		1782	4839	1399	1777	1787		1710	1248	
Flt Permitted	0.08	1.00		0.25	1.00	1.00	0.42	1.00		0.72	1.00	
Satd. Flow (perm)	152	4716		471	4839	1399	795	1787		1304	1248	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	457	1027	58	75	1454	273	7	36	14	195	50	189
RTOR Reduction (vph)	0	4	0	0	0	164	0	11	0	0	120	0
Lane Group Flow (vph)	457	1081	0	75	1454	109	7	39	0	195	119	0
Confl. Peds. (#/hr)	3		3	3		3	6		12	12		6
Heavy Vehicles (%)	2%	8%	3%	0%	6%	11%	0%	0%	0%	3%	3%	38%
Turn Type	pm+pt	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2			6			4				8
Permitted Phases	2			6		6	4			8		
Actuated Green, G (s)	77.6	77.6		45.8	45.8	45.8	23.2	23.2		23.2	23.2	
Effective Green, g (s)	77.6	77.6		45.8	45.8	45.8	23.2	23.2		23.2	23.2	
Actuated g/C Ratio	0.68	0.68		0.40	0.40	0.40	0.20	0.20		0.20	0.20	
Clearance Time (s)	3.0	6.6		6.6	6.6	6.6	6.9	6.9		6.9	6.9	
Vehicle Extension (s)	3.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	506	3202		189	1939	561	161	363		265	253	
v/s Ratio Prot	c0.23	0.23			0.30			0.02				0.10
v/s Ratio Perm	c0.39			0.16		0.08	0.01			c0.15		
v/c Ratio	0.90	0.34		0.40	0.75	0.19	0.04	0.11		0.74	0.47	
Uniform Delay, d1	32.5	7.6		24.4	29.3	22.3	36.6	37.1		42.7	40.2	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	19.3	0.3		6.1	2.7	0.8	0.2	0.3		12.2	2.9	
Delay (s)	51.8	7.9		30.5	32.1	23.0	36.9	37.4		54.9	43.0	
Level of Service	D	A		C	C	C	D	D		D	D	
Approach Delay (s)		20.9			30.6			37.3			48.4	
Approach LOS		C			C			D			D	

**Intersection Summary**

HCM Average Control Delay	28.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	114.3	Sum of lost time (s)	9.9
Intersection Capacity Utilization	86.7%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis 2031 PM Peak without NSTC(Single WB Left)  
 2: Bovaird Drive & Ashby Field Road 2/4/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	16	2034	175	169	1570	68	49	16	101	220	71	57
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.2	6.2	6.2	3.0	6.2	6.2	6.7	6.7		6.7	6.7	
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91	1.00	1.00	1.00		0.97	1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	1.00	1.00	0.98		1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.87		1.00	0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1785	4885	1531	1785	4932	1597	1692	1603		3463	1740	
Flt Permitted	0.14	1.00	1.00	0.07	1.00	1.00	0.67	1.00		0.95	1.00	
Satd. Flow (perm)	267	4885	1531	137	4932	1597	1202	1603		3463	1740	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	16	2034	175	169	1570	68	49	16	101	220	71	57
RTOR Reduction (vph)	0	0	78	0	0	27	0	90	0	0	12	0
Lane Group Flow (vph)	16	2034	97	169	1570	41	49	27	0	220	116	0
Confl. Peds. (#/hr)			1	1			5		11	11		5
Heavy Vehicles (%)	0%	5%	2%	0%	4%	0%	5%	0%	0%	0%	0%	0%
Turn Type	Perm		Perm	pm+pt		Perm	Perm			Prot		
Protected Phases		2		1	6			4		3	8	
Permitted Phases	2		2	6		6	4					
Actuated Green, G (s)	51.8	51.8	51.8	61.8	61.8	61.8	11.5	11.5		9.4	27.6	
Effective Green, g (s)	51.8	51.8	51.8	61.8	61.8	61.8	11.5	11.5		9.4	27.6	
Actuated g/C Ratio	0.51	0.51	0.51	0.60	0.60	0.60	0.11	0.11		0.09	0.27	
Clearance Time (s)	6.2	6.2	6.2	3.0	6.2	6.2	6.7	6.7		6.7	6.7	
Vehicle Extension (s)	5.0	5.0	5.0	3.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	135	2474	775	196	2979	965	135	180		318	469	
v/s Ratio Prot		0.42		c0.06	0.32			0.02		c0.06	0.07	
v/s Ratio Perm	0.06		0.06	c0.46		0.03	c0.04					
v/c Ratio	0.12	0.82	0.12	0.86	0.53	0.04	0.36	0.15		0.69	0.25	
Uniform Delay, d1	13.3	21.4	13.3	23.2	11.8	8.2	42.0	41.0		45.0	29.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.8	3.2	0.3	30.0	0.7	0.1	3.5	0.8		8.0	0.6	
Delay (s)	15.0	24.6	13.6	53.3	12.4	8.3	45.5	41.8		53.1	29.8	
Level of Service	B	C	B	D	B	A	D	D		D	C	
Approach Delay (s)		23.7			16.1			42.9			44.5	
Approach LOS		C			B			D			D	
<b>Intersection Summary</b>												
HCM Average Control Delay			23.0									C
HCM Volume to Capacity ratio			0.74									
Actuated Cycle Length (s)			102.3							16.4		
Intersection Capacity Utilization			88.0%									E
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis 2031 PM Peak without NSTC(Single WB Left)  
 3: Bovaird Drive & Mississauga Road 2/4/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	85	1420	290	509	1501	105	456	890	697	170	1319	138
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.6	6.6	3.0	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91	1.00	0.97	0.91	1.00	1.00	0.91	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1552	4885	1452	1684	5029	1507	3177	4980	1536	1785	4932	1288
Flt Permitted	0.12	1.00	1.00	0.07	1.00	1.00	0.95	1.00	1.00	0.31	1.00	1.00
Satd. Flow (perm)	190	4885	1452	133	5029	1507	3177	4980	1536	578	4932	1288
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	85	1420	290	509	1501	105	456	890	697	170	1319	138
RTOR Reduction (vph)	0	0	164	0	0	42	0	0	181	0	0	66
Lane Group Flow (vph)	85	1420	126	509	1501	63	456	890	516	170	1319	72
Heavy Vehicles (%)	15%	5%	10%	6%	2%	6%	9%	3%	4%	0%	4%	24%
Turn Type	pm+pt		Perm	pm+pt		Perm	Prot		Perm	Perm		Perm
Protected Phases	5	2		1	6		7	4			8	
Permitted Phases	2		2	6		6			4	8		8
Actuated Green, G (s)	61.6	52.5	52.5	76.5	64.4	64.4	14.4	50.3	50.3	29.3	29.3	29.3
Effective Green, g (s)	61.6	52.5	52.5	76.5	64.4	64.4	14.4	50.3	50.3	29.3	29.3	29.3
Actuated g/C Ratio	0.44	0.38	0.38	0.55	0.46	0.46	0.10	0.36	0.36	0.21	0.21	0.21
Clearance Time (s)	3.0	6.6	6.6	3.0	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Vehicle Extension (s)	3.0	5.0	5.0	5.0	5.0	5.0	3.0	5.0	5.0	5.0	5.0	5.0
Lane Grp Cap (vph)	172	1832	545	305	2313	693	327	1789	552	121	1032	270
v/s Ratio Prot	0.03	0.29		c0.25	0.30		c0.14	0.18			0.27	
v/s Ratio Perm	0.18		0.09	c0.66		0.04			0.34	c0.29		0.06
v/c Ratio	0.49	0.78	0.23	1.67	0.65	0.09	1.39	0.50	0.93	1.40	1.28	0.27
Uniform Delay, d1	24.4	38.5	29.9	44.7	29.1	21.3	62.8	35.0	43.3	55.4	55.4	46.4
Progression 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
Incremental Delay, d2	2.2	3.3	1.0	315.1	1.4	0.3	195.2	0.5	23.8	224.2	132.7	2.4
Delay (s)	26.6	41.8	30.9	359.8	30.5	21.6	258.0	35.4	67.1	279.5	188.1	48.8
Level of Service	C	D	C	F	C	C	F	D	E	F	F	D
Approach Delay (s)		39.3			109.3			95.9			185.8	
Approach LOS		D			F			F			F	

























Intersection Summary		
HCM Average Control Delay	105.6	HCM Level of Service F
HCM Volume to Capacity ratio	1.52	
Actuated Cycle Length (s)	140.0	Sum of lost time (s) 16.2
Intersection Capacity Utilization	114.0%	ICU Level of Service H
Analysis Period (min)	15	

c Critical Lane Group



HCM Signalized Intersection Capacity Analysis 2031 PM Peak without NSTC(Single WB Left)  
 4: Bovaird Drive & Heritage Road

2/4/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	92	1875	29	34	1457	19	82	199	117	80	181	141
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.4	7.4	7.4	7.4	7.4	7.4	6.2	6.2		6.2	6.2	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.94		1.00	0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1785	3368	1597	1785	3500	1597	1785	3372		1785	3303	
Flt Permitted	0.13	1.00	1.00	0.08	1.00	1.00	0.53	1.00		0.54	1.00	
Satd. Flow (perm)	251	3368	1597	141	3500	1597	994	3372		1010	3303	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	92	1875	29	34	1457	19	82	199	117	80	181	141
RTOR Reduction (vph)	0	0	5	0	0	4	0	12	0	0	34	0
Lane Group Flow (vph)	92	1875	24	34	1457	15	82	304	0	80	288	0
Confl. Peds. (#/hr)												7
Heavy Vehicles (%)	0%	6%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm		Perm	Perm		Perm	Perm			Perm		
Protected Phases		2			6			4			8	
Permitted Phases	2		2	6		6	4			8		
Actuated Green, G (s)	53.3	53.3	53.3	53.3	53.3	53.3	15.2	15.2		15.2	15.2	
Effective Green, g (s)	53.3	53.3	53.3	53.3	53.3	53.3	15.2	15.2		15.2	15.2	
Actuated g/C Ratio	0.65	0.65	0.65	0.65	0.65	0.65	0.19	0.19		0.19	0.19	
Clearance Time (s)	7.4	7.4	7.4	7.4	7.4	7.4	6.2	6.2		6.2	6.2	
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	163	2187	1037	92	2272	1037	184	624		187	612	
v/s Ratio Prot		c0.56			0.42			c0.09			0.09	
v/s Ratio Perm	0.37		0.01	0.24		0.01	0.08			0.08		
v/c Ratio	0.56	0.86	0.02	0.37	0.64	0.01	0.45	0.49		0.43	0.47	
Uniform Delay, d1	8.0	11.4	5.1	6.6	8.7	5.1	29.7	30.0		29.6	29.9	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	13.4	4.6	0.0	11.0	1.4	0.0	3.6	1.3		3.3	1.2	
Delay (s)	21.4	16.0	5.2	17.7	10.1	5.1	33.3	31.2		32.9	31.1	
Level of Service	C	B	A	B	B	A	C	C		C	C	
Approach Delay (s)		16.1			10.2			31.6			31.4	
Approach LOS		B			B			C			C	
<b>Intersection Summary</b>												
HCM Average Control Delay			16.9				HCM Level of Service			B		
HCM Volume to Capacity ratio			0.78									
Actuated Cycle Length (s)			82.1				Sum of lost time (s)		13.6			
Intersection Capacity Utilization			105.2%				ICU Level of Service		G			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis 2031 PM Peak without NSTC(Single WB Left)  
 5: Bovaird Drive & Caseley Street 2/4/2010



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↩			↩	↩	
Volume (veh/h)	477	5	2	373	1	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	477	5	2	373	1	0
Pedestrians	1			3	12	
Lane Width (m)	3.5			3.5	3.5	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	0			0	1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			494		870	494
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			494		870	494
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1070		321	572

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	482	375	1
Volume Left	0	2	1
Volume Right	5	0	0
cSH	1700	1070	321
Volume to Capacity	0.28	0.00	0.00
Queue Length 95th (m)	0.0	0.0	0.1
Control Delay (s)	0.0	0.1	16.3
Lane LOS		A	C
Approach Delay (s)	0.0	0.1	16.3
Approach LOS			C

Intersection Summary			
Average Delay		0.0	
Intersection Capacity Utilization		36.4%	ICU Level of Service A
Analysis Period (min)		15	































HCM Signalized Intersection Capacity Analysis 2031 PM Peak without NSTC(Double WB Left)  
 3: Bovaird Drive & Mississauga Road

2/4/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	85	1420	290	509	1501	105	456	890	697	170	1319	138
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Lane Util. Factor	1.00	0.91	1.00	0.97	0.91	1.00	0.97	0.91	1.00	1.00	0.91	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1552	4885	1452	3267	5029	1507	3177	4980	1536	1785	4932	1288
Flt Permitted	0.11	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.31	1.00	1.00
Satd. Flow (perm)	176	4885	1452	3267	5029	1507	3177	4980	1536	578	4932	1288
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	85	1420	290	509	1501	105	456	890	697	170	1319	138
RTOR Reduction (vph)	0	0	177	0	0	43	0	0	120	0	0	65
Lane Group Flow (vph)	85	1420	113	509	1501	62	456	890	577	170	1319	73
Heavy Vehicles (%)	15%	5%	10%	6%	2%	6%	9%	3%	4%	0%	4%	24%
Turn Type	pm+pt		Perm	Prot		Perm	Prot		Perm	Perm		Perm
Protected Phases	5	2		1	6		7	4			8	
Permitted Phases	2		2			6			4	8		8
Actuated Green, G (s)	63.5	54.6	54.6	14.1	63.4	63.4	15.9	51.5	51.5	29.0	29.0	29.0
Effective Green, g (s)	63.5	54.6	54.6	14.1	63.4	63.4	15.9	51.5	51.5	29.0	29.0	29.0
Actuated g/C Ratio	0.45	0.39	0.39	0.10	0.45	0.45	0.11	0.37	0.37	0.21	0.21	0.21
Clearance Time (s)	3.0	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Vehicle Extension (s)	3.0	5.0	5.0	5.0	5.0	5.0	3.0	5.0	5.0	5.0	5.0	5.0
Lane Grp Cap (vph)	167	1905	566	329	2277	682	361	1832	565	120	1022	267
v/s Ratio Prot	0.03	c0.29		c0.16	0.30		0.14	0.18			0.27	
v/s Ratio Perm	0.20		0.08			0.04			c0.38	c0.29		0.06
v/c Ratio	0.51	0.75	0.20	1.55	0.66	0.09	1.26	0.49	1.02	1.42	1.29	0.27
Uniform Delay, d1	23.9	36.7	28.2	63.0	29.9	21.9	62.0	34.1	44.2	55.5	55.5	46.6
Progression 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
Incremental Delay, d2	2.4	2.7	0.8	260.8	1.5	0.3	138.8	0.4	43.3	229.2	138.2	2.5
Delay (s)	26.3	39.4	29.0	323.8	31.4	22.1	200.9	34.5	87.5	284.7	193.7	49.2
Level of Service	C	D	C	F	C	C	F	C	F	F	F	D
Approach Delay (s)		37.1			101.3			89.7			190.9	
Approach LOS		D			F			F			F	
<b>Intersection Summary</b>												
HCM Average Control Delay			102.2				HCM Level of Service		F			
HCM Volume to Capacity ratio			1.09									
Actuated Cycle Length (s)			140.0				Sum of lost time (s)		26.4			
Intersection Capacity Utilization			102.5%				ICU Level of Service		G			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis - PM Peak Hour without NSTC (Single WB Left)  
 22: James Potter Road/Creditview Road & Bovaird Drive 3/22/2012

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		  			  			 			 	
Volume (vph)	451	1624	6	86	1432	169	104	977	367	359	660	629
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.0	6.0	6.0	6.6	6.6	4.6	4.6	4.6	3.0	6.6	6.6
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1750	5029	1566	1750	5029	1566	1750	3500	1566	1750	3500	1566
Flt Permitted	0.12	1.00	1.00	0.14	1.00	1.00	0.40	1.00	1.00	0.12	1.00	1.00
Satd. Flow (perm)	222	5029	1566	249	5029	1566	738	3500	1566	227	3500	1566
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	451	1624	6	86	1432	169	104	977	367	359	660	629
RTOR Reduction (vph)	0	0	2	0	0	124	0	0	83	0	0	200
Lane Group Flow (vph)	451	1624	4	86	1432	45	104	977	284	359	660	429
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8			2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)	52.2	42.2	42.2	33.6	29.6	29.6	31.4	31.4	31.4	46.4	46.4	46.4
Effective Green, g (s)	52.2	42.2	42.2	33.6	29.6	29.6	31.4	31.4	31.4	46.4	46.4	46.4
Actuated g/C Ratio	0.47	0.38	0.38	0.30	0.27	0.27	0.28	0.28	0.28	0.42	0.42	0.42
Clearance Time (s)	3.0	6.0	6.0	6.0	6.6	6.6	4.6	4.6	4.6	3.0	6.6	6.6
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	365	1908	594	129	1339	417	208	988	442	286	1460	653
v/s Ratio Prot	c0.21	0.32		0.02	0.28			0.28		c0.16	0.19	
v/s Ratio Perm	c0.37		0.00	0.18		0.03	0.14		0.18	c0.36		0.27
v/c Ratio	1.24	0.85	0.01	0.67	1.07	0.11	0.50	0.99	0.64	1.26	0.45	0.66
Uniform Delay, d1	33.3	31.6	21.5	29.9	40.8	30.8	33.3	39.7	35.0	31.5	23.3	26.0
Progression 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
Incremental Delay, d2	127.5	3.9	0.0	12.3	45.5	0.1	8.3	26.1	7.0	140.2	1.0	5.1
Delay (s)	160.8	35.5	21.5	42.2	86.3	30.9	41.7	65.8	42.0	171.7	24.3	31.1
Level of Service	F	D	C	D	F	C	D	E	D	F	C	C
Approach Delay (s)		62.6			78.5			58.0			59.0	
Approach LOS		E			E			E			E	
<b>Intersection Summary</b>												
HCM Average Control Delay			64.7		HCM Level of Service					E		
HCM Volume to Capacity ratio			1.16									
Actuated Cycle Length (s)			111.2		Sum of lost time (s)				6.0			
Intersection Capacity Utilization			115.6%		ICU Level of Service					H		
Analysis Period (min)			15									
c Critical Lane Group												



## Queue Summary





## Existing Queues





Queuing and Blocking Report  
 <Existing> AM Peak Hour

3/22/2012

Intersection: 1: Lake Lousie Drive/Worthington Avenue & Bovaird Drive

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	T	TR	L	T	T	T	L	TR	L	TR
Maximum Queue (m)	21.8	44.9	40.6	41.6	8.1	42.5	52.9	42.3	27.2	54.6	71.8	175.8
Average Queue (m)	14.6	18.5	23.4	27.2	4.3	27.5	32.7	4.0	7.8	19.8	57.6	85.2
95th Queue (m)	25.3	40.0	41.4	44.1	10.3	45.7	51.5	21.5	19.6	44.2	80.1	173.4
Link Distance (m)		291.8	291.8	291.8		351.2	351.2	351.2		288.6		196.6
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)	230.0				90.0				50.0		50.0	
Storage Blk Time (%)										1	21	19
Queuing Penalty (veh)										0	64	56

Queuing and Blocking Report  
 <Existing> AM Peak Hour

2/4/2010

Intersection: 2: Bovaird Drive & Ashby Field Road

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	T	R	L	T	T	R	L	TR	L	L
Maximum Queue (m)	12.6	60.1	59.5	7.6	9.9	65.2	40.9	14.2	23.0	26.4	4.2	8.8
Average Queue (m)	4.9	30.2	30.7	2.7	6.1	49.7	22.6	8.8	11.4	13.1	1.8	3.4
95th Queue (m)	14.9	72.3	70.6	9.4	14.0	77.2	48.7	18.3	25.1	27.3	6.6	10.6
Link Distance (m)		185.4	185.4			246.2	246.2			93.2		
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)	148.0			90.0	110.0			110.0	75.0		31.0	31.0
Storage Blk Time (%)												
Queuing Penalty (veh)												

Intersection: 2: Bovaird Drive & Ashby Field Road

Movement	SB
Directions Served	TR
Maximum Queue (m)	12.3
Average Queue (m)	4.3
95th Queue (m)	14.6
Link Distance (m)	107.2
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (m)	
Storage Blk Time (%)	0
Queuing Penalty (veh)	0

Intersection: 3: Bovaird Drive & Mississauga Road

Movement	EB	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	R	L	TR	L	TR	L	TR
Maximum Queue (m)	15.9	164.8	94.5	113.9	86.5	29.3	57.2	24.9	152.6
Average Queue (m)	4.7	112.3	33.7	72.3	62.6	14.1	34.3	6.5	107.5
95th Queue (m)	26.1	193.7	111.2	133.6	105.5	30.9	61.8	35.5	195.8
Link Distance (m)		464.2			697.1		403.2		358.2
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (m)	20.0		100.0	60.0		36.0		18.0	
Storage Blk Time (%)	2	49		27	7	1	7	3	60
Queuing Penalty (veh)	14	118		127	21	3	6	14	11

Intersection: 4: Bovaird Drive & Heritage Road

Movement	EB	EB	EB	WB	WB	NB	SB
Directions Served	L	T	R	L	T	LTR	LTR
Maximum Queue (m)	10.2	142.2	7.1	20.4	57.0	10.3	32.7
Average Queue (m)	4.1	79.7	2.1	10.3	27.2	5.1	22.1
95th Queue (m)	12.4	149.6	8.4	21.6	67.7	13.9	35.7
Link Distance (m)		925.4			438.3	521.8	436.6
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (m)	50.0		10.0	55.0			
Storage Blk Time (%)		25	1		9		
Queuing Penalty (veh)		18	9		5		

Intersection: 5: Bovaird Drive & Caseley Street

Movement	EB	WB	NB
Directions Served	TR	LT	LR
Maximum Queue (m)	5.1	13.3	12.0
Average Queue (m)	1.0	2.7	5.4
95th Queue (m)	7.0	17.0	14.5
Link Distance (m)	261.3	119.3	93.3
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 580

Queuing and Blocking Report  
 <Existing> Midday Peak Hour

3/22/2012

Intersection: 1: Lake Lousie Drive/Worthington Avenue & Bovaird Drive

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	T	TR	L	T	T	L	TR	L	TR
Maximum Queue (m)	41.1	33.2	35.9	34.5	22.0	37.8	54.0	27.8	22.0	47.6	22.8
Average Queue (m)	10.4	8.7	14.4	18.4	9.0	19.1	27.8	9.1	5.2	24.9	7.5
95th Queue (m)	29.3	22.9	32.4	29.8	19.1	37.9	44.7	22.5	15.2	44.1	18.7
Link Distance (m)		291.8	291.8	291.8		351.2	351.2		288.6		196.6
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (m)	230.0				90.0			50.0		50.0	
Storage Blk Time (%)										0	
Queuing Penalty (veh)										0	

Queuing and Blocking Report  
 <Existing> Midday Peak Hour

2/4/2010

Intersection: 2: Bovaird Drive & Ashby Field Road

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	T	R	L	T	T	R	L	TR	L	L
Maximum Queue (m)	8.3	28.3	31.8	8.9	14.2	54.4	34.4	1.4	14.4	10.0	2.9	5.0
Average Queue (m)	1.9	13.1	17.0	1.8	7.6	27.8	11.3	0.6	6.3	5.3	0.6	2.3
95th Queue (m)	9.5	32.7	35.5	9.9	17.3	57.4	35.4	3.7	16.8	13.0	3.8	7.2
Link Distance (m)		185.4	185.4			246.2	246.2			93.2		
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)	148.0			90.0	110.0			110.0	75.0		31.0	31.0
Storage Blk Time (%)												
Queuing Penalty (veh)												

Intersection: 2: Bovaird Drive & Ashby Field Road

Movement	SB
Directions Served	TR
Maximum Queue (m)	5.3
Average Queue (m)	1.7
95th Queue (m)	7.3
Link Distance (m)	107.2
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (m)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 3: Bovaird Drive & Mississauga Road

Movement	EB	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	R	L	TR	L	TR	L	TR
Maximum Queue (m)	16.3	83.6	11.8	41.6	62.8	23.3	35.2	10.3	35.5
Average Queue (m)	4.6	50.7	5.5	26.1	40.9	15.8	21.1	4.7	19.0
95th Queue (m)	18.9	93.4	13.2	47.8	72.1	29.0	40.2	14.5	43.5
Link Distance (m)		464.2			697.1		403.2		358.2
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (m)	20.0		100.0	60.0		36.0		18.0	
Storage Blk Time (%)	2	30		1	2		2	1	10
Queuing Penalty (veh)	10	27		2	3		1	1	2

Queuing and Blocking Report  
 <Existing> Midday Peak Hour

2/4/2010

Intersection: 4: Bovaird Drive & Heritage Road

Movement	EB	EB	EB	WB	WB	NB	SB
Directions Served	L	T	R	L	T	LTR	LTR
Maximum Queue (m)	2.6	30.5	3.2	6.4	33.9	8.7	10.2
Average Queue (m)	0.5	13.3	0.6	2.3	10.6	3.7	4.7
95th Queue (m)	3.5	34.9	4.2	7.4	36.0	10.7	12.8
Link Distance (m)		925.4			438.3	521.8	436.6
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (m)	50.0		10.0	55.0			
Storage Blk Time (%)		8	0		3		
Queuing Penalty (veh)		2	0		1		

Intersection: 5: Bovaird Drive & Caseley Street

Movement	EB	WB	NB
Directions Served	TR	LT	LR
Maximum Queue (m)	6.2	6.8	12.5
Average Queue (m)	1.2	1.7	5.7
95th Queue (m)	8.8	8.5	16.4
Link Distance (m)	53.4	119.3	93.3
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 132

Queuing and Blocking Report  
 <Existing> PM Peak Hour

3/22/2012

Intersection: 1: Lake Louise Drive/Worthington Avenue & Bovaird Drive

Movement	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB	SB	
Directions Served	L	T	T	TR	L	T	T	T	R	L	TR	L	
Maximum Queue (m)	164.5	147.9	25.7	39.1	22.1	60.4	65.4	46.9	36.2	9.1	27.2	64.2	
Average Queue (m)	88.6	18.7	11.7	19.2	8.8	38.9	43.8	13.6	4.4	1.2	8.6	32.7	
95th Queue (m)	167.4	76.1	22.7	35.7	20.8	56.1	63.9	39.8	23.2	6.3	21.1	56.0	
Link Distance (m)		291.8	291.8	291.8		351.2	351.2	351.2			288.6		
Upstream Blk Time (%)													
Queuing Penalty (veh)													
Storage Bay Dist (m)	230.0						90.0				90.0	50.0	50.0
Storage Blk Time (%)												3	
Queuing Penalty (veh)												7	

Intersection: 1: Lake Louise Drive/Worthington Avenue & Bovaird Drive

Movement	SB
Directions Served	TR
Maximum Queue (m)	97.2
Average Queue (m)	29.2
95th Queue (m)	84.5
Link Distance (m)	196.6
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (m)	
Storage Blk Time (%)	5
Queuing Penalty (veh)	7

Queuing and Blocking Report  
 <Existing> PM Peak Hour

2/4/2010

Intersection: 2: Bovaird Drive & Ashby Field Road

Movement	EB	EB	EB	WB	WB	WB	WB	B25	NB	NB	SB	SB
Directions Served	T	T	R	L	T	T	R	T	L	TR	L	L
Maximum Queue (m)	48.2	52.7	9.6	23.0	90.4	61.0	8.0	62.2	16.7	12.0	16.8	21.3
Average Queue (m)	34.9	35.8	5.7	14.3	67.1	39.9	1.9	12.4	8.5	7.8	13.2	15.3
95th Queue (m)	59.1	62.8	12.6	32.7	121.5	87.4	7.6	112.9	19.9	14.5	19.9	23.6
Link Distance (m)	185.4	185.4			246.2	246.2		291.5		93.2		
Upstream Blk Time (%)								0				
Queuing Penalty (veh)								1				
Storage Bay Dist (m)			90.0	110.0			110.0		75.0		31.0	31.0
Storage Blk Time (%)					1	0						
Queuing Penalty (veh)					1	0						

Intersection: 2: Bovaird Drive & Ashby Field Road

Movement	SB
Directions Served	TR
Maximum Queue (m)	17.8
Average Queue (m)	9.4
95th Queue (m)	21.9
Link Distance (m)	107.2
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (m)	
Storage Blk Time (%)	1
Queuing Penalty (veh)	2

Intersection: 3: Bovaird Drive & Mississauga Road

Movement	EB	EB	EB	WB	WB	B14	B14	NB	NB	SB	SB
Directions Served	L	T	R	L	TR	T		L	TR	L	TR
Maximum Queue (m)	23.6	133.2	16.3	110.1	180.2	68.0	29.2	118.8	411.1	13.2	59.7
Average Queue (m)	8.4	97.5	10.4	58.5	127.1	13.6	5.8	68.4	352.9	4.5	31.7
95th Queue (m)	28.9	154.0	20.7	122.2	214.1	90.1	53.1	147.3	501.2	14.1	64.7
Link Distance (m)		464.2			697.1	185.4	185.4		403.2		358.2
Upstream Blk Time (%)						0			19		
Queuing Penalty (veh)						0			0		
Storage Bay Dist (m)	20.0		100.0	60.0				36.0		18.0	
Storage Blk Time (%)	0	48		14	27			16	57	1	30
Queuing Penalty (veh)	2	58		100	62			122	126	1	6



Queuing and Blocking Report  
 <Existing> PM Peak Hour

2/4/2010

Intersection: 4: Bovaird Drive & Heritage Road

Movement	EB	EB	EB	WB	WB	WB	NB	SB
Directions Served	L	T	R	L	T	R	LTR	LTR
Maximum Queue (m)	7.2	61.3	1.4	5.4	90.5	3.0	50.2	9.4
Average Queue (m)	2.3	37.7	0.3	1.1	51.0	0.8	34.7	4.0
95th Queue (m)	8.7	69.1	2.6	5.1	106.9	4.6	57.5	11.4
Link Distance (m)		925.4			438.3		521.8	436.6
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (m)	50.0		10.0	55.0		15.0		
Storage Blk Time (%)		19	0		19			
Queuing Penalty (veh)		6	1		6			

Intersection: 5: Bovaird Drive & Caseley Street

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (m)	3.3	1.7
Average Queue (m)	0.7	0.3
95th Queue (m)	5.9	3.1
Link Distance (m)	119.3	93.3
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 594





## 2021 Queues



Intersection: 1: Lake Louise Drive/Worthington Avenue & Bovaird Drive

Movement	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB	SB	
Directions Served	L	T	T	TR	L	T	T	T	R	L	TR	L	
Maximum Queue (m)	71.7	73.4	108.6	113.7	14.1	67.9	71.1	73.5	30.0	28.4	41.3	71.9	
Average Queue (m)	22.6	35.7	40.3	47.5	3.3	43.4	45.6	45.1	1.0	9.9	10.5	59.2	
95th Queue (m)	48.4	72.8	82.3	90.1	10.3	64.2	66.6	71.6	9.9	21.1	28.7	84.1	
Link Distance (m)		291.8	291.8	291.8		351.2	351.2	351.2			288.6		
Upstream Blk Time (%)													
Queuing Penalty (veh)													
Storage Bay Dist (m)	230.0					90.0				90.0	50.0		
Storage Blk Time (%)												9	
Queuing Penalty (veh)												39	

Intersection: 1: Lake Louise Drive/Worthington Avenue & Bovaird Drive

Movement	SB
Directions Served	TR
Maximum Queue (m)	208.5
Average Queue (m)	129.5
95th Queue (m)	255.3
Link Distance (m)	196.6
Upstream Blk Time (%)	13
Queuing Penalty (veh)	0
Storage Bay Dist (m)	
Storage Blk Time (%)	30
Queuing Penalty (veh)	74

Queuing and Blocking Report  
 <2021> AM Peak Hour

4/26/2011

Intersection: 2: Bovaird Drive & Ashby Field Road

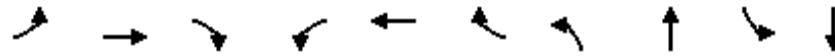
Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	T	T	T	R	L	T	T	T	R	L	TR
Maximum Queue (m)	21.2	56.7	53.2	52.7	7.8	21.1	173.9	172.8	203.9	149.0	42.6	91.5
Average Queue (m)	9.5	27.3	30.3	33.0	2.5	9.5	140.7	136.8	147.1	86.1	22.7	33.5
95th Queue (m)	20.0	47.7	46.3	52.1	8.4	19.5	175.7	174.2	200.1	189.9	40.3	65.9
Link Distance (m)		185.2	185.2	185.2			246.1	246.1	246.1			89.6
Upstream Blk Time (%)												0
Queuing Penalty (veh)												0
Storage Bay Dist (m)	148.0				90.0	110.0				110.0	75.0	
Storage Blk Time (%)							38		54			1
Queuing Penalty (veh)							34		108			1

Intersection: 2: Bovaird Drive & Ashby Field Road

Movement	SB	SB	SB
Directions Served	L	L	TR
Maximum Queue (m)	19.1	15.8	8.4
Average Queue (m)	6.2	5.3	1.6
95th Queue (m)	15.0	12.5	6.0
Link Distance (m)			103.5
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)	70.0	70.0	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Queues  
2: Bovaird Drive & Ashby Field Road

<2021> AM Peak Hour  
5/3/2011



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	52	1421	44	91	1841	199	159	217	62	29
v/c Ratio	0.64	0.57	0.05	0.39	0.64	0.20	0.65	0.56	0.22	0.06
Control Delay	65.5	22.4	5.9	16.3	18.5	2.5	53.9	28.0	51.7	19.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	65.5	22.4	5.9	16.3	18.5	2.5	53.9	28.0	51.7	19.7
Queue Length 50th (m)	8.7	82.3	0.0	8.1	98.3	0.0	32.3	23.8	6.5	3.1
Queue Length 95th (m)	#34.5	112.8	6.8	18.0	136.3	11.0	54.2	47.2	14.1	9.3
Internal Link Dist (m)		176.0			237.1			83.8		97.9
Turn Bay Length (m)	148.0		90.0	110.0		110.0	75.0		70.0	
Base Capacity (vph)	81	2487	801	238	2860	1009	359	521	305	739
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.64	0.57	0.05	0.38	0.64	0.20	0.44	0.42	0.20	0.04

Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.  
Queue shown is maximum after two cycles.

Queuing and Blocking Report  
 <2021> AM Peak Hour

4/26/2011

Intersection: 3: Bovaird Drive & Mississauga Road

Movement	EB	EB	EB	EB	EB	B15	B15	B15	WB	WB	WB	WB
Directions Served	L	T	T	T	R	T	T	T	L	T	T	T
Maximum Queue (m)	109.7	476.7	476.3	470.3	200.0	22.5	73.3	76.7	209.9	407.2	271.0	247.1
Average Queue (m)	43.0	277.6	283.4	295.2	90.9	3.0	6.9	8.6	195.0	219.6	110.2	66.0
95th Queue (m)	111.8	505.8	507.0	522.5	217.6	15.4	38.7	45.5	247.3	451.7	277.2	150.6
Link Distance (m)		456.1	456.1	456.1		469.1	469.1	469.1		688.8	688.8	688.8
Upstream Blk Time (%)		5	2	8								
Queuing Penalty (veh)		21	7	31								
Storage Bay Dist (m)	50.0				140.0				150.0			
Storage Blk Time (%)	0	68		69					62			55
Queuing Penalty (veh)	0	77		259					240			77

Intersection: 3: Bovaird Drive & Mississauga Road

Movement	WB	NB	NB	NB	NB	NB	SB	SB	SB	SB	SB
Directions Served	R	L	T	T	T	R	L	T	T	T	R
Maximum Queue (m)	48.9	185.0	411.0	409.8	398.8	62.0	77.8	63.5	69.6	78.0	22.8
Average Queue (m)	14.6	158.4	168.5	179.1	97.1	33.5	47.1	40.3	47.0	51.5	8.6
95th Queue (m)	33.5	223.4	417.4	432.8	250.2	58.9	71.9	65.5	73.0	73.1	21.1
Link Distance (m)			395.1	395.1	395.1			346.8	346.8	346.8	
Upstream Blk Time (%)			1	0	0						
Queuing Penalty (veh)			0	0	0						
Storage Bay Dist (m)	25.0	125.0				100.0	50.0				30.0
Storage Blk Time (%)	2	76			0		20	3		38	
Queuing Penalty (veh)	8	275			1		48	3		27	



Queues  
3: Bovaird Drive & Mississauga Road

<2021> AM Peak Hour  
5/3/2011



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	113	1231	374	572	1165	139	238	1082	418	86	730	70
v/c Ratio	0.52	1.03	0.73	1.11	0.53	0.20	0.94	0.61	0.51	0.80	0.60	0.20
Control Delay	25.1	78.1	27.7	106.7	26.0	11.2	73.5	33.9	5.0	90.7	42.6	15.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.1	78.1	27.7	106.7	26.0	11.2	73.5	33.9	5.0	90.7	42.6	15.3
Queue Length 50th (m)	11.8	~113.5	36.9	~138.2	72.8	9.1	40.0	76.5	0.0	19.1	56.0	3.3
Queue Length 95th (m)	20.8	#142.4	73.7	#205.9	87.2	21.8	#86.5	91.4	20.8	#48.8	69.6	15.0
Internal Link Dist (m)		454.4			686.3			391.3			342.2	
Turn Bay Length (m)	50.0		140.0	150.0		25.0	125.0		100.0	50.0		30.0
Base Capacity (vph)	233	1197	511	514	2198	700	254	1760	813	107	1208	355
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.48	1.03	0.73	1.11	0.53	0.20	0.94	0.61	0.51	0.80	0.60	0.20

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Intersection: 4: Bovaird Drive & Heritage Road

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	SB
Directions Served	L	T	T	R	L	T	T	R	L	T	TR	L
Maximum Queue (m)	45.5	464.4	464.4	15.5	45.0	77.9	105.1	9.1	14.7	31.9	31.3	7.7
Average Queue (m)	18.6	91.6	68.3	4.8	15.5	36.5	44.6	5.6	5.2	10.4	15.9	2.5
95th Queue (m)	36.0	334.8	244.6	12.4	34.7	64.3	86.9	12.3	13.8	21.8	27.6	8.3
Link Distance (m)		919.6	919.6			432.6	432.6			517.6	517.6	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)	50.0			30.0	55.0			15.0	30.0			30.0
Storage Blk Time (%)	0	0	11			1	22	0		1		
Queuing Penalty (veh)	0	0	8			1	14	0		0		

Intersection: 4: Bovaird Drive & Heritage Road

Movement	SB	SB
Directions Served	T	TR
Maximum Queue (m)	26.6	31.9
Average Queue (m)	15.4	20.6
95th Queue (m)	24.4	31.1
Link Distance (m)	432.4	432.4
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)	0	
Queuing Penalty (veh)	0	

Intersection: 5: Bovaird Drive & Caseley Street

Movement	B12	B12	NB
Directions Served	T		LR
Maximum Queue (m)	185.9	147.7	8.4
Average Queue (m)	12.4	9.8	1.1
95th Queue (m)	88.9	70.7	5.6
Link Distance (m)	919.6	919.6	93.3
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 1477

Queuing and Blocking Report  
 <2021> AM Peak Hour

2/14/2012

Intersection: 22: James Potter Road/Creditview Road & Bovaird Drive

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	T	T	T	R	L	T	T	T	R	L	T
Maximum Queue (m)	54.5	73.9	89.4	97.3	14.7	28.5	155.2	150.6	122.8	128.4	7.0	25.4
Average Queue (m)	27.6	36.2	43.1	53.4	3.0	14.9	85.6	74.9	73.5	11.4	1.0	6.9
95th Queue (m)	49.1	74.8	81.6	90.5	10.5	26.5	142.6	127.5	126.2	48.3	4.7	17.6
Link Distance (m)		407.1	407.1	407.1			448.2	448.2	448.2			312.8
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)	170.0				80.0	100.0				70.0	40.0	
Storage Blk Time (%)				2			10		11			
Queuing Penalty (veh)				0			9		9			

Intersection: 22: James Potter Road/Creditview Road & Bovaird Drive

Movement	NB	NB	SB	SB	SB	SB
Directions Served	T	R	L	T	T	R
Maximum Queue (m)	18.0	10.4	27.5	38.6	39.6	115.1
Average Queue (m)	9.4	2.4	13.0	20.2	24.2	44.2
95th Queue (m)	17.6	8.0	25.1	35.3	38.9	93.5
Link Distance (m)	312.8			309.0	309.0	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (m)		55.0	80.0			100.0
Storage Blk Time (%)						1
Queuing Penalty (veh)						3

Intersection: 1: Lake Louise Drive/Worthington Avenue & Bovaird Drive

Movement	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB	SB
Directions Served	L	T	T	TR	L	T	T	T	R	L	TR	L
Maximum Queue (m)	115.8	51.9	42.8	51.9	33.9	91.6	96.0	103.6	55.0	8.6	15.7	64.7
Average Queue (m)	50.1	12.6	15.6	25.4	13.7	63.7	63.9	63.3	11.4	0.9	8.4	38.4
95th Queue (m)	96.5	34.4	38.5	47.7	27.6	87.5	92.8	98.7	43.7	4.7	17.3	63.5
Link Distance (m)		291.8	291.8	291.8		351.2	351.2	351.2			288.6	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)	230.0				90.0				90.0	50.0		50.0
Storage Blk Time (%)						1		2				9
Queuing Penalty (veh)						0		5				19

Intersection: 1: Lake Louise Drive/Worthington Avenue & Bovaird Drive

Movement	SB
Directions Served	TR
Maximum Queue (m)	61.8
Average Queue (m)	27.3
95th Queue (m)	59.5
Link Distance (m)	196.6
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (m)	
Storage Blk Time (%)	2
Queuing Penalty (veh)	3

Queuing and Blocking Report  
 <2021> PM Peak Hour without NSTC

2/4/2010

Intersection: 2: Bovaird Drive & Ashby Field Road

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	T	T	T	R	L	T	T	T	R	L	TR
Maximum Queue (m)	5.8	81.3	78.0	85.0	17.7	44.5	84.2	73.8	73.0	8.2	16.8	19.3
Average Queue (m)	2.6	47.6	47.5	52.3	8.1	28.1	41.9	38.6	43.0	3.9	9.6	11.1
95th Queue (m)	9.0	88.6	86.9	92.7	19.1	50.9	91.8	86.9	88.0	10.6	21.2	24.3
Link Distance (m)		185.2	185.2	185.2			246.1	246.1	246.1			89.7
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)	148.0				90.0	110.0				110.0	75.0	
Storage Blk Time (%)				2			1					
Queuing Penalty (veh)				3			1					

Intersection: 2: Bovaird Drive & Ashby Field Road

Movement	SB	SB	SB
Directions Served	L	L	TR
Maximum Queue (m)	30.4	36.4	20.5
Average Queue (m)	23.0	26.3	13.4
95th Queue (m)	42.6	50.2	24.9
Link Distance (m)			103.7
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)	31.0	31.0	
Storage Blk Time (%)	12	17	
Queuing Penalty (veh)	14	20	

Queuing and Blocking Report  
 <2021> PM Peak Hour without NSTC

2/4/2010

Intersection: 3: Bovaird Drive & Mississauga Road

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	T	T	T	R	L	T	T	T	R	L	T
Maximum Queue (m)	47.5	81.5	77.2	87.2	41.4	149.8	262.6	203.9	71.4	14.1	151.2	318.6
Average Queue (m)	19.0	64.3	66.3	74.2	23.5	124.2	147.6	103.9	50.1	7.9	120.8	134.0
95th Queue (m)	49.0	93.0	92.7	92.5	47.4	189.2	321.4	218.5	78.2	16.6	202.4	362.0
Link Distance (m)		456.1	456.1	456.1			688.9	688.9	688.9			395.1
Upstream Blk Time (%)												0
Queuing Penalty (veh)												0
Storage Bay Dist (m)	20.0				100.0	60.0				60.0	80.0	
Storage Blk Time (%)	6	40		0		59	4		5		54	
Queuing Penalty (veh)	22	28		0		243	15		4		130	

Intersection: 3: Bovaird Drive & Mississauga Road

Movement	NB	NB	NB	SB	SB	SB	SB	SB
Directions Served	T	T	R	L	T	T	T	R
Maximum Queue (m)	330.4	185.5	64.5	77.8	155.8	164.2	165.7	23.3
Average Queue (m)	110.6	62.4	41.1	42.4	95.5	111.3	107.8	11.7
95th Queue (m)	359.7	227.2	71.0	86.3	188.5	235.7	199.6	24.4
Link Distance (m)	395.1	395.1			346.8	346.8	346.8	
Upstream Blk Time (%)	0	0			0	0	0	
Queuing Penalty (veh)	0	0			0	0	0	
Storage Bay Dist (m)			150.0	18.0				60.0
Storage Blk Time (%)				55	66		38	
Queuing Penalty (veh)				197	92		43	

Intersection: 4: Bovaird Drive & Heritage Road

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	SB
Directions Served	L	T	T	R	L	T	T	R	L	T	TR	L
Maximum Queue (m)	19.0	155.0	236.3	6.4	7.6	49.4	58.0	4.9	25.4	16.2	36.2	23.3
Average Queue (m)	9.5	69.5	94.2	1.9	3.1	23.1	32.6	1.2	13.7	11.5	23.5	13.0
95th Queue (m)	20.7	206.8	277.2	7.6	8.9	49.5	63.1	6.0	26.7	23.5	39.9	27.4
Link Distance (m)		919.6	919.6			432.6	432.6			517.6	517.6	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)	50.0			30.0	55.0			30.0	30.0			30.0
Storage Blk Time (%)		6	19			0	7		1	0		2
Queuing Penalty (veh)		4	5			0	1		1	0		1

Intersection: 4: Bovaird Drive & Heritage Road

Movement	SB	SB
Directions Served	T	TR
Maximum Queue (m)	17.5	32.2
Average Queue (m)	10.7	20.2
95th Queue (m)	22.8	37.6
Link Distance (m)	432.4	432.4
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)	0	
Queuing Penalty (veh)	0	

Intersection: 5: Bovaird Drive & Caseley Street

Movement
Directions Served
Maximum Queue (m)
Average Queue (m)
95th Queue (m)
Link Distance (m)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (m)
Storage Blk Time (%)
Queuing Penalty (veh)

Network Summary

Network wide Queuing Penalty: 957

Intersection: 14: James Potter Road/Creditview Road & Bovaird Drive

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	T	T	T	R	L	T	T	T	R	L	T
Maximum Queue (m)	72.8	101.2	103.9	105.1	8.1	20.8	165.2	169.5	104.0	14.9	21.2	45.5
Average Queue (m)	36.2	47.7	51.4	60.0	0.5	4.5	78.6	68.8	57.5	6.1	9.5	23.6
95th Queue (m)	61.7	88.3	90.3	94.5	3.8	12.8	147.1	140.6	100.1	15.0	18.4	39.7
Link Distance (m)		424.5	424.5	424.5			435.3	435.3	435.3			311.0
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)	170.0				80.0	100.0				70.0	40.0	
Storage Blk Time (%)				2			19		4			1
Queuing Penalty (veh)				0			5		4			0

Intersection: 14: James Potter Road/Creditview Road & Bovaird Drive

Movement	NB	NB	SB	SB	SB	SB
Directions Served	T	R	L	T	T	R
Maximum Queue (m)	52.0	31.4	51.6	12.5	31.8	110.3
Average Queue (m)	29.1	10.2	22.1	6.6	10.9	23.6
95th Queue (m)	43.2	21.5	43.3	13.1	22.7	63.8
Link Distance (m)	311.0			250.2	250.2	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (m)		55.0	80.0			100.0
Storage Blk Time (%)	0					3
Queuing Penalty (veh)	0					3





2031 Queues



Intersection: 1: Lake Louise Drive/Worthington Avenue & Bovaird Drive

Movement	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB	SB
Directions Served	L	T	T	TR	L	T	T	T	R	L	TR	L
Maximum Queue (m)	41.6	107.8	109.5	107.4	7.9	133.3	137.8	147.8	30.7	28.2	34.0	72.0
Average Queue (m)	24.8	50.7	58.6	64.4	3.9	62.6	68.0	72.6	4.1	11.0	14.0	57.9
95th Queue (m)	45.0	106.0	112.6	117.4	10.0	123.2	125.2	133.2	21.2	24.4	29.4	91.2
Link Distance (m)		291.8	291.8	291.8		351.2	351.2	351.2			288.6	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)	230.0				90.0				90.0	50.0		50.0
Storage Blk Time (%)						8		8				23
Queuing Penalty (veh)						1		15				126

Intersection: 1: Lake Louise Drive/Worthington Avenue & Bovaird Drive

Movement	SB
Directions Served	TR
Maximum Queue (m)	215.8
Average Queue (m)	207.0
95th Queue (m)	214.0
Link Distance (m)	196.6
Upstream Blk Time (%)	47
Queuing Penalty (veh)	0
Storage Bay Dist (m)	
Storage Blk Time (%)	45
Queuing Penalty (veh)	114

Intersection: 2: Bovaird Drive & Ashby Field Road

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	T	T	T	R	L	T	T	T	R	L	TR
Maximum Queue (m)	26.4	127.6	126.8	128.4	9.0	38.4	141.9	164.5	172.1	15.6	80.7	83.1
Average Queue (m)	13.8	60.6	61.5	69.7	4.7	12.7	96.6	97.0	102.6	9.6	46.5	35.5
95th Queue (m)	23.9	117.6	119.5	122.5	11.1	27.5	153.0	152.2	156.0	13.4	77.3	71.1
Link Distance (m)		185.2	185.2	185.2			246.1	246.1	246.1			89.7
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)	148.0				90.0	110.0				110.0	75.0	
Storage Blk Time (%)				6			4		5		1	2
Queuing Penalty (veh)				3			4		11		1	5

Intersection: 2: Bovaird Drive & Ashby Field Road

Movement	SB	SB	SB
Directions Served	L	L	TR
Maximum Queue (m)	14.0	12.6	11.6
Average Queue (m)	5.8	7.0	2.1
95th Queue (m)	12.2	14.1	8.7
Link Distance (m)			103.7
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)	70.0	70.0	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Queuing and Blocking Report  
 <2031 with NSTC> AM Peak Hour

4/27/2011

Intersection: 3: Bovaird Drive & Mississauga Road

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	WB	NB	
Directions Served	L	T	T	T	R	L	L	T	T	T		R	L
Maximum Queue (m)	109.6	231.6	231.6	180.1	61.0	140.1	141.1	163.9	173.7	173.7		33.1	107.2
Average Queue (m)	22.1	179.2	158.0	149.7	33.8	95.0	98.5	79.8	88.8	79.1		9.4	84.4
95th Queue (m)	63.8	227.0	203.1	175.4	60.5	147.3	152.2	156.0	163.7	155.3		23.9	113.4
Link Distance (m)		454.1	454.1	454.1				410.2	410.2	410.2			
Upstream Blk Time (%)													
Queuing Penalty (veh)													
Storage Bay Dist (m)	50.0				140.0	150.0	150.0					25.0	190.0
Storage Blk Time (%)		53		11				0		20		1	
Queuing Penalty (veh)		42		37				1		19		4	

Intersection: 3: Bovaird Drive & Mississauga Road

Movement	NB	NB	NB	NB	NB	SB	SB	SB	SB	SB
Directions Served	L	T	T	T	R	L	T	T	T	R
Maximum Queue (m)	122.8	397.1	397.8	396.8	74.3	51.6	63.9	349.2	348.2	42.4
Average Queue (m)	84.7	105.0	131.6	73.0	29.9	27.7	46.4	72.0	74.0	13.0
95th Queue (m)	115.4	346.5	396.4	217.1	55.1	46.9	66.5	196.0	197.1	30.2
Link Distance (m)		393.2	393.2	393.2			344.6	344.6	344.6	
Upstream Blk Time (%)		0	0	0				0	0	
Queuing Penalty (veh)		0	0	0				0	0	
Storage Bay Dist (m)	190.0				100.0	50.0				30.0
Storage Blk Time (%)						0	6		43	2
Queuing Penalty (veh)						1	7		47	4

Intersection: 4: Bovaird Drive & Heritage Road

Movement	EB	EB	EB	EB	WB	WB	WB	WB	B15	NB	NB	NB
Directions Served	L	T	T	R	L	T	T	R	T	L	T	TR
Maximum Queue (m)	14.1	36.6	45.8	16.7	15.3	33.7	47.1	8.9	144.2	14.2	7.2	19.5
Average Queue (m)	4.3	17.4	26.1	3.7	7.7	18.5	28.1	1.2	9.6	3.4	1.6	6.0
95th Queue (m)	10.9	35.7	45.1	11.9	17.1	33.5	47.9	6.1	69.0	10.9	6.4	16.6
Link Distance (m)		919.6	919.6			432.6	432.6		454.1		517.6	517.6
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)	50.0			30.0	55.0			15.0		30.0		
Storage Blk Time (%)			3				16					
Queuing Penalty (veh)			1				3					

Intersection: 4: Bovaird Drive & Heritage Road

Movement	SB	SB	SB
Directions Served	L	T	TR
Maximum Queue (m)	7.7	19.4	25.4
Average Queue (m)	2.0	6.8	13.7
95th Queue (m)	7.6	16.7	23.0
Link Distance (m)		432.4	432.4
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)	30.0		
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: Bovaird Drive & Caseley Street

Movement	NB
Directions Served	LR
Maximum Queue (m)	7.4
Average Queue (m)	0.5
95th Queue (m)	3.5
Link Distance (m)	93.3
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (m)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 6: James Potter Road/Creditview Road & Bovaird Drive

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	B14	B14
Directions Served	L	T	T	T	R	L	T	T	T	R	T	T
Maximum Queue (m)	159.4	108.4	122.5	128.9	109.8	164.9	270.3	262.2	262.5	167.9	23.4	44.6
Average Queue (m)	107.9	90.5	97.6	105.6	26.4	72.4	138.2	141.8	154.9	46.6	1.6	3.0
95th Queue (m)	176.9	105.1	117.6	126.0	94.5	157.3	228.6	236.4	257.5	146.3	11.2	21.3
Link Distance (m)		410.2	410.2	410.2			248.2	248.2	248.2		185.2	185.2
Upstream Blk Time (%)							1	1	2			
Queuing Penalty (veh)							6	9	16			
Storage Bay Dist (m)	170.0				50.0	105.0				110.0		
Storage Blk Time (%)				31			15		20			
Queuing Penalty (veh)				24			41		42			

Intersection: 6: James Potter Road/Creditview Road & Bovaird Drive

Movement	B14	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	T	L	T	T	R	L	T	T	R
Maximum Queue (m)	46.5	7.4	70.5	63.5	12.9	77.9	94.2	112.9	164.8
Average Queue (m)	3.5	2.1	34.2	34.8	5.9	41.2	63.5	71.9	92.7
95th Queue (m)	22.7	6.8	58.8	53.8	11.3	64.8	89.0	105.1	151.9
Link Distance (m)	185.2		207.2	207.2			218.0	218.0	
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (m)		40.0			80.0	80.0			115.0
Storage Blk Time (%)			10			0	2	0	3
Queuing Penalty (veh)			1			0	3	1	11

Zone Summary

Zone wide Queuing Penalty: 410

Queues  
6: James Potter Road/Creditview Road & Bovaird Drive

<2031 with NSTC> AM Peak Hour

3/22/2012



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	415	1314	77	272	1925	206	7	379	79	155	724	519
v/c Ratio	0.98	0.55	0.10	0.77	0.98	0.29	0.08	0.66	0.24	0.56	0.75	0.75
Control Delay	77.0	27.1	9.9	35.0	56.2	6.8	46.3	56.1	11.0	41.9	47.8	20.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	77.0	27.1	9.9	35.0	56.2	6.8	46.3	56.1	11.0	41.9	47.8	20.4
Queue Length 50th (m)	88.9	87.1	3.3	30.1	175.4	3.7	1.5	48.4	0.0	30.2	88.9	39.6
Queue Length 95th (m)	#174.6	121.8	14.1	67.9	#243.4	21.3	5.9	64.4	13.3	47.7	109.7	81.8
Internal Link Dist (m)		418.6			243.9			202.4			212.6	
Turn Bay Length (m)	170.0		50.0	105.0		110.0	40.0		80.0	80.0		115.0
Base Capacity (vph)	425	2383	770	410	1959	721	136	849	440	284	1255	787
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.98	0.55	0.10	0.66	0.98	0.29	0.05	0.45	0.18	0.55	0.58	0.66

Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.  
Queue shown is maximum after two cycles.



Intersection: 1: Lake Lousie Drive/Worthington Avenue & Bovaird Drive

Movement	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	SB	SB
Directions Served	L	T	T	TR	L	T	T	T	R	TR	L	TR
Maximum Queue (m)	136.2	59.7	64.6	77.2	40.8	98.1	103.4	110.9	49.3	21.5	71.8	87.2
Average Queue (m)	78.2	20.5	26.8	32.9	15.8	73.8	76.3	78.9	27.1	5.0	41.1	25.9
95th Queue (m)	131.6	47.3	52.3	62.3	35.5	101.9	99.6	101.5	55.6	15.1	72.6	71.3
Link Distance (m)		291.8	291.8	291.8		351.2	351.2	351.2		288.6		196.6
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)	230.0				90.0				90.0		50.0	
Storage Blk Time (%)						2		4			4	1
Queuing Penalty (veh)						2		9			9	3

Intersection: 22: James Potter Road/Creditview Road & Bovaird Drive

Movement	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB	NB
Directions Served	L	T	T	T	L	T	T	T	R	L	T	T
Maximum Queue (m)	166.6	45.4	57.0	57.1	38.1	241.4	236.4	239.5	129.0	100.0	217.0	217.0
Average Queue (m)	100.9	31.1	35.9	41.7	18.2	159.3	167.7	171.9	26.2	34.9	151.3	155.9
95th Queue (m)	148.4	46.8	52.1	55.3	34.3	243.3	248.8	257.7	74.6	80.8	214.7	218.4
Link Distance (m)		408.6	408.6	408.6		249.4	249.4	249.4			212.4	212.4
Upstream Blk Time (%)											1	3
Queuing Penalty (veh)											0	0
Storage Bay Dist (m)	170.0				105.0				110.0	40.0		
Storage Blk Time (%)	0			5		40		42		11	75	64
Queuing Penalty (veh)	0			0		32		66		39	57	175

Intersection: 22: James Potter Road/Creditview Road & Bovaird Drive

Movement	NB	SB	SB	SB	SB
Directions Served	R	L	T	T	R
Maximum Queue (m)	140.0	84.3	58.8	63.8	83.0
Average Queue (m)	101.9	55.5	39.6	43.9	43.3
95th Queue (m)	170.6	84.3	60.1	64.5	79.7
Link Distance (m)			265.3	265.3	
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (m)	80.0	80.0			115.0
Storage Blk Time (%)	6	1			
Queuing Penalty (veh)	21	1			

Zone Summary

Zone wide Queuing Penalty: 415

## Queues

&lt;2031&gt; PM Peak Hour with NSTC

## 22: James Potter Road/Creditview Road &amp; Bovaird Drive

3/23/2012



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	519	1925	7	79	1314	155	77	724	272	206	379	415
v/c Ratio	0.97	0.75	0.01	0.52	0.99	0.29	0.38	0.99	0.64	0.96	0.34	0.53
Control Delay	72.7	29.7	12.7	36.1	74.5	7.3	53.8	84.5	33.9	88.0	37.3	5.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	72.7	29.7	12.7	36.1	74.5	7.3	53.8	84.5	33.9	88.0	37.3	5.8
Queue Length 50th (m)	126.8	152.1	0.4	8.5	133.7	0.0	18.5	106.1	37.1	42.2	42.1	0.0
Queue Length 95th (m)	#198.6	170.8	3.0	20.6	#166.8	16.9	34.6	#146.7	68.2	#90.1	56.0	23.9
Internal Link Dist (m)		417.1			245.5			207.7			259.9	
Turn Bay Length (m)	170.0		50.0	105.0		110.0	40.0		80.0	80.0		115.0
Base Capacity (vph)	534	2565	801	159	1322	526	204	735	428	215	1123	784
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.97	0.75	0.01	0.50	0.99	0.29	0.38	0.99	0.64	0.96	0.34	0.53

## Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Queuing and Blocking Report  
 <2031> PM Peak with NSTC (Single WB Left)

2/4/2010

Intersection: 2: Bovaird Drive & Ashby Field Road

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	T	T	T	R	L	T	T	T	R	L	TR
Maximum Queue (m)	7.3	120.5	124.7	141.6	98.4	29.6	71.0	75.0	77.2	10.2	25.6	24.6
Average Queue (m)	2.9	79.3	82.0	95.9	27.5	21.4	40.4	41.1	45.4	4.8	13.3	14.9
95th Queue (m)	9.3	138.2	144.5	162.0	102.9	36.3	82.2	85.6	90.0	12.3	30.0	27.2
Link Distance (m)		185.2	185.2	185.2			246.1	246.1	246.1			89.7
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)	148.0				90.0	110.0				110.0	75.0	
Storage Blk Time (%)		0		8								
Queuing Penalty (veh)		0		15								

Intersection: 2: Bovaird Drive & Ashby Field Road

Movement	SB	SB	SB
Directions Served	L	L	TR
Maximum Queue (m)	36.3	41.7	33.2
Average Queue (m)	28.2	31.6	17.5
95th Queue (m)	41.1	47.7	37.7
Link Distance (m)			103.7
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)	31.0	31.0	
Storage Blk Time (%)	8	19	2
Queuing Penalty (veh)	11	25	5

Queuing and Blocking Report  
 <2031> PM Peak with NSTC (Single WB Left)

2/4/2010

Intersection: 3: Bovaird Drive & Mississauga Road

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	T	T	T	R	L	T	T	T	R	L	L
Maximum Queue (m)	44.9	207.8	167.4	169.6	104.7	114.5	231.2	225.3	160.8	19.8	76.8	84.9
Average Queue (m)	24.3	144.7	132.6	135.0	52.1	92.3	105.3	111.2	90.4	9.7	58.5	62.4
95th Queue (m)	48.6	241.5	220.2	207.5	137.4	148.6	236.7	236.3	186.5	23.1	88.7	93.6
Link Distance (m)		454.3	454.3	454.3			687.2	687.2	687.2			
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)	20.0				100.0	60.0				60.0	80.0	80.0
Storage Blk Time (%)	13	51		22		46	13		13		3	3
Queuing Penalty (veh)	80	56		82		261	41		14		7	7

Intersection: 3: Bovaird Drive & Mississauga Road

Movement	NB	NB	NB	NB	SB	SB	SB	SB	SB
Directions Served	T	T	T	R	L	T	T	T	R
Maximum Queue (m)	42.8	260.8	262.8	96.3	28.6	53.8	61.8	65.8	22.5
Average Queue (m)	27.9	90.0	96.2	69.8	18.7	44.2	50.5	54.9	13.5
95th Queue (m)	46.1	313.3	314.9	100.1	33.1	65.3	71.2	72.6	26.0
Link Distance (m)	394.9	394.9	394.9			346.7	346.7	346.7	
Upstream Blk Time (%)		0	0						
Queuing Penalty (veh)		0	0						
Storage Bay Dist (m)				150.0	18.0				60.0
Storage Blk Time (%)					16	44		4	
Queuing Penalty (veh)					41	43		3	

Queuing and Blocking Report  
 <2031> PM Peak with NSTC (Single WB Left)

2/4/2010

Intersection: 4: Bovaird Drive & Heritage Road

Movement	EB	EB	EB	EB	WB	WB	WB	WB	B15	NB	NB	NB
Directions Served	L	T	T	R	L	T	T	R	T	L	T	TR
Maximum Queue (m)	13.7	211.4	140.1	5.4	6.1	27.2	31.2	1.7	35.7	21.6	19.5	25.7
Average Queue (m)	6.5	59.8	54.6	1.8	2.3	15.8	21.6	0.3	7.1	12.2	10.7	16.9
95th Queue (m)	15.2	259.2	195.2	7.6	7.0	30.7	34.2	3.1	64.8	24.1	21.0	28.7
Link Distance (m)		919.6	919.6			432.6	432.6		454.3		517.6	517.6
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)	50.0			30.0	55.0			30.0		30.0		
Storage Blk Time (%)		0	8					1		0	0	
Queuing Penalty (veh)		0	1					0		0	0	

Intersection: 4: Bovaird Drive & Heritage Road

Movement	SB	SB	SB
Directions Served	L	T	TR
Maximum Queue (m)	10.1	7.3	15.6
Average Queue (m)	3.8	2.9	8.0
95th Queue (m)	11.0	8.8	17.8
Link Distance (m)		432.4	432.4
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)	30.0		
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: Bovaird Drive & Caseley Street

Movement	NB
Directions Served	LR
Maximum Queue (m)	1.6
Average Queue (m)	0.3
95th Queue (m)	2.9
Link Distance (m)	93.3
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (m)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

Network wide Queuing Penalty: 843

Queuing and Blocking Report  
 <2031> PM Peak with NSTC (WB Double Left)

2/4/2010

Intersection: 3: Bovaird Drive & Mississauga Road

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	WB	NB	
Directions Served	L	T	T	T	R	L	L	T	T	T		R	L
Maximum Queue (m)	43.0	211.2	163.0	137.5	52.1	55.9	59.3	170.1	175.2	132.0	14.4	49.1	
Average Queue (m)	22.9	129.6	118.6	108.6	31.5	43.5	44.9	92.5	101.0	84.3	8.5	37.4	
95th Queue (m)	46.1	232.2	197.6	145.8	56.3	61.6	65.1	196.4	202.8	143.6	16.9	55.4	
Link Distance (m)		454.1	454.1	454.1				687.0	687.0	687.0			
Upstream Blk Time (%)													
Queuing Penalty (veh)													
Storage Bay Dist (m)	20.0				100.0	60.0	60.0				60.0	80.0	
Storage Blk Time (%)	8	45		11		2	3	13		16			
Queuing Penalty (veh)	47	49		41		10	15	39		17			

Intersection: 3: Bovaird Drive & Mississauga Road

Movement	NB	NB	NB	NB	NB	SB	SB	SB	SB	SB
Directions Served	L	T	T	T	R	L	T	T	T	R
Maximum Queue (m)	57.1	325.5	328.1	49.5	87.3	33.1	176.7	130.3	78.7	19.3
Average Queue (m)	41.1	101.3	102.5	38.4	67.2	23.9	75.4	69.8	61.6	10.6
95th Queue (m)	59.6	345.7	346.1	54.0	95.3	42.9	210.7	166.5	84.4	23.0
Link Distance (m)		393.2	393.2	393.2			345.0	345.0	345.0	
Upstream Blk Time (%)		0	0				0	0		
Queuing Penalty (veh)		0	0				0	0		
Storage Bay Dist (m)	80.0				150.0	18.0				60.0
Storage Blk Time (%)						30	49		7	
Queuing Penalty (veh)						75	48		5	

Queuing and Blocking Report  
 <2031 without NSTC> AM Peak Hour

3/22/2012

Intersection: 1: Lake Louise Drive/Worthington Avenue & Bovaird Drive

Movement	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB	SB
Directions Served	L	T	T	TR	L	T	T	T	R	L	TR	L
Maximum Queue (m)	40.5	72.4	72.4	77.7	15.5	77.9	84.2	85.0	35.4	22.2	40.9	72.0
Average Queue (m)	21.7	29.6	36.1	46.4	2.0	47.2	55.0	55.0	4.5	9.0	7.7	65.6
95th Queue (m)	40.8	58.2	64.7	76.3	9.3	75.6	81.8	85.7	23.2	21.5	26.2	77.0
Link Distance (m)		291.8	291.8	291.8		351.2	351.2	351.2			288.6	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)	230.0				90.0				90.0	50.0		50.0
Storage Blk Time (%)								0				34
Queuing Penalty (veh)								0				167

Intersection: 1: Lake Louise Drive/Worthington Avenue & Bovaird Drive

Movement	SB
Directions Served	TR
Maximum Queue (m)	201.4
Average Queue (m)	124.7
95th Queue (m)	239.1
Link Distance (m)	196.6
Upstream Blk Time (%)	5
Queuing Penalty (veh)	0
Storage Bay Dist (m)	
Storage Blk Time (%)	19
Queuing Penalty (veh)	51

Queuing and Blocking Report  
 <2031 without NSTC> AM Peak Hour

4/27/2011

Intersection: 2: Bovaird Drive & Ashby Field Road

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	T	T	T	R	L	T	T	T	R	L	TR
Maximum Queue (m)	27.7	83.2	83.8	73.9	8.2	127.6	197.6	205.8	215.7	149.0	47.5	70.8
Average Queue (m)	13.8	36.0	33.9	39.1	4.0	20.6	152.0	153.5	155.8	103.1	29.3	37.7
95th Queue (m)	27.9	70.1	62.5	65.9	10.2	69.2	196.4	203.7	214.0	189.7	43.6	70.1
Link Distance (m)		185.2	185.2	185.2			246.1	246.1	246.1			89.6
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)	148.0				90.0	110.0				110.0	75.0	
Storage Blk Time (%)							34		42			0
Queuing Penalty (veh)							35		92			0

Intersection: 2: Bovaird Drive & Ashby Field Road

Movement	SB	SB	SB
Directions Served	L	L	TR
Maximum Queue (m)	18.1	16.5	8.5
Average Queue (m)	6.0	3.5	1.2
95th Queue (m)	15.0	11.1	4.7
Link Distance (m)			103.5
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)	70.0	70.0	
Storage Blk Time (%)			
Queuing Penalty (veh)			



Queuing and Blocking Report  
 <2031 without NSTC> AM Peak Hour

4/27/2011

Intersection: 3: Bovaird Drive & Mississauga Road

Movement	EB	EB	EB	EB	EB	B15	B15	B15	WB	WB	WB	WB
Directions Served	L	T	T	T	R	T	T	T	L	L	T	T
Maximum Queue (m)	109.7	468.2	468.6	472.8	200.0	69.4	76.3	102.2	179.8	193.2	79.1	84.5
Average Queue (m)	41.1	342.3	347.1	363.7	129.8	4.6	8.8	12.3	121.4	124.2	60.2	62.9
95th Queue (m)	101.0	542.6	544.1	559.7	254.1	33.2	43.3	56.4	173.4	176.7	82.9	87.6
Link Distance (m)		454.1	454.1	454.1		469.1	469.1	469.1			687.0	687.0
Upstream Blk Time (%)		4	3	13								
Queuing Penalty (veh)		19	16	64								
Storage Bay Dist (m)	50.0				140.0				150.0	150.0		
Storage Blk Time (%)	3	66		77					8	7		
Queuing Penalty (veh)	15	91		349					40	33		

Intersection: 3: Bovaird Drive & Mississauga Road

Movement	WB	WB	NB	NB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	T	R	L	L	T	T	T	R	L	T	T	T
Maximum Queue (m)	96.4	84.9	75.1	76.0	397.8	397.8	397.8	159.9	46.0	349.6	80.9	91.9
Average Queue (m)	71.6	28.8	54.4	55.2	223.9	182.3	150.2	68.8	25.0	82.5	67.8	71.0
95th Queue (m)	101.0	76.2	86.7	85.3	461.1	400.8	320.7	131.3	41.2	202.0	86.1	89.3
Link Distance (m)	687.0				393.2	393.2	393.2			345.0	345.0	345.0
Upstream Blk Time (%)					1	0	0			0		
Queuing Penalty (veh)					0	0	0			0		
Storage Bay Dist (m)		25.0	190.0	190.0				100.0	50.0			
Storage Blk Time (%)	70	1			0		19		0	22		54
Queuing Penalty (veh)	120	7			0		95		0	23		46

Intersection: 3: Bovaird Drive & Mississauga Road

Movement	SB
Directions Served	R
Maximum Queue (m)	86.7
Average Queue (m)	19.5
95th Queue (m)	52.9
Link Distance (m)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (m)	30.0
Storage Blk Time (%)	1
Queuing Penalty (veh)	2

Intersection: 4: Bovaird Drive & Heritage Road

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	SB
Directions Served	L	T	T	R	L	T	T	R	L	T	TR	L
Maximum Queue (m)	26.4	464.4	464.4	15.4	32.6	121.8	117.7	55.0	14.3	20.3	25.6	14.3
Average Queue (m)	12.9	126.9	107.0	5.6	18.4	63.0	68.0	11.7	4.4	9.2	14.7	3.4
95th Queue (m)	22.0	405.7	338.7	13.6	32.1	111.5	110.9	39.7	12.6	18.8	24.1	10.7
Link Distance (m)		919.6	919.6			432.6	432.6			517.6	517.6	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)	50.0			30.0	55.0			15.0	30.0			30.0
Storage Blk Time (%)		2	14			6	32	0				
Queuing Penalty (veh)		2	12			7	26	0				

Intersection: 4: Bovaird Drive & Heritage Road

Movement	SB	SB
Directions Served	T	TR
Maximum Queue (m)	32.3	45.4
Average Queue (m)	15.7	27.8
95th Queue (m)	26.9	43.2
Link Distance (m)	432.4	432.4
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)	0	
Queuing Penalty (veh)	0	

Intersection: 5: Bovaird Drive & Caseley Street

Movement	B12	B12	NB
Directions Served	T		LR
Maximum Queue (m)	372.7	347.0	8.4
Average Queue (m)	100.2	84.7	2.5
95th Queue (m)	345.8	318.7	8.7
Link Distance (m)	919.6	919.6	93.3
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 1510

Queuing and Blocking Report  
 <2031 without NSTC> AM Peak Hour

3/22/2012

Intersection: 22: James Potter Road/Creditview Road & Bovaird Drive

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	T	T	T	R	L	T	T	T	R	L	T
Maximum Queue (m)	229.8	416.5	380.0	382.8	26.5	164.9	449.5	418.2	421.9	170.0	7.4	153.3
Average Queue (m)	185.2	242.9	172.1	134.9	12.1	121.2	284.4	244.5	245.2	122.7	0.5	87.6
95th Queue (m)	285.4	482.4	376.6	319.1	24.4	213.3	443.0	368.3	379.3	232.4	3.6	156.6
Link Distance (m)		411.8	411.8	411.8			445.2	445.2	445.2			347.7
Upstream Blk Time (%)		5					5					
Queuing Penalty (veh)		36					36					
Storage Bay Dist (m)	170.0				50.0	105.0				110.0	40.0	
Storage Blk Time (%)	46	4		24		0	57		53			52
Queuing Penalty (veh)	221	25		25		1	210		190			3

Intersection: 22: James Potter Road/Creditview Road & Bovaird Drive

Movement	NB	NB	SB	SB	SB	SB
Directions Served	T	R	L	T	T	R
Maximum Queue (m)	158.4	139.9	139.9	307.0	312.8	175.0
Average Queue (m)	91.0	20.4	77.0	262.3	265.8	121.6
95th Queue (m)	161.1	74.6	164.8	387.6	389.1	230.8
Link Distance (m)	347.7			302.4	302.4	
Upstream Blk Time (%)				18	16	
Queuing Penalty (veh)				0	0	
Storage Bay Dist (m)		80.0	80.0			115.0
Storage Blk Time (%)	31			64	60	
Queuing Penalty (veh)	26			108	270	

Zone Summary

Zone wide Queuing Penalty: 1369

Queuing and Blocking Report  
 <2031> PM Peak Hour without NSTC (Single WB Left)

3/22/2012

Intersection: 1: Lake Louise Drive/Worthington Avenue & Bovaird Drive

Movement	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB	SB	
Directions Served	L	T	T	TR	L	T	T	T	R	L	TR	L	
Maximum Queue (m)	106.4	41.5	46.4	53.8	33.8	128.8	119.4	118.9	53.6	9.1	15.6	71.8	
Average Queue (m)	69.2	20.3	24.0	27.6	12.3	75.5	78.9	77.9	15.8	0.6	5.1	49.9	
95th Queue (m)	111.7	38.3	43.6	49.2	26.1	124.2	120.2	118.3	48.3	4.4	14.6	78.7	
Link Distance (m)		291.8	291.8	291.8		351.2	351.2	351.2			288.6		
Upstream Blk Time (%)													
Queuing Penalty (veh)													
Storage Bay Dist (m)	230.0				90.0				90.0		50.0		50.0
Storage Blk Time (%)						5		4					14
Queuing Penalty (veh)						4		10					33

Intersection: 1: Lake Louise Drive/Worthington Avenue & Bovaird Drive

Movement	SB
Directions Served	TR
Maximum Queue (m)	128.7
Average Queue (m)	45.4
95th Queue (m)	117.9
Link Distance (m)	196.6
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (m)	
Storage Blk Time (%)	9
Queuing Penalty (veh)	18

Queuing and Blocking Report  
 2031 PM Peak without NSTC(Single WB Left)

2/4/2010

Intersection: 3: Bovaird Drive & Mississauga Road

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	T	T	T	R	L	T	T	T	R	L	L
Maximum Queue (m)	64.7	101.4	107.4	111.9	43.8	159.8	315.1	213.0	83.4	22.8	94.8	97.2
Average Queue (m)	29.4	72.3	78.9	84.5	27.3	132.0	160.9	121.3	58.5	9.9	71.4	71.2
95th Queue (m)	63.5	118.3	125.1	130.5	49.0	194.2	353.9	238.1	93.9	26.4	118.2	118.2
Link Distance (m)		454.3	454.3	454.3			687.2	687.2	687.2			
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)	20.0				100.0	60.0				60.0	80.0	80.0
Storage Blk Time (%)	14	41		5		65	8		8		18	22
Queuing Penalty (veh)	67	35		14		324	41		8		52	64

Intersection: 3: Bovaird Drive & Mississauga Road

Movement	NB	NB	NB	NB	SB	SB	SB	SB	SB
Directions Served	T	T	T	R	L	T	T	T	R
Maximum Queue (m)	265.8	398.8	193.3	69.0	88.7	314.8	309.5	290.7	159.3
Average Queue (m)	75.4	123.1	71.2	49.9	70.8	192.5	192.8	189.7	56.1
95th Queue (m)	274.1	380.1	232.2	86.4	106.4	336.1	333.7	320.4	163.9
Link Distance (m)	394.9	394.9	394.9			346.7	346.7	346.7	
Upstream Blk Time (%)	0	0	0			0	0	0	
Queuing Penalty (veh)	0	0	0			0	0	0	
Storage Bay Dist (m)				150.0	18.0				60.0
Storage Blk Time (%)	0				79	74		65	0
Queuing Penalty (veh)	0				347	126		89	0

Queuing and Blocking Report  
 2031 PM Peak without NSTC(Single WB Left)

2/4/2010

Intersection: 2: Bovaird Drive & Ashby Field Road

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	T	T	T	R	L	T	T	T	R	L	TR
Maximum Queue (m)	8.4	112.7	120.1	123.0	42.2	43.8	78.7	75.2	74.2	11.6	17.8	21.9
Average Queue (m)	2.5	61.7	62.2	67.0	14.0	27.5	41.1	36.1	38.4	6.1	10.4	12.7
95th Queue (m)	8.7	112.7	117.3	124.7	60.3	50.0	87.6	78.4	76.2	13.7	21.0	24.4
Link Distance (m)		185.2	185.2	185.2			246.1	246.1	246.1			89.7
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)	148.0				90.0	110.0				110.0	75.0	
Storage Blk Time (%)				4			0					
Queuing Penalty (veh)				7			0					

Intersection: 2: Bovaird Drive & Ashby Field Road

Movement	SB	SB	SB
Directions Served	L	L	TR
Maximum Queue (m)	36.4	36.6	25.4
Average Queue (m)	26.4	26.5	14.6
95th Queue (m)	40.7	41.1	33.9
Link Distance (m)			103.7
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)	31.0	31.0	
Storage Blk Time (%)	5	11	2
Queuing Penalty (veh)	7	14	4

Queuing and Blocking Report  
 2031 PM Peak without NSTC(Single WB Left)

2/4/2010

Intersection: 4: Bovaird Drive & Heritage Road

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	SB
Directions Served	L	T	T	R	L	T	T	R	L	T	TR	L
Maximum Queue (m)	24.0	390.6	189.8	26.0	13.5	60.6	73.8	7.9	24.2	22.3	35.5	21.7
Average Queue (m)	12.9	172.9	112.2	6.6	5.7	33.6	46.9	1.6	16.1	15.6	27.3	15.6
95th Queue (m)	26.8	447.2	240.9	35.6	14.1	68.7	84.3	6.9	27.6	26.0	41.9	27.5
Link Distance (m)		919.6	919.6			432.6	432.6			517.6	517.6	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)	50.0			30.0	55.0			30.0	30.0			30.0
Storage Blk Time (%)		16	28			2	10		0	0		1
Queuing Penalty (veh)		14	8			1	2		0	0		1

Intersection: 4: Bovaird Drive & Heritage Road

Movement	SB	SB
Directions Served	T	TR
Maximum Queue (m)	19.6	39.5
Average Queue (m)	11.7	26.6
95th Queue (m)	23.3	43.0
Link Distance (m)	432.4	432.4
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)	0	
Queuing Penalty (veh)	0	

Intersection: 5: Bovaird Drive & Caseley Street

Movement	B12	B12
Directions Served	T	
Maximum Queue (m)	72.3	26.5
Average Queue (m)	20.4	5.3
95th Queue (m)	112.2	48.1
Link Distance (m)	919.6	919.6
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 1401

Queuing and Blocking Report  
 2031 PM Peak without NSTC(Double WB Left)

2/4/2010

Intersection: 3: Bovaird Drive & Mississauga Road

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	WB	NB	
Directions Served	L	T	T	T	R	L	L	T	T	T	T	R	L
Maximum Queue (m)	42.5	102.2	110.7	118.7	59.0	109.1	156.8	244.0	165.5	80.9	13.7	57.5	
Average Queue (m)	20.8	74.5	79.7	88.5	29.3	82.9	105.6	109.4	97.2	62.6	7.6	44.4	
95th Queue (m)	46.1	114.5	123.6	132.8	61.1	131.6	177.6	262.1	196.3	92.4	16.0	72.4	
Link Distance (m)		454.1	454.1	454.1				687.0	687.0	687.0			
Upstream Blk Time (%)													
Queuing Penalty (veh)													
Storage Bay Dist (m)	20.0				100.0	60.0	60.0				60.0	80.0	
Storage Blk Time (%)	10	42		5		51	61	6		8		0	
Queuing Penalty (veh)	50	36		14		254	303	30		9		0	

Intersection: 3: Bovaird Drive & Mississauga Road

Movement	NB	NB	NB	NB	NB	SB	SB	SB	SB	SB
Directions Served	L	T	T	T	R	L	T	T	T	R
Maximum Queue (m)	54.7	262.9	329.2	329.7	80.5	80.0	291.5	269.1	230.5	71.4
Average Queue (m)	47.4	88.0	118.8	95.0	61.9	66.4	173.1	166.8	157.4	32.0
95th Queue (m)	74.9	313.1	379.8	314.3	92.9	102.0	294.0	272.8	253.9	99.3
Link Distance (m)		393.2	393.2	393.2			345.0	345.0	345.0	
Upstream Blk Time (%)		0	0	0			0	0	1	
Queuing Penalty (veh)		0	0	0			0	0	0	
Storage Bay Dist (m)	80.0				150.0	18.0				60.0
Storage Blk Time (%)	1					87	75		63	0
Queuing Penalty (veh)	2					382	127		87	2



Queuing and Blocking Report  
 <2031> PM Peak Hour without NSTC (Single WB Left)

3/22/2012

Intersection: 22: James Potter Road/Creditview Road & Bovaird Drive

Movement	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB	NB
Directions Served	L	T	T	T	L	T	T	T	R	L	T	T
Maximum Queue (m)	229.6	383.2	335.0	351.0	164.6	454.2	457.5	456.4	170.0	70.4	134.7	141.0
Average Queue (m)	181.1	170.5	130.0	96.6	40.4	235.3	222.0	229.0	36.2	31.2	101.7	102.4
95th Queue (m)	280.5	360.0	293.8	220.6	143.2	474.8	452.0	452.1	124.4	56.4	138.5	132.2
Link Distance (m)		405.5	405.5	405.5		447.8	447.8	447.8			400.8	400.8
Upstream Blk Time (%)						5	4	5				
Queuing Penalty (veh)						28	21	26				
Storage Bay Dist (m)	170.0				105.0				110.0	40.0		
Storage Blk Time (%)	54	2		17		50		44		12	52	23
Queuing Penalty (veh)	294	8		1		43		74		60	54	83

Intersection: 22: James Potter Road/Creditview Road & Bovaird Drive

Movement	NB	SB	SB	SB	SB
Directions Served	R	L	T	T	R
Maximum Queue (m)	139.9	139.7	361.5	367.3	174.8
Average Queue (m)	56.1	122.7	200.5	188.0	85.7
95th Queue (m)	113.1	174.5	398.2	393.9	153.1
Link Distance (m)			356.9	356.9	
Upstream Blk Time (%)			3	1	
Queuing Penalty (veh)			0	0	
Storage Bay Dist (m)	80.0	80.0			115.0
Storage Blk Time (%)	3	69			7
Queuing Penalty (veh)	13	229			24

Zone Summary

Zone wide Queuing Penalty: 1024





## Appendix C

### Level of Service Definitions



# Levels of Service – Highway Capacity Manual

## Signalized Intersections

Level of Service	Stopped Delay per Vehicle (sec)	Expected delay to Minor Street traffic from the Major Street
A	< 10	Most vehicles arrive during the green phase and do not stop; traffic progression is extremely favourable.
B	10.1 - 20.0	More vehicles stop than for LOS A; traffic progression is good.
C	20.1 - 35.0	Individual cycle failures may appear and the number of vehicles stopping is significant; traffic progression is fair.
D	35.1 - 55.0	Individual cycle failures are noticeable and many vehicles stop; traffic progression is unfavourable.
E	55.1 - 80.0	Individual cycle failures are frequent; traffic progression is poor; acceptable delay is at its limit.
F	> 80	Many individual cycle failures; arrival flow rate exceeds capacity; delay is unacceptable to most drivers.

Source: Highway Capacity Manual, HCM2000

HIGHWAY LOS Signalized 08-04-07.doc





## Appendix D

### Region of Peel Queuing Methodology





# Levels of Service – Highway Capacity Manual

## Unsignalized Intersection

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Level of Service	Average Control Delays (s/veh)	Expected delay to Minor Street traffic from the Major Street
A	0 - 10	Little or no delay.
B	> 10 – 15	Short traffic delay.
C	> 15 – 25	Average traffic delay.
D	> 25 – 35	Long traffic delay.
E	> 35 – 50	Very long traffic delay.
F	> 50	Extreme delay encountered with queuing, which may cause severe congestion affecting other traffic movements in the intersection.

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source: Highway Capacity Manual, HCM 2000

UNSIGNALIZED LOS 08-04-07.doc



# Level Of Service

## Vehicle Arrival Rates And Phase Times

A 95%		B 90%		C 75%		D 60%		E 50%		X Vehicles	Phase Time Sec.
0.0	0.3	0.2	0.5	0.3	0.9	0.5	1.3	0.7	1.6	1	3.8
0.4	0.8	0.6	1.1	1.0	1.7	1.4	2.2	1.7	2.6	2	7.0
0.9	1.3	1.2	1.7	1.8	2.5	2.3	3.1	2.7	3.6	3	9.7
1.4	1.9	1.8	2.4	2.6	3.3	3.2	4.0	3.7	4.6	4	12.0
2.0	2.8	2.5	3.1	3.4	4.2	4.1	5.0	4.7	5.6	5	14.2
2.9	3.2	3.2	3.8	4.3	5.0	5.1	6.0	5.7	6.6	6	16.4
3.3	3.9	3.9	4.6	5.1	5.9	6.1	6.9	6.7	7.6	7	18.6
4.0	4.6	4.7	5.4	6.0	6.8	7.0	7.9	7.7	8.6	8	20.8
4.7	5.4	5.5	6.2	6.9	7.7	8.0	8.8	8.7	9.6	9	23.0
5.5	6.1	6.3	7.0	7.8	8.6	8.9	9.8	9.7	10.6	10	25.1
6.2	6.9	7.1	7.8	8.7	9.5	9.9	10.8	10.7	11.6	11	27.2
7.0	7.7	7.9	8.6	9.6	10.4	10.9	11.7	11.7	12.6	12	29.3
7.8	8.4	8.7	9.4	10.5	11.3	11.8	12.7	12.7	13.6	13	31.4
8.5	9.2	9.5	10.3	11.4	12.2	12.8	13.7	13.7	14.6	14	33.5
9.3	10.0	10.4	11.1	12.3	13.1	13.8	14.6	14.7	15.6	15	35.6
10.1	10.8	11.2	11.9	13.2	14.0	14.7	15.6	15.7	16.6	16	37.7
10.9	11.6	12.0	12.8	14.1	14.9	15.7	16.6	16.7	17.6	17	39.8
11.7	12.4	12.9	13.6	15.0	15.9	16.7	17.6	17.7	18.6	18	41.9
12.5	13.2	13.7	14.5	16.0	16.9	17.7	18.5	18.7	19.6	19	44.0
13.3	14.0	14.6	15.3	17.0	17.8	18.6	19.5	19.7	20.6	20	46.0
14.1	14.9	15.4	16.2	17.9	18.7	19.6	20.5	20.7	21.6	21	48.0
15.0	15.7	16.3	17.0	18.8	19.6	20.6	21.5	21.7	22.6	22	50.0
15.8	16.5	17.1	17.9	19.7	20.5	21.6	22.4	22.7	23.6	23	52.0
16.6	17.4	18.0	18.8	20.6	21.4	22.5	23.4	23.7	24.6	24	54.0
17.5	18.2	18.9	19.7	21.5	22.4	23.5	24.4	24.7	25.6	25	56.0
18.3	19.0	19.8	20.6	22.5	23.3	24.5	25.4	25.7	26.6	26	58.0
19.1	19.9	20.7	21.5	23.4	24.3	25.5	26.3	26.7	27.6	27	60.0
20.0	20.7	21.6	22.3	24.4	25.2	26.4	27.3	27.7	28.6	28	62.0
20.8	21.6	22.4	23.2	25.3	26.2	27.4	28.3	28.7	29.6	29	64.0
21.7	22.4	23.3	24.1	26.3	27.1	28.4	29.3	29.7	30.6	30	66.0
22.5	23.3	24.2	25.0	27.2	28.0	29.4	30.3	30.7	31.6	31	68.0
23.4	24.2	25.1	25.9	28.1	29.0	30.4	31.2	31.7	32.6	32	70.0
24.3	25.1	26.0	26.8	29.1	29.9	31.3	32.2	32.7	33.6	33	72.0
25.2	25.9	26.9	27.6	30.0	30.9	32.3	33.2	33.7	34.6	34	74.0
26.0	26.7	27.7	28.5	31.0	31.8	33.3	34.2	34.7	35.6	35	76.0
26.8	27.6	28.6	29.4	31.9	32.8	34.3	35.2	35.7	36.6	36	78.0
27.7	28.5	29.5	30.3	32.9	33.8	35.3	36.1	36.7	37.6	37	80.0
28.6	29.3	30.4	31.2	33.9	34.7	36.2	37.1	37.7	38.6	38	82.0
29.4	30.2	31.3	32.1	34.8	35.6	37.2	38.1	38.7	39.6	39	84.0
30.3	31.1	32.2	33.0	35.7	36.5	38.2	39.1	39.7	40.6	40	86.0
31.2	32.0	33.1	33.9	36.6	37.4	39.2	40.1	40.7	41.6	41	88.0
32.1	32.9	34.0	34.8	37.5	38.3	40.2	41.1	41.7	42.6	42	90.0
33.0	33.8	34.9	35.7	38.4	39.2	41.2	42.0	42.7	43.6	43	92.0
33.9	34.7	35.8	36.6	39.3	40.1	42.1	43.0	43.7	44.6	44	94.0
34.8	35.6	36.7	37.5	40.2	41.0	43.1	44.0	44.7	45.6	45	96.0
35.7	36.5	37.6	38.4	41.1	41.9	44.1	45.0	45.7	46.6	46	98.0
36.6	37.4	38.5	39.3	42.0	42.8	45.1	46.0	46.7	47.6	47	100.0
37.5	38.3	39.4	40.2	42.9	43.7	46.1	46.9	47.7	48.6	48	102.0
38.4	39.2	40.3	41.1	43.8	44.6	47.0	47.9	48.7	49.6	49	104.0
39.3	40.1	41.2	42.0	44.7	45.5	48.0	48.9	49.7	50.6	50	106.0
40.2	41.0	42.1	42.9	45.6	46.4	49.0	49.9	50.7	51.6	51	108.0
41.1	41.9	43.0	43.8	46.5	47.3	50.0	50.9	51.7	52.6	52	110.0
42.0	42.8	43.9	44.7	47.4	48.2	51.0	51.8	52.7	53.6	53	112.0
42.9	43.7	44.8	45.6	48.3	49.1	51.9	52.8	53.7	54.6	54	114.0
43.8	44.6	45.7	46.5	49.2	50.0	52.9	53.8	54.7	55.6	55	116.0
44.7	45.5	46.6	47.4	50.1	50.9	53.9	54.8	55.7	56.6	56	118.0
45.6	46.4	47.5	48.3	51.0	51.8	54.9	55.8	56.7	57.6	57	120.0
46.5	47.3	48.4	49.2	51.9	52.7	55.9	56.7	57.7	58.6	58	122.0
47.4	48.2	49.3	50.1	52.8	53.6	56.8	57.7	58.7	59.6	59	124.0
48.3	49.1	50.2	51.0	53.7	54.5	57.8	58.7	59.7	60.6	60	126.0
49.2	50.0	51.1	51.9	54.6	55.4	58.8	59.7	60.7	61.6	61	128.0
50.1	50.9	52.0	52.8	55.5	56.3	59.8	60.7	61.7	62.6	62	130.0
51.0	51.8	52.9	53.7	56.4	57.2	60.8	61.6	62.7	63.6	63	132.0
51.9	52.7	53.8	54.6	57.3	58.1	61.7	62.6	63.7	64.6	64	134.0
52.8	53.6	54.7	55.5	58.2	59.0	62.7	63.6	64.7	65.6	65	136.0
53.7	54.5	55.6	56.4	59.1	59.9	63.7	64.6	65.7	66.6	66	138.0
54.6	55.4	56.5	57.3	60.0	60.8	64.7	65.6	66.7	67.6	67	140.0
55.5	56.3	57.4	58.2	60.9	61.7	65.7	66.5	67.7	68.6	68	142.0
56.4	57.2	58.3	59.1	61.8	62.6	66.6	67.5	68.7	69.6	69	144.0
57.3	58.1	59.2	60.0	62.7	63.5	67.6	68.5	69.7	70.6	70	146.0



Intersection Queue Summary  
Existing Storage  
Calculations

Intersection	Movement	Cycle Length		Volumes						No. of Lanes	AM Peak			Midday Peak			PM Peak								
		AM Peak	PM Peak	Passenger Cars			Truck Volumes				Region's Methodology			Region's Methodology			Region's Methodology								
				AM Peak	Midday Peak	PM Peak	AM Peak	Midday Peak	PM Peak		"m" Values	"X" Values	Length	"m" Values	"X" Values	Length	"m" Values	"X" Values	Length						
<b>Bovaird Drive @ Worthington Avenue/Lake Louise Drive</b>																									
	Northbound Left	120	110	41	47	6	0	1	0	1	1.4	0.0	2	0	14	1.6	0.0	2	0	14	0.2	0.0	0	0	0
	Southbound Left	120	110	297	177	152	0	14	5	1	9.9	0.0	12	0	84	5.9	0.5	7	1	66	5.1	0.2	7	0	49
	Eastbound Left	120	110	100	88	241	0	2	5	1	3.3	0.0	12	0	84	2.9	0.1	4	0	28	8.0	0.2	10	0	70
	Westbound Left	120	110	25	31	53	0	1	0	1	0.8	0.0	1	0	7	1.0	0.0	2	0	14	1.8	0.0	3	0	21
<b>Bovaird Drive @ Ashby Field Road</b>																									
	Northbound Left	120	110	66	25	37	1	3	2	1	2.2	0.0	3	0	21	0.8	0.1	1	0	7	1.2	0.1	2	0	14
	Southbound Left	120	110	29	22	177	0	0	0	1	1.0	0.0	2	0	14	0.7	0.0	9	0	63	5.9	0.0	7	0	49
	Eastbound Left	120	110	20	6	6	3	2	0	1	0.7	0.1	1	0	7	0.2	0.1	0	0	0	0.2	0.0	0	0	0
	Westbound Left	120	110	42	19	92	2	0	0	1	1.4	0.1	2	0	14	0.6	0.0	1	0	7	3.1	0.0	4	0	28
<b>Bovaird Drive @ Mississauga Road</b>																									
	Northbound Left	120	110	80	65	202	5	18	20	1	2.7	0.2	4	0	28	2.2	0.6	3	1	38	6.7	0.7	8	1	73
	Southbound Left	120	110	17	12	13	2	2	4	1	0.6	0.1	1	0	7	0.4	0.1	1	0	7	0.4	0.1	1	0	7
	Eastbound Left	120	110	14	11	23	3	7	4	1	0.5	0.1	1	0	7	0.4	0.2	1	0	7	0.8	0.1	1	0	7
	Westbound Left	120	110	285	124	217	25	24	15	1	9.5	0.8	11	1	94	4.1	0.8	5	1	52	7.2	0.5	9	1	80
<b>Bovaird Drive @ Heritage Road</b>																									
	Eastbound Left	88.6	88.6	33	5	25	1	0	0	1	0.8	0.0	1	0	7	0.1	0.0	0	0	0	0.6	0.0	1	0	7
	Westbound Left	88.6	88.6	58	17	21	0	0	0	1	1.4	0.0	2	0	14	0.4	0.0	1	0	7	0.5	0.0	1	0	7

Bovaird Drive EA

Intersection Queue Summary - Peel Region Methodology

2021 Intersection Queue Lengths, Weekday AM Peak Hour

No.	Intersection Movement	Available Storage (m)	Cycle Length (sec.)	Volumes Passenger Cars (veh)	Percent Heavies	Volumes Heavies (veh)	Volumes All Traffic	No. of Lanes	"m" Values	"X" Values	Queue Length (m)
1	<b>Bovaird Drive @ Worthington Avenue</b>										
	Northbound Left	50	120	52	0%	0	52	1	1.7 0.0	2 0	14
	Southbound Left	50	120	240	3%	7	247	1	8.0 0.2	10 0	70
	Eastbound Left	230	120	164	4%	7	171	1	5.5 0.2	7 0	49
	Westbound Left	60	120	12	0%	0	12	1	0.4 0.0	1 0	7
2	<b>Bovaird Drive @ Ashby Field Road</b>			0		0					
	Northbound Left	75	120	156	2%	3	159	1	5.2 0.1	7 0	49
	Southbound Left	100	120	62	0%	0	62	2	1.0 0.0	2 0	14
	Eastbound Left	148	120	45	13%	7	52	1	1.5 0.2	2 0	14
	Westbound Left	110	120	86	5%	5	91	1	2.9 0.2	4 0	28
3	<b>Bovaird Drive @ Mississauga Road</b>										
	Northbound Left	80	140	224	6%	14	238	1	8.7 0.6	11 1	94
	Southbound Left	18	140	77	10%	9	86	1	3.0 0.3	4 1	45
	Eastbound Left	50	140	93	18%	20	113	1	3.6 0.8	5 1	52
	Westbound Left	60	140	526	8%	46	572	1	20.5 1.8	23 2	195
4	<b>Bovaird Drive @ Heritage Road</b>			0		0					
	Northbound Left	30	88.6	24	0%	0	24	1	0.6 0.0	1 0	7
	Southbound Left	30	88.6	16	0%	0	16	1	0.4 0.0	1 0	7
	Eastbound Left	50	88.6	112	3%	3	115	1	2.7 0.1	4 0	28
	Westbound Left	55	88.6	96	0%	0	96	1	2.4 0.0	3 0	21
5	<b>Bovaird Drive @ Creditview Road</b>										
	Northbound Left	40	90	4	2%	0	4	1	0.1 0.0	0 0	0
	Southbound Left	110	90	79	2%	2	81	1	2.0 0.0	3 0	21
	Eastbound Left	180	90	154	2%	3	157	1	3.8 0.1	5 0	35
	Westbound Left	85	90	89	2%	2	91	1	2.2 0.0	3 0	21

Bovaird Drive EA

Intersection Queue Summary - Peel Region Methodology

2021 Intersection Queue Lengths, Weekday PM Peak Hour

No.	Intersection Movement	Available Storage (m)	Cycle Length (sec.)	Volumes Passenger Cars (veh)	Percent Heavies	Volumes Heavies (veh)	Volumes All Traffic	No. of Lanes	"m" Values	"X" Values	Queue Length (m)
1	<b>Bovaird Drive @ Worthington Avenue</b>										
	Northbound Left	50	120	7	0%	0	7	1	0.2 0.0	0 0	0
	Southbound Left	50	120	172	3%	5	177	1	5.7 0.2	7 0	49
	Eastbound Left	230	120	406	2%	8	414	1	13.5 0.3	16 1	129
	Westbound Left	60	120	68	0%	0	68	1	2.3 0.0	3 0	21
2	<b>Bovaird Drive @ Ashby Field Road</b>			0							
	Northbound Left	75	120	42	5%	2	44	1	1.4 0.1	2 0	14
	Southbound Left	100	120	199	0%	0	199	2	3.3 0.0	4 0	28
	Eastbound Left	148	120	14	0%	0	14	1	0.5 0.0	1 0	7
	Westbound Left	110	120	153	0%	0	153	1	5.1 0.0	7 0	49
3	<b>Bovaird Drive @ Mississauga Road</b>			0							
	Northbound Left	80	140	340	9%	34	374	1	13.2 1.3	16 2	146
	Southbound Left	18	140	139	0%	0	139	1	5.4 0.0	7 0	49
	Eastbound Left	50	140	60	15%	11	70	1	2.3 0.4	3 1	38
	Westbound Left	60	140	393	6%	25	418	1	15.3 1.0	18 2	160
4	<b>Bovaird Drive @ Heritage Road</b>			0							
	Northbound Left	30	88.6	68	0%	0	68	1	1.7 0.0	2 0	14
	Southbound Left	30	88.6	66	0%	0	66	1	1.6 0.0	2 0	14
	Eastbound Left	50	88.6	76	0%	0	76	1	1.9 0.0	3 0	21
	Westbound Left	55	88.6	28	0%	0	28	1	0.7 0.0	1 0	7
5	<b>Bovaird Drive @ Creditview Road</b>										
	Northbound Left	40	90	29	2%	1	30	1	0.7 0.0	1 0	7
	Southbound Left	110	90	93	2%	2	95	1	2.3 0.0	3 0	21
	Eastbound Left	180	90	246	2%	5	251	1	6.1 0.1	8 0	56
	Westbound Left	85	90	25	2%	1	26	1	0.6 0.0	1 0	7

Bovaird Drive EA

Intersection Queue Summary - Peel Region Methodology

2031 Intersection Queue Lengths, Weekday AM Peak Hour, With North-South Transportation Corridor

No.	Intersection Movement	Available Storage (m)	Cycle Length (sec.)	Volumes Passenger Cars (veh)	Percent Heavies	Volumes Heavies (veh)	Volumes All Traffic	No. of Lanes	"m" Values	"X" Values	Queue Length (m)
1	<b>Bovaird Drive @ Worthington Avenue</b>										
	Northbound Left	50	120	64	0%	0	64	1	2.1 0.0	3 0	21
	Southbound Left	50	120	243	3%	8	251	1	8.1 0.3	10 0	70
	Eastbound Left	230	120	181	4%	8	189	1	6.0 0.3	8 0	56
	Westbound Left	90	120	14	0%	0	14	1	0.5 0.0	1 0	7
2	<b>Bovaird Drive @ Ashby Field Road</b>										
	Northbound Left	75	120	198	2%	4	202	1	6.6 0.1	8 0	56
	Southbound Left x2	100	120	62	0%	0	62	2	1.0 0.0	2 0	14
	Eastbound Left	148	120	50	13%	7	57	1	1.7 0.2	2 0	14
	Westbound Left	110	120	96	5%	5	101	1	3.2 0.2	4 0	28
3	<b>Bovaird Drive @ Mississauga Road</b>										
	Northbound Left x2	190	140	353	6%	23	375	2	6.9 0.4	8 1	73
	Southbound Left	50	140	95	10%	11	106	1	3.7 0.4	5 1	52
	Eastbound Left	50	140	65	18%	14	79	1	2.5 0.6	3 1	38
	Westbound Left x2	150	140	475	8%	41	516	2	9.2 0.8	11 1	94
4	<b>Bovaird Drive @ Heritage Road</b>										
	Northbound Left	30	88.6	16	0%	0	16	1	0.4 0.0	1 0	7
	Southbound Left	30	88.6	10	0%	0	10	1	0.2 0.0	0 0	0
	Eastbound Left	55	88.6	32	3%	1	33	1	0.8 0.0	1 0	7
	Westbound Left	50	88.6	71	0%	0	71	1	1.7 0.0	2 0	14
5	<b>Bovaird Drive @ Creditview Road</b>										
	Northbound Left	40	140	7	2%	0	7	1	0.3 0.0	0 0	0
	Southbound Left	80	140	152	2%	3	155	1	5.9 0.1	7 0	49
	Eastbound Left x2	80	140	407	2%	8	415	2	7.9 0.2	10 0	70
	Westbound Left	105	140	267	2%	5	272	1	10.4 0.2	12 0	84



Bovaird Drive EA

Intersection Queue Summary - Peel Region Methodology

2031 Intersection Queue Lengths, Weekday PM Peak Hour, With North-South Transportation Corridor

No.	Intersection Movement	Available Storage (m)	Cycle Length (sec.)	Volumes Passenger Cars (veh)	Percent Heavies	Volumes Heavies (veh)	Volumes All Traffic	No. of Lanes	"m" Values	"X" Values	Queue Length (m)
1	<b>Bovaird Drive @ Worthington Avenue</b>										
	Northbound Left	50	120	7	0%	0	7	1	0.2 0.0	0 0	0
	Southbound Left	50	120	189	3%	6	195	1	6.3 0.2	8 0	56
	Eastbound Left	230	120	489	4%	20	509	1	16.3 0.7	19 1	150
	Westbound Left	90	120	69	0%	0	69	1	2.3 0.0	3 0	21
2	<b>Bovaird Drive @ Ashby Field Road</b>										
	Northbound Left	75	120	48	2%	1	49	1	1.6 0.0	2 0	14
	Southbound Left x2	100	120	220	0%	0	220	2	3.7 0.0	5 0	35
	Eastbound Left	148	120	16	13%	2	18	1	0.5 0.1	1 0	7
	Westbound Left	110	120	147	5%	8	155	1	4.9 0.3	6 0	42
3	<b>Bovaird Drive @ Mississauga Road</b>										
	Northbound Left x2	190	140	318	6%	20	338	2	6.2 0.4	8 1	73
	Southbound Left	50	140	88	10%	10	98	1	3.4 0.4	5 1	52
	Eastbound Left	50	140	90	18%	20	110	1	3.5 0.8	5 1	52
	Westbound Left x2	150	140	282	8%	24	306	2	5.5 0.5	7 1	66
4	<b>Bovaird Drive @ Heritage Road</b>										
	Northbound Left	30	88.6	50	0%	0	50	1	1.2 0.0	2 0	14
	Southbound Left	30	88.6	19	0%	0	19	1	0.5 0.0	1 0	7
	Eastbound Left	55	88.6	49	3%	2	51	1	1.2 0.0	2 0	14
	Westbound Left	50	88.6	17	0%	0	17	1	0.4 0.0	1 0	7
5	<b>Bovaird Drive @ Creditview Road</b>										
	Northbound Left	40	140	75	2%	2	77	1	2.9 0.1	4 0	28
	Southbound Left	80	140	202	2%	4	206	1	7.9 0.2	10 0	70
	Eastbound Left x2	80	140	509	2%	10	519	2	9.9 0.2	12 0	84
	Westbound Left	105	140	77	2%	2	79	1	3.0 0.1	4 0	28

Bovaird Drive EA

Intersection Queue Summary - Peel Region Methodology

2031 Intersection Queue Lengths, Weekday AM Peak Hour, Without North-South Transportation Corridor

No.	Intersection Movement	Available Storage (m)	Cycle Length (sec.)	Volumes Passenger Cars (veh)	Percent Heavies	Volumes Heavies (veh)	Volumes All Traffic	No. of Lanes	"m" Values	"X" Values	Queue Length (m)
1	<b>Bovaird Drive @ Worthington Avenue</b>										
	Northbound Left	50	120	58	0%	0	58	1	1.9 0.0	3 0	21
	Southbound Left	50	120	265	3%	8	273	1	8.8 0.3	11 0	77
	Eastbound Left	230	120	181	4%	8	189	1	6.0 0.3	8 0	56
	Westbound Left	90	120	14	0%	0	14	1	0.5 0.0	1 0	7
2	<b>Bovaird Drive @ Ashby Field Road</b>										
	Northbound Left	75	120	172	2%	4	175	1	5.7 0.1	7 0	49
	Southbound Left x2	100	120	68	0%	0	68	2	1.1 0.0	2 0	14
	Eastbound Left	148	120	50	13%	7	57	1	1.7 0.2	2 0	14
	Westbound Left	110	120	96	5%	5	101	1	3.2 0.2	4 0	28
3	<b>Bovaird Drive @ Mississauga Road</b>										
	Northbound Left x2	190	140	273	6%	17	290	2	5.3 0.3	7 1	66
	Southbound Left	50	140	95	10%	11	105	1	3.7 0.4	5 1	52
	Eastbound Left	50	140	113	18%	25	138	1	4.4 1.0	6 1	59
	Westbound Left x2	150	140	108	8%	9	117	2	2.1 0.2	3 0	21
4	<b>Bovaird Drive @ Heritage Road</b>										
	Northbound Left	30	88.6	29	0%	0	29	1	0.7 0.0	1 0	7
	Southbound Left	30	88.6	19	0%	0	19	1	0.5 0.0	1 0	7
	Eastbound Left	55	88.6	137	3%	4	141	1	3.4 0.1	4 0	28
	Westbound Left	50	88.6	117	0%	0	117	1	2.9 0.0	4 0	28
5	<b>Bovaird Drive @ Creditview Road</b>										
	Northbound Left	40	140	6	2%	0	6	1	0.2 0.0	0 0	0
	Southbound Left	80	140	166	2%	3	169	1	6.4 0.1	8 0	56
	Eastbound Left	180	140	616	2%	13	629	1	24.0 0.5	27 1	206
	Westbound Left	105	140	360	2%	7	367	1	14.0 0.3	16 0	112

Bovaird Drive EA

Intersection Queue Summary - Peel Region Methodology

2031 Intersection Queue Lengths, Weekday PM Peak Hour, Without North-South Transportation Corridor

No.	Intersection Movement	Available Storage (m)	Cycle Length (sec.)	Volumes Passenger Cars (veh)	Percent Heavies	Volumes Heavies (veh)	Volumes All Traffic	No. of Lanes	"m" Values	"X" Values	Queue Length (m)
1	<b>Bovaird Drive @ Worthington Avenue</b>										
	Northbound Left	50	120	7	0%	0	7	1	0.2 0.0	0 0	0
	Southbound Left	50	120	189	3%	6	195	1	6.3 0.2	8 0	56
	Eastbound Left	230	120	439	4%	18	457	1	14.6 0.6	17 1	136
	Westbound Left	90	120	75	0%	0	75	1	2.5 0.0	3 0	21
2	<b>Bovaird Drive @ Ashby Field Road</b>					0					
	Northbound Left	75	120	48	2%	1	49	1	1.6 0.0	2 0	14
	Southbound Left x2	100	120	220	0%	0	220	2	3.7 0.0	5 0	35
	Eastbound Left	148	120	14	13%	2	16	1	0.5 0.1	1 0	7
	Westbound Left	110	120	161	5%	8	169	1	5.4 0.3	7 0	49
3	<b>Bovaird Drive @ Mississauga Road</b>					0					
	Northbound Left x2	190	140	429	6%	27	456	2	8.3 0.5	10 1	87
	Southbound Left	50	140	153	10%	17	170	1	6.0 0.7	7 1	66
	Eastbound Left	50	140	70	18%	15	85	1	2.7 0.6	4 1	45
	Westbound Left x2	150	140	468	8%	41	509	2	9.1 0.8	11 1	94
4	<b>Bovaird Drive @ Heritage Road</b>					0					
	Northbound Left	30	88.6	82	0%	0	82	1	2.0 0.0	3 0	21
	Southbound Left	30	88.6	80	0%	0	80	1	2.0 0.0	3 0	21
	Eastbound Left	55	88.6	89	3%	3	92	1	2.2 0.1	3 0	21
	Westbound Left	50	88.6	34	0%	0	34	1	0.8 0.0	1 0	7
5	<b>Bovaird Drive @ Creditview Road</b>										
	Northbound Left	40	140	102	2%	2	104	1	4.0 0.1	5 0	35
	Southbound Left	80	140	352	2%	7	359	1	13.7 0.3	16 0	112
	Eastbound Left	180	140	442	2%	9	451	1	17.2 0.4	20 1	157
	Westbound Left	105	140	84	2%	2	86	1	3.3 0.1	4 0	28



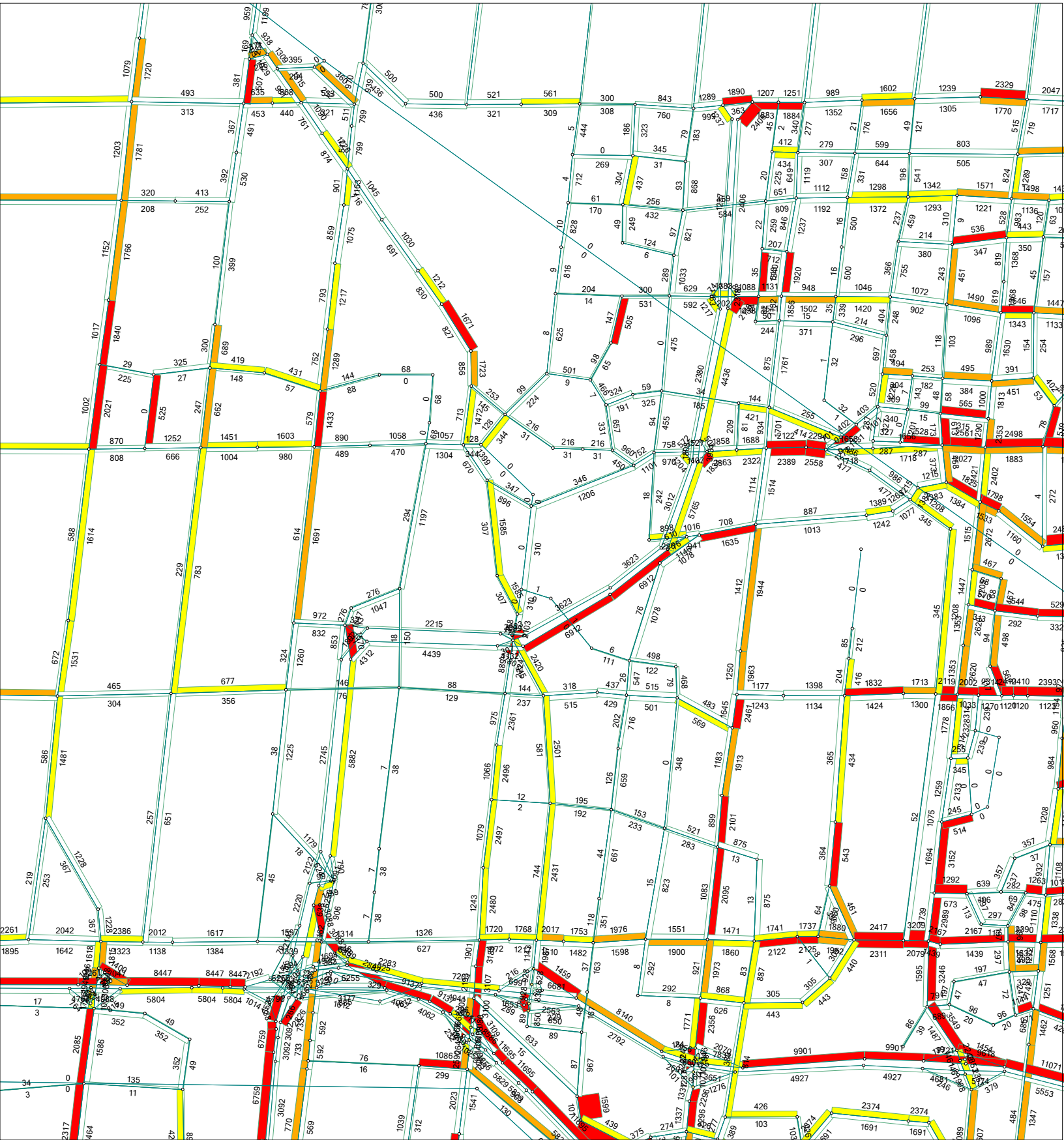


## Appendix E

### HP BATS EMME Model



# HP BATS with NSTC

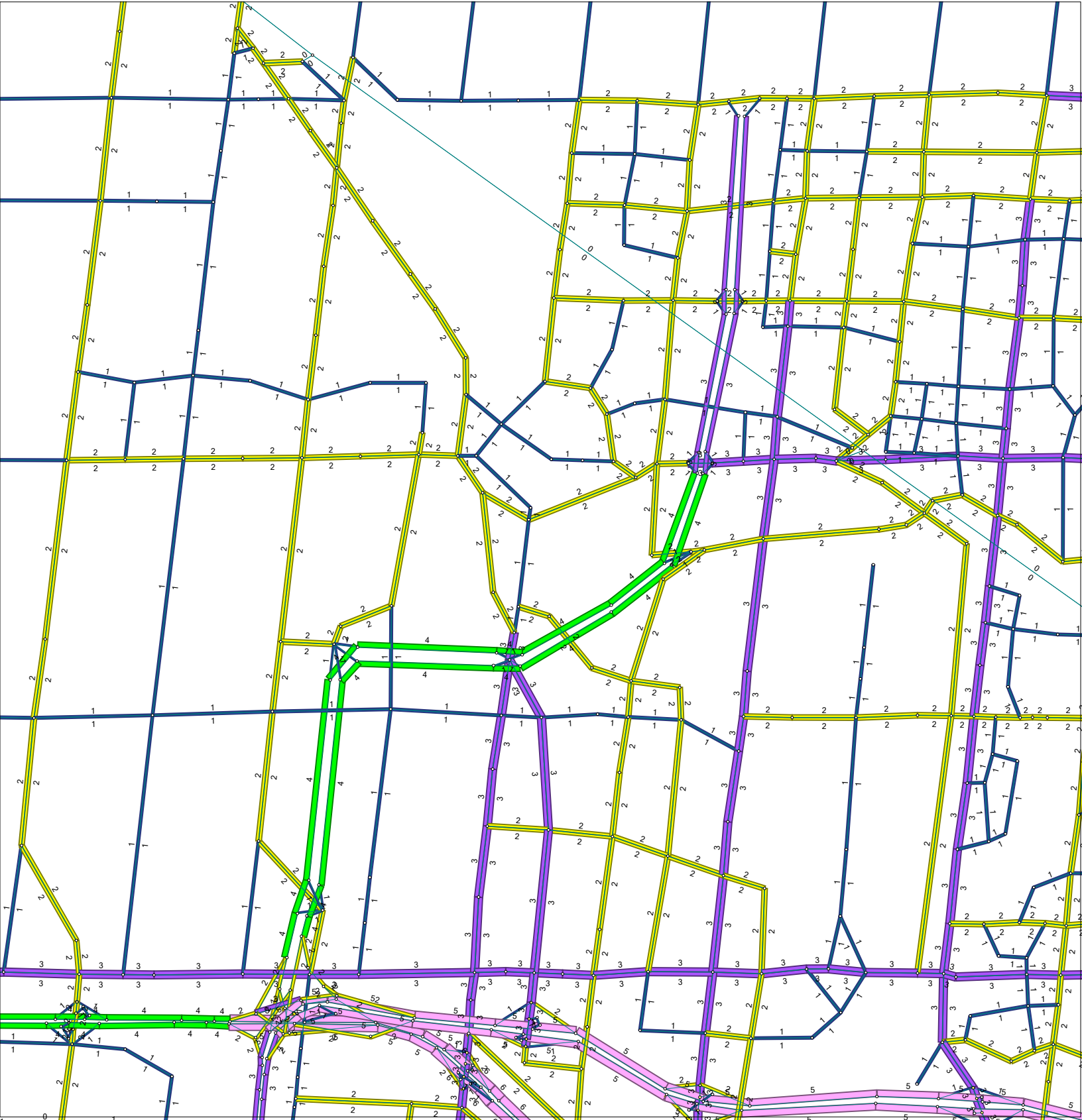


# HP BATS without NSTC





# Lanes







## Appendix F

### RODEL Capacity Output



# RODEL Roundabout Intersection Operations Analysis

## 2021 Conditions

### Bovaird Drive at Caseley Boulevard

PM Peak Hour with North-South Transportation Corridor

```

C:\WINDOWS\system32\cmd.exe
30:1:10      2021 BOVAIRD CASELEY WITH NSIC      4
E <(m)      4.00    4.00    4.00      TIME PERIOD    min    90
L' <(m)     10.00   10.00   10.00     TIME SLICE     min    15
U <(m)       3.50    3.50    3.50     RESULTS PERIOD min   15 75
RAD <(m)     20.00   20.00   20.00     TIME COST      $/hr   15.00
PHI <(d)     30.00   30.00   30.00     FLOW PERIOD    min   15 75
DIA <(m)     40.00   40.00   40.00     FLOW TYPE      pcu/veh UEH
GRAD SEP      0        0        0        FLOW PEAK      am/op/pm PM

LEG NAME     PCU     FLOWS <1st exit 2nd etc...U>  FLOF  CL  FLOW RATIO  FLOW TIME
BOVAIRD EB   1.05    0 25 0      1.00  50 0.75 1.125 0.75 15 45 75
CASELEY ST   1.05    0 1 0      1.00  50 0.75 1.125 0.75 15 45 75
BOVAIRD WB   1.05   176 1 0      1.00  50 0.75 1.125 0.75 15 45 75

MODE 2
FLOW         veh      25      1     177
CAPACITY     veh     1134   1121  1134
AVE DELAY    mins     0.05   0.05  0.06
MAX DELAY    mins     0.07   0.07  0.08
AVE QUEUE    veh       0       0     0
MAX QUEUE    veh       0       0     0
AUDEL s      3.6
L O S        A
VEH HRS      0.2
COST $       3.1

F1mode F2direct F3peak CtrlF3rev F4fact F6stats F8econ F9prnt F10run Esc
    
```

PM Peak Hour without North-South Transportation Corridor

```

C:\WINDOWS\system32\cmd.exe
30:1:10      2021 BOVAIRD CASELEY WITHOUT NSIC   3
E <(m)      4.00    4.00    4.00      TIME PERIOD    min    90
L' <(m)     10.00   10.00   10.00     TIME SLICE     min    15
U <(m)       3.50    3.50    3.50     RESULTS PERIOD min   15 75
RAD <(m)     20.00   20.00   20.00     TIME COST      $/hr   15.00
PHI <(d)     30.00   30.00   30.00     FLOW PERIOD    min   15 75
DIA <(m)     40.00   40.00   40.00     FLOW TYPE      pcu/veh UEH
GRAD SEP      0        0        0        FLOW PEAK      am/op/pm PM

LEG NAME     PCU     FLOWS <1st exit 2nd etc...U>  FLOF  CL  FLOW RATIO  FLOW TIME
BOVAIRD EB   1.05    4 389 0      1.00  50 0.75 1.125 0.75 15 45 75
CASELEY ST   1.05    0 1 0      1.00  50 0.75 1.125 0.75 15 45 75
BOVAIRD WB   1.05   305_ 2 0      1.00  50 0.75 1.125 0.75 15 45 75

MODE 2
FLOW         veh     393      1     307
CAPACITY     veh     1133   924   1134
AVE DELAY    mins     0.08   0.06  0.07
MAX DELAY    mins     0.10   0.08  0.09
AVE QUEUE    veh       1       0     0
MAX QUEUE    veh       1       0     0
AUDEL s      4.5
L O S        A
VEH HRS      0.9
COST $      13.3

F1mode F2direct F3peak CtrlF3rev F4fact F6stats F8econ F9prnt F10run Esc
    
```

# Bovaird Drive at Heritage Road

PM Peak Hour with North-South Transportation Corridor

```

C:\WINDOWS\system32\cmd.exe
4:2:10 2021 BOVAIRD HERITAGE WITH NSIC 9
E <m> 8.00 8.00 8.00 8.00 TIME PERIOD min 90
L' <m> 10.00 10.00 10.00 10.00 TIME SLICE min 15
U <m> 7.00 7.00 7.00 7.00 RESULTS PERIOD min 15 75
RAD <m> 25.00 25.00 25.00 25.00 TIME COST $/hr 15.00
PHI <d> 30.00 30.00 30.00 30.00 FLOW PERIOD min 15 75
DIA <m> 50.00 50.00 50.00 50.00 FLOW TYPE pcu/veh UEH
GRAD SEP 0 0 0 0 FLOW PEAK am/op/pm PM

LEG NAME PCU FLOWS <1st exit 2nd etc...U> FLOF CL FLOW RATIO FLOW TIME
HERITAGESB 1.05 27 35 15 0 1.00 50 0.75 1.125 0.75 15 45 75
BOVAIRD EB 1.05 13 848 42 0 1.00 50 0.75 1.125 0.75 15 45 75
HERITAGENB 1.05 58 99 41 0 1.00 50 0.75 1.125 0.75 15 45 75
BOVAIRD WB 1.05 8 600 14 0 1.00 50 0.75 1.125 0.75 15 45 75

MODE 2
FLOW veh 77 903 198 622
CAPACITY veh 1777 2213 1592 2126 AUDEL s 2.5
AUE DELAY mins 0.03 0.05 0.04 0.04 L O S A
MAX DELAY mins 0.04 0.06 0.06 0.05 UEH HRS 1.3
AUE QUEUE veh 0 1 0 0 COST $ 19.0
MAX QUEUE veh 0 1 0 0

F1mode F2direct F3peak CtrlF3rev F4fact F6stats F8econ F9prnt F10run Esc
    
```

PM Peak Hour without North-South Transportation Corridor

```

C:\WINDOWS\system32\cmd.exe
4:2:10 2021 BOVAIRD HERITAGE NO NSIC 27
E <m> 8.00 8.00 8.00 8.00 TIME PERIOD min 90
L' <m> 10.00 10.00 10.00 10.00 TIME SLICE min 15
U <m> 7.00 7.00 7.00 7.00 RESULTS PERIOD min 15 75
RAD <m> 25.00 25.00 25.00 25.00 TIME COST $/hr 15.00
PHI <d> 30.00 30.00 30.00 30.00 FLOW PERIOD min 15 75
DIA <m> 50.00 50.00 50.00 50.00 FLOW TYPE pcu/veh UEH
GRAD SEP 0 0 0 0 FLOW PEAK am/op/pm PM

LEG NAME PCU FLOWS <1st exit 2nd etc...U> FLOF CL FLOW RATIO FLOW TIME
HERITAGESB 1.05 115 148 66 0 1.00 50 0.75 1.125 0.75 15 45 75
BOVAIRD EB 1.05 24 1538 76 0 1.00 50 0.75 1.125 0.75 15 45 75
HERITAGENB 1.05 96 163 68 0 1.00 50 0.75 1.125 0.75 15 45 75
BOVAIRD WB 1.05 34 1457 19 0 1.00 50 0.75 1.125 0.75 15 45 75

MODE 2
FLOW veh 329 1638 327 1510
CAPACITY veh 1120 2088 1020 2034 AUDEL s 7.8
AUE DELAY mins 0.08 0.15 0.09 0.13 L O S A
MAX DELAY mins 0.11 0.26 0.14 0.20 UEH HRS 8.2
AUE QUEUE veh 0 4 1 3 COST $ 123.3
MAX QUEUE veh 1 6 1 5

F1mode F2direct F3peak CtrlF3rev F4fact F6stats F8econ F9prnt F10run Esc
    
```

# Bovaird Drive at Mississauga Road

PM Peak Hour with North-South Transportation Corridor

```

C:\WINDOWS\system32\cmd.exe
2:2:10 2021 BOVAIRD MISSISSAUGA WITH NSIC 67
E <m> 8.00 11.50 11.50 11.50 TIME PERIOD min 90
L' <m> 10.00 10.00 10.00 10.00 TIME SLICE min 15
U <m> 7.00 10.50 10.50 10.50 RESULTS PERIOD min 15 75
RAD <m> 30.00 35.00 30.00 30.00 TIME COST $/hr 15.00
PHI <d> 20.00 20.00 20.00 20.00 FLOW PERIOD min 15 75
DIA <m> 70.00 70.00 70.00 70.00 FLOW TYPE pcu/veh UEH
GRAD SEP 0 0 0 0 FLOW PEAK am/op/pm PM

LEG NAME PCU FLOWS <1st exit 2nd etc...U> FLOF CL FLOW RATIO FLOW TIME
MISSISS SB 1.05 65 621 80 0 1.00 50 0.75 1.125 0.75 15 45 75
BOVAIRD EB 1.05 308 1506 90 0 1.00 50 0.75 1.125 0.75 15 45 75
MISSISS NB 1.05 424 541 277 0 1.00 50 0.75 1.125 0.75 15 45 75
BOVAIRD WB 1.05 87 1403 251 0 1.00 50 0.75 1.125 0.75 15 45 75

MODE 2
FLOW veh 766 1904 1242 1741
CAPACITY veh 1119 2651 2050 2675 AUDEL s 6.1
AUE DELAY mins 0.24 0.09 0.08 0.07 L O S A
MAX DELAY mins 0.44 0.15 0.13 0.11 UEH HRS 9.5
AUE QUEUE veh 3 3 2 2 COST $ 143.1
MAX QUEUE veh 5 4 2 3

Fmode F2direct F3peak CtrlF3rev F4fact F6stats F8econ F9prnt F10run Esc
Ins
    
```

PM Peak Hour without North-South Transportation Corridor

```

C:\WINDOWS\system32\cmd.exe
2:2:10 2021 BOVAIRD MISSISSAUGA NO NSIC 44
E <m> 8.00 11.50 11.50 11.50 TIME PERIOD min 90
L' <m> 10.00 10.00 10.00 10.00 TIME SLICE min 15
U <m> 7.00 10.50 10.50 10.50 RESULTS PERIOD min 15 75
RAD <m> 30.00 35.00 30.00 30.00 TIME COST $/hr 15.00
PHI <d> 20.00 20.00 20.00 20.00 FLOW PERIOD min 15 75
DIA <m> 70.00 70.00 70.00 70.00 FLOW TYPE pcu/veh UEH
GRAD SEP 0 0 0 0 FLOW PEAK am/op/pm PM

LEG NAME PCU FLOWS <1st exit 2nd etc...U> FLOF CL FLOW RATIO FLOW TIME
MISSISS SB 1.05 113 1082 139 0 1.00 50 0.75 1.125 0.75 15 45 75
BOVAIRD EB 1.05 238 1165 70 0 1.00 50 0.75 1.125 0.75 15 45 75
MISSISS NB 1.05 572 730 374 0 1.00 50 0.75 1.125 0.75 15 45 75
BOVAIRD WB 1.05 86 1231 418 0 1.00 50 0.75 1.125 0.75 15 45 75

MODE 2
FLOW veh 1334 1473 1676 1735
CAPACITY veh 1061 2304 2320 2459 AUDEL s 91.3
AUE DELAY mins 6.75 0.07 0.11 0.09 L O S F
MAX DELAY mins 14.50 0.10 0.18 0.16 UEH HRS 157.7
AUE QUEUE veh 186 2 3 3 COST $ 2365.1
MAX QUEUE veh 290 2 5 4

Fmode F2direct F3peak CtrlF3rev F4fact F6stats F8econ F9prnt F10run Esc
Ins
    
```

# Bovaird Drive at Ashby Field Road

PM Peak Hour with North-South Transportation Corridor

```

C:\WINDOWS\system32\cmd.exe
2:2:10 2021 BOVAIRD ASHBY FIELD WITH NSIC 15
E <m> 8.00 11.50 8.00 11.50 TIME PERIOD min 90
L' <m> 10.00 10.00 10.00 10.00 TIME SLICE min 15
U <m> 7.00 10.50 5.00 10.50 RESULTS PERIOD min 15 75
RAD <m> 25.00 25.00 25.00 25.00 TIME COST $/hr 15.00
PHI <d> 30.00 30.00 30.00 30.00 FLOW PERIOD min 15 75
DIA <m> 65.00 65.00 65.00 65.00 FLOW TYPE pcu/veh UEH
GRAD SEP 0 0 0 0 FLOW PEAK am/op/pm PM

LEG NAME PCU FLOWS <1st exit 2nd etc...U> FLOF CL FLOW RATIO FLOW TIME
ASHBY SB 1.05 52 64 199 0 1.00 50 0.75 1.125 0.75 15 45 75
BOVAIRD EB 1.05 183 2117 17 0 1.00 50 0.75 1.125 0.75 15 45 75
ASHBY NB 1.05 91 15 44 0 1.00 50 0.75 1.125 0.75 15 45 75
BOVAIRD WB 1.05 56 1304 140 0 1.00 50 0.75 1.125 0.75 15 45 75

MODE 2
FLOW veh 315 2317 150 1500
CAPACITY veh 1304 2950 547 3218 AUDEL s 5.0
AVE DELAY mins 0.06 0.11 0.17 0.03 L O S A
MAX DELAY mins 0.08 0.19 0.29 0.05 UEH HRS 5.9
AVE QUEUE veh 0 4 0 1 COST $ 89.0
MAX QUEUE veh 0 7 1 1
Fmode F2direct F3peak CtrlF3rev F4fact F6stats F8econ F9prnt F10run Esc
Ins
    
```

PM Peak Hour without North-South Transportation Corridor

```

C:\WINDOWS\system32\cmd.exe
30:1:10 2021 BOVAIRD ASHBY FIELD NO NSIC 12
E <m> 8.00 11.50 8.00 11.50 TIME PERIOD min 90
L' <m> 10.00 10.00 10.00 10.00 TIME SLICE min 15
U <m> 7.00 10.50 5.00 10.50 RESULTS PERIOD min 15 75
RAD <m> 25.00 25.00 25.00 25.00 TIME COST $/hr 15.00
PHI <d> 30.00 30.00 30.00 30.00 FLOW PERIOD min 15 75
DIA <m> 65.00 65.00 65.00 65.00 FLOW TYPE pcu/veh UEH
GRAD SEP 0 0 0 0 FLOW PEAK am/op/pm PM

LEG NAME PCU FLOWS <1st exit 2nd etc...U> FLOF CL FLOW RATIO FLOW TIME
ASHBY SB 1.05 52 64 199 0 1.00 50 0.75 1.125 0.75 15 45 75
BOVAIRD EB 1.05 159 1841 14 0 1.00 50 0.75 1.125 0.75 15 45 75
ASHBY NB 1.05 91 15 44 0 1.00 50 0.75 1.125 0.75 15 45 75
BOVAIRD WB 1.05 62 1421 153 0 1.00 50 0.75 1.125 0.75 15 45 75

MODE 2
FLOW veh 315 2014 150 1636
CAPACITY veh 1220 2937 709 3221 AUDEL s 3.5
AVE DELAY mins 0.07 0.07 0.11 0.04 L O S A
MAX DELAY mins 0.10 0.11 0.17 0.05 UEH HRS 3.9
AVE QUEUE veh 0 2 0 1 COST $ 59.2
MAX QUEUE veh 0 3 0 1
Fmode F2direct F3peak CtrlF3rev F4fact F6stats F8econ F9prnt F10run Esc
    
```



# Bovaird Drive at Worthington/Lake Louise Drive

PM Peak Hour with North-South Transportation Corridor

```

C:\WINDOWS\system32\cmd.exe
2:2:10 2021 BOVAIRD WORTHINGTON WITH NSIC 12
E <m> 8.00 11.50 4.00 11.50 TIME PERIOD min 90
L' <m> 10.00 10.00 10.00 10.00 TIME SLICE min 15
U <m> 3.50 10.00 3.50 10.00 RESULTS PERIOD min 15 75
RAD <m> 20.00 25.00 20.00 25.00 TIME COST $/hr 15.00
PHI <d> 30.00 30.00 30.00 30.00 FLOW PERIOD min 15 75
DIA <m> 65.00 65.00 65.00 65.00 FLOW TYPE pcu/veh VEH
GRAD SEP 0 0 0 0 FLOW PEAK am/op/pm PM

LEG NAME PCU FLOWS <1st exit 2nd etc...U> FLOF CL FLOW RATIO FLOW TIME
WORTHIN SB 1.05 171 45 177 0 1.00 50 0.75 1.125 0.75 15 45 75
BOVAIRD EB 1.05 58 1036 461 0 1.00 50 0.75 1.125 0.75 15 45 75
WORTHIN NB 1.05 12 33 7 0 1.00 50 0.75 1.125 0.75 15 45 75
BOVAIRD WB 1.05 227 1210 62 0 1.00 50 0.75 1.125 0.75 15 45 75

MODE 2
FLOW veh 393 1555 52 1499
CAPACITY veh 882 2980 388 2805 AUDEL s 3.3
AUE DELAY mins 0.13 0.04 0.19 0.05 L O S A
MAX DELAY mins 0.19 0.06 0.28 0.07 VEH HRS 3.2
AUE QUEUE veh 1 1 0 1 COST $ 48.4
MAX QUEUE veh 1 1 0 1

F1mode F2direct F3peak CtrlF3rev F4fact F6stats F8econ F9prnt F10run Esc
Ins
    
```

PM Peak Hour without North-South Transportation Corridor

```

C:\WINDOWS\system32\cmd.exe
2:2:10 2021 BOVAIRD WORTHINGTON NO NSIC 11
E <m> 8.00 11.50 4.00 11.50 TIME PERIOD min 90
L' <m> 10.00 10.00 10.00 10.00 TIME SLICE min 15
U <m> 3.50 10.00 3.50 10.00 RESULTS PERIOD min 15 75
RAD <m> 20.00 25.00 20.00 25.00 TIME COST $/hr 15.00
PHI <d> 30.00 30.00 30.00 30.00 FLOW PERIOD min 15 75
DIA <m> 65.00 65.00 65.00 65.00 FLOW TYPE pcu/veh VEH
GRAD SEP 0 0 0 0 FLOW PEAK am/op/pm PM

LEG NAME PCU FLOWS <1st exit 2nd etc...U> FLOF CL FLOW RATIO FLOW TIME
WORTHIN SB 1.05 171 45 177 0 1.00 50 0.75 1.125 0.75 15 45 75
BOVAIRD EB 1.05 52 930 414 0 1.00 50 0.75 1.125 0.75 15 45 75
WORTHIN NB 1.05 12 33 7 0 1.00 50 0.75 1.125 0.75 15 45 75
BOVAIRD WB 1.05 247 1316 68 0 1.00 50 0.75 1.125 0.75 15 45 75

MODE 2
FLOW veh 393 1396 52 1631
CAPACITY veh 824 2975 456 2843 AUDEL s 3.4
AUE DELAY mins 0.15 0.04 0.15 0.05 L O S A
MAX DELAY mins 0.23 0.05 0.22 0.07 VEH HRS 3.3
AUE QUEUE veh 1 1 0 1 COST $ 49.9
MAX QUEUE veh 1 1 0 2

F1mode F2direct F3peak CtrlF3rev F4fact F6stats F8econ F9prnt F10run Esc
Ins
    
```



## 2031 Conditions

### Bovaird Drive at Caseley Boulevard

PM Peak Hour with North-South Transportation Corridor

```

C:\WINDOWS\system32\cmd.exe
30:1:10      2031 BOVAIRD CASELEY WITH NSIC      3
E <m> 4.00 4.00 4.00      TIME PERIOD min 90
L' <m> 10.00 10.00 10.00    TIME SLICE min 15
U <m> 3.50 3.50 3.50      RESULTS PERIOD min 15 75
RAD <m> 20.00 20.00 20.00    TIME COST $/hr 15.00
PHI <d> 30.00 30.00 30.00    FLOW PERIOD min 15 75
DIA <m> 40.00 40.00 40.00    FLOW TYPE pcu/veh UEH
GRAD SEP 0 0 0      FLOW PEAK am/op/pm PM

LEG NAME PCU FLOWS <1st exit 2nd etc...U> FLOF CL FLOW RATIO FLOW TIME
BOVAIRD EB 1.05 0 31 0 1.00 50 0.75 1.125 0.75 15 45 75
CASELEY ST 1.05 0 1 0 1.00 50 0.75 1.125 0.75 15 45 75
BOVAIRD WB 1.05 215 1 0 1.00 50 0.75 1.125 0.75 15 45 75

MODE 2
FLOW veh 31 1 216
CAPACITY veh 1134 1118 1134
AVE DELAY mins 0.05 0.05 0.06
MAX DELAY mins 0.07 0.07 0.08
AVE QUEUE veh 0 0 0
MAX QUEUE veh 0 0 0
AUDEL s 3.8
L O S A
VEH HRS 0.3
COST $ 3.9

F1mode F2direct F3peak CtrlF3rev F4fact F6stats F8econ F9prnt F10run Esc
  
```

PM Peak Hour without North-South Transportation Corridor

```

C:\WINDOWS\system32\cmd.exe
30:1:10      2031 BOVAIRD CASELEY WITHOUT NSIC    2
E <m> 4.00 4.00 4.00      TIME PERIOD min 90
L' <m> 10.00 10.00 10.00    TIME SLICE min 15
U <m> 3.50 3.50 3.50      RESULTS PERIOD min 15 75
RAD <m> 20.00 20.00 20.00    TIME COST $/hr 15.00
PHI <d> 30.00 30.00 30.00    FLOW PERIOD min 15 75
DIA <m> 40.00 40.00 40.00    FLOW TYPE pcu/veh UEH
GRAD SEP 0 0 0      FLOW PEAK am/op/pm PM

LEG NAME PCU FLOWS <1st exit 2nd etc...U> FLOF CL FLOW RATIO FLOW TIME
BOVAIRD EB 1.05 5 477 0 1.00 50 0.75 1.125 0.75 15 45 75
CASELEY ST 1.05 0 1 0 1.00 50 0.75 1.125 0.75 15 45 75
BOVAIRD WB 1.05 373 2_ 0 1.00 50 0.75 1.125 0.75 15 45 75

MODE 2
FLOW veh 482 1 375
CAPACITY veh 1133 877 1134
AVE DELAY mins 0.09 0.07 0.08
MAX DELAY mins 0.12 0.09 0.10
AVE QUEUE veh 1 0 0
MAX QUEUE veh 1 0 1
AUDEL s 5.1
L O S A
VEH HRS 1.2
COST $ 18.2

F1mode F2direct F3peak CtrlF3rev F4fact F6stats F8econ F9prnt F10run Esc
  
```

# Bovaird Drive at Heritage Road

## PM Peak Hour with North-South Transportation Corridor

```

C:\WINDOWS\system32\cmd.exe
4:2:10      2031 BOVAIRD HERITAGE WITH NSIC      10
E <m>      8.00      8.00      8.00      8.00      TIME PERIOD   min   90
L' <m>     10.00     10.00     10.00     10.00     TIME SLICE    min   15
U <m>      7.00      7.00      7.00      7.00     RESULTS PERIOD min  15 75
RAD <m>    25.00    25.00    25.00    25.00     TIME COST     $/hr  15.00
PHI <d>    30.00    30.00    30.00    30.00     FLOW PERIOD   min   15 75
DIA <m>    50.00    50.00    50.00    50.00     FLOW TYPE     pcu/veh UEH
GRAD SEP   0         0         0         0         FLOW PEAK     am/op/pm PM

LEG NAME   PCU   FLOWS <1st exit 2nd etc...U>  FLOF  CL   FLOW RATIO   FLOW TIME
HERITAGESB 1.05   33   42   19   0     1.00 50 0.75 1.125 0.75 15 45 75
BOVAIRD EB 1.05   16 1034 51   0     1.00 50 0.75 1.125 0.75 15 45 75
HERITAGENB 1.05   71  121 50   0     1.00 50 0.75 1.125 0.75 15 45 75
BOVAIRD WB 1.05   10  731 10   0     1.00 50 0.75 1.125 0.75 15 45 75

MODE 2
FLOW      veh      94   1101  242   751
CAPACITY  veh     1676 2208  1445 2097
AVE DELAY mins    0.04 0.05 0.05 0.04
MAX DELAY mins    0.05 0.07 0.07 0.06
AVE QUEUE  veh      0     1     0     1
MAX QUEUE  veh      0     1     0     1
AUDEL s    2.9
L O S      A
UEH HRS    1.8
COST $     26.9

F1node F2direct F3peak CtrlF3rev F4fact F6stats F8econ F9prnt F10run Esc
    
```

## PM Peak Hour without North-South Transportation Corridor

```

C:\WINDOWS\system32\cmd.exe
4:2:10      2031 BOVAIRD HERITAGE NO NSIC      29
E <m>      8.00      8.00      8.00      8.00      TIME PERIOD   min   90
L' <m>     10.00     10.00     10.00     10.00     TIME SLICE    min   15
U <m>      7.00      7.00      7.00      7.00     RESULTS PERIOD min  15 75
RAD <m>    25.00    25.00    25.00    25.00     TIME COST     $/hr  15.00
PHI <d>    30.00    30.00    30.00    30.00     FLOW PERIOD   min   15 75
DIA <m>    50.00    50.00    50.00    50.00     FLOW TYPE     pcu/veh UEH
GRAD SEP   0         0         0         0         FLOW PEAK     am/op/pm PM

LEG NAME   PCU   FLOWS <1st exit 2nd etc...U>  FLOF  CL   FLOW RATIO   FLOW TIME
HERITAGESB 1.05   141  181  80   0     1.00 50 0.75 1.125 0.75 15 45 75
BOVAIRD EB 1.05   29 1875 92   0     1.00 50 0.75 1.125 0.75 15 45 75
HERITAGENB 1.05   117  199  82   0     1.00 50 0.75 1.125 0.75 15 45 75
BOVAIRD WB 1.05   34 1457 19   0     1.00 50 0.75 1.125 0.75 15 45 75

MODE 2
FLOW      veh      402  1996  398  1510
CAPACITY  veh     1110 2054  769  1986
AVE DELAY mins    0.09 1.28 0.16 0.14
MAX DELAY mins    0.13 2.78 0.25 0.23
AVE QUEUE  veh      1     46   1     4
MAX QUEUE  veh      1     95   2     5
AUDEL s    40.0
L O S      E
UEH HRS    47.8
COST $    717.5

F1node F2direct F3peak CtrlF3rev F4fact F6stats F8econ F9prnt F10run Esc
    
```

# Bovaird Drive at Mississauga Road

PM Peak Hour with North-South Transportation Corridor

```

C:\WINDOWS\system32\cmd.exe
2:2:10      2031 BOVAIRD MISSISSAUGA WITH NSIC      38
E <m> 11.50 15.50 11.50 11.50      TIME PERIOD min 90
L' <m> 10.00 10.00 10.00 10.00     TIME SLICE min 15
U <m> 10.50 10.50 10.50 10.50     RESULTS PERIOD min 15 75
RAD <m> 30.00 30.00 30.00 30.00    TIME COST $/hr 15.00
PHI <d> 20.00 20.00 20.00 20.00    FLOW PERIOD min 15 75
DIA <m> 70.00 70.00 70.00 70.00    FLOW TYPE pcu/veh UEH
GRAD SEP 0 0 0 0      FLOW PEAK am/op/pm PM

LEG NAME  PCU  FLOWS <1st exit 2nd etc...U>  FLOF  CL  FLOW RATIO  FLOW TIME
MISSISS SB 1.05  79  757  98  0  1.00  50  0.75  1.125  0.75  15  45  75
BOVAIRD EB 1.05  375 1836 110 0  1.00  50  0.75  1.125  0.75  15  45  75
MISSISS NB 1.05  516 660  338 0  1.00  50  0.75  1.125  0.75  15  45  75
BOVAIRD WB 1.05  106 1710 306 0  1.00  50  0.75  1.125  0.75  15  45  75

MODE 2
FLOW      veh      934  2321  1514  2122
CAPACITY  veh      1500  2755  1751  2513
AVE DELAY mins    0.13  0.25  0.80  0.22
MAX DELAY mins    0.23  0.51  1.91  0.44
AVE QUEUE  veh       2  10  20  8
MAX QUEUE  veh       3  18  49  14
AUDEL s    20.7
L O S      C
VEH HRS    39.6
COST $     593.7

F1mode F2direct F3peak CtrlF3rev F4fact F6stats F8econ F9prnt F10run Esc
Ins
    
```

PM Peak Hour without North-South Transportation Corridor

```

C:\WINDOWS\system32\cmd.exe
2:2:10      2031 BOVAIRD MISSISSAUGA NO NSIC      32
E <m> 11.50 15.50 11.50 11.50      TIME PERIOD min 90
L' <m> 10.00 10.00 10.00 10.00     TIME SLICE min 15
U <m> 10.50 10.50 10.50 10.50     RESULTS PERIOD min 15 75
RAD <m> 30.00 30.00 30.00 30.00    TIME COST $/hr 15.00
PHI <d> 20.00 20.00 20.00 20.00    FLOW PERIOD min 15 75
DIA <m> 70.00 70.00 70.00 70.00    FLOW TYPE pcu/veh UEH
GRAD SEP 0 0 0 0      FLOW PEAK am/op/pm PM

LEG NAME  PCU  FLOWS <1st exit 2nd etc...U>  FLOF  CL  FLOW RATIO  FLOW TIME
MISSISS SB 1.05  138 1319 170 0  1.00  50  0.75  1.125  0.75  15  45  75
BOVAIRD EB 1.05  290 1420  85 0  1.00  50  0.75  1.125  0.75  15  45  75
MISSISS NB 1.05  697 890  456 0  1.00  50  0.75  1.125  0.75  15  45  75
BOVAIRD WB 1.05  105 1501 509 0  1.00  50  0.75  1.125  0.75  15  45  75

MODE 2
FLOW      veh      1627  1795  2043  2115
CAPACITY  veh      1424  2225  2073  2287
AVE DELAY mins    4.61  0.15  2.02  0.58
MAX DELAY mins   10.29  0.26  4.27  1.30
AVE QUEUE  veh     156  5  78  21
MAX QUEUE  veh     251  7  154  44
AUDEL s    104.0
L O S      F
VEH HRS    219.0
COST $     3285.4

F1mode F2direct F3peak CtrlF3rev F4fact F6stats F8econ F9prnt F10run Esc
Ins
    
```

# Bovaird Drive at Ashby Field Road

PM Peak Hour with North-South Transportation Corridor

```

C:\WINDOWS\system32\cmd.exe
30:1:10      2031 BOVAIRD ASHBY FIELD WITH NSIC      10
E <m>      8.00  11.50  8.00  11.50      TIME PERIOD   min   90
L' <m>     10.00 10.00 10.00 10.00      TIME SLICE    min   15
U <m>      7.00  10.50  5.00  10.50      RESULTS PERIOD min  15 75
RAD <m>    25.00 25.00 25.00 25.00      TIME COST     $/hr  15.00
PHI <d>    30.00 30.00 30.00 30.00      FLOW PERIOD   min  15 75
DIA <m>    65.00 65.00 65.00 65.00      FLOW TYPE     pcu/veh UEH
GRAD SEP   0      0      0      0      FLOW PEAK    am/op/pm PM

LEG NAME   PCU   FLOWS <1st exit 2nd etc...U>  FLOF  CL   FLOW RATIO   FLOW TIME
ASHBY SB   1.05   57   71  220  0      1.00  50  0.75 1.125 0.75 15 45 75
BOVAIRD EB 1.05   202 2338 18  0      1.00  50  0.75 1.125 0.75 15 45 75
ASHBY NB   1.05   101  16  49  0      1.00  50  0.75 1.125 0.75 15 45 75
BOVAIRD WB 1.05    62 1441 155 0      1.00  50  0.75 1.125 0.75 15 45 75

MODE 2
FLOW      veh      348  2558  166  1658
CAPACITY  veh      1203 2915  406  3212
AVE DELAY mins    0.07  0.30  0.38  0.04
MAX DELAY mins    0.10  0.63  0.77  0.05
AVE QUEUE  veh      0      13    1    1
MAX QUEUE  veh      1      25    2    1
AUDEL s    11.6
L O S      B
VEH HRS    15.2
COST $     228.2

F1mode F2direct F3peak CtrlF3rev F4fact F6stats F8econ F9prnt F10run Esc
    
```

PM Peak Hour without North-South Transportation Corridor

```

C:\WINDOWS\system32\cmd.exe
30:1:10      2031 BOVAIRD ASHBY FIELD NO NSIC      11
E <m>      8.00  11.50  8.00  11.50      TIME PERIOD   min   90
L' <m>     10.00 10.00 10.00 10.00      TIME SLICE    min   15
U <m>      7.00  10.50  5.00  10.50      RESULTS PERIOD min  15 75
RAD <m>    25.00 25.00 25.00 25.00      TIME COST     $/hr  15.00
PHI <d>    30.00 30.00 30.00 30.00      FLOW PERIOD   min  15 75
DIA <m>    65.00 65.00 65.00 65.00      FLOW TYPE     pcu/veh UEH
GRAD SEP   0      0      0      0      FLOW PEAK    am/op/pm PM

LEG NAME   PCU   FLOWS <1st exit 2nd etc...U>  FLOF  CL   FLOW RATIO   FLOW TIME
ASHBY SB   1.05   57   71  220  0      1.00  50  0.75 1.125 0.75 15 45 75
BOVAIRD EB 1.05   175 2034 16  0      1.00  50  0.75 1.125 0.75 15 45 75
ASHBY NB   1.05   101  16  49  0      1.00  50  0.75 1.125 0.75 15 45 75
BOVAIRD WB 1.05    68 1570 169_ 0      1.00  50  0.75 1.125 0.75 15 45 75

MODE 2
FLOW      veh      348  2225  166  1807
CAPACITY  veh      1111 2903  584  3214
AVE DELAY mins    0.08  0.10  0.16  0.04
MAX DELAY mins    0.12  0.17  0.27  0.06
AVE QUEUE  veh      0      4      0    1
MAX QUEUE  veh      1      6      1    2
AUDEL s    4.7
L O S      A
VEH HRS    6.0
COST $     89.4

F1mode F2direct F3peak CtrlF3rev F4fact F6stats F8econ F9prnt F10run Esc
    
```

# Bovaird Drive at Worthington/Lake Louise Drive

PM Peak Hour with North-South Transportation Corridor

```

C:\WINDOWS\system32\cmd.exe
30:1:10      2031 BOVAIRD WORTHINGTON WITH NSIC      7
E <m>      8.00  11.50  4.00  11.50      TIME PERIOD      min      90
L' <m>     10.00  10.00  10.00  10.00      TIME SLICE       min      15
U <m>      3.50  10.00  3.50  10.00      RESULTS PERIOD   min     15 75
RAD <m>    25.00  25.00  20.00  25.00      TIME COST        $/hr    15.00
PHI <d>    30.00  30.00  30.00  30.00      FLOW PERIOD      min     15 75
DIA <m>    65.00  65.00  65.00  65.00      FLOW TYPE        pcu/veh  UEH
GRAD SEP   0      0      0      0      FLOW PEAK        am/op/pm  PM

LEG NAME   PCU   FLOWS <1st exit 2nd etc...U>  FLOF  CL   FLOW RATIO   FLOW TIME
WORTHIN SB 1.05  189   50   195   0    1.00  50  0.75  1.125  0.75  15 45 75
BOVAIRD EB 1.05  64  1145  509   0    1.00  50  0.75  1.125  0.75  15 45 75
WORTHIN NB 1.05  14   36   7     0    1.00  50  0.75  1.125  0.75  15 45 75
BOVAIRD WB 1.05  251  1336  69   0    1.00  50  0.75  1.125  0.75  15 45 75

MODE 2
FLOW      veh      434  1718  57  1656
CAPACITY  veh      821  2956  310 2764
AVE DELAY mins  0.17  0.05  0.27  0.06
MAX DELAY mins  0.27  0.07  0.43  0.08
AVE QUEUE veh      1     1     0     2
MAX QUEUE  veh      2     2     0     2
AUDEL s    4.1
L O S      A
VEH HRS    4.4
COST $     65.8

F1mode F2direct F3peak CtrlF3rev F4fact F6stats F8econ F9prnt F10run Esc
    
```

PM Peak Hour without North-South Transportation Corridor

```

C:\WINDOWS\system32\cmd.exe
30:1:10      2031 BOVAIRD WORTHINGTON NO NSIC      8
E <m>      8.00  11.50  4.00  11.50      TIME PERIOD      min      90
L' <m>     10.00  10.00  10.00  10.00      TIME SLICE       min      15
U <m>      3.50  10.00  3.50  10.00      RESULTS PERIOD   min     15 75
RAD <m>    25.00  25.00  20.00  25.00      TIME COST        $/hr    15.00
PHI <d>    30.00  30.00  30.00  30.00      FLOW PERIOD      min     15 75
DIA <m>    65.00  65.00  65.00  65.00      FLOW TYPE        pcu/veh  UEH
GRAD SEP   0      0      0      0      FLOW PEAK        am/op/pm  PM

LEG NAME   PCU   FLOWS <1st exit 2nd etc...U>  FLOF  CL   FLOW RATIO   FLOW TIME
WORTHIN SB 1.05  189   50   195   0    1.00  50  0.75  1.125  0.75  15 45 75
BOVAIRD EB 1.05  58  1027  457   0    1.00  50  0.75  1.125  0.75  15 45 75
WORTHIN NB 1.05  14   36   7     0    1.00  50  0.75  1.125  0.75  15 45 75
BOVAIRD WB 1.05  273  1454  75   0    1.00  50  0.75  1.125  0.75  15 45 75

MODE 2
FLOW      veh      434  1542  57  1802
CAPACITY  veh      756  2951  386 2806
AVE DELAY mins  0.21  0.04  0.19  0.06
MAX DELAY mins  0.35  0.06  0.29  0.09
AVE QUEUE veh      2     1     0     2
MAX QUEUE  veh      2     1     0     3
AUDEL s    4.4
L O S      A
VEH HRS    4.7
COST $     70.0

F1mode F2direct F3peak CtrlF3rev F4fact F6stats F8econ F9prnt F10run Esc
    
```

# Bovaird Drive at Creditview Road/James Potter Road

PM Peak Hour with North-South Transportation Corridor

2031 BOVAIRD CREDITVIEW WITH NSIC												
E	<m>	11.50	11.50	8.00	15.50	TIME PERIOD	min					90
L'	<m>	10.00	10.00	10.00	10.00	TIME SLICE	min					15
U	<m>	10.50	10.50	7.00	10.50	RESULTS PERIOD	min	15				75
RAD	<m>	25.00	25.00	25.00	25.00	TIME COST	\$/hr					15.00
PHI	<d>	30.00	30.00	30.00	30.00	FLOW PERIOD	min					15 75
DIA	<m>	70.00	70.00	70.00	70.00	FLOW TYPE	pcu/veh					UEH
GRAD SEP		0	0	0	0	FLOW PEAK	am/op/pm					PM
LEG NAME	PCU	FLOWS <1st exit 2nd etc...U>				FLOF	CL	FLOW RATIO				FLOW TIME
CREDITVIEW	1.05	415	379	206	0	1.00	50	0.75	1.125	0.75	15 45 75	
BOVAIRD WB	1.05	155	1314	79	0	1.00	50	0.75	1.125	0.75	15 45 75	
JAMES POTT	1.05	272	724	77	0	1.00	50	0.75	1.125	0.75	15 45 75	
BOVAIRD EB	1.05	7	1925	519	0	1.00	50	0.75	1.125	0.75	15 45 75	
MODE 2												
FLOW	veh	1000	1548	1073	2451					AUDEL	s	17.4
CAPACITY	veh	1310	2418	1279	2883					L O S		C
AUE DELAY	mins	0.48	0.07	0.61	0.21					UEH HRS		29.4
MAX DELAY	mins	1.09	0.11	1.33	0.43					COST	\$	440.7
AUE QUEUE	veh	8	2	11	9							
MAX QUEUE	veh	17	3	23	16							
F1mode F2direct F3peak CtrlF3rev F4fact F6stats F8econ F9prnt F10run Esc Ins												